Federal Democratic Republic of Ethiopia
Ethiopian Roads Authority (ERA)

Consultancy Services for the Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia

(Credit No. 45610-ET: IDA Funded)

Final Report

Intercontinental Consultants and Technocrats Pvt. Ltd.
A-8, Green Park, New Delhi - 110 016, India

in association with

International Consultants and Technocrats Ethiopia Private Limited Company
House No.2082, Bole Sub City, Kebele 0305,
P.O. Box 279, Addis Ababa, Ethiopia
(as Sub Consultant)

December 2011

INTERCONTINENTAL CONSULTANTS AND TECHNOCRATS PVT. LTD.
Consultancy Services for Maintenance Needs Assessment and Updating of Road Financing Study (APL-4) Credit No. 45610-ET
Higher 17, Kebele 03/05, House # 2082, PO Box (Code 1110) 279,
Addis Ababa, Ethiopia: Tel: +251-11-6187256/57; Fax: +251-11-6627262; E-Mail: ictaa@ethionet.et

Ref. No. ICT: POE: RFS: 046
December 31, 2011

Ato Zaid W/Gebriel
Director General
Ethiopian Roads Authority
PO Box 1770
Addis Ababa, Ethiopia

Kind Attention: Ato Daniel Mengestie, Planning & Program Management Directorate Director

Subject: Consultancy Services for Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia – Submission of the Final Report

Dear Sir,

We are pleased to submit the Final Report on the Consultancy Services for Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia (five hard copies and three CDs). The Final Report has been prepared after having incorporated the comments given by the Clients and the Stakeholders during the Workshop on the Draft Final Report. We hope that you find the Report in order.

Thanking you and assuring you of our best attention.

Yours sincerely,

Satyakam
Team Leader

CC:
Ms. Fiona J. Collin, Sr. Transport Engineer (AFTTR), The World Bank, Ethiopia Country Office, Addis Ababa (two copies).

Head Office: A-8, Green Park, New Delhi - 110 016, INDIA,
Telephone: +91-11-26964757, 26863000; Fax:: +91-11-26855252
E-mail: cmd@ictonline.com; Website: www.ictonline.com

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

EXECUTIVE SUMMARY E-1to E-23

1. INTRODUCTION

1.1 General 1
1.2 Study Goals & Objective 1
1.3 The Present Report 2
1.4 Background 3
1.5 Road Maintenance in Ethiopia 4
1.5.1 Maintenance Needs 4
1.5.2 Maintenance Financing 4
1.6 The Report Coverage 4
1.7 Structure of the Report 5

2. ROAD DEVELOPMENT IN ETHIOPIA

2.1 General 1
2.2 Economic Indicators – A review 2
2.2.1 GDP Growth 2
2.2.2 Demographic Indicators 4
2.2.3 Macroeconomic Policy 4
2.2.4 External Position 5
2.3 Road Network in Ethiopia 5
2.4 Overall Road Condition in Ethiopia 7
2.5 Road Sector Institutions 7
2.6 Road Sector Development Programs (RSDPs) 8
2.6.1 Impact of RSDPs (1997-2010) 8
2.6.2 Plan Under RDSP IV 8
2.6.3 Targets for RSDP IV 9
2.6.4 Classified Road Network – Planned 9
2.6.5 Road Network with Wereda Roads 11
2.7 Road Transport System in Ethiopia 11
2.8 Level of Traffic on Ethiopia Roads 12
2.8.1 Traffic Flow Pattern 13
2.8.2 Road Surface & Traffic Type 13
2.8.3 Transport Output 14
2.9 Road Accident 14
2.10 Sum Up & Major Issues 15

3. ROAD MAINTENANCE PRACTICES: INTERNATIONAL AND ETHIOPIA

3.1 General 1
3.2 Road Maintenance Practices in Ethiopia 1
3.3 Road Maintenance Practices – International 3
3.3.1 Ghana 3
3.3.2 South Africa 4
3.3.3 Tanzania 5
3.3.4 India 5

3.3.5 AASTHO (USA) 6
3.3.6 ARRB Transport Research 7
3.3.7 International Road Maintenance Practices: Sum up 8
3.4 Ethiopian Road Maintenance Practices: Comments & Sum Up 8
3.4.1 Paved Roads (AC Surface) 8
3.4.2 Rigid Pavements 9
3.4.3 Paved Shoulders 9
3.4.4 Shoulder Rehabilitation 9
3.4.5 Roadside Routine Work 9
3.4.6 Structures 9
3.4.7 Day works 10
3.4.8 Betterment 10
3.4.9 Other Routine Maintenance 10
3.4.10 Dust Control Applications 10
3.4.11 Road Safety Measures 10
3.4.12 Road Inventory and Pavement Condition Survey 10
3.4.13 Traffic & Axle Load Surveys 11
3.4.14 Activities Not Under Maintenance 11
3.5 Major Issues 11

4. ELIGIBILITY MAINTENANCE WORKS AND PRIORITIZATION

4.1 Introduction 1
4.2 Maintenance Plan and Interventions: Pre-Requisites 1
4.2.1 Maintenance Needs Assessment 1
4.2.2 Proper Database 2
4.2.3 Periodic Maintenance and Rehabilitation 2
4.2.4 Traffic Volume 3
4.2.5 Technical Specifications 3
4.2.6 Calculations & Supporting Documentation 3
4.2.7 Approval of Full Allocations of Funds 3
4.2.8 Technological Choice 4
4.2.9 Performance based Road Management and Maintenance Contracts 6
4.2.10 Equipment Needs & Support 7
4.2.11 Maintenance of Cross Drainage Structures 8
4.2.12 Diagnosing the Cause of Deterioration 9
4.2.13 Skill & Productivity of Labor 9
4.2.14 Overloading 9
4.2.15 Life Cycle Cost Analysis 9
4.2.16 Training of the Staff 10
4.3 Maintenance Activities Eligible for ORF Financing 10
4.3.1 General 10
4.3.2 Road Safety Measures 10
4.4 Eligibility Criteria of Maintenance Works 12
4.4.1 Essential & Basic Criteria 12
4.4.2 Highly Desirable 16
4.4.3 Desirable 16
4.5 List of Eligible Road Maintenance Works for ORF Financing 19
4.6 Prioritization of Maintenance Works – Within Road Agencies 34
4.6.1 Rational & Priority Criteria 34
4.6.2 Influencing Factors 34
4.6.3 Ranking Procedures 36

4.6.4 Limitations 37

5. Road Maintenance Unit Cost in Ethiopia

5.1 Introduction 1
5.1.1 Application of Unit Costs 1
5.2 Estimation of Road Maintenance Costs 1
5.2.1 Direct Cost 2
5.2.2 Indirect Cost 2
5.2.3 Overhaul 5
5.3 Approach & Methodology for Setting the Unit Rates 5
5.3.1 Review of Existing Unit Rates 6
5.3.2 Categorization of Maintenance Activities 6
5.4 Data Base 6
5.4.1 Primary Data Collection 6
5.4.2 Secondary Data Collection 6
5.4.3 Data Collection for International Experience 7
5.5 Derivation of Unit Rates in Ethiopia – On Force Account 7
5.5.1 Summary of Unit Rates of Maintenance Components 7
5.5.2 Comparison of Cost 8
5.5.3 Effect of Lead on Haulage Cost 8
5.5.4 Costing for Periodic and Routine Maintenance (per km) 9
5.5.5 Road Maintenance Unit Rates in Ethiopia 10
5.6 Road Maintenance Unit Rates in Ethiopia 10
5.7 Derivation of Unit Costs In Future 12

6. ROAD INVENTORY AND PAVEMENT CONDITION IN ETHIOPIA

6.1 Background 1
6.2 The Coverage 1
6.3 Approach and Methodology 1
6.4 Road Inventory and Pavement Condition : Data Collection 3
6.4.1 Sampling of the Road 4
6.4.2 Preparation of Survey Formats and Survey Organization 7
6.4.3 Road Agencies 7
6.4.4 Training, Discussion & Distribution of Survey Formats 7
6.4.5 Verification Survey on the Sample Roads 8
6.5 Road Inventory and Pavement Condition : Data Analysis 10
6.5.1 Verification Survey Result 13
6.6 Road Inventory and Pavement Condition : Baseline Status 16
6.7 Issue and Constraints 18
6.7.1 Sampling 19
6.7.2 Verification Survey 19
6.7.3 Establishing the Baseline Data 19

7. Maintenance needs Assessment & Costs – Base Year

7.1 Introduction 1
7.2 Maintenance needs in Physical Term 1
7.3 ERA's Concept of Cost Minimizing Strategy 3
7.4 Maintenance Interventions Scenarios 3
7.4.1 Maintenance interventions and Costs: Scenario-1 5

7.4.2 Maintenance interventions and Costs: Scenario-2 5
7.4.3 Maintenance interventions and Costs: Scenario-3 6
7.4.4 Maintenance interventions and Costs: Scenario-4 6
7.5 Maintenance Needs in Financial Terms 7
7.5.1 Maintenance Cost Implications Analysis and the Preferred Scenario 7
7.5.2 Maintenance Cost Estimates 9
7.5.3 Unit Maintenance Cost – Fixed & Variable by Road Type 9
7.5.4 Annualized Road Maintenance Costs – Fixed & Variable 12
7.6 Allocation of Maintenance Cost and Road User Charges 12
7.7 Sum Up 14
8. Road Deterioration Model and Applications
8.1 General 1
8.2 Road Deterioration Model 1
8.2.1 Coverage and Uses 1
8.2.2 Road Maintenance Strategies and Standards 2
8.2.3 Factors Determining the Road Maintenance Requirements 2
8.2.4 Approach for Setting Maintenance Standards 2
8.2.5 Optimum Maintenance Standards 3
8.2.6 Recommended Maintenance Strategies and Standards 3
8.3 Multiyear Analysis 6
8.3.1 Classified Road Network – Planned 6
8.3.2 Road Network with Wereda Roads 8
8.3.3 Maintenance Needs Assessment for Classified Roads 8
8.3.4 Maintenance Cost for Additional Length in the Network (2011-20) 11
8.3.5 Maintenance Needs Assessment with Wereda Roads 12
8.4 Overloading Charges – An Analysis 13
8.4.1 General 13
8.4.2 Overloading Charges – International Practices 14
8.4.3 Overloading Practices & Charges in Ethiopia 17
8.4.4 Enforcement of Overloading Fines 18
8.4.5 Incidence of Overloading Vs Road Deterioration 18
8.4.6 Impact of Overloading on Road Safety 18
8.4.7 Estimation of Road Pavement Damages 19
8.4.8 Road Deterioration & Overloading fines 20
8.5 Weighbridges in Ethiopia – An Analysis 22
8.5.1 Present Status 22
8.5.2 Weighbridges Under Construction 23
8.5.3 Condition of Existing Weighbridges in the Country 23
8.5.4 Maintenance of Existing Weighbridges Stations in the Country 25
8.5.5 Proposed Additional Weighbridges Stations 26
8.5.6 Prevailing Weighing System in the Global Market 27
8.5.7 Accuracy of Weighing System 31
8.5.8 Weighing Tolerance 32
8.5.9 Operation and Management of Weighbridges 32
8.5.10 Weighbridges Operation and Procedures 33
8.5.11 Personnel Involved in Overload Control Operation 33
8.5.12 Weighbridge Verification and Calibration 33
8.6 Axle Load Control – Need of the Hour 34

8.6.1 Suggested Measures for Offloading the Overloaded Goods 35
8.6.2 Further Investigations 35
8.7 Mass Distance Charges – A Potential Sources of Revenue..... 36
8.8 Sum Up..... 37
8.8.1 Road Deterioration Model 37
8.8.2 Maintenance Strategies & Standards..... 37
8.8.3 Multiyear Maintenance Needs Assessment and Cost..... 38
8.8.4 Overloading Charges and Weighbridge Stations 39
8.8.5 Mass Distance Charges in Ethiopia 40

9. ROAD FUND BOARDS: REVIEW AND PERFORMANCE

9.1 Introduction 1
9.2 Basic Concepts of the Second Road Generation Road Fund 2
9.2.1 General 2
9.2.2 Definition of Road Fund 2
9.3 Review of the Road Fund Board..... 2
9.3.1 Structure..... 3
9.3.2 Process 4
9.3.3 Performance Outcome 6
9.4 Performance Analysis of the Road Funds 8
9.4.1 The Coverage 8
9.4.2 Quality of the Road Network 8
9.4.3 Operational Efficiency 14
9.4.4 Operational Efficiency as per the Second Generation Reforms 18
9.4.5 Allocative Efficiency 18
9.4.6 Development of Local Construction Industry 20
9.4.7 Private Sector Representation on the Road Fund Boards.... 23
9.5 Sum Up & Major Issues 23
9.5.1 Structure..... 24
9.5.2 Process 24
9.5.3 Performance Outcome 25
9.5.4 Road Safety Issues 25
9.5.5 Second Generation Road Fund- An Evaluation 25
9.5.6 Performance Analysis of Road fund..... 27
9.5.7 Issues Related to the Ethiopian Road Fund..... 27

10. ROAD FUND: SOURCES OF REVENUE

10.1 General 1
10.2 Sources of Revenue 1
10.2.1 Road User Charges 1
10.2.2 Charging Road Users..... 2
10.3 Sources of Revenue – A Brief Description 3
10.3.1 Government Budgetary Support 3
10.3.2 Levies on Fuel..... 3
10.3.3 VAT & Other Taxes 5
10.3.4 Annual Vehicle License Renewal Fees..... 6
10.3.5 Overloading Fines 8
10.3.6 Transit Charges..... 8
10.3.7 Weight-Distance Charges (Mass Distance Charges)..... 9
10.3.8 Other Sources 10

10.4 Charging Instruments in Sub-Sahara Counties 11
10.5 Sum Up & Major Issues 12

11. ROAD FUND REVENUE IN ETHIOPIA – A REVIEW

11.1 Background 1
11.2 Road Fund Activities in Ethiopia – An Overview 1
11.2.1 The Proclamation 1
11.2.2 Sources of the fund 1
11.2.3 Organs of the Fund 1
11.2.4 Management of the Road Fund 1
11.2.5 Member of the Board 2
11.2.6 Office of the Road Fund (ORF) 3
11.3 Road Fund Revenue – Existing 7
11.3.1 General 7
11.3.2 Budget Allocated by the Government to the Road Fund 7
11.3.3 Levies on Fuel 8
11.3.4 Transit Fees 12
11.3.5 Interest on Treasury Bills 14
11.3.6 Annual Vehicle License Renewal Fees 15
11.3.7 Overloading Fine 15
11.3.8 Road Fund Revenues – A Summary 16
11.3.9 Collection Instruments of the Fund 16
11.4 Road Fund Performance – A Review 17
11.4.1 Road Fund Budgeting Exercise 17
11.5 Distribution of the Fund 19
11.5.1 Overall Criteria 19
11.5.2 Road Fund Allocation & Transfer 20
11.6 Training Requirement 22
11.7 Sum Up & Major Issues 23
11.7.1 The Board & Organization Structure 23
11.7.2 The Road Fund Board, Fund Allocation and Transfer 24
11.7.3 The Fund Performance 25
11.7.4 Training Requirements 26

12. ROAD FUND REVENUE: POTENTIAL SOURCES

12.1 General 1
12.2 Potential Revenue in Future 1
12.2.1 Business as Usual 1
12.2.2 Revision of Existing Sources of Revenue 2
12.2.3 Additional/New Sources of Revenue 8
12.3 Sum Up 12

13. ROAD USER CHARGES : ANALYSIS & ESTIMATION

13.1 General 1
13.2 Road User Charges and Revenue 1
13.2.1 Levies on Fuel 1
13.2.2 Other Sources 3
13.3 Multiyear Analysis : A Summary 4
13.3.1 Road Inventory 4

13.4 Maintenance Costs 5
13.4.1 Overall Cost 6
13.5 Potential Sources of Revenue 6
13.6 Road User Charges Analysis 7
13.6.1 Sources of Revenues Considered in the Analysis 7
13.6.2 Road User Charges – Analysis Options 9
13.7 Proposed Sources of Revenue & its Impact 11
13.8 Proposed Road User Charges Option Matrix 11
13.8.1 RUCs Analysis with Wereda Roads 15
13.9 Adjustment of RUCs 15
13.10 Discussion & Comments 17
13.10.1 Transport Operators 17
13.10.2 The Ministry of Finance & Economic Development (MoFED) 18
13.11 Implementation Plan 18
13.12 Sum Up & Major Issues 19
13.12.1 With Existing Sources of Revenue 19
13.12.2 With Additional / New Sources of Revenue 19
13.12.3 Other Issues & Concerns 20

14. CONSEQUENCES OF NEGLIGENCE IN ROAD MAINTENANCE

14.1 General 1
14.2 Analysis Coverage 1
14.3 Negligence in Road Maintenance 2
14.3.1 Value of the Road Assets in Ethiopia 3
14.3.2 Road Rehabilitation Cost 4
14.4 Sum Up & Major Issues 10

15. E-RUCS & SOFTWARE USER'S MANUAL

15.1 General 1
15.2 Purpose & Application 1
15.3 User's Manual 1
15.3.1 Basic Buttons 2
15.3.2 Define User Settings 2
15.3.3 Defining Road Settings 3
15.3.4 How to Update Road Setting Data 4
15.3.5 Defining Road Maintenance Cost Setting 4
15.3.6 Defining Revenues 6
15.3.7 Report Generation 9
15.4 Application of the E-RUCS 11
15.5 Road Inventory Sub-System 11
15.6 Frequently Asked Questions (FAQs) 11

16. WORKS FINANCED BY THE OFFICE OF ROAD FUND & MAINTENANCE COSTS: REVIEW & EVALUATION

16.1 General 1
16.2 Review of Works Financed by the ORF 1
16.2.1 Performance & Efficiency in Maintenance Works 1

16.2.2 Current Unit Rates for Maintenance 4
16.2.3 Review of the Road Maintenance Actives Carried out 5
16.3 Maintenance Costs: Review & Evaluation 6
16.3.1 Private Contractors 6
16.3.2 Road Agencies – Own force Crews 10
16.3.3 Economy, Efficiency & Effectiveness 12
16.3.4 Unit Rate Development – Current Approach 13
16.4 Summary and Findings 22

17. OWN FORCE VS OUTSOURCING: A COST BENEFIT ANALYSIS

17.1 General 1
17.2 PPP in Road Maintenance Contracts during RSDPs 1
17.3 Proposed Strategies in RSDP IV for PPP 3
17.4 Approach & Methodology for Cost-Benefit Analysis 3
17.5 Term Maintenance Contracts Vs Own Force (Shashemene) 4
17.6 Labor-Based Maintenance Contracts Vs Own Force (Alemgena) 6
17.7 Review of Unit Rates: Own Force Vs Outsourcing (Alemgena) 9
17.8 Qualitative and Quantitative Comparisons 9
17.8.1 Favoring Own Force 10
17.8.2 Favoring Private Contractors 10
17.9 Sum Up 11

List of Tables

Table 1.1 Workshops & Presentations Organized During the Study
Table 1.2 Classified Road Network of Ethiopia in km (2010)
Table 1.3 Pavement Condition of the Classified Roads in Ethiopia, 2010

Table 2.1 Government Expenditure & Revenue by Purpose
Table 2.2 Current Account (Percentage of GDP)
Table 2.3 Road Network in Ethiopia (km)
Table 2.4 Change in Road Network and Density (1997-2011)
Table 2.5 Road Condition Improvement (in %)
Table 2.6 Changes in Selected Indicators with RSDPs
Table 2.7 RSDP IV Annual Targets
Table 2.8 Classified Road Network as Planned under the RSDP IV (2011-2015)
Table 2.9 Projected Classified Road Network (2015-2020)
Table 2.10 Classified Road Network & Wereda Roads (2015-20)
Table 2.11 Registered Motor Vehicles in Ethiopia ('000)
Table 2.12 Changes in Vehicle Fleet (2005-2011)
Table 2.13 Traffic Flow Pattern
Table 2.14 Composition of Vehicles by Road Surface Type in 2008 (%)
Table 2.15 Transport Output
Table 2.16 Accident Statistics in Ethiopia (2006-2007)

Table 3.1 Maintenance Activities-ERA's Technical Specification
Table 3.2 Group of Maintenance Activities in Ghana
Table 3.3 Maintenance Activities in Tanzania
Table 3.4 Summary of Maintenance Activities in India
Table 3.5 Roadway Maintenance Activities (AASHTO)
Table 3.6 Maintenance Practices on Sealed & Unsealed Roads

Table 4.1 Appropriate use of Equipment & Labor in Maintenance Works
Table 4.2 Eligible Maintenance Activities in Ethiopia
Table 4.3 Summary of the Proposed National road Safety Program (NRSP), Ethiopia
Table 4.4 Suggested Road Safety Provisions During Maintenance Works
Table 4.5 Possible Road Safety Hazards and Treatment
Table 4.5 Weights Used for Ranking
Table 4.6 Rural Road Network in Ethiopia (2009-10)
Table 4.6 Proposed Scores for the Prioritization
Table 4.7 Kebele Accessibility (2009)
Table 4.8 Wereda Roads Development Plan

Table 5.1 Range of Overhead Charges (%)
Table 5.2 Summary of Unit Rates of Maintenance components by Road Type
Table 5.3 Composition of Costs/Prices and Wages in 2007 & 2011
Table 5.4 Carriage of Materials
Table 5.5 Percentage-wise Component of Maintenance Activites
Table 5.6 Routine Maintenance

Table 5.7 Periodic Maintenance
Table 5.8 (a) Per km Cost Estimate for Routine Maintenance Activities of Paved Roads (Typical)
Table 5.8 (b) Per km Cost Estimate for Routine Maintenance Activities of Paved Roads – DBST(Typical)
Table 5.8 (c) Per km Cost Estimate for Routine Maintenance Activities of Paved Roads – Asphalt (Typical)
Table 5.9 (a) Per km Cost Estimate for Routine Maintenance Activities of Unpaved Roads – (Typical)
Table 5.9 (b) Per km Cost Estimate for Routine Maintenance Activities of Unpaved Roads – (Typical)

Table 6.1 Distribution of Sample Road Length in Different Districts of ERA
Table 6.2 Distribution of Sample Roads in Different RRAs
Table 6.3 Distribution of Sample Roads in Different Municipalities (km)
Table 6.4 Sample Size Paved & Unpaved Roads (km)
Table 6.5 List of the Formats for Data Collection
Table 6.6 ERA Paved Roads Condition by Region
Table 6.8 ERA Paved Roads Condition by Region (Km)
Table 6.9 ERA Unpaved Roads Condition by Terrain (km)
Table 6.10 ERA Unpaved Roads Condition by Region (km)
Table 6.11 ERA Unpaved Roads Condition by Terrain (km)
Table 6.12 Regional Roads Condition (km)
Table 6.13 Regional Roads Condition by Terrain (km)
Table 6.14 Paved Roads Condition under MRAs by Region (km)
Table 6.15 Paved Roads Condition under MRAs by Terrain Type (km)
Table 6.16 Unpaved Roads Condition under MRAs by Region (km)
Table 6.17 Paved Roads Condition under MRAs by Terrain Type (km)
Table 6.18 Baseline Inventory of Road Network under ERA (km)
Table 6.19 Baseline Inventory of RRAs Network
Table 6.20 Baseline inventory of Road Network under MRAs (km)
Table 6.21 Pavement Condition of Road Network Under ERA (2011)
Table 6.22 Pavement Condition of Road Network of RRAs (Unpaved Roads)
Table 6.23 Pavement Condition of Road Network under MRAs

Table 7.1 Road Inventory with Condition Requiring Maintenance Interventions 2012
Table 7.2 Pavement Condition of the Classified Roads by Road Agencies (2010-11)
Table 7.3 Need & Rational of the Proposed Scenarios
Table 7.4 Alternative Maintenance Strategies
Table 7.5 Road Condition & Maintenance Intervention under Scenario – 1
Table 7.6 Costs of Routine & Periodic Maintenance under Scenario – 1
Table 7.7 Road Condition & Maintenance Intervention under Scenario – 2
Table 7.8 Costs of Routine & Periodic Maintenance under Scenario – 2
Table 7.9 Road condition & Maintenance Intervention under Scenario – 3
Table 7.10 Costs of Routine & Periodic Maintenance under Scenario – 3
Table 7.11 Road Condition & Maintenance Intervention under Scenario – 4

Table 7.12 Costs of Routine & Periodic Maintenance under Scenario – 4
Table 7.13 Maintenance Cost Implications in different Scenarios
Table 7.14 Unit Rate for Maintenance Works
Table 7.15 Annualized Maintenance Costs of Gravel Roads
Table 7.16 Annualized Maintenance Costs of Paved Roads
Table 7.17 Road Maintenance Costs – Fixed & Variable
Table 7.18 Vehicle-wise Allocation of Maintenance Costs

Table 8.1 Treatment Alternatives Considered for AMGB & STGB
Table 8.2 Federal Unpaved Roads – Basic Level of Maintenance
Table 8.3 Federal Unpaved Roads – Ideal Level of Maintenance
Table 8.4 Regional Roads – Basic Level of Maintenance
Table 8.5 Regional Roads – Ideal Level of Maintenance
Table 8.6 Classified Road Network as Planned under the RSDP-IV (2010-15)
Table 8.7 Projected Classified Road Network (2015-20)
Table 8.8 Projected Classified Road Network with Wereda Roads (2015-20)
Table 8.9 Maintenance Strategies for Paved Roads
Table 8.10 Maintenance Strategies for Unpaved Roads
Table 8.11 Estimated Road Maintenance Cost for Existing Classified Networks (2011-20) (Low Level Maintenance Strategy)
Table 8.12 Estimated Road Maintenance Cost for Existing Classified Networks (2011-20) (Medium Level Maintenance Strategy)
Table 8.13 Estimated Road Maintenance Cost for Existing Classified Networks (2011-20) (High Level Maintenance Strategy)
Table 8.14 Maintenance Cost for Additional Length (2011-20)
Table 8.15 Total Road Maintenance Cost of the Projected Classified Network including additional Length (2011-20)
Table 8.16 Year-wise Maintenance Cost of Wereda Roads
Table 8.17 Estimated Maintenance Cost of the classified Road Network Including Wereda Roads (2010-20)
Table 8.18 Practice of Overloading Fines in Different African Countries
Table 8.19 Comparison of System to Collect Overloading Charges
Table 8.20 Maximum Permissible Vehicle/Combination Mass/Weight in Select Countries (tons)
Table 8.21 Result of Axle Load Survey
Table 8.22 Difference of Maintenance Cost – With & Without Overloading
Table 8.23 Location of the Weighbridge Stations in Ethiopia
Table 8.24 Weighbridges Under Construction
Table 8.25 Locations of Additional Weighbridge Stations with Brief Justification
Table 8.26 Vehicle-Wise Estimated MDCs in Ethiopia
Table 8.27 Comparison of Estimated MDCs in Ethiopia with Prevailing Charges in Namibia

Table 9.1 Structure of the Road Fund Boards
Table 9.2 Summary of the Structure of the Road Fund Boards
Table 9.3 Level of Revenue & Expenditure of Different Road Fund Boards

Table 9.4 Process Being Followed by Different Road Fund Boards
Table 9.5 Performance-Allocation Trend, Disbursement, Efficiency
Table 9.6 Indicators Based Description of the Performance
Table 9.7 Change in Road Condition 2004-2007
Table 9.8 Road Network Length across Condition Class (%) 2008
Table 9.9 Average Maintenance Spending
Table 9.10 Maintenance Expenditure
Table 9.11 No. of Members & Share of Operating Budget to the Total Budget
Table 9.12 Availability of Funds Covering Costs for No. of Months
Table 9.13 Average Deadline for the Payment of Non-Controversial Bills (Days)
Table 9.14 Companies Meeting Deadlines in Contracts
Table 9.15 Over-Engineering and Under-Engineering on Main & Rural Road Networks
Table 9.16 Road Fund Allocation Rules-African Countries
Table 9.17 Private Sector Representation on the Road Fund Boards

Table 10.1 Charging Road Users
Table 10.2 Annual Vehicle License Fee (2000)
Table 10.3 Other Sources of Revenue for the Road Funds
Table 10.4 Prevailing Charging Instruments in the Sub-Sahara Countries
Table 10.5 Administrative Characteristic of Different Road User Charging Instruments

Table 11.1 Source of the Road Fund In Ethiopia
Table 11.2 Incidence of Taxation on the Petroleum Products in Ethiopia
Table 11.3 Retail Price build-up in Addis Ababa in April, 2011
Table 11.4 Charges – Fuel Levy, VAT & Municipal Tax (1997-98)
Table 11.5 Charges – Fuel Levy, VAT & Municipal Tax (April 2011)
Table 11.6 Contribution of Different Taxes (April 2011)
Table 11.7 Import/Consumption & Retail Price of POL in Ethiopia
Table 11.8 Different Taxes & Road Fund (June 2011)
Table 11.9 Contribution of Fuel to Road Fund and General Taxation
Table 11.10 Revenue Collected in Transit Charges from Djibouti Route
Table 11.11 Revenue Collected through Interest on the Treasury Bills
Table 11.12 Summary of Road Fund Revenue
Table 11.13 Revenue Sources of the Road Fund & the Instruments for the collections
Table 11.14 Budget Planning of ORF (2011)
Table 11.15 ORF's Revenue Estimation Exercise (2011)
Table 11.16 Basic Fund Allocation Criteria for the Road Agencies
Table 11.17 Road Fund Budget Allocation & Transfer
Table 11.18 Road Fund Budget Allocation
Table 11.19 Fund Distribution to the Road Agencies

Table 12.1 Charges – Fuel Levy, VAT & Municipal Tax (April 2011)
Table 12.2 Revenue by Levies on Fuel (2009-10)
Table 12.3 VAT, Road Fund Fuel Levy & Municipal Tax Collected by EPE (June 2011)
Table 12.4 Change in Taxes on Petrol & Diesel since 1997-98
Table 12.5 Fuel Contribution to Road Fund and General Taxation (2000-01)

Table 12.6 Retail Price in Addis Ababa
Table 12.7 Different Taxes and Road Fund (April 2011)
Table 12.8 Existing Sources of Revenue and its Level (2010-11)
Table 12.9 Interest on Treasury Bills
Table 12.10 Annual Vehicle License Fee as Proposed in Earlier Studies
Table 12.11 Mass Distance Charges
Table 12.12 Potential Sources of Revenue

Table 13.1 Road Inventory with Condition including Wereda Roads (2010)
Table 13.2 Revenue through Levies on Fuel (2009-10)
Table 13.3 VAT, Road Fund Fuel Levy & Municipal Tax Collected by EPE (June 2011)
Table 13.4 Year-wise Road Inventory of the Classified Roads in Ethiopia
Table 13.5 Year-wise Road Inventory of the Maintainable Roads in Ethiopia
Table 13.6 Year-wise Percentage of the Maintainable Roads to the Total Road Inventory (%)
Table 13.7 Estimated Annual Maintenance Cost of the Classified Roads in Ethiopia (Low Level Strategy)
Table 13.8 Estimated Annual Maintenance Cost of the Classified Roads in Ethiopia (Medium Level Strategy)
Table 13.9 Estimated Annual Maintenance Cost of the Classified Roads in Ethiopia (High Level Strategy)
Table 13.10 Existing & Potential Sources of Revenue
Table 13.11 Sources of Revenue Considered in the Road User Charges Analysis
Table 13.12 Road User Charges Options to meet the Maintenance Cost
Table 13.13 RUCs Option -1 (Existing Road User Charges with 110%VAT Transfer to the ORF)
Table 13.14 Road Users Charges under Different Options
Table 13.15 Different Levels of Annual Vehicle License Fee to Cover the Fixed Cost of Maintenance
Table 13.16 Mass Distance Charges (MDCs) for Different Vehicles
Table 13.17 Description and Impact on Road Users Under Different Road Users Charges Options
Table 13.18 Fuel Retail Price with the Proposed Fuel Levy under Different Road User Charges
Table 13.19 Percentage increase in Fuel Levy with Wereda Roads
Table 13.20 Application of the Adjustment Factors of the Road Users' Charges in E-RUCS
Table 13.21 RUCs Option - 2 (Existing Road User Charges with 100% VAT Transfer & Revised Fuel Levy)
Table 13.22 RUCs Option - 3 (Existing Road User charges with 50% VAT Transfer & Revised Fuel Levy)
Table 13.23 RUCs Option – 4 (Existing Road User Charges with 0% VAT Transfer & Revised Fuel Levy)
Table 13.24 RUCs Option – 5 (Existing Road User Charges with 75% VAT Transfer, AVL 25% & Revised Fuel Levy)
Table 13.25 RUCs Option – 6 (Existing Road User Charges with 50% VAT Transfer, AVL 25%, MDC 25%, Overloading Charges & Revised Fuel Levy)

Table 13.26 RUCs Option-7 (Existing Road User Charges with 25% VAT Transfer, AVL 25%, MDC 25%, Overloading Charges & Revised Fuel Levy)
Table 13.27 RUCs Option – 8 (Existing Road User Charges with 0% VAT Transfer, AVL 25%, MDC 25%, Overloading Charges & Revised Fuel Levy)
Table 13.28 RUCs Option – 9 (Existing Road User Charges with 0% VAT Transfer, AVL 45%, MDC 45%, Overloading Charges & Revised Fuel Levy)

Table 14.1 Without Maintenance the Loss of Road Assets
Table 14.2 Valuation of the Road Asset & Financing of Road Maintenance in Ethiopia
Table 14.3 Case – Paved Road (Year 1)
Table 14.4 Case – Paved Road (Year 10)
Table 14.5 Road User Cost & Expected Savings on good Roads (ETB)
Table 14.6 Derivation of Rehabilitation – Maintenance Ratio

Table 16.1 Selected Major Activities for Paved and Unpaved Roads from ERA's Daily Cost Calculation Sheet
Table 16.2 Summary of Current Equipment Rental Rates and Comparison of Fuel Cost Against Equipment Rental Rate Collected from Private Contractor
Table 16.3 (a) Ethiopian Roads Authority – Activity Daily Cost Calculation
Table 16.3 (b) Comparison of Direct Machine Cost for Asphalt Overlay Periodic Maintenance Activity
Table 16.4 (a) Ethiopian Roads Authority – Activity Daily Cost Calculation
Table 16.3 (b) Comparison of Direct Machine Cost for Gravel Resurfacing Periodic Main Activity
Table 16.5 Summary of The Three Approaches for Calculating Contemporary Direct Machine Cost

Table 17.1 Contracts Awarded to Contractors & ERA's Own Force
Table 17.2 Contracts Awarded to Contractors & ERA's Own Force (RSDPs)
Table 17.3 Maintenance Coverage under Shashemene District (2009-11)
Table 17.4 Maintenance Cost by Type of Contractor under Shashemene District (2009-11)
Table 17.5 Maintenance Coverage & Cost for a Hypothetical Own Force crew
Table 17.6 Cost Comparison Between LBT Contractors and a Hypothetical Own Force Crew in Alemgena District
Table 17.7 Comparison of Unit Rates for Own-Force & Private Contractors in Alemgena District

List of Figures

Figure 2.1 Map of Ethiopia
Figure 2.2 GDP Growth Rate Comparison
Figure 2.3 Sectorial Growth Rates
Figure 2.4 Average Exchange Rate (Birr to US$)
Figure 2.5 (a) Road Density (per '000km^2)
Figure 2.5 (b) Road Network Growth in Ethiopia ('000 km)
Figure 2.6 Road Condition During the RSDPs
Figure 2.7 Vehicle Composition in Ethiopia (2010-11)
Figure 2.8 Registered Vehicles In Ethiopia
Figure 6.1 Road Condition for Different Pavement Types under the Road Agencies
Figure 6.2 Road Condition for Entire Classified Network in Ethiopia
Figure 8.1 Average Roughness for Different Maintenance Strategies for Paved Road
Figure 8.2 Average Roughness for Different Maintenance Strategies for Gravel Road
Figure 8.3 Road and Vehicle Costs
Figure 8.4 Total Transport Costs
Figure 8.5 Locations of Existing Weighbridges Stations
Figure 8.6 Locations of Weighbridges Stations (Existing and Proposed) in Ethiopia
Figure 8.7 Accuracy of Weighing Systems
Figure 9.1 Main Network
Figure 9.2 Rural Network
Figure 9.3 Trend of Ethiopian Road Network Over 13 Year of RSDP (% change in Good Condition Roads)
Figure 9.4 Average Maintenance Spending
Figure 9.5 Maintenance Expenditure
Figure 9.6 Rehabilitation and Maintenance Spending Relative to Norms
Figure 9.7 Over-Engineering and Under Engineering on Main & Rural Road Network
Figure 9.8 Road Fund Allocation Rules in African Countries
Figure 9.9 Evaluation of Road Funds
Figure 10.1 Fuel Levy and Variable Maintenance Cost
Figure 11.1 Organizational Structure (Old)
Figure 11.2 Organizational Structure (Existing)
Figure 11.3 Petroleum Price Build in Ethiopia and Road Fund
Figure 11.4 ORF's Budgeting Exercise
Figure 15.1 E-RUCS Main Interface
Figure 15.2 Accessing User Interface
Figure 15.3 User Management Interface
Figure 15.4 Road Setting Menu
Figure 15.5 Cross Section Entry Form
Figure 15.6 Maintenance Cost Units Menu
Figure 15.7 Maintenance Unit Cost Form
Figure 15.8 Road Length Entry Form
Figure 15.9 Vehicle Fleet Information Form
Figure 15.10 Annual Distance Traveled Data Entry Form
Figure 15.11 Existing Source Data Entry Form
Figure 15.12 Data Entry Form Additional Source
Figure 15.13 Main Report Form
Figure 15.14 Sample Report Type

Annexures

Annexure 1.1	Terms of Reference
Annexure 1.2	Compliance Matrix on the Comments on "Draft Final Report"
Annexure 1.3	Workshop on the Draft Final Report
Annexure 1.4	Workshop on the Application of E-RUCS (ERA & ORF Participants)
Annexure 2.1	GDP by Economic Activity at Constant Prices
Annexure 6.1-a	Road Covered in Verification Survey Carried Out in Month of January 2011
Annexure 6.1-b	Road Covered in Verification Survey Carried Out in Month of February 2011
Annexure 6.1-c	Road Covered in Verification Survey at Addis Ababa City
Annexure 6.2	Road Inventory DATA (Paved Roads) : ERA/MRAs
Annexure 7.1	Maintenance Cost for Classified Road Network Scenario-1
Annexure 7.2	Maintenance Cost for Classified Road Network Scenario-2
Annexure 7.3	Maintenance Cost for Classified Road Network Scenario-3
Annexure 7.4	Maintenance Cost for Classified Road Network Scenario-4
Annexure 8.2	Axle Load Data
Annexure 8.3	Increment Damages due to Overloading and Annual Revenue Calculation from Overloading Fees
Annexure 8.4	Derivation of Mass Distance Charges (MDCs) Rates for Different Vehicles
Annexure 9.1	Questionnaire for Road Fund Board (Country…..)
Annexure 9.2	Questionnaire for Road Fund Board (Country Tanzania)
Annexure 9.3	Questionnaire for Road Fund Board (Country Ghana)
Annexure 12.1	Mass Distance Charges – Registration Form
Annexure 12.1	Mass Distance Charges – Assessment Form
Annexure 13.1	Proposed Implementation Plan, Schedule and Cost Implications

ACRONYMS AND ABBREVIATIONS

ACRONYMS & ABBREVIATIONS

AACRA	:	Addis Ababa City Roads Authority
AADT	:	Annual Average Daily Traffic
AASHTO	:	American Association of State Highway and Transportation Officials
AC	:	Asphalt Concrete
ADO	:	Automobile Diesel Oil
AMGB	:	Asphalt Mix on Granular Base
ARMFA	:	African Road Fund Maintenance Association
ARRB	:	Australian Road Research Board
ASDT	:	Average Seasonal Daily Traffic
AVL	:	Annual Vehicle License
BPR	:	Business Process Re-engineering
CDSs	:	Cross Drainage Structures
CIDF	:	Construction Industry Development Fund
CSA	:	Central Statistical Agency
CSIR	:	Council for Scientific and Industrial Research
DBST	:	Double Bituminous Surface Treatment
DED	:	District Engineering Department
DRMC	:	District Road Maintenance Contractor
DRMO	:	District Road Maintenance Offices (now known as DRMC)
EPE	:	Ethiopian Petroleum Enterprise
ERA	:	Ethiopian Roads Authority
ETB	:	Ethiopian Birr
ERF	:	Ethiopian Road Fund
ERP	:	Emergency Recovery Program
E-RUCS	:	Ethiopia-Road User Charges System
ESAL	:	Equivalent Standard Axle Loads
FAQs	:	Frequently Asked Questions
FDRE	:	Federal Democratic Republic of Ethiopia
FIDIC	:	International Federation of Consulting Engineers
GDP	:	Gross Domestic Product
GHA	:	Ghana Highway Authority
GTP	:	Growth and Transformation Program
GVM	:	Gross Vehicle Mass
HDI	:	Human Development Index
HDM	:	Highway Development and Management
HVF	:	Heavy Vehicle Fee
ILO	:	International Labor Organization
IRC	:	Indian Roads Congress
IRI	:	International Roughness Index
LBT	:	Labor Based Technology
MAP	:	Maintenance Action Plan
MDCs	:	Mass Distance Charges

MDGs	:	Millennium Development Goals
MGR	:	Mogas Regular – Petrol
MoFED	:	Ministry of Finance and Economic Development
MRAs	:	Municipal Road Authorities
NBE	:	National Bank of Ethiopia
NGOs	:	Non-Government Organizations
NRSP	:	National Road Safety Program
OBU	:	on-board unit
ORCE	:	Oromia Roads Construction Enterprise
ORF	:	Office of Road Fund
ORRA	:	Oromia Rural Roads Authority
PCE	:	Passenger Car Equivalents
PPB	:	Planning Programming and Budgeting
PPP	:	Public Private Partnership
PTA	:	Preferential Trade Area
RDWE	:	Road Deterioration/ Works Effects
RFAO	:	Road Fund Administration Office
RFBs	:	Road Fund Boards
RMI	:	Road Maintenance Initiatives
RONET	:	Road Network Evaluation Tool
RRAs	:	Regional Roads Authorities
RSDP	:	Road Sector Development Program
RTA	:	Road Transport Authority
RUCs	:	Road User Charges
RUE	:	Road User Effects
SANRAL	:	South African National Road Agency Limited
SRRA	:	Southern Region Roads Authority
SSATP	:	Sub-Sahara African Transport Policy
STGB	:	Surface Treatment on Granular Base
TANROADS	:	Tanzania National Roads Agency
TOR	:	Terms of Reference
TRL	:	Transport Research Laboratory
TRRA	:	Tigray Rural Roads Authority
TS	:	Tanzania Shilling
URA	:	Uganda Revenue Authority
URRAP	:	Universal Rural Road Access Program
VAT	:	Value Added Tax
VOC	:	Vehicle Operating Cost
VRU	:	Vulnerable Road Users
WAP	:	Weighted Average Price
WDC	:	Weight Distance Charges
WIM	:	Weigh-in-Motion
W/MDC	:	Weight/Mass-Distance Charges
WROs	:	Wereda Roads Offices

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1.0 GENERAL

The Government of the Federal Democratic Republic of Ethiopia (FDRE) has given a high priority for the country's Road Sector Development Programs (RSDPs), with the consideration that road transport system in Ethiopia facilitates the overall socio-economic development of the country; and hence, considerable investments have been made to improve the Road Network in the country.

In order to ensure the sustainability of the Road Sector with its growing road network, which has been playing an important role in the socio-economic development of the country, there is need for proper maintenance–routine and periodic, to maintain the service quality to its users, ensure economic and efficient road transport system cost, and also preserve the national asset, i.e. roads. The Government has been committed to successful implementation of the four building blocks of the Road Management Initiatives (started in 1997), viz. (i) Owner; (ii) Management; (iii) Responsibility; and (iv) Financing Aspects of the Road Sector.

Following the results of the above initiatives, the Ethiopian Road Fund (ERF) came into being in 1997 by the Proclamation with the objectives of "the Fund shall be to finance the maintenance of roads and road safety measures". The ERF, since its establishment, has been contributing significantly in the road maintenance activities in the country by making available budget for highways, rural roads and municipal roads maintenance expenditures, and also the road safety measures.

With this background and also to achieve sustainable road maintenance strategy in Ethiopia, the present "Consultancy Services for Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia" has been entrusted by the Ethiopian Roads Authority (ERA) to Intercontinental Consultants and Technocrats Pvt. Ltd. (ICT), India in association with International Consultants and Technocrats Ethiopia PLC (ICTE) with the following goals and objectives.

1.1 Study Goals & Objectives

The core objective of the Study is to achieve sustainable road maintenance strategy in Ethiopia. The Terms of Reference (ToR) of the Study also stipulate the following objectives under the Consultancy Services:

- Review road financing practices of Ethiopian Road Fund (ERF) to the Road Agencies (ERA, RRAs and MRAs) and Road Safety Coordinating Office in the last five years;
- Review the efficiency and effectiveness of Road Financing of ERF to RRAs, MRAs, ERA and Road Safety Office for maintenance of Roads and Road Safety Measures;
- Prepare a Multiyear Road Maintenance Need Forecast for coming 10 years, including:
  - Review the existing revenue sources and revenue level in order to understand/identify the budget gaps for Road Maintenance for ERA, RRAs and MRAs and Road Safety Measures; and
  - Identify the above budget gap of Road Maintenance of each year, and in the coming 10 years.
- Review the potential maintenance needs of the unclassified roads; and
- Establish a system that helps to adjust Road User Charges to reflect the road maintenance expenditure based on a fee for service principle.

Following the ToR, the findings and the outcomes of the Study have been brought out through the following four intermediate reports (Draft and Final) other than the Draft and Final Reports on the entire consultancy services:

(i) Guidelines for Approving Eligibility of Maintenance Works for ORF Financing;

(ii) Review of Existing Road Revenue and Recommendations for New Sources of Revenue;

(iii) Computer Model and Multiyear Road Maintenance Needs Assessment Report; and

(iv) Guidelines for Adjustment of Road Users Charges.

The above reports were submitted is Draft and Final. The Final Reports were prepared after incorporating the comments obtained from the Clients on the Draft Reports and also through several presentations and workshops during the Study. The compliance matrices illustrating all the comments given by the Clients on the Draft Reports, and the Consultants' efforts and clarifications with proper references, were

prepared for each of the above-mentioned intermediate reports, and attached with the respective Final Reports.

1.2 The Present Report

The present "Final Report" is the last deliverable under the consultancy services. As per the ToR, the Final Report needs to provide the summary of the tasks carried out, overall findings and conclusions during the consultancy services. The Final Report compiles the activities carried out and presented in the earlier four intermediate submissions.

The Final Report also addresses the exclusive comments given by the Reviewing Committee comprising officials from the ERA, the ORF and the Ministry of Transport on the Draft Final Report (DFR); and by different stakeholders during the Workshop on the DFR organized in third week of October 2011, and also suggestions given by the Clients from time to time. As per the request of the Clients, a new section, i.e. in addition to the ToR, illustrating the Implementation Plan of the proposals given in the Study has also been included in the Final Report.

1.3 Road Network in Ethiopia

Total network of the classified roads in Ethiopia measures more than 48,500 km (2010) excluding municipal roads (i.e. 4,556 km), which are administered and maintained by the ERA through 10 District Road Maintenance Organizations (DRMOs); 9 Regional Roads Authorities (RRAs); and 10 Municipal Road Authorities (MRAs). The road network in Ethiopia is dominated by unpaved roads (>85%); and, there are 7,476 km paved roads under ERA, and 1,285 km under MRAs. The entire road network of 26,944 km under the RRAs is unpaved. It is important to note that there is a network of about 100,400 km of unclassified roads developed and maintained by the Local Communities.

Road Agency	Length of Classified Road (km)		
	Paved	Unpaved	Total
ERA	7,476	14,373	21,839
RRAs	--	26,944	26,944
MRAs	1,285	3,271	4,556

Source: RSDP IV Document (2011).

The pavement condition of the classified roads in the country has been observed by the RSDP Document (2011), in terms of very good / good, fair, poor and very poor.

Road Agency	Very Good / Good	Fair	Poor	Very Poor	Total
ERA	13,947	5,280	2,622	--	21,849
RRAs	10,736	8,736	5,148	2,324	26,944
MRAs	2,971	845	674	66	4,556
Total	**27,654**	**14,861**	**8,444**	**2,390**	**53,349**
Percent	*51.8*	*27.9*	*15.8*	*4.5*	*100.0*

1.4 Road Maintenance in Ethiopia

In spite of regular interventions by the GoE, improvement in the condition of roads is still a big challenge in the country. Rehabilitation and upgrading of the road network under the Road Sector Development Programs (RSDPs I, II and III), brought the overall road network in good condition to 56% in 2010 from 22% in 1997. Nearly 73% of asphalt roads (from 17% in 1997) and 53% of gravel roads (from 25% in 1997) under ERA and 53% of rural roads (from 21% in 1997) have been reported to be in good condition.

It does not require further emphasis that an adequate and timely maintenance is required for all types of road surfaces to keep the roads in good level of serviceability, and also to preserve the national road assets which have been developed over a long period of time.

Earlier studies, viz. Road Funding and Road User Charges in Ethiopia (2004), Road Financing Study, Ethiopia (2005), etc. also brought out that the road maintenance in the country was grossly under-funded. Nevertheless, the RSDPs' initiatives, combined with the setting up of the "Second Generation Road Fund" in 1997 with dedicated revenues from levies on fuel, VAT and other sources have considerably improved the condition of the road network in the country.

1.5 Maintenance Financing

Road Maintenance activities of the classified roads of the country are financed by the ORF as per the Road Fund Proclamation (1997). In 2010-11, the revenue collected by the ERF was in the order of ETB 1.14 billion and disbursement from the road fund for maintenance activities was ETB 1.02 billion. As stated earlier, the present level of revenue is not sufficient to finance the maintenance needs of the classified roads to an acceptable level of service and also preserving the road asset.

For a quick appreciation, the fund requirements for carrying out the road maintenance activities and to preserve the asset as well as offering quality road system to its users, the present Study has made the estimates for next ten years (i.e. 2011-20); which shows that the classified road network in Ethiopia including the additional

roads planned to be constructed during the period, the road agencies would be requiring annualized maintenance cost ranging from ETB 2.9 billion to ETB 3.2 billion depending on different maintenance strategies, and if the maintenance of Wereda Roads is also included, the annualized expenditure on maintenance would be about ETB 3.4 billion to ETB 3.7 billion.

In order to implement the above massive road maintenance program effectively and efficiently, the institutions responsible for undertaking maintenance tasks would also be requiring proper capacity development and training programs.

1.6 Report Coverage

The "Final Report" on the Study, could be considered as a grand executive summary of all the activities carried out under the Study, which were presented in the following four intermediate reports:

(i) Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (Draft and Final);

(ii) Review of Existing Road Revenue and Recommendation for New Sources of Revenue (Draft and Final);

(iii) Computer Model and Multiyear Road Maintenance Needs Assessment Report (Draft and Final); and

(iv) Guidelines for Adjustment of Road Users Charges (Draft and Final).

Though the present Final Report summarizes all the tasks carried out during the consultancy services and the specific analyses and findings brought out in the earlier reports, for any details, the above-mentioned four intermediate reports, with necessary diagrams, tables, figures, illustrations, and annexures presented therein, should be duly referred to.

In view of the above, the details on the assumptions and analyses already undertaken and presented in the earlier reports are not further elaborated in the present Report. However, relevant references, and briefs for ready reference and appreciations are presented in a selective manner to maintain the flow and understanding.

1.7 Structure of the DFR

The "Final Report" has been presented in the following chapters:

Chapter–1: Introduction;

Chapter–2: Road Development in Ethiopia;

Chapter–3: Road Maintenance Practices: International & Ethiopia;

Chapter–4: Eligible Maintenance Works & Prioritization;

Chapter–5: Road Maintenance Unit Costs in Ethiopia;

Chapter–6: Road Inventory & Pavement Condition in Ethiopia;

Chapter–7: Maintenance Needs Assessment & Costs – Base Year;

Chapter–8: Road Deterioration Model & Applications;

Chapter–9: Road Fund Boards: Review & Performance;

Chapter–10: Road Fund: Sources of Revenue;

Chapter–11: Road Fund Revenue in Ethiopia: A Review;

Chapter–12: Road Fund Revenue: Potential Sources;

Chapter–13: Road User Charges: Analysis & Estimation;

Chapter–14: Consequences of Negligence in Road Maintenance;

Chapter–15: E-RUCS & Software User's Manual;

Chapter–16: Works Financed by the Office of Road Fund & Maintenance Costs: Review & Evaluation; and

Chapter–17: Own Force Vs Outsourcing: A Cost-Benefit Analysis.

2.0 ROAD DEVELOPMENT IN ETHIOPIA

At the end of 2010, the classified road network in Ethiopia comprised 48,793 km[1], of which 21,849 km were Federal Roads. About 95% of Ethiopia's passenger and freight traffic uses the road system and it is the only means of access to the widely scattered rural communities. But despite ongoing efforts to expand the road network, the country still has one of the lowest road densities in Africa with 44 km/'000 km^2 as per 2010 estimates, compared with other Sub-Saharan African countries, which have an average of 54 km/'000 km^2 of area. The Government of Ethiopia (GoE) has, therefore, singled out this area as being a top priority for public investment and has made concerted efforts and progress in the expansion of the country's road network as well as the improvement in pavement condition.

[1] At the time of writing this Report, it is reported that classified road network in the country has grown to 52,042 km (8,295 km paved and 14,136 km unpaved roads under ERA, and 29,611 km of unpaved roads under RRAs), resulting in the road density as 47 km/'000 km^2.

As far as the main road network is concerned, most of the major asphalt and gravel roads radiate from Addis Ababa to main cities, towns and centers of commercial, industrial and agricultural activities. International highways link Addis Ababa with neighboring countries: Djibouti, Eritrea, Kenya and the Sudan. Non-motorized traffic in the country is important not only in remote and inaccessible rural areas, but also in towns and cities of Ethiopia, as bulk of short haul traffic is carried as head and back load, and also by donkeys and camels.

As part of the extensive infrastructure development program, the Ethiopian Government has launched the Road Sector Development Programs (RSDPs), of which three successful phases have been completed, and it is envisaged to rehabilitate and upgrade trunk roads, upgrade and construct link roads and a substantial amount of rural roads in the coming years. The RSDP-I was launched in 1997 and subsequent RSDP-II in 2002, RSDP-III in 2007 for the overall improvement in the road system in the country, which has given the desired results, and over the years road network has improved as per the expectations. Currently, RSDP IV (2010-15) is going on with comprehensive road sector development strategies and polices.

- The road sector has had an impressive growth under the RSDPs since 1997, which has focused on rehabilitation and expansion of the main paved and unpaved roads and important regional roads. It has expanded the road network to 48,793 km (2010), increasing the road density 44.4 km/'000 km^2 and 0.58 km/'000 population;

- Due to the construction of new roads, the average distance from an all-weather road has been reduced from 21 km in 1997 to 11.3 km in 2010;

- The rehabilitation, upgrading and maintenance intervention efforts under the RSDPs improved the proportion of the road network in good condition to 56%; 23% in fair condition and remaining 21% in poor condition;

- Total cost of implementing the RSDP IV is estimated as ETB 125.3 billion, of which ETB 84.5 billion is allocated for Federal Roads, ETB 14.4 billion for Regional Roads, and ETB 26.4 billion for Wereda Roads;

- RSDP IV document states that in next five years; 4,331 km of roads would be added in the Federal Road network, whereas 11,212 km in the Regional Roads network;

- In view of socio-economic development in the country, the increase in road density with the size of classified road network including the Wereda Roads is expected at 4.8% pa;

- RSDP IV places a high emphasis on the construction of link roads and engineered low-volume roads.

- The total vehicle fleet in the country has increased from 218,000 (2002-03) to 376,000 (2010-11) registering 6.3% pa growth rate;

- Of the total roads, 21% of roads had traffic flow from 301-500 vpd; <200 vpd on 27% of the roads and about 5% of the roads observed <100 vpd;

- Total transport output in terms of average vehicle-km has increased from 9.32 million to 9.64 million showing a growth of 3% over previous year;

- Overall traffic growth during 2004-08 was observed at 14% pa, of which, cars registered at 12% pa; buses 17% pa; and trucks 12% pa;

- The motor vehicle accidents in Ethiopia were observed at high level in 2007-08, which estimated 15,000 accidents, however, total number of accidents fell down by about 7% over the previous year.

3.0 ROAD MAINTENANCE PRACTICES: INTERNATIONAL & ETHIOPIA

This chapter outlines the prevailing road maintenance practices, which are followed by the road agencies in Ethiopia, i.e. Ethiopian Roads Authority (ERA), Regional Roads Authorities (RRAs) and Municipal Road Authorities (MRAs). The chapter also presents a comparison of the Ethiopian maintenance practices with the international practices, so that inadequacies, if any, could be appreciated, and accordingly appropriate improvement and recommendations be made. The outcomes of the chapter would also be used while preparing the maintenance eligibility criteria and the maintenance needs assessment and strategies in the present Study.

Summary and the major issues of the chapter are presented below:

- The Technical Specification for Road Maintenance Works prepared for ERA is widely used by all the road agencies responsible for federal roads (paved and unpaved), regional rural roads (unpaved), and the urban/municipal roads (paved and unpaved). The Specifications require to be made more comprehensive to address much wider issues relating to all

categories of roads and different types of maintenance interventions.

• The Manuals used in various countries for carrying out the maintenance activities, under review, such as, Ghana, South Africa, Tanzania, India, AASHTO (USA) and ARRB (Australia), present several road maintenance practices for paved and unpaved roads. While comparing the prevailing road maintenance practices of Ethiopia and the International Practices, the exercise finds that there are some activities, which are not adequately addressed in the ERA's Technical Specifications (2003):

- The maintenance practices include different seals on AC surfaces, edge repairs, removal of excess binder and treatment of uneven bituminous surfaces and thin overlay in paved roads; dust control measures in unpaved roads; routine and periodic maintenance of minor and major structures as part of drainage; drop-off and grading down of shoulders; maintenance of paved shoulders and rigid pavement (if available in future), etc;
- Road Safety works include proper signage and pavement markings in case of sharp curves, road side hazards, side roads access, junctions, valley and bridge approaches and also for vulnerable road users, installation of speed breakers, crash barriers, improvement of sight distances, etc. for the safety of road users in general and also placing of adequate signage to ensure the safety of maintenance workers during the execution of maintenance activities as temporary road safety features; and
- All the above inadequacies as observed in the ERA's Technical Specifications need to be addressed and included properly in the Ethiopian Practices.

• There are some of the activities, which are not yet part of the Ethiopian maintenance practices, and hence not considered for the ORF financing, e.g. any types of rehabilitation works, viz. overlay thickness of 40-60 mm; realignment work; up-grading and widening of road; right of way additions; and maintenance of the roads under defect liability period.

• Sometimes, it is observed that there are some problems in the actual design of a specific road, like poor drainage on the road in low lying area, which requires frequent maintenance interventions and in absence of that, the road may be completely failed. In such cases, the exact cause of the problem should be mended; and there should be some earmarked fund for rectifying these problems.

• While choosing pavement type, i.e. gravel or paved, and also with paved option – DBST or AC should be determined based on the Life Cycle Cost Analysis with the optimum maintenance strategies and options with right trigger time for the maintenance interventions, and the overall cost saving option should be recommended.

4.0 ELIGIBLE MAINTENANCE WORKS & PRIORITIZATION

This chapter presents a comprehensive list of all the major maintenance activities, with its components, relating to: (i) routine; (ii) periodic; (iii) emergency; (iv) road safety measures; and (v) other related activities, which qualify for the ORF Financing, and termed as "Eligible for Road Maintenance and Financing".

The chapter also outlines broad framework with major influencing parameters governing the maintenance plans and interventions including choice of suitable technology, with special emphasis on labor-intensive technology, for undertaking the maintenance activities, and the road safety concerns.

The chapter presents a framework for undertaking road maintenance activities requiring a pragmatic approach, consisting of proper needs assessment, availability of latest data on road inventory, pavement condition, cross drainage structure, terrain, and traffic data on volume, composition and load-ability, desegregation of different types of maintenance as per the interventions required, appropriate technological choice, viz. man, machine and material.

The chapter also aims at establishing the prioritization criteria and methods for the maintenance works within the road network of the specific road agency. The proposed steps to be followed are discussed in detail in the chapter, and summary is given as follows:

• The priority criteria have been developed with the concept of causal relation of the road deterioration requiring higher attention of the maintenance support.

• For assigning relative weights to the influencing parameters to the prioritization process, the Consultants have proposed a two-tier system: (i) relative weight of the broad category; and (ii) within the broad category, relative score of the specific parameter

• The procedure for ranking is based on the attributes of scores for level of traffic (i.e. AADT), condition of the road, and importance of the connectivity for each road section and several other factors including road safety.

• After assigning the scores for traffic, road condition, connectivity for respective road section, road safety and other factors, the total scores for each road section should be obtained. The road section securing highest score should be selected showing as high priority road section for undertaking maintenance activities.

5.0 ROAD MAINTENANCE UNIT COSTS IN ETHIOPIA

This chapter derives the real unit costs for maintenance activities on the road network of Ethiopia. The unit costs, in conformity with the eligible maintenance activities, are developed after reviewing existing methodology, discussions with the officials of the road agencies, viz. ERA, RRAs and MRAs, and also the private Contracting Agencies. The road agencies and other entities, such as, Road Safety Coordination Office involved with road maintenance and undertaking related activities with the framework of the Road Fund Proclamation, approach the ORF for getting funds for their proposed projects.

It has been noticed that the unit costs of maintenance activities vary significantly from one agency to another. This chapter presents a comprehensive list of the unit costs by components of the maintenance activities in reference to Ethiopia, and also compared with other countries of similar nature. This exercise compliments in identifying the types of roads and activities eligible to receive fund from the ORF, and also establishing the real unit cost of maintenance activities, which would be useful for the ORF for making approvals effectively, and for the road agencies in preparing maintenance plans and budget.

The applications of the estimation of the maintenance unit costs by its components are as follows:

• This could be used by the ORF while approving any road maintenance financing requests from road agencies on account of acceptable maintenance unit costs;

• The unit costs can be used to evaluate the efficiency of the maintenance proposals on account of economy, and proper budgeting;

• For establishing the total maintenance costs at different levels, as per the requirements for planning and decisions making; and

• The unit costs would be also helpful in evaluating the performance of different road agencies in efficient management, proper utilization of resources, evaluation of the expenditures made on maintenance on different activities, future planning and budgeting for maintenance works, etc.

While deriving the unit maintenance costs for the present analysis, the required items have been identified and rates worked out for different activities involved in periodic and routine maintenance. It is mentioned that per km maintenance cost can only be estimated accurately once quantum of work involved in different sections is identified, based on the requirement of the proposed maintenance interventions, as the cost per km may vary due to the extent of damages on account of weathering actions, type of existing road surfaces, traffic, geographical features and structural maintenance.

The present exercise therefore aims at working out the per km maintenance cost on an indicative basis. It may be noted that while proposing the interventions for routine maintenance, the Consultants have taken the actual road condition survey results based on the Verification Surveys carried out during the present Study, and quantified the results using ERA's Road Network Definition Manual, w.r.t. each major severity and extent of defects.

6.0 ROAD INVENTORY & PAVEMENT CONDITION IN ETHIOPIA

This chapter establishes the road inventory details and pavement condition of the total classified road network of the country. The exercise is primarily based on the verification of data and information on road inventory and pavement condition as available and furnished by different road agencies on the road network under their jurisdiction. Following the ToR, the Study also collected the road inventory of classified RRAs, MRAs and ERA's road network and condition survey of about 4,000 km road samples to verify the accuracy of the data.

Based on the data and information collected through the Verification Survey of the classified road network and pavement condition, the Study has adjusted the road inventory and pavement condition, which would form the basis for establishing the existing condition of the entire classified road network of the country; that would

be considered as "Baseline Situation". The exercise would help in identifying the type and level of maintenance interventions required to preserve the road asset as well as offer quality service to its users.

6.1 Summary & Major Issues

The Study highlights the issues and constraints realized while undertaking this exercise, which are briefly presented in the following sections.

6.1.1 Sampling

- While undertaking the sampling exercise for the Verification Survey, particularly distributing the district-wise share of paved and unpaved roads, the Study Team, during the field surveys, found that most of the sample roads were paved, and not unpaved as per the available records. Under such situation, the Study selected unpaved roads from nearest or neighboring Districts of ERA.

- It was realized that the relative share of sample size of unpaved roads of the RRAs was rather low as compared to their vast road network, which was a challenging task to finalize the sample. The issue was sorted out by selecting shorter segments from different corners of the regions to have a wider spatial distribution and fair representation.

6.1.2 Verification Survey

- Roads planned for the Verification Survey were sometimes under construction or hard to drive due to their bad condition, which forced the sample to be modified in consultations with the Officials concerned.

- Main sources of some of the data on the Survey Formats have been the ERA's Districts, and RRAs or MRAs. However, the Study observed that most of them did not have database illustrating the design standards, traffic level, and other inventory data of their roads; particularly the MRAs, which were important components for establishing the baseline.

- The Study observed that most of the surfaced treatment roads under paved road category were in poor condition than asphalt concrete roads even though they were recently constructed or rehabilitated. It is, therefore, suggested that in view of little extra cost implications; the asphalt concrete roads should be preferred, which would also reduce the maintenance burden of future. The option is also supported with the HDM-4 based life cycle cost analysis.

- Roads, which have good pavement structure, are prone to get damaged due to lack of proper drainage structure.

- Almost all gravel roads have no road furniture, such as, sign post, guidepost, km-post, etc. This situation, among others, may cause more accidents, etc. to the users.

6.1.3 Establishing the Baseline Data

Data collected through the Verification Survey have been extrapolated to obtain the condition data for the entire classified network, which in some cases may not show the accurate results because of ongoing road improvement and rehabilitation programs by different road agencies under different schemes. The condition data, thus, establishing the baseline scenario have been used for the maintenance needs assessment, formulating and proposing the maintenance interventions, and the corresponding costs, and also analyzing the Road User Charges to meet the maintenance costs.

7.0 MAINTENANCE NEEDS ASSESSMENTS & COSTS – BASE YEAR

This chapter establishes the base year maintenance needs for different types of roads with current pavement condition requiring different maintenance interventions, and the corresponding maintenance cost implications. The entire maintenance needs assessment exercise is highly guided by the road asset preservation concept in the country, also the maintenance eligibility criteria.

For the purpose of estimating the maintenance needs, the conditions of the roads are categorized as: (i) very good/good; (ii) fair; (iii) poor; and (iv) very poor, which are in conformity with the ERA's classifications used for general and maintenance planning. These classifications are also termed in IRI values to avoid any subjectivity.

The roads showing first three categories, viz. (i) very good/good; (ii) fair; (iii) poor condition are considered as the "maintainable roads", and the roads in very poor condition are considered as failed, requiring rehabilitation with heavy capital cost expenditures, hence not taken under the category of maintainable roads.

The types of maintenance interventions considered for the Road Fund financing are

grouped under: (i) routine; (ii) periodic; and (iii) emergency.

The unit cost for each type of maintenance interventions is determined from the breakdown of activities under the above-mentioned three maintenance groups. The maintenance interventions have been proposed to improve all the roads with the "fair and poor condition" to "good condition". While formulating the maintenance strategies and related costs; the location of specific roads on different terrains and levels of traffic, have also been taken into account.

Summary of the chapter is given as follows:

- All the paved roads under ERA (7,476 km) and MRAs (1,285 km) are identified in maintainable condition, so appropriate routine maintenance, i.e. on yearly basis, and the periodic maintenance at an interval, i.e. 5-7 years, as per the surface condition, terrain, and levels of traffic, etc., have been proposed.
- Under paved roads, no road sections found as very poor roads or failed roads, so there is no case of backlog of severe maintenance or rehabilitation.
- While analyzing the results of unpaved roads, as much as 95% of the total unpaved roads have been found in maintainable condition.
- Entire road network under ERA is observed in maintainable condition.
- In case of unpaved road networks under the RRAs, more than 8.6% of the total road network has been found in very poor or failed condition, hence, does not qualify for the ORF financing, rather there is a need for rehabilitation with higher capital expenditures.
- Only 66 km of roads under MRAs found in very poor condition requiring rehabilitation.
- In order to have an optimum road maintenance strategy, particularly in view of the limited maintenance budget and capacity constraints of the road agencies, the Study has considered four alternative maintenance scenarios. The costs of annualized maintenance (2011) in ETB million including merits and demerits of different scenarios are summarized as follows:

Scenario	Maintenance Cost	Remarks / Comments
Scenario-1	3,717.14	High budget, not easy to achieve and capacity issue
Scenario-2	4,730.85	Very high budget, and not easily achievable
Scenario-3	2,409.68	Acceptable budget and more practical option
Scenario-4	2,257.59	Acceptable, but smaller network under maintenance

The Most Preferred Scenario: Scenario-3 is the most preferred option, which considers the past experience, capacity and budgetary constraints of undertaking maintenance activities, which could also be considered as most practical option. Under Scenario-3, considerable size of roads with fair and poor condition could be undertaken for maintenance, and hence, further deterioration could be arrested. The estimated cost worked out under Scenario-3 is realistic and acceptable, and the targets set can be achieved. This option/scenario, among others, ensures the preservation of road assets of the country with quality service.

8.0 ROAD DETERIORATION MODEL & APPLICATIONS

This chapter presents the results of the Road Deterioration Model based on the HDM analysis; and also suggests the required road maintenance interventions. The exercise has been carried out in view of the road asset preservation under different road surfaces, traffic levels and other external conditions, which are largely responsible for road deterioration.

Results of the Road Deterioration Model, among others, have also been used to derive the overloading fines/fees on account of damages caused by the overloaded vehicles in the country, and determining the rational road user charges, to cover the extent of road deterioration, e.g. Mass Distance Charges (MDCs) to be adopted for the federal paved road network in Ethiopia.

The chapter also reviews the enforcement mechanism to curb the tendency of overloading by intercepting the overloaded vehicles at the existing weighbridge stations and also identifies additional weighbridge stations at the appropriate strategic locations on the main road network in the country.

The chapter works out the maintenance needs and the costs for the next 10 years, i.e. multiyear

analysis. The exercise would enable to appreciate the requirements of fund, which would be needed yearly for maintaining and preserving the road assets of the country.

The multiyear analysis primarily estimates the costs for undertaking the maintenance activities on the classified roads being administered by the road agencies, and also incorporates the maintenance costs for the "Wereda Roads", which are being developed under the Universal Rural Road Access Program (URRAP) of the RSDP IV.

Summary of the Chapter is given as follows:

8.1 Maintenance Strategies & Standards

For preserving the road asset in the country, the "Optimum Work" standards have been proposed using the strategic analysis application while running HDM-4 by specifying a series of maintenance alternatives for the road networks under ERA (paved and unpaved), RRAs (unpaved) and MRAs (paved and unpaved), based on different traffic levels, pavement conditions, terrain, climate, etc.; in reality true optimum standards are very difficult to achieve without an intensive investigation, due to the level of interaction of the numerous deterioration parameters and works standards effects.

8.2 Paved Roads

- The following maintenance strategies, which ensures preserving the national road assets, have been proposed for the periodic maintenance of the classified paved road network in Ethiopia[2];

Maintenance Strategy	Resealing	Overlay
Low Level	Total Carriageway Cracked >=30 %	Roughness>=6 IRI
Medium Level	Total Carriageway Cracked >=20 %	Roughness>=5 IRI
High Level	Total Carriageway Cracked >=15 %	Roughness>= 4.5 IRI

- Recommended Maintenance Interventions Alternatives ensure that roughness of the roads with asphaltic pavement in the country assumed to be less than 6, 5 and 4.5 IRI during the analysis period, i.e. up to 2020, based on the maintenance strategy followed, termed as low, medium and high in view of offering the quality service and also reducing the VOCs.

- In case of DBST, at low level maintenance strategy, periodic maintenance is recommended when area of carriageway cracking reaches 30%; whereas for medium and high level of maintenance, periodic maintenance is worked out at 20% and 10% of carriageway area under cracking;

- The results of HDM-4 analysis with the above strategies confirmed that timely interventions would considerably increase the effectiveness of road maintenance. Delaying the maintenance interventions would cause premature rehabilitation or reconstruction, which would cost heavily to the economy; so undertaking proper and timely maintenance activities are highly desirable;

8.3 Unpaved Roads

- For gravel roads, two levels of serviceability have been considered: (i) basic level of maintenance, i.e. minimum requirement to maintain the network below roughness of 11 IRI; and (ii) ideal, i.e. desirable level of maintenance to maintain the network below roughness of 8 IRI; and

- HDM-4 analysis for unpaved roads has shown that the right combination of grading and re-gravelling is cost effective to maintain the network in an acceptable level of service. Grading has effect on maintaining the good road condition and user pass-ability, although it would not substantially reduce the road roughness.

8.4 Multiyear Analysis

- Total classified road network under the roads agencies, viz. ERA, RRAs and MRAs in the country is expected to increase from 53,349 km in 2010 to 86,591 km by 2020;

- The Wereda Roads being constructed under Wereda Road Offices (WROs), are likely to measure 90,417 km at the end of the analysis period, i.e. 2020, expected to be included in the classified road network of the country; if Wereda Roads are included, the length of classified roads would be about 177,000 km by 2020;

- Maintenance Cost of the classified road network has been estimated under three scenarios, i.e. low, medium and high maintenance strategies, with varying traffic level for paved and unpaved roads under ERA, RRAs and MRAs as per the actual road deterioration in next 10 years using the Road Deterioration Model;

- In order to preserve and maintain the classified road network in Ethiopia including the

[2] Besides periodic maintenance strategies, routine maintenance will be carried out every year.

additional roads planned to be constructed during the analysis period, the road agencies would be requiring the annualized maintenance cost ranging from ETB 2.9 billion to ETB 3.2 billion during 2011-20 depending on the maintenance strategy with low, medium and high;

• As per the RSDP IV, the roads to be constructed by WROs under URRAP are likely to be considered under classified road network. Hence, costs for maintaining the proposed Wereda Roads have also been estimated, which need to be financed by the ORF, if approved by the Road Fund Board;

• With the Wereda Roads included in the classified road network, the annualized expenditure on maintenance would be in the range of ETB 3.4 billion to ETB 3.7 billion; and

Annualized Maintenance Cost in ETB billion (2011-20)			
Strategy	**Low**	**Medium**	**High**
Without Wereda Roads	2.9	3.1	3.2
With Wereda Roads	3.4	3.6	3.7

• Results of Multiyear Analysis show that inclusion of Wereda Roads in the classified road network would increase the maintenance cost for the network by 15-17% under different maintenance strategies, i.e. low, medium and high.

8.5 Overloading Charges & Weighbridge Stations

• Overloading fine has been identified as one of the sources of the revenue as per the Road Fund Proclamation in Ethiopia. The fines are principally to be imposed as a deterrent to overloading to preserve the road pavement and not necessarily for generating revenues;

• In order to estimate the road deterioration caused by overloaded vehicles and the overloading fines in commensurate with damage to the roads, the Road Deterioration Model has been developed in the Study;

• Results of the Road Deterioration Model show that in order to cover the additional maintenance cost due to the overloaded vehicles, the overloaded vehicles would be required to pay ETB 0.13/veh/ton-km;

• Based on the above criteria, revenue through overloading fines can be expected up to ETB 33 million (approx.) per year with the present level of traffic;

• In order to minimize the incidences of overloading, nine stationary weighbridges covering most of the main routes were installed at strategically important places all over the country. In addition, three mobile weighbridge teams were introduced for random axle load control at different places in the country;

• Apart from nine existing weighbridges, three new weighbridges are found to be under construction;

• The existing numbers of weighbridge stations are not sufficient enough to intercept all the overloaded vehicles, particularly in view of growing road network of the country;

• The Study has proposed five additional weighbridge stations to be established in different parts of the country, so that the overloading practices could be properly controlled and monitored; and

• For permanent weighbridge stations in Ethiopia, multi-deck scales system may be preferred, and for surprise checking, mobile weighing systems, i.e. WIM should be resorted to.

Based on the international practices, particularly in the African countries, the Study briefly brings out some of the issues relating to overloading and weighbridges, which need to be considered while dealing with the incidence of overloading practices and administering the weighbridge stations:

- Estimation of the overloading fines/fees should include the level of overloading covering damage to the road, enforcement and administrative costs;
- There could be policy on setting progressive level of fines for the second and subsequent offences for effective enforcement;
- If required, the gross vehicle weight (GVW) could be reduced from 56 tons to 48 tons (Kenya practice). GVW is transferred to different axles of the vehicle, and by limiting GVW to 48 tons, the Study intends to reduce the overloading on the roads in the country. The provision of 48 ton as GVW as prevalent in Kenya, which may be proposed in other countries of Africa as well, following the regulations of COMESA, so that vehicles of different countries can easily pass through other countries without any problems. This would also ensure the harmonization in vehicle overload control;
- Offloading the overloaded vehicles is identified as one of the deterrent measures, which would require proper guidelines so

that such practices could be controlled, and also giving due regard to different commodities. For the purpose, the Study brings out a list of measures which could be kept in view while formulating such practices and guidelines for the evacuation of overloaded vehicles;

- In case of carrying perishable commodities or livestock that need to proceed without delay, cash bail out could be set, which should be paid immediately at the designated places;
- Common weighbridges at one-stop border posts to reduce delays of transit cargo;
- Mutual/reciprocal recognition of weighing certificates issued by accredited weighing stations in neighboring countries/states;
- The off-loading policy and related modus operandi prevailing in some countries, e.g. Tanzania may be followed in Ethiopia as well;
- The SADC Model Legislative Provisions for Management of Vehicle Loading call for setting overloading charges: (i) road use calculated on a weight-distance basis; (ii) enforcement activities; (iii) congestion factors; (iv) capital investment; and (v) any other expenditure borne by the national road authority relating to implementation of the provisions; and
- The SADC Model also call for transfer of overloading fees to the Road Fund, another good practice.

8.6 Mass Distance Charges (MDCs) in Ethiopia

• Mass Distance Charges (MDCs) is one of the new potential sources of revenue as road user charges for maintaining the roads in Ethiopia, which reduces the inequality among road users;

• The MDCs would be applicable for different types of heavy goods and passenger vehicles and contribute to meet the variable components of the maintenance cost;

• The MDCs for heavy goods and passenger vehicles have been worked out in the Study for different sizes of the vehicle based on the actual road deterioration caused by these heavy vehicles travelling on the road networks in the country;

• The Study estimates the rates of MDCs in five levels for accommodating different vehicles. The rates vary from ETB 7.1/'00 veh-km for small truck/mini bus to ETB 50/'00 veh-km for over-dimensional/abnormally heavy vehicle for travel on federal paved roads. The MDCs proposed for Ethiopia are fairly comparable with the rates applicable in Namibia, rather on the lower side; and

• If implemented, the proposed MDCs may contribute to the Road Fund up to 4-5% of the revenue with the assumed level of traffic with prevailing composition of vehicles.

9.0 Road Fund Boards: Review & Performance

This chapter presents salient features on functioning and operational efficiency of different Road Fund Boards (RFBs), in Africa including Ethiopia, engaged in preserving road assets and arranging finances for the road maintenance on sustainable basis following the "Second Generation" concept.

The compilation of the information relating to different RFBs has been carried out illustrating the following major areas: (i) structure, viz. objectives, legal basis, declared role, resource generation and distribution powers, composition of the boards, executing agency; (ii) process, viz. determining income, securing income, monitoring performance in allocation, technical audit, formal allocation processes, and development of supply agencies; and (iii) performance outcome, viz. underfunding, capacity of local construction industry, operational efficiency, and quality of road network, would present the international practices, and make the building blocks for reviewing and analyzing performance, and identifying the major issues and areas of improvement of the Ethiopian Road Fund (ERF).

The critical issue is however to what extent the Road Funds increased in productive efficiency and service improvements. The "Operational Efficiency" of a Road Fund essentially means the efficiency with which it handles its day to day operations that result in better service delivery and ultimately an "improved road network".

This chapter establishes the basic concepts of the Road Fund, reviews the Road Fund Boards of different African countries on account of several functional areas, and brings out common issues, etc. in special reference to Ethiopia. This exercise would also enable to appreciate the functioning of Ethiopian Road Fund Board, and useful lessons from the international practices.

Under the present consultancy services, the Consultants also prepared a "Questionnaire" soliciting relevant information from different Road Fund Boards functioning in Africa, so that the latest facts and figures could be obtained, and

used in the Study. For the purpose, the Road Fund Boards of Tanzania, Ghana, Malawi, Madagascar and Kenya, were approached to furnish the Questionnaire with the information requested. Responses from Tanzania and Ghana were received.

Summary and major issues of the chapter are as follows:

9.1 Structure

- The road funds generally secure the legal basis, and the Ethiopian Road Fund and the Board were set up by the Parliamentary Acts through a Proclamation in 1997.

- Most of the RFBs do not observe additional functions other than the required as per the usual Second Generation Road Fund norms, and the Ethiopian Road Fund also does not have any additional functions.

- For proper representation of the road users and business community, it is advised that at least half of the board members come from outside government, which would create a form of surrogate market discipline. The logic for the same is that they are paying for the roads and they have strong interest of not being over-charged, and also the money is well spent. On this criterion, the Ethiopian Road Fund Board has less private sector representation on the Board, i.e. only four out of 16 total members (1997). The presentation of rural network is also highly desirable.

- It is desirable that the planning function should be separate from the executing function, and the Ethiopian Road Fund does observe the same like most of the selected countries for the analysis.

- Most of the RFs are professionally managed; however, it has been observed that many RF Secretariats are not yet fully staffed by professionally qualified and experienced personnel or less than the approved or designated professional positions. In the ORF, Ethiopia, the number of approved staffs are 24 (21 professional and 3 secretaries), of which only 17 staffs are working (15 professional and 2 secretaries), so seven positions are vacant.

- There have been discrepancies found in the defined roles of the RFBs and the Secretariats among different countries' practices. The principle responsibilities of the Boards are resource generation, allocation and evaluation. In view of these, the roles need to be defined. In some of the countries, viz. Zambia and Malawi have gone beyond. However, for the Ethiopian RFB, it is advised to confine to their roles and responsibilities as per the Proclamation (1997).

9.2 Process

- The income level of the Fund has remained largely under control of the ORF, Ethiopia; whereas in many countries, it has been observed that the control largely remained with the government.

- The time taken during the transfer of revenue to the Road Fund account in Ethiopia, i.e. about one month, is reasonably acceptable, as in many countries it takes two to four months.

- As per the prevailing practices, about 50% of the VAT collected through sales of petrol and diesel, is transferred to the ORF.

- The funding arrangements in most of the countries, including Ethiopia, appear to be transparent with financial audits working well.

- Considering several merits and simple to implement, the formal allocation criteria based on the "Standard Formula" appear to be working well in many countries, including Ethiopia. The formula based allocation criteria ensure disbursement to different types of roads, viz. main, regional rural and municipal, it should, therefore continue. However, as revised in past, it could be revised in future, if felt necessary, particularly in view of the structural changes in the country's road network and the socio-economic development policies.

- In Ethiopia, for undertaking the quality checks for the road maintenance works by the road agencies, the ORF retains the private consultants for supervising the maintenance activities; the consultants submit the monthly, quarterly and annual progress reports of the works accomplished.

- Efforts are made in capacity development of road agencies in Ethiopia by the process of increasing the proportion of the contracting out the road maintenance activities. In fact, the above outsourcing process would increase the capacity of the road agencies.

9.3 Performance Outcome

- Due to growing size of the classified road networks, and also the number of road users all over, the road maintenance needs have accordingly been increasing, causing always resource constraints. Also in Ethiopia, there has been a sizeable growth in the classified road network, particularly since the implementation of various Road Sector Development Programs

(RSDPs), requiring much higher resources, which are not adequate enough to maintain the built up road assets, particularly for the periodic maintenance. This position would certainly leave behind several routine and periodic maintenance activities, which would result in, higher proportion of poor or bad roads.

• The absorbing capacity of the funds allocated to the maintenance executing agencies, has been recognized as one of the constraints. In Ethiopia by ongoing structural changes in road agencies, the practices of contracting out the road maintenance activities are expected to grow in near future, which would enhance the capacity and efficiency in view of market competition.

• Despite of several limitations, due to monitoring and evaluation of the RFBs, there has been reduction in maintenance costs in terms of per km. In Ethiopia as well, the evidence shows reduction in maintenance cost/km and improvement in quality by hiring private contractors in the maintenance activities. In view of the above, a study on performance based contracts on pilot basis has also been entrusted by the ERA for three road segments to a consultant; the outcomes of the study are awaited.

• The regular decline in road quality has been arrested and also the condition of the roads has been significantly improved. In Ethiopia, the level of road condition as "good" of the total classified road network has been estimated as 56% in 2010, which can be considered as quantum jump from merely 25% in 1999 level.

9.4 Road Safety Issues

Most of the RFBs are addressing the issue of Road Safety, as the Ethiopian RF has a special mention in the Proclamation and practices to finance the Road Safety related interventions.

9.5 Second Generation Road Fund – An Evaluation

Ethiopia stands in the second tier of the countries on the overall performance index (along with Ghana, Rwanda and Madagascar), after Namibia, Kenya and Tanzania, who are top scorers, as per the AICD Document. There are very few lessons to be learnt from African countries' experience, which have more or less similar problems regarding operational efficiencies.

The seven criteria of a good design specified by the 35-member Sub-Saharan Africa Transport Policy Program (SSATP) considered are presented as follows:

- Clear legal foundation;
- Separation of functions;
- Application of road-user charges;
- Direct transfer of funds;
- Representation of road users on the board;
- Clear revenue allocation rules; and
- Independent auditing of accounts.

Out of the above seven criteria, Ethiopia appears to do fairly well in about 80% of these cases. It has established a good institution with an existence of a road agency and follows most of the design features of any good Second Generation Road Fund. But it does lack from the channeling of resources point of view, whereby most of the resources of the road fund are still borne by government allocations (e.g. VAT) and not by the road user charges.

9.6 Performance Analysis of Road Fund

While evaluating the performance of select road funds in Africa based on various parameters of expenditure, institutions and quality, Ethiopia does fairly well in terms of setting good institutions and channeling large volumes of resources for the road fund. Largely, the problems and issues remain the same across African countries, they tend to suffer from the same issues of already burdened road users and limited finance availability, poor condition road network, huge maintenance backlogs, road user charges not properly framed, and if framed, not properly collected, yet there are good practices, which could be replicated by Ethiopia to improve performance. Countries, like, Kenya, Tanzania and Namibia have performed relatively better than other countries and could impart quite a few lessons to Ethiopia.

9.7 Issues Related to the ERF

Ethiopia's Road Fund was established in the year 1997 and, since that time, the maintenance problems of the country's road network have reduced to a great extent. As per the RSDP IV document, the trend of good condition road network, both for main road network and rural road network, has increased from 22% (1997) to 56% (2010), a statistic, not very impressive yet encouraging with an annual growth rate of 7% over 13 years of the road fund operation.

While evaluating the performance of the Road Fund Boards' operations since its inception in

Ethiopia vis-à-vis other countries' Road Funds, the major issues turn out to be as follows:

- Massive road sector development programs and regular road fund's support since 1997 have generally resulted in bringing majority of the road network condition to a good to fair condition; however these developments remain skewed towards the main road network, which shows a higher growth rate in the increase of good condition roads (12%) than the rural roads (7%). The spending pattern on rural roads is also half of what is spent on main road network;
- Ethiopia fulfills 100% of the routine maintenance requirements, but falls short of periodic maintenance needs; and
- There is also a marked capital bias in most of the works, with maintenance expenditure falling short of the requirements;
- While evaluating operational efficiency parameters, it was studied whether the road fund operations in sample countries have resulted in improved contract management and disbursement arrangements. Several countries have made important headways in this aspect.
- For Ethiopia, it appears that the main reasons for the slow utilization of road maintenance funds could be limited implementation capacity of the road agencies and local contractors caused by the shortage of equipment and supervision resources, as well as poor work scheduling practices.

10.0 Road Fund: Sources of Revenue

The basic purpose of the present chapter is to set the concept and rationale, and the prevailing practices and limitations of different sources of revenue of the road fund, which are also functional with different Road Fund Boards in developing countries, particularly African countries, that could be probably adopted in Ethiopia in view of the growing road maintenance needs and requirements of additional financing. While undertaking the exercise, the underlying assumptions, which are governed by the Second Generation Road Fund concept based on the user pay principle to cover the incremental cost for the road maintenance, have been kept in view.

Summary and the major issues emerged from the present chapter are given as follows:

- Main revenue-raising mechanism relates to "Road Use", viz. fuel levy, bridge tolls, and weigh bridge fee, or to "Road Access", i.e. license fee;
- Charging road users should consider appropriately on the following criteria:
  - Vehicle Usage (fuel charges, tolls and weigh-distance charges);
  - Payments relate to Vehicle Use: (vehicle license fees, registration fees, vehicle inspection fees and vehicle transfer fees);
  - Payment related to Vehicle Acquisition (import duties, excise taxes and sales tax/VAT); and
  - For Local Access (usually financed by General Tax Revenue).
- The "International Transit Fees", which charge foreign vehicles for use of the road network, should be paid into the Road Fund;
- The "Overloading Fines", it is legitimate to pay fines of overloading into the Road Fund;
- The Fuel Levy should be specified as a discrete charge added to the price of fuel, rather than a percentage of the fuel price;
- The "Weight-Distance Charge" or "Mass-Distance Charges", might replace the fuel levy on diesel in long term depending on the large size of non-transport users;
- The specific beneficiaries of the road maintenance interventions should pay for the maintenance cost proportionately, e.g. the agriculture cess; and
- Many Road Funds in Africa are now reconsidering road tolls especially on roads that are given concessions to private investors.

11.0 Road Fund Revenue in Ethiopia – A Review

This chapter aims at describing the Ethiopian Road Fund with its objectives, functions, sources of revenue, the responsibilities of the Board and the Secretariat. The chapter also presents the extent of revenues being collected from road users through different sources with a brief review on the magnitude and limitations of the sources. Among others, the chapter indicates the training requirement for the ORF staff for technical capacity development and also the road agencies and private contractors for effective and efficient implementation of the ORF financed projects and also the overall capacity development.

The present chapter analyzes the prevailing Road Fund Revenues, and further scope of generating additional revenues in view of the

growing road networks and maintenance needs of the country.

Summary of the chapter is given as follows:

11.1 The Board & Organization Structure

- As stated earlier, the ERF Board has less private sector representation, as only four out of 16 members, which registers less than half of the advised level; and also presentation of rural network is desirable;
- The Board has power to "issue directive to define collection and disbursement procedures of the Fund";
- The ORF also observes lack of staff for supervision or audit missions, which makes it difficult to keep a budgetary control over road agencies;
- The number of approved staffs in the ORF are 24 (21 professional and 3 secretaries), of which there are only 17 staffs are working (15 professional and 2 secretaries), so 7 positions are vacant, which are required to be filled in as soon as possible;
- In order to monitor the ORF financed projects effectively and efficiently, and also ensuring proper implementation in view of value for money, particularly addressing the outcomes of present Study, there is a need for additional in-house expertise for undertaking the various tasks;
- It is crucial to strengthen the Engineering Department at ORF by adding more technical audit experts/staffs; addressing the growing size of the network and geographical proximities; and
- The Study proposes additional Technical Audit Experts/Staffs at ORF, who would be responsible for several technical activities relating to the monitoring and evaluating the ORF financed projects. A total of 11 additional Technical Audit Staffs are proposed under the Department of Technical Audit, in a phased manner depending on the scale and requirements, to properly follow and make the maintenance works successful.

11.2 The Road Fund Board, Fund Allocation & Transfer

- The maintenance needs assessment carried out by road agencies varies from one agency to the other; due to lack of resources, some of the agencies confirmed that they carried out visual roughness inspection surveys to assess the road deterioration levels and the need for re-gravelling or resurfacing;
- Most of the road agencies have expressed their inability to carry out any surveys before drawing up their preliminary budgets for road maintenance mainly due to resource constraints;
- The unit rates adopted for the preparation of the cost estimates also vary from one agency to the other;
- It may be noted that the Proclamation (1997) suggests that "disbursement of the Fund shall only be made for the works performed and for goods and services procured as set out in the approved annual program and according to procedures established by the Board";
- The structure as well as additional/new source of the Road User Charges needs to be rationalized in view of the growing maintenance needs and costs in the country;
- The level of revenue of the Fund has remained largely under the control of the ORF, Ethiopia;
- The Road Fund generally allocates up to 90% of the total budget to the road maintenance activities, which is distributed among the three road agencies, as 65% to the ERA, 25% to the RRAs, and 10% to the MRAs, for maintaining the roads under their jurisdiction;
- The above Fund Allocation criteria for the road agencies are not necessarily based on a systematic method or plan rather more on historical practices and structure of the classified road network of the country. However, the allocation criteria in present context appear to be rational in view of addressing the road maintenance needs of all types under the classified road network, and hence may continue in near future as well;
- Following the RSDPs, particularly RSDP IV, the structure of the classified road network in the country is likely to be changed in coming years with inclusion of the Wereda Roads, which may influence the Fund Allocation Criteria in future. It is, therefore, desirable to review the changing structure of the classified road network on regular basis, and accordingly suitable changes in the best interest of the socio-economic development of the country may be proposed;
- Under the RSDP IV, there is a plan to improve more than 71,000 km of the Wereda Roads with proper engineering standards by 2015 which are presently under unclassified category. These roads would provide links to transport goods and services in rural areas, which would also require

maintenance. The development of Wereda Roads would influence the policy and allocation criteria, once it becomes the part of Classified Road network;

• Allocation of the Fund on the "Road Safety Measures" needs to be broadened within the Road Fund Budget for the purpose. The factors affecting the process are type and capacity of road agency for maintenance works, estimated road maintenance needs, and regional social and economic factors;

• Considering the upper limits of the budget allocation set by the ORF for the road agencies; the actual budget transfer takes place in accordance with work progress and invoicing for those works; and

• Since 1997-98, the commencement year of the Ethiopian Road Fund, a sum of ETB 7.7 billion was allocated for road maintenance purposes, of which ETB 6.9 billion (88%) got transferred to the road agencies; and a sum of ETB 900 million (approx) allocated towards the traffic safety measures, capacity building and ORF Support.

11.3 The Fund Performances

• Physical performance of the Road Fund, i.e. in terms of km, shows a higher level of target achievements. More than 30,000 km of roads were brought under planning for the maintenance activities during 2009-10, but on an average only 87% of the roads targeted for maintenance could be accomplished, which need to be improved by taking suitable measures;

• The growing level of the proportion of "Good Roads" in the Classified Road Network of the country administered by different road agencies shows an encouraging pattern (i.e. 73% of paved roads and 53% of unpaved roads under ERA and 53% of roads under RRAs are in good condition). The reasons could be obviously attributed to the Road Fund financing of the maintenance activities;

• Earlier studies, viz. Road Funding and Road User Charges in Ethiopia (2004), and Road Financing Study, Ethiopia (2005) brought out that the road maintenance needs assessment in the country was grossly under-funded. Nevertheless, the RSDPs' initiatives, combined with the setting up of the "Second Generation Road Fund" in 1997 with dedicated revenues from levies on fuel have considerably improved the condition of the road network in the country;

• The current revenue level of the Road Fund and its structure of the road user charges will not be in position to meet the growing maintenance needs of existing and new roads of the country. It is reported that the Road Fund is currently able to support the routine maintenance activities with partial support to periodic maintenance;

• The PPB Department, ORF has limited skilled resources to check on the action plans submitted by the road agencies; which restrict the ORF in checking the maintenance works and the corresponding unit rates properly and discrepancies found in the unit rates of different regions for the same works;

• The Engineering Unit usually prepares the budgets without much consultation with the Finance Unit, so that it is difficult to ascertain the authenticity of the Unit Rates, which are not matched with actual past expenditures for various maintenance works;

• The Study assesses and identifies the requirements of capacity development of the Office of Road Fund, particularly the need for an independent Engineering Department with the required Technical Staff, so that proper technical, planning, monitoring and evaluation could take place. The arrangement would ensure in-house capacity for effective and efficient monitoring and evaluation of the ORF financed projects; and

• The training could be organized at several levels as per the need of different functional areas relating to the road maintenance needs assessment, costing, road users charges, etc.

11.4 The Fund Performances

• In view of the requirements of the ORF, the Study has identified the major areas of training, such as, different maintenance interventions; operating E-RUCS software for maintenance needs assessment, costs and adjusting the road users charges; Procurement of Works and Contract Management; Monitoring and Evaluation of the ORF Financed Maintenance Projects; and derivation and evaluation of unit cost for different road surfaces;

• For the benefit of the ORF and proper road maintenance planning and implementation, the following trainings may be organized suitable for the road agencies and/or the private contractors from time to time, viz. Maintenance Planning, Road Inventory and Pavement Condition Survey; Pricing and Specification; Supervision of Maintenance Works; Maintenance Operations; and Equipment operation and machine maintenance; and

• For on-job training, the Study has identified Namibia, Tanzania and Kenya as well

functioning road funds based on the analysis carried out by the RMI for the SSATP. The training in these countries would be particularly beneficial in view of implementing additional/new sources of revenue and other related activities, e.g. the Annual Vehicle License Fees, Mass Distance Charges, restricting overloading practices, proper usage of weighbridges, etc.

12.0 Road Fund Revenue: Potential Sources

This chapter identifies the potential sources of revenue for the Ethiopian Road Fund. The exercise is highly guided and dependent on the internationally accepted practices following the Second Generation Road Fund concept; equitable road user charges determined by the road deterioration model, incremental road user charges, etc. within the overall frame of the Ethiopian Road Fund Proclamation (1997).

The need for potential sources of revenue is highly realized in view of the growing road maintenance needs in future on account of both preserving the existing assets and additional roads (new and rehabilitated) of the network and offering quality service.

While identifying the potential sources of revenue for the Road Fund, the Study explores the possibilities of: (i) revision of the prevailing sources of revenue; and (ii) identification of the additional sources of revenue.

The chapter describes various potential sources of revenue by revision of the existing sources of revenue and also additional/new sources within the Second Generation Road Fund concept and the Ethiopian Road Fund Proclamation. The additional/new sources of revenues have been identified on the basis of international practices with its suitability in Ethiopian conditions, and also conforming the user pay and equitable principle. The above exercise has been mainly guided by the Road Deterioration Model using HDM-4 Analysis. The potential sources of revenue with the description and remarks are highlighted as follows:

Potential Source			Description & Remarks
Existing Source of Revenue	Government Budget		Partial Contribution mainly through VAT collected on Fuel
	Levies on Fuel	Road Fund Fuel Levy	Needs to be increased
		Municipal Tax	No changes in rates proposed
	Transit Fees		Needs to be rationalized and suitably revised
	Interest on Treasury Bills		Should be restricted up to 0.05% to the RF
Additional/ New Sources	Annual Vehicle License Fees		Needs to be introduced to cover Fixed Cost
	Mass Distance Charges (MDCs)		Needs to be introduced to make the charges rational for heavy vehicles
	Overloading Fines		Based on Rational Fines/Fees, as deterrent only

13.0 Road User Charges: Analysis & Estimation

This chapter analyzes the Road User Charges based on the existing and also potential sources of revenue for the Ethiopian Road Fund (ERF) for meeting the costs of road maintenance activities in the country. The exercise incorporates the effects of revisions of prevailing sources as well as additional/new sources of revenue, which could adequately finance the maintenance tasks on a sustainable basis. The above analysis has been carried out with the application of "E-RUCS Software" specially developed for estimating the road maintenance needs, cost and the road user charges under varied conditions and scenarios

The Road User Charges (RUCs) being analyzed and proposed are highly guided by: the needs for additional fund for the road maintenance of the "classified roads" found in maintainable condition in the country; best international practices with high probability of its acceptance in the Ethiopian condition; rational and equity derived on the basis of Road Deterioration Model using HDM-4 analysis; user pay concepts, and preserving the national assets to avoid heavy losses in case of negligence in road maintenance, particularly in view of inadequate road user charges, which may result in huge maintenance fund gap.

The exercise basically aims at meeting the maintenance needs of the classified roads (maintainable), but it also estimates the maintenance needs of the Wereda Roads under another scenario, as the Wereda Roads which are presently under the unclassified roads category are likely to be brought under the classified roads category.

13.1 Sum Up & Major Issues

The analysis of Road Users Charges has been carried out in view of minimum and rational changes in the existing sources, and the additional/new sources identified of revenue for the Ethiopian Road Fund, which could eliminate the fund gap on a sustainable basis.

While undertaking the exercise, it was kept in view that the proposed options could be accepted for short to long-term time horizon, and also its adaptability in the effective manner.

The RUCs analysis has been carried out under several options and scenarios, and for illustration, nine different options have been presented, of which four options consider the changes in existing sources of revenue, and remaining five options also incorporate the effects of additional/new sources of revenue.

Summary, findings and major issues relating to the Road Users Charges analysis and estimates are presented in the following sections.

13.1.1 With the Existing Sources of Revenue

The Road Users Charges considering the extant practices, i.e. no inclusions of additional/new sources of revenue, the analysis mainly aimed at not disturbing the proven major sources of revenue, i.e. levies on fuel (VAT, Road Fund Fuel Levy and Municipal Tax). It has also been realized that collection of levies on fuel is relatively easy, transparent and cost effective, besides no realization on new taxation, i.e. only marginal impact.

- In view of the requirements of road maintenance needs and costs, and also the socio-economic development of the country, a regular Government support would be required, e.g. the levies on fuel collected from the road users need to be transferred to the ORF; as it has been observed that only 50% (approx.) of the total VAT collected on fuel is transferred to the ORF;

- While analyzing the Road Users Charges, under the existing sources of revenue, i.e. no consideration of any additional/new sources of revenue, if the current practice of 50% VAT transfer to the ORF prevails, the increase in Road Fund Fuel Levy would be required up to ETB 1.60/liter for petrol, and ETB 1.34/liter for diesel. It may be noted that the prevailing rates of Road Fund Fuel Levy are: ETB 0.095/liter on petrol and ETB 0.080/liter on diesel, which have not been changed/revised since its introduction in 1997;

- If the entire amount collected through VAT is transferred to the ORF, the level of Fuel Levy would be restricted to ETB 0.84/liter for petrol, and ETB 0.70/liter for diesel to meet the maintenance requirements, i.e. nominal increase in the Fuel Levy; and

- The analysis has identified RUCs Option-2 as the preferred option with no considerations of additional/new sources. Option-2 aims at 100% transfer of VAT to the ORF, and rational changes in Fuel Levy, as the Fuel Levy rates have not been revised so far.

13.1.2 With Additional/New Sources of Revenue

In order to rationalize the Road Users Charges and reducing the growing burden on the levies on fuel, the Study has explored additional/new sources of revenue. Considering higher damages made by heavy vehicles to road surface, which is usually not recovered by the Fuel Levy collected through the fuel sales/consumption, the Study has accordingly incorporated the need for additional sources. The exercise is mainly based on the Road Deterioration Model, which would share the burden of levies on fuel judiciously:

- The Annual Vehicle License (AVL) Fees and the Mass Distance Charges (MDCs) in particular are identified as potential sources of revenue. These sources of revenue are widely used including African countries. Since these two sources of revenue are new, it may take some time in acceptance, its implementation and also the institutional arrangements, specially for the MDCs; and

- With the additional/new sources of revenue, RUCs Option-6, which considers AVL Fees and MDCs (only 25% of the estimated charges for covering the respective damages) is the preferred option; after its acceptance, it would require a few years to develop a proper mechanism to administer the same.

Depending on the Government's policy and guidelines, and also introduction of additional/new sources of revenue with revised level of existing sources of revenue, the transfer of the proceeds collected as VAT on petrol and diesel to the ORF could be reduced in a phased manner, if required, after a few years considering the time taken for adopting the additional/new sources of revenue.

For an illustration, the Study would propose that first, AVL Fees, which are already under consideration, should be introduced as soon as

possible, and the MDCs, which requires special preparation and collection mechanism should follow, say after a couple of years.

To make the above-mentioned additional/new sources of revenue operational, it may take two to three years, so the reduction process of transferring VAT to the ORF may take place from 2015 onwards in phased manner, i.e. on a progressively reducing share of VAT to the ORF, as per the requirements, availability of alternate source(s) of revenue and the Government's policy and guidelines.

13.1.3 Other Issues & Concerns

• In the Government 5-year's Growth and Transformation Program (GTP), new URRAP Roads, i.e. Wereda Roads would be developed and come into the existence. These roads would make the network more coherent and required, particularly for rural areas for their socio-economic development. Hence, the importance of considering the maintenance cost for the Wereda Roads in future is high, and accordingly should be considered while formulating the required maintenance policy and plans.

• Reducing share of the VAT, while transferring to the ORF for undertaking maintenance activities, and increasing burden on Fuel Levy would highly affect majority of the population – directly or indirectly; as any increase in fuel prices will have an impact on costs of transporting goods and services, and hence every walks of life.

• Considering the role of VAT, which is not a committed source of revenue to the ORF; it may be proposed to reduce the contribution of VAT to the ORF for maintenance activities in future, which is based on the Government priorities and policy, in a phased manner, if the alternate sources of revenue, such as, AVL Fees and MDCs are accordingly introduced with an acceptable level; as the introduction of AVL Fees and MDCs in view of rationalizing the road user charges, would also affect the transport costs in general.

• Under the present Study, the E-RUCS has been developed to work out the maintenance costs, maintenance interventions, and suitable road user's charges under varied conditions and scenarios. To obtain more realistic maintenance cost estimates, road inventory and pavement condition data need to be collected on a regular basis through proper field investigations and surveys. There is a need to enforce the road agencies to collect such data on a regular basis, so that realistic road maintenance needs assessment could be established, and for the purpose, suitable financing arrangement on sustainable basis is required.

14.0 Consequences of Negligence in Road Maintenance

The need for undertaking timely road maintenance has been widely realized for conserving the asset and also for ensuring uninterrupted efficient and effective road transport system. It has been often noticed that in socio-economic development plan, the construction of new roads get due consideration, but when it comes on preserving the asset by proper maintenance plan and adequate financial support, it does not get the required importance. And with the result, i.e. "due to negligence in road maintenance", the road network gets deteriorated considerably and even completely. In such conditions, the network requires severe maintenance or rehabilitation demanding much higher financial allocations, causing higher transport cost, en-route damages and inconvenience to the road users.

With the above brief background, this chapter aims at addressing and estimating the "consequences of negligence in road maintenance" through several methods and parameters, so that the message could be strongly highlighted and appreciated by those who are directly or indirectly involved at higher levels in decision making process for the road maintenance plans, strategies and arranging sustainable financial support.

The costs of negligence based on the assumptions, facts and figures relating to Ethiopia have been worked out, which shows that; (i) the value of road asset would be reduced to half in ten years; (ii) Rehabilitation – Maintenance Ratio would increase to 4.85, which would be huge loss to the economy.

The adverse impacts of negligence in road maintenance have been analyzed with tangible evidences, e.g. Valuation of the Road Asset in Ethiopia; Road Rehabilitation Costs; Higher Vehicle Operating Costs; Higher Road User Charges; Higher Transport Cost (Economic Movement, etc.); and Road Safety Concerns.

The affected areas mentioned above set a logical and convincing argument to give due importance to the timely road maintenance interventions. It has also been realized that in absence of proper, regular and sustainable financial support, mainly based on the road user charges, for the maintenance, it may cause inadequate maintenance strategy and interventions. Such situation would lead to further deterioration in the road pavement, requiring much higher maintenance cost, causing higher VOCs, inconvenience to road users, etc. Eventually, the higher maintenance costs, would result in substantially higher road user charges in comparison with the base year road user charges.

15.0 E-RUCS & Software User's Manual

Ethiopian Road User Charge System (E-RUCS), i.e. computer Software, has been specially developed under the present consultancy services for adjusting the Road Users' Charges to meet the road maintenance needs and costs worked out under different conditions. The E-RUCS has been developed as per the requirements of the ToR, which, inter alia, estimates the multiyear road maintenance requirements, maintenance intervention costs, and impact on road user charges and its analysis under several assumed scenarios.

The E-RUCS is a user friendly software, which requires data inputs relating to the road inventory, maintenance interventions, costs and road users' charges, and generates outputs as per the user's requirements.

The Software is designed to provide with the decision making tools by incorporating different levels of road inventory with pavement conditions under different road agencies, varied maintenance costs, and different sources of road user charges with changes in existing as well as additional/new sources of revenue for the Ethiopian Road Fund.

The E-RUCS is fully capable of managing road inventory data and related information, computing and generating outputs on maintenance needs assessment, proposed interventions, maintenance cost, and analyzing road user charges. However, the present chapter mainly describes and utilizes the application of the software for analyzing the road user charges for immediate understanding and illustration.

E-RUCS Software is developed to estimate the road maintenance needs, maintenance intervention costs, and the road user charges to cover and/or identify the maintenance fund gaps under different scenarios and options. The Software will generate reports providing details relating to different road agencies, e.g. the Districts of ERA, Regions of RRAs and Municipalities of MRAs, and also for the roads located at varied terrains, viz. plains, hilly and mountainous.

15.1 Application of the E-RUCS

During the present consultancy services, the E-RUCS Software has been extensively used for analyzing the "Road User Charges" under different scenarios incorporating several changes in the sources and levels of charges for the Road Fund revenue estimations to meet the road maintenance costs with different levels of interventions.

The E-RUCS could also be used for managing road inventory data and related information, computing and generating outputs on maintenance needs assessment, required interventions, maintenance cost, and road user charges.

The E-RUCS Software is fully capable to incorporate any changes in different parameters, internal or external, it is advisable that the users should use the system for analyzing the road maintenance related activities, costs, etc. under different road agencies, and the road users charges derivations.

16.0 Works Financed by the Office of Road Fund & Maintenance Costs: Review & Evaluation

The chapter presents review of the road works financed by the ORF in terms of cost, type of work, quality and effectiveness. The exercise has been undertaken, based on availability of details received from the ORF, the road agencies and consultations with the Officials concerned on sample basis.

Besides reviewing and evaluating the works financed by the ORF, the chapter also investigates further working of the maintenance costs in Ethiopia, so that the real costs of maintenance activities could be captured. For the purpose, the chapter particularly evaluates

economy, efficiency and effectiveness of road agencies while undertaking maintenance works and corresponding unit rates and total cost implications with additional facts and figures to capture the real costs.

Findings and major issues are given as follows:

The summary and major issues related to the exercise undertaken are given as follows:

- More than 250,500 km of roads brought under maintenance activities from 1998-99 to 2009-10, i.e. on an average, more than 19,000 km of different roads annually maintained. On the contrary, country has a substantial backlog in road maintenance task, as about 21,500 km (44%) of roads are in still fair/poor conditions or just on the verge of becoming very bad roads, which would become "non-maintainable roads".

- In view of quality checks for the maintenance activities, the Financial and Audit Department, ORF carries out the following tasks: (i) accomplishment report review; (ii) surprise visit to the sites for quality check; and (iii) retaining the private consultants for the maintenance activities. The staff often conducts the visual inspections of the work sites, which provides with more subjective inferences.

- Lack of proper and functional maintenance equipment has also been reported to be a serious hindrance achieving the maintenance targets in Ethiopia.

- The operational efficiency is likely to improve by introduction of the institutional reforms in the Road Agencies in Ethiopia which would lead higher efficiency for the available resources.

- Using the rates for undertaking the maintenance activities, as fixed in 2006-07 are no longer valid, which is one of the major reasons, the local contractors are not motivated to take the maintenance works.

- There are some discrepancies observed in Monthly Progress Reports and related payment certificates, related to unit rates, work planned and work executed:

  - In the Progress Report submitted by Oromiya Region, there is a discrepancy in the planned amount for each of the maintenance projects, contract network length (4,484.1 km in the financial statement and 3,965.8 km in the progress report) and the financial accomplishment for each of the maintenance projects.

  - In Tigray RRA, some municipalities resorted to transport cobblestone from too far to the worksite, e.g. Alamata Municipality transported cobblestones from Mekelle, which is about 137 km. This could have a negative impact on the progress and total project cost; fearing possibility of failing to complete the work, Adwa Municipality transferred the amount budgeted for cobblestone into a new unplanned work item, i.e. selected material re-gravelling; and Axum Municipality shifted the amount budgeted for periodic maintenance into cobblestone work, due to shortage of equipment/machinery that could have been resulted efficiently if managed, during planning stage instead of shifting the budget later during execution.

  - The SRRA planned to carry out 284 km periodic maintenance work and 1,164 km routine maintenance work in the fiscal year 2009-10. In the physical status, it was noted from the MPR that 1,164 km had been planned for execution in routine maintenance works with a budget about ETB 7.53 million. However, in a summary (SRRA Progress Report, June 2009-10), a sum of ETB 9.09 million was utilized for a length of 460 km only.

  - The MPR of Sheshemane District shows that in the fiscal year 2009-10, an additional amount of ETB 2.4 million was budgeted, when compared with the previous year, 2008-09. However, when the utilized amount is analyzed, there was a decrease of ETB 2.85 million in 2009-10 as compared to 2008-09 figure.

  - As per the MPR of Alemgena, the district accomplished what had been planned for 2008-09 fiscal year. However for 2009-10 fiscal year, the district performed well on regular term maintenance, but not on intensive, as accomplishment was 51.7%, and temporary term maintenances, as 14.4%.

  - Considering the financial progress, as presented in the MPR, the AACRA almost accomplished what was planned for 2008-09 fiscal year, whereas in 2009-10, it accomplished more than that planned.

- In general, the Employer's Representative engaged for supervising the maintenance work by the road agencies indicated some problems, such as, shortage of sufficient machineries/equipment and necessary spare parts, old aged machineries, and less performance of length-person crew, Non-availability of suitable materials near the work sites, etc.

Before finalizing the core activities of the present Study, the Consultants assumed an additional verification assignment to investigate economy, efficiency and effectiveness of road agencies while undertaking maintenance works and corresponding unit rates and total cost implications. This exercise in particular is important in view of fund constraints and also value for money.

The level of economy, efficiency and effectiveness of road agencies in maintenance works and corresponding unit rates and total costs have been investigated. The exercise has also assessed the impact of direct equipment cost both for paved and unpaved roads for the maintenance work and the practices followed by the road agencies using own forces and the private contractors as well as leasing companies in Addis Ababa.

In ERA, despite the reform of the maintenance districts into corporate level, contemporary costing of projects and supporting activities are not in the form of profit oriented arrangement, rather it follows the former trend of force account operations. Unit rates for the capital projects accommodate market price of construction materials, rental equipment and revised salary scale of Government.

However, the ERA's Districts as well as the RRAs still apply the Unit Rates of 2007, as fixed by the ORF for periodic and routine maintenance activities, although they are using rental equipment from the market, particularly for periodic maintenance projects.

In view of the above situation, the road agencies argue that appropriate budget should be allocated first, at least considering the current rental rates of equipment and fuels, before evaluating effectiveness and efficiency of road agencies in maintenance operations.

It is reported that the road agencies measure their efficiency by timely maintenance of planned roads to avail service for the road users, which is a common interest of public agencies. Achieving such goals, amid low maintenance unit rates, however, result in, cost overruns making negative cashflows in different public road enterprises.

At this juncture, the ERA's Maintenance Districts and RRAs own force crews, now enterprises, challenge the situation in such a way that if the ORF doesn't reconsider the practical road maintenance cost requirements, rather, it persists in bringing-in new network to the system, then, the National Road Maintenance Strategy will be in a problem in view of the following:

None of the indicators, i.e. Economy, Efficiency and Effectiveness, would be achieved by the new public enterprises; deterioration of the road asset will be wide in coverage, fast in time, serious in depth and eventually lead to high cost of restoration/ rehabilitation; the private sector will not be attracted to the sector, which, in turn, blocks the comparative advantages of competition; and the sector will remain as a scapegoat for high transport cost, weak mobility and negative impact to the general macroeconomy of the nation.

On the other hand, based on the market survey on direct costs of equipment required for the operation of the above two major maintenance activities, comparisons are made between the unit rates fixed by ORF (2007), revised rates as estimated in the present Study, and revised rates exercised by ERA's Districts in 2010.

Results of the analysis show that the current market unit rates of the two major activities are increased by more than 50% for gravel resurfacing, and more than 65% for the asphalt overlay from the ORF rates as fixed in 2007. This exercise generally indicates that the estimates made under the present Study are in line with the current market rates, and reflect a similar picture of the existing situation.

17.0 Own Force Vs Outsourcing: A Cost-Benefit Analysis

The present chapter carries out the cost-benefit analysis of the "Own Force" Vs the "Outsourced" options for carrying out maintenance activities - periodic and routine, in terms of unit cost, total maintenance cost of different interventions and related advantages and disadvantages.

The objective of the above exercise is to appreciate whether the "Own Force" or "Outsourced" maintenance options are more economical and benefiting in performing maintenance activities in Ethiopia, particularly in long term; to propose the future line of action, and also present indicative benefits by using the recommended approach.

17.1 Summary & Findings

As per the global trend and also in a number of countries in Africa, "Outsourcing" is considered to be more efficient than the Own Force option with added advantages described as follows:

- Better Accountability;
- Increased efficiency of private sector;
- Readily available expertise in private sector on demand/as per the requirements;

- Availability/Adaptability of modern technique and equipment;
- Clause of penalties, in case, project is not executed within the time schedule and standards set;
- Flexibility of changing the executing agency in case of failures;
- Long term liability of the staff is avoided;
- Accountable/Efficient Management and lower overhead cost; and
- Sharing of risks associated with the maintenance work.

However, success of performance depends on proper supervision.

It is also observed that since the out-sourcing model in Ethiopia is operational on a very limited scale and not yet fully utilized, there is no real competition in the market. It is a proven fact world-wide that once a large number of contractors are available in the country, cost of the project execution could be expected to be lower by about 15% or more than the present level.

In view of the policies and guidelines also given in the RSDP IV, particularly the encouragement of the private sector participation and capacity building development, Outsourcing will be best option of the future maintenance activities.

It is advised that for better efficiency in long term, the role of the government agencies should be limited to the policy making, planning, standardization of policy; and the responsibility of implementation of the projects should be left to the private sector.

However, presently, both the models of own force and outsourcing should continue till the private sector is strong and capable enough to take the entire load of the maintenance activities of the country. On the same time, emergency works should be taken care of by the own force in order to avoid the delays in bidding for hiring the private sector.

In general, when contract is awarded, for both private and own force contractors, labor-based construction or length-person option should be encouraged appropriately, as it has several advantages. Details are discussed in the previous report on the Guidelines for Approving Eligibility of Maintenance Works for ORF Financing, and also in RSDPs Documents, particularly in 13 Years Performance Report.

However, there are some important issues, particularly relevant for maintenance cost savings, are listed as follows:

- Labor-Based option minimizes construction and maintenance costs: Based on the average cost for one km built using equipment-based methods, 2.5 km could be built using labor-based method;

- About 45% of the cost of labor-based road works goes to labor wages, and only 22% while using equipment-based method; and

- Employment opportunity is relatively high. Over five times more direct employment is created, while opting for labor-based, as compared with equipment-based methods.

18.0 THE WAY FORWARD

The Study has, inter alia, brought out several estimates relating to the maintenance needs assessment with road inventory and pavement condition surveys, updating the maintenance unit costs, adopting appropriate maintenance strategies and policies for different types of road pavement, adjustment of the road users charges with revising the existing and considering additional/new sources of revenue for the Ethiopian Road Fund, and application of the E-RUCS Software. The above would require an implementation plan with indicative cost implications. For the purpose, the Final Report has also brought out an Implementation Plan illustrating the above-mentioned issues with indicative cost estimates. The Implementation Plan would be helpful to the Office of Road Fund for crystallizing the future line of action.

1. INTRODUCTION

1.0 INTRODUCTION

1.1 General

The Government of the Federal Democratic Republic of Ethiopia (FDRE) has given a high priority for the country's Road Sector Development Programs (RSDPs), with the consideration that road transport system in Ethiopia facilitates the overall socio-economic development of the country; and hence, considerable investments have been made to improve the Road Network in the country.

In order to ensure the sustainability of the Road Sector with its growing road network, which has been playing an important role in the socio-economic development of the country, there is need for proper maintenance–routine and periodic, to maintain the service quality to its users, ensure economic and efficient road transport system cost, and also preserve the national asset, i.e. roads. The Government has been committed to successful implementation of the four building blocks of the Road Management Initiatives (started in 1997), viz. (i) Owner; (ii) Management; (iii) Responsibility; and (iv) Financing Aspects of the Road Sector.

Following the results of the above initiatives, the Ethiopian Road Fund (ERF) came into being in 1997 by the Proclamation with the objectives of "the Fund shall be to finance the maintenance of roads and road safety measures". The ERF, since its establishment, has been contributing significantly in the road maintenance activities in the country by making available budget for highways, rural roads and municipal roads maintenance expenditures, and also the road safety measures.

With this background and also to achieve sustainable road maintenance strategy in Ethiopia, the present "Consultancy Services for Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia" has been entrusted by the Ethiopian Roads Authority (ERA) to Intercontinental Consultants and Technocrats Pvt. Ltd. (ICT), India in association with International Consultants and Technocrats Ethiopia PLC (ICTE) with the following goals and objectives.

1.2 Study Goals & Objectives

The core objective of the Study is to achieve sustainable road maintenance strategy in Ethiopia. The Terms of Reference (ToR) of the Study also stipulate the following objectives under the Consultancy Services:

- Review road financing practices of Ethiopian Road Fund (ERF) to the Road Agencies (ERA, RRAs and MRAs) and Road Safety Coordinating Office in the last five years;
- Review the efficiency and effectiveness of Road Financing of ERF to RRAs, MRAs, ERA and Road Safety Office for maintenance of Roads and Road Safety Measures;
- Prepare a Multiyear Road Maintenance Need Forecast for coming 10 years, including:
  - Review the existing revenue sources and revenue level in order to understand/identify the budget gaps for Road Maintenance for ERA, RRAs and MRAs and Road Safety Measures; and
  - Identify the above budget gap of Road Maintenance of each year, and in the coming 10 years.
- Review the potential maintenance needs of the unclassified roads; and

Establish a system that helps to adjust Road User Charges to reflect the road maintenance expenditure based on a fee for service principle.

The ToR of the present Study is attached as Annexure 1.1.

Following the ToR, the findings and the outcomes of the Study have been brought out through the following four intermediate reports (Draft and Final) other than the Draft and Final Reports on the entire consultancy services:

(i) Guidelines for Approving Eligibility of Maintenance Works for ORF Financing;

(ii) Review of Existing Road Revenue and Recommendations for New Sources of Revenue;

(iii) Computer Model and Multiyear Road Maintenance Needs Assessment Report; and

(iv) Guidelines for Adjustment of Road Users Charges.

The above reports were submitted in Draft and Final. The Final Reports were prepared after incorporating the comments obtained from the Clients on the Draft Reports and also through several presentations and workshops during the Study (Table 1.1). The compliance matrices illustrating all the comments given by the Clients on the Draft Reports, and the Consultants' efforts and clarifications with proper references, were prepared for each of the above mentioned intermediate reports, and attached with the respective Final Reports.

Table 1.1: Workshops & Presentations Organized During the Study

Presentations/Workshops	Date
Presentation on the Study at the Office of the Road Fund (ORF)	08 Jun. 2010
Workshop on the Inception Report (Draft)	02 Jul. 2010
Knowledge Sharing Mission: The World Bank	09 Nov. 2010
Workshop on the Verification Survey Formats	14 Jan. 2011
Presentation during the Launch of RSDP IV Conference, ERA	25 Jan. 2011
Presentation on the Study at Ministry of Transport, GoE	01 Feb. 2011
Knowledge Sharing Mission: The World Bank & ORF	02 May 2011
Knowledge Sharing Mission: The World Bank & ERA	03 May 2011
Draft Final Report at the Ministry of Transport, GoE	14 Sep. 2011
Workshop on the Draft Final Report	19 Oct. 2011
Training on the Application of E-RUCS for the ERA and ORF Officials	21 Oct. 2011

1.3 The Present Report

The present "Final Report" is the last deliverable under the consultancy services. As per the ToR, the Final Report needs to provide the summary of the tasks carried out, overall findings and conclusions during the consultancy services. The Final Report compiles the activities carried out and presented in the earlier four intermediate submissions. The Final Report also addresses the exclusive comments given by the Reviewing Committee comprising officials from the ERA, the ORF and the Ministry of Transport on the Draft Final Report (DFR); and by different stakeholders during the Workshop on the DFR organized in third week of October 2011, and also suggestions given by the Clients from time to time. As per the request of the Clients, a new section, i.e. in addition to the ToR, illustrating the Implementation Plan of the proposals given in the Study has also been included in the Final Report.

The Compliance Matrix addressing the comments on the DFR is attached as Annexure 1.2 in the present Report, whereas the attendance sheets of the Workshop on DFR and the Training on the Application of E-RUCS are given as Annexures 1.3 and 1.4 respectively.

1.4 Background

The total network of the classified roads in Ethiopia measures more than 48,500 km[1] excluding municipal roads (i.e. 4,556 km), which is administered and maintained by road agencies, viz. the ERA through 10 District Road Maintenance Organizations (DRMOs); 9 Regional Roads Authorities (RRAs); and 10 Municipal Road Authorities (MRAs). The road network in Ethiopia is dominated by unpaved roads (>83%); however, there are 7,476 km paved roads under ERA, and 1,285 km under MRAs. The entire road network of 26,944 km under the RRAs is unpaved. It is important to note that there is a network of 100,384 km of unclassified roads[2] developed and maintained by the Local Communities.

Table 1.2: Classified Road Network of Ethiopia in km (2010)

Road Agency	Paved	Unpaved	Total
ERA	7,476	14,373	21,849
RRAs	--	26,944	26,944
MRAs	1,285	3,271	4,556
Total	**8,761**	**44,588**	**53,349**
Percent	*16.4%*	*83.6%*	*100.0%*

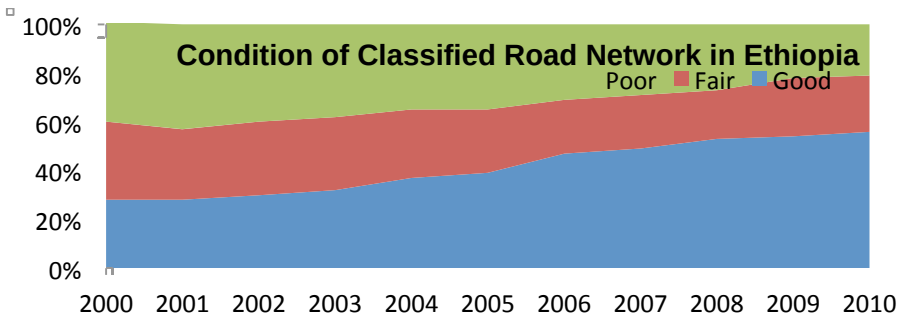
Source: RSDP IV Document (2011).

The pavement condition of the classified roads in the country in terms of very good / good, fair, poor and very poor has been observed by the RSDP IV Document (2011). The pavement condition of the roads under different road agencies is presented in Table 1.3.

Table 1.3: Pavement Condition of the Classified Roads in Ethiopia, 2010 (km)

Road Agency	Very Good / Good	Fair	Poor	Very Poor	Total
ERA	13,947	5,280	2,622	--	21,849
RRAs	10,736	8,736	5,148	2,324	26,944
MRAs	2,971	845	674	66	4,556
Total	**27,654**	**14,861**	**8,444**	**2,390**	**53,349**
Percent	*51.8%*	*27.9%*	*15.8%*	*4.5%*	*100.0%*

Source: The Consultants' Estimates.



[1] At the time of writing this Report (i.e. end of 2011), it is reported that classified road network in the country has grown to 52,042 km (8,295 km paved and 14,136 km unpaved roads under ERA, and 29,611 km of unpaved roads under RRAs), resulting in the road density as 47 km/'000 km^2. Further details, such as, breakup of the above inventory and also the pavement conditions for different road surfaces under the road agencies are awaited.

[2] Source: RSDP IV Document (2011).

1.5 Road Maintenance in Ethiopia

1.5.1 Maintenance Needs

In spite of regular interventions by the GoE, improvement in the condition of roads is still a big challenge in the country. Rehabilitation and upgrading of the road network under the Road Sector Development Programs (RSDPs I, II and III), brought the overall road network in good condition to 56% in 2010 from 22% in 1997. Nearly 73% of asphalt roads (from 17% in 1997) and 53% of gravel roads (from 25% in 1997) under ERA and 53% of rural roads (from 21% in 1997) have been reported to be in good condition.

It does not require further emphasis that an adequate and timely maintenance is required for all types of road surfaces to keep the roads in good level of serviceability, and also to preserve the national road assets which have been developed over a long period of time.

Earlier studies, viz. Road Funding and Road User Charges in Ethiopia (2004), Road Financing Study, Ethiopia (2005), etc. also brought out that the road maintenance in the country was grossly under-funded. Nevertheless, the RSDPs' initiatives, combined with the setting up of the "Second Generation Road Fund" in 1997 with dedicated revenues from levies on fuel, VAT and other sources have considerably improved the condition of the road network in the country.

1.5.2 Maintenance Financing

Road Maintenance activities of the classified roads of the country are financed by the ORF as per the Road Fund Proclamation (1997). In 2010-11, the revenue collected by the ERF was in the order of ETB 1.14 billion and disbursement from the road fund for maintenance activities was ETB 1.02 billion. As stated earlier, the present level of revenue is not sufficient to finance the maintenance needs of the classified roads to an acceptable level of service and also preserving the road asset.

For a quick appreciation, the fund requirements for carrying out the road maintenance activities and to preserve the asset as well as offering quality road system to its users, the present Study has made the estimates for next ten years (i.e. 2011-20); which shows that the classified road network in Ethiopia including the additional roads planned to be constructed during the period, the road agencies would be requiring annualized maintenance cost ranging from ETB 2.9 billion to ETB 3.2 billion depending on different maintenance strategies, and if the maintenance of Wereda Roads is also included, the annualized expenditure on maintenance would be about ETB 3.4 billion to ETB 3.7 billion.

In order to implement the above massive road maintenance program effectively and efficiently, the institutions responsible for undertaking maintenance tasks would also be requiring proper capacity development and training programs.

1.6 The Report Coverage

The "Final Report" on the Study, could be considered as a grand executive summary of all the activities carried out under the Study, which were presented in the following four intermediate reports:

(i) Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (Draft and Final);

(ii) Review of Existing Road Revenue and Recommendation for New Sources of Revenue (Draft and Final);

(iii) Computer Model and Multiyear Road Maintenance Needs Assessment Report (Draft and Final); and

(iv) Guidelines for Adjustment of Road Users Charges (Draft and Final).

Though the present Final Report summarizes all the tasks carried out during the consultancy services and the specific analyses and findings brought out in the earlier reports, for any details, the above-mentioned four intermediate reports, with necessary diagrams, tables, figures, illustrations, and annexures presented therein, should be duly referred to.

In view of the above, the details on the assumptions and analyses already undertaken and presented in the earlier reports are not further elaborated in the present Report. However, relevant references, and briefs for ready reference and appreciations are presented in a selective manner to maintain the flow and understanding.

1.7 Structure of the Report

The "Final Report" on the Consultancy Services for Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia consists of the following chapters:

- **Chapter–1: "Introduction"**, the present chapter, outlines the overall background and the objectives of the Study and coverage of the present Report;
- **Chapter–2: "Road Development in Ethiopia"**, describes the road development plan in Ethiopia under the RSDPs, which also makes a ground for the present Study. The chapter also presents in brief about major socio-economic performance indicators of the country, which are directly or indirectly related to the transport sector development;
- **Chapter–3: "Road Maintenance Practices: International & Ethiopia"**, outlines the international road maintenance practices, and also prevailing maintenance practices followed by the road agencies in Ethiopia, i.e. Ethiopian Roads Authority, Regional Roads Authorities and Municipal Road Authorities. The chapter also presents a comparison of the Ethiopian maintenance practices with the international practices, so that inadequacies, if any, could be appreciated, and accordingly appropriate improvement and recommendations be made. The outcomes of the chapter forms basis for listing the maintenance activities and eligibility criteria;
- **Chapter–4: "Eligible Maintenance Works & Prioritization"**, identifies and illustrates various issues, summary and recommendations about road maintenance practices in Ethiopia, and presents a comprehensive list of activities qualifying for road maintenance and "Eligible for Maintenance" for the ORF financing including the road safety measures in Ethiopia. The chapter also presents broad framework with major influencing parameters governing the maintenance plans and interventions including choice of suitable technology, with special emphasis of labor-intensive technology, for undertaking the maintenance activities, and the road safety concerns. The chapter also illustrates the priority criteria of maintenance works in view of optimizing the scarce resources within the road agencies by assigning relative weights for various influencing parameters in order to preserve the national asset, i.e. roads on priority basis;
- **Chapter–5: "Road Maintenance Unit Cost in Ethiopia"**, aims at reviewing and setting up the unit rates for maintenance activities in Ethiopia, which could form a basis for road maintenance cost assessment, formulating plans and budget. This exercise is particularly carried out to update the unit costs and also to reflect the real cost of various components of maintenance activities, so that any discrepancies in the estimates made by the ORF's and the Road Agencies could be analyzed and appreciated;
- **Chapter–6: "Road Inventory & Pavement Condition in Ethiopia"**, establishes the road inventory details and pavement condition of the entire classified road network of the country. The exercise is primarily based on the verification of data and information on road inventory and pavement condition as available and furnished by different road agencies on the road network under their jurisdiction. The chapter also brings out the

details on the Verification Survey on more than 3,500 km of roads of the classified network on sample basis;

- **Chapter–7: "Maintenance Needs Assessment & Costs – Base Year"**, establishes the base year maintenance needs for different roads requiring different maintenance interventions on different types of road surfaces, and also the corresponding maintenance cost implications. The maintenance needs assessment exercise is highly guided by the road asset preservation concept in the country;
- **Chapter–8: "Road Deterioration Model & Applications"**, presents the results of the Road Deterioration Model based on the HDM-4 analysis; and also suggests the required road maintenance interventions and costs for the next 10 years, i.e. multiyear analysis. The exercise has been carried out in view of the road asset preservation for different road surfaces, varied traffic levels and other external conditions, which are largely responsible for road deterioration. Results of the above exercise have also been used to derive the overloading fines on account of damages caused by the overloaded vehicles, and determining the rational road user charges, in view of road deterioration, e.g. Mass Distance Charges (MDCs);
- **Chapter–9: "Road Fund Boards: Review & Performance"**, presents salient features of different Road Fund Boards, particularly their operational efficiency and also functioning in Africa including Ethiopia; engaged in preserving road assets and arranging finances for the road maintenance on sustainable basis following the "Second Generation" concept;
- **Chapter–10: "Road Fund: Sources of Revenue"**, presents the basic concepts, rationale and prevailing international practices of different sources of the Road Funds' Revenue, so that it could make a proper background for reviewing and making revisions, if required, in the existing sources of revenues in a logical manner; and also while exploring new/additional sources of revenue for bridging the fund gap and also meeting growing maintenance costs in special reference to Ethiopia;
- **Chapter–11: "Road Fund Revenue in Ethiopia: A Review"**, aims at describing the Ethiopian Road Fund with its objectives, functions, sources of revenue, the responsibilities of the Board and the Secretariat. The chapter also presents the extent of revenues being collected through different mandated sources with a brief review on the magnitude and limitations of the sources. The analysis establishes the Road Fund Revenues as prevailing scenario, and further scope of generating more revenues in view of the requirements and growing road maintenance needs of the country;
- **Chapter–12: "Road Fund Revenue: Potential Sources"**, identifies the potential sources of revenue for the Ethiopian Road Fund. The exercise is highly guided by the internationally accepted practices following the Second Generation Road Fund concept; equitable road user charges determined by the road deterioration model, incremental road user charges, etc. within the overall frame of the Ethiopian Road Fund Proclamation (1997). The need for potential sources of revenue is highly realized in view of the existing fund gap and growing road maintenance needs in future on account of both preserving the existing, i.e. assets already developed and additional roads (new and rehabilitated) of the network and offering quality service;
- **Chapter–13: "Road User Charges: Analysis & Estimation"**, presents the requirements of revenue for meeting the growing maintenance cost, the need for revising the existing road user charges for covering the maintenance costs within the framework of the Ethiopian Road Fund Proclamation. The chapter identifies the level of revisions required in prevailing road user charges, and also analyzing the need for additional/new sources of road user charges. The exercise has been carried out under several conditions and scenarios using the Ethiopian Road Users Charges System (E-RUCS), the Software developed under the Study, which would enable the policy and decision makers to consider the options in view of the fund requirements and their acceptance in the

Ethiopian conditions. The Chapter also suggests the Implementation Plan for the recommended options for sources of revenue;

- **Chapter–14: "Consequences of Negligence in Road Maintenance"**, aims at addressing the "consequences of negligence in road maintenance" through several methods, parameters and illustrations, so that the message could be strongly conveyed and appreciated by those who are directly or indirectly involved at higher levels in decision making process for the road maintenance plans, formulating strategies and arranging sustainable financial supports;
- **Chapter–15: "E-RUCS & Software User's Manual"**, presents the applications of the Ethiopian Road User Charges System (E-RUCS) designed for adjusting the Road Users' Charges to meet the road maintenance needs and costs under different conditions. The E-RUCS has been developed as per the requirements of the ToR. The Software estimates the multiyear road maintenance requirements, maintenance intervention costs, and impact on road user charges and analysis under several scenarios;
- **Chapter 16: "Works Financed by the Office of Road Fund & Maintenance Costs: Review & Evaluation "**, presents review of the road works financed by the ORF in terms of cost, type of work, quality and effectiveness. The exercise has been undertaken on sample basis, as per availability of the details and documents received from the ORF, the road agencies and consultations with the officials concerned. Besides reviewing and evaluating the works financed by the ORF, the chapter also investigates further working of the maintenance costs in Ethiopia, so that the real costs of maintenance activities could be captured. For the purpose, the chapter particularly evaluates economy, efficiency and effectiveness of road agencies while undertaking maintenance works and corresponding unit rates and total cost implications with additional facts and figures to capture the real costs. The exercise also assesses the impact of equipment cost for paved and unpaved roads for maintenance works and the practices being followed by the road agencies with own force and the private contractors, and also leasing companies in the country; and
- **Chapter–17: "Own Force Vs Outsourcing: A Cost-Benefit Analysis"**, aims at making comparisons of costs and implementing efficiency between the options of own force and outsourcing the maintenance activities, so that the analysis could present the cases with illustrations for making policy guidelines. The results of the analysis would enable the decision makers for making choice between the own force choice and contracting out different types of maintenance activities.

The chapters of the Report are appropriately supported with diagrams, graphs, tables, illustrations and annexures.

2. ROAD DEVELOPMENT IN ETHIOPIA

2.0 ROAD DEVELOPMENT IN ETHIOPIA

2.1 General

Ethiopia is a landlocked country with the varied geographical terrains and scattered settlement pattern, located in the Horn of Africa. Currently, almost all of its imports and exports are routed through the port facilities in neighboring Djibouti. Ethiopia is Africa's third most populated country, with 82 million inhabitants and is renowned for its distinctive cultural heritage and varied topography.

For transportation of goods and services, road system plays an important role. At the end of 2010, the classified road network in Ethiopia comprised 48,793 km[1], of which 21,849 km were Federal Roads. About 95% of Ethiopia's passenger and freight traffic uses the road system and it is the only means of access to the widely scattered rural communities. But despite ongoing efforts to expand the road network, the country still has one of the lowest road densities in Africa with 44 km/'000 km^2 as per 2010 estimates, compared with other Sub-Saharan African countries, which have an average of 54 km/'000 km^2 of area. The Government of Ethiopia (GoE) has, therefore, singled out this area as being a top priority for public investment and has made concerted efforts and progress in the expansion of the country's road network as well as the improvement in pavement condition.

Figure 2.1: Map of Ethiopia

[1] At the time of writing this Report, it is reported that classified road network in the country has grown to 52,042 km (8,295 km paved and 14,136 km unpaved roads under ERA, and 29,611 km of unpaved roads under RRAs), resulting in the road density as 47 km/'000 km^2.

Ethiopia is predominantly a rural country. The capital city of Addis Ababa, located right in the middle of the country, is the largest urban center, where all the administrative, educational, medical, and social facilities and activities are concentrated. Somehow, the development of infrastructure has tended in and around Addis Ababa, with a radial spread from there outwards. It may be seen in Figure 2.1 that least developed links are towards southeast of Addis Ababa.

As far as the main road network is concerned, most of the major asphalt and gravel roads radiate from Addis Ababa to main cities, towns and centers of commercial, industrial and agricultural activities. International highways link Addis Ababa with neighboring countries: Djibouti, Eritrea, Kenya and the Sudan. Non-motorized traffic in the country is important not only in remote and inaccessible rural areas, but also in towns and cities of Ethiopia, as bulk of short haul traffic is carried as head and back load, and also by donkeys and camels.

As part of the extensive infrastructure development program, the Ethiopian Government has launched the Road Sector Development Programs (RSDPs), of which three successful phases have been completed, and it is envisaged to rehabilitate and upgrade trunk roads, upgrade and construct link roads and a substantial amount of rural roads in the coming years. The RSDP-I was launched in 1997 and subsequent RSDP-II in 2002, RSDP-III in 2007 for the overall improvement in the road system in the country, which has given the desired results, and over the years road network has improved as per the expectations. Currently, RSDP IV (2010-15) is going on with comprehensive road sector development strategies and polices.

For the administrative and development planning purposes, the country has been divided into Regions, Zones, and Woredas. The spread of HIV/AIDS is one of the biggest challenges in Ethiopia, as adult prevalence rate recorded at about 2.1% (2007), and people living with HIV/AIDS are 980,000 (2007)[2].

Before understanding the dynamics of the road sector in Ethiopia, it is extremely important to appreciate the status of Ethiopian economy so that a proper assessment of the growth of the transport sector vis-à-vis other sectors of the economy could be carried out. The following sections provide in brief the performance of main economic indicators of the country.

2.2 Economic Indicators – A Review

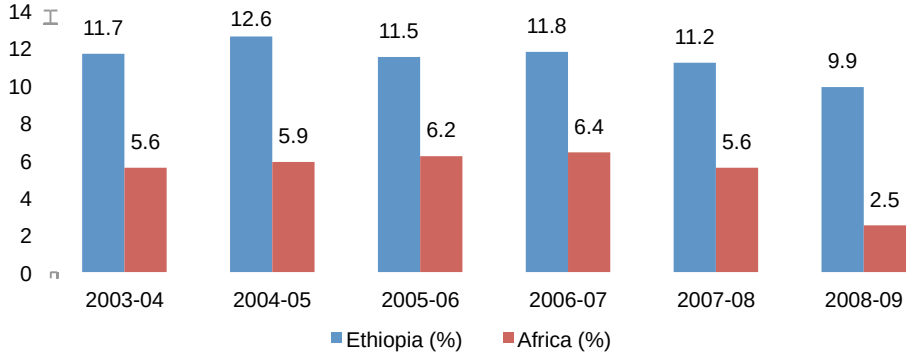
With its 82 million inhabitants, Ethiopia is the third most populous country in Africa, with a rapidly growing young population. It is one of the world's least developed countries, ranking in place 180 out of 187 on the Human Development Index (HDI). Ethiopia's GNI per capita is as low as US$ 280 (2008). In 2007, 39% of the population was estimated to live below the poverty line of US$ 1.25 a day (PPP) – i.e. a considerable improvement compared to the 61% reported in 1995. Lack of basic education is a big problem, but the Government is undertaking strong efforts to improve the situation. The percentage of the relevant age group that has completed primary education increased rapidly, i.e. from 22% in 2000 to 46% in 2007.

2.2.1 GDP Growth

Despite its poor economic condition, Ethiopia has experienced strong economic growth in recent years. With real GDP growth at or near double levels since 2003-04, the country has consistently outperformed most other countries in Africa expanded much faster than the continent wide average (Figure 2.2). At the same time, the country still faces some structural weaknesses that present significant challenges in the medium term.

[2] World Fact Book, Ethiopia (March 2010).

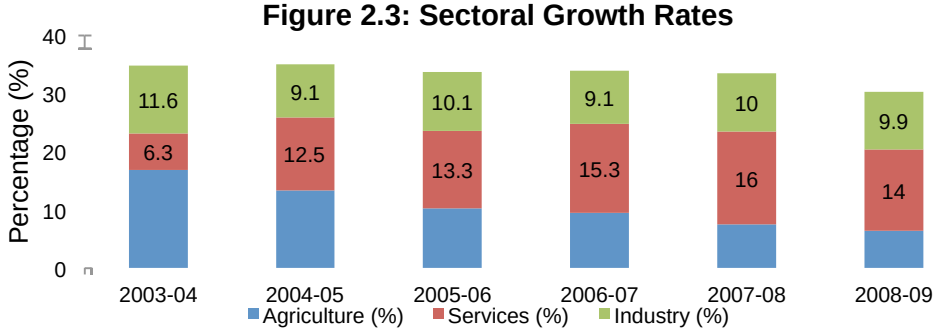
Figure 2.2: GDP Growth Rate Comparison



Source: African Development Bank, Economic Brief, 2010.

Real GDP growth averaged 11.2% during 2003-04 to 2008-09 period, placing Ethiopia among the top performing economies in the Sub-Sahara Africa. This growth performance is well above the population growth rate; as growth rate of 7% required for attaining the MDGs for halving poverty by 2015.[3] While GDP growth has remained high, the per capita income is among the lowest in the world. The figures relating to the GDP for a few recent years are presented in Annexure 2.1.

Figure 2.3: Sectoral Growth Rates



(i) Agriculture: The economy of Ethiopia is considerably based on agriculture, which accounts for 43.2% of GDP, 60% of exports, and 80% of total employment, besides the agricultural sector suffers from frequent drought and poor cultivation practices. Ethiopia's livestock population is believed to be the largest in Africa, as livestock accounted for 10.6% of Ethiopia's export income (2006-07), with leather and leather products making up 7.5% and live animals 3.1%. Ethiopia's flower industry has become a new source for export revenue. The flower industry began in 2004, when the government made an aggressive push for foreign investments by establishing a presence at major international floricultural events. Since then, export earnings from this sector have grown to about US$ 65 million in 2006-07 and are projected to double over the next few years.

(ii) Industry: Industry in Ethiopia includes manufacturing (large and medium scale, small scale and handicraft industry), mining and quarrying, electricity and water, and construction. In terms of the structure, the industrial sector is characterized by the production of consumer goods like food, textiles and beverages. The manufacturing sector is dominated by capital intensive technology; and is fully dependent on imported machinery and equipment, and also for raw materials to a large extent.

(iii) Service: The service sector has been steadily growing, which is driven by rapid expansion in financial intermediation, public administration and retail business activities. On

[3] African Development Bank Group, Chief Economist Complex, Economic Brief, 2010

the other hand, the share of industry in GDP has remained static, registering between 13% and 14%. The manufacturing sector grew by 7% pa during 2005-06 to 2008-09.

2.2.2 Demographic Indicators

Ethiopia's population consists of highly diverse ethnic groups. The Oromo, Amhara, and Tigrayans make up more than three-fourths of the population, but there are more than 80 different ethnic groups within Ethiopia. Among other African countries, Ethiopia shows very less proportion of people living in urban areas, i.e. 17%, as compared to Kenya (22%), Namibia (37%), Ghana (51%), and Africa average (39%). The compound annual growth rate for population during 2004-05 to 2009-10 was recorded at 2.8%.

2.2.3 Macroeconomic Policy

The total revenues with grants in Ethiopia rose from ETB 30.1 billion (2006-07) to ETB 55.3 billion (2008-09), whereas the total expenditure in the same period rose from ETB 36.8 billion to ETB 58.5 billion forming a deficit of ETB 3.3 billion in 2008-09. The percentage of total revenues to total expenditure has increased from 82% in 2006-07 to 94% in 2008-09, followed by the decrease in the deficit financing from ETB 6.7 billion to ETB 3.3 billion in the same periods; with the result, the borrowings also decreased from ETB 6.3 billion (2006-07) to ETB 2.8 billion (2008-09).

The maximum proportion of the Government's revenues was in the form of external assistance, i.e. about 26% of the total revenues. The share of non-tax revenues increased substantially from 14% in 2006-07 to 21% in 2008-09. The share of tax revenues remained almost stable at 18% in the total revenues over the same period.

Table 2.1: Government Expenditure & Revenue by Purpose

(ETB million)

Particular	2006-07	2007-08	2008-09
Expenditure			
A. Recurrent Expenditure	18,347.8	23,626.8	27,935.7
B. Capital Expenditure	18,397.0	24,121.0	30,598.7
C. Sinking Fund	44.3	-	-
Total Expenditure	**36,789.1**	**47,747.8**	**58,534.4**
Revenue			
A. Ordinary Revenue	21,487.1	30,802.4	4,0644.4
B. Capital Receipts	168.0	-	-
C. External Assistance	8,409.0	10,198.9	14,633.9
D. Cash Balance	-6,725.0	-6,746.5	-3,256.1
E. Borrowings	6,247.0	8,796.0	2,759.0
Total Revenue and Grants	**30,064.1**	**41,001.3**	**55,278.3**

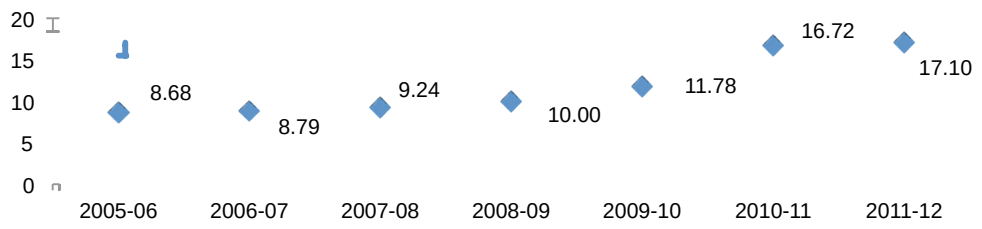
Source: Central Statistical Abstract, 2009

In terms of the Government Expenditure, the capital expenditure (economic and social development, general services) has been increasing steadily from ETB 18.4 billion (2006-07) to ETB 30.6 billion (2008-09). The share of recurrent expenditure of total expenditure (general services, social and economic services, public debt) has gone down from 49% in 2006-07 to 47.7% in 2008-09.

Although, the economic growth remained strong in the recent years, macroeconomic management had its fair share of problems, namely rising inflation and a sharply depreciating national currency. Monetary policy in 2009 and 2010 focused on fighting inflation. Exchange rate management, despite its negative impact on inflation, was also an important monetary policy in 2010 as it addressed the shortage of foreign exchange. The exchange rate in Ethiopia is characterized by managed floating with strong government control. The year 2010 witnessed a continuous depreciation of the local currency against major currencies. Figure 2.4 presents the depreciating Ethiopian Birr (ETB) against a US Dollar over the last 7 years.

The Government's plan for 2010-15 includes a monetary policy target for the next five years of below 10% inflation.[4]

Figure 2.4: Average Exchange Rate (ETB to US$)



Source: Central Statistical Agency Ethiopia,

2.2.4 External Position

Ethiopia experienced a marginal decline of 1.2% in the nominal value of merchandise exports in 2008-09 after hitting annual growth of 25.5% from 2003-04 to 2007-08. The value of exports as a percentage of GDP was recorded at 4.5% in 2008-09 and remained fairly unchanged in 2009-10 as well.

Table 2.2: Current Account (Percentage of GDP)

Particular	2002	2007	2008	2009	2010 (e)	2011 (p)	2012 (p)
Trade balance	-16	-20.1	-19.9	-19.5	-22.5	-23.9	-27.5
Exports of goods (f.o.b.)	5.8	6.1	5.4	4.5	4.6	6.6	5.7
Imports of goods (f.o.b.)	21.8	26.2	25.3	24	27.2	30.5	33.2
Services	2	0.8	0.5	1.3	1.6	2.1	3.1
Factor income	-0.5	0.1	0.1	-0.1	-0.3	-0.3	-0.6
Current transfers	10.1	14.8	13.8	13.3	14.6	15.8	13.1
Current account balance	-4.5	-4.5	-5.6	-5	-6.6	-6.4	-11.9

Source: African Economic Outlook, 2010; Figures for 2010 are estimates; for 2011 and later are projections.

The drop in merchandise exports in 2009 was observed mainly due to the global economic crisis hurting demand for key traditional export commodities; however, demand bounced back in 2010 for some of Ethiopia's key commodity exports, such as, coffee. Imports remained strong in 2010 at about 27.2% of GDP, compared with 24.0% of GDP in 2009. According to the Government's new five-year plan, the exports are projected to grow over five years, i.e. 30.5% in 2011 to 35.0% of GDP in the years to follow.

2.3 Road Network in Ethiopia

As stated earlier, the road network of Ethiopia continues to provide the principal mode of freight and passenger transport. The total classified road network has reached 48,793 km, of which 15% is paved (Federal Roads) and the rest 85% is unpaved, both at the Federal and Regional Roads. Of the classified road network (48,793 km), 21,849 km (44.8%) of the roads, designated as the Federal Roads, are administered by the Ethiopian Roads Authority (ERA), and the remaining 26,944 km (55%) of roads, categorized as "Regional Roads", are under the Regional Roads Authorities (RRAs).

[4] http://www.africaneconomicoutlook.org

Table 2.3: Road Network in Ethiopia (km)

Class of Road	Paved	Unpaved	Total	%age
Federal	7,476	14,373	21,849	44.8%
Regional	-	26,944	26,944	55.2%
Total	**7,476**	**41,317**	**48,793**	**100.0%**

Source: ERA RSDP IV Document, 2011.

In 1951, when the Ethiopian Roads Authority (ERA) was established, the total length of road network in Ethiopia was merely 6,400 km, which has increased to 48,793 km (excluding unclassified roads / community roads) in 2010. Since 1997, with the commencement of the RSDPs, the growth in total road network has been observed as 4.6% pa, of which, asphalt road by 5.4% pa, gravel roads by 1.7% pa, and rural roads by 6.7% pa[5].

Table 2.4: Change in Road Network and Density (1997-2010)

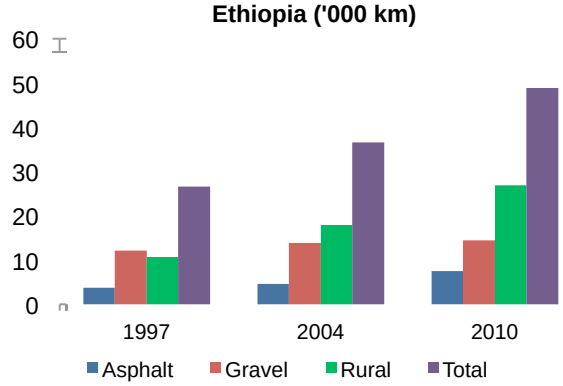
Year	Road network in km				GR (%)	Road Density	
	Asphalt	Gravel	Rural	Total		'000 Popln.	'000 km^2
1997	3,708	12,162	10,680	26,550	--	0.46	24.14
2004	4,635	13,905	17,956	36,496	7.8	0.51	33.18
2010	7,476	14,373	26,944	48,793	4.2	0.58	44.39

Source: ERA RSDP IV Document, 2011. GR=Growth Rate.

The RSDPs have focused on rehabilitation and expansion of the main paved and unpaved roads and important regional roads. The total road network has expanded from about 26,550 km at the beginning of the RSDP to its current 48,793 km, increasing the road density from 24.1 to 44.4 km/'000 km^2 of area and 0.46 to 0.58 km/'000 population.

Figure 2.5 (a): Road Density (per '000 km²)

Figure 2.5 (b): Road Network Growth in Ethiopia ('000 km)



Source: ERA RSDP IV Document, 2011.

Level of accessibility measured in terms of average distance from the road network and proportion of area farther than 5 km from an all-weather road, shows that substantial progress has been made in expanding the road network. Specifically, due to the construction of new roads, the average distance from a road has been reduced from 21 km in 1997 to 11.3 km in 2010. The proportion of area farther than 5 km from an all-weather road, which was 79% in 1997, has been reduced to 64.3% in 2010.

[5] Growth rates are estimated using the semi log method.

2.4 Overall Road Condition in Ethiopia

Improving the road condition of the entire network is a major challenge for any road sector development programs. At the inception stage of RSDP in 1997, 52% of the road network was in poor condition and only 22% was in good condition. The rehabilitation, upgrading and maintenance intervention efforts under the RSDPs improved the proportion of the road network in good condition to 56%, 23% in fair condition and remaining 21% in the poor condition (2010).

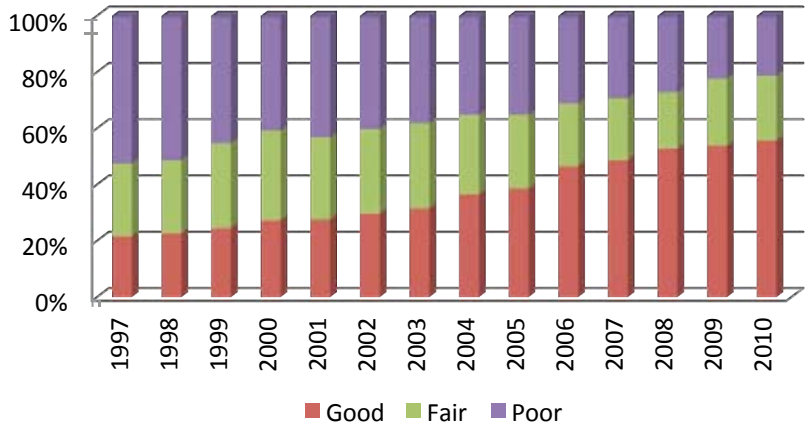
Table 2.5: Road Condition Improvement (in %)

Year	Good	Fair	Poor
1997	22	26	52
2000	28	32	41
2004	37	28	35
2009	54	24	22
2010	56	23	21

Source: ERA RSDP IV Document, 2011.

The proportion of roads in good condition overtook the proportion of roads in poor condition from 2004 onwards. Roads in fair and poor condition are consistently declining, which means the share of good roads is increasing. The condition of the classified road network from 1997 to 2010 is presented in Table 2.5 and also illustrated in Figure 2.6.

Figure 2.6: Road Condition During the RSDPs



Source: ERA RSDP IV Document, 2011.

2.5 Road Sector Institutions

Transport development in Ethiopia is the responsibility of the Ministry of Transport and the Ministry of Works and Urban Development. Road sector development and maintenance is mainly executed by ERA, RRAs, MRAs and the Wereda Road Desks. Federal Roads, which share about 44.8% (21,849 km) of the total road network, are maintained by the ERA, the remaining 26,944 km of “low level” roads (all unpaved), generally categorized as “rural roads” are under the Regional Roads Authorities (RRAs),

The urban roads in the country (4,556 km) are maintained by the respective municipalities, referred to MRAs in the present report. Municipalities of the cities and towns have their own departments who are responsible for the administration of their road networks. Addis Ababa and Dire Dawa have independent road authorities responsible for road administration. Separate ownership and administration provides better road planning and management, and enables swift maintenance interventions.

ERA undertakes the maintenance activities through the District Road Maintenance Contractors (DRMCs), as well as private contractors. ERA is also responsible for the overall network planning, road sector policy, and implementation and coordination in the country.

For funding the road maintenance activities, the Office of Road Fund (ORF) has been established to administer and allocate resources to the Road Agencies, viz. ERA, RRAs and MRAs, whereas, the Road Transport Authority (RTA) is responsible for regulating transport services, including vehicle registration, licensing, etc.

2.6 Road Sector Development Programs (RSDPs)

2.6.1 Impact of RSDPs (1997-2010)

As a result of the investments in RSDPs, the total road network in Ethiopia has increased, on average, by about 4.2% pa. By June 2010, i.e., the completion year of the RSDP III, the classified road network increased to 48,793 km (excluding the Community Roads). This is an increase of some 22,243 km since the launch of the Program in 1997, estimating the road density of 44.4 km/'000 km^2 of area and 0.58 km/'000 population.

Proportion of the road network in good condition has also increased, from 22% in 1997 to 56% in 2010. Improvements have been realized in the quality of regional roads and rural accessibility has improved through the construction of new link roads and rural roads, in addition to a significant number of new community roads.

Table 2.6: Changes in Selected Indicators with RSDPs

Indicator		1997	2002	2007	2010
Proportion of Good Roads	Asphalt Roads	17%	35%	64%	73%
	Gravel Roads	25%	30%	49%	53%
	Rural Roads	21%	28%	46%	53%
	Total Road Network	**22%**	**30%**	**49%**	**56%**
Road Density/'000 km^2		24.1 km	30.3 km	38.6 km	44.4 km
Road Density/'000 population		0.46 km	0.49 km	0.55 km	0.58 km
Road Density/'000 km^2 (incl. community roads)		24 km	30.3 km	91.4 km	136.6 km
Road Density/'000 population (incl. community roads)		0.49 km	0.49 km	1.3 km	1.83 km
Proportion of area >5 km from an all-weather road		79%	75%	68%	64.2%
Average distance to all-weather road		21 km	17 km	13 km	11.3 km

Source: ERA's RSDP IV Document, 2011.

As part of the United Nations' Millennium Development Goals (MDGs), it is envisaged that the federal road network will increase in length from 18,500 km in 2004 to 25,600 km 2015; and the regional and community roads network will increase in length from 18,000 km in 2004 to 78,400 km in 2015. Taking these targets together, will involve near tripling of the existing road lengths in the country by 2015.

2.6.2 Plans under RSDP IV (2010-15)

The RSDP IV document has been prepared as part of the Governments' Overall Growth and Transformation Plan. Implementation of the RSDP IV is major strategic pillar of the above Plan, and is intended to transform the road sector by boosting the size and quality of the road network, enhancing institutional capacity and improving overall efficiency.

Unlike earlier phases of the RSDPs, the RSDP IV places a high emphasis on the construction of link roads and engineered low-volume roads. The RSDP IV will be implemented over a period of five years (2010-15) with the following tasks:

- Rehabilitation of 728 km of trunk roads;
- Upgrading of 5,023 km of trunk and link roads;

- Construction of 4,331 km of new link roads;
- Heavy maintenance of 4,700 km of paved and gravel roads; and
- Routine maintenance of 84,649 km of road network.

The Program also consists of the Regional and Wereda Road components, i.e. construction of 11,212 km of new rural roads through the RRAs; and construction of 71,523 km of the Wereda Roads through the Wereda Road Offices.

Total cost of implementing RSDP IV is estimated to be ETB 125.3 billion, of which ETB 84.5 billion allocated for the ERA's Federal Roads, ETB 14.4 billion for the RRAs and ETB 26.4 billion for the Wereda Roads.

2.6.3 Targets for RSDP IV

After implementation of the RSDP IV, i.e. by 2015, the total classified road network of the country is expected to reach 136,044 km from the existing 48,793 km in 2010, which also includes Wereda Road Network (Table 2.7). The proportion of area farther than 5 km from an all-weather road would have been reduced to 29% from 64.2% (2010). All Kebeles will be connected by all-weather roads and the proportion of rural population within 2 km from an all-weather road will increase from the current 27% to 67%.

Table 2.7: RSDP IV Annual Targets

Indicator	2010-11 (Base Yr)	2010-11	2011-12	2012-13	2013-14	2014-15
Road including Wereda Roads (km)	48,793	61,204	79,117	98,255	117,561	136,044
Road excluding Wereda Roads (km)	48,793	51,636	54,818	58,211	61,771	64,522
Proportion of area >5 km from all weather road	64.2%	57.3%	48.7%	40.9%	34.3%	29.0%
Proportion of area >2 km from all weather road	84%	80%	75%	70%	65%	61%
Road density (km/'000 km^2)	44.4	55.6	71.9	89.3	106.9	123.7
Proportion of roads in acceptable condition (Fair+Good Condition)	80%	81%	83%	85%	86%	87%
Proportion of Kebele connected by all weather road	39%	48%	63%	78%	93%	100%
Proportion of rural population within 2 km of an all weather road	27%	30%	39%	49%	58%	67%

Source: ERA's RSDP IV Document, 2011.

2.6.4 Classified Road Network – Planned

In continuation to the previous section, the RSDP IV document (2011) presents details on the planned additional road length, which are to be included by 2015 under different road agencies. The document states that in next five years; 4,331 km of roads would be added in the Federal Road network, whereas 11,212 km in the RRAs network. The year-wise incremental changes in the total length of the classified road network, is shown in Table 2.8.

Table 2.8: Classified Road Network as Planned under the RSDP IV (2010-2015)

(km)

Particular	2010	2010-11	2011-12	2012-13	2013-14	2014-15
Addition in the ERA's network (plan)	-	621	970	987	984	769
Planned ERA's Network	21,849	22,470	23,440	24,427	25,411	26,180
Addition in the RRAs network (plan)	-	1,917	2,205	2,472	2,590	2,028
Planned RRAs Network	26,944	28,861	31,066	33,538	36,128	38,156
MRAs Network[6]	4,556	4,693	4,833	4,978	5,128	5,282
Total classified network (including MRAs)	53,349	56,024	59,339	62,943	66,667	69,618
Total classified network (excluding MRAs)	48,793	51,331	54,506	57,965	61,539	64,336
Road Density /'000 km^2 of Area (excl. MRAs)	44.40	46.71	49.60	52.74	56.00	58.54

Source: RSDP IV Document (2011).

As per the Tor, the present Study is to estimate the road maintenance needs for the next five years, i.e. up to 2015, and on "rough basis", for another five years, i.e. from 2015 to 2020. While making the above estimates, it has been observed that:

- Presently, the road density in the country shows as 44.4 km/'000 km^2, which has increased from 1997 to 2010 by 4.6% pa with the introduction of RSDPs;
- With the future plan and additional network during the RSDP IV, there would be increase in road density, as the road length is expected to grow at 4.8% pa;
- As per Mid-term review of RSDP-II, Assessment of Accomplishment (April 2005) and indicators to satisfy the Millennium Development Goals (MDGs), the road density in 2012 for Ethiopia was predicted as 72 km/'000 km^2 of area; that level is somehow not yet achieved;
- If compared with the level of road density in Ethiopia with neighboring countries, e.g. Tanzania, road density was recorded 71.2 km/'000 km^2 in 2004 as against 33.2 in Ethiopia in the same year. In view of socio-economic development of the country, there is a need to increase the road length, which would, in turn, enhance the road density as well.

Keeping the above in view, it is assumed that the classified road network in Ethiopia would increase by 4.8% pa from 2015 to 2020. The estimated classified road network during 2015-20 is presented in the Table 2.9.

Table 2.9: Projected Classified Road Network (2015-20)

(km)

Particular	2015-16	2016-17	2017-18	2018-19	2019-20
Addition in the ERA's network (plan)	806	845	885	928	972
Expected ERA's Network	26,986	27,831	28,716	29,643	30,615
Addition in the RRAs network (plan)	2,125	2,227	2,334	2,446	2,564
Expected RRAs Network	40,281	42,508	44,842	47,288	49,852
MRAs Network	5,440	5,603	5,771	5,945	6,123
Total classified network (including MRAs)	72,707	75,942	79,329	82,877	86,591
Total classified network (excluding MRAs)	67,267	70,340	73,559	76,932	80,468
Road Density /'000 km^2 of Area (excluding MRAs)	61.2	64.0	66.9	70.0	73.2

Source: The Consultants' Projection.

[6] RSDP IV does not cover increase in the road network under MRAs. However, for analysis purposes the Study assumes 3% pa increase in MRAs network, same as population growth in the country.

2.6.5 Road Network with Wereda Roads

As per the RSDP IV document, more than 71,500 km of roads would be constructed in next five years under the Wereda Roads Offices (WROs), which are expected to be included in the classified road networks of the country. Future length of the roads under WROs is also assumed to be increased by 4.8% pa during 2015-20 for the analysis purpose.

Table 2.10: Size of Classified Road Network & Wereda Roads (2015-20)

(km)

Year		Wereda Roads*	Classified Roads including Wereda	Total Road Density (km/'000 km^2 of Area)
RSDP IV	2010	-	48,793	44.4
	2011	9,568	60,899	55.4
	2012	24,299	78,805	71.7
	2013	40,044	98,009	89.2
	2014	55,790	117,329	106.8
	2015	71,522	135,858	123.6
Projected	2016	74,956	142,223	129.4
	2017	78,554	148,893	135.5
	2018	82,325	155,883	141.8
	2019	86,276	163,209	148.5
	2020	90,417	170,886	155.5

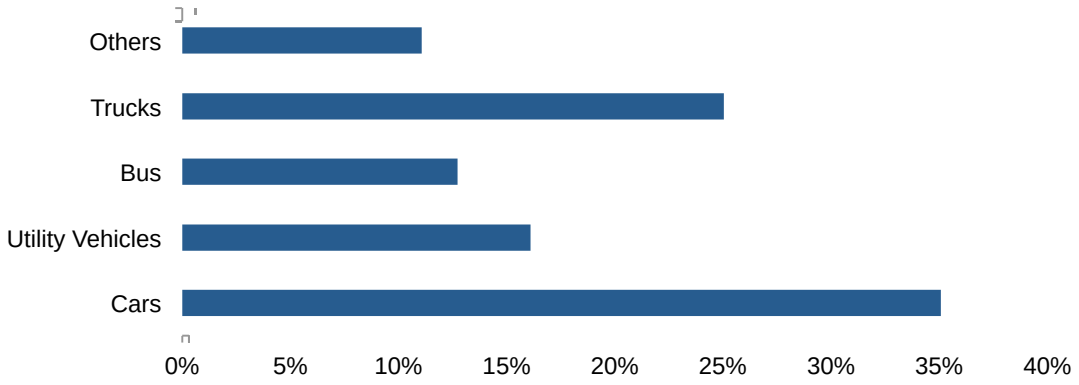
Source: The Consultants' Estimates. *Not yet under the classified roads category.

2.7 Road Transport System in Ethiopia

Since 95% of the traffic in Ethiopia is dependent on roads, i.e. the main mode of transport, accordingly, there has been a continuous increase in the vehicular population also. The vehicle categories have been grouped in the following manner: All cars, both petrol and diesel have been grouped under the "cars" category; all utility vehicles, petrol and diesel under the "Utility" category; all buses, mini, midi and heavy, both petrol (mini) and diesel under the "bus" category; all trucks, light, medium, heavy as well as articulated under the "trucks" category; all the other vehicles, such as, which fall in the category of motor-cycles/2-wheelers, others, unspecified and the agricultural tractors under "others" category.

The data collected by the Road Transport Authority (2010-11) show that the "cars" register for the maximum proportion of vehicles, which is about 35% of the total vehicle composition, followed by 25% of all kinds of trucks. The public transport represented by bus is about 13% of the vehicle composition while all the others, utility vehicles as well as in the others category share about 27% of all the vehicles in Ethiopia.

Figure 2.7: Vehicle Composition in Ethiopia (2010-11)



The figures show that the motor vehicle fleet has grown by about 6.3% pa during 2002-10. The number of cars before 2002 was about 76,000 of the total vehicle fleet, which have risen by 6.3% pa to 132,000 in 2010-11. Buses in the lighter category have increased by 6.5% pa, whereas 3.9% pa in the large category. Similarly, lighter trucks have risen by 6% pa in comparison to 4.5% in the articulated truck category. Total number of vehicles has increased from 218,000 to 376,000 since 2002 registering an overall growth of 6.3% pa.

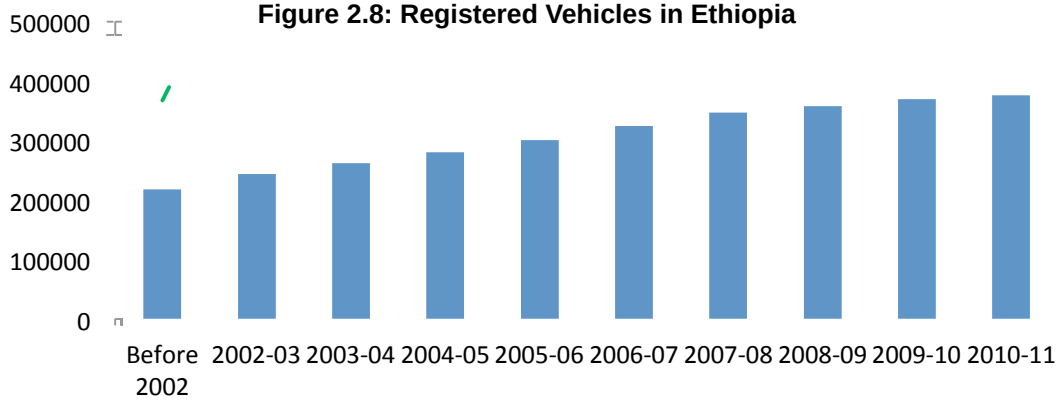
Table 2.11: Registered Motor Vehicles in Ethiopia ('000)

Vehicle Groups	Before 2002	2005-06	2008-09	2010-11	Growth Rate (2002-2010)
Cars	76.5	109.0	129.0	132.1	6.3%
Utility Vehicles	35.6	49.0	56.8	60.6	6.1%
Bus	27.9	37.8	44.9	47.9	6.2%
Trucks	57.5	75.1	90.1	94.2	5.6%
Others	20.7	29.8	37.1	41.7	8.1%
Total	218.2	300.7	358.0	376.5	6.3%

Source: Road Transport Authority, 2011.

The total number of vehicles increased from 218,000 (2002) to 376,000 (2010-11) registering a growth of 6.3% pa. Figure 2.8 shows the increase in registered vehicles since 2002.

Figure 2.8: Registered Vehicles in Ethiopia



Source: Road Transport Authority, 2010.

There have hardly been any changes observed in the pattern of vehicle fleet, its size and composition in the country. It appears to be almost constant over the years (Table 2.12).

Table 2.12: Changes in Vehicle Fleet Composition (2005-2010)

Vehicle Group	2005-06	2010-11
Cars	36%	35%
Utility Vehicles	16%	16%
Bus	13%	13%
Trucks	25%	25%
Others	10%	11%
Total	100%	100%

Source: Transport Authority Statistics, 2010-11.

2.8 Level of Traffic on Ethiopian Roads

Information on traffic volume, composition and loading are important factors in the determination of appropriate standard of road. In view of this, ERA conducts seasonal traffic

survey three times a year to provide traffic flow data on individual road. The traffic seasons represent high, medium and low agricultural related economic activity seasons of the year. Average Seasonal Daily Traffic (ASDT) is computed for each count. The three seasonal counts are averaged to reach at Average Annual Daily Traffic (AADT).

2.8.1 Traffic Flow Pattern

As per the Annual Traffic Movement survey conducted by ERA, the traffic flow found more than 500 vpd, throughout the reporting year (2008) on 5,685 km (40% in 2008) of roads of Ethiopia. This flow is significantly high relative to structural and surface capacity on some of roads. The high traffic flow roads are all in the vicinity of major industrial, distribution and trade centers, such as, Addis Ababa, Dire Dawa, and Awassa.

Out of the total 2,960 km, 21% of roads had traffic flow from 301–500 vpd. However, traffic flow is less than 200 AADT on 3,840 km (27%) of the road under traffic survey. In the year 2008, 201-300 vpd on 1,787 km, of the total roads length were observed. Table 2.13 illustrates the pattern of traffic flow as observed on Federal Road networks of Ethiopia in 2008.

Table 2.13: Traffic Flow Pattern

AADT	Length (km)	Percent
Up to 100	676	5%
101 - 200	3,164	22%
201 - 300	1,787	13%
301 - 400	2,073	15%
401 - 500	887	6%
501 and above	5,685	40%
Total	**14,272**	**100%**

Source: Annual Rural Traffic Movement in Ethiopia (2008).

2.8.2 Road Surface & Traffic Type

Out of the 14,272 km of ERA's roads surveyed as per the Report on Annual Rural Traffic Movement in Ethiopia (2008), 41% of the roads were asphalt and the rest 59% gravel roads. Truck found to be dominant type of vehicle moving on asphalt and gravel roads of the country, i.e. 37% and 48% of vehicles moving on asphalt and gravel roads respectively.

Table 2.14: Composition of Vehicles by Road Surface Type in 2008 (%)

Vehicle Type	Asphalt (5,818 km)		Gravel (8,454 km)		All Roads (14,272 km)	
	AADT	%	AADT	%	AADT	%
Car	28,416	23%	4,815	16%	33,231	22%
Bus	34,465	28%	7,880	27%	42,345	27%
Truck	46,184	37%	14,280	48%	60,464	39%
Truck & Trailer	15,736	13%	2,585	9%	18,321	12%
Total	**1,24,801**	**100%**	**29,560**	**100%**	**1,54,361**	**100%**

Source: Report on Annual Rural Traffic Movement in Ethiopia (2008).

This analysis clearly brings out that heavier vehicles, which are more responsible for damaging pavement are plying on the roads of Ethiopia.

2.8.3 Transport Output

On the basis of traffic flow pattern (AADT) observed in 2008 and in 2007, and the yearly vehicle utilization level, ERA has estimated the average output in terms of million veh-km. As depicted in Table 2.15, total average vehicle-km traveled per day in 2007 and 2008 was 9.32 million vehicle-km and 9.64 million vehicle-km respectively, showing an increase of 3%.

Table 2.15: Transport Output

Vehicle Type	2007		2008		% Change
	AVKM (million)	%	AVKM (million)	%	
Car	1.74	19%	1.81	19%	4%
Bus	2.23	24%	2.49	26%	12%
Truck	3.86	41%	3.87	40%	0%
Truck and Trailer	1.50	16%	1.46	15%	-3%
Total	**9.32**	**100%**	**9.64**	**100%**	**3%**

Source: Report on Annual Rural Traffic Movement in Ethiopia (2008).

2.9 Road Accidents

Accident Statistics of Ethiopia, although show high level of accidents in 2007-08, i.e. in tune of 15,000 accidents, the number of total accidents, somehow, fell down by about 7% from the previous year of 2006-07 (16,000 accidents). The following facts relating to the road accidents are interesting to note, as observed in 2006-07:

- Light accidents have registered an increase by almost 49%, going up from 1,400 accidents to 2,100 accidents, which is a substantial jump;
- The fatal accidents have gone down in 2007-08 from 2,000 accidents to 1,800 accidents in 2007-08. Similarly, property damage cases also registered a decline by 11.5%;
- The overall number of deaths due to accidents on roads in Ethiopia declined by 14%, but the deaths happening to children and aged registered an increase of 8% and 12% respectively, perhaps due to their vulnerable nature;
- The total number of people injured in road accidents in 2006-07 was about 9,500, which declined by about 25%, i.e. to 7,100 in 2007-08; and
- The number of injured adults, however, showed an increase of 30%, from a total of 1,500 injuries to 2,000 injuries in 2007-08.

Table 2.16: Accident Statistics in Ethiopia (2006-2007)

Accident Type	2006-07	2007-08	GR (%)
Total Accidents	**16,147**	**15,086**	**-6.6%**
Heavy	2,504	2,156	**-13.9%**
Light	1,426	2,123	**48.9%**
Fatal	2,047	1,802	**-12.0%**
Property Damage	10,170	9,005	**-11.5%**
Number of Deaths	**2,517**	**2,161**	**-14.1%**
Child	450	485	**7.8%**
Youth	937	745	**-20.5%**
Adult	817	581	**-28.9%**
Aged	313	350	**11.8%**
Number of People Injured	**9,553**	**7,122**	**-25.4%**
Child	3,249	1,074	**-66.9%**
Youth	3,847	3,238	**-15.8%**
Adult	1,524	2,003	**31.4%**

Aged	933	807	**-13.5%**

Source: Central Statistical Abstract, 2009.

2.10 Sum Up & Major Issues

2.10.1 Socio-economic Performance

- With its 82 million people, Ethiopia is the third most populous country in Africa, with a per capita as low as US$ 280 (2008). In 2007, 39% of the population was estimated to live below the poverty line of US$ 1.25/day (PPP);
- In recent years, Ethiopia has experienced strong economic growth with real GDP growth at or near double levels since 2003-04. Real GDP growth averaged 11.2% pa during 2003-04 and 2008-09 period, placing Ethiopia among the top performing economies of Africa in the Sub-Sahara Africa;
- The economy of Ethiopia is mainly based on agriculture, which accounts for 43.2% of GDP, 60% of exports, and 80% of total employment. But off late, it is the service sector, which is the growth driver for the economy, growing at the rate of 14% pa; and
- Although growth remained strong in the recent years rising inflation and a sharply depreciating national currency remained to be some issues which the government has been dealing with.

2.10.2 Road Transport Sector

- The road sector has had an impressive growth under the RSDPs since 1997, which has focused on rehabilitation and expansion of the main paved and unpaved roads and important regional roads. It has expanded the road network to 48,793 km (2010), increasing the road density 44.4 km/'000 km^2 and 0.58 km/'000 population;
- Due to the construction of new roads, the average distance from an all-weather road has been reduced from 21 km in 1997 to 11.3 km in 2010;
- The rehabilitation, upgrading and maintenance intervention efforts under the RSDPs improved the proportion of the road network in good condition to 56%; 23% in fair condition and remaining 21% in poor condition;
- Total cost of implementing the RSDP IV is estimated as ETB 125.3 billion, of which ETB 84.5 billion is allocated for Federal Roads, ETB 14.4 billion for Regional Roads, and ETB 26.4 billion for Wereda Roads;
- RSDP IV document states that in next five years; 4,331 km of roads would be added in the Federal Road network, whereas 11,212 km in the Regional Roads network;
- In view of socio-economic development in the country, the increase in road density with the size of classified road network including the Wereda Roads is expected at 4.8% pa;
- RSDP IV places a high emphasis on the construction of link roads and engineered low-volume roads.
- The total vehicle fleet in the country has increased from 218,000 (2002-03) to 376,000 (2010-11) registering 6.3% pa growth rate;
- Of the total roads, 21% of roads had traffic flow from 301-500 vpd; <200 vpd on 27% of the roads and about 5% of the roads observed <100 vpd;
- Total transport output in terms of average vehicle-km has increased from 9.32 million to 9.64 million showing a growth of 3% over previous year;

- Overall traffic growth during 2004-08 was observed at 14% pa, of which, cars registered at 12% pa; buses 17% pa; and trucks 12% pa;
- The motor vehicle accidents in Ethiopia were observed at high level in 2007-08, which estimated 15,000 accidents, however, total number of accidents fell down by about 7% over the previous year.

3. ROAD MAINTENANCE PRACTICES: INTERNATIONAL AND ETHIOPIA

3.0 ROAD MAINTENANCE PRACTICES: INTERNATIONAL & ETHIOPIA

3.1 General

This chapter outlines the prevailing road maintenance practices, which are followed by the road agencies in Ethiopia, i.e. Ethiopian Roads Authority (ERA), Regional Roads Authorities (RRAs) and Municipal Road Authorities (MRAs). The chapter also presents a comparison of the Ethiopian maintenance practices with the international practices, so that inadequacies, if any, could be appreciated, and accordingly appropriate improvement and recommendations be made. The outcomes of the chapter would also be used while preparing the maintenance eligibility criteria and the maintenance needs assessment and strategies in the present Study.

The following sections present the prevailing road maintenance practices in Ethiopia and also compare these with some of developing and developed countries. For the purpose, the Consultants obtained the prevailing maintenance practices being followed in Ethiopia from the document "Technical Specification for Road Maintenance Works, August 2003" and have compared with other international standards and practices, such as,

- **African Countries:**
  - Ghana Highway Authority: Road Maintenance Operation Manual;
  - South African National Road Agency Ltd. (SANRAL); and
  - TANROADS Maintenance Manual (Tanzania).
- **Asian Country:**
  - Indian Roads Congress (IRC) in India.
- **Developed Countries:**
  - American Association of State Highway and Transportation Officials (AASHTO); and
  - ARRB Transport Research (Australia).

The issue regarding lack of some of maintenance activities in the prevailing ERA's Technical Specification for Road Maintenance Works was also discussed with the Officials of various road agencies in Ethiopia.

3.2 Road Maintenance Practices in Ethiopia

The Ethiopian Roads Authority developed a document entitled, "Technical Specification for Road Maintenance Works, August 2003", which is used by all the road agencies in Ethiopia for undertaking all types of maintenance activities. However, some of the RRAs, mainly due to fund constraints, have been noticed to carry out maintenance works on ad-hoc basis, i.e. not necessarily following any proper standards and practices.

The ERA's maintenance specifications provide a statement of the standard activities to be carried out under the heads of routine and periodic maintenance; which are assigned a three-digit unique reference number and grouped under headings of:

- Gravel Roads: Routine and Periodic Maintenance;
- Paved Roads: Routine and Periodic Maintenance;
- Drainage;
- Road side;

- Structures;
- Dayworks; and
- Material Production.

These maintenance activities are presented in Table 3.1.

Table 3.1: Maintenance Activities - ERA's Technical Specification

Road Surface/Head	Ref. No.	Activity
Gravel Roads	**Routine Maintenance**	
	110	Spot Repair Gravel Road - Selected Material
	111	Spot Repair Gravel Road - Crushed Aggregate
	220	Blading Gravel Road (Light)
	221	Blading Gravel Road (Heavy)
	222	Gravel Provision - Selected Material (Extra-Over)
	223	Gravel Provision - Crushed Aggregate (Extra-Over)
	Periodic Maintenance	
	317	Gravel Resurfacing (Selected Material)
	318	Gravel Resurfacing (Crushed Aggregate)
Paved Roads	**Routine Maintenance**	
	210	Asphalt Patching (Seal Coat)
	211	Asphalt Patching (Single Surface Treatment)
	212	Asphalt Patching (Double Surface Treatment)
	213	Asphalt Patching (Cold Mix)
	214	Asphalt Patching (Hot Mini - Mix)
	215	Crack Sealing (Individual Cracks)
	216	Pothole Reinstatement (Double Surface Treatment)
	217	Pothole Reinstatement (Cold Mix)
	218	Pothole Reinstatement (Hot Mini Mix)
	219	Pothole (Base Failure Repair)
	Periodic Maintenance	
	309	Sand Seal Coat
	310	Single Bituminous Surface Treatment (SBST)
	311	Double Bituminous Surface Treatment (DBST)
	312	Mix in Place Overlay (Cold Mix)
	313	Asphalt Concrete Overlay
	314	Bitumen Prime Coat
	315	Bituminous Tack Coat
	316	Pavement Reconstruction (Aggregate Road Base)
Routine Maintenance (Drainage)	121	Culvert Cleaning
	122	Ditch Clearing (Manual)
	230	Ditch Clearing (Machine)
	123	Repair Erosion Damage (Selected Fill)
	124	Repair Erosion Damage (Rock Fill)
	125	Mortared Masonry Repair

Road Surface/Head	Ref. No.	Activity
	126	Dry Masonry Repair
	127	Gabion Structures
Routine Maintenance (Roadside)	131	Bush Clearing
	240	Shoulder Blading
	241	Shoulder Rehabilitation
Structures	251	Concrete Construction (Class 1)
	252	Concrete Construction (Class 2)
	253	Steel Reinforcement
Day Works	410	Emergency Repairs
	411	Other Routine Maintenance
	412	Betterment (Traffic Signs, Km Posts, Small Scale Improvements of Road Curves, etc.
	413	Environmental Protection
Haulage	510	Overhaul
Material Production	M10	Cold Mix Production (Pug-mill)
	M11	Cold Mix Production (Mix-in place)
	M12	Hot Mini-Mix Production (Mobile Unit)
	M13	Hot Mix Production (Central Plant Mix)
	M14	Crushed Aggregate (Bituminous Surfacing)
	M15	Crushed Aggregate (Road Base)
	M16	Selected Material (Gravel Road Surfacing)
	M17	Crushed Aggregate (Gravel Road Surfacing)
	M18	Masonry Stone Production

Source: ERA's, Technical Specification for Road Maintenance Works, August 2003.

3.3 Road Maintenance Practices – International

While reviewing the international road maintenance practices, the Study collected documents/manuals of Ghana, South Africa, Tanzania and India in developing countries group and AASHTO and ARRB in developed countries group. The above international practices have been discussed in detail in the Report on "Guidelines for Approving Eligibility of Maintenance of Works for ORF Financing (June 2011) under the present Study. However, for ready reference, main features of these practices are mentioned by country as follows:

3.3.1 Ghana

Trunk roads in Ghana constitute the main highways, and they are developed, managed and maintained by the Ghana Highway Authority (GHA). The GHA Maintenance Department has responsibility for the maintenance of all National, Inter-regional and Regional Roads. As per the GHA: Road Maintenance Operation Manual, maintenance work can be divided as routine maintenance and periodic maintenance, described as follows:

(i) **Routine Maintenance:** Routine maintenance is classified as a work that is performed as needed throughout the year. It is the day to day maintenance of the road. Routine maintenance is carried out on the road once or more times per year. It aims to prevent degradation of the road service level by maintaining the road surface condition, and ensuring that the pavement does not weaken; and

(ii) Periodic Maintenance: Periodic maintenance is classified as the type of maintenance work that is only required over a long time interval, usually a number of years. Roads deteriorate due to the actions of weather and traffic. The rate of deterioration depends mainly on the type and quantity of traffic, the weather and the amount and effectiveness of routine maintenance given to the road. Periodic maintenance activities are expensive and the objective is to extend the time interval between periodic maintenance by means of good routine maintenance. For example, if the time interval between reseals can be extended from (say) 6 years to 8 years by effective routine maintenance the cost savings are substantial.

According to the Road Maintenance Operation Manual (Ghana), the activities are grouped into five levels as given in Table 3.2.

Table 3.2: Group of Maintenance Activities in Ghana

Level 100	Surface Maintenance on Paved Roads
Level 200	Surface Maintenance on Unpaved Roads
Level 300	Drainage Maintenance
Level 400	Road Side Maintenance
Level 500	Road Side Furniture Maintenance

Levels 100 and 200 constitute periodic and routine maintenance as sub-classes; whereas the other levels include only routine maintenance works.

The GHA's Road Maintenance Operation Manual briefly covers routine and periodic maintenance of bituminous surfaces, rigid pavements and also for unpaved gravel road surfaces. It also includes detailed drainage maintenance, roadside maintenance and roadside furniture maintenance.

In comparison with the Ethiopian practices, it is observed that some of the activities of road side furniture maintenance have not been adequately covered in ERA's Technical Specification for Maintenance Works, which need to be included in ERA's Specifications. These activities are discussed in Section 3.4.

3.3.2 South Africa

As per the South African National Road Agency Limited (SANRAL), "Routine Road Maintenance Manual" and SANRAL website, maintenance of South Africa's entire national road network is covered by routine road maintenance contracts. The entire national road network is maintained by contractors responsible for maintenance and any emergencies that arise[1].

Some of the factors that influence the application of specific road works and the selection of general strategies for national roads include:

- historical performance;
- materials availability;
- availability of funds;
- traffic volume and composition;
- road classification and adjacent land use; and
- environment.

SANRAL's Routine Road Maintenance Manual suggests that routine maintenance should be based on the historical performance of the particular road under maintenance, and on availability of material at the site and funds allocated. The Manual also suggests type of

[1] Transport Note No. TRN-4 June 2005, the World Bank, Washington, DC.

maintenance on the basis of traffic level and its composition, road classification and adjacent landuse and also on the mitigation of environmental impacts.

Such practices of road maintenance may also be considered in Ethiopia.

3.3.3 Tanzania

There is a document illustrating the road maintenance in Tanzania, entitled "TANROADS: Road Maintenance Handbook, November 2008". The Handbook presents definition and descriptions of defects accruing on roads across Tanzania. The description is designed to give adequate indications to identify the defects on site, possible causes of the defects, appreciation of potential danger of the pavement deterioration. The Handbook also describes the execution works for routine, periodic and urgent maintenance. The road maintenance activities brought out in the document are briefly presented in Table 3.3.

Table 3.3: Maintenance Activities in Tanzania

- Paved Roads : Surface, Base Course, Sub-base, Sub-grade;
- Concrete Roads: Surface;
- Unpaved Roads: Carriageway;
- Shoulders;
- Slopes;
- Embankment;
- Drainage;
- Structures;
- Road Furniture; and
- Footpath.

"TANROADS: Road Maintenance Handbook" includes all the major activities of road maintenance as mentioned in ERA's Technical Specifications for Maintenance Works. In addition, the Tanzanian Maintenance Handbook covers some additional activities, such as, bleeding, edge repair, waving in case of paved roads; loss of surface texture, cracking and joint settlement in case of concrete roads[2]; manholes and drainage pipes for drainage; and potholes/depressions and obstructions in case of footpaths, etc.

3.3.4 India

In view of the increased road network over the years in India, which resulted in more maintenance requirements, the Ministry of Road Transport and Highways formed a committee to frame the norms for maintenance of roads; and a document entitled, "Report of the Committee on Norms for Maintenance of Roads in India", was developed and published by the Indian Roads Congress (IRC). The Report is quite comprehensive. Among others, it covers routine and periodic maintenance of flexible pavement, rigid pavement and also for unpaved roads. The report is extensively used for maintenance works throughout the country and also a number of developing countries. Summary of the recommended activities for different road surface types is presented in Table 3.4.

Table 3.4: Summary of Maintenance Activities in India

- Routine Maintenance;
- Periodic Maintenance;
- Drainage;
- Shoulders;
- Road Side;
- Traffic Safety;

[2] Concrete roads also known as rigid pavements; do not exist presently in Ethiopia.

- Signing and Marking;
- Landscape;
- Lighting Signals and Communications;
- Facilities Management;
- Others – Snow and Ice Removal, Inspections, etc.; and
- Routine and Periodic Maintenance for Bridges.

Presently, many of the maintenance activities, like, AC treatments, maintenance of rigid pavement, paved shoulders, bridge maintenance, road safety features, etc. are not in practice in Ethiopia, these may be included in the specifications.

3.3.5 AASTHO (USA)

Road Maintenance practices as outlined by the American Association of State Highway and Transportation Officials (AASHTO) in the "Maintenance Manual for Road Ways and Bridges, 2007" are as follows:

(i) Roadway Maintenance

Maintenance of the roadway is the primary way in which a highway agency carries out its goal of providing a safe, efficient transportation system on a day-to-day basis. Roadway maintenance activities suggested are presented in Table 3.5.

Table 3.5: Roadway Maintenance Activities (AASHTO)

- Maintaining the Traveled Lanes;
- Shoulders;
- Minor Drainage Structures;
- Drainage Structures and Drainage Surfaces;
- Safety Hardware; and
- Other Appurtenances.

(ii) Preventive Roadway Maintenance Philosophy

The AASHTO recently adopted a definition of preventive maintenance, which includes the following activities:

- Prevents the intrusion of water into the pavement structure, e.g. with seal coats, joint seal, crack seals and thin overlays;
- Provides for the removal of water from the pavement structure, e.g. with under drains and restoration of drainage systems;
- Restores pavement rideability, e.g. with profiling and milling; and
- Prevents deterioration of bridges, e.g. with cleaning and painting, scour counter-measures, deck rehabilitation, and deck drain cleaning.

As per the AASHTO, in most cases, anything that is not construction or traffic operations on existing highways is a maintenance responsibility.

AASHTO's Maintenance Manual for Roadways and Bridges emphasizes the importance of drainage, covers extensively minor drainage structures as well as drainage structures and surfaces. It also includes the traffic safety features preventive maintenance. These activities have not been adequately covered in existing ERA's Technical Specification for Maintenance Works.

3.3.6 ARRB Transport Research (Australia)

(i) The ARRB defines the maintenance as those activities that are intended to maintain the serviceability of the road, due to the deterioration caused by traffic and climate, from its original condition.

(ii) The ARRB Transport Research has developed two documents regarding maintenance for sealed and unsealed roads.

For management and administrative purposes, maintenance for sealed and unsealed roads is normally divided into two categories: Routine and Periodic as illustrated in Table 3.6.

Table 3.6: Maintenance Practices on Sealed & Unsealed Roads[3]

I. Sealed Roads
(i) Routine Maintenance Activities
• The bituminous surface: pothole patching, crack filling/sealing, sweeping, surface correction, minor sealing, and ice and snow clearing
• The pavement: excavating and replacing, scarifying and reshaping, (minor) stabilizing
• Surface drains: cleaning, replacing, scour checks
• Culverts, pipes, pits, subsoil drains, floodways: cleaning, repairing
• Vegetation/road furniture: cleaning, repairing, replacing, painting
• Signs and road furniture: cleaning, repairing, replacing, painting
• Pavement markings: repainting, replacing
• Signals, lighting: servicing, repairs
(ii) Periodic Maintenance Activities
• Asphalt resurfacing, sprayed bituminous resurfacing, slurry sealing, enrichment or rejuvenation treatment, and resheeting of shoulders
(iii) Provision for Traffic
• Proper signage, markings, etc. for safety of road users and construction workers
(iv) Drainage and Minor Culvert Maintenance
• Unlined surface drains
• Lined surface drains
• Culverts, pipes and pits, cattle grid
• Subsoil drains
(v) Signs, Line Marking and Road Furniture
(vi) Road Side Maintenance
II. Unsealed Roads
(i) Routine Maintenance
• Patrol Maintenance: minor repairs to pavements, shoulders, drains, culverts and road furniture

[3] ARRB Transport Research uses the terminology 'sealed' and 'unsealed' roads in place of commonly used terms 'paved' and 'unpaved' roads respectively.

plus off-road maintenance undertaken on day to day basis
• Light formation grading of pavements and shoulders as directed and usually undertaken at least annually
(ii) **Periodic Maintenance**
• Medium formation grading including watering plus compaction
• Heavy formation grading, as for medium but including ripping and may include additional material in part
• Resheeting which includes preparation of road subgrade, placing of imported material, and two months' defect liability period

The ARRB Transport Research includes routine and periodic maintenance for both sealed and unsealed roads and adequately covers all the essential features of maintenance. It also suggests that there should be proper signage and road markings during execution of maintenance in order to ensure safety of road user as well as worker and the necessity of adequate road furniture for safe movement. Suggestions as given by ARRB may be considered in Ethiopian context.

3.3.7 International Road Maintenance Practices: Sum up

It is noticed that all the International Manuals prepared for road maintenance, emphasize that in order to preserve the road asset, there should be timely and adequate routine and periodic maintenance w.r.t. the road surface: paved or unpaved; road side maintenance; shoulder repair; cross drainage structures; traffic safety; landscape; and also highlights the importance of proper inspection of works.

3.4 Ethiopian Road Maintenance Practices: Comments & Sum up

Reviews of road maintenance practices followed in different developed and developing countries in comparison with the Ethiopian maintenance practices show that there are some activities, which are not adequately addressed in the ERA's Technical Specifications for Road Maintenance Works, August 2003. These should be included in separate heads, whereas some of the items, which are not found eligible for maintenance should be excluded, as stated in subsequent sections.

3.4.1 Paved Roads (AC Surface)

3.4.1.1 Routine Maintenance

There are some activities, prevailing in other countries; required also in context of Ethiopia, but not found in the Technical Specifications, viz. edge repairs, treating bleeding pavements (i.e. removal of excess binder), heater planning (treating of uneven bituminous surface and removal of excessive material). These activities should be included in case of AC surface.

3.4.1.2 Periodic Maintenance

There are some activities, which are not presently used in periodic maintenance of AC surface in Ethiopia, because of capacity constraints, but practiced in other countries, such as,

- fog seal;
- slurry seal;
- 20 mm premix carpet;
- 20 mm mix seal surfacing; and

- 25 mm semi-dense bituminous carpet.

Life of these treatments is more than SBST/DBST, so these may be included in the maintenance list[4].

3.4.2 Rigid Pavements

Presently, rigid pavements are not prevailing in Ethiopia, but with the quantum increase in traffic on some of the road sections, rigid pavements may also be preferred in coming years, in view of its advantages as well as less need and frequency for routine and periodic maintenance. So the maintenance practices related to the rigid pavement are also suggested in the maintenance list prepared for Ethiopia.

3.4.3 Paved Shoulders

Maintenance Practices of paved shoulders are presently not in practice in Ethiopia, but with the increase in traffic and road safety concerns in future; there would be need for paved shoulders on some sections. In view of the above, maintenance of paved shoulders may be included.

3.4.4 Shoulder Rehabilitation

"Shoulder Rehabilitation" (Ref No. 241 in the ERA's Technical Specification for Road Maintenance Works) should specifically include reconstructing and regraveling to repair specific erosion or other damages, correcting shoulder drop-off and also grading down, regraveling unpaved shoulder along road way section.

3.4.5 Roadside Routine Work

'Bush Clearing' (Ref. No. 131, ERA's Technical Specification for Road Maintenance Works), covers cutting, collecting, removing and disposing of roadside vegetation on shoulders, side slope, inlet and outlets of culverts and ditches. As the purpose is to restore safe sight distance, maintain and improve drainage and keep off-road areas clear to accommodate pedestrian and animal traffic. The above activities should be elaborated and works like trim mowing, shrub/brush trimming, tree trimming, etc. and also included.

3.4.6 Structures

3.4.6.1 Routine Maintenance

A new item, i.e. routine maintenance of bridges under the head "drainage" should be included with cleaning of silt and vegetation, etc. from kerb side of deck drainage spouts, expansion joints, sides of bearing and sub-structure; replacement of missing stones, washed away from bed flooring, apron, toe walls, masonry portion of bridges, welding and riveting of joints, repair of damaged wearing course; and cleaning, painting, repairing and replacing missing elements of hand rails, etc.

3.4.6.2 Periodic Maintenance

ERA's Technical Specification for Road Maintenance Works does not cover maintenance activities for structures adequately.

Detailed works, such as, steel structure member painting, joint/sealant replacement, epoxy concreting, bridge/kerb painting for cross drainage structure and retaining wall, crack sealing of affected portion of bridges should also be included within the technical specifications.

[4] There is a need to make changes in policy of periodic maintenance in Ethiopia observing all the pros and cons.

3.4.7 Dayworks

Dayworks come to play at circumstances when a certain task is not clearly defined in the quotation or/and rates are not detailed. The Dayworks include additional unforeseen work/expenditures and even a change of mind on the part of the client at the time of execution of the work.

For this type of situations, the engineer-in-charge may instruct that a variation shall be executed on dayworks basis. The work then shall be valued in accordance with the dayworks schedule included in the contract, and the procedure provided in the conditions of contract shall apply. Generally, total value of dayworks items should not exceed 3-4% of the contract value. It is mentioned that there are some activities, which are included in dayworks in ERA's Specifications, but should be dealt in separate items, such as, Road Safety Features, Other Routine Maintenance, etc.

3.4.8 Betterment

'Betterment' (Ref. No. 412 of ERA's Technical Specification for Road Maintenance Works), presently covers the performance of new work items, which do not fall within the work description of one of the standard activities in the technical specification for road maintenance works. Betterment includes culvert pipe production/installation, construction of check dams, manufacture of permanent traffic signs, kilometer posts, and may also include small scale improvements of road curves and grade compensation works. The scope of the item is classified as 'dayworks'.

However, considering the dimension and type of works, manufacture of permanent traffic signs, kilometer posts, small scale improvements of road curves and grade compensation works shall be dealt in a separate 'Road Safety Features' head and not under the betterment'.

3.4.9 Other Routine Maintenance

"Other Routine Maintenance" (Ref. No. 411 in ERA's Specifications), covers works of non-standard work quality authorized by the Employer's Representative (e.g. shortage of mandatory equipment or specified material).

However, the activity should also incorporate works like daily inspection, hazardous removal, and flood control measures, litter removal along the road side (during and immediately after the rainy season), wayside amenities, and removal of encroachments.

3.4.10 Dust Control Applications

In case of unpaved roads, a separate item "Dust Control Applications", i.e. application of wetting and adhesive solutions to reduce dust from gravel roads should be introduced, as there is no such item in the ERA's Technical Specification for Road Maintenance Works, 2003.

3.4.11 Road Safety Measures

As per the Proclamation of ORF, road safety measures which include carrying out the works necessary for prevention of accident at the roads and the placement of traffic control posts and devices on the roads should be covered under the head road safety features for funding in the proposed list. An extensive list of Road Safety features has been given in Chapter 4.

3.4.12 Road Inventory & Pavement Condition Survey

It has been reported that road agencies do not have adequate fund for carrying out road inventory and pavement condition survey, which is an important task for assessing the latest maintenance needs, some of the road agencies were noticed either undertaking the survey

work on ad-hoc basis with less reliable data or adding the cost of survey work in the overhead cost.

In some cases, the road agencies assess the road condition by recording the vehicle speed Vs design speed of the road, which is quite a crude method for estimating the present pavement condition.

Hence, it would be better, if the Road Inventory and Pavement Condition Surveys are carried out periodically, and in case of any fund constraints may be funded by any external sources as per the requirement.

3.4.13 Traffic & Axle Load Surveys

Traffic and Axle Load Surveys should be carried out, as and when required. This would also help the Office of Road Fund to have clear picture of the road segments that need maintenance in the country.

3.4.14 Resealing / Thin Overlay

Resealing / Thin overlay of 25-30 mm thickness should be undertaken as a part of periodic maintenance and not overlay of more than 40 mm which is resorted to in case of failed pavement.

3.4.15 Activities Not Under Maintenance

There are some activities, which should not be considered under the arena of road maintenance, as presented in the following sections.

3.4.15.1 Full Overlay

Overlay thickness of 40-60 mm should be included in rehabilitation and should be taken care through some other funding mechanism and not in periodic maintenance allocation by the ORF.

3.4.15.2 Realignment Work & Upgrading Work

Realignment work, up-gradation work and widening of roads are not the maintenance work, and hence not eligible for the ORF financing.

3.4.15.3 ROW Additions

Right of Way (ROW) additions should not be covered under maintenance activities.

3.4.15.4 Maintenance of the Roads under Defect Liability Period

Maintenance of the roads under defect liability period of the newly constructed/ upgraded/rehabilitated roads is the responsibility of the contractor, so maintenance of such roads should not be funded by the ORF, till the expiry of defect liability period and handing over to the road agency concerned.

3.5 Major Issues

- Ethiopia is highly dependent on the road transport system for passenger and freight movement. Out of nearly 49,000 km of the classified road network, only 56% roads are reported to be in good condition; which reflects the high need for road maintenance with proper planning, technical strategies, and sustainable funding.
- The Technical Specification for Road Maintenance Works prepared for ERA is widely used by all the road agencies responsible for federal roads (paved and unpaved), regional rural roads (unpaved), and the urban/municipal roads (paved and unpaved).

The Specifications require to be made more comprehensive to address much wider issues relating to all categories of roads and different types of maintenance interventions.

- The Manuals used in various countries for carrying out the maintenance activities, under review, such as, Ghana, South Africa, Tanzania, India, AASHTO (USA) and ARRB (Australia), present several road maintenance practices for paved and unpaved roads. While comparing the prevailing road maintenance practices of Ethiopia and the International Practices, the exercise finds that there are some activities, which are not adequately addressed in the ERA's Technical Specifications (2003):
  - The maintenance practices include different seals on AC surfaces, edge repairs, removal of excess binder and treatment of uneven bituminous surfaces and thin overlay in paved roads; dust control measures in unpaved roads; routine and periodic maintenance of minor and major structures as part of drainage; drop-off and grading down of shoulders; maintenance of paved shoulders and rigid pavement (if available in future), etc;
  - Road Safety works include proper signage and pavement markings in case of sharp curves, road side hazards, side roads access, junctions, valley and bridge approaches and also for vulnerable road users, installation of speed breakers, crash barriers, improvement of sight distances, etc. for the safety of road users in general and also placing of adequate signage to ensure the safety of maintenance workers during the execution of maintenance activities as temporary road safety features; and
  - All the above inadequacies as observed in the ERA's Technical Specifications need to be addressed and included properly in the Ethiopian Practices.
- There are some of the activities, which are not yet part of the Ethiopian maintenance practices, and hence not considered for the ORF financing, e.g. any types of rehabilitation works, viz. overlay thickness of 40-60 mm; realignment work; up-grading and widening of road; right of way additions; and maintenance of the roads under defect liability period.
- Sometimes, it is observed that there are some problems in the actual design of a specific road, like poor drainage on the road in low lying area, which requires frequent maintenance interventions and in absence of that, the road may be completely failed. In such cases, the exact cause of the problem should be mended; and there should be some earmarked fund for rectifying these problems.
- While choosing pavement type, i.e. gravel or paved, and also with paved option – DBST or AC should be determined based on the Life Cycle Cost Analysis with the optimum maintenance strategies and options with right trigger time for the maintenance interventions, and the overall cost saving option should be recommended.

All the above-mentioned issues and the probable challenges, have been reviewed and extensively utilized while formulating the "Eligibility Criteria" for the ORF financing, so that a comprehensive document addressing several maintenance activities – current and future could be prepared as well as followed by the ORF and the road agencies of the country.

4. ELIGIBILITY MAINTENANCE WORKS AND PRIORITIZATION

4.0 ELIGIBLE MAINTENANCE WORKS & PRIORITIZATION

4.1 Introduction

Road Maintenance requirements of a country depend on size of the network and its classification in terms of surface type, and overall maintenance policy, institutional capability and availability of funds to undertake the routine and periodic maintenance works on a regular basis. A comprehensive note illustrating the prevailing road maintenance practices in Ethiopia and its comparison with some of the developed and developing countries is given in Chapter 3.

The above exercise makes the base broader as well as assimilate building blocks for establishing and crystallizing those activities of road maintenance, which could qualify for its financing from the Office of Road Fund (ORF); and, in turn, help developing the "Guidelines for the Eligible Road Maintenance Activities for ORF Financing".

This chapter presents a comprehensive list of all the major maintenance activities, with its components, relating to: (i) routine; (ii) periodic; (iii) emergency; (iv) road safety measures; and (v) other related activities, which qualify for the ORF Financing, and termed as "Eligible for Road Maintenance and Financing". The chapter also outlines broad framework with major influencing parameters governing the maintenance plans and interventions including choice of suitable technology, with special emphasis on labor-intensive technology, for undertaking the maintenance activities, and the road safety concerns.

All the above-mentioned activities are undertaken within scope and guidelines of the Ethiopian Road Fund Proclamation (1997) with preserving the road asset concept under the Second Generation Road Fund practices.

The chapter also illustrates the priority criteria of maintenance works in view of optimizing the scarce resources within the road agencies by assigning relative weights for various influencing parameters in order to preserve the national asset, i.e. roads on priority basis.

4.2 Maintenance Plan & Interventions: Pre-requisites

Undertaking road maintenance activities requires a pragmatic approach, which would consist of proper needs assessment, availability of latest data on road inventory, pavement condition, cross drainage structure, terrain, and traffic data on volume, composition and load-ability, desegregation of different types of maintenance as per the interventions required, appropriate technological choice, viz. man, machine and material. There is no need to emphasize the importance that the availability of funds is very essential for carrying out the proper and timely road maintenance works.

Though this chapter primarily aims at establishing the guidelines for eligibility criteria for considering the road maintenance activities for the ORF financing, it is equally important to appreciate and recognize the broad framework, which is the pre-requisite for undertaking the maintenance activities, as briefly presented in the following sections.

4.2.1 Maintenance Needs Assessment

A proper assessment of the maintenance needs is the foremost task for formulating any maintenance strategies and also there is a need to develop a sustainable mechanism to estimate the road maintenance needs in any given regions or areas. The ORF may develop a mechanism, particularly for the RRAs, for organizing the condition survey and assessing the maintenance needs on a regular basis. For the purpose, the Formats prepared for the

Verification Survey under the present Study (Annexure 6.2) may be used for data collection, and provision for budgetary support for data collection efforts may also be attached with the overall allocation for the maintenance works.

4.2.2 Proper Database

Without proper database, particularly for the road inventory and latest pavement condition, any road maintenance interventions, planning, costing, funding, etc. cannot be worked out. Hence, all the road agencies must have a sustainable mechanism and system for collecting data with analysis support. For better data storing and analysis on an iterative basis for any planning purposes, computerized database arrangement would be highly useful, and hence desirable. The road agencies should have proper budgetary and adequate trained manpower support for the data collection on a regular basis. It is also advised that the Ethiopia National Road Network Database developed by Addis Ababa University with the financial assistance of the ORF may be used.

4.2.3 Periodic Maintenance & Rehabilitation

Periodic maintenance is an integral part of the entire road maintenance strategy, and in absence of such maintenance, any road surface would deteriorate faster or even fail, and would need rehabilitation after some time requiring much higher cost. It is a sequential phenomenon. Somehow, there are some areas where periodic maintenance and rehabilitation may appear more or less the same due to definitional problems on different activities or there could be several overlapping activities and hence difficult to segregate. In practice also, the classification between normal rehabilitation and periodic maintenance could be overlapping on account of certain components, hence confusions for planning and financing[1] may be encountered.

With the above background and ensuring quality service to the road users as well as preserving the asset, the Study puts forward the following argument for considering a small and limited size of rehabilitation along with periodic maintenance, if felt necessary. It has been discussed and argued that the ORF is basically supposed to finance the routine, periodic and emergency maintenance activities on the classified road network of the country; hence the Fund does not finance the rehabilitation and other activities which might require heavy investments. However, considering the need for efficient and smooth transport system required for socio-economic development, the Study suggests that the rehabilitation work on a limited scale on a few segments of any road sections could be considered. The limit could be fixed as 10% of the total physical length of the road section under the periodic maintenance interventions, and 15% of the periodic maintenance cost of that specific road section; whichever is less.

[1] In some of the cases, for non-technical persons or specific decision making it is difficult to distinguish the activities that fall under the periodic maintenance and rehabilitation when undertaking the periodic maintenance activities, like a small section of a particular road may be in a very poor condition requiring full overlay, could be taken under maintenance or a culvert or minor bridge is damaged making the link cut off from the main road network. It is also seen that drainage system is not properly provided, particularly in hilly/rolling terrain, which causes failure of roads frequently; that needs to be adequately addressed with small cost to ensure the all-weather accessibility, e.g. road from Bedle to Dedesse river bridge lacks proper cross drainage structures and the road found to be damaged; this was observed during the Verification Survey. While undertaking the periodic maintenance, length of such road sections requiring rehabilitation should not be more than 10% of total road length. In view of the above, the Study suggests to have provision of about 10-15% (max.) of periodic maintenance funds to improve such sections of the road, whereas, if a full road is under very poor or failed condition that should not be taken as a case of maintenance, hence not to be funded by the ORF, and should be improved/rehabilitated by some other source of funding.

The acceptance of the above provision of considering the rehabilitation activities on a limited scale is, however guided by the policy decisions of the Road Fund Board, and the road system requirements, in view of the asset preservation, efficient transport costs, and maintaining the roads for round the year accessibility.

The Guidelines for Approving Eligibility of Maintenance Works for ORF Financing will be very useful in sorting out this problem. However, in view of the requirement of technical knowledge while scrutinizing the requests from road agencies for different activities of the maintenance, it would be highly desirable to have services of qualified trained manpower either in-house or hired from time to time.

4.2.4 Traffic Volume

Level of traffic is one of the main concerns of planning and developing the road network or any specific sections. This is also required in view of optimizing the total transport cost of the country. It has been widely acknowledged that traffic level more than 200 vpd on any road section would warrant for asphalt road standards, and also recommended for the Ethiopian roads[2]. It is mentioned here that ERA's Manual for LVRs, 2011 recommends the cut-off figure for gravel roads as 300 vpd[3]. Otherwise, unpaved or gravel surface with higher level of traffic would require frequent re-gravelling, and may be an uneconomical proposition.

4.2.5 Technical Specifications

Any maintenance activities, either routine or periodic or others, to be carried out by the road agencies and financed by the ORF must be in conformity with the latest standard technical specifications recommended by ERA or other designation technical bodies in Ethiopia or international practices with due references.

4.2.6 Calculations & Supporting Documentation

Any road maintenance proposals initiated by any road agencies must be supported with details on the work schedules including equipment and labor components, etc., which could also be used as a mark of authenticity for records, reference and verifications.

4.2.7 Approval of Full Allocations of Funds

Due to financial constraints, particularly when the fund is not fully allocated as per the requests made or any other reasons, it is often found and also reported by the road agencies that only partial maintenance work on road section(s) are carried out. This partial maintenance could be in terms of thickness of the surface, i.e. less than the recommended specification, quality of materials, not maintaining full length of a road section, leaving any en-route cross drainage structures unattended, etc. In such cases, the maintenance works carried out will not sustain, and start deteriorating fast, which would result in heavy loss; and such negligence on a continuous basis, would lead to much heavier loss requiring severe rehabilitation with substantial capital investments.

The planners and decision makers must keep in view that such losses are the national loss on the macro level, i.e. on account of untimely asset deterioration, road safety requirements, higher vehicle operating costs to the road users and also inconvenience and en-route damages of the commodities in transit, particularly valuable and perishable items with food safety concerns, etc.

Hence, in order to address this issue under any budgetary constraints, the work carried out for routine or periodic maintenance should be in accordance with the proper specifications

[2] ERA's Geometric Design Manual (2002).

[3] For details refer to Chapter 2 of the Report "Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (June 2011)" under the present Study.

and standards, particularly, if the work needs to be carried out on the important and critical sections.

4.2.8 Technological Choice

For undertaking road maintenance activities also, an optimum structure and composition of the usage of man-machine-material is highly desirable, particularly in case of developing countries like Ethiopia, where there are scarce capital resources, existence of high rural open and seasonal unemployment, and lack of proper technology of using local materials. Therefore, while formulating the maintenance interventions and planning, the above issues relating to the judicious use of resources need to be kept in view, which are briefed in the sections that follow.

4.2.8.1 Labor Intensive

It is always desirable to utilize the national resources optimally in development process including transport infrastructure. For the purpose, the planners and decision makers must ensure that the most economical resources, based on their relative opportunity costs, need to be mobilized and utilized for creating and preserving the infrastructural assets in present context. For example, in an economy, where the incidence of open and seasonal unemployment is observed at higher level, it would be highly desirable to opt for the labor-intensive technology, so that unutilized labor force could be deployed more in the road maintenance activities as well. However, while making any such decisions, the types of work to be carried out on different roads, etc. need to be properly considered.

In several developing countries including Ethiopia, the practice of labor-intensive propositions in maintenance work, particularly on low volume unpaved roads serving rural areas are very popular including higher participation of women labor.

Besides providing more jobs, the advantage of labor-intensive technology for the above types of roads, as the semi-skilled local manpower are also easily available, they can perform specific jobs suitable for them with least or no use of any machines. Among others, the above system may not require usual organizational hassles.

While considering the labor-intensive maintenance option for specific road types, e.g. unpaved with low volume road, the foremost task is to define clearly the concept of “labor-intensive” in physical and financial terms.

Physical term refers to the specific type of works, such as, ditch cleaning, repair of minor cross drainage structures, filling of unpaved surfaces and slopes, etc., whereas financial refers to the minimum labor component, i.e. share of expenditure envisaged for deployment of labor, for example, expenditure on labor should not be less than 50% or so of the total expenditure on the maintenance.

ERA’s document on RSDP IV (2011)[4] adequately highlights the benefits for labor-based method in road construction and maintenance realized in Ethiopia in comparison with the traditional heavy equipment-based methods. The Document also describes that at micro and macro levels, the use of a labor-based approach has significant economic advantages over the use of an equipment-based approach in the improvement and maintenance of roads in Ethiopia.

[4] ERA’s RSDP IV; Sub-Program Universal Rural Road Access Program (URRAP) describes the implementation approach for construction and maintenance with focus on labor-based actions.

Some of the facts observed, relating to the labor-intensive option while comparing with the conventional method of using the equipment-based methods in Ethiopia[5] are briefly presented in the following paragraphs:

(i) Labor-based method would encourage the local contractors to enter in the road sector market, as the level of investments required by the contractors would be much lower in comparison with the equipment-intensive operation;

(ii) Over five times more direct employment is created while opting for the labor-based methods, as compared with the equipment-based methods;

(iii) Labor-based methods also include substantial proportion of women employment, i.e. about 30%;

(iv) Labor-based methods are found economical[6] than equipment-based methods for similar types of work with the same quality and standards;

(v) Based on the average cost for one km built using the equipment-based methods, 2.5 km could be built using labor-based methods;

(vi) About 45% of the cost of labor-based road-works goes to labor wages, 22% while using equipment-based methods; and

(vii) On the macro-economic impact, labor-based methods generate nearly 70% higher national output per unit of investment compared to equipment-based; of which, 80% is due to indirect effect.

4.2.8.2 Mechanization

In the road construction and maintenance work, the use of heavy and light machine and equipment is appropriately considered mainly with their inherent advantages. Such equipment requires high initial capital investments with adequate operation and maintenance support. This option would require highly skilled manpower at high cost usually requiring foreign exchange resources on regular basis. It has been often observed that due to lack of spare parts and repair supports, equipment remain idle for long time causing considerable financial loss and delays, particularly in remote rural areas.

All put together, the use of heavy equipment, particularly the imported ones, is an inevitable burden on the developing countries, so the deployment of specific equipment needs to be made judiciously, mainly based on the merits of specific cases supported with proper economic analysis.

However, there are several areas of road maintenance, where usage of equipment is required, i.e. periodic maintenance on the paved and unpaved roads in general, and road in urban areas and also roads with heavy traffic in particular.

In urban areas and roads with heavy traffic would need the use of machines due to its certain advantages of equipment based technology as well as time savings, as those roads cannot be closed for a longer period to its users.

Moreover, in order to observe uniformity and high quality of serviceability with cost effective and time saving proposition, the use of machine and equipment would be highly preferred, provided operation and maintenance support on regular basis is ensured.

[5] Comparative Study of the Impact of Labor-based and Equipment-Based Methods in Roadworks in Ethiopia – Study Rural Roads Authority Tigray and Ahmara Regions in collaboration with the International Labor Organization (ILO), 2008.

[6] The RRAs using force account units, report that the average cost/km for rural road construction using labor-based methods was about 54% cheaper than the equipment-based.

4.2.8.3 Appropriate Use of Labor & Equipment

For road maintenance, an appropriate combined use of labor and machines would provide the most suitable solution. It has been realized that certain maintenance tasks can be carried out more effectively by machines while others are best carried out by using labor. Hence, the appropriate technology will depend on the type and nature of maintenance related activities, and the availability of labor and equipment in the area where the work is implemented.

It may be noted that the choice between equipment and labor-based work methods for also affects the basic organization of road maintenance[7]. Use of equipment at high degree will entail a more centralized organization, whereas labor-based would favor decentralized. So, it is advisable that while selecting the optimal approach to road maintenance, the implementing agency should analyze the information on the specific roads, traffic level, resource available in terms of funds, labor, machines and materials, etc. Besides the above, information on staff skills, training requirements, equipment performance and utilization, labor productivities, effects of critical resources, etc. need to be analyzed and appreciated.

For quick understanding and planning the use of labor and machine for undertaking several maintenance activities, Table 4.1 presents activities which are best suited for labor, and most suitable for using equipment.

Table 4.1: Appropriate Use of Equipment & Labor in Maintenance Works

Activity	Potential	
	Equipment	Labour
Ditch cleaning and reshaping	Good*	Good
Minor bridges and culvert repairs	Poor	Good
Building scour check	Poor	Good
Repair of structures	Poor	Good
Grading unpaved surfaces	Good	Poor
Patching, sanding or local sealing of bituminous surfaces	Poor	Good
Filling of unpaved surfaces and slopes	Poor	Good
Grass cutting	Good	Good
Repairing and replacing traffic signs	Poor	Good
Road line marking	Good	Good
Stock piling gravel	Good	Fair
Re-gravelling	Good	Fair
Producing chippings	Good	Fair
Surface dressings	Good	Fair

* Requires a V-shape ditch.
Source: Rural Road Maintenance Management, Rural Infrastructure Improvement Project, Asian Development Bank (1999).

Use of labor-intensive option, inter alia, supports social justification, but in most of the cases, the choice between labor and machines is not an either/or situation – it is possible to find cost-effective solutions combining the two approaches. Moreover, past experience has shown that an intensive use of "intermediate equipment"[8] can be extremely cost-effective for excavation, compaction and hauling, provided that locally available skills and materials are drawn upon in an imaginative way[9].

[7] Rural Road Maintenance Management, Rural Infrastructure Improvement Project, Asian Development Bank (1999).

[8] Such as, wheeled agricultural tractors and related ancillary equipment, etc. These may be used in mostly labor based maintenance for LVRs, using available manpower and resources.

[9] Ibid.

4.2.9 Performance-Based Road Management & Maintenance Contracts

The Performance-Based Road Management and Maintenance Contract, popularly known as the "Performance-Based Contracts (PBC)" define minimum condition of road, bridges, and traffic assets that have to be met by the contractors, and also several data, etc. relating to the management of asset. In fact this method is different from the traditional way of contracting out road maintenance, i.e. based on the amount of work being measured and paid for on agreed rates for different work items[10].

The concept of PBC is based on the cost efficiency, the contractors need to meet the maintenance level of services, it enhances the capacity of the road agencies, transparency in the operations, etc. Under the PBC, the client does not specify any method or material requirements (provided the country's requirements are met); instead the client specifies the performance indicators (levels of service) that the contractor is required to meet when delivering the maintenance services[11].

As per an estimate, PBCs have shown cost savings from 10% to 40% over traditional contracts in different countries. This system[12], among others, ensures expenditure certainty with a fixed price based on a regular schedule without any unexpected variation orders; reduction in the in-house workforce or capacity building support; improved conditions of contracted road assets and reduction in roads in poor condition; greater road user satisfaction; multi-year financing of a maintenance program; etc.

However, there could be certain apprehensions among the private prospective bidders of the PBC, viz.: (i) condition of road pavement under the proposed PBC; (ii) real maintenance needs assessment; (iii) real maintenance cost estimations; (iv) maintenance specifications and standards; etc.

The PBC in Ethiopia is a new concept, and not yet functional or experienced. In view of that ERA has entrusted a Pilot Study on the Output and Performance-Based Road Maintenance Contracts (OPRC), funded by the World Bank. The study is on-going, the outcomes may not be available during the present consultancy services.

Based on the successful experience of the PBC in several developed and developing countries including the African countries, the introduction of PBC for maintaining the paved and unpaved roads in the country could reduce the financial burden of maintenance due to the expected cost savings, capacity building and higher level of service.

In case, the PBC is functional in near future in Ethiopia, the scope of work, as defined by ERA or other road agencies would be binding on the contractors to follow; and that would form the basis for guiding the eligibility criteria under any PBC arrangements, if any financial or other implications directly or indirectly arise. However, the PBC arrangements, ideally, share the load of road agencies against pre-determined rates, which would also decrease the burden of road agencies in terms of institutional capability and initial resources, viz. man, machine and materials.

4.2.10 Equipment Needs & Support

As briefly discussed in Section 4.2.8, i.e. choice of technology, appropriate use of equipment in different road maintenance activities is important. Normally, funding of purchasing any

[10] "Cutting Costs and Improving Quality through Performance-Based Road Management and Maintenance Contracts" (2008) – Latin American and OECD Experience, by Dr. Gunter Zietlow.

[11] "Performance-based Contracting for Preservation and Improvement of Road Assets" (2009), by Natalya Stankevich, Navaid Qureshi and Cesar Queiroz, Transport Note No. TN-27, The World Bank.

[12] Ibid.

maintenance equipment is not the mandate of the ORF, though it is essential for undertaking the maintenance activities effectively and efficiently in certain cases.

In reality, it has been reported that about 50% of the maintenance equipment are old and not useful for the performance[13], besides the frequent breakdown and remained out of service for considerable time due to lack of timely and adequate repair and maintenance support. This situation affects adversely the entire maintenance program in terms of cost and time overrun.

With this background, there is a need to appreciate the ground realities of availability of the maintenance equipment – owned or hired, and adequate repair and maintenance support, particularly in the remote and isolated rural areas. To address the issue properly, it is highly desirable that the road agencies should make their equipment requirement on the basis of ground reality in a transparent manner. However, the ORF financing on account of expenditure on equipment is concerned, it should be confined mainly to the operation and maintenance only. Any proposals for purchasing of equipment for maintenance work should not be approved under the ORF financing.

However, in view of genuine need for equipment for undertaking maintenance works and non-availability of equipment, as also identified in the Road Financing Study, Ethiopia (2005) and suggested in the Technical Audit and Financial Services Report (2005), the ORF should select major private equipment companies to act as "Management Agent" of ORF for renting out the ORF purchased equipment[14].

In order to solve the issue of non-availability of machine and equipment, particularly for backward regions and also private contractors may not be interested to work there, such as, Afar, Somale, Gambela, and Benshangul Gumuz, the ORF could also enter into financial arrangement with any prospective companies involved in importing, selling or leasing of maintenance equipment under collateral arrangement.

The system may work like that some portion of the maintenance costs (rental cost of equipment for the next few years), covering the equipment cost in the total cost/allocation for the maintenance, could be used for yearly payments, as per the agreement, against equipment procured for the specific RRAs from the company under hypothecated form[15]. The details of the same could be worked out. This proposal is mainly guided for providing assistance to the most backward regions, which may not be capable to stand at their own in near future. The arrangement may be considered on a trial basis to start with. The proposed arrangements may require the Road Fund Board's approval.

4.2.11 Maintenance of Cross Drainage Structures

Cross drainage structures (CDSs) provide links and accessibilities through causeways, culverts, minor and major bridges, etc. so that the road users could observe all-weather movement, contrary to that in absence of proper CDSs, regardless of the maintenance level of the road pavement condition, there would not be proper pass-ability, and may lead to delinking of the area being served by any particular road(s), and making its inhabitants vulnerable. If the catchment areas of any particular road remain delinked due to any hurdles with the serving CDSs, there could be serious problems of supplies, marketing of agricultural

[13] Road Financing Study, Ethiopia (2005).

[14] "These companies would rent out the equipment exclusively to road agencies and the local contractors engaged in road maintenance contracts funded by the ORF. The rent to contractors and road agencies should include managing agents' costs and profit; while ORF should recover only depreciation and investment cost at a reasonable rate from the rent". It may require the Board's decisions or suitable changes in the Proclamation.

[15] Hypothecated form refers to pledge (property, equipment, etc.) as security or collateral for a debt without transfer of title or possession.

products, particularly the perishable commodities, access to education, health services, and socio-economic facilities.

Provisions of the CDSs usually require high capital investments with not much repair and maintenance, however due to several geographical reasons, such as, climatic conditions, terrain type, floods, etc., routine and periodic maintenance of CDSs are highly desirable for observing throughout the year accessibility. Depending on the situations, the maintenance of CDSs may require on the emergency basis. Accordingly, the maintenance policies for maintaining the CDSs need to be formulated and considered.

4.2.12 Diagnosing the Cause of Deterioration

It is important to identify the cause of deterioration and to correct it if possible, rather than just treating the symptoms. For example, there is little point in continually filling in pot-holes in a road if the pothole is occurring because of poor drainage. Finding the real problem and focusing attention on its solution will produce a more cost effective use of maintenance resources.

Some problems, of course, may be outside the scope of maintenance. For example, a road across flat terrain with inadequate drainage outfalls may experience base failure as a result of the capillary rise of water in the wet season. Solution to the problem is to raise the level of the road. This would be a road improvement, not a maintenance operation and as such, it may warrant a special allocation of resources in accordance with the organizations' procedures for road improvement work.

In view of the above, up to 10% of the road segment or less could be considered as the threshold level, which could be considered as eligible for the maintenance work. If the problem is found more than that, which requires higher allocation, would not be qualifying for the maintenance, or that case would be for rehabilitation or so.

4.2.13 Skill & Productivity of Labor

The skill and productivity of labor and of immediate supervisory staff is an area critical to overall performance on the ground. Proper training, reporting system and surprise checking by higher level officers with a definite check list of items of maintenance can bring about slowly but steadily the sense of responsibility and accountability.

4.2.14 Overloading

It has been widely acknowledged that overloaded vehicles damage any road surface considerably, i.e. nothing but huge capital loss. Frequent occurrence of the happening leads to much faster deterioration of the road surface, which leads eventually to resurfacing or immediate rehabilitation, as per the extent of the damages. Unless the incidence of overloading is not restricted through proper measures including effective enforcement, the damages due to overloading or premature maintenance requirements could not be deferred. Hence, strict and effective enforcement is highly desirable to arrest the rapid loss of the road asset; otherwise, it would require heavy outlays for maintenance or rehabilitation. A detailed analysis presenting several issues relating to the overloading is given in Chapter 8.

4.2.15 Life Cycle Cost Analysis

In order to preserve the road assets, it is essential to administer the proper maintenance interventions, which should be ideally based on the life cycle cost analysis. This exercise would also ensure good value for money, i.e. investments and long-term reliability of the maintenance activities to be carried out. It may not be possible for every road agency to undertake the life cycle cost analysis regularly for different roads of their network, mainly due to lack of in-house technical capability; instead they should follow appropriate standard

design and maintenance practices recommended for different types of roads, climatic conditions, terrain type and level of traffic volume. This analysis and consideration would also ensure the maintenance implementing agencies for optimum utilization of resources with the most appropriate option for the maintenance interventions.

4.2.16 Training of the Staff

The staff responsible for undertaking the maintenance activities should be adequately trained, particularly in the fast changing world on account of the technological changes. Trained staff is an integral part of the maintenance functions responsible for not only the implementation of the maintenance tasks, but also planning and arranging and deploying the suitable resources on time. It is also highly desirable that the staff should have adequate expertise and professional working knowledge of the latest and most appropriate road maintenance methods and techniques, which could be suitably utilized for the purpose.

This requires continuous and regular training in different functional areas of the road maintenance at different levels of officials and supporting staff. Under the present Study, the Consultants have identified different areas of training, which have been addressed in Chapter 11.

4.3 Maintenance Activities Eligible for ORF Financing

4.3.1 General

Based on in-depth investigations on prevailing practices in Ethiopia, literature search mainly on the international practices and series of consultations, the Study has developed a comprehensive list of the activities and sub-activities falling under different categories of maintenance, viz. routine, periodic, and special for gravel/unpaved and paved roads, which are presented in Table 4.2, featuring at pages 4.20 to 4.25.

For clarification, it may be noted that those activities not featuring in Table 4.2 are generally not eligible for maintenance, and hence do not qualify for the ORF financing.

4.3.2 Road Safety Measures

“Road Safety Measures” is one of the mandates of the Ethiopian Road Fund Proclamation (1997), particularly in view of growing concerns of the road safety on the Ethiopian road network. The Proclamation does not provide a comprehensive scope of work with specific activities, which could be brought under the umbrella of the eligibility criteria for the ORF financing.

The statistics relating to the road accidents[16] certainly alert the road users as well as the transport planners and decision makers, and the Government’s commitment to bring it down to a much lower level, would also require adequate and regular funding, besides a well conceived and constantly monitored road safety action plan. As per an estimate, about 3% of the ORF budget could be allocated to the road safety measures on several activities addressing the road safety.

These expenditures could be dovetailed either along with the on-going maintenance activities – routine or periodic, and also exclusively for the road safety projects in form of research activities, data collection and analysis, workshops, public awareness, drivers training for road safety and immediate first-aid service to any road accident victims, training of nearby villagers in catchment areas of the road network, medical supports, communication support, special tools/equipment for enforcement, etc.

[16] RSDP IV (2011)

The activities could also be initiated by any non-government organizations (NGOs)/civil societies, and also could be synergized under any public-private partnership arrangements along with any corporate bodies, e.g. active partner in any road safety campaigns, organizing road safety weeks, road safety hoardings, road safety painting competition, etc.

In special reference to Ethiopia, a study funded by the European Commission entitled "Sectoral Road Safety Program in Ethiopia" was carried out in 2001. This study, among others, developed a comprehensive guideline for undertaking tasks relating to the road safety measures for five years, which is valid for long term as well. The overall objective of the National Road Safety Program (NSRD) was to minimize the adverse effects of motorization and development by reducing the consequences of road accidents. Specifically, the program's purpose is to develop the skills, resources and system needed to combat the increasing number of road accidents[17].

The plans and tasks suggested on the road safety are grouped under ten broad groups as follows: Road Safety Co-ordination and Funding; Road Safety Engineering Activities; Driving standards; Accident Data System; Vehicle Inspection System; Traffic Law Enforcement; Road Safety Publicity; Medical Services; Insurance and Industry; and Research and Accident Costing. The sub-tasks under each of the above groups are also brought out, are presented in Table 4.3 at pages 4.26-4.27; which provides a broad guidelines and directions for the road safety activities in Ethiopia.

Within the framework of Ethiopian Road Fund Proclamation, and the mission of reducing the road accident to a substantial level, the scope of the road safety eligibility needs to be increased in much wider terms. Towards the same, the Study has listed out the activities, which need to be undertaken as road safety measures while planning and implementing the routine and periodic maintenance, and presented in Table 4.4 at pages 4.28-4.29. A brief description on the road safety measures to be considered during different types of maintenance is given in the sections that follow.

4.3.2.1 Road Safety Measures during Routine Maintenance

The routine maintenance program generally does not refer to the expenditure on capital type investments; therefore, the activities relating to the road safety during the routine maintenance should not involve any capital type expenditures, e.g. it should cover repairing or reinstalling and restoring of already installed safety features to bring those in the original condition. The activities may also include the measures for improving the visibility of signs and reapplication of road markings to improve the readability of road.

4.3.2.2 Road Safety Measures during Periodic Maintenance

It is widely believed that after any road improvement program, e.g. periodic maintenance enhances surface quality considerably, resulting in, more motorized traffic and higher speed, which often increase the probability and severity of road accidents.

To mitigate the above most likely problems, it is highly desirable and essential to list out the engineering measures for road safety, which could minimize the chances of road accidents. These measures, which need to be undertaken during the periodic maintenance, are presented in Table 4.4. Various degrees of importance are also shown in terms of "number of stars" in Table 4.4, so that the implementing agencies and decision makers could take special care for those specific activities.

The signs shall be of retro-reflective in nature, the pavement marking shall be of hot applied thermoplastic and the roadside furniture shall be forgiving type.

[17] Draft Study Report for a Sectoral Road Safety Program in Ethiopia (2001), funded by the European Commission under the 7th European Development Fund.

4.3.2.3 Road Safety Measures during Emergency & Special Maintenance

There are unplanned maintenance works, such as, road repairs because of heavy rains/flood, cyclone, land slide, etc, which require maintenance of the specific sections of the road on emergency basis, i.e. on top priority. Past experience of specific locations and hazards indicate the scale of the resources towards road safety need to be set aside for these activities. Similarly special maintenance works are also sometimes urgently required, i.e. improvement of sight distance, cross drainage structures, etc. Special signs, delineators and other road safety features are required to ensure that workers and public are protected from the hazard of site activities. The measures identified to address such activities are presented in Table 4.5.

Table 4.5: Possible Road Safety Hazards & Treatment

Safety Hazard	Treatment
Sharp Curves	Curve warning signs, delineator posts, speed limit, W-beam crash barriers, and centre and edge line markings.
Vertical Curves	Steep gradient with insufficient sight distance
Road Side Hazard	Proper visibility during night time by providing retro-reflective Object Hazard Markers shielded with W-Beam crash barrier.
Side Road Access	Lowering the speed of side road by speed breakers and proper signage.
Junctions	Warn and guide the driver while approaching, speed breaker on the side roads, proper signs and markings, signals and street lighting.
Valley & Bridge Approaches	Crash barriers in valley side and bridge approaches.
Vulnerable Road Users[18]	Pedestrian crossings, footpaths, warning signs.

4.4 Eligibility Criteria of Maintenance Works

The sole objective of road agencies engaged in road maintenance activities is to preserve the existing road assets with the proper use of technology choice, i.e. using right mix of labor-based/intensive and equipment-based technology, so that efficient and effective mobility in the country could be ensured. In order to achieve the above, proper maintenance of road network is highly desired in the country. This aspect has been adequately discussed in earlier sections of the report including extant maintenance practices in Ethiopia, and also compared with other standard practice in the World, which are the building blocks of establishing the “Eligibility Criteria of Maintenance Works”. The proposed criteria are grouped under the categories of: (i) Essential and Basic Criteria; (ii) Highly Desirable; and (iii) Desirable, which are discussed as follows:

4.4.1 Essential & Basic Criteria

4.4.1.1 Maintainable Roads

Only those roads, which are in “maintainable condition”[19] would be considered eligible for the ORF financing for routine and periodic maintenance with the exception of emergency and

[18] Vulnerable road users are pedestrians, children, old age people, bicyclists, motorcyclists, etc.

[19] As per the TRL Overseas Road Note 20: Management of Rural Roads Network, a road or a section of road, is in a maintainable, or good or fair, condition if it serves the needs of the road users and has only minor defects which can be rectified using routine or periodic maintenance. The Note further describes; the roads which do not cover development (new construction, widening, new carriageway works) or rehabilitation work to perform at an acceptable level of service and meets users’ need for mobility are said to be maintainable.

special cases, as specified in the criteria; failed roads or roads requiring severe maintenance (rehabilitation and overlay of 60 mm thickness or more) excluding spot maintenance of limited extent, say up to 10-15% or so; upgrading work of any nature, would not be part of the ORF financing. Such works should be financed through some other arrangement of funding and only after the failed road is brought to the maintainable condition, then only, the requests could be admissible for routine and periodic maintenance for the ORF financing.

In order to measure the condition of roads whether the road is failed or in maintainable condition, it is prudent to mention that the level of deterioration on the roads needs to be determined by the international roughness index (IRI) and other pavement distress parameters, such as, rutting, raveling, cracking, edge break, etc., but it has been brought out from a series of consultative meetings with the road agencies, especially RRAs that most of the agencies don't have either resources or equipment to have comprehensive or even basic pavement condition survey of the roads under their jurisdiction. Therefore, the visual inspection data as per ERA's prevailing practices could be considered, which can be refined once the equipment for measuring roughness and other road deterioration parameters are available to the road agencies. Till the adequate arrangements are made available, the Pavement Condition Formats developed in the present Study (Annexure 6.2) could be resorted to, i.e. roads falling under very good and good category (needing routine maintenance only to serve on an acceptable level of service), fair category (needing routine maintenance and resurfacing) and poor roads (needing routine maintenance, resurfacing and partial rehabilitation) should be undertaken for maintenance using the ORF financing. Very poor roads requiring complete rehabilitation should be first brought in maintainable condition by some other source of funding and then it will be valid for maintenance under the ORF's financing.

4.4.1.2 Classified Roads

All the roads, administered by the road agencies, viz. Federal Road Network (DS1 to DS 10)[20] under ERA; Regional Road Network under RRAs; and Urban Road Network under MRAs will be eligible for maintenance by the ORF financing.

4.4.1.3 Unclassified Roads

(i) Rural Road Network Stock in Ethiopia: Other than the Federal Road network under the ERA, and the urban roads under different MRAs, there are rural road network of considerable size administered by respective RRAs and Wereda / Communities. As earlier stated that the road networks under the ERA, RRAs and MRAs are categorized under "Classified Roads"; and remaining networks are under "Unclassified Roads" including Wereda / Community Roads. However, the GoE has taken several initiatives, particularly through the RSDP IV, to develop the Wereda / Community Roads in a phased manner. A brief note on the same is given in the following sections.

During 2004-05 to 2009-10, under the RSDPs about 80,000 km of Community / Wereda Road Network was planned, but 100,384 km of roads got accomplished, showing the achievement level of 125%. For the appreciation of the rural road network stock in the country, administered by the Regional Roads Authorities (RRAs) and the Wereda / Community is presented in Table 4.6.

[20] As per the ERA Geometric Design Manual 2002, roads have been divided under the categories as DS1 to DS10 based on the functional classification, design traffic, surface types, lane configuration, design speed and terrain types. Maintenance interventions of all the above road types in various conditions will be different.

Table 4.6: Rural Road Network in Ethiopia (2009-10)

Type	km
Total Regional Road Network (RRAs)	26,944
Total Community Road Network (Wereda /Community)	100,384
Total Rural Road Stock	**127,328**

Source: RSDP IV, ERA (p. 93).

(ii) Wereda / Community Roads: As shown in Table 4.6, the Kebele (Wereda) and Community Roads in Ethiopia are estimated at 100,384 km. Out of the total number of Kebele (15,937), about 37% of the Kebeles are connected with all-weather roads (AWRs), and around 20% of all Kebele have community roads with 26,000 km (approx.) providing seasonal access (only during dry season).

Table 4.7: Kebele Accessibility (2009)

Particular		Figure
Number of Wereda		702
Number of Kebele		15,937
Kebele Connected by All-weather Roads	No.	5,937
	%	37

Source: RSDP IV, ERA (p. 98).

And remaining 43% of all Kebeles do not have any motorable access and remain impassable or unreachable by motorized transport in any season. Connection to these Kebele requires construction of about 71,523 km of all-weather access roads[21].

(iii) Wereda Road Development Plan under the RSDP IV: The Wereda Roads aim at providing connections to the Kebeles. The GoE has envisaged connecting all Kebele to nearby all-weather roads[22]. As part of the RSDP IV, the GoE is embarking on a Universal Rural Road Access Program (URRAP) that sets out to connect all Kebeles by roads of standard that provides all-weather, year around access, meets the needs of the rural communities, are affordable and maintainable[23].

A total of 71,523 km of all-weather and year round roads will be constructed by the Wereda during the RSDP IV, i.e. by 2015, which would cost ETB 26.4 billion (approx.). During the first year of RSDP IV, about 9,570 km of construction and upgrading is planned.

Table 4.8: Wereda Roads Development Plan

Year	Length (km)	Cost (ETB million)		
		Construction	Maintenance	Total Cost
2010-11	9,568	3,347.0	--	3,347.0
2011-12	14,731	5,156.0	--	5,156.0
2012-13	15,745	5,511.0	334.5	5,845.5
2013-14	15,746	5,511.1	515.2	6,026.3
2014-15	15,732	5,506.3	550.7	5,557.0
Total	**71,523***	**25,031.4** (95%)	**1,400.4** (5%)	**26,431.8** (100%)

Source: RSDP IV, ERA (p. 76), *as given in the RSDP IV document.

[21] RSDP IV, ERA, 2011 (pp. 98-99).
[22] Ibid.
[23] Ibid.

(iv) Wereda Roads - Design Standards & Ownership: As per ongoing URRAP estimates, i.e. in addition to the existing and proposed classified road network under different road agencies, i.e. ERA, RRAs and MRAs (48,793 km), a total of 71,523 km of all-weather roads will be constructed through the "Wereda Road Offices (WROs)" in five years, i.e. by 2015, which is the concluding year of RSDP IV (2010-15).

The network, which is planned under the above URRAP, would be well engineered roads following the ERA's Low Volume Roads Manual, 2011, suitable for such roads. It may be noted that the proposed Design Standards of the Wereda Roads would be comparable to the "DS6 Standards" of the ERA's Geometric Design Manual, 2002. The DS6 Standards proposed for the Wereda Roads is fully comparable with the standards set for the RRAs for low volume of traffic. The roads planned under the URRAP will be developed and administered by the Wereda Road Offices.

With the consideration of well defined "Ownership", and developed following the design standards offering all-weather accessibility suitable for low volume motorized traffic, the Wereda Roads are being brought[24] under the category of "Classified Roads"; which would be under the Wereda Road Offices (WROs), and may be considered as one of the Road Agencies in the country.

Being considered in the category of classified roads, logically, these Wereda Roads should qualify for the ORF financing for the maintenance activities. However, as per the Ethiopian Road Fund Proclamation (66/1997), the "Road Agency" means a Federal, Regional or Municipal organ responsible for the development, maintenance and administration of roads. With the existing scope of the Proclamation, the network under WROs is not eligible for the ORF Financing, unless there is a change in the Proclamation.

In view of the above, the present Study would make maintenance needs assessment under two broad scenarios: (i) for the existing and planned classified roads under the ERA, RRAs and MRAs; and (ii) with the additional roads which are likely to be added in the classified road network of the country along with the Wereda Roads. The above exercises would bring out implications of levels of road user charges under both the scenarios, which would enable the decision makers for a meaningful and logical conclusion.

4.4.1.4 Community Roads

Community roads, which are not under upgrading by the Wereda Road Offices under any programs and where the design, location, ownership, etc. not exactly known[25] are not eligible for maintenance by the ORF financing.

4.4.1.5 Roads in Existence

The roads which physically exist, owned and administered by one of the road agencies, are termed as "Roads in Existence". The roads under construction (regardless of level of progress) and if completed, but still under any defect liabilities period, would not qualify for any maintenance financing from the ORF, and hence considered as "not eligible".

4.4.1.6 Ownership

The roads under maintenance must be under as well as part of the network of one of the Road Agencies, viz. ERA, RRAs and MRAs; or Wereda Roads, if improved under the RSDP

[24] As reported during the discussion with the ERA's Planning and Program Management Directorate Director, and Rural Roads Technical Support Team Leader

[25] RSDP IV, 2011 document.

IV requiring maintenance as planned and duly accepted by the Ethiopian Road Fund Proclamation for financing.

4.4.1.7 Traffic Diversion

During any road development/upgrading works, the agency or contractor on the job, should provide and maintain the traffic diversion lanes to a good level of service to ensure pass-ability and safety of road users. The responsibility to maintain the above temporary roads will be fully borne by the agency or contractors and not the ORF.

4.4.2 Highly Desirable

4.4.2.1 Institutional Capability

In view of undertaking and administering the maintenance works of varied sizes, in-house capability of the Road Agencies is highly desirable; which should be considered as an integral part of the eligibility criteria; e.g., adequately trained technical/engineering staff for undertaking and supervising the maintenance works, skilled and semi-skilled plant/machinery operators, vehicle drivers, proper machinery – owned or hired based on the types of work involved. In view of the size of maintenance work, the Road Agencies should look for outsourcing arrangements to enhance their capacity. Institutional capability under highly desirable category for eligibility criteria assumes that there has to be minimum capacity available with the Road Agencies commensurate with the size of network and expertise required for planning, budgeting and maintenance needs assessment for procurement and contract management, etc.

4.4.2.2 Private Contractors

Availability of private contractors for carrying out the maintenance works in specific area or region with adequate capability should be considered as added capability of the Road Agencies.

4.4.2.3 Proper Reference

The roads or road segments under the maintenance must have proper reference in terms of start and end points, which could be duly verifiable physically.

4.4.2.4 Cross Drainage Structures

Cross drainage structures providing links under maintenance during periodic or routine as per the eligibility criteria should be attended on priority.

4.4.3 Desirable

4.4.3.1 Part of Network

The road(s) or road segment(s) should be part of the network under the jurisdiction of the Road Agencies, not in isolation or a part of any special project or enterprise.

4.4.3.2 Periodic Maintenance (Frequency)

Frequency of periodic maintenance depends on various factors, such as, type of surface, type of material used during construction, traffic using the road, geographical location, terrain type, climate, etc. The frequency of periodic maintenance varies from 3 to 8 years, as

follows: (i) 3-4 years in case of gravel roads; (ii) around 5 years in case of DBST; (iii) 5-7 years in case of AC; and (iv) 8-10 years in case of rigid pavement. For general understanding and planning purposes, it can be taken as 5 years. On an average, about 15-20% of the road network, depending on the pavement surface may be taken up for periodic maintenance every year in order to have judicious use of resources.

4.4.3.3 Eligibility for Rehabilitation

In view of the uninterrupted and effective transport system as well as local urgency, there could be some instances where a number of stretches on any road sections are found , Photo 3 and Photo 4 may be referred to, which show "poor and very poor roads" requiring complete rehabilitation, and hence, should not be considered for the ORF financing. In case, the limit is increasing severely damaged due to several technical reasons[26]. Therefore, while carrying out the periodic maintenance tasks, such activities warranting rehabilitation on a few stretches would be highly desirable to attend, otherwise, such road sections would not offer the desired transport services. This should be a general consideration, and in the emerging and isolated regions of the country[27] with socio-economic concerns, etc., it requires a special attention.

In order to set an "Eligibility Criteria" to address the above issue in a transparent manner, it is realized the need for setting up a criterion, which could limit the rehabilitation type activities under the periodic maintenance. Towards the same, the Maximum Threshold of the specific road sections that can be accepted for the ORF financing for rehabilitation works within the framework of periodic maintenance could be limited to 10-15% of the total length of road in km terms.

For illustration more than the specified limit, i.e. up to 15%, the Consultants propose that those road sections should be considered as case of rehabilitation and be financed by some other source(s), i.e. other than the ORF.

4.4.3.4 Training & Capacity Development

Road maintenance being one of specialized and important areas of engineering and also considering the gravity of the discipline, the maintenance engineering staff of the Road Agencies need specialized training on a regular basis in different functional areas of road maintenance including the procurement of such types of works. It is highly desirable to organize seminars, workshops, etc. on the subject as per the requirements of the maintenance staff to work efficiently and effectively, and for their capacity development. A detailed note on the training requirement has been given in chapter 11.

4.4.3.5 Outsourcing / Private Contractors

In view of the capacity constraints and improved efficiency, the maintenance works could also be outsourced to the private contractors, with adequate experience and proven ability to undertake the maintenance works efficiently. Such arrangements, which would enhance the capability of the Road Agencies, within the limit of comparative cost implications and advantage in comparison with the Road Agencies, should be eligible for the ORF financing.

[26] Sub-grade condition; other layer condition; upper layer/wearing course; poor drainage; sub-soil condition; heavy axle-load traffic; etc. cause severe damages to specific stretches on any road sections.

[27] RSDP IV identifies four emerging regions in the country, viz. Gambella, Benishangul-Gumuz, Afar and Somali.

4.4.3.6 Dry-Day Season for Maintenance Works

Ideally, the size of periodic maintenance contracts should include works, which can be completed in "one dry season". This implies, on an average, 12-15 km long sections for re-gravelling contracts[28] for small and medium local contractors. However, this should not be a constraint for the major contractors who can perform on a bigger scale.

4.4.3.7 Feedback on the Works Performed

Apart from submissions of the Monthly, Quarterly and Annual Progress Reports by the Road Agencies to the ORF, in order to evaluate the capacity of the entities for undertaking the maintenance works, the Road Agency and the ORF (within the provisions of the Ethiopian Road Fund Proclamation) should conduct technical audits by site visits of the periodic, routine and term maintenance contracts on sample basis annually to ensure whether the entity has been operating in accordance with the generally accepted quality standards and procedures.

4.4.3.8 Dayworks

The Dayworks cover tasks, which generally cannot be defined clearly in the quotation and/or rates are not detailed. These include additional unforeseen work/expenditures at the time of execution of the work, such as, emergency repairs, betterment, other routine maintenance, environmental protection, etc. For such situations, the work shall be valued in accordance with the dayworks schedule included in the contract, and the procedure provided in the conditions of contract shall apply. Generally, total value of dayworks items should not exceed 3-4% of the contract value, and with this financial range, the activities under the dayworks can be considered eligible for the ORF financing.

4.4.3.9 Unit Rates of Maintenance Works

The Unit Rates must present or within the range of true and reliable cost applicable to Region(s) where the maintenance works are planned. The revised unit rates have been worked out in terms of direct and indirect costs, which are presented in Chapter 5[29]; the eligibility criteria of the maintenance intervention costs should be accordingly guided.

4.4.3.10 Road Safety Measures

There should be "safety audits" of road maintenance works before, during and after the execution of work. Safety measures for sharp horizontal and vertical curves, road side hazard, side road access, junctions approach, bridge approach and especially for vulnerable road users should adequately be taken up.

Safety measures should also be taken during the execution of works to ensure the safety and convenience of road users and also maintenance workers at site and guide the safe and

[28] Road maintenance contracts should be tendered on a slice and package basis. The timing of the procurement process should be scheduled in such a way that the contracts are awarded not later than the end of rainy season of each year to allow contractors to complete mobilization before the beginning of the dry season. Bidding documents should be based on the Standard Bidding documents for smaller works of the World Bank.

[29] The basic unit rates derived refer to those applicable for the maintenance works in Addis Ababa, and for other places, it would be higher in view of the mobilization and demobilization costs of the resources to distant places. This would mainly affect the indirect or overhead cost. For the purpose, the basic unit costs would be increased by 15-35% of the direct costs, depending upon the distance of the sites from Addis Ababa.

efficient movement of traffic by constructing the traffic diversion lanes during the execution of major rehabilitation, upgrading and major maintenance works. This should cover proper signage, warning signs in case of sharp curves and other road safety features.

4.4.3.11 Environment Management Plan

Environmental Management Guidelines related to road maintenance works included in ERA's Standard Technical Specification should be followed with the mitigation works as required while undertaking the maintenance works, failing the compliance of the same would not qualify for the eligibility of the ORF financing.

4.4.3.12 Other Issues

There may be cases, which initially do not look eligible for maintenance funding, but may help in retarding the road deterioration process, such as, provision of non-existing roadside drainage or non-existing culvert, which could be considered under severe maintenance or preventive rehabilitation. Non-existence of such items may result in total failure of the road segment/section in the network and would cost heavily to the Road Agencies as well as to the road users in terms of impassability, isolation and heavy vehicle operating costs besides hindrance in the socio-economic development. Hence, such cases should be brought under eligibility of the ORF financing.

4.5 List of Eligible Road Maintenance Works for ORF Financing

While processing the requests for different road maintenance activities as initiated by the road agencies, it is very important and highly desirable to consider and keep in view the issues discussed in Section 4.2 presenting "Maintenance Plan and Interventions: Pre-requisites". It is important to maintain the roads in order to preserve the national asset as well as to provide all-weather accessibility to the residents living in the catchment areas of the road and also freight transporters using the road.

As of now, the rigid pavement option is not yet observed in the country, but in years to come this option may become popular, which would require maintenance after a fairly long interval with different types of maintenance interventions, e.g. maintenance of rigid pavement, thin overlay (AC).

In future, some of the items referred to in the Eligible Road Maintenance Activities may be deleted and/or further be added in view of the technological development and its adaptability – partial or full.

A comprehensive list of Eligible Road Maintenance Activities for roads of different pavement types with its components is presented in Table 4.2 (I to XI) with the following coverage:

Table No.	Road Type / Activity	Description
4.2 (I)	Gravel Roads	Routine & Periodic Maintenance
4.2 (II)	Paved Roads	Routine & Periodic Maintenance
4.2 (III)	Rigid Pavement	Routine & Periodic Maintenance
4.2 (IV)	Drainage	Routine
4.2 (V)	Road Side	Routine & Additional Activities
4.2 (VI)	Structures	Periodic Maintenance
4.2 (VII)	Dayworks	Emergency Repairs, etc.
4.2 (VIII)	Haulage	Overhaul
4.2 (IX)	Material Production	Several Activities Covered
4.2 (X)	Temporary Safety Measures	Lane Closure

4.2 (XI)	Others	Road Safety, Dust Control, etc.

Table 4.2: Eligible Maintenance Activities in Ethiopia

I. Gravel Roads

Activity	Description
Routine Maintenance	
Spot Repair Gravel Road - Selected Material	• Hand repair of potholes, ruts, soft-spots and erosion gullies in gravel roads using selected material.
Spot Repair Gravel Road - Crushed Aggregate	• Hand repair of potholes, ruts, soft-spots and erosion gullies in gravel roads using crushed aggregate material.
Blading Gravel Road (Light)	• Frequent light mechanical grading of gravel roads and their shoulders to restore a smooth riding surface.
Blading Gravel Road (Heavy)	• Mechanical blading of gravel roads and their shoulders to restore shape and provide a smooth riding surface.
Gravel Provision - Selected Material (Extra-Over)	• Supply of specified selected road wearing course gravel and the delivery of this to the road site for incorporation into heavy blading operations.
Gravel Provision - Crushed Aggregate (Extra-Over)	• Supply of crushed aggregate, road wearing course gravel and delivery of this to the road site for incorporation into heavy blading operations.
Periodic Maintenance	
Gravel Resurfacing (Selected Material)	• Complete resurfacing of an existing gravel road by the application of uniform thickness course of shaped, compacted natural gravel surfacing material
Gravel Resurfacing (Crushed Aggregate)	• Complete resurfacing of an existing gravel road by the application of uniform thickness course of shaped, compacted crushed aggregate gravel surfacing material

II. Paved Roads

Activity	Description
Routine Maintenance	
Asphalt Patching (Seal Coat)	• Localized patch sealing of existing bituminous surfaced roads
Asphalt Patching (Single Surface Treatment)	• Localized resealing of existing bituminous surfaced roads in patches using a single bituminous surface treatment.
Asphalt Patching (Double Surface Treatment)	• Localized resealing of existing bituminous surfaced roads in patches using a double bituminous surface treatment applied in two layers.
Asphalt Patching (Cold Mix)	• Localized resurfacing or regulating of existing bituminous paved roads in patches using asphalt cold-mix pre-prepared in a pug-mill mixer. Application of tack coat to bond the cold-mix to the existing surface
Asphalt Patching (Hot Mini - Mix)	• Localized surfacing or regulating of existing bituminous paved roads in patches using asphalt hot mix. Application of tack coat to bond the hot-mix to the existing surface.
Crack Sealing (Individual Cracks)	• Sealing/filling of individual, wide cracks (>3mm) using hot penetration of grade bitumen in order to seal it against the ingress of water.

Activity	Description
Pothole Reinstatement (Double Surface Treatment)	• Permanent repair of isolated potholes that have formed in the surface of an asphalt cold-mix or surface dressed pavement. Removal of failed material and application of tack or prime coat.
Pothole Reinstatement (Cold Mix)	• Permanent repair of isolated potholes that have formed in the surface of an asphalt cold-mix or surface dressed pavement. Removal of failed material and application of tack or prime coat bitumen to cut faces.
Pothole Reinstatement (Hot Mini Mix)	• Permanent repair of isolated potholes that have formed in the surface of an asphalt concrete pavement. Removal of failed material and application of tack or prime coat and bitumen to cut faces.
Pothole (Base Failure Repair)	• The task is performed in conjunction with bitumen surfacing repairs where the depth of potholes or other failure areas, extend significantly within lower unbound pavement layer.
Edge Repair*	• Repair to edge breakages
Treating Bleeding Pavements*	• Removal of excess binder, resurfacing, choice of binder, etc.
Heater Planning*	• Heat uneven bituminous surface and remove excessive material
	Periodic Maintenance
Sand Seal Coat	• Consists of the bulk application of a single hot film of bituminous binder over a full road-lane width, followed by the application of clean sand, which is bedded in by pneumatic tyred roller. Treatment is applied over an existing or newly constructed asphalt road surface.
Single Bituminous Surface Treatment (SBST)	• Consists of the single application of a hot film of bituminous binder over a full road-lane width, followed by the application and rolling of single sized crushed rock chippings. The treatment is usually applied to an existing asphalt road surface rather than to an unbound base.
Double Bituminous Surface Treatment (DBST)	• Consists of bulk application of a hot film of bituminous binder over a full road-lane width, followed by the application and rolling of single sized crushed rock chippings.
Mix in Place Overlay (Cold Mix)	• Consists of constructing one or more asphalt cold-mix pavement surfacing courses.
Asphalt Concrete Overlay	• Consists of bulk paving an existing tack-coated asphalt road or primed aggregate base layer, with hot asphaltic concrete produced at a central batch plant. A uniform compacted layer thickness of between 25-40 mm is normally specified.
Bitumen Prime Coat	• Consists of spraying a thick layer of heated low viscosity cut-back bitumen onto the surface of a prepared unbound pavement layer.
Bituminous Tack Coat	• Consists of spraying a very thin layer of bitumen to an existing bitumen surfaced road prior to the laying of a new bitumen surface layer.
Pavement Reconstruction (Aggregate Road Base)	• Consists of trimming, preparing and compacting the road bed including the removal and disposal of unsuitable materials.
Fog Sealing*	• Apply high volatile content bituminous rejuvenation product to reseal and rebind pavement surface material
Slurry Seal*	• Seal, protect and improve wearing surface using a thin (3-6 mm) bituminous and aggregate mixture and spread by a mobile machine
20 mm Premix Carpet Resurfacing*	• Providing and laying open graded 20 mm premix carpet with specified graded crushed aggregates for wearing course including loading of

Activity	Description
	aggregates with F.E. loader, heating binder and aggregates in hot mix plant 30-40 tonne, transporting the mixed material with tipper and laying with paver finisher to the required level and grade, rolling with power roller 8-10 tonne
20 mm Mix Seal Surfacing*	• Providing and Laying mix seal surfacing on a prepared surface as wearing course with specified graded crushed aggregates premixed with bituminous binder in ahot mix plant 20/30 Tonne, laying with paver finisher 30-40 tonne transporting the mixed material by tipper and rolling with power roller 8-10 tonne
25 mm Semi-dense Bituminous Carpet*	• Providing and laying 25 mm thick bituminous concrete on prepared surface with specified graded stone aggregate for wearing course including loading of aggregates with F.E. loader and hot mixing of bitumen filler with aggregates in hot mix plant transporting the mixed material with tipper to paver and laying with mechanical paver finisher to required level, grades and rolling with power roller to achieve the desired density

III. Rigid Pavement**

Activity	Description
	Routine Maintenance
Crack Filling Sealing**	• Application of liquid bituminous or sealer to fill, seal and cover stress cracks
Spot Patching with PCC**	• Removal of broken concrete, replacing with Portland cement concrete mixture
Spot Patching (Bituminous)**	• Removal of broken concrete pieces and filling and covering damaged sections with bituminous concrete paving material or special patching mix
	Periodic Maintenance
Joint Maintenance**	• Cleaning of transverse and longitudinal construction joints using hand tools and compressed air or, if necessary, saws and compressed air and the installation of prescribed filler land sealing material.
Deep Patching (PCC)**	• Sawing and removing damaged sections, restoring base material and repouring pre-mixed portland cement concrete
Joint Levelling**	• Using bituminous concrete paving material to level transverse and longitudinal construction joints and joints between slabs and bridge decks
Slab Replacement**	• Complete demolition and removal of a slab, reconstruction of base and repouring of the slab

IV. Drainage (Routine)

Activity	Description
	Routine Maintenance
Culvert Cleaning	• Cleaning of silt and other debris from pipe, box culverts and other enclosed drainage facilities including inlet and outlet headwall aprons and also proper disposal of waste spoil.
Bridge Maintenance*	• Cleaning of silt and vegetation, etc. From kerb side of deck drainage spouts, expansion joint, sides of bearings and substructure. Replacement of missing stones, washed away from bed flooring, apron, toe walls, masonry portion of bridges, etc. Welding, riveting of

Activity	Description
	joints. Repair of damaged wearing course.
Ditch Clearing (Manual)	• Returning roadside ditches and outfall drains to their originally constructed profile/shape by the removal of sediments, other slipped materials, and waste, by hand excavation.
Ditch Clearing (Machine)	• Mechanical cleaning and reshaping of unlined roadside drains and turnouts by motor grader.
Repair Erosion Damage (Selected Fill)	• Hand repair of erosion gullies and minor slips occurring in road shoulders, verges or drain sides. Involves the trimming and preparing of the cuts and reinstating with compacted selected fill in order to achieve the original feature shape.
Repair Erosion Damage (Rock Fill)	• Reinstatement of erosion, washouts and minor slips in places prone to future water inundation or seepage using hand placed rock fill
Mortared Masonry Repair	• Construction of mortared stone masonry in bridge, culverts and retaining structures to neat lines.
Scouring and Maintenance of Check-dams	• Scouring: Repair of cross drainage structures' inlets and outlets, and beds. • Check-down: Repair and provision of check-dams,
Dry Masonry Repair	• Construction of dry masonry in drainage and retaining structures to neat lines.
Gabion Structures	• Provision of new, rock filled wire gabions to provide stabilization or erosion protection to structures or land slides. May include taking down of exiting damaged gabions including the excavation and preparation of foundations when required.

V. Road Side (Routine)

Activity	Description
	Routine Maintenance
Bush Clearing	• Cutting, collecting, removing and disposing of roadside vegetation on shoulders, side slopes, inlet and outlets of culverts and ditches. Should include works like trim mowing, shrub/brush trimming and tree trimming and litter collection.
Shoulder Blading	• Mechanical blading of high or inadequately sloped shoulders adjacent to bituminous surfaced roads.
Shoulder Rehabilitation	• Reshaping, scarifying, patching and generally building up the level and shape of deformed or eroded shoulders to regain originally designed profiles.
	Additional Activities for Paved Shoulders**
Bituminous Patching**	• Application of bituminous concrete paving material to repair damage to paved shoulder
Seal Coating**	• Application liquid bituminous and aggregate over sections of shoulder to repair surface and prevent further deterioration
Bituminous Levelling**	• Placement of bituminous concrete paving material along sections of shoulder to make level with road surface and to restore proper slope

VI. Structures (Periodic)

Activity	Description
	Periodic Maintenance
Structures Maintenance*	• Work like steel structure member painting, joint/sealant replacement, epoxy concreting, bridge/kerb painting for cross drainage structure and retaining wall, crack sealing of affected portion of bridges.
Concrete Construction (Class 1)	• Reconstruction or new construction of general concrete works that normally incorporate steel reinforcement. Includes the preparation of existing damaged structures and the provision of temporary timber formworks and supports.
Concrete Construction (Class 2)	• Reconstruction or new construction of general concrete works that are normally un-reinforced.
Steel Reinforcement	• Comprises the provision, cutting, bending, fixing and securing of steel reinforcement and is intended for use with class 1 concrete. Not suitable for main load bearing elements of bridge decks or heavily loaded structures.

VII. Dayworks

Activity	Description
Emergency Repairs	• Comprises attending swiftly, clearing debris and reinstating access after events which have interrupted access at a particular location on the highway, due to slides, washouts or the clearance of other obstacles fallen on the road.
Other Routine Maintenance*	• Should incorporate works like daily inspection, hazardous removal, and flood control measures, litter removal along the road side, wayside amenities, and removal of encroachments*
Betterment	• Work items not covered within one of the standard activities, e.g. culvert pipe production / Installation.
Environmental Protection	• Includes planting and aftercare of vegetation (grasses, shrubs and trees) together with other general methods of slope and ground protection for erosion control.

VIII. Haulage

Activity	Description
Overhaul	• Authorized hauling of defined material types over a distance greater than the free-haul allowance of 5 km.

IX. Material Production

Activity	Description
Cold Mix Production (Pug-mill)	• Pug-mill production of cold bituminous premixed macadam for pothole repair and localised patching in low grade asphalt roads.
Cold Mix Production (Mix-in place)	• Production of asphaltic cold mix macadam, mixed on an existing sealed or prepared surface using a motor grader.
Hot Mini-Mix Production (Mobile Unit)	• Production of hot bituminous premixed dense wearing course macadam for pothole repair and localised patching in asphalt roads.

Activity	Description
Hot Mix Production (Central Plant Mix)	• Central plant production of hot bituminous premixed asphaltic concrete.
Crushed Aggregate (Bituminous Surfacing)	• Selecting, quarrying, crushing, screening and stock piling of single sized, hard stone aggregates for bitumen surfacing works
Crushed Aggregate (Road Base)	• Selecting, quarrying, crushing, screening and stock piling of crushed material for use as road base
Selected Material (Gravel Road Surfacing)	• Establishment and operation of a borrow site for the excavation of naturally occurring material for use in gravel resurfacing or repair works
Crushed Aggregate (Gravel Road Surfacing)	• Establishment and operation of a quarry site for the production of suitable rock fragments or gravel, which shall than be mechanically crushed, screened, blended, stockpiled and loaded on to transport
Masonry Stone Production	• Production of suitable, hard, shaped and dressed masonry stone for use in the repair or reconstruction of masonry structures.

X. Temporary Safety Measures

Activity	Description
Lane Closure	• Setting up, operating and subsequently removing traffic safety measures for the duration of maintenance works within the highway which involve the closure of one or more traffic lanes to safeguard both the road user and the work man.

XI. Others

Activity	Description
Road Safety Features*	• Production of permanent traffic signs, kilometre posts, small scale improvements of road curves and grade compensation. • Note: Alignment changes, excepts small improvement of road curves, shall not be treated in the road maintenance works.
Dust Control*	• Dust control in case of unpaved roads. includes wetting and adhesive solutions to reduce dust from gravel roads
Road Inventory and Pavement Condition Survey*	• Axle load survey, road inventory and road condition survey

*Not in ERA's Technical Specifications for Road Maintenance Works, August 2003, hence not under practice in Ethiopia presently. **Not existing at present in Ethiopia, but may come up in future, as these are globally used.

Though the list prepared on Eligible Road Maintenance Activities is fairly comprehensive, there would be several other activities in future on account of technological changes and other unforeseen reasons, which are not known as of now or so. Therefore, the Eligible Road Maintenance Activities should be accordingly revised, when such needs arise. The Road Fund Board may take such decisions appropriately.

Table 4.3: Summary of the Proposed National Road Safety Program (NRSP), Ethiopia

Major Area	Activities
Road Safety Co-ordination and Funding	• Establishment of a Road Safety Board and Regional Road Safety Committees (RSB-RRSC) • Provision of statutory powers to enable the RSB to function effectively • The production of a detailed Road Safety Plan • Provide technical and financial support to the RSB • Organize RRSCs and develop Regional Road Safety Plans • Provide an adequate level of funding to implement the Road Safety Plan Effectively
Road Safety Engineering Activities	• Develop a Road Safety Engineering Unit in ERA and the Addis Ababa Municipality • Introduce a Road Sector Development Program (RSDP) Traffic Safety Policy • Develop a Pedestrian Management Plan for Addis Ababa
Driving standards	• Revise the driving test so that emphasis moves from vehicle technical control to hazard perception and risk awareness • Train all examiners/trainers in the proposed new approach • Revise instructor training • Promote improved driver training schemes for fleet operators
Accident Data System	• Update police accident reporting system with more emphasis on location in revised form • Strengthen accident data analysis capabilities with computerization of individual accident report forms and location details • Produce hazardous location maps • Increase accident data application in engineering, enforcement and education • Improve medical reporting systems to provide more accurate road accident casualty data
Vehicle Inspection System	• Revise test to target main safety defects of vehicles • Introduce minimum standards of equipment testing requirements • Improve test buildings and sites • Introduce random roadside vehicle inspections of safety equipment
Traffic Law Enforcement	• Update Traffic police training at Police College and Regional Training Centers • Introduce targeted enforcement policy on “moving offences” • Improve communication and equipment for faster response and better use of existing resources • Introduce highway patrols • Develop victim support schemes

Major Area	Activities
	• Senior staff to undertake regional study tour to countries with police projects • Update national traffic legislation
Road Safety Publicity	• Devise community based campaigns for towns/villages on rehabilitated roads • Develop and initiate an adult pedestrian campaign to tackle the high incidence of accidents involving pedestrians. • Develop and initiate a Road Transport Workers awareness campaign • Design and conduct mass media campaign based on accident data
Medical Services	• Develop agreed minimum trauma management capabilities • Improve emergency rescue services, including communications systems. • Introduce First Aid training for Traffic Police and other road related industry workers • Increase role of medical professionals in highlighting the extent and nature of the road accident casualty problem
Insurance and Industry	• Introduce mandatory third party insurance with road safety levy included • Promote private sector participation in road safety programs • Introduce claim and compensation guidelines • Introduce fuel station policy with minimum first aid assistance requirements
Research and Accident Costing	• Develop co-ordinate research program • Investigate adult pedestrian safety problem • Investigate problem of alcohol and road user/casualties • Produce detailed accident cost estimates

Source: Draft Study Report for a Sectoral Road Safety Program in Ethiopia, Transport Research Laboratory (TRL), funded by the European Commission.

Table 4.4: Suggested Road Safety Provisions During Maintenance Works

Description	Paved Roads	Unpaved Roads
(I) Road Safety during Routine Maintenance		
(i) Washing of Road Signs	●●●●●	●●●●●
(ii) Installation/Replacement of Stop/Give Way/Warning Signs/Hazard Markers	●●●●●	●●●●●
(iii) Trimming of Tree Branches & Vegetation that obscure the Signs	●●●●●	●●●●●
(iv) Installation / Repair of Speed Breakers	●●●●●	NA
(v) Installation/Restoration of Crash Barrier on Valley Side and Approaches to Bridges	●●●●○	●●●●○
(vi) Improving Skid Resistance	●●●○○	NA
(vii) Application/Re-application Pavement Markings	●●●●●	NA
(viii) Testing of Retro- Reflectivity of Signs	●●●○○	●●●○○
(II) Road Safety during Periodic Maintenance		
Provisions for: • Road sections having curves with radii up to 90 m & 85th percentile speed <50 kmph • Road sections having curves with radii up to 160 m & 85th percentile speed ranges from 50 to 65 kmph • Road sections having curves with radii up to 250 m & 85th percentile speed ranges from 65 to 80 kmph • Road sections having curves with radii up to 400m & 85th percentile speed >80kmph		
(i) Warning Signs	●●●●●	●●●●●
(ii) Chevron Signs	●●●●●	●●●○○
(iii) Delineator Posts	●●●●○	●●●●○
(iv) Speed Limit	●●●●○	●●●○○
(v) W-Beam Barrier	●●●○○	●●●○○
(vi) Centre Line Markings	●●●●●	NA
(vii) Edge Line Markings	●●●●○	NA
(III) Parapet of CD Structures & Roadside Hazard within 2.5 m from Edge Line		
(i) Object Hazard Markers	●●●●●	●●●●●
(IV) Side Road Accessing the Main Road & Approaches to Villages/Settlements		
(i) Speed Breakers	●●●●●	NA
(ii) Hazard Ahead Sign	●●●●○	●●●○○

Description	Paved Roads	Unpaved Roads
(iii) Pavement Markings	●●●●○	NA
(V) Junctions		
(i) Advance Direction Boards	●●●●●	●●●●○
(ii) Junction Control Sign (Give way/Stop)	●●●●●	●●●●●
(iii) Junction Control Markings (Give way/Stop)	●●●●●	NA
(iv) Speed Breaker on Side Road Approaches	●●●●○	NA
(v) Traffic Signals	●●●○○	NA
(vi) Street Lightings	●●●○○	NA
(VI) Embankment/Valley Protection & Bridge Approaches		
(i) W-Beam Crash Barrier	●●●●○	●●●●○
(VII) Vulnerable Road Users		
(i) Pedestrian Crossing Markings	●●●●●	NA
(ii) Footpath	●●●●○	NA
(iii) Pedestrian Railing	●●●●○	NA
(iv) School Warning Sign	●●●●●	●●●●●
(VIII) Road Safety during Emergency & Special Maintenance		
(i) Installation of Warning Signs	●●●●●	●●●●●
(ii) Installation of Traffic Cones and Delineators	●●●●○	●●●●○
(iii) Temporary Speed Limit Signs	●●●●●	●●●●●
(iv) Temporary Barricades	●●●○○	●●●○○
(v) Temporary Road Humps	●●●○○	NA

Legend:

●●●●● Essential

●●●●○ Highly Desirable

●●●○○ Desirable

Roads in Poor and Very Poor Condition

Photo 1: Recently constructed road with oversized material; the surfacing material is not properly graded so it is difficult to drive more than 20km/hr on the road, The Road is Agaro-GeraAgri Development, found in Jimma district.

Photo 2: Alaba-Denboya-Hossina Regional Gravel Road of very poor side drainage so water over floods over the pavement and creates longitudinal gullies. This happens in most of the road sections and the road is deformed.

Photo 3: Tule-Hantate-Shigasha (SRA Road). Part of this road after km 30+000 is very poor, totally deformed and not passable. The road lost all of its gravel, has no camber, no side and cross drainage structures.

Photo 4: Gebelmeno-Kabura-Segen Road. It traversed on mountainous and escarpment terrain, the gradient is very steep. The surfacing material is very poor so driving is difficult and unsafe.

Photo 5: Jimma-Agaro Road. This section of the road (km 0+000 to 10+000) got maiantenace three or four years back. The maintenance is done using cold mix aspahlt concrete by outsourcing to local contractor, but it created rutting and deformation in most of its section.

Photo 6: This road Nekemte-Gutin, found in Nekmte District. The surfacing material is very fine of high Plasticity Index (PI). Since the road has very high traffic of trucks and truck-trailers, the back section fails while the forward section is under maintenance.

Roads in Fair Condition

Photo 7: This Road is **Nekemte-Dedessa** River Bridge, found in Nekmte District. In some sections the road lost its gravel and camber. Driving is not that much comfortable. Part of the road got maintenance and was in good condition during survey.

Photo 8: Konso-Yabello Road. This road is 100 km long and traversed over mountainous and rolling terrain. In some sections, the road lost its gravel and partly oversized material. Driving more than 30 km/hr become difficult.

Photo 9: This is **Kingi-Kamashi Road** in Benshagul Gumuz Region. Ravelling is dominant problem. The road traverses rolling and mountains terrain with Kolla (nearly desert) agro ecology. Driving is difficult because of less friction.

Photo 10: This is **Kose-Atat Junction road** under Alemgena District. Oversized material is a typical problem and makes the driving uncomfortable. it is more than 46 km of length and similar in pavement characteristics.

Photo 11: This is **Limu Jun-Kosa road** under Jimma District. Oversized material and lack of binding material is a typical problem. Driving is not that comfortable and vehicles prefer to use the road edge so that rutting frequently occurred.

Photo 12: This road is **Asityta Jun-Asiyta.** It is recently constructed road but ravelling created in many sections. The road is deformed and not comfortable for driving.

Roads in Good and Very Good Condition

Photo 13: This Road is Saja-Asendabo. Recently constructed Asphalt Concrete in very good condition. No problem observed on the pavement and drainage.

Photo 14: This is Arbaminch-Wezeka road. It is double surface treatment (DBST). Ravelling started in some of the sections. Rainfall is high and sections of poor binding asphalt exposed for ravelling. DBST is not the right type of pavement for such climate or agro ecology.

Photo 15: This is Doyogena-Areka-Sodo Road under Sodo District. It is DBST with some potholes in some sections.

Photo 16: This is Konso-Delbena River road of nearly 28 km. This part is recently completed and it is in very good condition.

Photo 17: *Gambella-Abobo Road, Jimma District.* The 43 km Gambella - Abobo gravel road segment is linking the regional capital Gambella to the agricultural investment potential of Abobo Woreda. The road traverses along a flat terrain with few drainage structures and some of them are damaged due to over flooding.

Photo 18: *The Road Meiso-Arbreket in Diredawa District,* is an asphalt concrete road in *very good condition. It traversed in mountainous terrain with steep gradient.*

Structural Failures

Photo 19: The Bonga–Sirimezhenger Road (32 km), recently completed gravel rural road administrated by Gambellla RRA. The road traverses over rolling terrain. This is to show Damage of Triple Pipe.

Photo 20: Chano-Chuncha Road: This is Southern Rural Road connecting the main road of Sodo Arbaminch to Chuncha (The Dorze Ethinck group). Even though the road is in fair condition, there are some old structures and few of them in failed condition. Unless getting maintenance sooner the road will no more serviceable.

Photo 21: Alaba-Denboya-Hossina Road: This is a typical failure in the side drain. The water overfloods on the pavement and creates longitudinal gullies.

Photo 22: This is a typical improper design of side drain. Nekemete-Dedessa River Bridge Road connecting Jima and Nekemete District.

4.6 Prioritization of Maintenance Works – Within Road Agencies

In developing countries, resources are generally scarce, so expenditure in any field needs to be carefully planned and prioritized. In the same line, it has been observed that it is usually not possible for the ORF to allocate the funds as per the requests sent by the road agencies, and the Maintenance Engineers of the road agencies need to prioritize the maintenance works out of the proposed works within their jurisdiction.

The underlying theme in the prioritization methodology is to protect road infrastructure as a national asset through adopting proper maintenance strategy, which would also result in optimizing the allocated budget on maintenance expenditure. In order to reduce the subjectivity, the Consultants propose a selection procedure based on the logic and rationale while developing the priority criteria; proper identification of the influencing parameters, ordinal ranking based on the cardinal numbers or tangible scores developed on the assigning relative weight designated to the influencing parameters.

4.6.1 Rationale & Priority Criteria

For developing the selection process and priority criteria, the Study has considered the most influencing factors for the road deterioration or requiring higher maintenance consideration and interventions. The priority criteria have been developed with the concept of causal relation of the road deterioration requiring higher attention of the maintenance support.

4.6.2 Influencing Factors

4.6.2.1 Traffic Level

There are several external factors influencing the road surface, or deteriorating the pavement surface, causing potholes, initiating rutting process, cracking, raveling, etc. requiring routine and periodic maintenance support to maintain a desired service level, and riding quality. Level of traffic, particularly motorized and heavy axle-load vehicles, is one of the important factors affecting the road surface quality, which requires suitable maintenance strategy. With the above consideration, while assigning the priority for the road maintenance, “traffic level” (AADT) should be considered as one of the most important parameters, and, thus, it has been incorporated in the ranking procedure discussed later.

4.6.2.2 Road Condition

The road surface condition influences the efficiency and effectiveness of the road transport system, which, inter alia, considerably affects different components of the vehicle operating cost, resulting in higher road user charges and transport cost. Worse road condition would lead to higher road user cost and reduce the reliability of the road network with retrogressive consequences. It is interesting to note that higher traffic level of motorized vehicles with higher axle-level, further deteriorates road condition. In light of the above logic, the “road condition” represented in terms of very good, good, fair, poor and very poor has been considered as one of the major influencing parameters for the road maintenance activities. The road condition would determine the level and type of maintenance interventions required.

4.6.2.3 Connectivity

For developing the priority criteria, any road section providing “connectivity” in a specific road transport corridor or in a network with specific importance should be given a high score. The transport corridors should be divided into three classes, viz. high, medium and low on the

basis of the importance of agriculture, industrial activities, mining, international trade or transit with neighboring countries and tourism industry.

Five criteria are applied for preliminary selection of new roads[30]. These criteria are: roads leading to economic development potential areas; roads leading to surplus food crop and cash crop growing areas; missing links between main roads or shortcuts; new access to large population centers and roads in emerging regions. A brief note based on RSDP IV (2011) illustrating the guidelines for the prioritization with their respective weights are given as follows:

- **Economic Development Potential:** Ethiopia is endowed with natural resources in different parts of the country, mainly irrigable potential agricultural land and minerals, which are not yet exploited. Priority is given to the construction of new roads providing access to areas with unexploited natural resources with 20% weight;
- **Surplus Food Crops and Cash Crops Growing Areas:** Some areas grow and supply surplus food crops to urban and rural markets and food deficit areas. Additionally, there are areas producing exportable crops. Not all of these surplus food crops and cash crops growing areas are connected by roads. To improve supply of food crops to urban and rural markets and increase the volume of exportable crops, construction of new roads linking to these areas is vital. Priority is given to the construction of new roads creating access to these areas with 20%;
- **Missing Links:** Several towns in the country are linked to each other by circuitous roads and connectivity of the road network is not optimized. Consequently transportation cost and travel times are high between towns. Costs and time of travelling can be reduced significantly by constructing link or short access roads between some towns in the country and priority is given to the construction of link roads with 20% weight;
- **New Access to Population Centers:** There are large rural communities in different parts of the country which are totally isolated from the rest of the country because of the absence of roads. These communities need to become socially and economically integrated with the rest of the country. By the virtue of this, priority is given to the construction of new roads providing access to large isolated rural communities in the country with 30% weight; and
- **Emerging Regions/Isolated Areas:** There are four emerging regions in the country Gambella, Benishangul-Gumuz, Afar and Somali. Due to neglect in the past, distribution of main roads in these regions and some pastoral areas of the country is minimal. To bring about balanced development amongst the regions in the country, roads provision should be equitable. Priority is given to construction of new roads in these emerging regions with 10% weight.

4.6.2.4 Road Safety Concerns

Road safety is one of the mandates of the Road Fund Proclamation, so it is important to give due weight to the road safety initiatives in the maintenance works. There are certain maintenance interventions – routine and periodic, which are, inter alia, very important to address and cover the road safety concerns as well, as briefly discussed in the following paragraphs:

- **Pothole Repairs at Critical Locations:** For example, in wheel paths on the curves, particularly sharp curves, there are high chances of overturn, slippages, vehicle

[30] The guidelines have been given for the project proposed under RSDP IV, which are equally valid for the maintenance works, particularly under “Connectivity” sub-head with their relative weights.

damages, general inconvenience, etc. if suitable and timely measures of pothole repairs are not carried out:

- **Sealing of Wide Cracks:** Wide cracks generally disturb the traffic movement in general, adversely affect the vehicles (breakdown, etc.), damaging quality of freight traffic (particularly perishables), etc., but their role in causing frequent road accidents – minor or serious is important;
- **Removal of Debris and Stabilization of Soil Slopes:** It does not require any special emphasis that presence of any debris on road carriageway or sides, and not properly stabilized the soil on the slopes, would cause frequent accidents and slippages of vehicles to the sides or ditches;
- **Up-keeping of Road Signs and Markings:** Up-keeping of road signs and markings and traffic calming measures is very much required wherever needed and should be paid adequate attention of road authorities; and
- **Accident Prone Locations:** On some of the locations where there is a history of repeated accidents, safety measures should be taken up on priority.

4.6.2.5 Other Factors

There are some other factors, which should be considered while prioritization exercise, e.g. the roads, which have fair level of traffic and have not brought under maintenance for last three to four years because of some reasons, should be given the priority in view of asset preservation. Similarly, the activities which are urgently required should be given the priority to keep the road operational, such as:

- Emergency repairs to the roads blocked or impassable; and
- Maintaining accessibility for the strategic locations.

4.6.3 Ranking Procedures

Based on the parameters described in Section 4.4.2 with the arguments for assigning relative weights to the influencing parameters to the prioritization process, the Study has proposed a two-tier system: (i) relative weight of the broad category (Table 4.5); and (ii) within the broad category, relative score of the specific parameter (Table 4.6).

Table 4.5: Weights Used for Ranking

Particulars	Indicator	Approach		Weight (%)
		Level	Priority	
Traffic Level	AADT (Motorized)	High	High	40
Road Condition	V. Good/Good/Fair/Poor/V. Poor	V. Good	High	25
Road Transport Corridor	Connectivity Importance	High	High	15
Road Safety Concerns	Enhancing the Safety of the Users	-	High	10
Other Factors	Not brought under maintenance for last 3-4 years, etc.	-	High	5
Total				**100**

Table 4.6: Proposed Scores for the Prioritization

Traffic		Road Condition		Road Corridor	
AADT	Score	Condition	Score	Connectivity Importance	Scores
<300	10	V. Good	25	Low	10
300 to 1,000	20	Good	20	Medium	15
1,000 to 5,000	30	Fair	15	High	20
5,000 to 10,000	35	Poor	10		
>10,000	40	V. Poor	5		
Road Safety Concerns & Other Factors*			15		

* Population size served in the area may also be considered.

After assigning the scores for traffic, road condition, connectivity for respective road section, road safety and other factors, the total scores for each road section should be obtained. The road section securing highest score should be selected showing as high priority road section for undertaking maintenance activities.

While developing the methodology for undertaking the ranking exercise, there have been strong arguments supporting that the road sections relatively in bad conditions with the high level of traffic should be given higher priority for the maintenance activities following the preservation of the asset approach, as the probability for further worsening of those bad roads with high traffic is relatively very high.

It is mentioned here that preserving the investment on the road network through timely maintenance is more cost effective than waiting for a road to fail requiring capital expenditure, i.e. pavement rehabilitation and reconstruction (Chapter 14). It is, therefore, recommended to opt for the proper and timely maintenance activities.

4.6.4 Limitations

There are a few limitations in the present prioritization exercise of maintenance works because of scarce resources, within the road agencies, which are as follows:

- ERA normally carries out “traffic counts” three times in a year on most of the federal roads under its jurisdiction, but the same practice is not there on the roads under other road agencies. However, there are Regions, viz. Tigray and Amhara, which carry traffic counts every year, though it is not as organized as ERA, and other Regions did not practice the traffic counts in the past;
- Road agencies in Ethiopia normally evaluate the road condition by visual assessment and term the road as very good, good, fair, poor and very poor, etc. Such estimates of road condition in absence of some tangible parameters may not illustrate the true picture of road condition;
- Road Safety Concerns are usually based on vulnerability of road users, which should be taken up on priority. There should not be any subjectivity in decision process; and
- There are generally capacity constraints in the Regions in performing condition survey, traffic count, planning for maintenance works, etc.

5. ROAD MAINTENANCE UNIT COST IN ETHIOPIA

5.0 ROAD MAINTENANCE UNIT COSTS IN ETHIOPIA

5.1 Introduction

This chapter derives the real unit costs for maintenance activities on the road network of Ethiopia. The unit costs, in conformity with the eligible maintenance activities, are developed after reviewing existing methodology, discussions with the officials of the road agencies, viz. ERA, RRAs and MRAs, and also the private Contracting Agencies. The road agencies and other entities, such as, Road Safety Coordination Office involved with road maintenance and undertaking related activities with the framework of the Road Fund Proclamation, approach the ORF for getting funds for their proposed projects.

It has been noticed that the unit costs of maintenance activities vary significantly from one agency to another. This chapter presents a comprehensive list of the unit costs by components of the maintenance activities in reference to Ethiopia, and also compared with other countries of similar nature. This exercise compliments in identifying the types of roads and activities eligible to receive fund from the ORF, and also establishing the real unit cost of maintenance activities, which would be useful for the ORF for making approvals effectively, and for the road agencies in preparing maintenance plans and budget.

5.1.1 Application of the Unit Costs

The applications of the estimation of the maintenance unit costs by its components are as follows:

- This could be used by the ORF while approving any road maintenance financing requests from road agencies on account of acceptable maintenance unit costs;
- The unit costs can be used to evaluate the efficiency of the maintenance proposals on account of economy, and proper budgeting;
- For establishing the total maintenance costs at different levels, as per the requirements for planning and decisions making; and
- The unit costs would be also helpful in evaluating the performance of different road agencies in efficient management, proper utilization of resources, evaluation of the expenditures made on maintenance on different activities, future planning and budgeting for maintenance works, etc.

5.2 Estimation of Road Maintenance Costs

The maintenance of roadways involves mainly two types of maintenance, i.e. Routine Maintenance and Periodic Maintenance. Maintenance cost for construction roadways tend to increase with both age and use of the facility. The routine maintenance costs increase as the pavement ages, but decline after each resurfacing (Periodic Maintenance). As the pavement continues to age, resurfacing (Periodic Maintenance) becomes more frequent until the roadway is completely reconstructed.

In order to estimate the total cost implications of road maintenance works, it is important to capture the relevant components of direct and indirect costs, and review the components that need to be covered for the Road Fund financing. For the purpose, the Study has reviewed and analyzed the direct and indirect cost components that should be covered by the Road

Fund. A brief note on the concept and coverage followed for undertaking the exercise is presented in the following sections.

5.2.1 Direct Cost

Direct costs/expenses, also known as prime-cost are those for activities or services that benefit specific projects, e.g., wages/salaries for labor/staff, materials and other expenses, viz. on special tools, consumables, etc. purchased for the activity or cost center specifically, required for particular project and activities, as these activities are easily traced to projects, and their costs are usually charged to projects on an item-by-item basis.

Hence, direct costs or prime-cost are summation of: (i) direct labor/staff; (ii) direct other expenses on tools, machinery, etc.; and (iii) direct materials. In brief, the direct costs are those costs, which could be easily worked out and established for a particular task or item of work, such as, labor, material, masonry and other consumables.

5.2.1.1 Manpower

(i) **Unskilled/ Semi-skilled Labor:** labor for maintenance work is usually arranged from site location based on requirement of the work. This is highly unorganized sector. Normally, during the crop season, daily wages increase due to scarcity of labor; and

(ii) **Equipment Operator:** operators may be employee of any government agencies involved in maintenance activities or can join the work with machinery hired on rent.

5.2.1.2 Machinery

Different agencies involved in maintenance activities are not having sufficient machinery support. This is a common practice among different agencies to hire the required machines on rental basis, as owning those machineries requires huge capital investment and may not be a viable or workable solution, particularly for the works of maintenance nature. Addis Ababa is the principal source in Ethiopia to hire machineries. Mobilization and demobilization of machineries to working sites is an additional cost to work, besides layoff or non-functional waiting time.

5.2.1.3 Material

Naturally available items, such as, gravel, aggregate, sand and stone, etc. are prevalently available near working sites. For procurement of other materials like bitumen, steel and cement Addis Ababa is the main source.

5.2.2 Indirect Cost

Indirect costs/expenses are not directly accountable to a cost object, or not capable of being attributable directly to a particular product or service or cost center, any maintenance activities in present case. Indirect costs are those costs, which cannot be identified with a specific maintenance activity, but they support the project as a whole, e.g. cost of the project site management staff and the site office.

Indirect costs are usually called site or project overheads. They are also called general condition costs, since site management usually performs the task required by the General Conditions of Contract. Some indirect costs are one-time costs, e.g. setting up the site/camp, and other indirect costs are administrative/head office expenditures.

While carrying out the costing exercise, it is important to bring out clearly the costs attributable and apportionment of the overheads for specific costing purpose; which requires some rational means and logical steps.

In general, there are three types of "Overhead Expenses: Direct, Indirect and Fixed". These expenses and accounting for them need to be done by the road agencies or private contractor engaged in the maintenance works.

5.2.2.1 Direct Overhead Expenses

Maintenance job sites will have several direct overhead expenses, which include temporary offices, equipment rental, administrative salaries and utilities, such as, water, power and transport for the job sites. These overhead expenses are necessary expenditures to carry out the maintenance works at the job sites to complete the jobs. The costs incurred on the above are added to the unit cost, and should be accordingly budgeted during the fund allocation process.

5.2.2.2 Indirect Overhead Expenses

Indirect overhead expenses include items, such as, utilities, insurance, employment taxes and retirement plans. The agency/company carrying out the maintenance tasks must incur costs on these items on a regular basis regardless the agency/company is actually undertaking the tasks. When calculating the cost of activity, the estimate must include sufficient money to cover these expenses for the company to be able to execute the works. Rent, communications, and equipment used for more than one job also fall under the heading of indirect overhead expenses.

5.2.2.3 Fixed Business Overhead Expenses

Fixed business overhead expenses included payroll taxes, unemployment insurance, bid bonds, and licensing. The amount may change due to fluctuations in the number of bids and the amount of labor during a project, but must be accounted for when preparing bids and estimates.

5.2.2.4 Indirect / Overhead Costs

Overhead charges necessarily include the elements, as presented in Table 5.1. The variations in percentage terms illustrating as "minimum" and "maximum" are also given in Table 5.1.

Table 5.1: Range of Overhead Charges (%)

Description	Mini-mum (%)	Maxi-mum (%)	Average (%)
Site accommodation, setting up plant, water supply, electricity, Office furniture, equipment, communication, and general arrangement.	2.00	5.00	3.50
Expenditure on site supervision and documentation	0.50	1.00	0.75
Mobilization/ demobilization of resources	4.00	8.00	6.00
Labor camp and transportation to work sites	0.50	2.00	1.25
Light vehicles for site supervision	0.20	0.50	0.35
Laboratory equipment and quality control including field and laboratory testing	1.00	2.50	1.75
Minor tool and plants and survey instruments	1.00	2.50	1.75
Watch and ward	0.20	0.50	0.35
Traffic management during construction	0.20	0.60	0.40
Expenditure on safeguarding environment	0.20	0.50	0.35
Work insurance and compensation	0.20	0.40	0.30
Costs of Meeting Government regulations	0.50	3.00	1.75
Administrative salaries and expenses	4.50	8.50	6.50
Total	**15.00**	**35.00**	**25.00**

5.2.2.5 Overhead Costing in Ethiopia

Accounting for overhead, i.e. indirect cost has been always a complicated task, particularly for an entity engaged in undertaking multiple tasks. The apprehension of estimating overheads costs is also valid for the road agencies in the country, which are undertaking a variety of tasks relating to road development, planning, construction, etc. other than road maintenance works. In multi-task situations as administered and carried out by the road agencies, the appropriation of overhead expenditure on the maintenance only is a debatable issue; as the road agencies do not maintain such account on overhead, which could reflect the indirect costs on the works done under the maintenance heads.

The road agencies in the country, while preparing the estimates of maintenance budget, have been putting cap on the direct costs on man, machine and material to reflect the overhead cost implications, which is usually based on the historical practices and also some minor adjustments from time to time.

In brief, the overhead costing in practice is not necessarily derived on the basis of actual cost incurred to perform that specific type of activity, rather generally based on a lump sum provision to take care of the administrative and headquarters expenditures.

This practice has resulted in a wide range of variation in overhead cost, which could be observed from 20% to 40%[1] or even more on the direct cost components. The level of variation in overhead as stated above creates severe problems to the ORF in making real maintenance costs as well as approving requests received from the road agencies for

[1]ORF, Technical Audit and Financial Services (2005), refers to about the prevailing practices on overhead accounting for maintenance works as 37.5%

maintenance works. As far as private contractors are concerned, they also follow the lump sum overhead practices, i.e. 20% on the maintenance work projects, and 10% on the road construction projects[2]. The private contractors are also involved in multi-tasks in road construction and maintenance activities, and they too observe difficulties in apportionment of the indirect costs on both or more activities.

With the above investigations and analysis carried out by the Consultants coupled with the international practices, including in African countries, the Study proposes to consider the overhead as 15% as lower bound and 35% as upper bound. The percentage of the overheads on different components of the maintenance works would vary mainly from the source and place of procurement and location of sites for mobilization and demobilization of those resources.

5.2.3 Overhaul

This activity consists of authorized hauling of defined material types over a distance greater than the 'free-haul' allowance of 5 km (single one way journey). The items to which overhaul allowance may apply to:

- Crushed or selected gravel resurfacing material;
- Crushed aggregates and sand for bitumen road works;
- Masonry stone;
- Bitumen, cement and steel; and
- Disposal of spoil materials ordered to be removed from the road or drainage features by another activity.

For all other materials / works, the haulage is deemed to be included in the activity unit price. The haul distance shall be measured along the shortest reasonable route as determined by the employer's representative.

When the site of work is away from Addis Ababa, which is principal source of main materials (bitumen, cement and steel) and masonry, the rate will proportionally increase with the increase in distance due to haulage costs. The increase in rates can be attributed to the distance implications.

5.3 Approach & Methodology for Setting the Unit Rates

For reviewing and setting the unit rates of the road maintenance activities, such as, routine, periodic and emergency maintenance and propose the actual for the above activities of ERA, RRAs, MRAs based on eligible expenditures, different maintenance activities relating to the paved and gravel roads have been identified based on road type and related maintenance components. For each maintenance activity, component-wise unit inputs are worked out incorporating all the possible and probable maintenance activities.

For the purpose, the Consultants collected the prevailing practices with the road agencies which principally based on the ERA's "Technical Specification for Road Maintenance Works", (August 2003), and additional works identified and proposed following the practices in different developing countries, including Tanzania and India.

[2] Higher percentage on the overhead costing in case of maintenance in comparison with road construction works, is argued mainly on the basis of scale of operation, i.e. higher in case of construction, frequent mobilization and demobilization of resources in case of maintenance work, particularly equipment and machines which may be unproductive waiting times, etc. would cost more.

5.3.1 Review of Existing Unit Rates

Existing unit rates being adopted by the road agencies were approved by a competent authority in Year 2006-07. And different elements of the existing unit rates are based on the ERA's "Construction Management System Manual" (formerly known as Ethiopian Transport Construction Authority) and site experience of various road agencies and private contractors involved in maintenance activities

5.3.2 Categorization of Maintenance Activities

The description of items, except road markings, is given briefly with relevance to the Technical Specification for Road Maintenance Works (2003), which may be referred to for detailed descriptions, provision and interpretation. Road marking is added as an additional maintenance activity, which may be referred to the Division 9500 of "Standard Technical Specification of 2002."

The services have been divided and listed into different types of pavement and condition:

I. **Gravel Road:** (i) Routine Maintenance; and (ii) Periodic Maintenance:

II. **Paved Road:** (i) Routine Maintenance; and (ii) Periodic Maintenance: and

III. **Others:** (i) Material Production; (ii) Drainage; (iii) Roadside; (iv) Structure; and (v) Haulage

5.4 Data Base

5.4.1 Primary Data Collection

In order to develop the road maintenance cost, the Study collected data on prevailing input rates, and also discussed the methods being followed by different road agencies, with special emphasis on the estimation of overhead cost. For this purpose the Consultants visited the following agencies:

- Oromia Rural Road Authority (ORRA);
- Oromia Road Construction Enterprises (ORCE);
- Addis Ababa City Road Authority (AACRA);
- Alemgena District Engineering Division (DED);
- Southern Rural Road Authority; and
- Some of the leading Contractors in Addis Ababa.

5.4.2 Secondary Data Collection

Apart from the agencies as mentioned in Section 5.4.1, the Consultants also collected input rates from the following sources:

- National Oil Ethiopia PLC (NOC);
- Ries Engineering Share company;
- Central Statistics Agency, Ethiopia;
- DiribaDefershaAmosha General Contractor;
- Mugher Cement Enterprise; and
- Suppliers/Agents in Local Market.

5.4.3 Data Collection for International Experience

The details of rates were collected and worked out for the maintenance items based on the Consultants' previous experience of similar activities carried out in Tanzania, i.e. representing an African developing country and India as other developing countries.

5.5 Derivation of Unit Rates in Ethiopia – On Force Account

The unit rates were derived as per the format of ERA. The labor, material and machinery rates were taken from the prevalent market rates, discussion with the road agencies and private contractors.

5.5.1 Summary of Unit Rates of Maintenance Components

The detailed working of unit rates for different item of works is given in the report "Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (June 2011); and for ready reference a summary of the derived unit rates of maintenance activities is given in Table 5.2 on pages 5.13 to 5.15.

The prevailing unit rates for undertaking various road maintenance activities fixed by the ORF during 2006-07, are outdated, and don't reflect the real maintenance cost; which, in turn, creating problems for ORF while approving the maintenance project requests as well as road agencies while preparing the budget for maintenance activities as well as implementing the maintenance projects. It was, therefore, highly desirable to establish duly updated real maintenance cost. For the purpose, the Study reviewed the existing unit rates[3] and also updated the same.

While updating the unit maintenance rates, it is noticed that the unit rates derived as in November 2010 are higher in the range of 40% to 80% than the then prevailing rates fixed during 2006-07, which registers that there have been yearly increase in prices in the range of 10-20% since 2006-07. During the last five years, there have been considerable changes in the cost of imported as well as domestic products, and also labor-force which directly affect the current unit rates of the maintenance works.

In order to appreciate and analyze the considerable changes in the unit rates, the Consultants have made comparisons of various input components' rates recorded in 2007 and 2011. The input unit rates for both the years are compared in Table 5.3.

Table 5.3 Comparison of Costs/Prices and Wages in 2007 & 2011

Item		Unit	2007 rates (ETB)	2011 rates (ETB)	Increase (2007-2011)
Cement		qt	127	520	309%
Fuel		ltr	7.56	18	138%
Steel		kg	11.2	24	114%
Asphalt		Barrel	1,644-2,216	3,000-5,000	104%
Labour Force	Skilled	Monthly (ETB)	575-1,664	1,197-3,612	112%
	Unskilled	Monthly (ETB)	333-575	649-1,197	101%
Foreign Exchange Rate		ETB/US$	8.79	17.1	95%

Source: The Consultants' Efforts.

The Consultants, being considerate of the changes in the unit rates as illustrated in Table 5.3, have made preliminary and necessary revisions of unit rates based on "ERA's Activity

[3] The updated unit rates presented in this report refer to as in November, 2010.

Daily Cost Calculation of 2007" methodology, so that the changes in cost or wages on major input resources are incorporated.

As ERA receives a significant share (i.e. 65%) of the Road Fund's allocation, addressing major changes of ERA's cost components based on similar computational approach will take care of changes to a great extent in other road agencies as well.

5.5.2 Comparison of Cost

5.5.2.1 Road Agencies

The works can be carried out either by contractor or by force account. Maintenance work is being carried out by different road agencies (ERA, RRAs and MRAs) in their respective jurisdiction predominately by own force.

For the purpose of maintenance operation, the Ethiopian Roads Authority, the regulatory agencies have floated their own operation wing with the name of District Road Maintenance Contractors (DRMC) / Enterprise; and Oromiya Rural Roads Authorities also separated their functional wing into (i) Road Construction Enterprise; and (ii) Roads and Transport Authorities, and Tigray and SNNP Regions are also in process of that. However, urban roads are developed and maintained by respective Municipal Roads Authorities.

5.5.2.2 The Private Contractors

In isolated instances, routine term maintenance work is awarded to the private contracting agencies, in such case the unit rates are quoted by the contractors, which may differ from the approved unit rates applicable for the own force arrangement. To explore outsourcing option of maintenance works, the Consultants had discussions with the private contractors, who were involved with maintenance works in the country. The main findings of the above discussions are:

- Since the amount and quantities of maintenance work items are relatively less as compared to the construction activities, this is not feasible for the contractors to erect plant and deploy machineries dedicated to the maintenance activities;
- During the maintenance activities, part of the existing carriageway is kept open for traffic movement; consequently, each activity is conducted twice for the entire stretch; due to this reason the machineries and other resources mobilized are constrained to stand idle, sometimes for long duration; and
- Due to dependence on imports, the economy of Ethiopia is accordingly sensitive towards the international factors, particularly the price fluctuations and changes in foreign exchange rates. This may cause unusual fluctuations in the costs of the maintenance components. Price adjustment clause in the Terms and Conditions of Contracts w.r.t. actual escalation sometimes doesn't provide sufficient protection.

Apart from the above-mentioned issues, private contractors have to raise capital from the market for which they need to pay financial charges, i.e. an additional cost.

Hence, in case of outsourcing the maintenance works to the private contractors, the overhead costs may be higher than the road agencies, but it should be expected to be offset by the efficiency factor of the private sector with judicious utilization of the resources and proper time management to complete the works.

5.5.3 Effect of Lead on Haulage Cost

It is observed that the cartage of material is essential part of the road construction activity and involves transportation by different type of modes i.e. Road, Rail, Air and Sea. The per-km cost of transportation involves by road is generally required for our costing purpose. The variation due to the effect of increase in length of the project locations can be based on the following existing model based on schedule of rates of different states of India. It can be seen that cartage reduces telescopically with increase in length as given Table 5.4.

Table 5.4: Carriage of Materials

Materials	Unit	Rate (in US$)							
		1 km	2 km	3 km	4 km	5 km	Beyond 5 km up to 10 km per km	Beyond 10 km up to 20 km per km	Beyond 20 km per km
Sand, Stone aggregate, cement, stone blocks, CC pipes and other heavy materials, steel bitumen etc.	m^3	X^*	$X^* + X^* \times 0.14$	$X^* + X^* \times 0.28$	$X^* + X^* \times 0.42$	$X^* + X^* \times 0.55$	$X^* \times 0.12$	$X^* \times 0.1$	$X^* \times 0.08$
X=USD 0.90		0.90	0.99	1.152	1.278	1.395	0.108	0.09	0.072

Value of x will vary for sand, stone aggregate, cement, steel and bitumen, etc.

X^* is the cost of carriage of material for first 1 km in India at current price of High Speed Diesel of US$ 0.90/liter.

5.5.4 Costing for Periodic & Routine Maintenance (per km)

The maintenance items have been identified and rates worked out for different activities involved in periodic and routine maintenance. It is mentioned that per km maintenance cost can only be estimated accurately once quantum of work involved in different sections is identified, based on the requirement of the proposed maintenance interventions, as the cost per km may vary due to the extent of damages on account of weathering actions, type of existing road surfaces, traffic, geographical features and structural maintenance.

Therefore, the present exercise aims at working out the per km maintenance cost on an indicative basis. The cost of routine and periodic maintenance for paved and unpaved roads based on the interventions required for different conditions of roads have been presented in Table 5.8 and Table 5.9 on pages 5.18 to 5.26.

It may be noted that while proposing the interventions for routine maintenance, the Consultants have taken the actual road condition survey results based on the Verification Surveys carried out during the present Study, and quantified the results using ERA's Road Network Definition Manual, w.r.t. each major severity and extent of defects. Sample road segments have been selected from four ERA Regional Offices to have wider representations of traffic, terrains, climate, socio-economic zones and maintenance practices.

Work load quantities of periodic maintenance activities to be adopted are project specific and should be finalized based on timely pavement condition surveys. Therefore, to reach a typical one-km quantity, numbers of executed periodic maintenance projects by ERA have been reviewed for the present exercise. The Consultants have included repeatedly occurring and commonly known activities in the list, with the assumption that the complete list of activities will rarely be occurring in day to day life and all the activities might not occur at a time in any given project. It is prudent to mention that a significant number of the activities in the ERA projects are not from mainstream periodic maintenance tasks per se, rather, some rehabilitation and construction activities are included as part of periodic maintenance in these projects.

It may, further, be noted that the cost derived in Tables 5.8 and 5. 9 on pages 5.18 to 5.26 might show significant variations from one region to another region and also from project to project, based on the extent of deteriorations and also on availability of man, machine and materials at the location. The findings can be used to appreciate the trend and to notice the variation of maintenance cost for different project roads. With regard to periodic maintenance, the prevailing trend of undertaking the maintenance at a very late and collapsed stage is not advisable for adoption.

Accordingly, the current cost and quantity estimates, particularly for paved roads, assume that anything above 25% deterioration of pavement will entitle the segment to be scheduled for periodic maintenance. This deterioration value may go to a maximum of 50% rate of damage, but not beyond. Paved roads shouldn't be tolerated to reach this maximum stage of deterioration and, if happens, the segment will not be eligible for the ORF financing; rather rehabilitation is the right strategy for such segments from some other source of funding.

Similarly, cost per km for emergency and special works would depend on the quantum of work required in a particular and specific situation that may be determined using the unit rates of various road maintenance activities proposed in Table 5.2.

It is observed that per km cost also varies on the length of the road section to be maintained, as utilization of equipment, size of manpower and apportionment of overheads for executing the job depend on the quantum of work to be carried out. On small stretches, generally, it is not possible to work efficiently as all the above listed resources will not be fully or optimally utilized; and moreover, there will be frequent mobilization and demobilization of resources, etc. This phenomenon will certainly increase the per km cost mainly on account of economy of scale. Exercise has been carried out for varied length of maintenance sections in order to establish the probable range of variations in per km cost.

It has been observed that as the length of stretch for the maintenance decreases, estimated cost per km increases. The cost of one km stretch is recorded higher by 7%, as compared to per km cost of 10 km stretches or more. Similarly cost of one km stretch is higher by 3%, as compared to the cost of 5 km stretch. These results are based on a sample exercise. However, the actual cost variations may be further observed, if type of work requires more usage of equipment, such as maintenance work in hilly and urban areas. The above exercise has been detailed in the report "Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (June 2011).

5.5.5 Component of Maintenance Activities in Percentage Terms

Table 5.5 (pages 5.16 to 5.17) presents the percentagewise breakup of different components involved in maintenance work.

5.6 Road Maintenance Unit Rates in Ethiopia

Maintenance unit rates by its components duly classified in routine maintenance and periodic maintenance have been worked out and presented in Table 5.6 and Table 5.7 respectively. The unit rates, among others, will be useful in preparing the multilayer Road maintenance forecast for short-term to mid-term planning.

These costs should be updated following the methods suggested in Section 5.7.

Table 5.6: Routine Maintenance

Type	Name of Activity*	Unit	Routine Maintenance				Total Rate	
			Direct Cost		Indirect Cost			
			ETB	US$	ETB	US$	ETB	US$
Gravel Roads	Spot Repair Gravel Road - Selected Material	m^3	164.00	9.80	25.00	1.50	189.00	11.30
	Spot Repair Gravel Road - Crushed Aggregate	m^3	410.00	24.60	61.00	3.70	471.00	28.30
	Blading Gravel Road (Light)	km	983.00	59.00	147.00	8.80	1,130.00	67.80
	Blading Gravel Road (Heavy)	km	5445.00	326.70	814.00	48.80	6,259.00	375.50
	Gravel Provision - Selected Material (Extra-Over)	m^3	115.00	6.90	17.00	1.00	132.00	7.90
	Gravel Provision - Crushed Aggregate (Extra-Over)	m^3	328.00	19.70	49.00	2.90	377.00	22.60
Paved Roads	Asphalt Patching (Seal Coat)	m^2	34.00	2.00	5.00	0.30	39.00	2.30
	Asphalt Patching (Single Surface Treatment)	m^2	36.00	2.20	5.00	0.30	41.00	2.50
	Asphalt Patching (Double Surface Treatment)	m^2	64.00	3.80	9.00	0.50	73.00	4.40
	Asphalt Patching (Cold mix)	m^3	2722.00	163.30	407.00	24.40	3,129.00	187.70
	Asphalt Patching (Hot mini - mix)	m^3	2773.00	166.40	414.00	24.80	3,187.00	191.20
	Crack Sealing (individual cracks)	m	30.00	1.80	4.00	0.20	34.00	2.00
	Pothole Reinstatement (Double Surface Treatment)	m^2	77.00	4.60	12.00	0.70	89.00	5.30
	Pothole Reinstatement (Cold mix)	m^3	2768.00	166.10	414.00	24.80	3,182.00	190.90
	Pothole Reinstatement (Hot mini mix)	*m^3*	*2818.00*	*169.10*	*421.00*	*25.30*	*3,239.00*	*194.30*
	Pothole (Base Failure Repair)	*m^3*	*506.00*	*30.40*	*76.00*	*4.60*	*582.00*	*34.90*

Table 5.7: Periodic Maintenance

Type	Name of Activity*	Unit	Periodic Maintenance				Total Rate	
			Direct Cost		Indirect Cost			
			ETB	US$	ETB	US$	ETB	US$
Gravel Roads	Gravel Resurfacing (Selected Material)	m^3	177.00	10.60	27.00	1.60	204.00	12.20
	Gravel Resurfacing (Crushed Aggregate)	m^3	411.00	24.70	61.00	3.70	472.00	28.30
Paved Roads	Sand Seal Coat	m^2	24.00	1.40	4.00	0.20	28.00	1.70
	Single Bituminous Surface Treatment (SBST)	m^2	29.00	1.70	4.00	0.20	33.00	2.00
	Double Bituminous Surface Treatment (DBST)	m^2	59.00	3.50	9.00	0.50	68.00	4.10
	Mix in Place Overlay (Cold mix)	m^3	2577.00	154.60	385.00	23.00	2,962.00	177.70
	Asphalt Concrete Overlay	m^3	2509.00	150.50	375.00	22.50	2,884.00	173.00
	Bitumen Prime Coat	ltr	25.00	1.50	4.00	0.20	29.00	1.70
	Bitumen Tack Coat	ltr	23.00	1.40	3.00	0.20	26.00	1.60
	Pavement Reconstruction (Aggregate Road Base)	m^3	410.00	24.60	61.00	3.70	471.00	28.30
	Road Marking	m^2	40.00	2.40	6.00	0.40	46.00	2.80

Exchange Rate: 1US =16.667 ETB (November 2010)

*These major items may qualify for real road maintenance of above type of roads, though the list is not comprehensive as it excludes item pertaining to drainage, structure, Road side and haulage.

5.7 Derivation of Unit Costs in Future

Under the present analysis, the unit rates are derived using the market price as of November 2010. To make the unit rates useful in future years as well, it is advisable to update these rates by using the international standard practices, e.g. FIDIC or the national practices.

In Ethiopia, ERA has recommended a formula, which incorporates the following variables to arrive at price adjustment factors for specific number of years. The formula refers to the type construction works of roads, which is also valid for the maintenance works in view of similar works.[4]

In simple manner, the required cost updating could be done by applying appropriate adjustment factors based on individual weight of different components of General Consumer Price Indices in the country and regional level, as per availability of data at the Central Statistical Agency, Ethiopia,

In addition to the above, in case of overhead cost, the most important factor, among others, would be the distance of maintenance sites involved, e.g. the remote and isolated places and difficult geographical terrains; which would increase the mobilization/demobilization cost of resources including equipment and machineries. Table 5.5 presents the percentage-wise breakup of different components, viz. manpower, material and machinery involved in maintenance work, which could be suitably used.

[4] Reference Conditions of Contract for Works of Civil Engineering Construction prepared by FIDIC, Sub-Clause 70.3 Adjustment Formulae:

The adjustment to the Interim Payment Certificates in respect of changes in cost and legislation shall be determined from formulae of payment and each of the types of construction work to be performed and Plant to be supplied. The formulae will be of the following general type:

$$pn = A + b\frac{Fn}{Fo} + c\frac{Bn}{Bo} + d\frac{Sn}{So} + e\frac{Cn}{Co} + f\frac{En}{Eo}$$

Where:

pn is a price adjustment factor to be applied to the amount of the work carried out in the subject month, determined in accordance with Sub-Clause 60.1 (c), and with Sub-Clauses 60.1 (d) and (e), where such variations and Day work are not otherwise subject to adjustment;

A is a constant, specified in the Appendix to Bid, representing the nonadjustable portion in contractual payments;

b, c, d, e and f are weightings or coefficients representing the estimated proportion of each cost element of materials eligible for price adjustment (Fuel, Bitumen ,Reinforcement steel, Cement and Equipment) in the Works or sections thereof, net of Provisional Sums, as specified in the Appendix to Bid; the sum of A, b, c, d, e, f etc., shall be one;

Fn, Bn, Sn, Cn and En are the current cost indices or reference prices of Fuel, Bitumen, Reinforcement steel, cement and equipment respectively for month "**n**," determined pursuant to Sub-Clause 70.5, applicable to each cost element; and

Fo, Bo, So, Co and Eo are the base cost indices or reference prices corresponding to the above cost elements at the date specified in Sub-Clause 70.5.

The formula for price adjustment of the contract will not include the labour factor. The Contractor is therefore advised to take this into account when preparing his bid."

Table 5.2: Summary of Unit Rates of Maintenance Components by Road Type
[Location: Addis Ababa]

As on November 2010

Scope	Name of Activity	Unit	Unit Rate*	
			(ETB)	US$**
Routine Maintenance (Gravel Roads)	Spot Repair Gravel Road - Selected Material	m^3	189.00	11.30
	Spot Repair Gravel Road - Crushed Aggregate	m^3	471.00	28.30
	Blading Gravel Road (Light)	km	1,130.00	67.80
	Blading Gravel Road (Heavy)	km	6,259.00	375.50
	Gravel Provision - Selected Material (Extra-Over)	m^3	132.00	7.90
	Gravel Provision - Crushed Aggregate (Extra-Over)	m^3	377.00	22.60
Periodic Maintenance (Gravel Roads)	Gravel Resurfacing (Selected Material)	m^3	204.00	12.20
	Gravel Resurfacing (Crushed Aggregate)	m^3	472.00	28.30
Routine Maintenance (Paved Roads)	Asphalt Patching (Seal Coat)	m^2	39.00	2.30
	Asphalt Patching (Single Surface Treatment)	m^2	41.00	2.50
	Asphalt Patching (Double Surface Treatment)	m^2	73.00	4.40
	Asphalt Patching (Cold mix)	m^3	3,129.00	187.70
	Asphalt Patching (Hot mini - mix)	m^3	3,187.00	191.20
	Crack Sealing (individual cracks)	m	34.00	2.00
	Pothole Reinstatement (Double Surface Treatment)	m^2	89.00	5.30
	Pothole Reinstatement (Cold mix)	m^3	3,182.00	190.90
	Pothole Reinstatement (Hot mini mix)	m^3	3,239.00	194.30
	Pothole (Base Failure Repair)	m^3	582.00	34.90
Periodic Maintenance (Paved Roads)	Sand Seal Coat	m^2	28.00	1.70
	Single Bituminous Surface Treatment (SBST)	m^2	33.00	2.00
	Double Bituminous Surface Treatment (DBST)	m^2	68.00	4.10
	Mix in Place Overlay (Cold mix)	m^3	2,962.00	177.70
	Asphalt Concrete Overlay	m^3	2,884.00	173.00
	Bitumen Prime Coat	ltr	29.00	1.70
	Bitumen Tack Coat	ltr	26.00	1.60
	Pavement Reconstruction (Aggregate Road Base)	m^3	471.00	28.30
	Road Marking	m^2	46.00	2.80
Material Production	Cold Mix Production (Pug-mill)	m^3	2,149.00	128.90
	Cold Mix Production (Mix-in place)	m^3	2,423.00	145.40
	Hot Mini-Mix Production (Mobile Unit)	m^3	2,197.00	131.80
	Hot Mix Production (Central Plant Mix)	m^3	2,361.00	141.70
	Crushed Aggregate (Bituminous Surfacing)	m^3	461.00	27.70
	Crushed Aggregate (Road Base)	m^3	329.00	19.70
	Selected Material (Gravel Road Surfacing)	m^3	68.00	4.10
	Crushed Aggregate (Gravel Road Surfacing)	m^3	313.00	18.80
	Masonry Stone Production	m^3	46.00	2.80

Scope	Name of Activity	Unit	Unit Rate*	
			(ETB)	US$**
Drainage	Culvert Cleaning	m^3	104.00	6.20
	Ditch Cleaning (Manual)	m	9.00	0.50
	Ditch Cleaning (Machine)	km	5,195.00	311.70
	Repair Erosion Damage (Selected Fill)	m^3	221.00	13.30
	Repair Erosion Damage (Rock Fill)	m^3	290.00	17.40
	Mortared Masonry Repair	m^3	795.00	47.70
	Dry Masonry Repair	m^3	246.00	14.80
	Gabion Structures	m^3	716.00	43.00
Road Side	Bush Clearing	m^2	0.22	0.01
	Shoulder Blading	km	850.00	51.00
	Shoulder Rehabilitation	m^3	165.00	9.90
Structure	Concrete Construction (Class 1)	m^3	3,298.00	197.90
	Concrete Construction (Class 2)	m^3	2,376.00	142.60
	Steel Reinforcement	kg	21.00	1.30
Haulage	Overhaul	m3 -km	6.00	0.40
Unit Rates of Additional Activities (Proposed)				
Bituminous Surface	Edge Repair	m	49.40	3.00
	Fog Sealing	m^2	11.10	0.70
	5 mm thick Slurry Seal	m^2	16.60	1.00
	20 mm Premix Carpet Resurfacing	m^2	37.60	2.30
	20 mm Mix Seal Surfacing	m^2	43.50	2.60
	25 mm Semi-dense Bituminous carpet	m^2	64.60	3.90
	Thin overlay of 25 mm	m^2	66.40	4.00
	Dust control	km	22,140.20	1,328.50
Rigid Pavement	Sealing of Cracks	kg	225.50	13.50
	Spot Patching with PCC	m^2	288.20	17.30
	Spot Patching (Bituminous)	m^3	2,654.60	159.30
	Joint Maintenance	m	9.20	0.60
	Joint Leveling	m	163.10	9.80
	Slab Replacement	m^3	2,051.70	123.10
	Deep Patching (PCC)	m^3	922.50	55.40
Road Safety	**Retro-Reflectorised Traffic Signs**			
	Chevron Sign (800mm x 2062 mm Rectangular)	no.	6,305.50	378.30
	Stop Sign (900 mm Octagonal)	no.	2,581.20	154.90
	Give way Sign (900 mm Triangular)	no.	1,574.50	94.50
	Hazard Markers Sign (300 mm x 900 mm Rectangular)	no.	1,004.80	60.30
	Speed limit Sign (600 mm Circular)	no.	1,365.30	81.90
	Advance Direction Sign (1200 mm x 1800 mm Rectangular)	no.	8,256.50	495.40

Scope	Name of Activity	Unit	Unit Rate*	
			(ETB)	US$**
	School Sign(900 mm Triangular)	no.	1,574.50	94.50
	Hazard Ahead sign (900 mm Triangular)	no.	1,574.50	94.50
	Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads	m^2	226.20	13.60
	Painting Lines, dashes, Arrows etc on Roads	m^2	22.10	1.30
	Printing new letter and figures of any shade	cm height / letter	0.20	0.01
Other Features	**Delineator Post**	no.	300.00	18.00
	W- Beam Crash Barrier	m	1,061.30	63.70
	Railing: Providing, fixing and erecting 50 mm dia steel pipe railing in 3 rows duly painted on medium weight steel channels 100 mm x 50 mm, 1.2 meters high above ground, 2 m centre to centre	m	542.40	32.50
	Speed Breakers (100 mm high)	m	369.00	22.10
	Traffic Signal for 4 armed Intersection	no.	295,203.00	17,712.80
	Street Lights: Providing and erecting street light mounted on a steel circular hollow pole for street lighting, 9 m high spaced 40 m apart, 1.8 m overhang fitted with sodium vapor lamp and fixed firmly in concrete foundation.	no.	27,675.30	1,660.60
	Road Stud: Providing and fixing of road stud 100x100 mm, die-cast in aluminum, resistant to corrosive effect of salt and grit, fitted with lens reflectors, installed in concrete or asphaltic surface by drilling hole 30 mm up to a depth of 60 mm and bedded in a suitable bituminous grout or epoxy mortar	no.	221.40	13.30
	Footpath: Construction of footpath by providing a 150 mm compacted granular sub base and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar 1:3 including provision of all drainage arrangements	m^2	590.40	35.40
	Precast Concrete Kerb **Non-mountable:** Construction of precast cement concrete kerb with top and bottom width 115 and 165 mm respectively, 325 mm high in M 20 grade PCC on M-10 grade foundation 100 mm thick, having 50 mm projection beyond kerb stone	m	97.40	5.80
	Mountable: Construction of precast cement concrete kerb with top and bottom width 75 and 150 mm respectively, 275 mm high in M 20 grade PCC on M-10 grade foundation 100 mm thick having 50 mm projection beyond kerb stone.	m	83.00	5.00
	Rumble strips: Provision of rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center to control speed, marked with white strips of road marking paint.	m	44.30	2.70

*The rates are derived by using average input rates, which vary from region to region.
** Exchange Rate: 1US$ = 16.667 ETB (November 2010).

Table 5.5: Percentage-wise Component of Maintenance Activities

Scope	Name of Activity	Derived Unit Rate (ETB)	Percentage Component				
			Manpower (a)	Machinery (b)	Material (c)	Overhead (d) = 15% of (a+b+c)	Total (a+b+c+d)
Routine Maintenance (Gravel Roads)	Spot Repair Gravel Road - Selected Material	189.00	5.74%	81.26%	0.00%	13%	100%
	Spot Repair Gravel Road - Crushed Aggregate	471.00	2.87%	68.84%	15.30%	13%	100%
	Blading Gravel Road (Light)	1,130.00	1.91%	85.09%	0.00%	13%	100%
	Blading Gravel Road (Heavy)	6,259.00	2.87%	84.13%	0.00%	13%	100%
	Gravel Provision - Selected Material (Extra-Over)	132.00	1.91%	85.09%	0.00%	13%	100%
	Gravel Provision - Crushed Aggregate (Extra-Over)	377.00	0.96%	68.84%	17.21%	13%	100%
Periodic Maintenance (Gravel Roads)	Gravel Resurfacing (Selected Material)	204.00	1.91%	85.09%	0.00%	13%	100%
	Gravel Resurfacing (Crushed Aggregate)	472.00	0.96%	70.75%	15.30%	13%	100%
Routine Maintenance (Paved Roads)	Asphalt Patching (Seal Coat)	39.00	3.82%	34.42%	48.76%	13%	100%
	Asphalt Patching (Single Surface Treatment)	41.00	2.87%	37.29%	46.85%	13%	100%
	Asphalt Patching (Double Surface Treatment)	73.00	1.91%	28.68%	56.41%	13%	100%
	Asphalt Patching (Cold mix)	3,129.00	1.91%	29.64%	55.45%	13%	100%
	Asphalt Patching (Hot mini - mix)	3,187.00	1.91%	31.55%	53.54%	13%	100%
	Crack Sealing (individual cracks)	34.00	2.87%	51.63%	32.51%	13%	100%
	Pothole Reinstatement (Double Surface Treatment)	89.00	0.96%	25.81%	60.23%	13%	100%
	Pothole Reinstatement (Cold mix)	3,182.00	1.91%	29.64%	55.45%	13%	100%
	Pothole Reinstatement (Hot mini mix)	3,239.00	1.91%	32.51%	52.58%	13%	100%
	Pothole (Base Failure Repair)	582.00	1.91%	70.75%	14.34%	13%	100%
Periodic Maintenance (Paved Roads)	Sand Seal Coat	28.00	0.96%	21.03%	65.01%	13%	100%
	Single Bituminous Surface Treatment (SBST)	33.00	0.96%	21.99%	64.05%	13%	100%
	Double Bituminous Surface Treatment (DBST)	68.00	0.96%	22.95%	63.10%	13%	100%
	Mix in Place Overlay (Cold mix)	2,962.00	0.96%	25.81%	60.23%	13%	100%
	Asphalt Concrete Overlay	2,884.00	0.96%	22.95%	63.10%	13%	100%
	Bitumen Prime Coat	29.00	0.96%	5.74%	80.31%	13%	100%

Scope	Name of Activity	Derived Unit Rate (ETB)	Percentage Component				
			Manpower (a)	Machinery (b)	Material (c)	Overhead (d) = 15% of (a+b+c)	Total (a+b+c+d)
	Bitumen Tack Coat	26.00	0.96%	2.87%	83.18%	13%	100%
	Pavement Reconstruction (Aggregate Road Base)	471.00	1.91%	69.79%	15.30%	13%	100%
	Road Marking	46.00	1.91%	14.34%	70.75%	13%	100%
Material Production	Cold Mix Production (Pug-mill)	2,149.00	0.96%	21.99%	64.05%	13%	100%
	Cold Mix Production (Mix-in place)	2,423.00	0.96%	21.99%	64.05%	13%	100%
	Hot Mini-Mix Production (Mobile Unit)	2,197.00	0.96%	24.86%	61.19%	13%	100%
	Hot Mix Production (Central Plant Mix)	2,361.00	0.96%	20.08%	65.97%	13%	100%
	Crushed Aggregate (Bituminous Surfacing)	461.00	1.91%	71.70%	13.38%	13%	100%
	Crushed Aggregate (Road Base)	329.00	1.91%	64.05%	21.03%	13%	100%
	Selected Material (Gravel Road Surfacing)	68.00	0.96%	86.04%	0.00%	13%	100%
	Crushed Aggregate (Gravel Road Surfacing)	313.00	0.96%	65.97%	20.08%	13%	100%
	Masonry Stone Production	46.00	87.00%	0.00%	0.00%	13%	100%
Drainage	Culvert Cleaning	104.00	23.90%	63.10%	0.00%	13%	100%
	Ditch Cleaning (Manual)	9.00	18.16%	68.84%	0.00%	13%	100%
	Ditch Cleaning (Machine)	5,195.00	4.78%	82.22%	0.00%	13%	100%
	Repair Erosion Damage (Selected Fill)	221.00	12.43%	74.57%	0.00%	13%	100%
	Repair Erosion Damage (Rock Fill)	290.00	30.59%	56.41%	0.00%	13%	100%
	Mortared Masonry Repair	795.00	16.25%	23.90%	46.85%	13%	100%
	Dry Masonry Repair	246.00	33.46%	53.54%	0.00%	13%	100%
	Gabion Structures	716.00	12.43%	36.33%	38.24%	13%	100%
Road Side	Bush Clearing	0.22	87.00%	0.00%	0.00%	13%	100%
	Shoulder Blading	850.00	3.82%	83.18%	0.00%	13%	100%
	Shoulder Rehabilitation	165.00	1.91%	85.09%	0.00%	13%	100%
Structure	Concrete Construction (Class 1)	3,298.00	3.82%	35.37%	47.80%	13%	100%
	Concrete Construction (Class 2)	2,376.00	2.87%	39.20%	44.93%	13%	100%
	Steel Reinforcement	21.00	10.52%	0.00%	76.48%	13%	100%
Haulage	Overhaul	6.00	0.96%	86.04%	0.00%	13%	100%

Note: (i) Stone is directly procured from government quarry and hence material component is zero in material production at Sl. No. 34 & 36; and (ii) It can be seen from the table that average component of labor is 8%, machinery is 47%, material is 32% and overhead of 13%.

Table 5.8 (a) Per km Cost Estimate for Routine Maintenance Activities of Paved Roads (Typical)

Road Element	Activity	Unit	Unit Rate (ETB)	Average Quantity/km as per pavement condition				Average Cost/km as per pavement condition (ETB)			
				Very Good	Good	Fair	Poor	Very Good	Good	Fair	Poor
Pavement	Asphalt Patching (Seal Coat)	m^2	39.00	142.29	284.58	369.96	455.33	5,549.38	11,098.75	14,428.38	17,758.00
	Asphalt Patching (Single Surface Treatment)	m^2	41.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Asphalt Patching (Double Surface Treatment)	m^2	73.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Asphalt Patching (Cold Mix)	m^3	3,129.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Asphalt Patching (Hot Mini - Mix)	m^3	3,187.00	0.32	0.65	0.84	1.04	1,033.62	2,067.24	2,687.42	3,307.59
	Crack Sealing (Individual Cracks)	Lm	34.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pothole Reinstatement (Double Surface Treatment)	m^2	89.00	0.60	1.20	1.55	1.91	53.19	106.39	138.30	170.22
	Pothole Reinstatement (Cold Mix)	m^3	3,182.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pothole Reinstatement (Hot Mini Mix)	m^3	3,239.00	0.01	0.03	0.03	0.04	40.49	80.98	105.27	129.56
	Pothole (Base Failure Repair)	m^3	582.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drainage	Culvert Cleaning	m^3	104.00	0.69	1.38	1.79	2.21	71.78	143.56	186.63	229.70
	Ditch Clearing (Manual)	m	9.00	33.22	66.45	86.38	106.31	299.01	598.02	777.43	956.83
	Ditch Clearing (Machine)	km	5,195.00	0.01	0.03	0.03	0.04	64.94	129.88	168.84	207.80
	Repair Erosion Damage (Selected Fill)	m^3	221.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Repair Erosion Damage (Rock Fill)	m^3	290.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Mortared Masonry Repair	m^3	795.00	0.01	0.03	0.03	0.04	9.94	19.88	25.84	31.80
	Dry Masonry Repair	m^3	246.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Gabion Structures	m^3	716.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roadside	Bush Clearing	m^2	0.22	133.22	266.44	346.38	426.31	29.31	58.62	76.20	93.79
	Shoulder Blading	Km	850.00	0.03	0.05	0.07	0.08	22.51	45.01	58.52	72.02
	Shoulder Rehabilitation	m^3	165.00	4.93	9.86	12.82	15.78	813.81	1,627.61	2,115.90	2,604.18

Road Element	Activity	Unit	Unit Rate (ETB)	Average Quantity/km as per pavement condition				Average Cost/km as per pavement condition (ETB)			
				Very Good	Good	Fair	Poor	Very Good	Good	Fair	Poor
Material Production	Selected Material (Gravel Road Surfacing)	m^3	68.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Masonry Stone Production	m^3	46.00	0.02	0.03	0.04	0.05	0.75	1.50	1.94	2.39
	Cold Mix Production (Pug-mill)	m^3	2,149.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Cold Mix Production (Mix-in place)	m^3	2,423.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Mini-Mix Production (Mobile Unit)	m^3	2,197.00	0.33	0.66	0.86	1.06	729.38	1,458.77	1,896.40	2,334.03
	Hot Mix Production (Central Plant Mix)	m^3	2,361.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Crushed Aggregate (Bituminous Surfacing)	m^3	461.00	0.06	0.12	0.16	0.19	27.55	55.11	71.64	88.17
	Crushed Aggregate (Road Base)	m^3	329.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous (20% of the above)								1,812.38	3,624.76	4,712.19	5,799.62
							Total Per km Cost	**10,874.28**	**21,748.56**	**28,273.13**	**34,797.70**

Table 5.8 (b) Per km Cost Estimate for Periodic Maintenance Activities of Paved Roads - DBST (Typical)

Road Element	Activity	Unit	Unit Rate (ETB)	Average Per km Quantity and Cost								Average Quantity/ km	Average Cost/Km (ETB)
				Flat		Rolling		Hilly		Mountainous			
				Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost		
Pavement	Sand Seal Coat	m^2	28.00	600.00	16,800.00	600.00	16,800.00	540.00	15,120.00	540.00	15,120.00	**570.00**	**15,960.00**
	Single Bituminous Surface Treatment (SBST)	m^2	33.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Double Bituminous Surface Treatment (DBST)	m^2	68.00	3,500.00	238,000.00	4,200.00	285,600.00	5,040.00	342,720.00	5,040.00	342,720.00	**4,445.00**	**302,260.00**
	Mix in Place Overlay (Cold Mix)	m^3	2,962.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Asphalt Concrete Overlay	m^3	2,884.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Bitumen Prime Coat	Ltr.	29.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Bituminous Tack Coat	Ltr.	26.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Pavement Reconstruction (Aggregate Road Base)	m^3	471.00	157.50	74,182.50	173.25	81,600.75	190.58	89,760.83	190.58	89,760.83	**177.98**	**83,826.23**
Drainage	Mortar Masonry Repair	m^3	795.00	0.72	573.99	0.79	631.39	0.87	694.53	0.87	694.53	**0.82**	**648.61**
	Concrete Construction (Class 1)	m^3	3,298.00	2.00	6,596.00	2.20	7,255.60	2.64	8,706.72	2.64	8,706.72	**2.37**	**7,816.26**
	Concrete Construction (Class 2)	m^3	2,376.00	2.00	4,752.00	2.20	5,227.20	2.64	6,272.64	2.64	6,272.64	**2.37**	**5,631.12**
	Steel Reinforcement	kg	21.00	262.50	5,512.50	275.63	5,788.13	289.41	6,077.53	289.41	6,077.53	**279.23**	**5,863.92**
Roadside	Shoulder Rehabilitation	m^3	165.00	360.00	59,400.00	396.00	65,340.00	435.60	71,874.00	435.60	71,874.00	**406.80**	**67,122.00**
Haulage	Overhaul	m^3-km	6.00	3,600.00	21,600.00	3,780.00	22,680.00	3,969.00	23,814.00	3,969.00	23,814.00	**3,829.50**	**22,977.00**
Material Production	Selected Material (Gravel Road Surfacing)	m^3	68.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**

Road Element	Activity	Unit	Unit Rate (ETB)	Average Per km Quantity and Cost								Average Quantity/ km	Average Cost/Km (ETB)
				Flat		Rolling		Hilly		Mountainous			
				Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost		
	Masonry Stone Production	m^3	46.00	0.94	43.18	0.94	43.18	702.00	32,292.00	702.00	32,292.00	**351.47**	**16,167.59**
	Cold Mix Production (Pug-mill)	m^3	2,149.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Cold Mix Production (Mix-in place)	m^3	2,423.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Hot Mini-Mix Production (Mobile Unit)	m^3	2,197.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Hot Mix Production (Central Plant Mix)	m^3	2,361.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Crushed Aggregate (Bituminous Surfacing)	m^3	461.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Crushed Aggregate (Road Base)	m^3	329.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Miscellaneous (20% of the above)				85,492.03		98,193.25		119,466.45		119,466.45		105,654.54
	Total Cost /km				**512,952.20**		**589,159.49**		**716,798.69**		**716,798.69**		**633,927.27**

Table 5.8 (c) Per km Cost Estimate for Periodic Maintenance Activities of Paved Roads - Asphalt (Typical)

Road Element	Activity	Unit	Unit Rate	Average Per km Quantity and Cost								Average Quantity/ km	Average Cost/Km
				Flat		Rolling		Hilly		Mountainous			
				Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost		
Pavement	Sand Seal Coat	m^2	28.00	600.00	16,800.00	600.00	16,800.00	540.00	15,120.00	540.00	15,120.00	**570.00**	**15,960.00**
	Single Bituminous Surface Treatment (SBST)	m^2	33.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Double Bituminous Surface Treatment (DBST)	m^2	68.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Mix in Place Overlay (Cold Mix)	m^3	2,962.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Asphalt Concrete Overlay	m^3	2,884.00	140.00	403,760.00	140.00	403,760.00	126.00	363,384.00	126.00	363,384.00	**133.00**	**383,572.00**
	Bitumen Prime Coat	Ltr.	29.00	2,100.00	60,900.00	2,310.00	66,990.00	2,541.00	73,689.00	2,541.00	73,689.00	**2,373.00**	**68,817.00**
	Bituminous Tack Coat	Ltr.	26.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Pavement Reconstruction (Aggregate Road Base)	m^3	471.00	105.00	49,455.00	115.50	54,400.50	127.05	59,840.55	127.05	59,840.55	**118.65**	**55,884.15**
Drainage	Mortar Masonry Repair	m^3	795.00	0.72	573.99	0.79	631.39	0.87	694.53	0.87	694.53	**0.82**	**648.61**
	Concrete Construction (Class 1)	m^3	3,298.00	2.00	6,596.00	2.20	7,255.60	2.64	8,706.72	2.64	8,706.72	**2.37**	**7,816.26**
	Concrete Construction (Class 2)	m^3	2,376.00	2.00	4,752.00	2.20	5,227.20	2.64	6,272.64	2.64	6,272.64	**2.37**	**5,631.12**
	Steel Reinforcement	kg	21.00	262.50	5,512.50	275.63	5,788.13	289.41	6,077.53	289.41	6,077.53	**279.23**	**5,863.92**
Roadside	Shoulder Rehabilitation	m^3	165.00	90.00	14,850.00	99.00	16,335.00	108.90	17,968.50	108.90	17,968.50	**101.70**	**16,780.50**
Haulage	Overhaul	m^3-km	6.00	900.00	5,400.00	945.00	5,670.00	992.25	5,953.50	992.25	5,953.50	**957.38**	**5,744.25**
Material Production	Selected Material (Gravel Road Surfacing)	m^3	68.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Masonry Stone	m^3	46.00	0.94	43.18	0.94	43.18	702.00	32,292.00	702.00	32,292.00	**351.47**	**16,167.59**

Road Element	Activity	Unit	Unit Rate	Average Per km Quantity and Cost								Average Quantity/ km	Average Cost/Km
				Flat		Rolling		Hilly		Mountainous			
				Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost		
	Production												
	Cold Mix Production (Pug-mill)	m^3	2,149.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Cold Mix Production (Mix-in place)	m^3	2,423.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Hot Mini-Mix Production (Mobile Unit)	m^3	2,197.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Hot Mix Production (Central Plant Mix)	m^3	2,361.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Crushed Aggregate (Bituminous Surfacing)	m^3	461.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Crushed Aggregate (Road Base)	m^3	329.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Miscellaneous (20% of the above)				113,728.53		116,580.20		117,999.79		117,999.79		116,577.08
	Total Cost /km				682,371.20		699,481.19		707,998.76		707,998.76		699,462.48

Table 5.9 (a) Per km Cost Estimate for Routine Maintenance Activities of Unpaved Roads (Typical)

Road Element	Activity	Unit	Unit Rate	Average quantity/km as per pavement condition				Average Cost/km as per pavement condition			
				Very Good	Good	Fair	Poor	Very Good	Good	Fair	Poor
Pavement	Spot Repair Gravel Road - Selected Material	m^3	189.00	11.01	22.02	28.62	35.23	2,080.72	4,161.44	5,409.87	6,658.31
	Spot Repair Gravel Road - Crushed Aggregate	m^3	471.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Blading Gravel Road (Light)	km	1,130.00	0.39	0.78	1.02	1.25	441.24	882.48	1,147.22	1,411.96
	Blading Gravel Road (Heavy)	km	6,259.00	0.04	0.07	0.09	0.11	223.54	447.07	581.19	715.31
	Gravel Resurfacing-(Selected Materal)	m^3	204.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Drainage	Culvert Cleaning	m^3	104.00	0.55	1.10	1.42	1.75	56.97	113.95	148.13	182.32
	Ditch Clearing (Manual)	m	9.00	31.29	62.59	81.36	100.14	281.64	563.28	732.27	901.25
	Ditch Clearing (Machine)	km	5,195.00	0.19	0.39	0.50	0.62	1,007.77	2,015.53	2,620.19	3,224.85
	Repair Erosion Damage (Selected Fill)	m^3	221.00	0.60	1.20	1.56	1.91	132.21	264.41	343.73	423.06
	Repair Erosion Damage (Rock Fill)	m^3	290.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Mortared Masonry Repair	m^3	795.00	0.00	0.01	0.01	0.01	2.48	4.97	6.46	7.95
	Dry Masonry Repair	m^3	246.00	0.13	0.25	0.33	0.40	30.75	61.50	79.95	98.40
	Gabion Structures	m^3	716.00	0.25	0.50	0.65	0.80	179.00	358.00	465.40	572.80
Roadside	Bush Clearing	m^2	0.22	759.44	1,518.88	1,974.54	2,430.21	167.08	334.15	434.40	534.65
	Shoulder Blading	Km	850.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Shoulder Rehabilitation	m^3	165.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Day Works	Emergency Repairs	DWs	1,012.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Other Routine Maintenance	DWs	1,012.50	0.13	0.25	0.33	0.40	126.56	253.13	329.06	405.00
	Betterment	DWs	254.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Road Element	Activity	Unit	Unit Rate	Average quantity/km as per pavement condition				Average Cost/km as per pavement condition			
				Very Good	Good	Fair	Poor	Very Good	Good	Fair	Poor
	Environmental Protection	DWs	1,012.50	0.25	0.50	0.65	0.80	253.13	506.25	658.13	810.00
Haulage	Overhaul	m^3-km	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material Production	Selected Material (Gravel Road Surfacing)	m^3	68.00	14.31	28.62	37.21	45.80	973.20	1,946.41	2,530.33	3,114.26
	Crushed Aggregate (Gravel Road Surfacing)	m^3	313.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Masonry Stone Production	m^3	46.00	0.00	0.01	0.01	0.01	0.19	0.37	0.49	0.60
	Miscellaneous (20% of the above)							1,191.29	2,382.59	3,097.37	3,812.14
	Total Cost /km							**5,067.05**	**10,134.09**	**13,174.32**	**16,214.55**

Table 5.9 (b) Per km Cost Estimate for Periodic Maintenance Activities of Unpaved Roads (Typical)

Road Element	Activity	Unit	Unit Rate	Average Per km Quantity and Cost								Average Quantity/ km	Average Cost/Km
				Flat		Rolling		Hilly		Mountainous			
				Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost		
Pavement	Gravel Resurfacing (Selected Material)	m^3	204.00	900.00	183,600.00	900.00	183,600.00	810.00	165,240.00	810.00	165,240.00	**855.00**	**174,420.00**
	Gravel Resurfacing (Crushed Aggregate)	m^3	472.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
Drainage	Repair Erosion Damage (Rock Fill)	m^3	290.00	30.00	8,700.00	36.00	10,440.00	43.20	12,528.00	43.20	12,528.00	**38.10**	**11,049.00**
	Mortar Masonry Repair	m^3	795.00	0.72	573.99	0.79	631.39	0.87	694.53	0.87	694.53	**0.82**	**648.61**
	Ditch Clearing (Machine)	km	5,195.00	1.00	5,195.00	0.80	4,156.00	0.72	3,740.40	0.72	3,740.40	**0.81**	**4,207.95**
	Concrete Construction (Class 1)	m^3	3,298.00	0.50	1,649.00	0.55	1,813.90	0.61	1,995.29	0.61	1,995.29	**0.57**	**1,863.37**
	Concrete Construction (Class 2)	m^3	2,376.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Steel Reinforcement	kg	21.00	10.50	220.50	11.55	242.55	12.71	266.81	12.71	266.81	**11.87**	**249.17**
	Pipe Installation	Lm	1,240.98	2.00	2,481.96	2.20	2,730.16	2.64	3,276.19	2.64	3,276.19	**2.37**	**2,941.12**
	Pipe Production	Lm	760.43	2.00	1,520.86	2.20	1,672.95	2.64	2,007.54	2.64	2,007.54	**2.37**	**1,802.22**
	Embankment Placing	m^3	88.43	262.50	23,212.88	275.63	24,373.52	289.41	25,592.19	289.41	25,592.19	**279.23**	**24,692.70**
	Structural excavation	m^3	53.40	12.00	640.80	13.20	704.88	14.52	775.37	14.52	775.37	**13.56**	**724.10**
	Roadbed Preparation	Lm	69.15	50.00	3,457.50	52.50	3,630.38	55.13	3,811.89	55.13	3,811.89	**53.19**	**3,677.92**
Haulage	Overhaul	m^3-km	6.00	13,500.00	81,000.00	13,500.00	81,000.00	12,150.00	72,900.00	12,150.00	72,900.00	**12,825.00**	**76,950.00**
	Crushed Aggregate (Gravel Road Surfacing)	m^3	313.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
	Masonry Stone Production	m^3	46.00	0.94	43.18	1.03	47.49	1.14	52.24	1.14	52.24	**1.06**	**48.79**
	Miscellaneous (20% of the above)				62,459.13		63,008.64		58,576.09		58,576.09		60,654.99
	Total Cost /km				**374,754.79**		**378,051.85**		**351,456.53**		**351,456.53**		**363,929.93**

6. ROAD INVENTORY AND PAVEMENT CONDITION IN ETHIOPIA

6.0 ROAD INVENTORY & PAVEMENT CONDITION IN ETHIOPIA

6.1 Background

This chapter establishes the road inventory details and pavement condition of the total classified road network of the country. The exercise is primarily based on the verification of data and information on road inventory and pavement condition as available and furnished by different road agencies on the road network under their jurisdiction. Following the ToR, the Study also needs to "conduct road inventory of classified RRAs, MRAs and ERA's road network and condition survey of 3,500 km road samples to verify the accuracy of the data…"

Based on the data and information collected through the Verification Survey of the classified road network and pavement condition, the Study has adjusted the road inventory and pavement condition, which would form the basis for establishing the existing condition of the entire classified road network of the country; that would be considered as "Baseline Situation". The exercise would help in identifying the type and level of maintenance interventions required to preserve the road asset as well as offer quality service to its users.

In view of the above, the Verification Survey aimed at obtaining details on the road inventory and pavement condition on the sample roads to justify and adjust the data collected from the road agencies. The data and information verified have been used to determine the status of the entire classified road network of the country.

6.2 The Coverage

In conformity with the ToR, the chapter, among others, establishes the baseline road inventory details and the pavement condition of classified roads under different road agencies. The chapter also presents the detail on organizing and administering the Verification Survey throughout the country. The Sample Roads selected for the survey represent all types of roads in the total road network, regional distribution, varied geometry, terrain, pavement types and conditions, etc. The chapter also deals with the requirements in view of considering the complexity to forecast the maintenance needs of coming five years detailed analysis with 10 years of rough estimates, and maintenance needs of each year.

6.3 Approach & Methodology

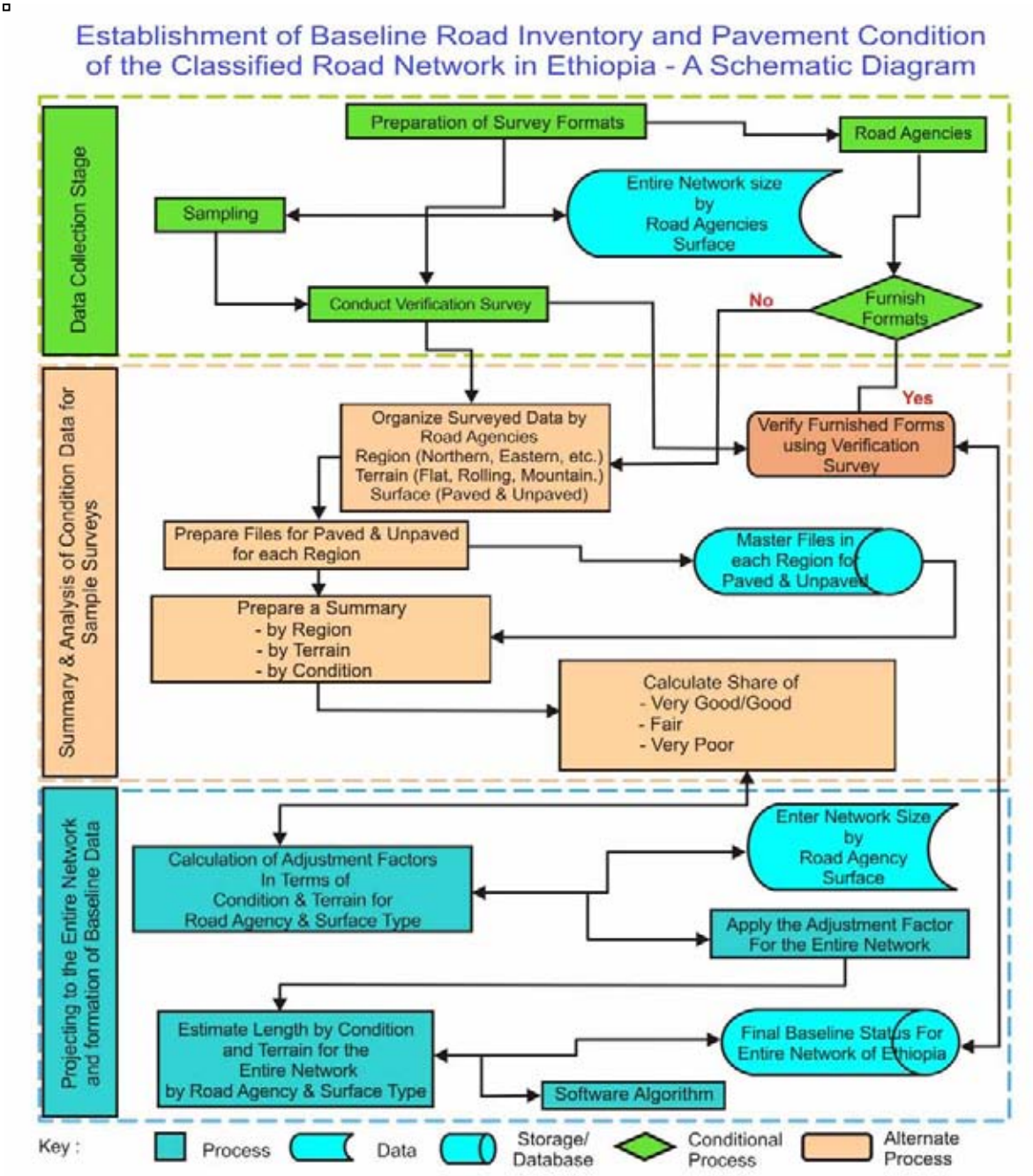
For establishing the road inventory and pavement condition data, the Study first carried out the exercise on the basis of the secondary data, i.e. through published documents and reports from different road agencies; followed by collecting primary level data, i.e. through the Survey Formats specially designed for the purpose. The steps that followed for carrying out the above exercise to set up the baseline condition of the classified road network, are described as follows:

- Identify the size of the entire classified road network; based on the data collected through different sources;
- Prepare the survey instruments, viz. different Survey Formats appropriately designed for collecting data and information relating to the road inventory and pavement condition for paved and unpaved roads and cross drainage structures;
- After having pretested the efficiency and effectiveness of the Survey Formats in field, which are to be used by the road agencies for furnishing the data and information as well as during the Verification Survey, distribute the Survey

Formats to all the road agencies, ERA, RRAs and MRAs, followed by monitoring and quality check with communications and clarifications, as and when required, while furnishing the details in the Survey Formats;

- As stated above, the Survey Formats have been utilized for the Verification Survey on 3,500 km road network selected on sample basis covering all the road agencies;
- Checking the data collected through sample survey and determine the condition of respective networks by adjusting the differences suitably, as required; and
- Establishing the road inventory and pavement condition of the classified roads in the country.

The following schematic diagram illustrates the steps that followed for establishing the baseline road inventory and pavement condition. The activities are grouped into the data collection, analysis of data, and establishment of baseline data for further use and analysis.



6.4 Road Inventory & Pavement Condition: Data Collection

Following the ToR, the Study carried out the Verification Survey for the road inventory and pavement condition of the classified road network on sample basis. As part of the Verification Survey, a total of 3,999 km of roads were surveyed selected from all the road agencies spread all over the country. The sampling criteria covered parameters like, geographical and spatial distribution, traffic level and surface types, so that the selected roads could represent adequately for the entire network of classified roads in the country. For sampling and selecting the roads, a brief description is given in the following paragraphs.

6.4.1 Sampling of the Roads

For the sampling, the relevant data relating to all the Federal, Regional and Municipality Roads were collected. The sampling exercise was carried out in a series of activities in several steps. The Study carried out the Verification Survey on the sample roads following the method comprehensive enough to capture true representation of roads under different road agencies, viz. ERA, RRAs and MRAs, in the varied terrains and geographical setup of the country, pavement type, traffic level, etc. As stated earlier, total 3,999 km of sample roads were selected from the classified road network of Ethiopia for the Verification Survey.

First, on the basis of general criteria followed by the ORF for allocating budget to different road agencies for the road maintenance, i.e. 65% to the ERA: 25% to the RRAs and 10% to the MRAs, the total length of 3,500 km of roads, i.e. the size of sample suggested in the ToR, were distributed among the road agencies; which resulted in 2,275 km of the roads under ERA, 875 km of the roads under RRAs and 350 km of the roads under MRAs.

The above length of the roads was re-distributed among the Maintenance Districts under ERA, different Regions under RRAs, and different Municipalities under MRAs of the country.

The distribution of the roads was done on the basis of their respective share, e.g. 2,275 km of the roads distributed among the Maintenance Districts under ERA, as per their percentage share in the ERA's network. After having obtained the road length under each District of ERA, Regions of RRAs and Municipality of the MRAs, the selection of specific roads was carried out. For undertaking the exercise, the Consultants realized the requirements of the spatial distribution of the road network under different road agencies as well as their respective Districts, Regions and Municipalities, so that a proper and comprehensive representation of the sample roads could also be appreciated.

This exercise was carried out on an iterative basis to finalize the specific road sections for the Verification Survey. The methods deployed for selecting the specific section of the Federal, Regional and Municipal Roads were different, as briefed below:

- **For the Federal Roads:** the basic approach followed to have fair distribution of the sections in the Maintenance Districts of ERA, and for the purpose, the roads got selected randomly/unbiased until the total of the road length with, paved and unpaved surface, became equal to the length considered for the sample size under the category (Table 6.1);
- **For the Regional Roads:** the remoteness or bit far from the Federal Roads was one of the major criteria of the sample selection, and/or those roads, which were found in the areas of the unselected Federal Roads (Table 6.2);
- **For the Municipal Roads:** other than Addis Ababa, the selections were made as per the total length of the sample and considering local conditions, as the road sections and segments observed were not big, whereas for Addis Ababa, the sample sections were based on the list collected from the AACRA, and its distribution among the districts in Addis Ababa; as per their relative size of the network to have a fair distribution and representation of paved and unpaved roads (Table 6.3); and
- **List of the Sample Roads:** Following the above methods and coverage, the sample roads selected from the ERA, RRAs and MRAs are presented in Annexure 6.1.

Tables 6.1 to 6.3 summarize the sample road lengths and their distribution among the Maintenance Districts of ERA, RRAs in different Regions and MRAs of different municipalities, and also illustrated in Map 6.1. The total sample size planned for paved and unpaved roads under the road agencies is presented in Table 6.4.

Table 6.1: Distribution of Sample Road Length in Different Districts of ERA (km)

Sl. No.	District Name	Climatic Zone	Paved	Unpaved	Total (km)	Percent
1	Alemgena	Central	166	226	392	17.2
2	Adigrat	Northern	61	110	171	7.5
3	Combolcha	Northern	99	116	215	9.5
4	D/Markos	Northern	38	113	151	6.6
5	Gonder	Northern	38	85	123	5.4
6	Shashemene	Southern	76	215	291	12.8
7	Diredawa	Eastern	94	208	302	13.3
8	Nekemte	Western	53	106	159	7.0
9	Jima	Western	37	224	261	11.5
10	Sodo	Southern	84	126	210	9.2
Total (km)			**746**	**1,529**	**2,275**	**100.0**

Table 6.2: Distribution of Sample Roads in Different RRAs (km)

Sl. No.	Region	Unpaved Road (km)	Percent
1	Tigray	48	5.5
2	Afar	36	4.1
3	Amhara	102	11.7
4	Oromia	277	31.7
5	Somali	72	8.2
6	SNNP	251	28.7
7	B.Gumuz	54	6.2
8	Gambella	29	3.3
9	Harar	6	0.6
Total		**875**	**100.0**

Map 6.1: Roads for the Verification Survey

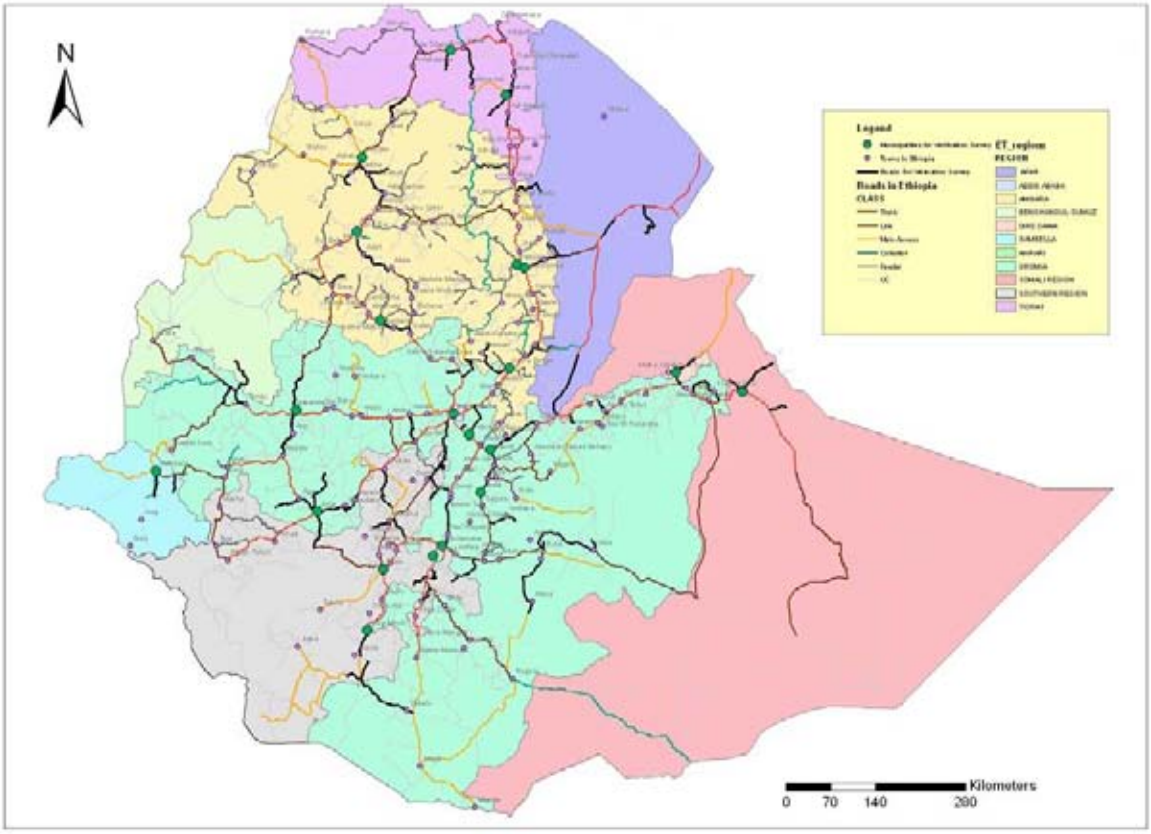


Table 6.3: Distribution of Sample Roads in Different Municipalities (km)

Sl. No.	Municipality	Paved	Unpaved	Total	Percent
1	Addis Ababa	76	112	188	53.7
2	Dire Dawa	3	12	15	4.3
3	Adama	1	6	7	2.0
4	Gonder	3	5	8	2.3
5	Mekele	3	9	12	3.4
6	Bahir Dhar	3	6	9	2.6
7	Jimma	1	4	5	1.4
8	Awassa	2	8	10	2.9
9	Shashemane	--	38	38	10.9
10	Kombolcha	--	5	5	1.4
11	Others	7	46	53	15.1
Total		**99**	**251**	**350**	**100.0**

Table 6.4: Sample Size - Paved & Unpaved Roads (km)

Road Agency	Paved	Unpaved	Total	Percent
ERA	746	1,529	2,275	65%
RRAs	--	875	875	25%
MRAs	99	251	350	10%
Total	**845**	**2,655**	**3,500**	**100%**
Percent	*24.1%*	*75.9%*	*100%*	

6.4.2 Preparation of Survey Formats & Survey Organization

Appropriate "Formats" were prepared for the Road Inventory and Pavement Condition Surveys for paved and unpaved roads to obtain the latest data from the Road Agencies, viz.

ERA, RRAs and MRAs[1]. The Formats are comprehensive enough to obtain the relevant information, and also easy to furnish the information desired, so that the verification of the data and information on the road inventory and pavement condition furnished could be effectively carried out through the proposed sample surveys of 3,500 km of roads under different road agencies.

List of the Formats for the Road Inventory and Pavement Condition Surveys is given in Table 6.5.

Table 6.5: List of the Survey Formats for Data Collection

Format	Pavement Type	Road Agency
Road Inventory Data *[Including Details on Drainage Structure/ Road Furniture Data]*	**Paved**	Ethiopian Roads Authority (ERA)
		Municipal Roads Authorities (MRAs)
	Unpaved	Ethiopian Roads Authority (ERA)
		Regional Rural Road Authorities (RRAs)
		Municipal Roads Authorities (MRAs)
Pavement Condition Data	**Paved**	Ethiopian Roads Authority (ERA)
		Municipal Roads Authorities (MRAs)
	Unpaved	Ethiopian Roads Authority (ERA)
		Regional Rural Road Authorities (RRAs)
		Municipal Roads Authorities (MRAs)

The entries need to be furnished in the Survey Formats aim at collecting information on the existing condition of the roads, in terms of pavement structure, side and cross drainage structures, terrain and road geometry/condition, etc.

The queries stated in the Survey Formats are simple and straight forward, and user friendly. In order to avoid subjective or descriptive narration while collecting the data, the same have been made easy by assigning numeric and alphabetic symbols; which have been illustrated at the bottom of the Formats. The descriptions and legends need to be referred to are very clear and easy to remember as well. The Survey Formats are attached as Annexure 6.2.

During the data collection phase, continuous discussions and updates were made to incorporate all the information required to estimate the existing maintenance needs and related details.

6.4.3 Road Agencies

All the Maintenance Districts of ERA, RRAs of the Regions and MRAs of the Municipalities were considered during the sampling. The contents of the Survey Formats and the sampling exercise were also discussed with officials of the road agencies.

6.4.4 Training, Discussions & Distribution of Survey Formats

During the Workshop organized by the ORF, which was held at Adama in the month of January 2011, and attended by different officials from all the regions of the country; the Study Team Members made a presentation and discussed the needs of establishing the road inventory and pavement condition of the classified road networks of the country. For the purpose, the specially designed “Survey Formats” to be used for collecting data and

[1] The Survey Formats were annexed in the Monthly Progress Report (September 2010) to obtain the feedback and comments from the stakeholders. Contents of the Survey Formats were discussed with the officials of ORF and different road agencies, and the comments were incorporated while finalizing the same.

information relating to the road inventory and the pavement condition of classified roads were discussed with the participants attending the Workshop.

The discussions and training were organized in three small groups in view of effective communications. The Study Team Members actively participated in the training followed by questions and answers session. For better understanding, the clarifications and explanations were made in Amharic, which was appreciated by different participants coming from all over the country.

During the end of training, the Survey Formats were distributed to all the road agencies, and it was requested to furnish data and information of all roads under their administration within one month's time. The need for filling in the Survey Formats was also underlined; which were verified by the Consultants on sample basis through the field surveys. The proposed Verification Survey on sample basis on about 3,500 km of roads selected throughout the country was also discussed during the training.

Photo 5.1: Workshop on Training for Furnishing Data & Information in the Survey Formats at Adama

6.4.5 Verification Survey on the Sample Roads

The Verification Survey was carried out by two groups from January to March 2011. In order to have proper and reliable data collection, each group had one civil engineer as group leader, one material technician, and one surveyor.

6.4.5.1 Selection & Training of the Survey Team

Selection of the Verification Survey staffs was made on the basis of their educational background and experience of carrying out road inventory and condition surveys. The Consultants identified suitably qualified and experienced staffs, who were interested and committed to perform to the best of their professional competence. Before fielding the

selected survey teams, a two-day training was organized in view of the objectives and requirement of the surveys, and handling the GPS and other equipment, etc.

The two-day training was organized with the following coverage:

- Understanding of the objectives, contents and descriptions, and abbreviations used on the Survey Formats;
- Responsibility of each team member and how to furnish the details in the Survey Formats;
- Using and Tracking the roads on the Handheld GPS; and
- Downloading of GPS tracks and files administration of each day activity, such as, naming tracks, naming and locating of photos on the roads and organizing these under special folders.

Field practice was organized in and around Addis Ababa to ensure the level of understanding of each team member and to adopt the content of the formats.

6.4.5.2 The Survey Execution & Administration

Two groups were assigned to cover all Districts under ERA, Regions, and Municipalities. Before starting the survey, discussions were made with the respective officials of the road agencies to obtain basic data of the sample roads. In order to have proper coverage of all the sample roads, responsibilities assigned to each group are stated as follows:

Survey Team	Description of the Responsibility Assigned
Group–1	To cover whole Northern and Eastern ERA's Districts including roads under regional administration, such as, Tigray, Amhara, Afar, Hareri, Somali and eastern part of Oromia, and the Municipalities of these regions.
Group–2	To cover Southern, South Western and Western Districts and regional roads, such as, Oromia, SNNPR, Gambella and Benshangul Gumuz, and the Municipalities of these regions.

Each group was equipped with "Handheld GPS" for proper tracking of the roads, tape to measure the carriageway width, shoulder, span and size of structures. For the measurement of gravel thickness, axles were used for digging the top gravel surface.

Gravel Thickness Measurement in Bedele-Dedessa River Bridge road under Jima District.

Carriageway width Measurement on Dilla-Aletawondo road under Shashemene District.

When the sample roads found under construction, the Consultants modified its sampling in consultations with the ERA's respective District or Regional Road Office staffs and organized the survey on the nearest representative road in the area. Also those regional roads, which

were difficult to drive and assess their condition, the survey team was forced to change to other roads in the vicinity. These required modifications and changes were discussed and also brought out in the Monthly Progress Reports in the corresponding months of the Verification Survey.

Consultations with Staff of Road Agencies on the Survey Formats & the Verification Survey.	Road under Construction observed During the Verification Survey.

Therefore, during the Verification Survey, the Consultants actually covered a total of 3,999 km of roads; under ERA (2,785 km), RRAs (916 km) and MRAs (298 km), which is 14% more than that of the suggested sample size (3,500 km) as per the ToR.

6.4.5.3 Monitoring & Quality Control Mechanism

To achieve the desired objective of the Verification Survey, it was felt necessary that the collected data should be up to the mark, and the Survey Formats contain all the required information properly filled in. Completeness, clarity and filling in the Survey Formats as designed were the requirements of the quality control mechanism during the Survey.

During the Survey, while driving on the roads and filling in the Survey Formats, the team members thoroughly discussed the details on condition of the pavement, shoulder and drainage structures, and also the extent of defects and damages. At the end of each day of the Survey, the team members were assigned to assemble to report and discuss with the Group Leader on the activities carried out, and specific Survey Formats of the roads were collected and recorded in a file. The GPS Tracks were downloaded and checked with the existing available GIS data on the map for proper referencing.

6.5 Road Inventory & Pavement Condition: Data Analysis

Simple and straight forward procedures were used to carry out the analysis of the road inventory and pavement condition on the sample road networks. Roads were categorized under their respective ownership, as ERA, RRAs and MRAs, and recorded in specific folders. In each folder, sub-folders were created as Central, Northern, Eastern, Southern and Western based on their location, and other factors, viz. climate, geographical terrain, etc., particularly in view of HDM-4 analysis. Also sub-folders, accommodating paved and unpaved roads were created for each road agency.

Table 6.6: List of Folders/Sub-Folders (ERA & MRAs)

Road Agency	Region	Surface Type
ERA / MRAs	Central	Paved
		Unpaved
	Northern	Paved
		Unpaved
	Eastern	Paved
		Unpaved
	Southern	Paved
		Unpaved
	Western	Paved
		Unpaved

Table 6.7: List of Folders/Sub-Folders (RRAs)

Road Agency	Region	Surface Type
RRAs	Central	Unpaved
	Northern	Unpaved
	Eastern	Unpaved
	Southern	Unpaved
	Western	Unpaved

The steps followed for analyzing the condition data are briefly given below:

- **First,** the road inventory and pavement condition data of 3,999 km of roads were analyzed by ownership of the road, i.e. ERA, RRAs and MRAs separately for paved and unpaved roads;
- **Second,** the data under the road agencies were divided under the five regions, i.e. Northern, Southern, Eastern, Western and Central Region. The above regions refer to the geographical location and assumed climatic zones to categorize roads having the same climate, average rainfall, etc. All the roads under the 10 districts and 9 regions were distributed among the five above-mentioned climatic regions;
- **Third,** the data collected through the Survey Formats got classified based on various terrains, i.e. flat, rolling and mountain;
- **Fourth,** under different terrains, data were sorted out in terms of condition of the roads, i.e. “very good / good”, “fair”, “poor” and “very poor”; and
- **Fifth,** based on the results obtained from the analysis of Verification Survey data, the share of very good, good, fair, poor and very poor roads was worked out in percentage for different terrains (flat, rolling and mountainous) under each road agencies, i.e. ERA, RRAs and MRAs. The road condition status, thus, worked out in terms of very good, good, fair, poor and very poor roads was suitably used for projecting the road pavement condition of the total road network under different road agencies.

While carrying out the Verification Survey, the Consultants made several observations, as presented below:

I. Federal Roads

- Since the inception of RSDPs, most of the federal roads have been rehabilitated or upgraded, so the proportion of the roads with good condition observed at higher level;
- Considerable size of road network brought under paved road category or currently under upgrading to the paved roads;
- Even though, there have been budgetary constrains for maintenance with all the road agencies, ERA has performed well with better institutional capacity to organize appropriate maintenance activities on all its roads with timely allocating budget; and

- The Consultants observed during the Verification Survey, that the roads under ERA with better pavement condition than the roads under RRAs.

This Road is Saja-Asendabo, recently constructed as Asphalt Concrete, in a very good condition. No problem observed on the pavement & drainage.	This is Konso-Delbena River road of nearly 28 km. This part is recently completed and found in very good condition.

II. Regional Roads

- The size of Regional Road Network has considerably increased, i.e. up to 26,944 km during the past 13 years of the RSDPs, but still there has been budget and capacity constraints realized for these roads on account of maintenance works;
- Except some of the relatively bigger regions, there are institutional problems to implement maintenance activities on a regular and timely manner;
- During the Verification Survey, the Consultants observed that considerable numbers of regional roads were in very poor or bad condition, it was rather difficult to drive even using 4-Wheel vehicles. Under the above situation, the Survey Team was forced to stop the Verification Survey after a few km on such roads;
- It was highly realized that the roads, which were in very poor or bad condition should be rehabilitated to provide proper service for the users, particularly to the rural and remote areas; and
- Insufficient maintenance budget in the regions forced them to perform maintenance activities only on a few sections of the roads under their respective jurisdictions.

Tule-Hantate-Shigasha (SRA Road), part of this road after km 30+000 is very poor, totally deformed and not passable. The road lost all of its gravel and has	Gebelmeno-Kabura-Segen, it traverses on mountainous and escarpment terrain, the gradient is very steep. The surfacing material is very poor so

no camber, no side and cross draiange structures.	that driving is difficult and unsafe.

6.5.1 Verification Survey Results

6.5.1.1 Roads under ERA

Tables 6.8 to 6.11 summarize the results of the Verification Survey showing the existing pavement condition of roads under ERA, region-wise as well as terrain-wise.

Table 6.8: ERA Paved Roads Condition by Region (km)

Region	Flat				Rolling				Mountainous				Total
	VG	G	F	P	VG	G	F	P	VG	G	F	P	
Central	220	14	-	-	94	28	70	-	32	2	2	-	462
Eastern	126	6	52	-	28	6	-	-	48	-	-	-	266
Northern	32	4	4	4	42	12	28	22	12	12	-	14	186
Southern	4	-	11	40	16	2	6	10	2	4	-	-	95
Western	-	-	-	-	6	30	10	-	114	-	-	-	160
Total	**382**	**24**	**67**	**44**	**186**	**78**	**114**	**32**	**208**	**18**	**2**	**14**	**1,169**

VG=Very Good; G=Good; F=Fair; P=Poor.

Table 6.9: ERA Paved Roads Condition by Terrain (km)

Condition	Flat	Rolling	Mountainous	Total	%
V. Good / Good	406	264	226	896	76.6
Fair	67	114	2	183	15.7
Poor	44	32	14	90	7.7
Total	**517**	**410**	**242**	**1,169**	**100.0**

The Verification Survey results show that more than 75% paved network under ERA in good condition, whereas nearly 16% of paved roads in fair condition and around 8% of paved roads in poor condition. The figures are quite near to the RSDP IV estimates.

Table 6.10: ERA Unpaved Roads Condition by Region (km)

Region	Flat				Rolling				Mountainous				Total
	VG	G	F	P	VG	G	F	P	VG	G	F	P	
Central	10	34	40	76	18	52	14	4	-	26	-	-	274
Eastern	-	46	80	12	-	8	8	8	-	14	28	44	248
Northern	2	54	10	-	6	28	2	-	18	142	38	-	300
Southern	8	132	98	28	4	64	44	6	-	40	30	12	466
Western	2	-	12	-	40	112	56	40	-	64	2	-	328
Total	**22**	**266**	**240**	**116**	**68**	**264**	**124**	**58**	**18**	**286**	**98**	**56**	**1,616**

VG=Very Good; G=Good; F=Fair; P=Poor.

Table 6.11: ERA Unpaved Roads Condition by Terrain (km)

Condition	Flat	Rolling	Mountainous	Total	%
V. Good / Good	288	332	304	924	57.2
Fair	240	124	98	462	28.6
Poor	116	58	56	230	14.2
Total	**644**	**514**	**458**	**1,616**	**100.0**

Nearly 57% of unpaved roads under ERA are in good condition and 14% are in poor condition requiring periodic maintenance to operate on an acceptable level of service.

6.5.1.2 Roads under RRAs

Regional Roads under different RRAs, the following road condition is obtained from the Verification Survey.

Table 6.12: Regional Roads Condition (km)

Region	Flat					Rolling					Mountainous					Total
	VG	G	F	P	VP	VG	G	F	P	VP	VG	G	F	P	VP	
Central	1	50	34	1	1	1	46	52	26	6	1	2	12	4	4	241
Eastern	1	20	38	36	1	1	1	1	1	1	1	1	1	1	1	106
Northern	1	46	8	6	1	1	26	14	1	1	1	48	30	8	1	193
Southern	2	40	28	26	4	8	6	32	22	1	1	20	12	22	18	242
Western	1	1	1	1	1	12	20	20	12	2	1	4	14	8	36	134
Total	**6**	**157**	**109**	**70**	**8**	**23**	**99**	**119**	**62**	**11**	**5**	**75**	**69**	**43**	**60**	**916**

VG=Very Good; G=Good; F=Fair; P=Poor; VP=Very Poor.

Table 6.13: Regional Roads Condition by Terrain (km)

Condition	Flat	Rolling	Mountainous	Total	%
V. Good/Good	163	122	80	365	39.8
Fair	109	119	69	297	32.4
Poor	70	62	43	175	19.1
V. Poor	8	11	60	79	8.6
Total	**350**	**314**	**252**	**916**	**100.0**

As per the Verification Survey results, about 40% roads under RRAs are in good condition, whereas about 28% roads are in poor/very poor condition, which shows the inadequate and improper maintenance on the part of RRAs on account of financial and capacity constraints.

6.5.1.3 Roads under MRAs

For Municipalities, the road condition is obtained is presented in Table 6.14.

Table 6.14: Paved Roads Condition under MRAs by Region (km)

Region	Flat				Rolling				Mountainous				Total
	VG	G	F	P	VG	G	F	P	VG	G	F	P	
Central	26.6	14.1	6.5	1.9	42.2	24.1	13.2	3.17	3.06	2.5	1.0	-	138.33
Eastern	4.0	2.0	-	-	-	-	-	-	-	-	-	-	6.00
Northern	1.1	3.45	-	-	-	4.8	-	-	-	-	-	-	9.35
Southern	-	8.6	-	-	1.2	1.9	-	-	-	-	-	-	11.70
Western	3.0	-	-	-	-	0.4	0.2	5.9	-	-	-	-	9.50
Total	**34.7**	**28.15**	**6.5**	**1.9**	**43.4**	**31.2**	**13.4**	**9.07**	**3.06**	**2.5**	**1**	**-**	**174.88**

VG=Very Good; G=Good; F=Fair; P=Poor.

Table 6.15: Paved Roads Condition under MRAs by Terrain Type (km)

Condition	Flat	Rolling	Mountainous	Total	%
V. Good / Good	62.85	74.60	5.56	143.01	81.8
Fair	6.50	13.40	1.00	20.90	11.9
Poor	1.90	9.07	-	10.97	6.3
Total	**71.25**	**97.07**	**6.56**	**174.88**	**100.0**

Condition of paved roads under MRAs is found to be much better as compared to the RRAs. Presently about 82% of paved roads under MRAs are observed in good condition and only 6% roads are in poor condition.

Table 6.16: Unpaved Roads Condition under MRAs by Region (km)

Region	Flat					Rolling					Mountainous					Total
	VG	G	F	P	VP	VG	G	F	P	VP	VG	G	F	P	VP	
Central	-	0.76	8.2	3.2	0.8	-	3.7	0.6	5.34	-	-	5.0	-	0.3	1.7	29.60
Eastern	-	6.4	3.5	-	-	-	-	-	2.0	-	-	6.0	4.0	-	-	21.90
Northern	-	24.1	7.8	8.25	-	-	4.0	0.75	-	-	-	-	-	-	-	44.90
Southern	-	10.7	-	0.9	-	-	-	-	-	-	-	-	-	-	-	11.60
Western	-	11.5	1.19	1.1	-	-	-	-	1.2	-	-	-	-	-	-	14.99
Total	**-**	**53.5**	**20.7**	**13.5**	**0.8**	**-**	**7.7**	**1.35**	**8.54**	**-**	**-**	**11**	**4**	**0.3**	**1.7**	**123**

VG=Very Good; G=Good; F=Fair; P=Poor; VP=Very Poor.

Table 6.17: Paved Roads Condition under MRAs by Terrain Type (km)

Condition	Flat	Rolling	Mountainous	Total	%
V. Good / Good	53.46	7.70	11.0	72.16	58.7
Fair	20.69	1.35	4.0	26.04	21.2
Poor	13.45	8.54	0.3	22.29	18.1
V. Poor	0.80	-	1.7	2.50	2.0
Total	**88.4**	**17.59**	**17**	**122.99**	**100.0**

Nearly 59% of unpaved roads under MRAs are in good condition and 18% are in poor condition requiring periodic maintenance. The situation is comparable with ERA's unpaved roads.

6.6 Road Inventory & Pavement Condition: Baseline Status

The federal and regional road networks considered for the analysis measure 48,793 km. From the total network, 21,849 km of the roads are under ERA, and 26,944 km under the RRAs. Also 4,556 km of Municipality Roads are considered in the analysis. The condition is analyzed by projecting the condition obtained from the results of the Verification Survey. The ERA Roads are distributed in the ten districts as presented in Table **6**.18.

Table 6.18: Baseline Inventory of Road Network under ERA (km)

Sl. No	District	Paved	Unpaved	Total	No. of Segments	Climatic Zone
1	Alemgena	1,597	2,118	3,715	76	Central
2	Adigrat	621	1,062	1,683	27	Northern
3	Combolcha	977	1,092	2,069	46	Northern
4	D/Markos	409	1,066	1,475	29	Northern
5	Gonder	411	799	1,210	27	Northern
6	Shashemene	759	2,011	2,770	48	Southern
7	Diredawa	930	1,944	2,874	25	Eastern
8	Nekemte	544	1,001	1,545	38	Western
9	Jima	397	2,095	2,492	50	Western
10	Sodo	831	1,185	2,016	27	Southern
Total (km)		**7,476**	**14,373**	**21,849**	**393**	

Regional Roads as distributed under different RRAs, are shown in Table 6.19, whereas base year inventory of urban roads - paved and unpaved under MRAs is given in Table 6.20.

Table 6.19: Baseline Inventory of RRAs Network

S. No.	Region	Length (km)
1	Tigray	1,473
2	Afar	1,101
3	Amhara	3,683
4	Oromia	8,354
5	Somali	2,137
6	SNNP	7,482
7	B. Gumuz	1,590
8	Gambella	846
9	Dir Dawa	278
Total		26,944

Source: RSD IV Document (2011).

Table 6.20: Baseline Inventory of Road Network under MRAs (km)

Sl. No	District	Paved	Unpaved	Total
1	Addis Ababa	990.0	1,453.0	2,443.0
2	Dire Dawa	40.8	154.5	195.3
3	Adama	17.5	74.8	92.3
4	Gonder	33.7	66.8	100.5
5	Mekele	37.5	124.9	162.4
6	Bahir Dar	38.3	78.6	116.9
7	Jimma	7.5	55.4	62.9
8	Awasa	25.5	101.5	127.0
9	Shashemene	2.2	495.0	497.2
10	Kombolcha	2.3	62.3	64.6
11	Additional Cities	89.8	604.0	693.8

Sl. No	District	Paved	Unpaved	Total
Total (km)		1,285	3,271	4,556

Source: ORF Budget Proposal for 2008-09.

Results of the Verification Survey have been extrapolated to work out the baseline pavement condition of the entire classified network under the road agencies, i.e. ERA, RRAs and MRAs using the following steps:

- Percentage of pavement condition, i.e. very good/good, fair, poor and very poor, for different pavement types have been obtained for all the districts of ERA, all the regions of the RRAs and all the municipalities in the country (Table 6.8 to Table 6.17). The same percentage has been used to the inventory as given in Table 6.18, Table 6.19, and Table 6.20 to work out the baseline condition data for Ethiopia.
- The terrain type (flat, rolling and mountainous) condition data under different road agencies have been worked out and used to get the similar data for the entire classified network.

The results of pavement condition data as estimated for the classified road network under the Road Agencies ERA, RRAs and MRAs in Ethiopia are shown in Tables 6.21 to 6.23.

Table 6.21: Pavement Condition of Road Network under ERA (2011)

(km)

Road Type	Terrain	V. G / Good	Fair	Poor	Very Poor	Total
Paved Roads	Plain	2,596	429	281	--	**3,306**
	Rolling	1,688	729	205	--	**2,622**
	Mountain	1,445	13	90	--	**1,548**
	Total	**5,729**	**1,171**	**576**	**--**	**7,476**
	Percent	*76.6%*	*15.7%*	*7.7%*	--	*100.0%*
Unpaved Roads	Plain	2,561	2,135	1,032	--	**5,728**
	Rolling	2,953	1,103	516	--	**4,572**
	Mountain	2,704	871	498	--	**4,073**
	Total	**8,218**	**4,109**	**2,046**	**--**	**14,373**
	Percent	*57.2%*	*28.6%*	*14.2%*	--	*100.0%*
Total ERA (km)		**13,947**	**5,280**	**2,622**	**--**	**21,849**
Percent		*63.8%*	*24.2%*	*12.0%*	--	*100.0%*

Table 6.22: Pavement Condition of Road Network of RRAs (Unpaved Roads)

(km)

Pavement Condition	Plain	Rolling	Mountainous	Total	%
Very Good / Good	4,795	3,588	2,353	10,736	39.8%
Fair	3,206	3,500	2,030	8,736	32.4%
Poor	2,059	1,824	1,265	5,148	19.1%
Very Poor	235	324	1,765	2,324	8.6%
Total	**10,295**	**9,236**	**7,413**	**26,944**	**100.0%**
Percent	*38.2*	*34.3*	*27.5*	*100.0%*	

Table 6.23: Pavement Condition of Road Network under MRAs

(km)

Road Type	Terrain	V. G / Good	Fair	Poor	Very Poor	Total
Paved Roads	Plain	462	48	14	-	**524**
	Rolling	548	98	67	-	**713**
	Mountain	41	7	-	-	**48**
	Total	**1.051**	**153**	**81**	**-**	**1,285**
	Percent	*81.8%*	*11.9%*	*6.3%*	-	*100%*
Unpaved Roads	Plain	1,422	550	358	21	**2351**
	Rolling	205	36	227	-	**468**
	Mountain	293	106	8	45	**452**
	Total	**1,920**	**692**	**593**	**66**	**3,271**
	Percent	*58.7%*	*21.2%*	*18.1%*	*2.0%*	*100%*

Road Type	Terrain	V. G / Good	Fair	Poor	Very Poor	Total
Total MRAs (km)		**2,971**	**845**	**674**	**66**	**4,556**
Percent		*65.2%*	*18.6%*	*14.8%*	*1.5%*	*100%*

Figure 6.1: Road Condition for Different Pavement Types under the Road Agencies

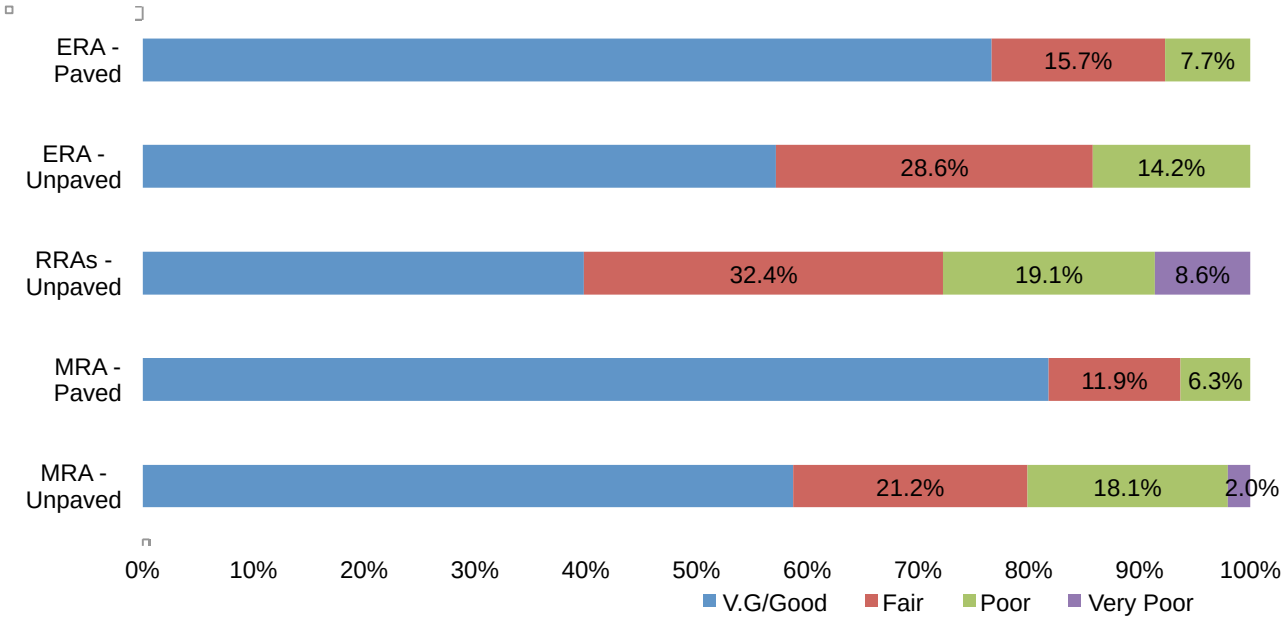
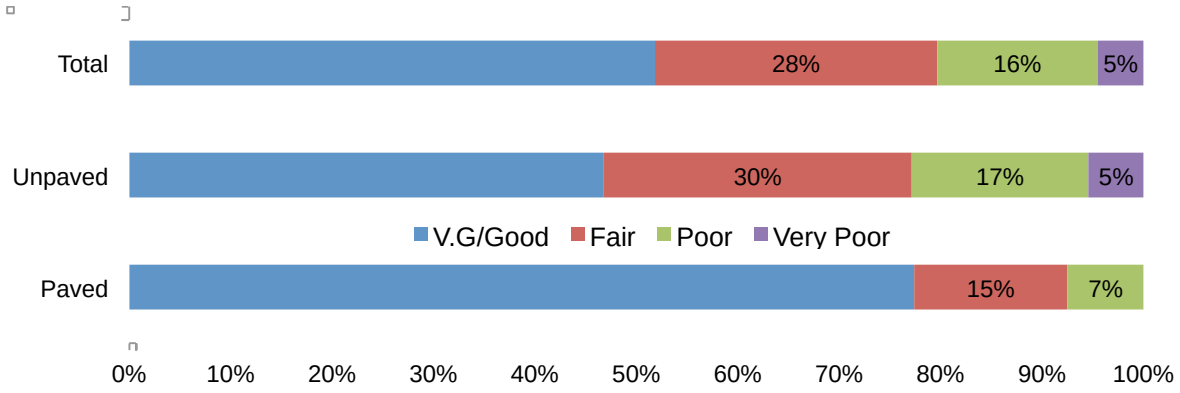


Figure 6.2: Road Condition for Entire Classified Network in Ethiopia



6.7 Issues & Constraints

The Study observed some constraints while undertaking the exercise of sampling, conducting the Verification Survey, and establishing the baseline data for road inventory and pavement condition of the entire classified road network of the country.

Initially, the Survey Formats were prepared for collecting the above data and information, which were to be filled in by the officials of the road agencies in complete manner, so that the data and information collected through the Verification Survey could be duly compared and verified, and discrepancies could be identified. But, most of the road agencies either could not furnish the complete set of data or “no response”. The main reasons for not furnishing the data could be attributed mainly to the lack of resources, capacity and logistics constraints, etc. with the road agencies.

The chapter highlights the issues and constraints realized while undertaking this exercise, which are briefly presented in the following sections.

6.7.1 Sampling

- While undertaking the sampling exercise for the Verification Survey, particularly distributing the district-wise share of paved and unpaved roads, the Study Team, during the field surveys, found that most of the sample roads were paved, and not unpaved as per the available records. Under such situation, the Study selected unpaved roads from nearest or neighboring Districts of ERA.
- It was realized that the relative share of sample size of unpaved roads of the RRAs was rather low as compared to their vast road network, which was a challenging task to finalize the sample. The issue was sorted out by selecting shorter segments from different corners of the regions to have a wider spatial distribution and fair representation.

6.7.2 Verification Survey

- Roads planned for the Verification Survey were sometimes under construction or hard to drive due to their bad condition, which forced the sample to be modified in consultations with the Officials concerned.
- Main sources of some of the data on the Survey Formats have been ERA's Districts, and RRAs or MRAs. However, the Study observed that most of them did not have database illustrating the design standards, traffic level, and other inventory data of their roads; particularly the MRAs, which were important components for establishing the baseline.
- In some districts and regions, it was difficult to contact the focal persons, particularly when the staffs were not in the office and also no right person assigned for discussions.
- The Study observed that most of the surfaced treatment roads under paved road category were in poor condition than asphalt concrete roads even though they were recently constructed or rehabilitated. It is, therefore, suggested that in view of little extra cost implications; the asphalt concrete roads should be preferred, which would also reduce the maintenance burden of future. The option is also supported with the HDM-4 based life cycle cost analysis.
- Roads, which have good pavement structure, are prone to get damaged due to lack of proper drainage structure.
- Almost all gravel roads have no road furniture, such as, sign post, guidepost, km-post, etc. This situation, among others, may cause more accidents, etc. to the users.

6.7.3 Establishing the Baseline Data

Data collected through the Verification Survey have been extrapolated to obtain the condition data for the entire classified network, which in some cases may not show the accurate results because of ongoing road improvement and rehabilitation programs by different road agencies under different schemes. The condition data, thus, establishing the baseline scenario have been used for the maintenance needs assessment, formulating and proposing the maintenance interventions, and the corresponding costs, and also analyzing the Road User Charges to meet the maintenance costs.

7. MAINTENANCE NEEDS ASSESSMENT & COSTS – BASE YEAR

7.0 MAINTENANCE NEEDS ASSESSMENT & COSTS – BASE YEAR

7.1 Introduction

This chapter establishes the base year maintenance needs for different types of roads with current pavement condition requiring different maintenance interventions, and the corresponding maintenance cost implications. The entire maintenance needs assessment exercise is highly guided by the road asset preservation concept in the country. The chapter also compiles the maintenance needs assessment on the basis of the results obtained in Chapter 6.

The Final Report on "Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (June 2011)" presents the details on the maintenance activities, which are eligible for the Road Fund financing. For the purpose of estimating the maintenance needs, the conditions of the roads are categorized as: (i) very good/good; (ii) fair; (iii) poor; and (iv) very poor, which are in conformity with the ERA's classifications used for general and maintenance planning. These classifications are also termed in IRI values to avoid any subjectivity.

The roads showing first three categories, viz. (i) very good/good; (ii) fair; (iii) poor condition are considered as the "maintainable roads", and the roads in very poor condition are considered as failed, requiring rehabilitation with heavy capital cost expenditures, hence not taken under the category of maintainable roads. It is important to note that the Study has considered only the roads under the "maintainable condition" for all the analyses including the maintenance cost exercise.

The types of maintenance interventions considered for the Road Fund financing are grouped under: (i) routine; (ii) periodic; and (iii) emergency.

The unit cost for each type of maintenance interventions is determined from the breakdown of activities under the above-mentioned three maintenance groups. The maintenance interventions have been proposed to improve all the roads with the "fair and poor condition" to "good condition". While formulating the maintenance strategies and related costs; the location of specific roads on different terrains and levels of traffic, have also been taken into account.

7.2 Maintenance Needs in Physical Terms

For establishing the current or base year scenario on the maintenance needs assessment for the road networks under the road agencies of the country, viz. ERA (21,849 km), RRAs (26,944 km) and MRAs (4,556 km), this chapter presents the exercise in detail. The share of maintainable roads (i.e. very good/good, fair and poor condition) in the total size of network has been assessed as 100% of the ERA's roads (paved and unpaved), 91.4% of the RRAs roads (unpaved), and 98.5% of the MRAs roads (100% paved and 98% unpaved).

Table 7.1: Road Inventory with Condition Requiring Maintenance Interventions (2011)

(km)

Road Agency	Paved Road			Unpaved road			Total Classified
	Maintainable	V-Poor	Total	Maintainable	V-Poor	Total	
ERA	7,476	--	7,476	14,373	--	14,373	21,849
RRAs	--	--	--	24,620	2,324	26,944	26,944
MRAs	1,285	--	1,285	3,205	66	3,271	4,556
Total	**8,761**		**8,761**	**42,198**	**2,490**	**44,607**	**53,349**
Percent	*100%*	*--*	*100%*	*95%*	*5%*	*100%*	

Source: The Consultants' Estimates.

It may be noted that the length of roads not found under the group of maintainable condition, could be considered as failed or very poor roads, which would require rehabilitation with higher level of capital expenditure, so does not qualify for maintenance interventions as per the eligibility criteria and, therefore, not to be financed by the Road Fund in normal condition[1].

A summary illustrating the pavement condition of the classified road networks is presented in Table 7.2, which also provides the length of the roads requiring different levels of maintenance interventions with terrain variations under different road agencies.

Table 7.2: Pavement Condition of the Classified Roads by Road Agencies (2010-11)

(km)

Road Type	Terrain	V. G / Good	Fair	Poor	Very Poor	Total	Percent
Ethiopian Roads Authority (ERA)							
Paved Roads	Plain	2,596	429	281	--	3,306	*44.2%*
	Rolling	1,688	729	205	--	2,622	*35.1%*
	Mountain	1,445	13	90	--	1,548	*20.7%*
	Total	**5,729**	**1,171**	**576**	**--**	**7,476**	*100.0%*
	Percent	*76.6%*	*15.7%*	*7.7%*	*--*	*100.0%*	
Unpaved Roads	Plain	2,561	2,135	1,032	--	5,728	*39.9%*
	Rolling	2,953	1,103	516	--	4,572	*31.8%*
	Mountain	2,704	871	498	--	4,073	*28.3%*
	Total	**8,218**	**4,109**	**2,046**	**--**	**14,373**	*100.0%*
	Percent	*57.2%*	*28.6%*	*14.2%*	*--*	*100.0%*	
Total ERA (km)		**13,947**	**5,280**	**2,622**	**--**	**21,849**	
Percent		*63.8%*	*24.2%*	*12.0%*	*--*	*100.0%*	
Regional Roads Authorities (RRAs)							
Unpaved Roads	Plain	4,795	3,206	2,059	235	10,295	*38.2%*
	Rolling	3,588	3,500	1,824	324	9,236	*34.3%*
	Mountain	2,353	2,030	1,265	1,765	7,413	*27.5%*
	Total	**10,736**	**8,736**	**5,148**	**2,324**	**26,944**	*100.0%*
Percent		*39.9*	*32.4*	*19.1*	*8.6*	*100%*	
Municipal Roads Authorities (MRAs)							
Paved Roads	Plain	462	48	14	--	524	*40.8*
	Rolling	548	98	67	--	713	*55.5*
	Mountain	41	7	--	--	48	*3.7*
	Total	**1,051**	**153**	**81**	**--**	**1,285**	*100*
	Percent	*81.8%*	*11.9%*	*6.3%*	*--*	*100.0%*	
Unpaved Roads	Plain	1,422	550	358	21	2,351	*71.9*
	Rolling	205	36	227	--	468	*14.3*
	Mountain	293	106	8	45	452	*13.8*
	Total	**1,920**	**692**	**593**	**66**	**3,271**	*100*
	Percent	*58.7%*	*21.2%*	*18.1%*	*2.0%*	*100.0%*	
Total MRAs (km)		**2,971**	**845**	**674**	**66**	**4,556**	
Percent		*65.2%*	*18.6%*	*14.8%*	*1.5%*	*100.0%*	
Total Classified Roads		***27,654***	***14,861***	***8,444***	***2,390***	***53,349***	
Percent		*51.8%*	*27.9%*	*15.8%*	*4.5%*	*100.0%*	

Source: The Consultants' Compilation based on the data collected during the Verification Survey.

[1] For details, the "Report on Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (June 2011)" may be referred to.

7.3 ERA's Concept of Cost Minimizing Strategy

ERA has prepared a Cost Minimizing Strategy Document for the implementation of growth and transformation program on the road sector for future, and also addressing the Universal Rural Road Access program (URRAP) of the GoE.

The document aims at sorting out the problems of the road sector, particularly the cost minimization strategy. The document, among others, encourages increasing and improving the number of local private contractors and consultants, and also addresses the problems and issues relating to the supply of construction materials and equipment.

The document does not, as such, cover the aspect of the maintenance cost, however, it suggests minimizing the construction cost and focuses on the following main directions:

- Improve performance of local private contractors and their participation;
- Produce more professional and skilled manpower;
- Improve and obtain diversified knowledge on asphalt road construction;
- Make projects to finish with the allocated budget and time;
- Improve the use of road construction technology, equipment and supply;
- Clear the right of way before bidding;
- Improve governmental organization which participate on design, supervision and construction activities;
- Purchase of construction materials and equipment at central level in bulk;
- Improve contract administration;
- Improve the design quality for better construction; and
- Improve research on the road sector.

Though, ERA's Cost Minimizing Strategy document has a limited role in influencing road maintenance strategy and costs for routine and periodic, the Study has reviewed and appropriately utilized the suggestions, etc. while making several maintenance cost estimates.

7.4 Maintenance Interventions Scenarios

The maintenance interventions and the related cost implications have been worked out on the basis of estimated road inventory and pavement conditions of the respective road networks under the road agencies, viz. ERA, RRAs and MRAs. It may be noted that the maintenance interventions also vary from region to region, and terrain to terrain, hence the maintenance costs for different roads with different surface types have been worked out with all the above considerations. The type and level of maintenance interventions have also considered the likely constraints with the road agencies, e.g. capacity and/or budgetary in view of yearly program, as reported during the Study.

It has also been reported that, in past, due to insufficient budget, the road agencies were compelled to perform maintenance activities partially, i.e. the sections which required immediate maintenance or those roads seriously damaged and required timely maintenance, and couldn't get maintenance at the right time, it would eventually fail and would not be able to provide even the minimum service.

In view of the above, the Study has considered different alternative maintenance strategies, which are presented as different scenarios. The need and rationale while proposing different scenarios are described in Table 7.3 for better understanding.

Table 7.3: Need & Rationale of the Proposed Scenarios

Alternative	Need & Rationale
Scenario-1	In order to preserve the existing assets and arrest further deterioration, more attention is proposed towards poor roads, which require periodic maintenance, it is considered that the road with fair condition could wait for a while for the periodic maintenance. So, under Scenario-1, all very good, good and fair roads are proposed for routine maintenance, and all poor roads for periodic maintenance.
Scenario-2	With the consideration of Scenario-1, if there is no financial constraints, some fair roads, which are likely to fall under poor condition, if not attended immediately, should be considered for the periodic maintenance also, particularly the fair roads of the Federal Road network (Trunk, Link and Main access categories), so that further deterioration could be checked/avoided.
Scenario-3	Based on the past experience as reported by the road agencies, viz. ERA and RRAs, particularly in view of the capacity and budget limitations for undertaking the periodic maintenance, 20% of fair roads for periodic and 80% of routine maintenance have been proposed under Scenario-3. And 50% of poor roads of the ERA, and 40% of the RRAs are proposed for periodic maintenance considering their administrative capability of conducting all related activities of the periodic maintenance, whereas poor roads of all MRAs have been proposed for periodic maintenance. Scenario-3 maintains a balance between: (i) saving some selected fair and poor roads from further damage; and (ii) capacity and budget constraints of respective road agencies.
Scenario-4	Scenario-4 considers need and logic as referred to under Scenario-3, excepting 10% of fair roads of ERA as periodic, and 90% as routine; and 50% of poor roads of ERA as periodic; all fair roads of RRAs as routine, and 50% poor roads of the RRAs and MRAs under periodic maintenance.

Table 7.4: Alternative Maintenance Strategies

Alternative	Road Agency / Surface Type	Road Condition	Maintenance Type
Scenario-1	ERA (paved & unpaved), RRAs (unpaved) and MRA (paved & unpaved)	Very Good/Good	Routine
		Fair	Routine
		Poor	Periodic
Scenario-2	ERA (paved & unpaved), RRAs (unpaved) and MRA (paved & unpaved)	Very Good/Good	Routine
		Fair	Routine (80%) & Periodic (20%) of the length
		Poor	Periodic
Scenario-3	ERA (paved & unpaved)	Very Good/Good	Routine
		Fair	Periodic (20%) & Routine (80%) of the length
		Poor	Periodic (50%) of the length
	RRAs (unpaved) and MRAs (paved & unpaved)	Very Good/Good	Routine
		Fair	Routine
		Poor	Periodic (40%) of the length of RRAs and all (100%) roads of MRAs
Scenario-4	ERA (paved & unpaved)	Very Good/Good	Routine
		Fair	Periodic (10%) & Routine (90%) of the length
		Poor	Periodic (50%) of the length
	RRAs (unpaved) and MRAs (paved & unpaved)	Very Good/Good	Routine
		Fair	Routine
		Poor	Periodic (50%) of the length

Source: The Consultants' proposal for analyses.

Summary of the maintenance costs estimated under different scenarios as shown in Table 7.4 is presented in the following sub-sections, whereas detailed working of the above cost estimates has been given in Annexures 7.1 to 7.4.

7.4.1 Maintenance Interventions & Costs: Scenario-1

Scenario-1 refers to where all roads with very good / good and fair condition shall get routine maintenance, and all poor roads, periodic maintenance. The minimum required activities in each type of maintenance intervention are considered to bring the road in good and serviceable condition. Scenario-1 assumes that there is little budget constraints to consider some portion of fair roads for periodic maintenance. It is, therefore, considered that all those roads in fair condition shall get routine maintenance.

Table 7.5: Road Condition & Maintenance intervention under Scenario-1

Road Agency / Surface Type	Road Condition	Maintenance
ERA (paved & unpaved), RRAs (unpaved) and MRA (paved & unpaved)	Very Good/Good	Routine
	Fair	Routine
	Poor	Periodic

Table 7.6: Costs of Routine & Periodic Maintenance under Scenario-1

(ETB in million)

Road Agency	Routine		Periodic		Total		Total
	Paved	Unpaved	Paved	Unpaved	Routine	Periodic	Routine & Periodic
ERA	98.48	85.32	418.80	711.90	183.80	1,130.70	1,314.50
RRA	-	151.05	-	1,953.93	151.05	1,953.93	2,104.98
MRA	16.24	16.70	59.24	205.48	32.94	264.32	297.66
Total	**114.72**	**253.12**	**478.04**	**2,871.31**	**367.79**	**3,349.35**	**3,717.14**

Source: The Consultants' Estimates.

7.4.2 Maintenance Interventions & Costs: Scenario-2

Scenario-2 accommodates all very good, good and 80% of fair condition roads of ERA for routine maintenance and 20% of fair condition, and all poor conditions roads get periodic maintenance. The roads under RRAs and MRAs Roads with very good, good and 80% of fair condition get routine maintenance; 20% of fair and all poor condition roads get periodic maintenance. Scenario-2 assumes that there are no budget constraints to consider all length of poor roads and 20% of fair roads for periodic maintenance in one year time.

Table 7.7: Road Condition & Maintenance intervention under Scenario-2

Road Agency / Type of Surface	Road Condition	Maintenance Type
ERA (paved & unpaved), RRAs (unpaved) and MRA (paved & unpaved)	Very Good/Good	Routine
	Fair	Periodic (20%) & Routine (80%) of the length
	Poor	Periodic

Table 7.8: Costs of Routine & Periodic Maintenance under Scenario-2

(ETB in million)

Road Agency	Routine		Periodic		Total		Total
	Paved	Unpaved	Paved	Unpaved	Routine	Periodic	Routine & Periodic
ERA	91.65	75.68	581.18	996.26	167.33	1,577.44	1,744.77
RRAs	--	130.51	--	2.559.47	130.51	2,559.47	2,689.98
MRAs	15.34	15.09	80.49	254.66	30.43	265.67	296.10
Total	**106.99**	**221.28**	**661.67**	**3,810.39**	**328.27**	**4,402.58**	**4,730.85**

Source: The Consultants' Estimates.

7.4.3 Maintenance Interventions & Costs: Scenario-3

Scenario-3 covers all very good, good and 80% of fair condition roads of ERA for routine maintenance and 20% of fair condition roads, and 50% of poor conditions roads for periodic maintenance. The RRAs and MRAs Roads with very good, good and fair condition will get

routine maintenance and 40% of poor condition RRAs roads and all poor condition roads of MRAs are proposed for periodic maintenance. Scenario-3 appreciates that there are some budget and capacity constraints to consider all length of poor roads for periodic maintenance in one year time.

Table 7.9: Road Condition & Maintenance intervention under Scenario-3

Road Agency, Type of Surface	Road Condition	Maintenance Type
ERA (paved & unpaved)	Very Good/Good	Routine
	Fair	Periodic (20%) & Routine (80%) of the length
	Poor	Periodic (50%) of the length
RRAs (unpaved) and MRAs (paved & unpaved)	Very Good/Good	Routine
	Fair	Routine
	Poor	Periodic (40%) of the RRAs length and all roads of MRAs

Table 7.10: Costs of Routine & Periodic Maintenance under Scenario-3

(ETB in million)

Road Agency	Routine		Periodic		Total		Total
	Paved	Unpaved	Paved	Unpaved	Routine	Periodic	Routine & Periodic
ERA	91.65	75.67	371.77	640.31	167.32	1,012.08	1,179.40
RRA	-	151.05	-	781.57	151.05	781.57	932.62
MRA	16.23	16.71	59.24	205.48	32.94	264.72	297.66
Total	**107.88**	**243.43**	**431.01**	**1,627.36**	**351.31**	**2,058.37**	**2,409.68**

Source: The Consultants' Estimates.

7.4.4 Maintenance Interventions & Costs: Scenario-4

After having appreciating the need and logic as referred to under Scenario-3, Scenario-4 considers 10% of fair roads of ERA as periodic, and 90% as routine; and 50% of poor roads of ERA as periodic; all fair roads of RRAs as routine, and 50% poor roads of the RRAs and MRAs under periodic maintenance.

Table 7.11: Road Condition & Maintenance intervention under Scenario-4

Road Agency, Type of Surface	Road Condition	Maintenance Type
ERA (paved & unpaved)	Very Good/Good	Routine
	Fair	Periodic (10%) & Routine (90%) of the length
	Poor	Periodic (50%) of the length
RRAs (unpaved) and MRAs (paved & unpaved)	Very Good/Good	Routine
	Fair	Routine
	Poor	Periodic (50%) of the length

Table 7.12: Costs of Routine & Periodic Maintenance under Scenario-4

(ETB in million)

Road Agency	Routine		Periodic		Total		Total
	Paved	Unpaved	Paved	Unpaved	Routine	Periodic	Routine & Periodic
ERA	95.06	80.50	290.59	498.13	175.56	788.72	964.28
RRA	-	151.04	-	976.96	151.04	976.96	1128.00
MRA	16.24	16.71	29.62	102.74	32.95	132.36	165.31
Total	**111.30**	**248.25**	**320.21**	**1,577.83**	**359.55**	**1,894.04**	**2,257.59**

Source: The Consultants' Estimates.

7.5 Maintenance Needs in Financial Terms

The Study has analyzed all the alternatives as discussed and categorized under Scenario-1 to Scenario-4; of which Scenario-3 appears to be the preferred option, which considers the

prevailing budgetary limitations and also the capacity constraints in implementing the entire maintenance activities on yearly basis, i.e. existing with the road agencies, viz. RRAs and the Districts of ERA.

The Study also considers the relative importance of ERA's roads in the country's network as they include major Trunk, Link and Main Access roads connecting major economic centers and important development corridors. Scenario-3 offers some attention to provide periodic maintenance for fair roads of ERA and at least half of the poor condition roads get periodic maintenance in the coming one year.

7.5.1 Maintenance Cost Implications Analysis & the Preferred Scenario

The Study has analyzed different maintenance cost implications, and the results to be achieved. Table 7.13 summarizes the exercise carried out in this regard.

Table 7.13: Maintenance Cost Implications in Different Scenarios

Scenario	Maintenance Cost (ETB million)			Cost Implications & Other Considerations
	Routine	Periodic	Total	
Scenario-1	367.79	3,349.35	3,717.14	All fair roads shall get routine maintenance, and all poor roads get periodic maintenance regardless of the road agencies. Also poor conditions shall get periodic maintenance in one year time, if there is no capacity and budgetary constraints.
Scenario-2	328.27	4,402.58	4,730.85	80% of fair roads shall get routine and 20% get periodic maintenance, and all poor roads get periodic maintenance regardless of the road agencies. It is important to include fair roads in the periodic maintenance program to decrease rate of deterioration, if the budget allows. Also poor conditions shall get periodic maintenance in one year time, if there is no capacity and budgetary constraints. At the end, more roads would achieve good condition.
Scenario-3*	351.31	2,058.37	2,409.68	Existing capacity and budgetary constraints got attention parallel with the type of condition and road agency. 80% of fair roads of ERA shall get routine and 20% periodic maintenance, but for the RRAs, all fair roads shall get routine maintenance. At least 50% of poor roads of ERA shall get periodic maintenance, and 40% of the RRAs roads in poor condition shall get periodic maintenance, and all poor roads of MRAs shall get the periodic maintenance. It is important to include major links into attention specially ERA's roads in the periodic maintenance program to decrease rate of deterioration. At the end, more roads would achieve the level of good condition.
Scenario-4	359.55	1898.04	2,257.59	It is the same as Scenario 3, except 10% of fair roads get periodic and 90% get routine maintenance for ERA roads, all fair roads of RRAs get routine maintenance. 50% of poor roads of RRAs and similarly 50% of poor roads of MRAs shall get periodic maintenance.

Source: The Consultants' Estimates. *Preferred option.

Table 7.13 shows maintenance cost implications and other related considerations under different scenarios. Scenarios-1 and -2 present the ideal scenarios where all poor roads would be maintained to bring entire classified network to the good condition in one year, whereas Scenarios-3 and -4 propose to bring all the roads in desirable condition in two years time. Scenario 3 considers 20% of fair roads of ERA and all poor road of MRAs for periodic maintenance, whereas Scenario 4 considers only 10% of fair roads of ERA and 50% of poor road of MRAs for periodic maintenance.

In view of financial as well as capacity constraints of the road agencies, it is important to emphasize major links especially ERA's roads in the periodic maintenance program to decrease rate of deterioration. Scenario-3 fulfills the requirements and, hence, is the preferred one.

7.5.1.1 Regional Variations

In order to address the discrepancies in the unit costs of several maintenance components and activities on account of the location of various regions the analysis has been carried out. For the purpose, remoteness or long distance from the city of Addis Ababa, the center of all major economic activities and availability of man-machine-materials; which considerably affects the unit costs as well as time elapsed in mobilization of the resources has been considered. With the above considerations, the Study has estimated the unit cost of each type of interventions of all the possible activities.

Basis for the assumptions of various costs include construction materials, labor (skilled and unskilled), construction equipment and transport, etc. Cost of construction materials varies mainly on its availability and the cost of transport required for moving the material to the target regions. Labor is also one of the basic factors which plays an important role in affecting the costs.

There are a few regions, which have ample and surplus labor force, e.g. Tigre, Amhara, Oromiya and SNNPR, whereas some regions, viz. Afar, Somali, Gambella, etc. have shortage or hardly any labor force available for the maintenance activities. The above phenomenon particularly has great impact on routine maintenance activities in the remote areas of some regions, where small size of labor force is required.

The regions, which have been reported and noticed as critical with the resource scarcity are: Afar, Somali, Gambella and Benshangul Gumuz.

Road traffic volume and its composition vary significantly when moving from central to remote areas of the country. In remote and far flung areas, traffic volume becomes smaller, but the presence of trucks and truck trailers are observed relatively more, so the extent of road deterioration and corresponding maintenance interventions are accordingly desirable. Also, some of the feeder and collector roads have low traffic, but the composition is skewed towards the heavy vehicles damaging the pavement surface, and in turn, requiring more maintenance cost.

In view of the above, the Study addresses the regional variations by adding 10% on an average on top of the unit rates derived for Addis Ababa.

7.5.1.2 Terrain Variations

Specific type of terrain is also another important factor, which influences the maintenance activities accordingly, and in turn, the maintenance cost. It is well realized that the road deterioration, among others, is also prone to types of terrain and road geometry. Road alignment is highly affected by the terrain classification of the traversed areas.

Erosion and scouring, sliding and slope instability are major problems of hilly and mountainous terrains. To protect the roadbed and structures from erosion and scouring, retaining walls, gabion walls, check dams, etc. are recommended maintenance activities, which get due attention in the calculation of the unit cost.

On the flat terrain, where cross drainage structures and ditches are more susceptible for siltation and over-flooding, ditch cleaning and removal of derbies are routine activities considered in deriving the unit cost. The Study estimates the routine and periodic maintenance costs considering variations in terrain and, hence, different unit costs are worked out for roads in flat, rolling and mountainous terrains.

7.5.2 Maintenance Cost Estimates

While determining the type of maintenance interventions required and the related costs for each type of activity, the Study considers the regional discrepancies, and terrain variations, as stated in the above sections. Table 7.14 brings out the unit costs for the routine and periodic maintenance for paved and unpaved roads, and also for different terrains, viz. flat, rolling and mountainous and existing surface condition of the roads.

Table 7.14: Unit Rates for Maintenance Works

(ETB/km)

Pavement Condition	Maint. Type	Paved Roads			Unpaved Roads		
		Plain	Rolling	Mountain	Plain	Rolling	Mountain
Ethiopian Roads Authority (ERA)							
V. Good/ Good	Routine	10,874	11,418	11,635	4,471	4,516	4,560
	Periodic	--	--	--	--	--	--
Fair	Routine	28,273	29,687	30,252	11,625	11,741	11,976
	Periodic	682,371	699,481	707,999	343,523	346,547	351,456
Poor	Routine	--	--	--	--	--	--
	Periodic	716,490	734,455	743,399	345,240	348,280	353,213
Rural Roads Authorities (RRAs)							
V. Good/ Good	Routine				4,471	4,517	4,560
	Periodic				--	--	--
Fair	Routine				11,625	11,741	11,976
	Periodic				343,523	346,547	351,456
Poor	Routine				--	--	--
	Periodic				376,629	379,942	383,741
Municipal Roads Authorities (MRAs)							
V. Good/ Good	Routine	10,874	11,418	11,635	4,471	4,516	4,560
	Periodic	--	--	--	--	--	--
Fair	Routine	28,273	29,687	30,252	11,625	11,741	11,976
	Periodic	682,371	699,481	707,999	343,523	346,547	351,456
Poor	Routine	--	--	--	--	--	--
	Periodic	716,490	734,455	743,399	345,240	348,280	353,213

Source: The Consultants' Estimates.

7.5.3 Unit Maintenance Costs – Fixed & Variable by Road Type

In order to derive the Road User Charges that could cover the maintenance costs, the present exercise aims at bifurcating the maintenance costs into fixed and variable cost components. The cost distribution, in terms of fixed and variable, is required to be distributed among the total vehicles of different types plying on the country's road networks, so that equitable distribution of the maintenance cost and the corresponding road user charges could be estimated rationally.

The concept and methodology used for estimating the "Fixed and Variable Costs" have been discussed in detail in the Report on "Review of Existing Road Revenue and Recommendation for New Sources of Revenue (Final Report, September 2011). For the reference, the maintenance cost components with descriptions whether fixed or variable for different pavement types are presented in the following sections.

7.5.3.1 Annualized Unit Costs

In view of different types of maintenance interventions, viz. routine and periodic, which need to be carried out appropriately as per the requirements of different road surface and pavement conditions, any estimates of the maintenance need and costs in isolation, say only for a particular calendar or financial year, may be misleading, particularly when considering the periodic maintenance, which is administered after certain intervals of year depending on

the surface type, terrain, traffic level, etc. In order to address the above cost implication issues, which could cater to the routine and periodic maintenance costs, the Study has adopted the concept of "annualized cost" estimates, so that the required budget for the maintenance on a yearly average basis could be appreciated.

7.5.3.2 Gravel Roads

Bifurcation of the unit maintenance costs, in terms of fixed and variable, for gravel roads, HDM-4 analyses have been carried out by using the appropriate maintenance standards for base level of service for different road classes and traffic levels.

In order to estimate the fixed costs for periodic maintenance, HDM-4 Model has been used for the minimum level of periodic maintenance required. Under no traffic case, only the effects of environment/climate are considered. The analysis shows that even without any traffic, re-graveling would have to be carried every 12 years to keep the gravel thickness at the required serviceability level; and hence, such cost need to be classified as 'Fixed Costs'. The Variable Costs of maintenance that mainly depend on the traffic are estimated by the additional interventions required for different traffic levels.

For routine maintenance, grading costs and spot graveling, mainly dependent on traffic levels, have been considered as "Variable Costs", and all other routine maintenance costs taken as "Fixed Costs". The unit annualized maintenance costs for periodic maintenance and for routine maintenance are shown in Table 7.15.

Table 7.15: Annualized Maintenance Costs of Gravel Roads

Road Class (vpd)	Daily Traffic (vpd)	Periodic Maintenance (ETB/km/yr)		
		Fixed	Variable	Total
Periodic Maintenance				
Federal Roads				
Very Low Traffic (0-75)	55	27,828	2,530	30,358
Low Traffic (75-150)	135	27,828	5,566	33,394
Medium Traffic (150-300)	270	27,828	9,276	37,104
High Traffic (300-500)	480	27,828	13,914	41,742
Very High (>500)	620	27,828	13,914	41,742
Weighted Average	320	27,828	9,897	37,725
Regional Roads	63	16,697	3,339	20,036
Urban Roads	244	22,262	4,452	26,714
Routine Maintenance				
Federal Roads				
Very Low Traffic (0-75)	55	10,176	4,563	14,739
Low Traffic (75-150)	135	10,176	5,693	15,869
Medium Traffic (150-300)	270	10,176	9,125	19,301
High Traffic (300-500)	480	10,176	11,637	21,813
Very High (>500)	620	10,176	14,148	24,324
Weighted Average	**320**	**10,176**	**9,449**	**19,625**
Regional Roads	63	6,106	2,927	9,033
Urban Roads	244	8,141	4,452	12,593

Source: The Consultants' Estimates.

7.5.3.3 Paved Roads

For the paved roads, the bifurcation of unit annualized maintenance costs in terms of fixed and variable costs have been carried out using the appropriate maintenance interventions under both the conditions, of no traffic, and different levels of traffic.

Based on the above concept, the optimal periodic maintenance frequency for different levels of traffic has been worked out. For estimating the fixed cost components of paved roads maintenance, the HDM analysis illustrates that even without traffic; periodic maintenance would have to be carried out every 15 years to keep the road at the required level of serviceability.

Variable costs have been estimated by the additional maintenance required for different levels of traffic. For routine maintenance, asphalt patching (seal coat), hot mini-mix and pot hole reinstatement costs, and costs relating to the betterment and markings, which are dependent on different levels of traffic, have been considered as "Variable Costs", and all other routine maintenance costs not affected by levels of traffic are taken as "Fixed Costs".

The unit annualized maintenance costs for periodic maintenance and routine maintenance for paved roads are shown in Table 7.16.

Table 7.16: Unit Annualized Maintenance Costs of Paved Roads

Road Class (vpd)	Daily Traffic (vpd)	Periodic Maintenance (ETB/km/yr)		
		Fixed	Variable	Total
Periodic Maintenance				
Federal Roads				
Very Low Traffic	402	37,146	9,287	46,433
Low Traffic	1,250	37,146	13,508	50,654
Medium Traffic	2,500	37,146	24,764	61,910
High Traffic	6,600	37,146	42,453	79,599
Weighted Average	1,834	37,146	17,228	54,374
Urban Roads	4,896	37,146	18,573	55,719
Routine Maintenance				
Federal Roads				
Very Low Traffic	402	9,441	3,279	12,720
Low Traffic	1,250	9,441	6,558	15,999
Medium Traffic	2,500	9,441	13,148	22,589
High Traffic	6,600	9,441	17,107	26,548
Weighted Average	1,834	9,441	8,889	18,330
Urban Roads	4,896	9,441	3,279	12,720

Source: The Consultants' Estimates.

7.5.4 Annualized Road Maintenance Costs – Fixed & Variable

In view of the logic as stated in Section 7.5.3.1, this part of the chapter presents annualized maintenance costs in aggregate manner and distributed among the road agencies, road surface type and traffic levels in terms of fixed and variable costs.

As described earlier, for estimating the road user charges, the annualized road maintenance cost has been derived and bifurcated into the fixed and variable cost components. The steps followed for carrying out the exercise for the classified road network in Ethiopia, are given as follows:

- Estimates of annual distance traveled by different vehicles have been undertaken using road network length under different road agencies; and the figures obtained showing total vehicle-km got distributed by vehicle and road type based on the average traffic volume on different types of roads;
- Road maintenance costs for different road types – paved and unpaved, have been estimated based on the existing road condition and, therefore, appropriate interventions to preserve the national assets and also to bring the roads to an acceptable level of service; and
- The maintenance cost, thus, estimated, is divided into the fixed and variable costs for allocating to different vehicle types to observe the equitable distribution, conforming to the road user charges concept in a rational manner.

Total maintenance costs for the base year (i.e. 2010-11) in terms of fixed and variable costs are given in Table 7.17.

Table 7.17: Road Maintenance Costs – Fixed & Variable

(ETB in million)

Road Classification	Surface	Fixed Cost		Variable Cost		Total Cost	
		Amount	% to Total	Amount	% to Total	Amount	%
Federal (ERA)	Paved	303.87	36.3	532.80	63.7	836.67	100.0
	Unpaved	476.29	66.3	242.33	33.7	718.63	100.0
Regional (RRAs)	Unpaved	536.17	78.4	147.34	21.6	683.51	100.0
Municipal (MRAs)	Paved	52.25	88.4	6.88	11.6	59.13	100.0
	Unpaved	86.43	77.3	25.31	22.7	111.75	100.0
Total (With MRAs)	All Inclusive	1,455.02	60.4	954.66	39.6	2,409.69	100.0
Total (No MRAs)	--do--	1,316.34	58.8	922.47	41.2	2,238.81	100.0

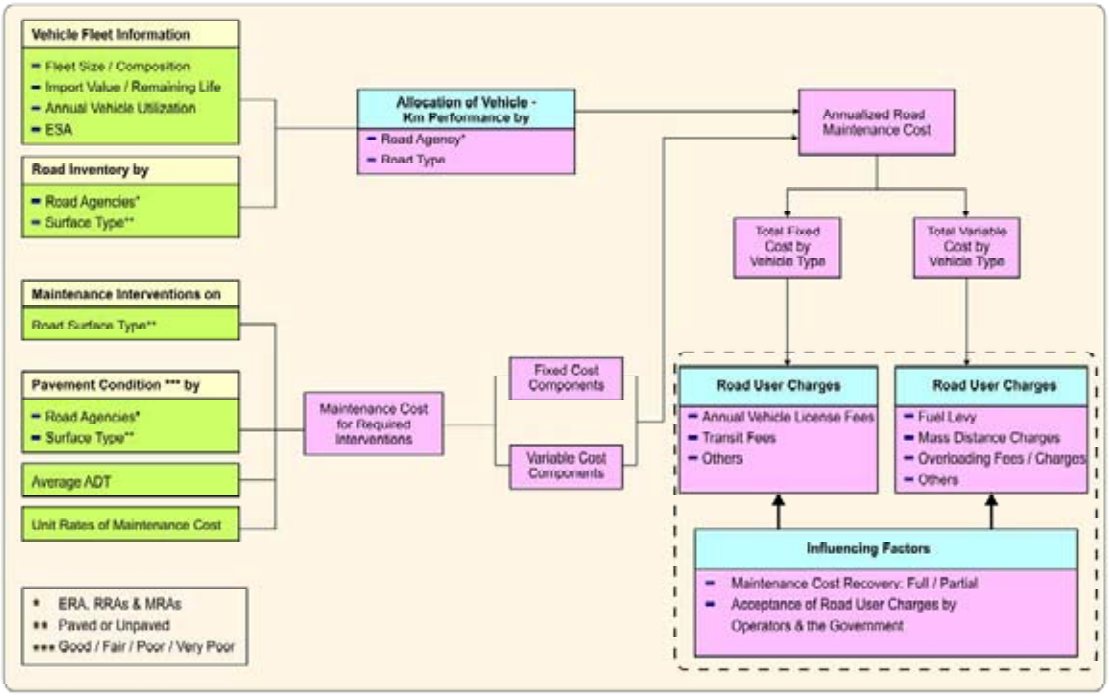
Source: The Consultants' Estimates.

7.6 Allocation of Maintenance Cost & Road User Charges

Under the Study, finalizing the road maintenance needs and cost implications of the maintainable roads under the classified road categories administered by the road agencies, have been worked out and presented in the Report on "Computer Model and Multiyear Road Maintenance Needs Assessment (Final Report, November 2011). The exercise is based on several parameters and logical algorithm, which would be carried out by the specially developed Software, i.e. E-RUCS on an iterative basis.

The Study has developed the maintenance costs of the classified roads considering their present road length and the surface type and condition; and its allocation to different types of vehicle plying on different types of road under different road agencies; so that an equitable distribution of the maintenance could be observed. The steps and methodology followed to develop the road maintenance cost and its allocation to different vehicles duly classified into the components of fixed costs and variable costs, are illustrated in a flow chart (Figure 7.1).

Figure 7.1: Methodology for Road Maintenance Needs, Cost & Setting Road User Charges



It is important to mention that while developing the road user charges, the fixed and variable cost components need to be logically used considering their role in road surface consumption and also the collection convenience, transparency in estimation and advocacy for accepting the proposed revision of prevailing sources of revenue and introduction of additional/new sources of revenue. For example, the annual vehicle license fees should largely be used for recovering the fixed cost in maintenance, whereas, the fuel levy, mass-distance charges and heavy vehicle tax should cover the variable cost components of the maintenance cost.

Table 7.18: Vehicle-wise Allocation of Maintenance Costs

(ETB)

Vehicle Type	Periodic & Routine Maintenance Cost				Routine Maintenance Cost Only			
	Fixed Cost per Vehicle	Variable Cost		Total per Vehicle	Fixed per Vehicle	Variable Cost		Total per Vehicle
		Per Veh.-km	Per Vehicle			Per Veh.-km	Per Vehicle	
Car (P)	660	0.0238	296	956	159	0.0115	144	303
Car (D)	972	0.0237	294	1,266	241	0.0115	143	383
Station Wagon (P)	6,934	0.0732	2,641	9,574	1,798	0.0349	1,261	3,058
Station Wagon (D)	7,596	0.0732	2,643	10,239	1,971	0.0350	1,262	3,232
Minibus (P)	2,359	0.0295	1,185	3,544	571	0.0143	576	1,147
Minibus (D)	2,352	0.0294	1,182	3,533	569	0.0143	574	1,143
Large Bus (D)	8,756	0.0592	2,764	11,520	2,193	0.0255	1,190	3,383
Light Truck (P)	3,868	0.0829	1,277	5,145	1,002	0.0394	606	1,608
Light Truck (D)	3,862	0.0828	1,276	5,137	1,000	0.0393	606	1,606
Med. Truck (D)	9,884	0.2234	8,873	18,757	2,496	0.0835	3,316	5,813
Heavy Truck (D)	15,353	0.2510	13,465	28,818	3,811	0.0939	5,035	8,846
Artic. Truck (D)	27,368	0.3190	19,088	46,456	6,837	0.1247	7,464	14,301

Source: The Consultants' Estimates. (P)=Petrol; and (D)=Diesel.

One of the basic requirements of the Study is to determine the multiyear road maintenance needs and costs for next 10 years[2] in order to ensure the performance of roads in Ethiopia on an acceptable level of service. Maintenance needs assessment and the related costs for the next 10 years and, thus, average annualized maintenance cost for the classified road network in the country has been estimated and presented in chapter 8.

Accordingly, vehicle-wise Allocation of Maintenance Costs is given in Table 7.18. The figures given under columns of fixed cost per vehicle and variable cost per vehicle-km/vehicle have been suitably used to meet the total road maintenance cost depending on the maintenance strategies and policies.

7.7 Sum Up

The results of the exercise carried out on road maintenance needs assessment and cost implications are summarized as follows:

- All the paved roads under ERA (7,476 km) and MRAs (1,285 km) are identified in maintainable condition, so appropriate routine maintenance, i.e. on yearly basis, and the periodic maintenance at an interval, i.e. 5-7 years, as per the surface condition, terrain, and levels of traffic, etc., have been proposed.
- Under paved roads, no road sections found as very poor roads or failed roads, so there is no case of backlog of severe maintenance or rehabilitation.
- While analyzing the results of unpaved roads, as much as 95% of the total unpaved roads have been found in maintainable condition.
- Entire road network under ERA is observed in maintainable condition.
- In case of unpaved road networks under the RRAs, more than 8.6% of the total road network has been found in very poor or failed condition, hence, does not qualify for the ORF financing, rather there is a need for rehabilitation with higher capital expenditures.
- Only 66 km of roads under MRAs found in very poor condition requiring rehabilitation.
- In order to have an optimum road maintenance strategy, particularly in view of the limited maintenance budget and capacity constraints of the road agencies, the Study has considered four alternative maintenance scenarios. A brief description, merits and demerits of the scenarios considered is illustrated as follows:

Scenario	Merit	Demerit
Scenario-1	It ensures to preserve the road assets, as this considers all poor roads for periodic maintenance, and checks further deterioration.	Requires higher budget, and does not consider the capacity of the road agencies in implementing, particularly for periodic maintenance.
Scenario-2	It also considers some fair roads, in addition to all poor roads for periodic maintenance. Some federal roads of trunk, link and main access category get attention for the maintenance.	It requires much higher budget, with no consideration of capacity constraints to implement the periodic maintenance on yearly basis, as per the requirements.
Scenario-3	Considers budget constraints and past experience of implantation of periodic maintenance as well as preserving considerable size of fair and poor roads from further deterioration by providing periodic maintenance.	Does not consider all poor roads for periodic maintenance, resulting in further deterioration.
Scenario-4	Considers budget constraints and past experience of the road agencies, and requires bit lesser budget than Scenario-3, accordingly lesser size of road network maintenance, particularly for periodic maintenance.	As compared to Scenario-3, it considers smaller size of road network for periodic maintenance activities.

[2] As per the ToR, the Study is required to present the year-wise detailed maintenance needs assessment for first 5 years and rough estimate for next 5 years.

- The summary of total annualized costs of maintenance (routine and periodic) under different scenarios is given as follows:

Scenario	Maintenance Cost (ETB in million)	Remarks / Comments
Scenario-1	3,717.14	High budget, not easy to achieve and capacity issue
Scenario-2	4,730.85	Very high budget, and not easily achievable
Scenario-3	2,409.68	Acceptable budget and more practical option
Scenario-4	2,257.59	Acceptable, but smaller network under maintenance

- **The Most Preferred Option:** Scenario-3 is the most preferred option, which considers the past experience, capacity and budgetary constraints of undertaking maintenance activities, which could also be considered as most practical option. Under Scenario-3, considerable size of roads with fair and poor condition could be undertaken for maintenance, and hence, further deterioration could be arrested. The estimated cost worked out under Scenario-3 is realistic and acceptable, and the targets set can be achieved. This option/scenario, among others, ensures the preservation of road assets of the country with quality service.

8. ROAD DETERIORATION MODEL AND APPLICATIONS

8.0 ROAD DETERIORATION MODEL & APPLICATIONS

8.1 General

This chapter presents the results of the Road Deterioration Model based on the HDM analysis; and also suggests the required road maintenance interventions[1]. The exercise has been carried out in view of the road asset preservation under different road surfaces, traffic levels and other external conditions, which are largely responsible for road deterioration.

Results of the Road Deterioration Model, among others, have also been used to derive the overloading fines/fees on account of damages caused by the overloaded vehicles in the country, and determining the rational road user charges, to cover the extent of road deterioration, e.g. Mass Distance Charges (MDCs) to be adopted for the federal paved road network in Ethiopia.

The chapter also reviews the enforcement mechanism to curb the tendency of overloading by intercepting the overloaded vehicles at the existing weighbridge stations and also identifies additional weighbridge stations at the appropriate strategic locations on the main road network in the country.

The chapter works out the maintenance needs and the costs for the next 10 years[2] , i.e. multiyear analysis. The exercise would enable to appreciate the requirements of fund, which would be needed yearly for maintaining and preserving the road assets of the country.

The multiyear analysis primarily estimates the costs for undertaking the maintenance activities on the classified roads being administered by the road agencies, and also incorporates the maintenance costs for the “Wereda Roads”, which are being developed under the Universal Rural Road Access Program (URRAP) of the RSDP IV.

The outputs of this chapter would be the building blocks for the subsequent chapters dealing with and working out the maintenance needs assessment and cost implications for present and future, and also determining and rationalizing various road user charges.

8.2 Road Deterioration Model

8.2.1 Coverage & Uses

The Road Deterioration Model has been developed based on the HDM-4 analysis. The Model covers the entire maintainable classified road networks administered by different road agencies, which would help in developing proper strategies and policies of preserving the road assets in the country.

The Deterioration Model, inter alia, has been used to assess the year-wise requirement of maintenance interventions to keep the maintainable classified road network on a satisfactory level of service for the next 10 years. The Model’s results have also been used for estimating the overloading charges in order to meet the incremental maintenance cost caused by the heavily loaded vehicles due to damages made by the overloaded vehicles, and to estimate the probable Mass Distance Charges (MDCs), i.e. one of the potential sources of revenue to

[1] The details are given in the “Computer Model and Multiyear Maintenance Needs Assessment (Final Report), November 2011 under the present Study.

[2] As per the ToR, the Study is required to present the year-wise detailed maintenance needs assessment for first 5 years and rough estimate for next 5 years.

the Road Fund in Ethiopia. The MDCs may be introduced as an additional source of revenue to cover part of the variable costs for maintenance.

8.2.2 Road Maintenance Strategies & Standards

Funds allocation for the road maintenance in Ethiopia is generally based on resource and capacity available, not necessarily on the actual maintenance requirements of road network in the country. Like other developing countries, in Ethiopia also, maintenance of roads usually does not receive adequate attention of the authorities responsible. The consequences of this practice are the deterioration of road network in the country[3]. The required maintenance activities are performed by the road agencies, but not on the optimal basis because of resource constraints. Hence, in order to have proper assessment of maintenance requirement, there is a need for formulating adequate road maintenance strategies and standards, i.e. timely and proper maintenance interventions, to be setup related to traffic, terrain, and climate for different road types for maintaining the network to an acceptable level of service.

8.2.3 Factors Determining the Road Maintenance Requirements

The major factors responsible for road deterioration are age, traffic and construction material quality and workmanship for paved roads, and traffic, quality of materials, terrain and climate for unpaved roads. From the road users point of view, for paved roads roughness and for unpaved roads roughness and all weather pass-ability are the important characteristics of a road. These are the key factors also influencing vehicle operating costs and ability to use the road.

The International Roughness Index (IRI), a measure for road roughness, is considered to be an indicator of pavement condition of any roads. For example, a new asphalt concrete road can have a roughness (IRI) as low as 2.5. This level of IRI provides smooth riding quality. A newly constructed gravel road of good materials can have a roughness (IRI) of nearly 5. Over the time, increase in roughness, among others, may be observed due to the traffic, terrain and weather.

In Ethiopia, where there is substantial use of natural aggregates, the newly constructed gravel roads could have roughness value of around 5.5 IRI for higher standard roads, and 6.5-7.5 IRI for lower standard roads. As per the prevailing practices, according to the ERA's Pavement Management System of categorizing roads according to riding quality, gravel roads with less than 11 IRI and paved roads with less than 4.5 IRI are classified as being in good condition.

8.2.4 Approach for Setting Maintenance Standards

Maintenance standards are combinations of optimal maintenance operations to be applied on routine or periodic basis linked to the traffic levels, pavement type, climatic condition, and terrain type. These standards have to be applied either on scheduled basis (i.e. on a fixed time interval), or on a responsive basis (i.e. when a specified threshold level is attained).

Maintenance for paved and unpaved roads has been considered under two broad categories: (i) Routine Maintenance; and (ii) Periodic Maintenance, which are discussed specifically for unpaved and paved roads in the sections that follow.

[3] Details are discussed in Chapter 14: Consequences of Negligence in Road Maintenance.

8.2.5 Optimum Maintenance Standards

Optimum Maintenance Interventions[4] have been worked out using HDM-4 by specifying a series of maintenance alternatives including ranges of traffic level, pavement condition for different pavement types, for different regions with varied terrains and climate, etc., and proposed for next 10 years for the road networks under the road agencies. Though, in reality, a true optimum level of maintenance interventions is difficult to achieve without intensive investigations, due to the level of interaction of the numerous deterioration parameters and works standards effects, the Study has adopted intervention levels based on internationally accepted standards to set a deterioration model for the country. The exercise has been carried out as per availability of the relevant data.

8.2.6 Recommended Maintenance Strategies & Standards

8.2.6.1 Routine Maintenance

(i) **Paved Roads:** For paved roads, routine maintenance includes patch repairs, crack sealing, edge repair, cleaning of road side drains/cross drainage structures, repairing of shoulders, painting of highway signs and km-stones, arboriculture and turfing, road markings, removal of litter, debris, replacement of damaged signs and maintenance of culverts, etc., whereas, periodic maintenance activities involve provision of renewal coat to the wearing surface at a predetermined frequency; say 3-8 years based on the treatment type, to safeguard the road crust and keeping the pavement for better riding surface.

For paved roads, the critical parameters influencing the performance and the maintenance effort are the existing pavement condition in terms of roughness (IRI) and level of patching/cracking, traffic loading in terms of equivalent standard axles, and pavement strength in terms of structural number (SN). HDM-4 analysis has been undertaken in the Study to assess the quantum of routine maintenance (repairing potholes, sealing cracks, edge breaks, etc.) and periodicity of resealing for maintaining the roads under different levels of serviceability in terms of IRI.

(ii) **Unpaved Roads:** Routine maintenance for unpaved roads includes filling up of depressions, making up rain cuts, removal of rock falls, slips and other obstructions, cleaning of drains/cross-drainage, etc., along with grading and spot graveling, whereas periodic maintenance consists of resurfacing and re-gravelling.

In the present Study, HDM-4 analysis has been carried out for different traffic levels for two levels of serviceability for unpaved roads, i.e. basic level (IRI<11) and the most desirable (ideal) level (IRI<8) and the periodicity of such operations has been determined and used in assessing the road maintenance needs in the country for next 10 years.

8.2.6.2 Periodic Maintenance

(i) **Paved Roads:** For paved roads, the development of set of “optimum” economic based standards, as a matrix of intervention levels for different traffic levels, pavement type, climate and terrain has been developed. The analysis has been carried out for Asphalt Mix on Granular Base (AMGB) and Surface Treatment on Granular Base (STGB).

Various maintenance alternatives have been taken based on the existing practices of maintenance activities in Ethiopia. The treatment alternatives tested for AMGB and

[4] Optimum maintenance interventions in the Study have been taken based on the maximizing NPV.

STGB for various combinations of options of maintenance strategies are given in Table 8.1.

The alternatives have been examined using the HDM-4 Strategic Analysis Module to produce a set of 'Optimum Section Alternatives', with the alternative giving the highest NPV being chosen as the best alternative for each matrix cell.

The analysis shows that for AMGB, the maintenance strategy of Overlay when Roughness>= 4.5 IRI and reconstruction/rehabilitation when Roughness >=8 IRI yields the highest NPV with the interval between overlays varying for different traffic levels and terrains.

And that for STGB, the maintenance strategy (high) of reseal, when total cracked area >=15% and reconstruction/rehabilitation when Roughness >=8 IRI gives the highest NPV with the interval between resealing and reconstruction varying for different traffic levels and terrains.

Table 8.1: Treatment Alternatives Considered for AMGB & STGB

Maintenance Strategy	Resealing	Overlay	Reconstruction
Low Level	Total Carriageway Cracked >=30 %	Roughness>=6 IRI	Roughness>= 10 IRI
Medium Level	Total Carriageway Cracked >=20 %	Roughness>=5 IRI	Roughness>=9 IRI
High Level	Total Carriageway Cracked >=15 %	Roughness>= 4.5 IRI	Roughness>=8 IRI

* All periodic maintenance strategies include routine maintenance very year.

Alternative maintenance interventions, as presented in Table 8.1, ensure that roughness of the roads with asphaltic pavement in the country assumed to be less than 6, 5 and 4.5 IRI during the entire analysis period of the Study, i.e. up to 2020, based on the suggested level of maintenance strategy, viz. low, medium and high. So the periodic maintenance is recommended whenever the roughness of the pavement exceeds the IRI as indicated in Table 8.1.

Similarly in case of DBST, at low level maintenance strategy, periodic maintenance is recommended when area of carriageway cracking reaches 30%; whereas for medium and high levels of maintenance, periodic maintenance is worked out at 20% and 10% of carriageway area under cracking respectively.

Average roughness assumed for the analysis period for paved roads under different road maintenance strategies has been graphically presented in Figure 8.1.

Figure 8.1: Average Roughness for Different Maintenance Strategies for Paved Roads

(ii) Unpaved Roads: Working out the optimum maintenance strategy for unpaved roads involved using HDM-4 Strategic Analysis Tool and creating a large number of alternatives for grading at intervals of between 1 and 14 times per year, spot gravelling with various percentages of material loss to replace and re-gravelling. Five traffic levels (very low, low, medium, high and very high AADT), starting road condition as "good" was selected for the analysis period. The analysis was carried out to evolve optimum standards for federal unpaved roads, regional and unpaved roads under MRAs. In

finalizing the optimum maintenance strategies, which maximize the NPV, two levels of serviceability, viz. basic level and ideal level have been considered:

- basic level of maintenance to maintain the network below roughness of 11 IRI; and
- ideal level of maintenance to maintain the network below roughness of 8 IRI.

The outcome of the analysis is shown in Table 8.2 and Table 8.3 for unpaved roads under ERA and MRAs, and Table 8.4 and Table 8.5 for regional roads as a set of optimum grading frequencies for each operation, with the optimum level derived on the basis of maximizing NPV.

Table 8.2: Federal Unpaved Roads - Basic Level of Maintenance (Roughness <11 IRI)

(per year)

Traffic Category (vpd)	Plain	Rolling	Mountainous
Very Low (<75)	2 gradings	2 gradings	2 gradings
Low (75-150)	4 gradings	4 gradings	4 gradings
Medium (150-300)	7 gradings	7 gradings	7 gradings
High (300-500)	12 gradings	12 gradings	12 gradings
Very High (>500)	14 gradings	14 gradings	14 gradings

Spot gravelling every year (Annual material loss to replace: 25%), *Regravelling @ Gravel Thickness <75 mm.

Table 8.3: Federal Unpaved Roads - Ideal Level of Maintenance (Roughness <8 IRI)

(per year)

Traffic Category (vpd)	Plain	Rolling	Mountainous
Very Low (<75)	4 gradings	4 gradings	4 gradings
Low (75-150)	6 gradings	6 gradings	6 gradings
Medium (150-300)	8 gradings	8 gradings	8 gradings
High (300-500)	12 gradings	12 gradings	12 gradings
Very High (>500)	14 gradings	14 gradings	14 gradings

Spot gravelling every year (Annual material loss to replace: 25%), *Regravelling @ Gravel Thickness <100 mm.

Table 8.4: Regional Roads (Unpaved) - Basic Level of Maintenance (Roughness <11 IRI)

(per year)

Traffic Category (vpd)	Plain	Rolling	Mountainous
Very Low (<10)	1 grading	1 grading	1 grading
Low (10-20)	1 grading	1 grading	1 grading
Medium (20-30)	1 grading	1 grading	1 grading
High (30-50)	2 gradings	2 gradings	2 gradings
Very High (>50)	2 gradings	2 gradings	2 gradings

Spot Regravelling every year (Annual material loss to replace: 10%), *Regravelling @ Gravel Thickness <50 mm.

Table 8.5: Regional Roads (Unpaved) - Ideal Level of Maintenance (Roughness <8 IRI)

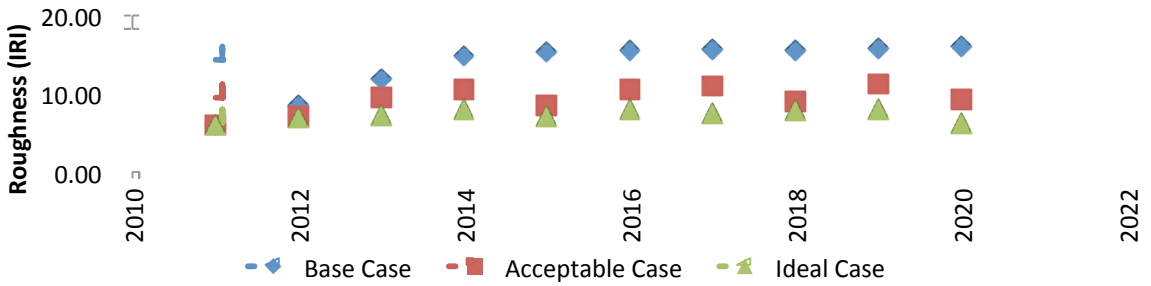
(per year)

Traffic Category (vpd)	Plain	Rolling	Mountainous
Very Low (<10)	2 gradings	2 gradings	2 gradings
Low (10-20)	2 gradings	2 gradings	2 gradings
Medium (20-30)	2 gradings	2 gradings	2 gradings
High (30-50)	3 gradings	3 gradings	3 gradings
Very High (>50)	4 gradings	4 gradings	4 gradings

Spot gravelling every year (Annual material loss to replace: 25%), Regravelling @ Gravel Thickness <75 mm.

The graphical representation of average roughness for the Base Case, Acceptable Case and Ideal Case during the analysis period is given in Figure 8.2.

Figure 8.2: Average Roughness for Different Maintenance Strategies for Gravel Roads



8.3 Multiyear Analysis

The approach and methodology used for carrying out the multiyear maintenance need analysis and estimating the cost implications for the classified road network in the country are mainly based on the Road Deterioration Model developed during the present Study. It is important to mention that the maintenance interventions are proposed only on the "maintainable roads", as per the eligibility criteria set for the maintenance activities[5]. While conducting the multiyear analysis, the following issues and considerations were kept in view:

- The road networks under different road agencies, identified as very good/good, fair and poor condition, are categorized as "Maintainable Roads", which need to remain in good/fair condition for next 10 years. This approach would preserve the road assets;
- Establish the extent and magnitude of maintenance needs of the total classified road network under the roads agencies, viz. ERA, RRAs and MRAs in the country for next 10 years for varied terrains in different regions. This exercise considers the RSDP IV projections, i.e. up to 2015, and beyond, i.e. up to 2020, the expected growth in the road network in the country in view of the past trend and requirements for the socio-economic development of the country;
- The effects of varied traffic levels on the road networks on varied terrains and regional distribution on the maintenance needs assessment of the classified road network for next 10 years, i.e. up to 2020; and
- The Study also estimates and incorporates the implications of the Wereda Roads[6], in case these roads become part of the "Classified Roads" of the country, and, therefore, would qualify for the Road Fund financing. The costs, thus, obtained, i.e. with the Wereda Roads scenario, have also been used while estimating the road user charges, so that the incremental effects of the maintenance of Wereda Roads could also be appreciated.

8.3.1 Classified Road Network - Planned

The total road network in Ethiopia has expanded from about 26,550 km at the beginning of RSDP in 1997 to 48,793 km in 2010. This phenomenal growth has increased the level of

[5] Report on "Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (June 2011)" under the present Study.

[6] A note on the development of Wereda Roads in a phased manner and related details with facts and figures, has been presented in the above report (June 2011).

road density in the country, i.e. 44.4 km/'000 km^2 of area, and 0.58 km/'000 population by the end of 2010. The pavement condition of the above road network has been observed as 56% roads in good condition, 23% in fair condition, and 21% in poor condition.

The Road Sector Development Plan (RSDP IV) document (2011) presents details on the planned additional road length, which are to be included by 2015 under different road agencies.

This section deals with the derivation of projected classified road network in the country, which needs to be maintained for next 10 years. RSDP IV document states that in next five years; 4,331 km of roads would be added in the Federal Road network, whereas 11,212 km in the RRAs network. The year-wise incremental changes in the total length of the classified road network, is shown in Table 8.6.

Table 8.6: Classified Road Network as Planned under the RSDP IV (2010-15)

(km)

Particular	2010	2010-11	2011-12	2012-13	2013-14	2014-15
Addition in the ERA's Network (Plan)	-	621	970	987	984	769
Planned ERA's Network	21,849	22,470	23,440	24,427	25,411	26,180
Addition in the RRAs Network (Plan)	-	1,917	2,205	2,472	2,590	2,028
Planned RRAs Network	26,944	28,861	31,066	33,538	36,128	38,156
MRAs Network[7]	4,556	4,693	4,833	4,978	5,128	5,282
Total Classified Network (incl. MRAs)	53,349	56,024	59,339	62,943	66,667	69,618
Total Classified Network (excl. MRAs)	48,793	51,331	54,506	57,965	61,539	64,336
Road Density /'000 km^2 of Area (excl. MRAs)	44.40	46.71	49.60	52.74	56.00	58.54

Source: RSDP IV Document (2011).

As mentioned earlier, the Study is to estimate the road maintenance needs for the next five years, i.e. up to 2015, and on "rough basis" for another five years, i.e. from 2015 to 2020. To estimate the above network, it has been observed that:

- Presently, the road density in the country is observed as 44.4 km/'000 km^2, i.e. an increase by 4.6% pa during 1997-2010 with the introduction of RSDPs;
- With the future plan of RSDP IV network, there would be increase in road density, as the road length is expected to grow at 4.8% pa;
- As per Mid-term review of RSDP-II, Assessment of Accomplishment (April 2005) and indicators to satisfy the Millennium Development Goals (MDGs), the road density in 2012 for Ethiopia was predicted as 72 km/'000 km^2 of area; that level is not yet achieved; and
- If compared with the level of road density in Ethiopia with neighboring countries, e.g. Tanzania, road density was recorded 71.2 km/'000 km^2 in 2004 as against 33.2 in Ethiopia in the same year. In view of socio-economic development of the country, there is a need to increase the road length, which would in turn enhance the road density as well.

Keeping the above in view, it is assumed that the classified road network in Ethiopia would increase by 4.8% pa during 2015-20. The estimated classified road network during 2015-20 is presented in Table 8.7.

[7] RSDP IV does not cover increase in the road network under MRAs. However, for analysis purposes the Study assumes 3% pa. increase in MRAs network, same as population growth in the country.

Table 8.7: Projected Classified Road Network (2015-20)

(km)

Particular	2015-16	2016-17	2017-18	2018-19	2019-20
Addition in the ERA's Network (Plan)	806	845	885	928	972
Planned ERA's Network	26,986	27,831	28,716	29,643	30,615
Addition in the RRAs Network (Plan)	2,125	2,227	2,334	2,446	2,564
Planned RRAs Network	40,281	42,508	44,842	47,288	49,852
MRAs Network	5,440	5,603	5,771	5,945	6,123
Total Classified Network (incl. MRAs)	72,707	75,942	79,329	82,877	86,591
Total Classified Network (excl. MRAs)	67,267	70,340	73,559	76,932	80,468
Road Density /'000 km^2 of Area (excl. MRAs)	61.21	64.00	66.93	70.00	73.22

Source: The Consultants' Efforts.

8.3.2 Road Network with Wereda Roads

As per RSDP IV document, more than 71,500 km of roads would be constructed in next five years under the Wereda Roads Offices (WROs), which are expected to be included in the classified road networks of the country. Future length of the roads under WROs is also assumed to be increasing by 4.8% pa during 2015-20 for the analysis purpose.

Table 8.8: Projected Classified Road Network with Wereda Roads (2015-20)

(km)

	Year	Wereda Roads	Classified Roads (km)		
			ERA & RRAs	ERA, RRAs & Wereda*	Road Density (km/'000 km^2 of Area)
RSDP IV	2010	-	48,793	48,793	44.4
	2011	9,568	51,331	60,899	55.4
	2012	24,299	54,506	78,805	71.7
	2013	40,044	57,965	98,009	89.2
	2014	55,790	61,539	117,329	106.8
	2015	71,522	64,336	135,858	123.6
Projected	2016	74,956	67,267	142,223	129.4
	2017	78,554	70,339	148,893	135.5
	2018	82,325	73,559	155,883	141.8
	2019	86,276	76,933	163,209	148.5
	2020	90,417	80,468	170,886	155.5

Source: The Consultants' Estimates. *Not yet under the classified roads category.

8.3.3 Maintenance Needs Assessment for Classified Roads

The maintenance needs for the classified road network in the base year for the maintainable roads has been discussed in Chapter 7, and the following sections present maintenance needs for future years, i.e. up to 2020. Multiyear maintenance needs requirement of the road networks under ERA, RRAs, and MRAs, and also under Wereda Roads are presented in the following sub-sections. The analysis also presents the corresponding years' maintenance costs. The maintenance needs assessment and the costs have been carried out by using the Road Deterioration Model based on HDM-4.

It is assumed that after the maintenance of the road network in 2011-12 (Chapter 7), the entire network is brought to be in good condition (with roughness between 6 and 11 IRI for the gravel roads, and between 4.5 and 6.0 IRI for paved roads), and predicted pavement condition of the roads, i.e. in future, would be in good condition as illustrated in the following sections.

8.3.3.1 For Paved Roads

As illustrated earlier, the analysis has been carried out for the paved roads in three maintenance strategies, i.e. low (IRI=<6.0), medium (IRI=<5.0) and high (IRI=<4.5), so that during the analysis period of 10 years, roads under different road agencies are likely to work on a satisfactory level of service and also ensure preserving the road assets.

Table 8.9: Maintenance Strategies for Paved Roads

Maintenance Strategy	Target Roughness
Low	IRI=<6.0
Medium	IRI=<5.0
High	IRI=<4.5

8.3.3.2 For Unpaved Roads

Two types of maintenance strategies have been proposed for unpaved roads, i.e. (i) Acceptable Level of Maintenance, where the roughness level of <11 IRI is likely to be attained; and (ii) Desirable (Ideal) Level of Maintenance, where the roughness level is likely to remain <8 IRI, throughout the analysis period.

Table 8.10: Maintenance Strategies for Unpaved Roads

Level of Service	Activity Requirement	Intervention Level
Accept - able	Spot graveling @ Gravel Thickness	<=100 mm (up to 25% annual material loss to replace)
	Re-graveling @ Gravel Thickness	<=75 mm
	Routine Maintenance	Every Year
Desirable (Ideal)	Spot graveling @ Gravel Thickness	<=125 mm (up to 25% annual material loss to replace)
	Re-graveling @ Gravel Thickness	<=100 mm
	Routine Maintenance	Every Year

In view of estimating Road Maintenance Costs, latest traffic details required for the HDM analysis have been collected from ERA. Length of the stretches with various traffic levels have been sorted out and per km maintenance cost in each maintenance strategy, i.e. low, medium and high, by varying traffic levels for paved and unpaved roads under ERA, RRAs and MRAs have been calculated as per the actual road deterioration in next 10 years and presented in Table 8.11 to Table 8.13 and detailed working of the maintenance costs (i.e. HDM-4 Analysis) has been provided in Annexure 8.1 as soft copy.

It is envisaged that in order to economize the maintenance cost and to promote the labor-based low cost maintenance strategy in long term, the unit maintenance cost for the unpaved roads under different RRAs has been taken as 60% of gravel roads maintenance cost under ERA, whereas in case of gravel roads under MRAs, it has been taken as 80%.

Table 8.11: Estimated Road Maintenance Cost for Existing Classified Networks (2011-20)
(Low Level Maintenance Strategy)

(ETB million)

Year	ERA			RRAs	MRAs			Total
	Paved	Unpaved	Total	Unpaved	Paved	Unpaved	Total	
2011	463.42	715.98	1,179.40	932.62	75.48	222.19	297.67	2,409.69
2012	286.91	411.62	698.53	1,260.28	14.38	14.39	28.77	1,987.58
2013	176.63	397.84	574.47	309.48	26.05	66.35	92.40	976.35
2014	149.65	720.58	870.23	309.48	14.41	66.35	80.76	1,260.46
2015	213.70	1,067.17	1,280.87	309.48	667.45	88.86	756.31	2,346.65
2016	149.60	1,462.25	1,611.85	402.01	14.41	426.22	440.63	2,454.49
2017	540.76	702.11	1,242.87	2,184.75	14.41	66.35	80.76	3,508.38
2018	787.40	1,387.30	2,174.70	309.48	667.45	92.37	759.82	3,244.00
2019	455.65	612.27	1,067.92	309.48	14.41	93.17	107.58	1,484.99
2020	2,892.83	2,086.20	4,979.03	410.58	14.41	466.01	480.42	5,870.04
Total	**6,116.55**	**9,563.31**	**15,679.86**	**6,737.63**	**1,522.88**	**1,602.26**	**3,125.14**	**25,542.63**

Table 8.12: Estimated Road Maintenance Cost for Existing Classified Networks (2011-20)
(Medium Level Maintenance Strategy)

(ETB million)

Year	ERA			RRAs	MRAs			Total
	Paved	Unpaved	Total	Unpaved	Paved	Unpaved	Total	
2011	463.42	715.98	1,179.4	932.62	75.48	222.19	297.67	2,409.69
2012	286.91	411.62	698.53	1260.28	14.38	14.39	28.77	1,987.58
2013	248.61	397.84	646.45	309.48	26.05	66.35	92.4	1,048.32
2014	634.47	720.58	1,355.05	309.48	667.45	66.35	733.8	2,398.32
2015	2,064.44	1,067.17	3,131.61	309.48	14.41	88.86	103.27	3,544.36
2016	1,719.99	1,462.25	3,182.24	402.01	14.41	426.22	440.63	4,024.88
2017	547.57	702.11	1,249.68	2,184.75	667.45	66.35	733.8	4,168.22
2018	149.55	1,387.30	1,536.85	309.48	14.41	92.37	106.78	1,953.10
2019	561.29	612.27	1,173.56	309.48	14.41	93.17	107.58	1,590.63
2020	401.21	2,086.20	2,487.41	410.58	667.45	466.01	1,133.46	4,031.45
Total	**7,077.45**	**9,563.31**	**16,640.76**	**6,737.63**	**2,175.92**	**1,602.26**	**3,778.18**	**27,156.57**

Table 8.13: Estimated Road Maintenance Cost for Existing Classified Networks (2011-20)
(High Level Maintenance Strategy)

(ETB million)

Year	ERA			RRAs	MRAs			Grand Total
	Paved	Unpaved	Total	Unpaved	Paved	Unpaved	Total	
2011	463.42	715.98	1,179.4	932.62	75.48	222.19	297.67	2,409.69
2012	286.91	411.62	698.53	1,260.28	14.38	14.39	28.77	1,987.58
2013	176.63	543.78	720.41	333.74	26.05	70.56	96.61	1,150.76
2014	97.71	979.27	1,076.98	424.13	14.41	92.51	106.92	1,608.03
2015	4,526.78	1,233.42	5,760.20	425.17	667.45	331.31	998.76	7,184.13
2016	213.68	1,138.37	1,352.05	1,708.05	667.45	95.11	762.56	3,822.67
2017	201.48	709.88	911.36	333.74	14.41	95.83	110.24	1,355.34
2018	539.95	1,637.35	2,177.30	431.75	14.41	344.23	358.64	2,967.69
2019	769.14	748.98	1,518.12	433.25	667.45	97.38	764.83	2,716.21
2020	201.48	1,259.37	1,460.85	1,826.93	14.41	98.23	112.64	3,400.43
Total	**7,477.19**	**9,378.03**	**16,855.22**	**8,109.67**	**2,175.92**	**1,461.74**	**3,637.66**	**28,602.54**

Table 8.11 to Table 8.13 present the estimated cost requirement for maintaining the existing classified road network with various maintenance strategies, i.e. low, medium and high.

It may be noted that the annualized maintenance cost has been derived using the HDM-4 Model; the Model calculates the maintenance needs and costs based on the defined maintenance interventions and the unit rates of different maintenance activities; requirements of the maintenance in future years on the particular roads are based on the previous years'

pavement condition and the maintenance tasks undertaken, i.e. type and extent of maintenance: routine and periodic. So it is showing irregular growth pattern. That is why annualized maintenance cost has been carried out in the analysis.

For an illustration, to repair "area under cracking" is one of the major components in routine maintenance, which requires much higher cost, that may not be required in next or subsequent years. Therefore, the cost incurred on the above account may not repeatedly feature in years to come. Also, the maintenance costs are worked out for entire maintainable road network, which is further categorized with different traffic level groups influencing the maintenance interventions, etc.; accordingly, HDM-4 analysis was carried out with the responsive option in the model. Further, the above exercise was carried out on a macro level aggregate for planning and policy formulation purposes.

As stated earlier, RSDP IV document presents the additional roads to be added up in the networks under different road agencies during 2010-15, and the Study has also projected the same for 2015-20 (Table 8.7 and Table 8.8). The maintenance costs of these additional roads have been calculated and given in sub-sections that follow.

8.3.4 Maintenance Cost for Additional Length in the Network (2011-20)

For coming years, RSDP IV plans a significant increase in road length under different road agencies (Table 8.6). In view of the above, the Study has distributed the increase in length of ERA's and MRAs' networks among paved and unpaved roads in the prevailing ratio, whereas, the network under RRAs has been assumed to remain as gravel only. Routine and periodic maintenance costs of the additional length have been taken on the basis of paved and unpaved road maintenance as given in the Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (June 2011)[8].

Newly constructed roads have been assigned routine maintenance every year after the completion of defect liability period of one year after the construction. Being new, these roads would be requiring periodic maintenance at the interval of 5-7 years; accordingly the roads constructed between 2011 and 2013 have been assigned one cycle of periodic maintenance starting from the year 2018, whereas roads constructed from 2014 onwards have been provided routine maintenance only, and not periodic maintenance, as these roads would not require any periodic maintenance during the analysis period, i.e. up to 2020. The maintenance costs for the roads under ERA, RRAs and MRAs constructed during 2011-20 have been presented in Table 8.14.

Table 8.14: Maintenance Cost for Additional Length (2011-20)[9]

(ETB million)

Year	ERA			RRAs	MRAs			Total
	Paved	Unpaved	Total	Unpaved	Paved	Unpaved	Total	
2011	-	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-	-
2013	5.08	4.55	9.63	12.82	0.92	0.88	1.80	24.25
2014	13.02	7.11	20.13	27.57	1.87	0.90	2.77	50.48
2015	21.10	14.35	35.45	44.10	2.85	1.83	4.68	84.23
2016	29.16	21.57	50.73	61.42	3.85	2.79	6.64	118.79
2017	35.45	27.20	62.65	74.99	4.89	3.77	8.66	146.31
2018	176.75	181.79	358.54	507.79	30.40	33.36	63.76	930.08
2019	259.37	271.53	530.90	585.57	32.23	35.26	67.49	1,183.97
2020	270.30	282.09	552.39	659.49	34.12	37.22	71.34	1,283.22

[8] Please refer to Tables 7.9 & 7.10 of the Report (June 2011).

[9] Maintenance work and cost have been assigned after the completion of defect liability period.

Table 8.14 shows maintenance costs derived for the additional lengths of the classified road network during 2011-20. The additional maintenance costs have been added in the cost given in Table 8.11 to Table 8.13 and the total maintenance cost of projected classified network is shown in Table 8.15.

Table 8.15: Total Road Maintenance Cost of the Projected Classified Network including Additional Length (2011-20)

(ETB million)

Year	Strategy		
	Low Level	Medium Level	High Level
2011	2,409.69	2,409.69	2,409.69
2012	1,987.58	1,987.58	1,987.58
2013	1,000.60	1,072.58	1,175.02
2014	1,310.94	2,448.80	1,658.51
2015	2,430.89	3,628.60	7,268.36
2016	2,573.28	4,143.67	3,941.46
2017	3,654.69	4,314.53	1,501.65
2018	4,174.08	2,883.19	3,897.77
2019	2,668.95	2,774.59	3,900.18
2020	7,153.26	5,314.67	4,683.65
Total	**29,363.96**	**30,977.89**	**32,423.86**
Cost/Year	**2,936.40**	**3,097.79**	**3,242.39**

Table 8.15 shows that in order to preserve and maintain the classified road network in Ethiopia including the additional roads, which are planned to be constructed during the analysis period, the road agencies would be requiring annual budget as on present prices[10] on an average about ETB 2.9 billion to ETB 3.2 billion based on the adaptation of maintenance strategy, i.e. low, medium and high.

8.3.5 Maintenance Needs Assessment with Wereda Roads

More than 71,500 km of Wereda Roads are planned during the RSDP IV, i.e. 2011-15 under the ongoing URRAP in the country. These Wereda Roads would be constructed as per "DS6 Standards" following the ERA's Geometric Design Manual, 2002. Being low volume and newly constructed roads as per the standards, these roads are likely to operate on an acceptable level of service with routine maintenance only, and will not require periodic maintenance during the analysis period of the Study.

The Road Deterioration Model developed in the Study shows that low volume roads (traffic <200 vpd) require the periodic maintenance 6-8 years after the construction. Hence, while carrying out the analysis, the Study considers the average routine maintenance cost of Wereda Roads, i.e. ETB 11,000/km. The average cost has been adopted on the basis of gravel road maintenance cost as worked out in the Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (June 2011).

Table 8.16: Year-wise Maintenance Cost of Wereda Roads

(ETB million)

Particular	2013	2014	2015	2016	2017	2018	2019	2020	Total
Length (km)	9,568	24,299	40,044	55,790	71,523	74,956	78,554	82,325	-
Annual Cost	105.25	267.29	440.48	613.69	786.75	824.52	864.09	905.58	4,807.65

As mentioned earlier, the Wereda Roads being constructed following the "DS6 Standards" under the RSDP IV are expected to be considered in the category of the classified roads and the newly constructed roads have been assigned routine maintenance every year after the

[10] All the maintenance costing exercises have been worked out on the present market prices.

completion of defect liability period of one year after the construction. So roads constructed in 2011 have been assigned maintenance in 2013 and so on, and also the corresponding costs.

As shown in Table 8.16, maintenance of Wereda roads would cost the WROs, about ETB 4.8 billion during 2013–20.

Table 8.17: Estimated Maintenance Cost of the Classified Road Network Including Wereda Roads (2011-20)

(ETB million)

Year	Strategy		
	Low Level	Medium Level	High Level
2011	2,409.69	2,409.69	2,409.69
2012	1,987.58	1,987.58	1,987.58
2013	1,105.85	1,177.83	1,280.27
2014	1,578.23	2,716.09	1,925.80
2015	2,871.37	4,069.08	7,708.84
2016	3,186.97	4,757.36	4,555.15
2017	4,441.44	5,101.28	2,288.40
2018	4,998.60	3,707.71	4,722.29
2019	3,533.04	3,638.68	4,764.27
2020	8,058.84	6,220.25	5,589.23
Total	**34,171.61**	**35,785.54**	**37,231.51**
Cost/year	**3,417.16**	**3,578.55**	**3,723.15**

Table 8.17 shows that including Wereda Roads, the total expenditure on maintenance would be in the range of ETB 3.4 billion to ETB 3.7 billion annually on the classified road network of the country.

8.4 Overloading Charges - An Analysis

8.4.1 General

The "overloading charges" are levied on those vehicles carrying load more than the permitted limits, which could be termed as overloaded vehicles. The fines/fees are principally to be imposed as a deterrent to overloading practices though the estimates address the issue of the charging for the damage caused to the pavement due to overloading. It is usually observed that the fines are too low to act as a serious deterrent or to compensate for the additional damage caused to the road pavement due to overloading. It is generally argued that the damage caused by an overloaded vehicle is much higher than the fine imposed.

The damage that vehicles do to road pavements increases exponentially at the "4.5 power of the axle load"; e.g. a 16-tonne axle does about 20 times more damage to a road pavement than 8-tonne axle.

Conceptually, in context of the Road Fund, overloading fines cannot be taken as source of revenue, rather deterrent to restrict the road users not to overload their vehicles.

With the above background, the chapter aims at bringing out certain estimations, which would be advocating and rationalizing the extent and nature of the "Overloading Fines". General approach and methods followed for carrying out the above exercise is largely based on the Road Deterioration Model analyzed by using HDM-4, which adopts the pavement damage relationship of the axle load 4.5 power law to predict pavement deterioration.

The exercise is undertaken with the actual weight and axle load distribution of the fleet in the country, and the extent of pavement damages with varied axle load situations while running the HDM-4 Model.

The outputs of the above exercise would be useful in determining the appropriate fine/fees levels for the overloaded vehicles, i.e. to reflect the economic costs imposed on the community. Such estimates are urgently required in monetary terms with logic, so that the Overloading Fines could be rationally introduced in Ethiopia. The finalization of proposed overloading fines/fee needs to be also discussed with various stakeholders and also the transport operators in the country.

8.4.2 Overloading Charges – International Practices

8.4.2.1 Road Fund & Overloading Charges

The Overloading Fines/Fees are identified as source of revenue by many Road Fund Boards (RFBs), including the Ethiopian Road Fund. However, in most of the countries, the revenue from overloading fines goes to the Government General Accounts, not to the Road Funds, including Ethiopia. The overloading fines including in Ethiopia, are collected as minor offense, the actual fine imposed on the overloaded vehicles depends upon the court's decision.

Fines in Kenya are set "per ton-km" that refers to the weigh-distance basis; fines in Tanzania and Uganda[11] are set "per-km", and fines in Burundi and Rwanda are set either on tons or ton-km basis. It may be noted only in case of Tanzania, the overloading charges are paid to the Road Authority, rather than the public treasury.

Table 8.18: Practices of Overloading Fines in Different African Countries

Country	Description of Practices for Overloading Charges
Kenya	First Conviction: US$ 60 for <1,000 kg (for Axle/Excess Vehicle Weight); US$ 2,500 for 10,000 kg; Second Conviction: US$ 120 for <1,000 kg; US$ 5,000 for >=10,000 kg. Tolerance Allowance: 5% on Axle Load Limits only. Proposal: US$ 125+US$ 0.25/t-km travelled for Overloading for <2,000 tons, and plus US$ 4.75/t-km travelled for overloading over 2,000 tons.
Tanzania	US$ 8 for 100 kg to US$ 2,986 for 10,000 kg; for Gross Vehicle Mass Overloading Fees: US$ 22 for 500 kg to US$ 35,000 for 31,500 kg Overloaded Vehicles is detained free of charge for 3 days, after that UD$ 20/day is charged until proof of payment is produced. A fee of US$ 2,000 is charged for bypassing or absconding from a weighbridge, in case the fee is not paid within 90 days, the vehicle may be auctioned, etc. This is perhaps also applicable to empty trucks. Tolerance Allowance: 5% on an axle or group of axle.
Uganda	First Time Offence: US$ 120 and/or imprisonment for one year; Second Time Offence: US$ 250 and/or imprisonment for two years Additional Fine, if the offence continued, US$ 80 for each day Overload Fines: US$ 8-120 applies for 500-2,000 kg for each overload axle; US$ 180 for 2,000-4,000 kg for each overload axle, US$ 250 for 4,000 kg Tolerance Allowance: No such allowance is applicable in Uganda. Proposal: (i) Abolish the current court procedure for violators and replace it by an administrative procedure; and (ii) Drafting principles for the new law is a move towards more realistic, scientifically based fee levels, prevailing fines are too low compared to the damage caused by vehicle overloading.
Burundi	An adequate law to protect the road infrastructure against overloading is not yet in force in Burundi, as they have no functional weighbridges, etc. US$ 2 or imprisonment of two months, although not on a mandatory basis; US$ 40 fine if a road is damaged due to overloading or other reasons. Proposal: Burundi is likely to revise its road traffic code in 2011; the revision is now

[11] Fines in Uganda include a flat component.

Country	Description of Practices for Overloading Charges
	with the Parliamentary committee.
Rwanda	Rwanda is still at the early stages of development of laws and regulations to control vehicle overloading. However, maximum fines set under the law as as follows; For first offence, US$ 17, and US$ 34 for subsequent offences, these amounts may be increased by a factor of 9, i.e. US$ 150-300. Proposal: Under a TA Report funded by the European Development Fund explores the possibility of introducing an administrative fee schedule system to provide for simplified charges for overloading offences without use of criminal court system

Source: Study for the Harmonization of Vehicle Overload Control in the East African Community (April 2011).

Table 8.19: Comparison of System to Collect Overloading Charges

Description	Burundi	Kenya	Rwanda	Tanzania	Uganda
Name of target fees/fines	Fines for axle overloading/ gross weight overloading	Overload Fines	Overloading Penalties	Overloading Fees	Axle Load Fines
Collected?	No	Yes	No	Yes	Yes
Supposed to be collected by whom?	Police	Court (modifies amounts reported by police)	Revenue Authority	TANROADS (Road Agency)	Court (decides amounts)
Supposed to be checked by whom?	Revenue Authority	KeNHA (Road Agency) / Police	Revenue Authority/Police	TANROADS (Road Agency/ Police)	UNRA (Road Agency) / Police
Budget allocation	Road Maintenance Fund	General Budget	Road Maintenance Fund	Road Maintenance Fund	General Budget (Planned to become Road Maintenance Fund)
Range of Charges depending on level of overloading?	No (not clear in the current regulation)	Yes	No (not clear in the current regulation)	Yes	No

Source: Ibid.

Table 8.19 shows that overloading fines are collected in Kenya, Tanzania and Uganda with different collection mechanism, the overloading charges thus collected are sent to the road fund or general budget. The Consultants are of the view that the overloading charges collected, regardless of the methods, should be transferred to the Road Fund, so that it may be judiciously used for road maintenance, enforcement against the practice, road safety measures, etc.

Comparison of permissible limit of gross vehicle mass also known as combined mass of various axles for different vehicle types in some of the African countries including Ethiopia is shown in Table 8.20.

Table 8.20: Maximum Permissible Vehicle/Combination Mass/Weight in Select Countries (tons)

Vehicle / Combination Type	Kenya	Tanzania	Uganda	Ethiopia
Vehicle with 2 Axles	18	18	18	18
Vehicle with 3 Axles	24	26	24	24
Vehicle with 4 Axles	28	28	30	32
Vehicle + Semitrailer with 3 Axles	28	28	28	28
Vehicle + Semitrailer with 4 Axles	34	36	32	34
Vehicle + Semitrailer with 5 Axles	42	44	40	42
Vehicle + Semitrailer with 6 Axles	48	50	48	50
Vehicle + Drawbar Trailer with 4 Axles	36	37	38	38
Vehicle + Drawbar Trailer with 5 Axles	42	45	42	44
Vehicle + Drawbar Trailer with 6 Axles	48	53	50	50
Vehicle + Drawbar Trailer with 7 Axles	--	56	56	56

Source: ibid.

8.4.2.2 Issues & Limitations

As per a study carried out for ERA on "Axle Load Management in Ethiopia" (2000), the relationship between Axle Load and Cost has been established. The study describes that the principal cost of operating the road transport system comprises the costs of building and maintaining the road plus the total vehicle operating costs (VOCs). The latter is largely a function of the quantity of goods and passengers that need to be moved and the total distance that has to be travelled by the vehicle fleet. The total travel distance (vehicle-km) can be reduced, if more goods are loaded onto each truck, because this will reduce the number of trips that are necessary to generate the required transport output. If this is done, the total cost of operating the vehicles would decrease.

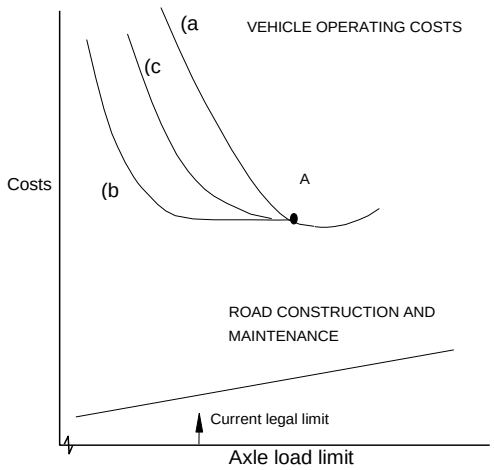


Figure 8.3: Road and Vehicle Costs

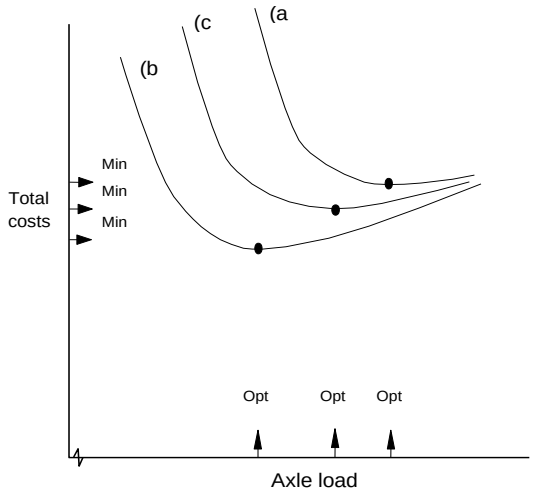


Figure 8.4: Total Transport Costs

The conceptual relationship between VOCs and the axle load of the most heavily loaded trucks is shown in Figure 8.3, line (a). As loads increase, there will come a point where VOCs begin to increase because vehicles will be loaded beyond their capacity.

The damage that vehicles do to road pavements increases exponentially at the 4.5 power of the axle load; e.g. a 16-ton axle does about 20 times more damage to a road pavement than an 8 ton axle (Section 8.4.1). In the normal range of axle loads, i.e. the axle loads for which vehicles are designed, it is relatively easy to design roads to cope with this, but the costs increase as axle loads increase, as shown in Figure 8.3. For severe axle over-loading, i.e. where axle loads exceed the values on which the road design data are based, the damage almost certainly increases more rapidly than indicated by the 4.5 power law, but this situation is highly undesirable and should be avoided.

The total costs of the road transport system to the country can be obtained by adding the costs of constructing and maintaining the roads to the VOCs (Figure 8.4). These costs are very large indeed, often amounting to as much as 10% of GDP, hence all the governments' aim at minimizing such costs.

The point labeled 'A' in Figure 8.3 shows the observed situation in Ethiopia. A sizeable proportion of vehicles are loaded well above the current legal limits, and it is instructive to consider what happens when the maximum axle loads are changed. The line labeled (a) in Figure 8.3 has been drawn on the basis that, as axle loads are reduced, then *extra* vehicle trips are needed to carry the off-loaded goods.

In practice, of course, only a proportion of vehicles are fully loaded to the limits shown, and it is, therefore, possible for the off-loaded goods to be redistributed to vehicles that are

currently running empty or only partially loaded. However, some vehicles will be carrying low density products with high volume rather than weight may limit the transport system capacity.

Other vehicles will be designed for specific products, e.g. oil tankers, and will be unable to carry other goods so no help in transport capacity increase for general cargo. In general, however, there is scope for redistribution of transport requirement. One measure of this is the number of vehicles that run empty and international comparisons indicate that in an efficient freight industry, there are likely to be only 15% of freight vehicles in this category. In Ethiopia the figure can be as high as 30%.

For illustrative purposes, it is instructive to examine what could happen in the limiting case, where all the over-loads could be redistributed and no extra trips were necessary.

An even distribution of load across all axles reduces road damage, substantially. Given this, more axles per ton of gross weight lead to less damage to the road, but may involve greater cost to the vehicle operator (initial cost of vehicle and increased tyre wear). This leads to the recommendation for vehicle type approval. It is an area that needs a comprehensive study and analysis for a meaningful conclusion.

8.4.3 Overloading Practices & Charges in Ethiopia

Overloading fine is part of the Road Fund Proclamation, Ethiopia (66/1997), and identified as one of the sources of the revenue. The basic concept behind imposing the “Overloading Fines” is not necessarily for generating revenues, rather it is used as a deterrent, so that the road users do not overload their vehicles, and also do not make severe damages to the road surface. For observing traffic discipline and also to protect the road pavement, the overloading fines are imposed on the vehicles carrying more loads than the permitted limits. In fact, the overloaded vehicles make the damages to the road surface much more than what they pay as overloading fines.

Within the above conceptual framework, the Overloading Fines need to be imposed in the country, as the fines are presently collected as minor offence from the vehicles carrying more loads than the permitted, which are not necessarily based on any scientific methods for estimating the fines against damages made; moreover the fines collected are not fixed or uniform.

Presently, the proceeds collected as overloading fines go to the Government General Accounts, instead of going to the Office of Road Fund, so that it could be utilized for several activities with purpose, such as, road safety concerns, tight enforcement on checking overloading and organization of regular campaigns to reduce such practices.

The Study Team discussed with the officials concerned at ERA on the latest practices, issues and charges on the overloading fines. It has been reported that currently, there are no fixed rates for charging the overloaded vehicles, and moreover, the charges vary from place to place; as the charges decided by the Courts located nearby the place where the vehicles found with overloads than the permitted limits.

The amount collected yearly against the overloading or the offence committed by the vehicles carrying more loads, is expected to be about ETB 1.0 million[12]. Though, the amount is not that significant in comparison to the Road Fund requirements for maintenance activities, the amount should be preferably transferred to the ORF in view of the ERF Proclamation, so that it could be properly utilized for positive purposes, particularly for road safety and campaign for stopping the overloading practices.

[12] About ETB 873,000 collected in the first quarter of the Fiscal Year (July-September 2010).

8.4.4 Enforcement of Overloading Fines

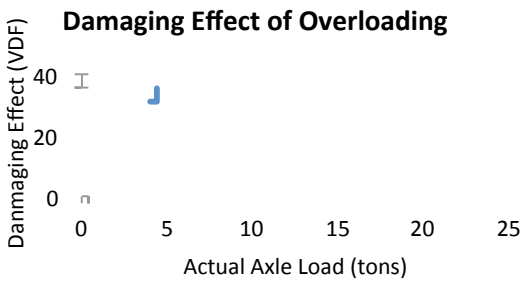
It has also been reported that the vehicles intercepted carrying loads more than the permitted limits, are forced to offload their excess cargo, and penalized by the nearby Courts for the damages they cause. The level of penalty is, however, so small that it does not have a serious effect on persistent offenders[13].

It is empirically proven fact that overloaded vehicles deteriorate the road surface much more than the vehicles with the permitted axle load limit. In view of reducing the incidence and extent of overloading on the road network in the country, the present Study, among others, aims at reviewing the locations of existing weighbridges, and also recommend the additional weighbridges across the main import-export corridors as well as near major industrial locations. The aspect is elaborated in the sections that follow.

8.4.5 Incidence of Overloading Vs Road Deterioration

Overloading of transport vehicles is one of the major causes of premature deterioration of the road pavement and thereby raising the maintenance, rehabilitation and reconstruction costs for the road network. It is a well known fact that wheel loads of heavy vehicles contribute to various forms of pavement distress. Of these, fatigue (which leads to cracking) and permanent deformation (rutting) are of serious consequence, resulting in premature damage to the pavement. Consequently, designed life of the pavement is shortened. Due to the heavy overloaded vehicles, roads may require major rehabilitation within two or three years of their opening to traffic, whereas in normal case, it would be required in 5-7 years. Road Pavements are designed to carry a range of standard axles (8.2 tons) over a period of time. The number of equivalent standard axles (ESA) is determined w.r.t. the type of traffic expected to use the road over its design life.

The American Association of State Highway and Transportation Officials (AASHTO) road tests that were carried out in the USA during the years 1959-61 established that the deterioration of the road is approximately proportional to the fourth power of the axle load for the same number of passes, and which resulted in the well known formula, i.e. fourth power law, illustrating an exponential relationship between axle loads and damaging power.



Vehicle Damage Factor = $(W/S)^4$
Where, W = Actual Axle Load, and S = Standard Axle load, i.e. 8.2 tons.

In view of the consequence of increasing maintenance and rehabilitation costs, now-a-days transport authorities of the developing countries have started realizing the axle load monitoring and control, as a great concern to contain and minimize the maintenance costs of the road network.

8.4.6 Impact of Overloading on Road Safety

As the degree of overloading increases, major safety issues are raised in addition to the non-recovery from the road users of damage to the infrastructure. These issues include:

- Increased severity of road accidents when overloaded vehicles are involved;

[13] Mid Term Review of RSDP II (2005).

- Reduced grade climbing capability and acceleration;
- Greater loss of lateral stability;
- Increased breaking distance required for overloaded vehicles; and
- Increased vehicle emissions, noise and ground–borne vibrations.

The severity of road accidents in Africa is extremely high that is estimated to be some 30-50 times higher than the U.K. or the USA. Many of these accidents are caused by overloaded commercial vehicles. The cost of overloading is estimated to consume about 2% of GNP in Africa[14].

8.4.7 Estimations of Road Pavement Damages

In the present Study, an exercise has been carried out indicating the road pavement damages based on the Road Deterioration Model using HDM-4. The exercise has involved the following stages:

- Data Collection,
- Data Analysis, and
- Evaluation.

Primary data required for road pavement damages are the axle load details of vehicles plying on the road network. There are a number of ways for collecting the above data, depending upon the traffic intensity on the network. In most of the developing countries, road side Axle Load Surveys are carried out at strategic locations on major and overloading prone roads. In some countries, as in Ethiopia, these surveys are undertaken regularly and periodically on the classified paved road network, whereas in other countries these surveys are project specific and are undertaken as per the requirements. In addition, in countries where axle load enforcement is in place, roadside weighbridge data are used for checking the instances of overloading.

For the present analysis, in view of determining the road pavement damages for heavy vehicles, axle load data have been obtained from ERA's Pavement Management Branch, 2009-10 Annual Axle Load Control Report, and presented in Annexure 8.2, and results of the analysis have been given in Table 8.21.

Tables 8.21: Results of Axle Load Survey
(Based on ERA's Pavement Management Branch Annual Axle Load Control Report, 2009-10)

Weigh Station	Position of the Axle	Total no. of Axles	No. of Legal Axles	No. of Illegal Axles	% of Illegal Axles	Average Axle Load of Legal Axles	Average Axle Load of Vehicles exceeding Legal Limit	Overloading (Tons)
Alemgina	Front	7,901	7,721	180	2.28	6.6	8.66	1,559
	Rear	21,616	20,185	1,431	6.62	8.72	13.47	19,275
Dengego	Front	8,626	8,297	329	3.81	6.53	8.52	2,803
	Rear	29,755	27,525	2,230	7.49	8.82	11.07	24,693
Awash	Front	28,580	27,900	680	2.38	6.83	8.74	5,946
	Rear	129,406	100,247	29,159	22.53	8.86	12.07	351,845
Holeta	Front	13,207	13,003	204	1.54	6.03	8.61	1,757
	Rear	35,684	27,923	7,761	21.75	8.83	11.74	91,132

[14] Source: TRL: Towards Safer Roads for Developing Countries, 1991.

Weigh Station	Position of the Axle	Total no. of Axles	No. of Legal Axles	No. of Illegal Axles	% of Illegal Axles	Average Axle Load of Legal Axles	Average Axle Load of Vehicles exceeding Legal Limit	Overloading (Tons)
Jima	Front	2,073	2,049	24	1.16	6.37	9.775	205
	Rear	5,638	4,547	1,091	19.35	8.61	11.74	12,804
Combolcha	Front	6,349	6,163	186	2.93	7.17	8.5	1,581
	Rear	28,240	13,907	14,333	50.75	9.35	10.64	152,482
Modjo	Front	64,559	63,658	901	1.40	6.79	8.56	7,715
	Rear	182,656	173,473	9,183	5.03	9.09	11.31	103,833
Sululta	Front	9,639	9,477	162	1.68	6.82	8.78	1,422
	Rear	29,320	16,091	13,229	45.12	9.06	11.11	146,928
Shashemane	Front	7,112	7,082	30	0.42	6.53	8.78	259
	Rear	23,632	22,805	827	3.50	8.53	13.03	10,776
Total	Front	148,046	145,350	2,696	1.96	6.63	8.77	23,246
	Rear	485,947	406,703	79,244	20.24	8.87	11.80	913,764
	Total	633,993	552,053	81,940	11.54	7.71	10.12	937,010

Source: Compiled by the Consultants using the axle load data collected from ERA's Pavement Management Branch, 2009-10 Annual Axle Load Control Report.

From the ERA's Axle Load Survey of 2009-10, the following inferences can be drawn:

- About 634,000 axles were checked at the weighing stations across the country and weight of 81,940 axles was found to be illegal, which was 11.5% of total axles (i.e. 2% of front axles and 20.2% of rear axles);
- Average axle load of vehicles exceeding legal limit was observed as 10.12 tons as against 7.71 tons in case of average axle load of legal axles; and
- Extent of overloading was estimated in the order of 937,000 tons (approx.) and the 12.9% of total trucks were found to be overloaded.

The above analysis has been used in working out the overloading charges in the Study and detailed analysis had been provided in Annexure 8.3.

8.4.8 Road Deterioration & Overloading Fines

In order to estimate the road deterioration caused by overloaded vehicles and the overloading fines commensurate with damage to the roads, the Road Deterioration Model using HDM-4 has been developed and used in the analysis as discussed in the following sections:

8.4.8.1 Traffic Characteristics

Data relating to traffic required for HDM-4 analysis are: (i) traffic volume; (ii) traffic composition; (iii) vehicle fleet; and (iv) traffic projection for future years. Latest traffic data (2010) were collected from ERA. Prevailing vehicle fleet using the classified paved network of the country has been used in the Study, whereas the vehicle-wise future traffic growth rates (varying from 6.5% to 8% pa for different vehicles) have been derived based on the analysis of socio-economic performance indicators.

8.4.8.2 Determination of Road Deterioration & Overloading Fines

With the help of HDM-4 model, the exercise estimates the difference of road deterioration under the scenarios "with" and "without" overloading and also difference of total maintenance cost. Under the scenarios "with overloading" a typical overloading situation in Ethiopia as depicted from the traffic data obtained from ERA has been used. For the case of "without overloading", calculations have been made by assuming overloading vehicles be replaced by fully loaded vehicles with GVM at the legal limit, resulting in less per vehicle payload and additional number of vehicles. The above exercise is based on the following steps:

- ***Present Conditions of Overloading and Traffic Characteristics for the "With Overloading" Case:*** The Study obtained the axle load data from ERA, collected at several weighbridges in different districts, and analyzed the overloading characteristics prevailing in the country.
- ***Traffic characteristics for the "Without Overloading" Case:*** For "Without Overloading" case, the following steps were involved;

  (i) ***Segregate the overloaded traffic:*** Overloaded traffic and non-overloaded traffic were segregated. A set of data for the non-overloaded traffic for HDM-4 analysis was prepared. As per the prevailing practice in Ethiopia, load >8 tons on the front axle and >10 tons on the rear axle are considered as illegal.

  (ii) ***Specify fully-loaded vehicle types:*** *An ideal vehicle satisfying both axle load and GVM limit regulations was specified for the goods vehicle configuration and standard axle loads associated with each type were calculated.*

  (iii) ***Replace overloaded vehicles by the ideal vehicles:*** *Number of ideal vehicles necessary to carry overloaded amount of the present overloaded vehicles are estimated by means of the following:*

  - Identify overloaded amount for each axle of each vehicle by comparing with the regulation per axle;
  - Accumulate the overloaded amount for all vehicles; and
  - Specify the number of ideal vehicles equivalent to carry the total accumulated overloaded amount by dividing the figure with the maximum payload. Additional vehicles using the above method with the data presented in Annexure 8.2 are calculated as 151 (number), that amounts to 11% extra vehicles than the actual figure.

  (iv) ***Apply the two types of vehicles into HDM-4 analysis:*** *GVM and standard load characteristics for the non-overloaded vehicles and the ideal vehicles were specified and necessary amount for maintenance cost for each scenario were estimated by applying both of non-overloaded and ideal vehicles together into the HDM-4 analysis.*

Table 8.22: Difference of Maintenance Cost – With & Without Overloading

Particular	Cost (ETB) per		
	'00 km	Veh-km	Veh/ton-km
Maintenance Cost "with Overloading" (Present)	18,953,977	-	-
Maintenance Cost "without Overloading" (Ideal)	16,413,100	-	-
Difference (Present and Ideal Situation)	**2,540,877**	**164.99**	**0.13**

Source: The Consultants Estimates.

Results of the above exercise show that in order to cover the additional maintenance cost due to the overloading, the overloaded goods vehicles would be required to pay ETB 0.13/veh/ton-km. Revenue generated by the overloading fines may be expected in the range

of ETB 33 million pa with the assumption that only 50% of overloaded vehicles are likely to be tapped, and other reasons, like, sampling procedure, improper enforcement, inadequate number of weighbridges in the country, change of route by the vehicles, etc.

The proposed overloading charges as indicated in Table 8.22 may be worked out and imposed in different slabs of travel-km of overloaded vehicles. For illustration, the overloading charges can be grouped under the following vehicle-km slabs: 0-50 km, 50-200 km, 200-500 km, 500-1,000 km and >1,000 km.

Though the revenue generated through the overloading fines should be treated as deterrent, it should be diverted to the ORF account for having the additional burden of road maintenance due to overloading as well as enforcement purposes and road safety.

8.5 Weighbridges in Ethiopia – An Analysis

As per the ToR, the Study needs to assess the location of weighbridges and recommend the appropriate locations that will decrease the extent of damages by controlling the overloading at relative destinations say on/near the port and potential export destination. In view of undertaking the above exercise, the Study also reviews the existing weighbridge stations, practices, and also condition of the operating weighbridges in the country.

8.5.1 Present Status

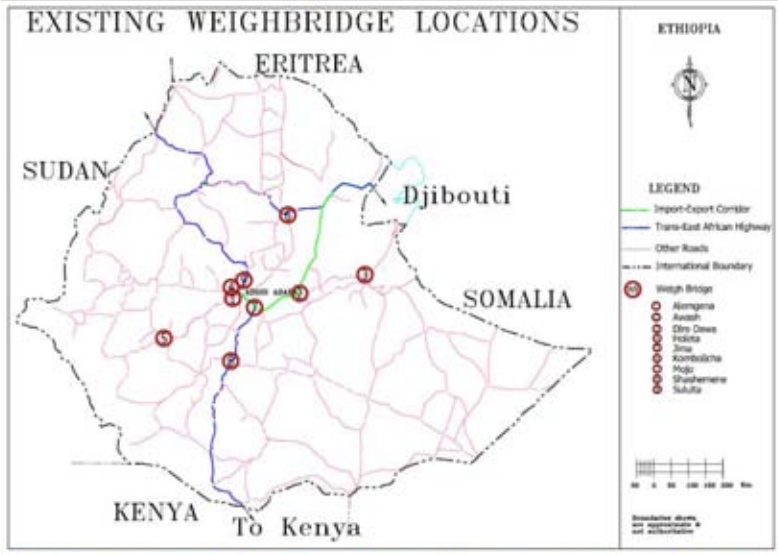
Initially, the Road Transport Authority (RTA) was responsible for controlling the size and the weight of vehicles in the country, but this responsibility was transferred to the ERA in 1999 to improve the management and enforce the legal limits. For the purpose, nine stationary weighbridges covering most of the main routes were installed at strategically important places all over the country. In addition, three mobile weighbridge teams were introduced for random axle load control at different places in the country.

Table 8.23: Location of the Weighbridge Stations in Ethiopia

Location	District	Region	Remarks
1. Alemgena	Alemgena	Central	West to Addis Ababa
2. Modjo			East & South to Addis Ababa
3. Holeta			West to Addis Ababa
4. Sululita			North to Addis Ababa
5. Awash	Diredawa	East	East to Addis Ababa via Modjo
6. Dengego/Diredawa			East to Addis Ababa via Modjo
7. Shashemene	Shashemene	South	South to Addis Ababa via Modjo
8. Jima	Jima	West	West to Addis Ababa via Alemgena
9. Kombolicha	Kombolicha	East	East & North of Addis Ababa

Source: ERA.

Figure 8.5: Locations of Existing Weighbridge Stations



8.5.2 Weighbridges under Construction

Apart from nine existing weighbridges, three new weighbridges are reported to be under construction.

Table 8.24: Weighbridges under Construction

Location	District	Region	Remarks / Justification
1. Semera	Kombolcha	North	Semera is located on Addis-Djibouti Corridor in Afar Region. It is one of main Import-Export corridors between Djibouti and Addis Ababa. It is an important location, to capture and control the overloading traffic plying on this corridor, linking the serving port of Djibouti. The weighbridge is under construction.
2. Sendafa	Alemgena	Central	A weighbridge at Sendafa would help in intercepting the overloaded vehicles, if not captured or over-passed Kombolcha weighbridge station. The weighbridge is under construction.
3. Wereta	Gonder	North	To capture the overloaded vehicles, particularly coming from Woldia and the surrounding regions, a weighbridge at wereta would be helpful, which is under construction.

8.5.3 Conditions of Existing Weighbridges in the Country

The Study team visited a few important existing weighbridge stations in the country in order to know the types and condition of weighbridges with its operation, existing enforcement practices, like off-loading the excess goods, problems faced by the weighbridges staff, etc. In order to appreciate the above facts, the required details of two major weighbridge stations, viz. Alemgena and Modjo are presented here.

8.5.3.1 Weighbridge Station at Alemgena

- There is an Electric-Mechanical type Weigh Machine at Alemgena;
- 8/10 tonnes is the legal limit for front and rear axles for the commercial vehicles;
- In a month, on an average 1,500 vehicles are checked and about 60 vehicles found to be overloaded;
- For overloading vehicles, the overloaded weight is off-loaded from the vehicle and vehicle is produced in the court. The court imposes fine for the overloading;

- ERA doesn't take care of the goods off-loaded from the overloaded vehicles and there is a no warehouse available to store the off-loaded goods;
- At Alemgena, Vehicles Weight Control station 13 staff members are working with 8 inspectors and 3 guards;
- Least count of Weighbridge is 10 kg and it weighs up to 99,999 kg. Weighbridge is Testut model from France and digital display in reader room is Gedge system from Australia;
- Annually Weighbridge undergoes routine maintenance 3 times and calibration once in a year; and
- It is reported that, due to lack of generator, the weighbridge does not work when the electricity is not available. In the night period, some vehicles are not entering into weighbridge due to lack of sufficient enforcement at the weighbridge.

Photo 8.1: Weighbridge Office at Alemgena

Photo 8.2: Weighbridge at Alemgena

Photo 8.3: Weighing the Trucks at Alemgena Weighbridge Station

8.5.3.2 Weighbridge Station at Modjo

- There is an Electric-Mechanical type Weigh Machine;
- In a month, on an average 5,000 vehicles are checked and about 900 vehicles found to be overloaded;
- Truck drivers have been reported to overload the vehicle while transporting the construction materials like sand and aggregates. At the weighbridge those vehicles are not sent to the court for penalty, they are forced to off-load the overloaded weight;

- For overloaded vehicles, the excess weight is off-loaded from the vehicle and vehicle is produced in the court at Modjo and the court imposes fine for overloading;
- ERA does not take care of the off-loaded goods from the overloaded vehicles and there are no warehouses available to store the off-loaded goods;
- Vehicles Weight Control station has the staff of 12 inspectors and 4 guards;
- Least count of the weighbridge is 20 kg, and it weighs up to 33,000 kg;
- Annually weighbridge undergoes routine maintenance three times and calibration once in a year;
- At the weighbridge, less space is available to store the off-loaded goods from overloaded vehicle and the approach roads to the weighbridge are in poor condition, so the vehicles frequently observe breakdown and cause congestion at the weighbridge; and
- Weighbridge is too old, and it frequently gets damaged. During the rainy season, water percolates into weigh machine causing further damage and the damaged spare parts are not generally available.

Photo 8.4: Off-loading goods from Overloaded Trucks at Modjo Weighbridge Station

Photo 8.5: Approach Road to Modjo Weighbridge

Photo 8.6: Weighbridge at Modjo

8.5.4 Maintenance of Existing Weighbridge Stations in the Country

For maintenance of the existing weighbridges, routine maintenance is carried out every three months and calibration is done annually in the presence of the professionals of quality and Standard Authority, Ethiopia. One of the crucial issues / problems as reported by the weighbridges staff is that the weighbridges are of old model and it is difficult to get the spare parts when damaged. In addition, it becomes difficult to maintain the weighbridges during the rainy season, as being embedded in the ground; drain water percolates easily into the weighbridges.

It has been reported that weighbridges at Kombolcha and Shashemene suffered due to road re-alignment and redirection of traffic to other routes, which makes them practically less operational. The most feasible suggestion is to relocate them on appropriate site on the revised road alignment in order to make them functional.

8.5.5 Proposed Additional Weighbridge Stations

In view of growing incidences of the overloading on the road network of Ethiopia as well as to protect the road asset from the overloading practices, the present Study identifies the appropriate places for establishing additional weighbridges, and also recommends suitable measures to reduce the practices of overloading substantially.

The need for additional weighbridges has been identified on the Ethiopian road network at strategic places with high possibility of intercepting the overloaded trucks/vehicles. With the above consideration, additional weighbridges have been proposed on the strategic locations. The exercise is mainly based on the volume of traffic and movement and loading pattern, and where overloaded trucks are expected, accordingly need and probability of intercepting overloaded trucks is more like near major industrial/agricultural locations.

It does not require any special emphasis to control the overloading practices as much as possible on the road networks in the country, as likely damages on account of overloaded vehicle have been established. While reviewing the locations of existing weighbridge stations on the road network established for intercepting the vehicles carrying more loads than the permitted, and also consultations with the officials concerned, the Study analyzed the existing practices, and also realized the need for additional weighbridge stations to be established; so that the overloading practices could be properly controlled. The locations of additional weighbridge stations with brief justification to support the proposal are given in Table 8.25 and also illustrated in Figure 8.6.

Table 8.25: Locations of Additional Weighbridge Stations with Brief Justification

Location	District	Region	Brief Justification
1. Metema	Gonder	North	Metema is located in Amhara region, near Sudan Border, which would be an ideal place for intercepting the overloaded trucks from Sudan in near future, plying between Sudan and Metema areas. The area is also famous for sesame production, and probability of overloading, among others, is considered high.
2. Dejen	Debremarkos	North	A weighbridge station at Dejen is proposed to regulate overloading vehicles plying on Dejen and Mota roads; Bahirdar areas and on Nekampte-Bure corridor. These areas are known for high agricultural production.
3. Nekemte	Nekemte	Western	To intercept the overloading traffic originated from Nekemte and Gimbi areas, a weighbridge at Nekemte is highly desirable. This area is also known for coffee and other agricultural productions.
4. Asassa	Shashemene	Southern	The roads linking Asela and Dodola, and Dodola and Bale are recently paved and some sections are under construction. So the weighbridge station at Asessa will help to intercept the overloaded trucks, particularly originating from Bale areas passing through Assasa to Asela. These areas with high agricultural potential are particularly known for wheat and barley production.
5. Mega	Shashemene	Southern	A weighbridge station at Mega is desirable to intercept the overloaded vehicles specially originating from Kenya and Mega areas. It is important to note that Awassa-Moyale is one of the future high import-export corridors.

Source: The Consultants' Efforts.

Figure 8.6: Locations of the Weighbridge Stations (Existing & Proposed) in Ethiopia

8.5.6 Prevailing Weighing Systems in the Global Market

This section presents the details of weighing systems prevailing in the global market, which would be helpful in selecting an appropriate system for the existing/proposed weighbridge stations in the country. A brief note on the same is given in the following sections.

8.5.6.1 Fixed / Static Weighing Systems

- Multi-Deck System;
- Axle Unit Scales; and
- Single Axle Scales.

(i) Multi-Deck System: Where the traffic volumes warrant (typically >500 vpd), a multi-deck weighbridge (also known as split-deck weighbridge) should be provided. The System consists of four individual decks with lengths typically of 3 m, 6 m, 7 m and 6 m respectively, giving an overall length of 22 m, with a width of 3.2 m. Each deck must be capable of weighing a maximum mass of 40,000 kg, giving a total weighing capacity of 160,000 kg.

Photo 8.7: Typical 3.2 m × 22 m Multi-deck Weighbridge

Benefits of Multi-Deck Scales
• Static weighing which results in very accurate measurement (<1% error) of individual axles and axle unit configurations as well as GVM; • Level of tolerance on the approach slabs is not normally a problem as the whole vehicle is weighed at once; • It is relatively very quick to weigh a vehicle; • Short verification tests can easily be done without test weights (measure any axle or axle unit on each of the weighbridge decks and the results should be consistent); and • It is more difficult to "manipulate" the weighing process, as the whole vehicle is weighed in one go (with an axle unit scale it is easy to weigh only part of an axle unit or to weigh one unit twice and skip an overloaded unit).

(ii) Axle Unit Scales: Where commercial traffic volumes are relatively less, i.e. typically <500 vpd, do not warrant the use of a more expensive multi-deck weighbridge. An axle unit scale can offer a cost-effective choice of weighing system. These scales are typically 3.2 m × 4 m and comprise a single deck which can be connected to a digital weight indicator and are capable of weighing a maximum mass of about 40,000 kg. A digital summing indicator can then be used to display the combined weight of the individual axles and axle groups to give the GVM.

Photo 8.8: Typical 3.2 m × 4 m Axle Unit Scale

Benefits of the Axle Unit Scale
• They can weigh any axle unit of a truck (i.e. single, tandem or tridem unit), not as quickly as a multi-deck scale, but much more quickly than a single axle scale; • Level of tolerance on the approach slabs no longer has to be as accurate as for the single axle scale, but still need to meet minimum requirements; • Verification testing is relatively simple (limited staking of test weights); and • It is far quicker to weigh multi-axle vehicles than using a single axle scale, but not as quick as using a multi-deck scale.

(iii) Single Axle Scales: These may be described as the "first generation" scales that were used commonly in many countries in eastern and southern Africa. They typically comprise a single, 3.2 m x 1 m deck placed centrally within a 40 m concrete slab with a recess to accommodate the scale. The scale can be connected to a computer linked to a digital reader and printer for producing weighbridge slips indicating the various weights of the axles and axle groups.

Photo 8.9: 3.2 m × 1 m Single Axle Scale

Though relatively cheaper to install in comparison, Single Axle Scales have a number of drawbacks including:
• The sites have to be constructed to very precise level requirements which are not easily possible; • Weighing of multi axles is cumbersome and time consuming, especially for articulated or truck-trailer vehicles when up to seven or eight separate axles must be weighed; and • Verification of the scales is difficult due to the difficulty of fitting the test weights onto the small deck.

8.5.6.2 Portable Scales

- Static & Dynamic (Portable Scales); and
- Fixed / Dynamic (Weigh-in-Motion – WIM).

(i) Portable (Mobile) Scales – either statically or dynamically operated, are normally used for screening purposes. These portable scales can be set-up next to any road where there is a suitable surface and an area to pull off and weigh trucks. These scales cannot

be used for law enforcement purposes, but are sufficiently accurate to identify vehicles that are probably overloaded with a high degree of confidence. Due to the fairly high accuracy of the portable scales, screening can take place at considerable distances from the weighbridge, as the chance of diverting vehicles that are legally loaded to the weighbridge is slim. These portable weighing devices are considerably cheaper than static scales, are relatively light, can be set up very rapidly to measure individual wheels, axles, axle units and vehicle/combination mass.

Photo 8.10: Portable Static Weighing Device

(ii) Weigh-in-Motion (WIM): A WIM system is a device that measures the dynamic axle mass of a moving vehicle to estimate the corresponding static axle mass. These systems are designed to capture and record axle weights and gross vehicle weights as vehicles drive over a measurement site at normal traffic speeds. Overhead variable message signs are used to redirect legally loaded vehicles onto the highway while vehicles suspected of being overloaded are directed to an adjacent lane for accurate weighing on a static scale. Thus, the total number of vehicles to be weighed should be considerably less and a smaller facility may then be adequate.

Photo 8.11: Portable Dynamic WIM Device

WIM systems fall into two broad groups as follows:

- High speed (HSWIM) – vehicle travel ≤15 km/h; and
- Low speed (LSWIM) – vehicle speed >15 km/h.

8.5.6.3 Satellite (Virtual) Weighing Station

Satellite weighing stations (sometimes referred to as "virtual weight stations") provide a means of economically and unobtrusively monitoring commercial vehicle traffic at locations where there are a number of alternatives, by-pass routes to cover. These stations deploy WIM systems that automatically weigh vehicles as they travel at normal speeds along a road, classifies them based on weight and axle spacing's determines when vehicles are in violation of regulations, and produces a display of these records on a computer with a network connection. Overloaded heavy vehicles cannot be prosecuted or detained at such satellite stations and would have to be sent or escorted to a static weighbridge where they can be weighed accurately for enforcement purposes.

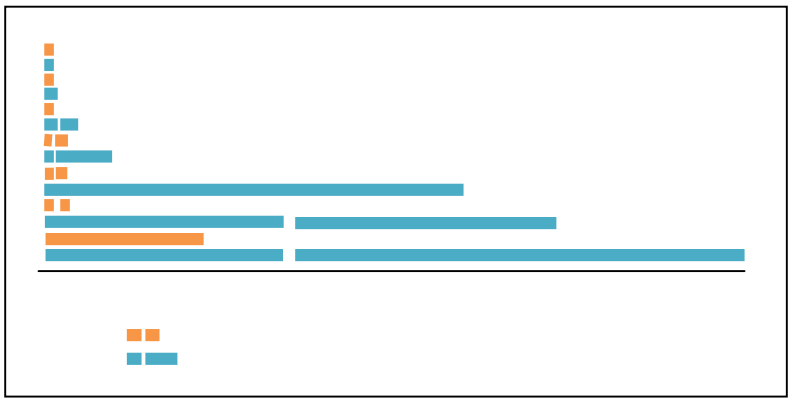
8.5.7 Accuracy of Weighing Systems

The accuracy of weighing systems is primarily influenced by the following factors:

- ***The Error of the Scale*:** This is the *difference* between the *indication* and the *load* placed on the platform of the weighing device. It is affected by factors, such as, temperature, eccentric load, tilted condition, repeatability, creep, span stability, etc.
- ***External Factors*:** There are some influences, which make a wheel or axle load lower or higher, that it would be under perfect conditions. The perfect condition is: absolutely level site, all suspensions of the vehicle on an average, frictionless position, no braking, and no vehicle oscillation. These external factors have nothing to do with the scale accuracy.

The accuracy of the weighing system will depend on the type of system used and the weighing method adopted. Figure 8.7 illustrates a good indication of the accuracy of various types of weighing systems.

Figure 8.7: Accuracy of Weighing Systems



Source: HAENNI (2009), Technical Aspects of Weighing Road Vehicles. Proc. BSEC Conference, Geneva, 18 June 2009.

As illustrated in Figure 8.7, the most accurate method of weighing is by the use of a multi-deck, static scale, which is not affected by external factors that are produced by unfavorable characteristics of the vehicle and weighing site. In contrast, the least accurate method of static weighing is by the use of a single axle scale, which weighs one axle at a time and for which the difference in height between the approach slab and the weighing platform is a critical factor. Accordingly, for permanent weighbridges in Ethiopia, multi-deck scales may be preferred, and for surprise checking, mobile weighing systems, i.e. WIM should be resorted to.

Based on a survey carried out to assess the effect of level of tolerance on mass accuracy of weighbridges[15], the proposed specifications, including tolerance limits, are as follows:

Proposed Specifications, Including Tolerance Limits
• Approach slab: a minimum length of 20 m on either side of the scale; • Tolerance on coping: Zero to -1 mm; • Tolerance on deck: Zero to -2 mm; • Tolerance on approach slab up to 3 m on either side of deck: Zero to +2 mm; and • Tolerance of approach slab from 3 m to 20 m on either side of deck: 30 mm (e.g.+/- 15 mm; 0 to +30 mm; 0 to – 30 mm).

8.5.8 Weighing Tolerances

Due to scale errors and other external factors contributing to the accuracy of weighing systems, no systems can be totally accurate all the time. For the above reasons, some allowance in the weighing measurement is normally made in the form of a *weighing tolerance.* The magnitude of such an allowance is based on the assumed scale error (scale type dependent) plus that estimated for external factors.

In order to ascertain a reasonable basis for setting a weighing tolerance, a National Weighbridge Survey was carried out in South Africa in 2002,[16] in which 57 weighbridges were used (single axle scales, axle unit scales and muiti-deck scales) to weigh a multi-axle vehicle that had been previously weight-assized. The survey found that:

- ***Gross Vehicle Mass*:** All readings fell within the range –0.88% to +0.76% of the average combination mass;
- ***Axle Unit*:** All readings fell within the range –2.14% to +2.78% of the average combination mass; and
- ***Steering Axle*:** All readings fell within the range –5.12% to +4.96% of the average steering axle mass.

Based on the above findings, it was recommended that the tolerance on GVM should be set at +/-2% and that on axles at +/-5%. It was also agreed at a tripartite (SADC/COMESA/EAC) Regional Workshop on Harmonization of Key Elements of Best Practice in Overload Control (InfraAfrica (Pty) Ltd, 2008) that, as an interim measure, a mass tolerance of 5% on axles, axle units and GVM would be adopted.

8.5.9 Operation & Management of Weighbridges

There are a number of different specialist disciplines required in the area of weighbridge management, operations and maintenance (MOM) including the following:

• Legal issues	• Facilities management
• Electronic systems	• Staff management
• Computer systems	• Operations management
• Mechanical systems	• Maintenance management
• Traffic signaling systems	

[15] Council for Scientific and Industrial Research (CSIR) (1994), Assessing the Effect of Level of Tolerance on Mass Accuracy of Weighbridges. Pretoria 001, South Africa.

[16] Council for Scientific and Industrial Research (CSIR) (2003), National Weighbridge Survey 2002: National Department of Transport, Pretoria, January 2003.

8.5.9.1 In-house Operation

In this option, the designated Roads Agency, e.g. ERA in Ethiopia takes full responsibility for the operation and management of the weighbridge facilities. However, historically, for several reasons, this arrangement has generally not been very effective or efficient in the southern African region. Moreover, many of the weighbridge facility operations are generally not considered to be core functions of a Roads Agency and, in principle, should be contracted out to the private sector either as a commercialized or privatized operation.

8.5.9.2 Private Sector Operation

Under this option, the private sector may be appointed by the Roads Agency to carry out some or all of the operational management responsibilities listed above-in essence, a public-private partnership (PPP). Various PPP arrangements may be considered, each with their advantages and disadvantages. In Kenya, operation of some weighbridges has been outsourced to private operators[17].

8.5.10 Weighbridge Operation & Procedures

For legal enforcement purposes, it is mandatory that the personnel involved in the weighbridge operations are legally authorized to do so. Typically in the eastern and southern African regions, such personnel come from the traffic section of the Police or from a Traffic Inspectorate. It is also critical that personnel involved in weighbridge operations are properly trained and able to carry out the weighing procedures in the prescribed manner, particularly in those countries where overloading is treated as a criminal offence.

Some of the weighbridge operational procedures depend on the type of weighbridge being used while others are mandatory to all facilities. It would be normal for any weighbridge facility to have a “Weighbridge Operators Manual” to ensure that all operational procedures are carried out in a proper and consistent manner in accordance with the manufacture’s requirements. Failure to adhere to proper weighbridge operational procedures could result in an overloading violation being thrown out in court.

8.5.11 Personnel Involved in Overload Control Operation

The efficient and effective control of overloading utilizing increasingly sophisticated equipment requires well trained and experienced staff who are conversant with a wide range or related disciplines including the following:

• Transport environment	• Management reporting
• Legislation and regulations	• Staff management
• Weighbridge equipment	• Operations management
• Weighing operations	• Maintenance management
• Software operation	• Safety
• Data management	

8.5.12 Weighbridge Verification & Calibration

The verification process basically involves placing mass pieces that are calibrated to the national standard on the scale(s) and then confirming that the reading given is correct. The frequency of verification is prescribed in the Act. Failure to comply in all respects with the

[17] Study for the Harmonization of Vehicle Overload Control in the East African Community (April 2011).

legal requirements of the Weights and Measures Act of the country, including the verification procedures, would render weighbridge operations illegal.

Calibration of a weighbridge is the carrying out of a set of prescribed operations, which establishes, under reported conditions, the relationship between the weighing system output and corresponding known values of the load applied to the weighbridge. The calibration exercise is normally carried out by an accredited body in accordance with a prescribed procedure, such as, that contained in "A Code of Practice for the Calibration of Industrial Process Weighing Systems, October 2003" published as – BS EN ISO 9000 series of Quality Management and Quality Assurance Standards as issued by the Institute of Measurement and Control in the UK.

The data obtained as a result of the calibration operation may be used to estimate the weighing system errors or to adjust the system output to an agreed specified value.

The frequency of calibration is governed by the following factors:

- Manufacturer's recommendation;
- Frequency and manner of use;
- Environmental influence; and
- Accuracy sought.

8.6 Axle Load Control – Need of the Hour

Axle Load Controls are important for preservation of road infrastructure assets and reduced maintenance costs. They should, however, be managed in a fair, transparent manner and one which imposes minimum delays on truck movements and, therefore, adds little cost to law abiding road transporters.

The best control mechanism is to encourage better voluntary compliance, by proper advocacy the damage effects and costs and enlisting the support of transport associations, public agencies and revenue authorities.

The transporters need to be educated that adhering to axle load limits will cause less damage to the roads and that will mean less operating costs and increased life of their vehicles and it is in their interest as well to adhere to the rules and regulations.

There should be appropriate signs on the road network indicating the legal limit, etc.

Any Axle load control program could have the following components:

- Information and awareness campaign;
- Legal initiative;
- Minimize corrupt practices;
- Weighbridge equipment and sites;
- Commercialization of weighbridges;
- Project monitoring; and
- Vehicles overload management system.

The following measures need to be kept in view to enforce effective axle load control:

- The existing weighbridges should be better maintained and calibrated frequently;
- Allow weighbridge controllers to collect fines, which will reduce delays by avoiding court proceedings;

- A vehicle carrying transit goods container could be provided with a Certificate of Compliance at the originating weigh stations. With this certificate, they should not normally be subject to further weight controls until arrival at destination. At the destination, using the planned mobile scale, the weight can be rapidly determined and compared with that on the Certificate, because vehicles in transit weighing at more than one station is unnecessary and causes substantial delays;
- For petroleum product tankers, axle load control could be achieved without routinely weighing each vehicle as follows: for each petroleum product, there is a specific weight per liter. For each tank trailer's axle configuration, one could measure the volume that could be carried to conform to axle load regulation limits. A tabular matrix, with tanker configuration and product type for allowable loads in liters for each set, would allow axle control by enforcement agents simply checking that quantity does not exceed that specified for the tanker axle configuration and product type; and
- With the advancement in the road construction technology and the vehicle technology, the regulations on axle load controls need to be reviewed to give better haulage capacity to transporters. So a comprehensive study needs to be carried out before arriving at the legal limits and these limits need to be updated from time to time with the change in technology.

8.6.1 Suggested Measures for Offloading the Overloaded Goods

Offloading the goods from overloaded vehicles is identified as one of the deterrent measures, which would require proper guidelines so that the practices of overloading could be controlled, and also giving due regard to different commodities while offloading. For the purpose, the Study brings out the following measures which could be kept in view while formulating guidelines for evacuation of overloaded vehicles:

- Need for guidelines for different types of commodities, such as, liquid and dry cargoes, building materials (sand, boulders, cement, steel, etc), hazardous materials, valuable commodities, fragile and perishable items, etc.;
- Special treatment for overloaded vehicles, carrying high-value fragile goods, particularly agricultural products, which may be allowed to proceed with proper and heavy fines with warning;
- A proper recording system of number and types of overloaded vehicles, penalties imposed, vehicles with repeated overloading, etc. needs to be established for effective monitoring and analysis;
- Suitable storage/warehouses may be provided for valuable commodities with proper charges; for low value commodities, often in bulk, e.g. sand should not be allowed to be offloaded nearby the weighbridge stations, and if kept in open, may also cause adversely to arable land, besides traffic hazard; and
- Fuel carrying overloaded vehicles would be difficult to offload, so may be offloaded at nearby filling stations (if agreed) with suitable charges for the quantity stored with stern warning to the fuel distribution agency.

8.6.2 Further Investigations

A project for "Development of the National Axle Load Control Policy" in line with on-going study in Uganda[18] may be proposed for Ethiopia as well. Similarly, a study is proposed to investigate the total road transport system cost in view of prevailing overloading practices

[18] Source: Study for the Harmonization of Vehicle Overload Control in the East African Community (p 2-9), April 2011.

and rational distributions of loads in view of empty hauling, and more uses of multi-axle vehicles to rationalize the loads causing less damage to the road pavement.

8.7 Mass Distance Charges – A Potential Source of Revenue

The concept behind imposing the Mass Distance Charges (MDCs), i.e. also known as Weight Distance Charges is based on reducing the inequality among road users by ensuring that heavy vehicle owners/operators pay their fair share for the maintenance of roads in the country, as the road consumption increases more sharply with the increase in gross vehicle mass (GVM) than it does with the level of fuel consumption. The MDCs contribute to the variable costs component of the road maintenance cost. A detailed note on the rationale, need and modus operandi of collecting MDCs is given in the "Review of Existing Road Revenue and Recommendation for New Sources of Revenue (Final Report)" submitted under the present Study in September 2011.

The Mass Distance Charges for different types of heavy goods and passenger vehicles for Ethiopia have been worked out in the Study based on the actual road deterioration caused by the heavy vehicles travelling on the road networks in the country. The exercise has been carried out using the multiple runs of HDM-4 model by using different types of additional heavy vehicles in the present traffic scenario on the federal paved road network (trunk) of ERA. HDM-4 analysis has been carried out "with" and "without" additional heavy vehicles with the existing traffic on the federal roads, and the incremental impact of heavy vehicles on the additional maintenance needs and, hence, the additional maintenance cost was derived considering both the scenarios.

It is learnt that the road deterioration rate increases exponentially with the increase in vehicle weight, the difference of maintenance cost, as per the concept of the MDCs should be borne by none other than these heavy vehicles. Hence, the increased maintenance cost has been distributed on various vehicle types depending on their share of annual vehicle utilization on the main road network in the country. The MDCs, thus, estimated in five levels for accommodating different vehicles are presented in Table 8.26 and details are attached as Annexure 8.4.

Table 8.26: Vehicle-wise Estimated MDCs in Ethiopia

Level of Charges	Vehicle Type	Rate/Vehicle (ETB/100 km)
Level 1	Mini Bus (Petrol)	7.1
	Mini Bus (Diesel)	
	Small Truck (Petrol)	
	Small Truck (Diesel)	
Level 2	Large Bus (Diesel)	16.6
	Medium Truck (Diesel)	
Level 3	Heavy Truck (Diesel)	19.6
Level 4	Very Heavy Truck (Diesel)	23.5
Level 5	Over dimensional/abnormally Heavy Vehicle	50.0

Source: The Consultants' Estimates.

The practice of MDCs has been successfully operational in a number of developing and developed countries, such as, New Zealand, Switzerland, Iceland, CAR, Zimbabwe, etc.[19] The MDCs, as one of the sources of the Road Fund is recently introduced in Namibia. For the purpose of analysis and appreciation, a comparison of the rates estimated for MDCs in Ethiopia with the prevailing rates in Namibia, is presented in Table 8.27.

[19] A detailed note on the MDCs is given in the Report on "Review of Existing Road Revenue & Recommendation for New Sources of Revenue (July 2011)".

Table 8.27: Comparison of Estimated MDCs in Ethiopia with Prevailing Charges in Namibia

Level of Charges	Vehicle		MDCs (ETB/'00 veh-km)	
	Type	Description	Estimated for Ethiopia	Prevailing in Namibia*
1	Mini Bus Small Truck	V Value: >3,500 kg or <=7,000 kg	7.1	US$ 0.59 (ETB 9.9)
2	Medium Bus Medium Truck	V Value: >7,000 kg or <=16,000 kg	16.6	US$ 0.75 (ETB 12.6)
3	Large Bus	V Value: >16,000 kg	19.6	US$ 1.45 (ETB 24.4)
	Heavy Truck	V Value: >16,000 kg or <=34,000 kg		
	Trailers	D Value: >16,000 kg or <=34,000 kg		
4	Trailers	D Value: >34,000 kg or <=44,000 kg	23.5	US$ 2.90 (ETB 48.7)
5	Trailers	D Value: >44,000 kg	50.0	US$ 4.35 (ETB 73.1)

*Converted to ETB for comparison as per present conversion rate.
V Value – maximum legally allowed mass of vehicle, not equipped to drawing unit, D Value – maximum permissible drawing vehicle mass of a power unit.

Table 8.27 shows that MDCs proposed for different vehicles in Ethiopia are comparable, rather slightly on the lower side as per the prevailing rates in Namibia. It may be noted that the contribution of MDCs in Namibia is accounted for 2-3% of the total revenue of Road Fund.

If implemented, the proposed MDCs may contribute to the Road Fund up to 4-5% with the assumed level of traffic with composition of vehicles. This issue is presented in Chapter 13 dealing with road users charges.

8.8 Sum Up

8.8.1 Road Deterioration Model

- A Road Deterioration Model based on HDM-4 has been developed in the present Study to assess the multiyear requirement of maintenance interventions to keep the classified road network in a satisfactory level of service for the next 10 years, with the concept of preserving the road asset in the country; and
- The Road Deterioration Model's results have been used for estimating the overloading charges in order to meet the incremental maintenance cost caused by the heavily loaded vehicles, and also to estimate the probable Mass Distance Charges (MDCs), a potential source of revenue to the Road Fund in Ethiopia, which would be covering part of the variable cost components of maintenance, if implemented.

8.8.2 Maintenance Strategies & Standards

- For preserving the road asset in the country, the "Optimum Work" standards have been proposed using the strategic analysis application while running HDM-4 by specifying a series of maintenance alternatives for the road networks under ERA (paved and unpaved), RRAs (unpaved) and MRAs (paved and unpaved), based on different traffic levels, pavement conditions, terrain, climate, etc.; in reality true optimum standards are very difficult to achieve without an intensive investigation, due to the level of interaction of the numerous deterioration parameters and works standards effects;

- The following maintenance strategies, which ensures preserving the national road assets, have been proposed for the periodic maintenance of the classified paved road network in Ethiopia;

Maintenance Strategy for Paved Roads	Resealing	Overlay
Low Level	Total Carriageway Cracked >=30 %	Roughness>=6 IRI
Medium Level	Total Carriageway Cracked >=20 %	Roughness>=5 IRI
High Level	Total Carriageway Cracked >=15 %	Roughness>= 4.5 IRI

Note: All periodic maintenance strategies include routine maintenance very year.

- Recommended Maintenance Intervention Alternatives ensure that roughness of the roads with asphaltic pavement in the country assumed to be less than 6, 5 and 4.5 IRI during the analysis period, i.e. up to 2020, based on the maintenance strategy followed, termed as low, medium and high in view of raising the quality of service and also reducing the VOCs;
- In case of DBST, at low level maintenance strategy, periodic maintenance is recommended when area of carriageway cracking reaches 30%; whereas for medium and high level of maintenance, periodic maintenance is worked out at 20% and 10% of carriageway area under cracking;
- The results of HDM-4 analysis with the above strategies confirmed that timely interventions would considerably increase the effectiveness of road maintenance. Delaying the maintenance interventions would cause premature rehabilitation or reconstruction, which would cost heavily to the economy; so undertaking proper and timely maintenance activities are highly desirable;
- For gravel roads, two levels of serviceability have been considered: (i) basic level of maintenance, i.e. minimum requirement to maintain the network below roughness of 11 IRI; and (ii) ideal, i.e. desirable level of maintenance to maintain the network below roughness of 8 IRI; and
- HDM-4 analysis for unpaved roads has shown that the right combination of grading and re-gravelling is cost effective to maintain the network in an acceptable level of service. Grading has effect on maintaining the good road condition and user pass-ability, although it would not substantially reduce the road roughness.

8.8.3 Multiyear Maintenance Needs Assessment & Cost

- Total classified road network under the roads agencies, viz. ERA, RRAs and MRAs in the country is expected to increase from 53,349 km in 2010 to 86,591 km by 2020;
- The Wereda Roads being constructed under Wereda Road Offices (WROs), are likely to measure 90,417 km at the end of the analysis period, i.e. 2020, expected to be included in the classified road network of the country; if Wereda Roads are included, the length of classified roads would be about 177,000 km by 2020;
- Maintenance Cost of the classified road network has been estimated under three scenarios, i.e. low, medium and high maintenance strategies, with varying traffic level for paved and unpaved roads under ERA, RRAs and MRAs as per the actual road deterioration in next 10 years using the Road Deterioration Model;
- In order to preserve and maintain the classified road network in Ethiopia including the additional roads planned to be constructed during the analysis period, the road agencies would be requiring the annualized maintenance cost ranging from ETB 2.9 billion to ETB 3.2 billion during 2011-20 depending on the maintenance strategy with low, medium and high;

- As per the RSDP IV, the roads to be constructed by WROs under URRAP are likely to be considered under classified road network. Hence, costs for maintaining the proposed Wereda Roads have also been estimated, which need to be financed by the ORF, if approved by the Road Fund Board;
- With the Wereda Roads included in the classified road network, the annualized expenditure on maintenance would be in the range of ETB 3.4 billion to ETB 3.7 billion; and

Annualized Maintenance Cost in ETB billion (2011-20)			
Strategy Level	**Low**	**Medium**	**High**
Without Wereda Roads	2.9	3.1	3.2
With Wereda Roads	3.4	3.6	3.7

- Results of Multiyear Analysis show that inclusion of Wereda Roads in the classified road network would increase the maintenance cost for the network by 15-17% under different maintenance strategies, i.e. low, medium and high.

8.8.4 Overloading Charges & Weighbridge Stations

- Overloading fine has been identified as one of the sources of the revenue as per the Road Fund Proclamation in Ethiopia. The fines are principally to be imposed as a deterrent to overloading to preserve the road pavement and not necessarily for generating revenues;
- In order to estimate the road deterioration caused by overloaded vehicles and the overloading fines in commensurate with damage to the roads, the Road Deterioration Model has been developed in the Study;
- Results of the Road Deterioration Model show that in order to cover the additional maintenance cost due to the overloaded vehicles, the overloaded vehicles would be required to pay ETB 0.13/veh/ton-km;
- Based on the above criteria, revenue through overloading fines can be expected up to ETB 33 million (approx.) per year with the present level of traffic;
- In order to minimize the incidences of overloading, nine stationary weighbridges covering most of the main routes were installed at strategically important places all over the country. In addition, three mobile weighbridge teams were introduced for random axle load control at different places in the country;
- Apart from nine existing weighbridges, three new weighbridges are found to be under construction;
- The existing numbers of weighbridge stations are not sufficient enough to intercept all the overloaded vehicles, particularly in view of growing road network of the country;
- The Study has proposed five additional weighbridge stations to be established in different parts of the country, so that the overloading practices could be properly controlled and monitored; and
- For permanent weighbridge stations in Ethiopia, multi-deck scales system may be preferred, and for surprise checking, mobile weighing systems, i.e. WIM should be resorted to.

Based on the international practices, particularly in the African countries, the Study briefly brings out some of the issues relating to overloading and weighbridges, which need to be considered while dealing with the incidence of overloading practices and administering the weighbridge stations:

- Estimation of the overloading fines/fees should include the level of overloading covering damage to the road, enforcement and administrative costs;
- There could be policy on setting progressive level of fines for the second and subsequent offences for effective enforcement;
- If required, the gross vehicle weight (GVW) could be reduced from 56 tons to 48 tons (Kenya practice). GVW is transferred to different axles of the vehicle, and by limiting GVW to 48 tons, the Study intends to reduce the overloading on the roads in the country. The provision of 48 ton as GVW as prevalent in Kenya, which may be proposed in other countries of Africa as well, following the regulations of COMESA, so that vehicles of different countries can easily pass through other countries without any problems. This would also ensure the harmonization in vehicle overload control;
- Offloading the overloaded vehicles is identified as one of the deterrent measures, which would require proper guidelines so that such practices could be controlled, and also giving due regard to different commodities. For the purpose, the Study brings out a list of measures which could be kept in view while formulating such practices and guidelines for the evacuation of overloaded vehicles;
- In case of carrying perishable commodities or livestock that need to proceed without delay, cash bail out could be set, which should be paid immediately at the designated places;
- Common weighbridges at one-stop border posts to reduce delays of transit cargo;
- Mutual/reciprocal recognition of weighing certificates issued by accredited weighing stations in neighboring countries/states;
- The off-loading policy and related modus operandi prevailing in some countries, e.g. Tanzania20 may be followed in Ethiopia as well;
- The SADC Model Legislative Provisions for Management of Vehicle Loading call for setting overloading charges: (i) road use calculated on a weight-distance basis; (ii) enforcement activities; (iii) congestion factors; (iv) capital investment; and (v) any other expenditure borne by the national road authority relating to implementation of the provisions; and
- The SADC Model also call for transfer of overloading fees to the Road Fund, another good practice.

8.8.5 Mass Distance Charges in Ethiopia

- Mass Distance Charges (MDCs) is one of the new potential sources of revenue as road user charges for maintaining the roads in Ethiopia, which reduces the inequality among road users;
- The MDCs would be applicable for different types of heavy goods and passenger vehicles and contribute to meet the variable components of the maintenance cost;
- The MDCs for heavy goods and passenger vehicles have been worked out in the Study for different sizes of the vehicle based on the actual road deterioration caused by these heavy vehicles travelling on the road networks in the country;

[20] Vehicles overloaded with awkward loads are not offloaded at the weighbridge station unless special and legal safety precautions are taken. If the destination is further away than the starting point, the driver is to return to the starting point for offloading to legal limits after having paid the overload fee, and if the destination is nearer than the starting point the vehicle may proceed after having paid the overload fee plus a surcharge of four times the overloading fee.

- The Study estimates the rates of MDCs in five levels for accommodating different vehicles. The rates vary from ETB 7.1/'00 veh-km for small truck/mini bus to ETB 50/'00 veh-km for over-dimensional/abnormally heavy vehicle for travel on federal paved roads. The MDCs proposed for Ethiopia are fairly comparable with the rates applicable in Namibia, rather on the lower side; and
- If implemented, the proposed MDCs may contribute to the Road Fund up to 4-5% of the revenue with the assumed level of traffic with prevailing composition of vehicles.

9. ROAD FUND BOARDS: REVIEW AND PERFORMANCE

9.0 ROAD FUND BOARDS: REVIEW & PERFORMANCE

9.1 Introduction

This chapter presents salient features on functioning and operational efficiency of different Road Fund Boards (RFBs), in Africa including Ethiopia, engaged in preserving road assets and arranging finances for the road maintenance on sustainable basis following the "Second Generation" concept.

The compilation of the information relating to different RFBs has been carried out illustrating the following major areas:

- structure, viz. objectives, legal basis, declared role, resource generation and distribution powers, composition of the boards, executing agency;
- process, viz. determining income, securing income, monitoring performance in allocation, technical audit, formal allocation processes, and development of supply agencies; and
- performance outcome, viz. underfunding, capacity of local construction industry, operational efficiency, and quality of road network, would present the international practices, and make the building blocks for reviewing and analyzing performance, and identifying the major issues and areas of improvement of the Ethiopian Road Fund (ERF).

The critical issue is however to what extent the Road Funds increased in productive efficiency and service improvements. The "Operational Efficiency" of a Road Fund essentially means the efficiency with which it handles its day to day operations that result in better service delivery and ultimately an "improved road network".

The concepts, facts and figures, analysis, and other details are mainly based on the secondary source of information obtained through the literature survey on the subject, and several occasional and technical papers brought out from time to time, particularly relating to the Sub-Sahara Africa. There are many publications, particularly by the World Bank, working papers investigating road maintenance planning and arranging finance, etc., have been referred to while preparing this chapter. However, a few references, used frequently, are given in the footnote[1].

This chapter establishes the basic concepts of the Road Fund, reviews the Road Fund Boards of different African countries on account of several functional areas, and brings out common issues, etc. in special reference to Ethiopia. This exercise would also enable to appreciate the functioning of Ethiopian Road Fund Board, and useful lessons from the international practices.

Under the present consultancy services, the Consultants also prepared a "Questionnaire" soliciting relevant information from different Road Fund Boards functioning in Africa, so that the latest facts and figures could be obtained, and used in the Study (Annexure 9.1). For the purpose, the Road Fund Boards of Tanzania, Ghana, Malawi, Madagascar and Kenya, were approached to furnish the Questionnaire with the information requested. Responses from Tanzania and Ghana were received (Annexure 9.2 and 9.3).

[1] Selected References: Management and Financing of Roads – An Agenda for Reform, Ian G. Heggie, World Bank Technical Paper No. 275 (1995); Roads Funds Revisited: A Preliminary Appraisal of the Effectiveness of "Second Generation" Road Funds, Kenneth M. Gwilliam and Ajay Kumar (2002), World Bank (TWU-47); African Road Funds What Works and Why, Anne B. de Richecour and Ian G. Heggie (1995), World Bank, SSATP Working Paper No. 14.

9.2 Basic Concepts of the Second Generation Road Fund

9.2.1 General

The World Bank launched the Roads Maintenance Initiative (RMI), which, inter alia, encouraged the development of "Second Generation Road Fund', emphasizing their transparency and accountability qualities and their financing by user charges. The World Bank seeks to establish RFs that avoid some of the problems associated with the earlier examples created in the 1960s and 1970s[2].

A dedicated Road Fund (RF) is normally constituted as a separate fund, outside the central government's general budgetary framework, and charged with responsibility for financing road maintenance services, and in some cases, capital expenditures[3]. In past, there have often been opposed the creation of the RFs, primarily on grounds of inconsistency with macroeconomic control, and particularly expenditure, as distorting the allocation of resources available for public spending, and incompatible with the requirements of efficient cash and financial management[4].

9.2.2 Definition of a Road Fund

The Roads Maintenance Initiative (RMI) defines the role of Road Management Boards of Road Fund using Four Key Principles, as follows[5]:

- Involving road users in the management of roads;
- Securing enough money for road maintenance year after year;
- Ensuring that all parties know what they are responsible for; and
- Establishing a system for managing roads programs with clear accountability.

The World Bank sets the principle in more details on the financing of the Road Funds[6]. It describes "to influence demand and to provide a basis for linking revenues and expenditures so as to create a hard budget constraint, charging instruments should be:

- Related to road use;
- Easily recognizable;
- Easy to separate from taxes and other charges; and
- Simple to administer, e.g. not subject to widespread evasion, avoidance, and leakage".

Following the above principles and directions, the Road Fund Boards have been established throughout the world.

9.3 Review of the Road Fund Boards

For the purpose of reviewing the Road Fund Boards, the countries selected from Africa are Ethiopia, Benin, Ghana, Kenya, Malawi, Tanzania, Zambia and Uganda. The facts and figures, and the analysis structure have been compiled on the basis of the World Bank

[2] Dedicated Road Funds: A Preliminary View on A World Bank Initiative, An IMF Paper.

[3] Ibid.

[4] Ibid.

[5] Finance and Development (1995), by Rupert Pennant-Rae and Ian Heggie.

[6] Managing and Financing of Roads, The World Bank Technical Paper No. 275.

Document brought out for the purpose[7]. The review has been carried out in three categories: (i) Structure; (ii) Process; and (iii) Performance Outcome. The review, thus, made has also been observed in special reference to the Ethiopian practices.

9.3.1 Structure

Based on the concept of the Second Generation Road Fund, the structure of the Road Funds functional in different African countries has been illustrated through selected indicators in Table 8.1; which includes the strength of legal basis, composition and chairmanship of the board with its duties and powers, staff support, etc.

Table 9.1: Structure of the Road Fund Boards

Particular	Ethiopia	Benin	Ghana	Kenya	Malawi	Tanzania	Zambia	Uganda
Year of Establishment	1997	1996	1997	2000	1998	1999	1994	***
Statutory Basis	Law	Law	Law	Law	Law	Law	Order	***
Private Sector Share	4/16	5/9	8/13	8/13	9/12	5/9	7/11	***
Board Chairman	MoT	MoW	MoW	Private Sector	Private Sector	Ex-PS, MoF	Private Sector	***
Planning Separate from Execution	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Board Sets Fuel Tax Levy	No	No	No	No	No	No	No	***
Board Proposes Fuel Tax Levy	No	Yes	No	Yes	Yes*	No	Yes	***N.A.
Professional Management	Yes	Partly	Yes	In process	Yes	Yes	Yes	Yes
Board has Additional Functions	No	No	No	No	Yes	No	Yes	***
Semi/ Independent Executing Agencies Established	No	No	No	No	Partly	Yes	No	Yes

Source: Road Funds Revisited: A Preliminary Appraisal of the Effectiveness of "Second Generation" Road Funds (2002) by Kenneth M. Gwilliam and Ajay Kumar, The World Bank TWU Series.

Table 9.2 summarizes the structure of different Road Fund Boards (RFBs) in terms of legal basis, declared role, resource generation and distribution powers, composition of the Boards, etc. with special reference of the Road Fund Board in Ethiopia.

Table 9.2: Summary of the Structure of the Road Fund Boards

Parameter	Description
Legal Basis	The RFBs were set up by Parliamentary Acts between 1996 and 2000 including Ethiopia. Zambia set up a National Road Board under an exiting Ministerial Order.
Declared Role	The principal responsibilities of the RFBs are resource generation, allocation and evaluation. The RFBs serve as financer of services not as service provider, the ORF, Ethiopia follows the same. However, Zambia provides advice to agencies on procurement and monitors performance, etc. under the national road plan, and Malawi also de facto is road implementation agency. Some RFBs go beyond, e.g. some RFBs have responsibility of advising on general road policy matters, viz. vehicle overloading, and Zambia RF is also responsible for coordination of donor financed program, and management of the 10-year road investment program.

[7] Road Funds Revisited: A Preliminary Appraisal of the Effectiveness of "Second Generation" Road Fund (2002), TWU Series, the World Bank.

Resource Generation & Distribution Powers	The actual powers of the RFBs under this are much more restricted than the originally envisaged, e.g. Benin RFB to implement policy as laid down by the Review Council, Malawi RFB formally have the power to determine levy with approval of the MoT&W & MoF. However, the ultimate decisions of government continue. In other respects the autonomy of the RFBs is legally restricted, and most of the cases, the programs of expenditure have also to be approved by one or more ministries.
Composition of the Road Fund Board	This differs significantly among countries. RFBs of Ghana, Kenya, Malawi and Zambia have a dominant private sector representation, whereas Ethiopia and Benin RFBs are dominated by public sector. In Ethiopia, the composition of the RFB is to be revised every two years allowing for changes in structure based on past experience. In Ethiopia, it is legally reserved for a public official. In other cases, the chairman is appointed by the minister, not necessarily from public sector, viz. Malawi, Kenya, or chosen by the Board, viz. Zambia. In Ethiopia, Benin and Ghana, the Minister of Works is the board Chairman. In Tanzania, the Chairman is appointed by the President from amongst persons outside the civil service. Ethiopian RF has high level public representation on the board, particularly regional, which has given it strong support from the government.
Professional Base	The RFBs are supported with a Secretariat to perform the day-to-day functions. The strength of the secretariat; Zambia (8 professional and Management Support Service Team); Ethiopia (presently 15 professional, approved staff of 21)[8]; Ghana (13 staff), and Benin (3 staff), Tanzania (5 professional including the RF Manager – appointed for 5 years through an open competition).
Administrative & Operating Expenses for the Secretariat	The secretariat expenses in Zambia, Benin, Kenya, Tanzania and Ghana are paid from the RFs, i.e. up to 3% of the fund collection; whereas in Ethiopia, it is allocated from the Ministry of Finance, and i.e. less than 1% of the collection. In most of the selected countries, the secretariat salary is competitive with the private sector. The Secretariat in Ethiopia is yet to get full strength as approved.

Source: Compiled by on the basis of Road Funds Revisited: A Preliminary Appraisal of the Effectiveness of "Second Generation" Road Funds (2002).

9.3.2 Process

The concept of the Second Generation Road Funds was to develop business like, rather than bureaucratic; and to develop the process in order to provide adequate and stable source of financing for the road maintenance. Among others, the challenge has been to improve the use of scarce resources to develop a new strategy for maintenance, focused on out-sourcing most of the work requirements within commercial environment; which requires developing performance based long period area maintenance contracts, managed by key professional staff. Such arrangements would reduce the huge overhead costs associated with maintaining the large road agencies and provide incentives to local contractors to invest in equipment[9].

In order to analyze the process, the indicators illustrating the levels of revenue and expenditure, fund transferred and secured, expenditures allocated and implementation monitored and audited have been identified. The indicators on the process for the selected countries are presented in Tables 9.3 and 9.4.

[8] Information collected from the ORF (September 2011).
[9] The Road Funds Revisited, The World Bank TWU Series (2002).

Table 9.3: Level of Revenue & Expenditure of Different Road Fund Boards

Particular	Ethiopia	Benin	Ghana	Kenya	Malawi	Tanzania	Zambia	Uganda
Fuel Tax Levies paid direct to RF	Yes	No	No	Yes	Yes	No	No	--
Percent of Funds from Fuel Levy	25%*	75%	85%	>90%	95%	95%	95%	--
Percent of Revenue from own Resources	75%	10%	0%	10%	--	0%	0%	--
Regular Monthly Transfer of Fund	Yes	Yes	Yes	Yes	Yes	No	No	--
Independent Technical Audit	In Process	--	Yes	No	No	Yes	No	In Process
Independent Financial Audit	In Process	--	Yes	--	Yes	Yes	Yes	In Process
Performance Audit of Implementation	Yes	--	Yes	No	No	No	No	Yes
Program of Empower SME Contractors	Yes	Yes	Yes	--	--	Yes	Partly	In Process
Road Fund Financing Objectives	Maintenance	Maintenance	Maint./ Rehabilitation	Maint./ Rehabilitation	Maintenance	Maintenance	Maint./ Rehabilitation	--

Source: Road Fund Revisited: A Preliminary Appraisal of the Effectiveness of "Second Generation" Road Funds (2002) by Kenneth M. Gwilliam and Ajay Kumar, The World Bank TWU Series.
*As per 2010-11 estimates, the contribution of the Road Fund Fuel Levy is reduced to about 10% in the total Ethiopian Road Fund Revenue.

Table 9.4: Process Being Followed by Different Road Fund Boards

Indicator	Description
Process for Determining Income	This can be observed that the "Fuel Levy" is the dominant source of contribution to these road funds in the selected countries registering more than 90%. Fuel levy is at fixed charge/litre in Ethiopia, Ghana and Tanzania. Other sources of RFs are international transit tolls, weighbridge fines, motor vehicle licence fees, etc. In Ethiopia, the dominant contribution to the Road Fund comes from the VAT and Municipal Tax; as a result, the fuel levy has remained constant since its start, other taxes have rising, and so its contribution to the Road Fund.
Process for Securing Income	The process for channelling the revenue varies; in Ethiopia, the fuel levy** is credited directly from the Ethiopian Petroleum Enterprise (EPE) into the Road Fund account, on a regular basis, creating a fairly stable basis for the Road Fund. But in Benin and Zambia, the fuel levy is channelled into the RF a/c from the Petroleum Commission through the Ministry of Finance, taking about 4 months in the transfer, i.e. considerable delay. In Tanzania, e.g. Dar es Salaam region, the fuel levy is collected by Tanzania Revenue Authority from the fuel importers, and deposited in the Ministry of Finance a/c, from where the amounts are passed on to the Ministry of Works (i.e. for main roads), and Local Government (for district roads) in the agreed proportion. This arrangement is considered as cumbersome, as the amount, in turn, is deposited into the Road Fund a/c, which is responsible for disbursements to the executing agencies. For up-country regions, there are more steps in the collection process. In all these process, about 2 months time gets lost.
Monitoring Performance in Allocation	Arrangement of an independent monitoring of the performance is one of the requirements of the Second Generation RFs, aiming at flow of the funds, and the quantity, quality, and cost of road works. Zambia RF accounts are prepared on a quarterly basis and audited by an independent external auditor; whereas Ghana RFB has established a proper planning and programming of road works with well defined disbursement and accounting procedures, which has facilitated timely contracting arrangements. In Ethiopia, to monitor the performance, special procedures have been introduced, based on the preparation and approval of payment certificates and monthly progress reports. The system is found effective and satisfactorily.

Indicator	Description
Technical Audit	The system should audit the projects in progress for improving performance on a continuous basis. As suggested, there is a need to: (i) establish a credible and independent external auditing process to monitor the quantity and quality of the work; (ii) set up appropriate responsibilities for reporting and follow up of the audit recommendations; and (iii) develop an updated and rationalized inventory and condition survey of the classified road network. It has been reported that arrangement to systematically carry out independent technical audits are still lacking in most countries, with exception of Ghana RF, which has detailed internal and external monitoring procedures to ensure efficient use of money, accompanied by monthly progress reports, and external financial and technical audits. There have been many discrepancies found with RFs, such as, quality of works, disbursement on non-programmed activities and inadequacy of available funding. In Ethiopia, for undertaking the quality checks for the road maintenance works by the road agencies, the ORF retains the private consultants for supervising the maintenance activities; the consultants submit the monthly, quarterly and annual progress reports of the works accomplished.
Formal Allocation Processes	While analyzing the resource allocation criteria for road maintenance, it has been observed that the "Standard Formula" based system is widely used in the countries selected; more apparently in Ethiopia, Zambia, Kenya and Benin. It has also been observed that the disbursements are biased towards urban and main roads; in some countries the planned expenditures have been poorly disbursed for the rural road network, mainly on account of capacity constraints. Some countries observed external interventions, and among others, resources got diverted to rehabilitated roads, particularly in the capital cities. In Ethiopia, the allocation criteria got revised and the share of regional rural roads increased to 25% from 20%, by reducing 5% of the main road network (now 65%), and remaining 10% for the urban roads. It may be noted that in coming years, attention needs to be given not only to high volume urban roads, but also rural/feeder road network, to ensure equitable distribution of resources.
Development of the Supply Agencies	Enhancement of the capacity of the agencies is critical for improving performance. The resources allocated need to be used in most effective and efficient manner by the executing agencies, otherwise making available the fund will have limited usage. The capacity issues have greater concern, particularly at regional rural roads level. In view of several necessary requirements, it is critical to develop institutional and implementation arrangements to deliver an efficient road maintenance program

Source: Compiled by on the basis of Road Funds Revisited: A Preliminary Appraisal of the Effectiveness of "Second Generation" Road Funds (2002), **Out of the levies on fuel collected in Ethiopia, Road Fund Fuel Levy and Municipal Tax full and about 50% VAT go to the ORF.

9.3.3 Performance Outcome

While evaluating the performance of the RFBs, lack of reliable and comprehensive data has been observed. For the purpose, consultants are hired for financial and technical audits. The audits have raised a number of concerns, e.g. in Ghana, the concerns related to the use of funds, inadequate reporting practices, need for upward revision in fuel levy collections, and greater focus on rehabilitation rather than maintenance. It was also noticed that the audit did not fully address some of the major areas, such as, sector-wise discipline in expenditure management and control; share of planned programs executed; effectiveness of use of money, e.g. cost/km; and relation between amounts of money allocated for maintenance and quality of works over past years.

However, based on a few selected indicators of the level of performance illustrating trends in allocation and disbursement; efficiency of implementation; and the ultimate outcomes of road condition are presented in Table 9.5.

Table 9.5: Performance – Allocation Trend, Disbursement, Efficiency, etc.

Particular	Ethiopia	Benin	Ghana	Kenya	Malawi	Tanzania	Zambia	Uganda
RF Administrative Expenses Percent of Income	>1%	2%	--	3%	<3%	1%	<3%	--
Annual Change in Percent Roads in Good Condition	+3.0	+9.4	+4.5	--	--	--	+4	--
Annual Change in Percent Roads in Bad Condition	-10.0	--	>-10.0	--	>-10.0	--	-5.5	--
Annual Change in Percent Maintenance Works Contracted Out	+10.0	--	+30	--	+30	>+30	>+30	+10
Percent of Estimated Needs Financed	75%	--	50%	--	30%	30%	30%	80%
Percent of Funds Allocated (Trunk/Urban/Rural)	--	--	52/27/20	--	48/42/10	70/30*	40/20/40	--
Percent of Allocated Funds Disbursed (Trunk/Urban/Rural)	65/55/20 ***	55 (ave)	--	50/40/2	--	100/50*	24/69/8	--

Source: Road Funds Revisited: A Preliminary Appraisal of the Effectiveness of "Second Generation" Road Funds (2002) by Kenneth M. Gwilliam and Ajay Kumar, The World Bank TWU Series.
***Presently, the allocation criteria (%) in Ethiopia are changed as 65/25/10 to Federal/Regional/Municipal.

Table 9.6: Indicators Based Description of the Performance

Indicator	Description
Underfunding	In most of the countries, the funding for maintenance consistently growing, but generally the amount recorded short of estimated requirements. It has been estimated that the requirements would be greater to preserve roads in fair condition awaiting periodic maintenance or keeping roads passable awaiting rehabilitation. The underfunding in view of road maintenance needs has been noticed as Zambia's fund was sufficient for about 30%; same in case of Tanzania; Benin able to address the needs of the main road network only; Ethiopia able to address about 60-70% of the needs. It is important to note that the maintenance needs assessment should be carefully carried out; particularly the treatment of the substantial backlog, may not be motorable, requires rehabilitation to return to normal state. Disbursement of the fund to the executing agencies has also been a serious problem, particularly during the initial stages of the RFBs. However, Ghana proved to be the most successful in disbursing the fund. In Ethiopia, the level of unutilized money has been observed and the remaining money was invested in the treasury bills. In most of the countries, the level of disbursements has also been observed varying from type of road; with rural roads having low disbursement rates as compared to main and urban roads, mainly due to capacity constraints; and also political pressure and low representation of rural roads interest in most RFBs.
Capacity of Local Construction Industry	The capacity constraints of the road construction and maintenance industry in most of the selected countries have been observed/reported, which has been one of the major issues, i.e. in turn, affecting the efficient use of road funds. However, with the establishment of RFBs with maintenance contracting and payment arrangements, among others, the practices of engaging private domestic contractor has been on increase. Zambia and Ghana, and also Tanzania have shown a very high level of maintenance works contracted out, i.e. almost 90%. In Ethiopia, due to structural changes in the ERA by establishing commercial

	operations in maintenance districts, and also gradually at RRAs, and jointly implementing performance contract agreements with the ORF, Ethiopia would expect to improve its performance effectively; followed by increasing the practice of contracting out for maintenance works. In many countries, there has been dramatic increase on private sector contracting capacity and capability.
Operational Efficiency	Improved contract management and disbursement arrangements have resulted in enhanced operational efficiency, e.g. by reducing road Maintenance cost/km by 10-20% in Ethiopia, Zambia and Ghana.
Quality of the Road Network	Due to lack of reliable time series data on condition of road network, it is difficult to establish, with high level of confidence, what has happened to the quality of road network. However, there have been marked changes observed in terms of improved quality of road network, as most of the selected countries have shown substantial increase in the proportion of good roads. In Ethiopia, the level of good roads has increased up to 56% in 2010 from 25% in 1999.

Source: Compiled by the Consultants using several references including Road Funds Revisited: A Preliminary Appraisal of the Effectiveness of "Second Generation" Road Funds (2002).

9.4 Performance Analysis of the Road Funds

9.4.1 The Coverage

At this juncture, it is important to review how the Ethiopian Road Fund operational practices are different from those prevailing in other African countries; what are the apparent deficiencies, if any, in the Ethiopian practices, in terms of operational efficiencies of the Fund; what lessons could be learnt from good practices being followed in other similar countries, and what could be adopted or not to be adopted in the Ethiopian context. In this analysis, performance of the Road Funds is evaluated in terms of the parameters as described below.

Parameter	Description
Quality of the Road Network	Evaluated in terms of increase in good or fair condition of roads in terms of both main and rural road networks; adequacy of the funds spent on maintenance vis-à-vis its requirements; Rehabilitation and Maintenance Spending Relative to Norms.
Operational Efficiency	Evaluated in terms of improved contract management and disbursement arrangements (collections Vs disbursements); total number of members on board and percentage of operating budget to total budget; percentage of overheads in the total road fund budget; share of maintenance works contracted out; timely payment to contractors; percentage of under and over-engineering of works; collection of funds and coverage of costs in terms of months.
Allocative Efficiency	Formula Based vis-à-vis planned review of need based programs; capital bias-more focus; main Vs rural road network; maintenance spending vis-à-vis rehabilitation spending and deviation from norm; inadequate attention to non-core network; disbursements/km on different types of road networks.
Development of Local Construction Industry	Evaluated in terms of percentage of works being carried out by force account; number of local contractors.
User Representation on Road Fund Boards	To be analyzed in terms of the number of members representing road users' interests on the Road Fund Boards.

9.4.2 Quality of the Road Network

Road Network Quality is the primary indicator of the performance of the road maintenance management system in any country. If one looks at the trend of Road Condition data (main

road network) in countries with well established road funds, certain observations could be noted (Table 9.7)

Table 9.7 : Change in Road Condition 2004-2007

Country	2004	2007	Change to Good or Fair (%)
Ethiopia**	**64**	**69**	**5**
Madagascar	30	75	45
Kenya	57	77	20
Tanzania	50	69	19
Malawi	63	65	2
Ghana	65	60	-5

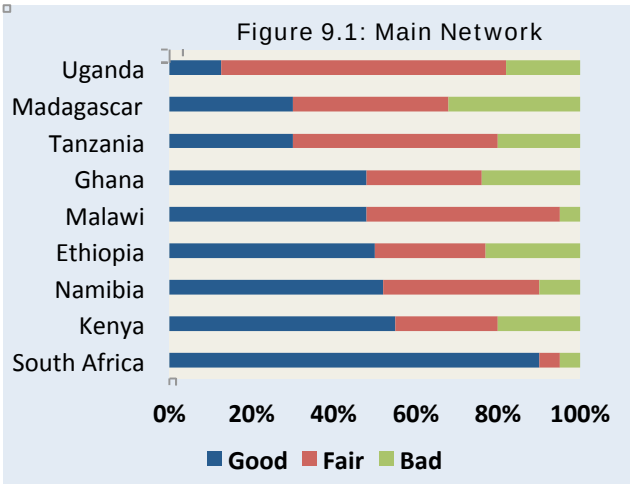
Source: RMI Matrix, 2004-2007. **Updated, based on the RSDP IV (2011).

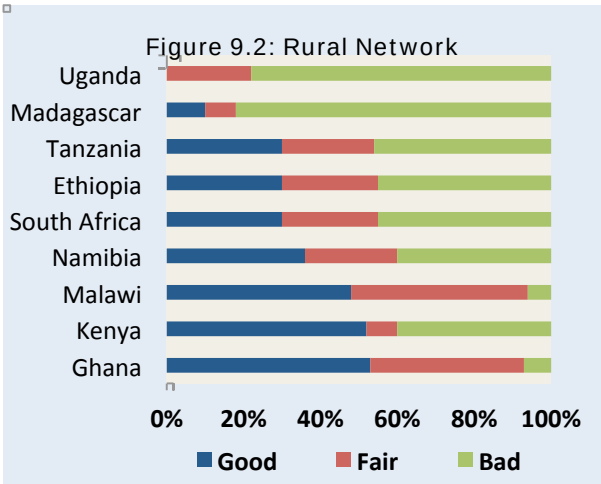
- Madagascar appears to have improved the most, i.e. from 30% good or fair condition roads (2004) to 75% (2007);
- Kenya and Tanzania also show substantial improvements in their road network quality, i.e. 57% of Kenya's road network was in good to fair condition in 2004, which increased up to 77%; similarly Tanzania also showed about 19% improvement in its road network condition between 2004 (50%) and 2007 (69%);
- Ethiopia and Malawi register up to 69% good/fair roads by 2007, i.e. improvements by 3% and 2% in the "good or fair" condition; and
- Ghana's road network actually shows deterioration from 65% to 60%, i.e. by 5% in the good condition roads. The probable reasons for this situation could also be attributed to inclusion of bad roads in the network.

Table 9.8: Road Network Length across Condition Class (%) 2008

Country	Main Network			Rural Network		
	Good	Fair	Bad	Good	Fair	Bad
Ethiopia**	**57**	**16**	**27**	**49**	**24**	**27**
South Africa	90	5	5	30	25	45
Kenya	55	25	20	52	8	40
Namibia	52	38	10	36	24	40
Ghana	48	28	24	53	40	7
Tanzania	30	50	20	30	24	46
Madagascar	30	38	32	10	8	82
Uganda	13	70	18	--	22	78

**Updated, based on RSDP IV 2011.

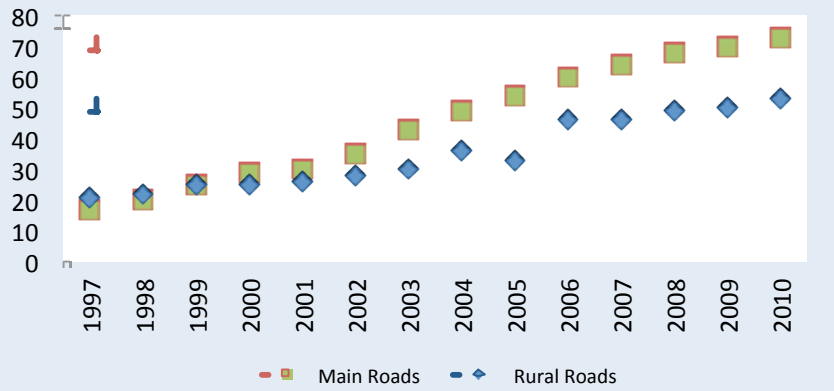




Source: AICD, Burden of Road Maintenance; Roads in Sub-Sahara Africa, 2008.

- Figures 9.1 and 9.2 show that there is a significant variation in the percentage of main roads in good condition among different countries, but less so in the percentage of main roads in good or fair condition (Table 9.8). On an average, about 46% of the main network is in good condition, a further 34% in fair condition and the remaining 20% in poor condition.
- The percentage in good condition ranges from 13% in Uganda to 90% in South Africa. Overall, the majority of countries have 60-90% of their main network in good or fair condition.
- As might be expected, the condition of the rural networks is substantially lower than that of the main road networks (Table 9.8). On an average, about 25% of the rural network is in good condition, and further 28% in fair condition and the remaining 47% in poor condition.
- The percentage of good roads ranges from zero in Uganda to more than 50% in Kenya and Ghana. Only a handful of countries succeed in maintaining more than 60% of their rural networks in good or fair condition.
- The road condition in Ethiopia shows an improvement at the main road network level as well as at the rural road network level. The Road Sector Development Programs commonly known as RSDPs had three successful phases in Ethiopia, starting from the year 1997. In the first year of the RSDP 52% of the road network was in poor condition and only 22% was in good condition. The rehabilitation, upgrading and maintenance intervention efforts under the RSDPs improved the proportion of the road network in good condition to 56% in the year 2010, with only 21% remaining in a poor condition.
- The proportion of roads in good condition overtook the proportion of roads in poor condition from 2004 onwards. Roads in fair and poor condition are consistently declining. Specifically, the RSDPs captured rehabilitation and upgrading of main roads; construction of new roads; and the execution of regular maintenance on the road network.

Figure 9.3: Trend of Ethiopian Road Network over 13 years of RSDP (% change in Good Condition Roads)



Source: RSDP 13 Years Performance and Phase IV.

- However, if one observes the growth in good condition roads, the main road network shows a higher growth rate, i.e. 12% pa, than what is observed for the rural road network, i.e. 7% pa. This implies that the maintenance interventions and strategies with capability remain skewed towards the main road network. The trend of the good condition rural road network shows a marked improvement during 2005-06 onwards (Figure 9.3).

- Therefore, a greater emphasis is still required over the improvements in road condition at the rural road network level.

9.4.2.1 Average Maintenance Spending on Main and Rural Networks

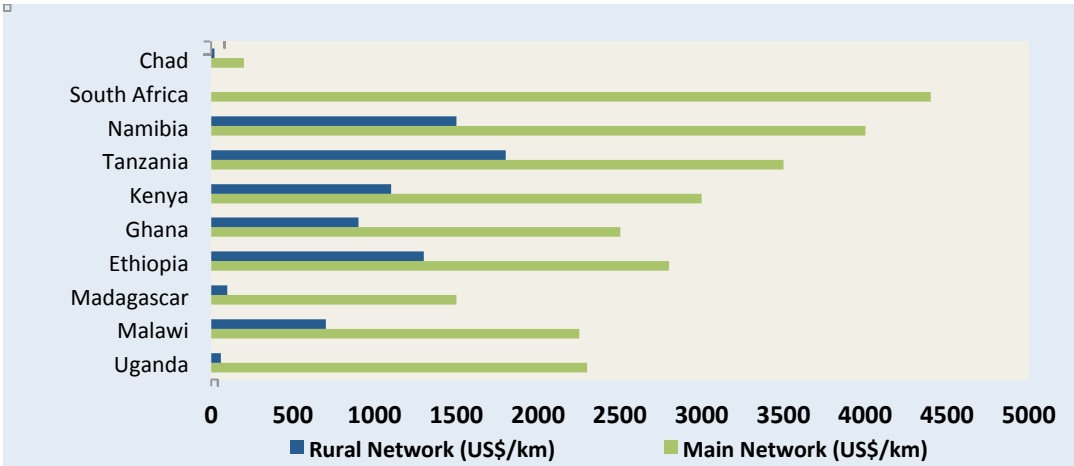
There appears to be a trade-off between levels of capital expenditure and levels of maintenance expenditure. On the one hand, countries that spend too little on maintenance will end up with larger rehabilitation liabilities, often resulting in the need for emergency works to restore the functionality of critical infrastructure. On the other hand, countries with large investment programs may have fewer resources left over to address road maintenance needs[10].

Table 9.9: Average Maintenance Spending

Country	Road Network (US$/km)	
	Main	Rural
Ethiopia	**2,800**	**1,300**
Uganda	2,300	60
Malawi	2,250	700
Madagascar	1,500	100
Ghana	2,500	900
Kenya	3,000	1,100
Tanzania	3,500	1,800
Namibia	4,000	1,500
South Africa	4,400	--
Chad	200	20

Source: AICD Fiscal Costs Study, 2008.

Figure 9.4: Average Maintenance Spending (US$/km)



Source: AICD Fiscal Costs Study, 2008.

- From Figure 9.4, there appears to be a variation in maintenance expenditure effort across countries of rural and main road networks. For the main road network, the range extends from barely US$ 200/km in Chad to over US$ 4,400/km in South Africa.
- For the rural road network, the range extends from barely US$ 20/km in Chad to more than US$ 1,800/km in Tanzania (Figure 9.4). On an average, countries are spending US$ 800/km on the rural network and more than US$ 2,500/km on the main network.

[10] AICD Document, 2008 – "The Burden of Maintenance-Roads in SSA".

- Ethiopia also tends to follow the above pattern of spending almost half of what it spends on its main roads maintenance expenditure in terms of US$. Nonetheless, it tends to spend larger amounts on rural road network on US$ 1,300/km basis when compared to other countries, which are not spending as much amounts.
- A general observation in this regard could also be that the problems of rural road maintenance are not uniquely related to finance. There are technical issues related to the lack of planning and the lack of information on the state of the road network. There are also major institutional factors relating to the lack of clear responsibility at different decentralized levels for maintenance planning, budgeting and implementation.

9.4.2.2 Maintenance Expenditure as the Percentage of Requirements

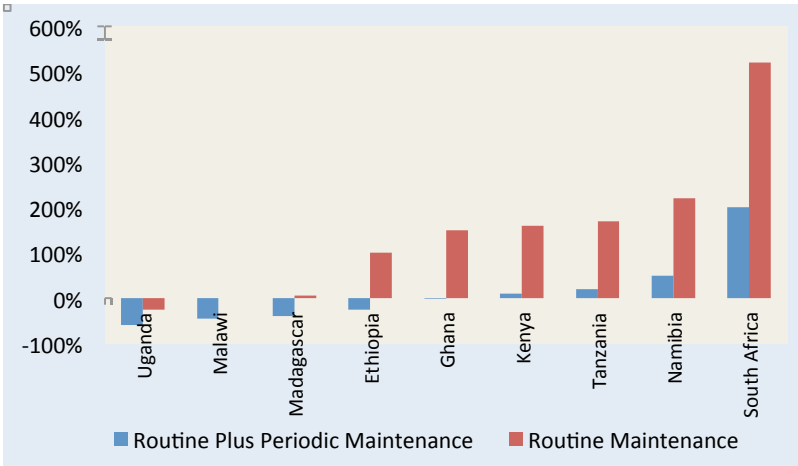
- The AICD Fiscal Costs Study, 2008 have used the RONET Model, to produce detailed estimates of the routine and periodic maintenance requirements for each country's road network taking into account the current distribution of network condition.
- On that basis, the maintenance requirements can be compared with the current levels of maintenance expenditure to determine whether these are high enough to preserve the network in good condition (Figure 9.5).
- Half of the countries are not devoting adequate resources to maintenance of the main road network, particularly Uganda, Madagascar, etc. Most of the countries are seen spending adequately on routine maintenance, but fall short of "routine plus periodic maintenance needs".
- Ethiopia fulfills 100% of the routine maintenance requirements, but falls short of periodic maintenance needs. On the other hand, South Africa fulfills 200% of the requirement of routine plus periodic maintenance needs.

Table 9.10: Maintenance Expenditure

Country	Maintenance (% Requirement)	
	Routine & Periodic	Routine
Ethiopia	**-25%**	**100%**
Uganda	-60%	-25%
Malawi	-45%	--
Madagascar	-40%	6%
Ghana	-2%	150%
Kenya	10%	160%
Tanzania	20%	170%
Namibia	50%	220%
South Africa	200%	520%

Source: AICD Fiscal Costs Study, 2008.

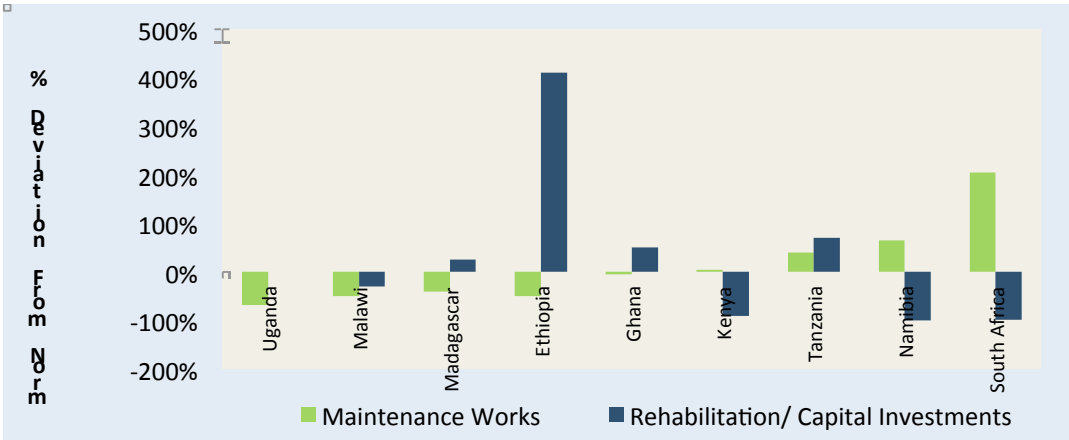
Figure 9.5: Maintenance Expenditure (%age of Requirement)



9.4.2.3 Rehabilitation & Maintenance Spending Relative to Norms

As per the AICD Fiscal Costs Study (2008), half of the countries are not spending adequately to meet maintenance needs. Rather, there is a clear capital bias found in most of the countries surveyed in that particular study (Figure 9.6).

Figure 9.6: Rehabilitation & Maintenance Spending Relative to Norms



Source: AICD Fiscal Costs Study, 2008; AICD RONET Analysis, 2008.

- Maintenance spending is below the norms in most countries, but Tanzania seems to be spending on rehabilitation works as well as maintenance works well above the norms; and
- Ethiopia stands out with a glaring well above the norm for rehabilitation works and below 50% of the norm of what it should be spending on maintenance works

9.4.3 Operational Efficiency

The operational efficiency of various RFBs has been observed from the perspective of whether the RFs under the present evaluation have resulted in improved contract management and disbursement arrangements, what has been the total number of members on board and percentage of operating budget to total budget; percentage of overheads in the total road fund budget; share of maintenance works contracted out; timely payment to contractors; percentage of under and over-engineering of works; collection of funds and coverage of costs in terms of months.

9.4.3.1 Management (Members & Share of Operating Budget to Total Budget)

- The operational efficiency of a country's road fund could also be seen from the number of members on its board and the proportion of its operating budget to the total budget.
- The size of road funds' secretariats varies from 9 in Niger to 72 in Lesotho. The average size of secretariats is 23 in terms of number of employees.
- Similarly, road funds operating budget also varies from 2% to 13% (Lesotho).
- The number of members in the secretariat shows a positive correlation with the operating budget as can be seen from the case of Lesotho.
- Table 9.11 provides the changes, which happened between 2006 and 2009 in terms of increased number of members and share of operating budget, and whether it has increased or decreased over the last three years.
- What also makes a difference is the composition of the RFBs, which differs significantly among countries. In Ghana, Kenya, Malawi and Zambia, the Boards have a dominant private sector representation, while in Ethiopia and Benin the boards are dominated by the public sector.

Table 9.11: No. of Members & Share of Operating Budget to the Total Budget

Country	2006		2009	
	Membership (Nos.)	% of the budget	Membership (Nos.)	% of the budget
Ethiopia			16	--
Burundi	14	5.7	16	3.6
Cameroon	13	3.5	17	2.5
Gabon			21	4.0
Ghana	12	0.2		
Guinea	21	9.0	23	8.0
Kenya	48			
Lesotho			72	13.0
Madagascar	23	2.0	22	2.0
Malawi			38	6.0
Mali	11	2.7	18	2.5
Namibia	16	1.0		
Niger	6	4.62	9	6.4
Rwanda	10	3.0		
Tanzania	10	1.1		
Chad	7	3.5	9	3.4
Zambia	11	5.0	18	4.0

Source: RMI Matrix, 2006-2009, *The Office of Road Fund.

9.4.3.2 Availability of Cash Reserves – Road Fund Accounts

The performance indicators show that, on an average, the road funds keep an amount of three-four months equivalent of road maintenance works as a minimum amount of cash available in their bank accounts.

Table 9.12: Availability of Funds Covering Costs for No. of Months

Country	Operating Costs covering for Months - 2006	Country	Operating Costs covering for Months - 2009
Burundi	2	Burundi	6
Cameroon	3	Cameroon	12
Ethiopia		Ethiopia	6
Ghana	1	Ghana	1
Kenya	1	Kenya	1
Lesotho		Lesotho	6
Madagascar	2	Madagascar	12
Malawi	2	Malawi	3
Mali	3	Mali	4
Rwanda	3	Rwanda	3
Tanzania	1	Tanzania	1
Zambia	3	Zambia	3

Source: RMI Matrix, 2009.

- This could also imply that the disbursement rates in those particular countries, which are showing a high availability of funds covering for 2-3 months is not very high, and consequently might have an effect on ultimately their quality of road network.
- From Table 9.12, it is evident that countries which show a high cash reserve equivalent to 12 months, such as, in Cameroon or Madagascar need not be the countries which are demonstrating a high quality road network as well; which mean that cash reserves have little or no correlation with the operational efficiency of the road fund board.
- Although having high cash reserve does not mean that funds raise sufficient revenues to meet all the assessed demands for maintenance, but it does contribute to the reduction of time in paying contractors bills. Ethiopia in the year 2009 showed about 6 month's equivalent of road maintenance works as a minimum amount of cash available in the RFB's bank account. As per the Financial and Technical Audit Report (2005), Ethiopia, overall 83% of the allocated budget for the six year period from 1997-98 to 2002-03 had been disbursed.
- The slow utilization of financial resources was considered to be the one of main problems in the operation of the Fund as per the Financial and Technical Audit Report (2005), Ethiopia. In consequence, the ORF had accumulated a substantial cash reserve mounting to over ETB 820 million in the year 2004. The main reasons for the slow utilization of road maintenance funds were taken as limited implementation capacity of the road agencies and local contractors caused by the shortage of equipment and supervision resources, as well as poor work scheduling practices.

9.4.3.3 Average Deadline for the Payment of Non-Controversial Bills

Another important parameter, which was decided by the African Road Maintenance Funds Association (ARMFA) members to evaluate performance of a road fund is the average deadline for the payment of non-controversial bills.

One of the major constraints hampering the promotion of small and medium enterprises (SMEs) is the irregularity of work contracts and long delays for payment of works done. The reduction of delays should contribute to the promotion of SMEs and also bringing down road maintenance unit costs in the long run.

Table 9.13: Average Deadline for the Payment of Non-Controversial Bills (Days)

Country	2007		2009		Average Rate of rejection of Bills
	Without dismissal	With dismissal	Without dismissal	With dismissal	
Ethiopia	5		5		-
Ghana	90		90		-
Kenya	90	135	-	-	-
Madagascar	2	21	6	20	6
Malawi	5	20	3	20	4
Namibia	30	60	-	-	<5 (2006)

Source: RMI Matrix, 2007-2009.

- Table 9.13 deals with various RFBs, and the time they take in paying contractors for their undisputed bills for the year 2007, and if there has been recent change in 2009.
- As per the SSATP's, Discussion Paper 6, 2006, most road funds in the Sub-Saharan Africa pay contractors directly. The RFBs of Tanzania and Ghana disburse funds through a revolving fund to implementing agencies, and do not directly pay contractors and consultants. In Ghana, this has extended delays in paying contractors bills (90 days) and the RFB has off late decided to pay directly contractors' bills.
- Table 9.13 indicates that the time period for paying the undisputed contractors' bills varies from 5 to 90 days with an average time of 25-30 days. The results of the survey on performance indicators show an average rejection rate of bills of 5%. This is a low rate and is not consistent with the findings of technical audit reports. This may indicate a weakness in the supervision and control of maintenance works and/or a lack of internal auditing.
- In Ethiopia Road Fund Board has resulted in improved accountability of road agencies and efficiency in resource use. No longer, the payment is made on a cash flow basis, rather on submission of payment certificates, approved by a supervisor. The payment certificates are based on agreed unit rates for each activity. The average time taken to pay contractors for whom regular payments are critical for survival and efficiency is about five days, which is on the lower side when compared to other Sub-Saharan countries in Africa.

9.4.3.4 Companies meeting Deadlines Specified in Contracts

- Another aspect of the operational efficiency could be the percentage of companies in various countries meeting deadlines specified in contracts. Failing to meet deadlines have an implication on road maintenance costs and also vehicle operating cost and inconvenience to the road users due to network getting deteriorated further, weak auditing arrangements, etc.

Table 9.14: Companies Meeting Deadlines in Contracts

Country	2006	2009
	% of companies	% of companies
Ethiopia		100
Guinea	13	
Kenya	30	
Madagascar	85	95
Malawi	60	95
Namibia	75	
Niger	100	

Source: RMI Matrix, 2006-2009.

- As per the RMI database, in Ethiopia 100% of the companies to whom works have been contracted out, meet deadlines; but the number of works outsourced out to private contractors is rather less.

9.4.3.5 Over-Engineering & Under-Engineering on Main & Rural Road Networks

Another aspect of operational efficiency of a road fund board, that how much over-engineered, correctly-engineered or under-engineered their road network is, as it reflects on the appropriateness of the technology at the design stage and also the efficacy of the technical audits and monitoring mechanism by the road funds.

As per the AICD RONET Analysis (2008), various countries were studied with the threshold traffic level of 300 vpd, making roads viable to be paved – whether roads were over-engineered, correctly-engineered or under-engineered.

Table 9.15: Over-Engineering & Under-Engineering on Main & Rural Road Networks

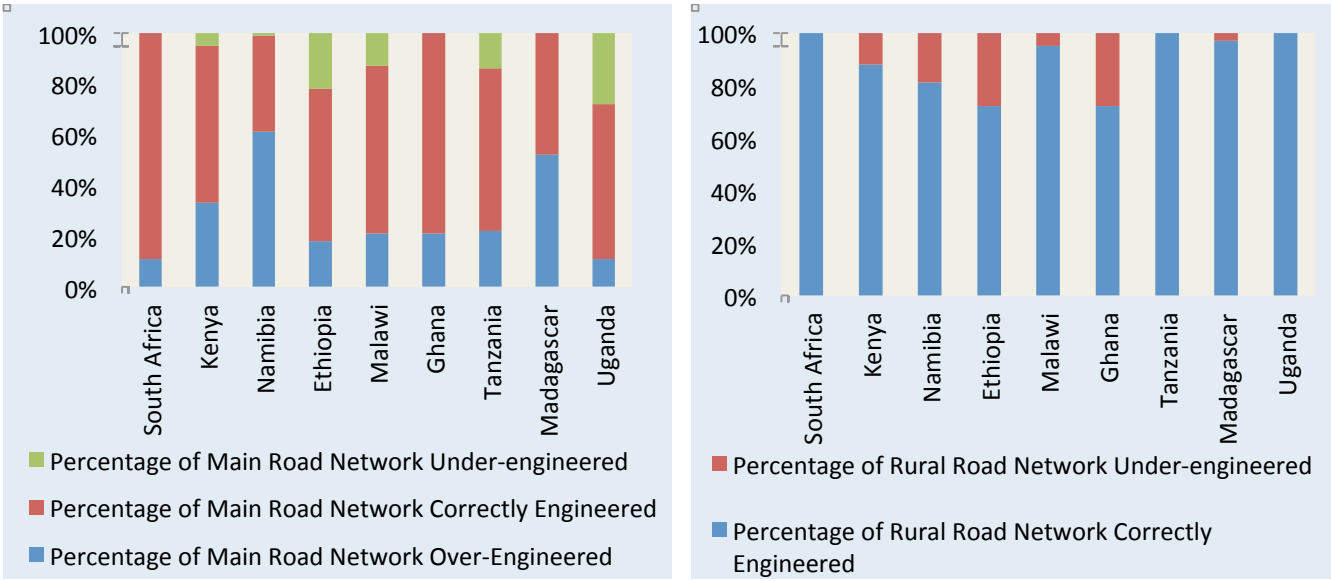
Country	Percentage of Main Road Network		
	Over-Engineered	Correctly Engineered	Under-engineered
South Africa	11%	89%	--
Kenya	33%	62%	5%
Namibia	61%	38%	1%
Ethiopia	18%	60%	22%
Malawi	21%	66%	13%
Ghana	21%	79%	--
Tanzania	22%	64%	14%
Madagascar	52%	48%	--
Uganda	11%	61%	28%

Country	Percentage of Rural Road Network	
	Correctly Engineered	Under-engineered
South Africa	100%	--
Kenya	88%	12%
Namibia	81%	19%
Ethiopia	72%	28%
Malawi	95%	5%
Ghana	72%	28%
Tanzania	100%	--
Madagascar	97%	3%
Uganda	100%	--

Source: AICD, 2008.

- This criterion reveals that, on an average across countries, about 30% of the main network is over-engineered and about 10% is under-engineered suggesting a scope for significant cost savings by better aligning surface types with traffic volumes.
- South Africa has the highest percentage of correctly engineered roads both on the main and rural road networks, which implies that their choice of technology is appropriate at the design stage, and in compliance with the traffic volumes plying on their road network.
- Ethiopia shows more evidence of under-engineering both on the main (22%) and rural (28%) road network, which indicates that the roads requiring paving and gravelling have not been attended to. The surface types need to be better aligned with the traffic volumes both on the entire road network.

Figure 9.7: Over-Engineering & Under-Engineering on Main & Rural Road Network



Source: AICD RONET Analysis, 2008.

- On the rural network, one finds substantial under-engineering (Figure 9.7). In this case, the key traffic threshold is 30 vpd widely considered to be the minimum required to justify gravelling of roads[11].
- The results indicate no particular evidence of over-engineering on the rural network, implying no real scope for cost savings on this part of the network. However, on the contrary, across countries about 15% of the rural network length appears to be under-engineered, meaning that a gravel surface could be warranted.
- Countries, such as, Ethiopia, Ghana, and Namibia show that about 30% of their rural network may be under-engineered; Countries such as Tanzania, South Africa, and Uganda show no evidence of under-engineering.

9.4.4 Operational Efficiency as per the Second Generation Reforms

The analysis shows that Ethiopia ranks in the second tier of the countries on the overall performance index (along with Ghana, Rwanda and Madagascar), after Namibia, Kenya and Tanzania who are top scorers, as per the AICD Document. There are very few lessons to be learnt from at least African countries, which have more or less similar problems regarding operational efficiencies. Figure 9.9 presents the relative position of the selected countries.

9.4.5 Allocative Efficiency

Resource allocation for road maintenance is usually driven by a standard formula in most African countries rather than a planned review of programs put forward by various road agencies.

9.4.5.1 Road Fund Allocation Rules

- The majority of countries in Africa are using formula to allocate funding among main, rural and urban roads. Countries allocate on average about 60% to main, 22% to rural and 15% to urban roads.

[11] AICD RONET Analysis (2008).

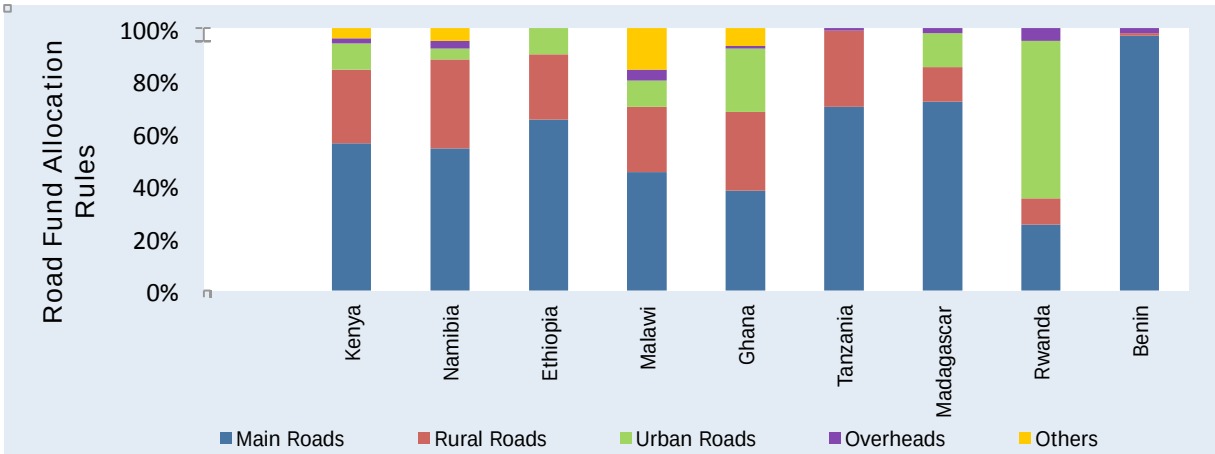
- While all the RFs allocate funds to urban roads, except Tanzania or Benin, Rwanda or Benin makes no allocations for rural roads. In some cases, such as, Rwanda, 60% goes to urban roads and about 25% to main roads.
- Ethiopia also has a standard formula of 65%:25%:10% among main, rural and urban road networks respectively rather than being governed by the maintenance needs of the network.

Table 9.16: Road Fund Allocation Rules – African Countries

Country	Main Roads	Rural Roads	Urban Roads	Overheads	Others
Kenya	56%	28%	10%	2%	4%
Namibia	54%	34%	4%	3%	5%
Ethiopia**	65%	25%	10%	--	--
Malawi	45%	25%	10%	4%	16%
Ghana	38%	30%	24%	1%	7%
Tanzania	70%	29%	0%	1%	0%
Madagascar	72%	13%	13%	2%	0%
Rwanda	25%	10%	60%	5%	0%
Benin	97%	1%	0%	2%	0%
Average	**58%**	**22%**	**15%**	**2%**	**4%**

Source: SSATP RMI Matrix, 2007. **Prevailing Criteria, of the total revenue, conventionally 85% for road maintenance, and rest for other activities.

Figure 9.8: Road Fund Allocation Rules in African Countries



9.4.5.2 New Zealand: A Brief Note on Dividing Funds on the Basis of Estimated Needs Using a Road Management System

New Zealand has one of the best systems for dividing funds between the main road agency and the various regional transport authorities. All the authorities are required to prepare their road programs on the basis of a standardized road management system and benefit-cost analysis. Staff from Transfund advise the transport authorities on how to operate the road management system and how to compute the benefit-cost ratios, and they carry out regular audits to ensure that each authority is applying the procedures correctly and is also achieving minimum maintenance standards and service levels (i.e., the audit checks to ensure that the allocated funds are actually spent on maintenance and that the maintenance is carried out to agreed standards). In the case of investments, staff from Transfund audits a sample of benefit-cost calculations, including those for all schemes over $700,000.

The method used by Transfund is one of the best ways of dividing funds between different road authorities. It nevertheless requires a technically strong road agency and this may not always be the case, particularly at the local government level.

Ethiopia, at the moment allocates road funds as per a formula driven approach, and appears it would continue in view of its inherent merits and straight forward approach. However, the maintenance need assessment by different categories of roads is desirable to make effective plans.

9.4.6 Development of Local Construction Industry

The performance assessment of the RFBs is also evaluated for the development of local construction industry in a particular country. This can be evaluated in terms of percentage of maintenance works being carried out by private contractors vis-à-vis force account; number of local contractors in a country, etc. The relative advantages of contracting out works to force account are as follows:

9.4.6.1 Disadvantages with Force Account

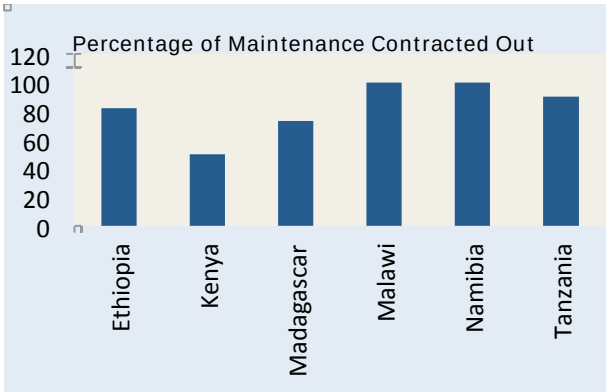
- funding tends to be erratic;
- management of equipment and its support facilities inadequate; and
- planning, supervision and execution require high standards of staffing, quality control may be poor; and reporting systems weak.

9.4.6.2 Advantages of Contracted Out Works

- payment of work is done to specifications;
- rates are known making budgeting and planning easier;
- risk is transferred from the Public Sector to the Private Sector; and
- the profit motive tends to promote efficiency and reduce unnecessary waste.

Country	Amount of Maintenance contracted out	Total No. of Contractors
	% of all works	in Maintenance Works
Ethiopia	82	47
Ghana	--	--
Kenya	50	50
Madagascar	73	329
Malawi	100	102
Mozambique	--	--
Namibia	100	263
Tanzania	90	400

Source: RMI Matrix, 2007.



During the course of the Study and field trips, it was reported that Ethiopia has a nascent private contractors industry with not many private contractors wanting to go to rural regions to carry out maintenance works; although the above statistic says about 82% of maintenance works are contracted out, it is skewed towards the main road network.

9.4.6.3 Experiences Elsewhere in Africa

A number of initiatives have recently been taken in many African countries to develop the capacity of local contractors, such as: (i) preparatory training, (ii) providing hands-on training,

(iii) providing access to plant and equipment, (iv) assisting road agencies to acquire the skills to supervise contracts, and (v) simplifying government procurement procedures[12].

(i) Preparatory Training: Seminars have been organized, or are under preparation, in Burundi, Ghana, Tanzania, and Zaire to teach contractors how to manage small civil works contracts. The most comprehensive seminar program for contractors is in Tanzania. It offers training for administrative managers, engineers, site superintendents, and technicians. The owners and managers of the firms have also asked to participate in the training so that they can understand what is being taught to their staff.

(ii) Hands-On Training: Potential contractors have been permitted to work on small projects to gain practical contract experience. In Ghana, sections involving 5 km of road rehabilitation were used as training works for implementing labor-based work methods (contract value around $50,000). Similarly, the International Labor Organization (ILO) organized 3 km training sections for labor-based rehabilitation of feeder roads in Guinea. In Uganda, contractors have been trained on 10 to 15 km road sections under contracts amounting to about $100,000. In Kenya, contractors have been progressively trained to bid for road rehabilitation works. The first time unit prices were fixed by the road agency. The second time contractors were allowed to bid on the same rates but with a plus or minus factor. Now they have to compute their unit prices themselves. Current contracts amount to about $500,000 each. In Tanzania, training works for equipment-based road rehabilitation are 30 to 70 km in length and are estimated at $1 to $2 million per contract.

(iii) Availability of Plant and Equipment: These initiatives have focused on helping contractors to get better access to plant and equipment. A plant pool has been in operation in Ghana for years and has helped to develop domestic road contractors. In Uganda, rented equipment belonging to the Ministry of Works was made available to contractors, but it was not sufficient. Contractors, therefore, decided to buy additional machinery and share it from a pool. Renting equipment to contractors is being considered by the Ministries of Works in Burundi, Guinea, Tanzania, and Zaire. The Integrated Roads Project in Tanzania is providing contractors with access to foreign currency to enable them to buy equipment and spares.

(iv) Contract Supervision: Most road agencies have a limited capacity to supervise contracts and several initiatives are under way to strengthen this capacity. Burundi, Guinea, Guinea-Bissau, Tanzania, and Zaire are all building or strengthening control units in the road agency in order to adequately supervise contracted road works. In each case, foreign expertise is involved in preparing sample documents for preparation, procurement, and supervision, staffing the unit during the initial years, and training civil servants in this new activity.

(v) Simplifying Procurement Procedures: Simplification of procurement procedures is an essential component of efforts to do more work under contract and develop the local construction industry. In Ghana, a comprehensive review of conditions of contracts for ICB and LCB has been carried out under the Road Rehabilitation and Maintenance Project. Proposals for changes have been prepared and accepted. New conditions of contracts are being implemented. If implemented earlier, some specific clauses, such as, provision for compensation for delayed payments, might have prevented some contractors from going bankrupt, although there is no substitute for prompt payment. In Chad, Guinea Bissau, and Tanzania, governments have decided to reshape and simplify the regulations for procurement and contract administration to make them easier for contractors.

(vi) Findings of the Financial and Technical Audit Report (2005) – Local Contractors in Ethiopia: The Financial and Technical Audit Report identified the following obstructions for more active participation of local road construction industry in road maintenance:

12 Management and Financing of Roads, Ian G. Heggie, the World Bank Technical Paper No. 275.

- The availability of equipment resources required for large road rehabilitation/ upgrading projects;
- The availability of financial resources;
- Difficulties in obtaining performance and bid securities from local banks; and
- The size and complexity of contracts.

Besides the normal technical and management problems associated with emerging construction industries the conclusion of the Auditor was that, the main cause of the problems of local contractors was the size and complexity of periodic road maintenance contracts, which were, so far, essentially road upgrading/ new construction/ rehabilitation contracts.

The Financial and Technical Audit Report concluded that the reduction of the size and scope of road maintenance contracts as key prerequisites for the development of the local road construction industry. Appropriate slicing of road maintenance contracts would bring the resource requirements to a level affordable by local contractors and increase competition.

(vii) Steps taken by ERA's RSDP IV for the Development of Local Contractors Industry[13]: The GoE has recently adopted a strategy to improve contractor performance that includes closer follow up mechanisms during mobilization; contractually requiring the contractor to complete construction of a given length of the project per period of time and providing incentives to those contractors who complete projects within the contractual time, quality and cost.

For an illustration, a lesson from Tanzania is set out in the following box:

Construction Industry Development Fund, Tanzania[14]: The CIDF was set up in 2003 by the NCC with the aim of:

- Providing funds to firms on easier terms than traditional banks;
- Acting as a guarantor for loans;
- Providing loans for equipment and tools;
- Providing training in business development;
- Fostering alliances among local firms and with foreign; and
- Managing a construction warranty scheme.

Management and board of directors come from contractors, consultants and suppliers. Sources of funds include membership fees, equity contributions from members, donations, grants, loans, and commissions on loans and guarantees.

A **Contractors Assistance Fund** was also set up by the Contractors Registration Board purely to guarantee advances and bonds for small scale contractors. Out of 400 companies assisted since 2002 only one has defaulted to date.

Capital is a major constraint for newly emerging contractors. Banks in developing countries are notoriously risk averse and particularly reluctant to provide credit to what they perceive as high risk industries, such as, construction. Enhanced credit availability to local contractors or creation of a fund, such as, CIDF, Tanzania could be one solution to this problem and which could be replicated by Ethiopia with some planned initiatives in this direction.

[13] RSDP 13 Years Performance and Phase IV.

[14] Transport Sector Board, World Bank Paper, 2006, "How a Road Agency Can Transform Force Account Road Maintenance to Contracting".

9.4.7 Private Sector Representation on the Road Fund Boards

Another aspect of road fund boards' performance is evaluating the road users' participation in the RFBs. This ensures that the interests of the road users are taken care of in all the decisions of the road funds and also gives a sense of ownership to the road users.

Given that current allocations for road maintenance are erratic and well below the levels needed to keep the road network in stable long-term condition, the first building block involves winning public support for more road funding and taking steps to ensure that road agencies do not operate as public monopolies and do not spend more on roads than the country can afford. This is an essential precondition for getting road users to willingly pay for roads on a fee-for-service basis. Most road users are unwilling to pay unless they can influence fee levels and are satisfied that the proceeds will be spent on roads, the work will be done efficiently, and managers will be relatively free from political interference. The usual mechanism for winning the support of road users is to involve them in the management of roads.

Most of the countries under reviewed in this part of the Study have the Road Fund Board/Administration institutionally separated from road administration. While Road Fund Boards are responsible for resource generation, allocation, and evaluation, the programming, tendering, evaluating, negotiating, awarding, supervising, and managing of contracts are the responsibility of the road administrations. The composition of the Road Fund Boards is different in different countries - Kenya, Zambia and Ghana the Boards have a dominant private sector representation, Ethiopia and Benin the Boards are dominated by the public sector (in Ethiopia, the composition of the Board is revised every two years allowing for changes in structure based on past experience).

The Kenya Roads Board Act specifies dominant private sector representation. The ORF, Ethiopia's Secretariat is presently supported by 15 professional staff (approved staff of 21), and Ghana by a thirteen staff Secretariat. The administrative and operating expenses for the Secretariat in Zambia, Benin, Kenya and Ghana are paid from the Road Fund and are about 3% of the RF collections; in Ethiopia, administrative expenses are allocated from the MoFED and are less than 1% of the RF collections.

Table 9.17: Private Sector Representation on the Road Fund Boards

Country	Private Sector Share on Board
Benin	5 / 9
Ethiopia	4 / 16
Ghana	8 / 13
Kenya	8 / 13
Lesotho	5 / 9
Malawi	9 / 12
Tanzania	5 / 9
Zambia	7 / 11

Source: Evaluation of Bank Support for Road Funds, World Bank, 2007.

9.5 Sum Up & Major Issues

The present chapter describing different activities and performance of the Road Fund Boards has brought out several issues, which are important for understanding and reviewing the functions of different Road Fund Boards as the Second Generation Road Fund. Summary of the Chapter is presented in the following sections.

9.5.1 Structure

- The road funds generally secure the legal basis, and the Ethiopian Road Fund and the Board were set up by the Parliamentary Acts through a Proclamation in 1997.
- Most of the RFBs do not observe additional functions other than the required as per the usual Second Generation Road Fund norms, and the Ethiopian Road Fund also does not have any additional functions.
- For proper representation of the road users and business community, it is advised that at least half of the board members come from outside government[15], which would create a form of surrogate market discipline. The logic for the same is that they are paying for the roads and they have strong interest of not being over-charged, and also the money is well spent. On this criterion, the Ethiopian Road Fund Board has less private sector representation on the Board, i.e. only four out of 16 total members (1997). The presentation of rural network is also highly desirable.
- It is desirable that the planning function should be separate from the executing function, and the Ethiopian Road Fund does observe the same like most of the selected countries for the analysis.
- Most of the RFs are professionally managed; however, it has been observed that many RF Secretariats are not yet fully staffed by professionally qualified and experienced personnel or less than the approved or designated professional positions. In the ORF, Ethiopia, the number of approved staffs are 24 (21 professional and 3 secretaries), of which only 17 staffs are working (15 professional and 2 secretaries), so seven positions are vacant.
- There have been discrepancies found in the defined roles of the RFBs and the Secretariats among different countries' practices. The principle responsibilities of the Boards are resource generation, allocation and evaluation. In view of these, the roles need to be defined. In some of the countries, viz. Zambia and Malawi have gone beyond. However, for the Ethiopian RFB, it is advised to confine to their roles and responsibilities as per the Proclamation (1997).

9.5.2 Process

- The income level of the Fund has remained largely under control of the ORF, Ethiopia; whereas in many countries, it has been observed that the control largely remained with the government.
- The time taken during the transfer of revenue to the Road Fund account in Ethiopia, i.e. about one month, is reasonably acceptable, as in many countries it takes two to four months.
- As per the prevailing practices, about 50% of the VAT collected through sales of petrol and diesel, is transferred to the ORF.
- The funding arrangements in most of the countries, including Ethiopia, appear to be transparent with financial audits working well.
- Considering several merits and simple to implement, the formal allocation criteria based on the "Standard Formula" appear to be working well in many countries, including Ethiopia. The formula based allocation criteria ensure disbursement to different types of roads, viz. main, regional rural and municipal, it should, therefore, continue. However, as revised in past, it could be revised in future, if felt necessary, particularly in view of the

[15] The World Bank Office Memorandum (1995).

structural changes in the country's road network and the socio-economic development policies.

- In Ethiopia, for undertaking the quality checks for the road maintenance works by the road agencies, the ORF retains the private consultants for supervising the maintenance activities; the consultants submit the monthly, quarterly and annual progress reports of the works accomplished.
- Efforts are made in capacity development of road agencies in Ethiopia by the process of increasing the proportion of the contracting out the road maintenance activities. In fact, the above outsourcing process would increase the capacity of the road agencies.

9.5.3 Performance Outcome

- Due to growing size of the classified road networks, and also the number of road users all over, the road maintenance needs have accordingly been increasing, causing always resource constraints. Also in Ethiopia, there has been a sizeable growth in the classified road network, particularly since the implementation of various Road Sector Development Programs (RSDPs), requiring much higher resources, which are not adequate enough to maintain the built up road assets, particularly for the periodic maintenance. This position would certainly leave behind several routine and periodic maintenance activities, which would result in, higher proportion of poor or bad roads.
- The absorbing capacity of the funds allocated to the maintenance executing agencies, has been recognized as one of the constraints. In Ethiopia by ongoing structural changes in road agencies, the practices of contracting out the road maintenance activities are expected to grow in near future, which would enhance the capacity and efficiency in view of market competition.
- Despite of several limitations, due to monitoring and evaluation of the RFBs, there has been reduction in maintenance costs in terms of per km. In Ethiopia as well, the evidence shows reduction in maintenance cost/km and improvement in quality by hiring private contractors in the maintenance activities. In view of the above, a study on performance based contracts on pilot basis has also been entrusted by the ERA for three road segments to a consultant; the outcomes of the study are awaited.
- The regular decline in road quality has been arrested and also the condition of the roads has been significantly improved. In Ethiopia, the level of road condition as "good" of the total classified road network has been estimated as 56% in 2010, which can be considered as quantum jump from merely 25% in 1999 level.

9.5.4 Road Safety Issues

Most of the RFBs are addressing the issue of Road Safety, as the Ethiopian RF has a special mention in the Proclamation and practices to finance the Road Safety related interventions.

9.5.5 Second Generation Road Fund – An Evaluation

Ethiopia stands in the second tier of the countries on the overall performance index (along with Ghana, Rwanda and Madagascar), after Namibia, Kenya and Tanzania, who are top scorers, as per the AICD Document. There are very few lessons to be learnt from African countries' experience, which have more or less similar problems regarding operational efficiencies.

The Second Generation reforms started taking place in most of the African countries around early and mid-90s. The initial thrust of the reform has been to create an independent source

of funding for road maintenance based on road-user charges. The funds are fenced off from the general government budget and administered by an autonomous board.

Some of the Indicators of Performance of the "Second Generation" Road Fund in SSA
▪ 27 active road funds are in place – of which 9 established since 2000 and 7 in Francophone Africa; ▪ 18 out of 27 are established by law; ▪ 12 with a board with private sector majority; ▪ 14 road funds rely 80% or more on road user charges as revenues; ▪ In nearly all cases, fuel levy is the principal means of raising road user charges; ▪ Average fuel levy in US Cent/litre is 8 and 7 for petrol and diesel respectively; ▪ 11 road funds have their revenues channelled directly to their bank account; and ▪ Only about one third of road funds may now be meeting routine maintenance expenditure needs on a regular basis.

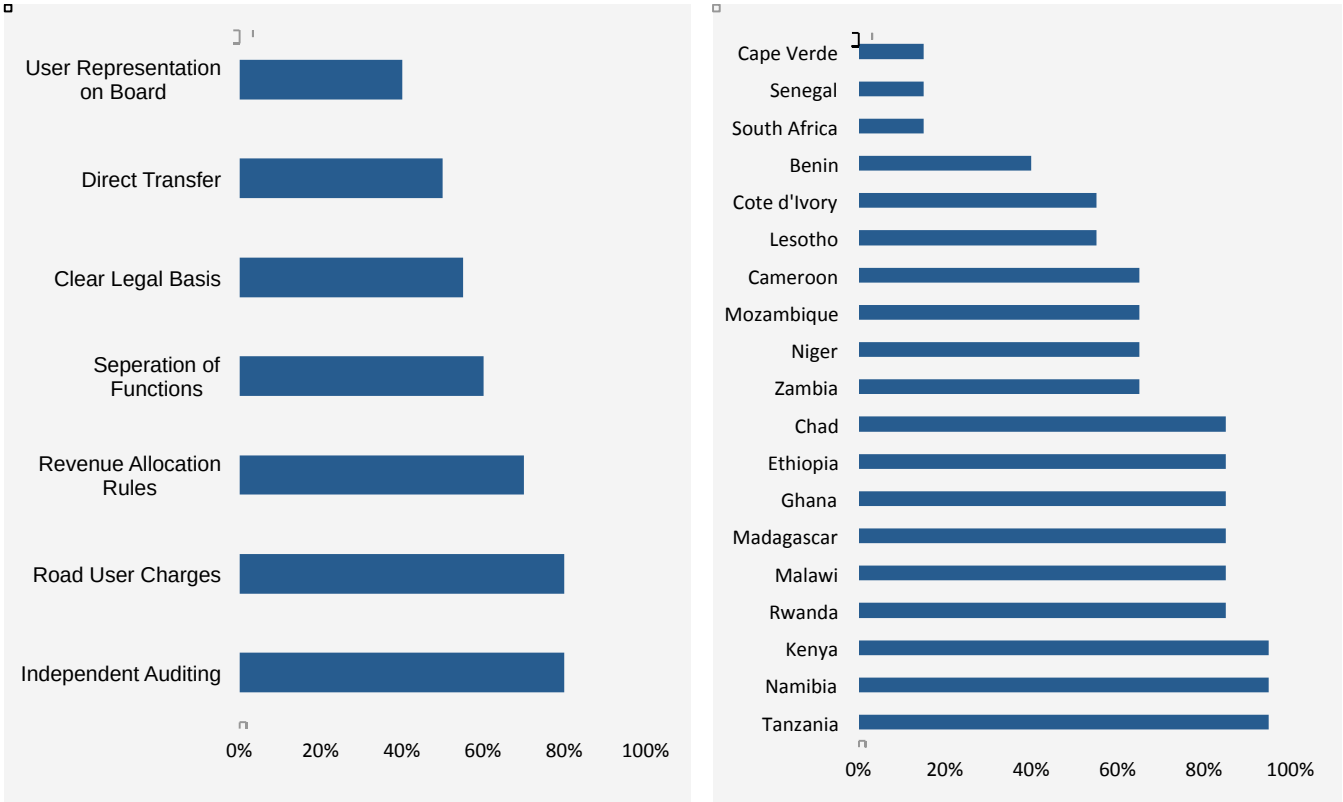
Source: A Discussion Paper by the World Bank, "Road Funds in Sub-Saharan Africa: A Reality Check (2006).

The seven criteria of a good design specified by the 35-member Sub-Saharan Africa Transport Policy Program (SSATP) considered are presented as below:

- Clear legal foundation;
- Separation of functions;
- Application of road-user charges;
- Direct transfer of funds;
- Representation of road users on the board;
- Clear revenue allocation rules; and
- Independent auditing of accounts.

Figure 9.9: Evaluation of Road Funds

Prevalence of Second Generation Road Fund Characteristics	Scores on Overall Performance Index



Source: SSATP, RMI Matrix 2007

Out of the above seven criteria, Ethiopia appears to do fairly well in about 80% of these cases. It has established a good institution with an existence of a road agency and follows most of the design features of any good Second Generation Road Fund. But it does lack from the channelizing of resources point of view, whereby most of the resources of the road fund are still borne by government allocations (e.g. VAT) and not by the road user charges.

In most African countries, fuel levies are a proxy of road user charges and mainly fund the maintenance expenditure in those countries. The level of fuel levy—and hence its utility—varies enormously across countries. The range extends from symbolic levels of around US$ 0.03/liter, [not adequate to make material contribution to road maintenance] to around US$ 0.16/liter, [adequate to cover most maintenance needs].

Ethiopia has a fuel levy which is much below even the symbolic levels and has not changed since its inception. It is time to review the "Fuel Levies" in order to have a realistic proxy of at least the variable cost of maintenance of the road network of the country. Also, because of lower-than-expected Fuel Levies, the Road Funds in Benin, Côte d'Ivoire, Ethiopia, Gabon, and Zambia are dependent on budget allocations for more than 75% of their resources.

While 60% of the Road Fund revenues are typically allocated to the main interurban road network, some countries have to varying degrees attempted to channel portions of the Road Fund toward the maintenance of rural and, to a lesser extent, urban road networks. Ethiopia too has a formula driven approach to allocate road funds, which is not a reflector of real maintenance needs of the road network. Also due to the problem of absorptive capacity at the rural road agency level, almost half of the rural road network is in fair to poor road condition.

Road agencies have moved toward contracting out performance-based maintenance contracts—an important trend. The potential advantage of such contracts is that they provide a strong incentive for maintenance contractors to perform well, while reducing expenditure uncertainties for the Road Fund. In about half of the sample countries, more than 80% of maintenance work was contracted out. Use of this approach has been strongly, though not exclusively, associated with the presence of a road agency.

Improved contract management and disbursement arrangements of this kind have reduced the unit cost of road maintenance by 10% to 20% in Ethiopia, Ghana, and Zambia. Lack of funding and institutional capacity shows up most strongly in the condition of the unpaved and lower tiers of the network; compromising territorial connectivity, which is a typical case for Ethiopia also.

9.5.6 Performance Analysis of Road Funds

While evaluating the performance of select road funds in Africa based on various parameters of expenditure, institutions and quality, Ethiopia does fairly well in terms of setting good institutions and channeling large volumes of resources for the road fund. Largely, the problems and issues remain the same across African countries, they tend to suffer from the same issues of already burdened road users and limited finance availability, poor condition road network, huge maintenance backlogs, road user charges not properly framed, and if framed, not properly collected, yet there are good practices, which could be replicated by Ethiopia to improve performance. Countries, like, Kenya, Tanzania and Namibia have performed relatively better than other countries and could impart quite a few lessons to Ethiopia.

9.5.7 Issues Related to the Ethiopian Road Fund

Ethiopia's Road Fund was established in the year 1997 and, since that time, the maintenance problems of the country's road network have reduced to a great extent. As per the RSDP IV document, the trend of good condition road network, both for main road network

and rural road network, has increased from 22% (1997) to 56% (2010), a statistic, not very impressive yet encouraging with an annual growth rate of 7% over 13 years of the road fund operation.

While evaluating the performance of the Road Fund Boards' operations since its inception in Ethiopia vis-à-vis other countries' Road Funds, the major issues turn out to be as follows:

- Massive road sector development programs and regular road fund's support since 1997 have generally resulted in bringing majority of the road network condition to a good to fair condition; however these developments remain skewed towards the main road network, which shows a higher growth rate in the increase of good condition roads (12%) than the rural roads (7%). The spending pattern on rural roads is also half of what is spent on main road network;
- Ethiopia fulfills 100% of the routine maintenance requirements, but falls short of periodic maintenance needs; and
- There is also a marked capital bias in most of the works, with maintenance expenditure falling short of the requirements;
- While evaluating operational efficiency parameters, it was studied whether the road fund operations in sample countries have resulted in improved contract management and disbursement arrangements. Several countries have made important headways in this aspect.
- For Ethiopia, it appears that the main reasons for the slow utilization of road maintenance funds could be limited implementation capacity of the road agencies and local contractors caused by the shortage of equipment and supervision resources, as well as poor work scheduling practices.

10. ROAD FUND: SOURCES OF REVENUE

10.0 ROAD FUND: SOURCES OF REVENUE

10.1 General

The basic purpose of the present chapter is to set the concept and rationale, and the prevailing practices and limitations of different sources of revenue of the road fund, which are also functional with different Road Fund Boards in developing countries, particularly African countries, that could be probably adopted in Ethiopia in view of the growing road maintenance needs and requirements of additional financing. While undertaking the exercise, the underlying assumptions, which are governed by the Second Generation Road Fund concept based on the user pay principle to cover the incremental cost for the road maintenance, have been kept in view.

10.2 Sources of Revenue

To provide an adequate and stable source of finance for undertaking the road maintenance activities are the objectives of the Road Funds. The revenues generally come through two main sources[1]:

(i) Road User Charges; and

(ii) Transfers from the Government's General Tax Revenues.

The first source, i.e. road user charges is relatively stable, whereas the second is highly unstable. It has been observed that the governments in Africa are seriously short of fiscal revenues and, even when willing, cannot provide a stable flow of finance. The Road Funds, which rely on transfers from the government's general revenues will, therefore, continue to provide an erratic flow of funds, as the actual payments will often be less than the budgeted amount[2].

However, following the practical approach, during the early stages of the RFs, when road revenues build up, some transfers from general revenues may be necessary. In long term, it would be desirable that the road users will have to accept the objective of "full cost recovery" for roads; which eventually aims at using the road fund to finance all "routine and periodic maintenance", the total currency component of donor-financed rehabilitation programs, together with interest payments and debt service on loans for rehabilitation, and all new investment[3].

In view of the above background, it has been suggested that the Road Funds should be designed to:

- Avoid reliance on transfers from the government's general revenue budget; and
- Eventually to achieve full cost recovery of roads.

10.2.1 Road User Charges

It may be important to define: (i) the Road User Taxes; and (ii) the Road User Charges. The Road User Taxes refer to any tax imposed on the acquisition and operation of road vehicles, including taxes and fees on vehicles, spare-parts and fuel. But, it is difficult to define Road User Charges. The term "charge" usually implies a fee for use or a charge levied to cover the cost imposed by vehicle use on the rest of society. There may be several instances that road

[1] African Road Funds What Works and Why, Anne B. de Richecour and Ian G. Heggie, Africa Region the World Bank (1995).

[2] Ibid.

[3] Ibid.

user charges will be component of road user taxes. However, where a specific road fund is set up then the charges are not considered as part of taxation[4]. Similarly, a road toll for using specific facility will not be considered as a tax.

To sum up, from the road fund's point, the revenues paid into a road fund – apart from transfers from the government's general revenue budget, and donor grants and loans – are derived from road user charges. To make it further clear that these are fees, rather than regular taxes, they are normally referred to as the "road tariff". Since the objective is to charge road users explicitly for operation and maintenance of roads, the tariff needs to be clearly recognizable and capable of being separated from general tax revenues[5].

Road User Charges are calculated to cover a wide variety of costs[6]. For road user charges, the following items are usually included in the analysis and discussion for specific purpose.

Traffic Management	Policing	Accidents
Control of international traffic	Environmental damage costs	Congestion costs
Routine & Periodic Maintenance Costs	Road Rehabilitation	New road construction

Out of the above list, for the purpose of present discussions and analysis for the RFBs, the road user charges will be primarily confined to cover the "routine and periodic maintenance costs".

10.2.2 Charging Road Users

For undertaking the road maintenance activities on a sustainable basis, it is highly desirable that there should be adequate flow of funds available for the purpose with the Road Funds. Since the financing of road maintenance is based on the Second Generation Road Fund concept, the mechanism for charging the road users is equally important. Towards the same, the following overall frame for developing the road user charges would be useful[7].

Table 10.1: Charging Road Users

Type of Charge	Description
Vehicle Usage	**Fuel Charges, Tolls & Weight-Distance Charges (WDC)** *[Fuel Charges are the most important, usually contribute significantly; Toll with high volume traffic & the WDC to charge diesel vehicle, countries with well-developed system]*
Payments related to Vehicle Use	**Vehicle Licenses, Registration Fees, Vehicle Inspection Fees & Vehicle Transfer Taxes** *[Periodic Vehicle Licenses, the most important of these, remaining not generally used to charge for road use]*
Payments related to Vehicle Acquisition	**Import Duties, Excise Taxes & Sales Taxes/VAT** *[These are usually general revenue taxes and not often used to charge for road use]*
For Local Access (Municipal & Rural)*	**Usually financed by General Tax Revenue** *[Charging instruments generally rely on benefit taxes and, when, i.e. not feasible, on general taxes. Hence, usually financed by General Tax Revenue]*

Source: Compiled by the Consultants using the information given by Heggie's Note (1992). *With Low Volumes of Traffic.

[4] Road Funding and Road User Charges in Ethiopia (2004), Ethiopian Roads Authority, Ethiopia.

[5] Ian G. Heggie (1995)

[6] Road Funding and Road User Charges in Ethiopia (2004), Ethiopian Roads Authority, Ethiopia.

[7] The concept and texts referring to the charging road users are mainly based on the "Selecting Appropriate Instruments for Charging Road Users" (1992) by Ian G. Heggie, the World Bank

Within the broad frame given in Table 10.1, different prevailing sources of revenue followed by different RFBs for financing the road maintenance activities are briefly described in the sections that follow.

10.3 Sources of Revenue – A Brief Description

10.3.1 Government Budgetary Support

10.3.1.1 Concept & Rationale

In most of the developing countries, due to lack of proper and timely maintenance interventions, a good proportion of road network remains under poor to failed conditions, and over a period of time, a huge backlog, requiring severe maintenance or rehabilitation, etc. gets piled up requiring serious government's interventions with considerable expenditures. Particularly, during the initial stages of the road funds, the government budgetary supports are highly desirable. Also in view of general socio-economic requirements, and availability of good road network, as a pre-condition of the development process, the governments need to ensure the same and also have long term policy for preserving the road asset. However, the government support should be on planned and limited manner, as it should not contradict significantly the user pay concept.

The government's support would also be required for maintaining lower order rural roads with more non-motorized traffic and very small number of motorized traffic with the logic of providing all-weather accessibility to rural population, and making available a dependable road transport infrastructure, particularly for marketing the agricultural produces with greater emphasis on the perishable and fragile commodities. The government support could be part of the road fund with clear objectives and purpose, mechanism and time-phase for the support; short- or long-term support[8].

10.3.1.2 Practices & Limitations

In view of the above, most of the Road Fund Proclamations have included and made provision for the government supports as one of the sources of revenue. However, the supports have been identified in terms of the VAT components (full or partial) in the fuel levies or direct allocations from the government budget, support for undertaking emergency maintenance, etc. The government supports are also extended for meeting the administrative expenses of the road fund boards and secretariats, which have been observed varying from 1% to 3% of the revenue in different countries. However, the government support may not be taken as stable source for the road fund revenue, as it is not a dedicated source, and may be highly dependent on the government's policy and priority of other sectors, which could change from time to time.

10.3.2 Levies on Fuel

10.3.2.1 Concept & Rationale

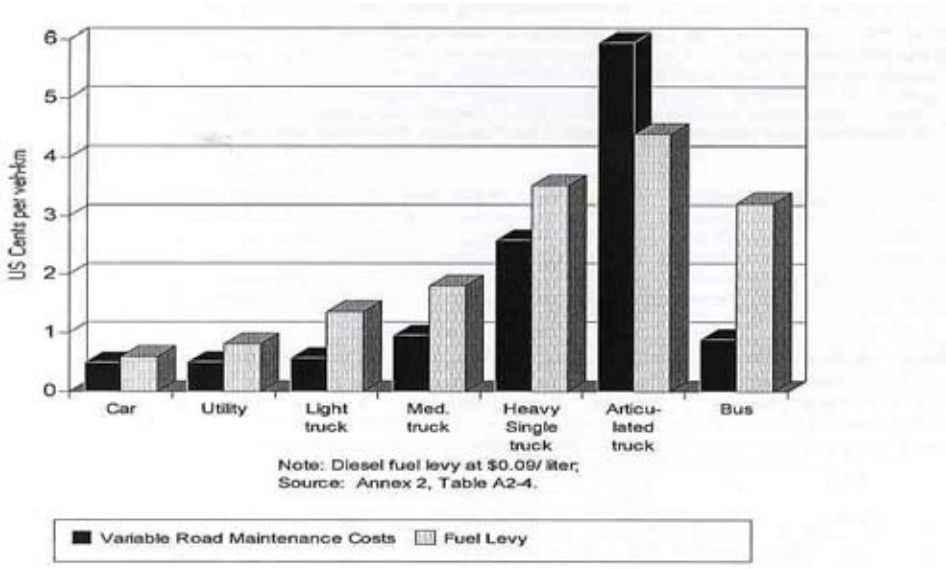
The "Levy on Fuel" are to take in to account the use of the road network, with such road usage usually argued to be closely linked to road maintenance costs. Additional maintenance, e.g. to improve standards, reduce pothole damages, etc. can, thus, be paid for at the margin by additions to the fuel levy. As main source of the Road Fund, the "Levies on

[8] "Although some transfers from general revenues may be necessary during early years while road revenues build up, road users will probably have to accept the long-term objective of full cost recovery for roads". African Road Funds What Works and Why? (1995), Anne B. de Richecour and Ian G. Heggie, the World Bank.

Fuel" have been noticed as the most important contributor[9], which usually accounts up to 99% of the Fund. It is fairly a good surrogate for a user charge, as it proves to have a reasonably close relationship to the cost of road use.

However, the proportion of Road Fund Fuel Levy component (i.e. dedicated exclusively as the road user charge to be transferred to the road fund) in all the taxes applied on fuel accounts for a lower level, e.g. in Ethiopia, it registers only 4% to the total tax components[10] for MGR (petrol) and 3.9% in case of ADO (diesel). The main reason for the same is that the Fuel Levy is based on "discrete charge", i.e. fixed and has remained unchanged since 1997, the commencement year of the Road Fund in Ethiopia.

Figure 10.1: Fuel Levy & Variable Maintenance Cost



Source" Ian G. Heggie (1995).

10.3.2.2 Practices & Limitations

Generally, the Fuel Levy, i.e. an exclusive source of revenue of the Road Fund is added to existing excise, sales tax/VAT, municipal tax, etc. For clear understanding, administration and transparency, it is always desirable that the Fuel Levy should feature separately. This practice would ensure that the revenue out of the Fuel Levy does not get mixed up or confused with the regular taxes applied to the transport fuels. The Fuel Levy is suggested to be applied as a "discrete charge" added to the fuel price, rather than as a "percentage" to the price, avoiding to refer to it as a tax. This practice communicates and emphasizes that the Fuel Levy is a road tariff and as a part of the regular fuel tax. In longer term, as a country improves its capacity to administer the road tariff, the Fuel Levy on diesel may be replaced by a "Weight-Distance Charge"[11].

It is suggested[12] that the Fuel Levy should be separate from regular fuel taxes, as discrete charge to avoid confusion, etc. If the Fuel Levy is charged as a percentage of the overall taxes on fuels, it would have several disadvantages, such as,

[9] This includes all the taxes collected through different fuel levies, viz. excise, fuel levy, VAT, municipal taxes, etc.

[10] That include fuel levy, VAT and municipal tax, which go to the Road Fund Account, Excise and Stabilization charges are not part of the Ethiopian Road Fund.

[11] Selecting Appropriate Instruments for Charging Road Users, by Ian G. Heggie (1992), the World Bank.

[12] African Road Funds What Works and Why?, Ian G. Heggie (1995), the World Bank.

(i) the levy is often applied on non-transport fuels, which would mean that the levy is not really a road user charge[13]; and

(ii) The revenue generated cannot be easily adjusted to meet the requirements of the road sector without adjusting the percentage earmarked for roads. Increasing the percentage for roads necessitates tightening the rest of the government's budget. And finally, since the fuel is not clearly separated from the other taxes applied to fuel, the revenue looks like straight forward earmarking.

However, applying higher levies to make higher contribution to the road funds meeting the maintenance needs, the price of transport fuel, in turn, would be higher, which would immediately have inflationary impact on the overall economy – influencing directly or indirectly all sectors of the economy with increased transport cost; which may not be acceptable or liked easily. It may also be argued that with the overall improvement of road network due to proper and timely maintenance with more funds available, the induced inflation on account of increase in fuel cost due to higher levies could be negligible, as improved roads reduce the vehicle operating costs, hence overall transport costs.

10.3.3 VAT & Other Taxes

10.3.3.1 Concept & Rationale

The Value Added Tax (VAT) applied on different products and components related to the transport sector should be part of the road fund or not, e.g. besides the taxes and duties on the petroleum products, several types of taxes and duties levied on motor vehicles, spare parts and tyres are not part of the road funds rather go to the general taxation revenue through: (i) Custom; (ii) Excise; (iii) Sales Tax/VAT; (iv) Surcharges, etc. The revenues, thus, collected using the above mechanism through the transport sector, could be logically and rationally diverted to the road fund account to finance the growing road maintenance. However, there has been counter arguments for not diverting these revenue to the road fund account. "Most of the other taxes and charges paid into the road fund – value added tax (VAT), registration fees, vehicle inspection fees, and driving license fees – are not really charges for road use and should not be paid into the road fund"[14]. They are either general taxes, which are designed to collect general tax revenues, or service fees[15].

10.3.3.2 Practices & Limitations

There has always been observed the fund gaps between the road maintenance needs and requirements of finance in developing countries, and to meet the required finance, it is often found to tap or divert the resources from existing and available sources. For example, the value added tax, particularly on the fuel has been usually found to be the part of the revenues of the road fund, including Ethiopia, rather it has its dominant role as well. In Tanzania[16], the full amount collected through the Excise Duties on petrol (US Cent 22/liter) and diesel (US Cent 20/liter) goes to the Road Fund.

Moreover, the VAT is applied *ad valorem*, its share with price of petroleum, e.g. over a period of time it keeps growing, as in Ethiopia[17], the Fuel Levies on petrol are ETB 0.095/litre, and

[13] For example, the levy is also applied to heating oil and kerosene.

[14] African Road Funds What Works and Why?, Ian G. Heggie (1995), the World Bank.

[15] Ibid. "Service Fees cover the costs of establishing title to property (to facilitate law enforcement), checking vehicles for mechanical soundness, and monitoring payment of license fees. As such, they are not user charges and should be set to only cover servicing costs".

[16] In Tanzania, the Fuel Levy: US Cent 13/liter on petrol and diesel.

[17] As per the current practices, about 50% of the VAT collected is transferred to the ORF.

the VAT is ETB 2.33/lt. (April 2011), and the contribution of VAT is observed manifold as compared to the prevailing Fuel Levy to the Road Fund; and the Excise Duty on petrol is ETB 3.59/liter (which does not contribute to the Road Fund), and there is no Excise Duty on diesel.

Other argument for the Road Fund Fuel Levy arises, when the same fuel, i.e. diesel for example is also used by non-road users. Ideally speaking, those users do not have to pay the fuel levy. This issue becomes serious when significant amount of gasoline or diesel are used for non-road purposes and the fuel levy is perceived to be high, efforts must be made to ensure that non-transport users do not have to pay the fuel levy, these problems apply primarily to diesel. There could be serious apprehension that failure to address the above-mentioned problem may generate strong public pressure to suspend the Fuel Levy.

In Ethiopia, the Study on the Road Funding and Road User Charges in Ethiopia (2004) brings out that all non-transport users contribute to the general revenue about 31% of the import value of all the transport related items, which include transport fuel, vehicles, parts, tyres, etc.

There are a few ways to ensure that non-road users do not have to pay the Fuel Levy destined to the road fund[18]:

- Replacing the diesel levy with “weight distance-charges;
- Offering exemptions;
- Coloring non-taxed diesel;
- Reimbursing non-road users, who have already paid the diesel levy, i.e. rebate systems, *the system may be considered as the easiest to implement in developing countries*;
- Compensating non-road users; and
- Devising special ways of compensating farmers, usually the most difficult group to deal with.

There are many countries, viz. Latvia, the USA and Japan, following different practices to deal with non-road users of diesel.

10.3.4 Annual Vehicle License Renewal Fees

10.3.4.1 Concept & Rationale

The Annual Vehicle License (AVL) Fees are mainly charged to the road users for “access to the road network”. The AVL Fees may vary to reflect axle-weight, etc., and, thus, take account of the physical and wider environmental damage (noise, pollution, etc.) caused by different types of vehicles. It is argued that let the fixed cost element of the maintenance cost be covered by the AVL Fees, i.e. on an annual basis as per the axle-weight, whereas the variable cost element of the maintenance cost through the Fuel Levy and other instruments. Most of the RFBs, including the ones in Africa, have made the provision in their respective Road Fund’s proclamations to have AVL Fees as one of the sources of the road fund revenue.

10.3.4.2 Practices & Limitations

In some of the countries, e.g. Tanzania, the AVL Fees are collected, but not transferred to the Road Fund account. The Annual Motor Vehicle License Fees and the Registration Fees go to the Ministry of Finance and Economic Affairs to the consolidated Budget. For Kenya, it is not clear as to what reasons have led to the abolition of the road license fee, except that

[18] Exempting Non-Road Users from Paying the Diesel Levy, by Ian G. Heggie (1999).

the documents or news articles say that it was abolished in July 2006, with an increase in the Fuel Levy; but what exactly led to its abolishment remains unknown. For Uganda, several sources have given reasons for its abolition, such as, high default rate, and rampant forgeries of license stickers; also high administrative expenses.

Despite having a place in most RFB's proclamations in Africa, only a few countries ensured that the annual vehicle license renewal fee or AVL cover their marginal costs. At the initial stages of Second Generation reforms, i.e. around late 90's and early 2000, the rates which were prevalent in most African countries are presented in Table 10.2.

Table 10.2: Annual Vehicle License Fee (2000)

Country	US$/Car	Country	US$/Car
Botswana	17	Nigeria	3
Cameroon	20	Rwanda	46
Ghana	--	Senegal	82
Kenya	16	South Africa	16
Lesotho	25	Swaziland	9
Madagascar	9	Tanzania	--
Malawi	19	Uganda	16
Mauritius	--	Zambia	--
Mozambique	10	Zimbabwe	11
Namibia	17		

Source: Taxes on Road Transport in Southern African Countries[19]

Heavy vehicles are nearly always under-charged and license fees on heavy vehicles generally need to be raised or combined with a supplementary heavy-vehicle license fee, to ensure that heavy vehicles pay their way. Some countries compound the under-charging of heavy vehicles, by having a diesel levy which is lower (often very much lower, as in Mozambique) than the levy on gasoline. Since trucks do more damage to the road pavement, the fuel levy on diesel should be at least as high as the levy on gasoline.[20]

- **Vehicle Licenses** are, therefore, common in most countries, mainly in the form of annual license fees. They are easy to collect and can differentiate between types of vehicle and reflect the costs that each type causes to the roads. The main drawback is that they are not use related. A truck used for only 20,000 km per year would pay the same as one traveling 100,000 km.

- **Direct Usage Charges** could provide an alternative to the flat annual vehicle license for heavy vehicles. This system has been introduced in a number of countries, including Norway, Sweden and New Zealand. The charges are administered through sealed hub odometers or other measuring devices. The problem is that such systems require a substantial initial outlay, sophisticated administration, and are prone to evasion. Even in law-abiding New Zealand, the evasion is estimated at 10% to 20%.

- **Experience of Kenya and Uganda**, in July 2006, Kenya abolished the Vehicle License Fee and following its example, Uganda in July 2007 abolished the road license fee under the Traffic Act and to compensate for the losses for such abolition, excise duties on fuel was increased. In Uganda, the road license fee was abolished, except for the first time registration of vehicles. The main reasons for the abolition of AVL in both these countries were as a result of increased defaults and forgeries of license stickers, which made it difficult to enforce compliance.[21] Also the high administrative expense in collection of the Road

19 This is a revised version of a paper presented at the South African Conference on Excise Taxation, Pretoria, South Africa, June 2003.

20 "African Road Funds, What Works and Why", SSATP Working Paper No. 14 by Anne Balcerac de Richecour and Ian G. Heggie

21 www.ugandaradionetwork.com

License Fee became another issue being faced by Uganda Revenue Authority (URA) and which subsequently led the way to the abolition of AVL in Uganda. The AVL was replaced by an increase in excise duty – on petrol by 21% and diesel by 18%.

10.3.5 Overloading Fines

10.3.5.1 Concept & Rationale

The "overloading charges" are levied on those vehicles carrying load more than the permitted limits, i.e. on the overloaded vehicles. The fines are principally to be imposed as a deterrent to overloading rather than as a charge for the damage caused. Usually, the fines are too low to act as a serious deterrent or to compensate for the additional damage caused to the road pavement. Conceptually, overloading fines cannot be taken as source of revenue, rather deterrent to restrict the road users not to overload their vehicles. It is generally believed that the damage caused by an overloaded vehicle is much higher than the fine imposed.

10.3.5.2 Practices & Limitations

The Overloading Fines are identified as source of revenue by many RFBs, including the Ethiopian Road Fund Proclamation (1997). However, in most of the countries, the overloading fine revenue goes to the Government General Accounts, not to the Road Funds. In most of the countries, and also in Ethiopia, the current fines are collected as minor offense, the actual fine imposed depends upon the court's decision. In order to address the issues relating to the overloading fines, there is a need to determine appropriate fine levels, i.e. to reflect the economic costs imposed on the community. The exercise should also consider the likely response of transporters to various fine levels.

Through the Questionnaire[22], the Road Fund Tanzania mentions about their practices on overloading fines; that refers to a system of administrative penalties for overloading, which aims at imposing fees that are commensurate with the economic costs of the overload. At present, overloading fines range between US$ 50 on <1,000 kg overload and US$ 2,500 >10,000 kg overload.

10.3.6 Transit Charges

10.3.6.1 Concept & Rationale

The Transit Fees are generally charged from the vehicles – passenger and freight passing through the country, i.e. utilizing the road network facilities of that specific country, and to some extent damaging the pavement, etc. For example, Ethiopia is a land-locked country, and served mainly by the Djibouti Port for sea borne traffic. The Djibouti Port may also serve nearby several land-locked countries by the surface transport through Ethiopia, for which, the "Transit Fees" need to be paid to the Government of Ethiopia. The transit fees are also subject to the bilateral agreements. The revenues, thus, collected usually go to the road funds. Ideally, the transit fees should cover the fixed cost component of maintenance cost.

10.3.6.2 Practices & Limitations

Many RFBs observe the practices through their proclamation to collect the "Transit Charges". The countries, namely, Ethiopia, Tanzania, Benin, Mozambique, Nigeria, Zambia, Kenya, Uganda, Zimbabwe, Chad, etc. are collecting international transit fee. In most of the

[22] The present Study organized a survey of the Road Fund Boards operating in African countries through a pre-structured "Questionnaire".

countries, viz. Tanzania, Mozambique, Zambia, Kenya, Uganda, Zimbabwe and Chad, the fees are collected under the "Preferential Trade Area (PTA) Agreement (Table 10.4).

In Tanzania[23], the Transit Fees collected are as follows: up to 3 axles: US$ 6 for every 100 km (i.e. US Cent 6/km); and more than 3 axles: US$ 16/100 km (i.e. US Cent 16/km).

10.3.7 Weight-Distance Charges (Mass Distance Charges)

10.3.7.1 Concept & Rationale

The "weight-distance charges" also apply directly for use of road network. In fact, this is an instrument, which is purchased to travel a specific distance, i.e. graduated by vehicle type. The need for this particular system is felt when it is highly realized that the prevailing sources of the road fund, such as, fuel levy, annual license fees, transit fees, etc. do not recover equitably the road surface consumption costs, particularly incurred by the heavy vehicles. The weight-distance charges, particularly due to its complexity, and not easy to administer, are not popular and hence not widely used.

It is believed that in long-term, when a country improves its capacity to administer the road tariff, the fuel levy on diesel may be replaced by the weigh-distance fee.

10.3.7.2 Practices & Limitations

When feasible, the weigh-distance charges should be used to charge diesel vehicles, but this will only be possible in countries with well-developed system of tax administration, or road agencies able to administer such charges.

New Zealand and Iceland use weight-distance fees to charge "diesel vehicles" for usage of roads. Until the early 1990s, Norway and Sweden used weight-distance, but somehow they have abolished the system.

"The basic principle is that all diesel vehicles must buy a license (in New Zealand, they are issued in multiples of 1,000 km) graduated according to axle configuration and gross vehicle weight. The charges are administered through sealed hub odometers or other certified distance meters. The charges are lower for vehicles with multiple axles and increases with gross vehicle weight"[24].

It is important to note that the weight-distance fee is administered separately from general tax system, and all revenues collected from the sale of weigh-distance licenses are paid into a special account set aside to support spending on roads[25].

In African countries, the practice is not yet popular, but recently Namibia started the system in 2010 as "Mass Distance Charges (MDCs)". The MDCs functional in Namibia aim at reducing inequity, by ensuring that heavy vehicle owners/operators part their fair share for maintenance of Namibia's road infrastructure, as the road surface consumption increases more sharply with the increase in vehicle mass than it does with the fuel consumption[26].

It has been observed that the "weight-distance charges" are relatively difficult to administer, particularly compared to the collecting fuel levy. There is considerable scope for evasion, mainly by under-stating vehicle weight, unless the sale of license checked for consistency and linked to an active enforcement program. However, the system works satisfactorily when it is effectively administered, with fees collected under contract, and vigorously enforced.

[23] Information collected through the Questionnaire under the present Study.

[24] Exempting Non-Road Users from Paying the Diesel Levy (1999), by Ian G. Heggie.

[25] Ibid.

[26] Mass Distance Charges (MDC), Road Fund Administration Document, Republic of Namibia.

In Namibia, during the process of the introduction of the MDCs, there were apprehensions of the effect of implementing MDCs on the cost of living, viz. increase in transport costs; the charges will have trickledown effect to the consumers; and this would result in a 15% (about) increase in consumer goods.

Weight-Distance Charge System (Developed Countries Practices)
New Zealand: the Low Technology Route All vehicles with a gross laden weight in excess of 3.5 t must pay the distance charge. Distance licenses are purchased in multiples of 1,000 km. Those vehicles paying the distance charge are classified according to: (i) whether the vehicle is powered or unpowered (trailer); (ii) the number of axles on the vehicle, and (iii) the number of tyres/axle. A license for a 2-axle truck (six wheels), with a permissible gross laden weight of 12 t, is $ 161.05/1,000 km. Licenses must be carried on vehicle and displayed on the passenger side windscreen. Vehicles with a gross laden weight in excess of 3.5 t must be fitted with an approved hub odometer (~$35) to record the distance travelled. The revenue goes to the National Roads Fund. The system is administered by the Land Transport Safety Authority and enforced by the New Zealand Police Revenue in FY 2004 is expected to be $ 634 million. **Switzerland: the High Technology Route** In 2001, Switzerland introduced a Heavy Vehicle Fee (HVF) system for all domestic and foreign vehicles. The HVF has many objectives, including (i) to internalize the costs from freight transport; (ii) to finance large scale railway projects; and (iii) to encourage the transfer of goods from road to rail. Fees are determined on a tone-km basis and also vary according to the emission category of the vehicle, with the average rate currently as 1.68 cent per ton-km. The fee collection is based on the principle of self declaration and uses Dedicated Short Range Community technology. For domestic vehicles, installation of an on-board unit (OBU) is mandatory. For foreign vehicles, installation of OBU is optional. Foreign vehicles can also pay using a ticket at self service stations at various entry and exit points to Switzerland. Currently the Swiss OBU has inter-operability in Austria and future inter-operability is planned in France.

10.3.8 Other Sources

Besides the sources of revenue discussed above, there are a few other sources by which a road fund could generate revenues for the road maintenance purposes, as illustrated in Table 10.3.

Table 10.3: Other Sources of Revenue for the Road Funds

Source of Revenue	Description
Interest on Treasury Bills	**Concept:** Any sum of the money of the Road Funds remains idle or unutilized is usually invested in short-term Treasury Bills to earn interest on the same. However, there have been instances the surplus money was deposited for two years, e.g. in Ethiopia.
	Issue: Earning interest on the idle money for short-term may be accepted, however that practice cannot be encouraged, as such practices would limit the capability of the Fund to finance more road maintenance works in near future. Growing cash balance should be a cause for services concerns of maintenance – periodic maintenance, etc.
Cess on High Value Perishable / Agricultural Produces	**Concept:** The specific beneficiaries of the road maintenance interventions should pay for the maintenance cost proportionately. Usually agriculture sector in developing countries, for several reasons, is considered as priority sector, but those who are engaged in producing high value commodities can pay for road maintenance accordingly.
	Practice/Limitations: In Kenya, the agriculture cess is also considered part of the Kenya Roads Fund Board. There may be resistance from the agriculture sector not to have any additional cess.

Source of Revenue	Description
Toll Charges	**Concept:** Many Road Funds in Africa are now reconsidering road tolls especially on roads that are given concessions to private investors.
	Practice: In more advanced economy, "toll roads" are also part of the tariff – though many developed, like U.K., and developing countries, like Tanzania, still resist them. However, Ghana has a public road which is tolled with the collection contracted out.

10.4 Charging Instruments in Sub-Sahara Countries

The Fuel Levy is highly accepted charging instrument for the road users throughout the Sub-Saharan Africa, the only exceptions are Nigeria and Zimbabwe not applying the fuel levy. The provision or existence of vehicle license fees is observed in many African countries, but they are not allocated on roads.

In Ethiopia, the Vehicle License Fees based on axle-load, is one of the sources suggested in the RF Proclamation, but not yet effective and operational. However, it appears that AVL Fee is likely to be operational in the country soon, and it has been reported that the system is under government's active consideration. Heavy Vehicle Fees, due to its collection problem or so, are not being followed by majority of countries. However, recently, Namibia introduced the Mass-Distance Charges system.

With a few exceptions, most of the countries in Africa are charging international transit fees, and it is generally based on the Preferential Trade Area (PTA) Agreement. Bridge and Road Tolls are also fairly being practiced in a number of Sub-Sahara Africa, which could be explored and used judiciously in other African countries, including Ethiopia.

Table 10.4: Prevailing Charging Instruments in the Sub-Sahara Countries

Country	License Fees	Heavy Vehicle Fees	Fuel Levy	International Transit Fees	Other Charges
Ethiopia	--	--	Yes	Yes*	Interest on Treasury Bills
Tanzania	Yes	--	Yes	Yes	Levies & Duties are paid to RF
Benin	--	Yes#	Yes	Yes	Bridges tolls, import duties, VAT
Mozambique	Yes	--	Yes	Yes*	Bridge tolls
Nigeria	Yes	--	--	Yes	Bridge & road tolls
Sierra Leone	Yes$	--	Yes	--	Data not available
Zambia	Yes	--	Yes	Yes*	-do-
Ghana	--	--	Yes	--	Bridges & road tolls, levy on all fuels
CAR	--	Yes	Yes	--	Bridges & ferry tolls
Rwanda	--	--	Yes	--	Road tolls
Kenya	Yes	--	Yes	Yes*	Road tolls
Uganda	Yes	--	Yes	Yes*	Road tolls
Zimbabwe	Yes	Yes	--	Yes*	Data not available
Chad	--	Axle-Wt.Tax	Yes	Yes	Ferry & road tolls

Source: The World Bank Project Report (Reproduced from Managing and Financing Roads, by Ian G. Heggie).
*Fees are collected under the Preferential Trade Area (PTA) Agreement.
#Weigh-Bridge Fees; $Provisions exist for collecting license fees, but they are not allocated for spending on roads.

In order to appreciate the effective adaptability of road user charging instruments, in context of Ethiopia, Table 10.5, (given at the end of the chapter) presents an analysis of all the prevailing charging instruments in respect to their potential role; degree of relation with the road use; status in terms of separate from general taxes; easy to recognize; administrative characteristics (% of collection cost, degree of avoidance of evasion and ease of collection); and finally, level of suitability for Africa.

Besides the fuel levy and the international transit fees, which are already widely accepted and functional in most of the African countries; "periodic vehicle license fees" and "heavy vehicle license fees" have been recognized as suitable instruments to be adopted in Africa.

So, it may be recommended that while exploring the additional sources of revenue for Ethiopia, these two instruments need to be considered. The finalization for adaptation, among others, requires extensive consultations with various stakeholders.

Somehow, Weight/Mass-Distance Charges (W/MDCs) are considered as low choice as one of the road user charging instruments. The facts and figures presented in Table 10.5 are old, and may not portray the changing scenario and adaptability of the African countries, as the MDCs are functional in Namibia. It has also advantage of low cost of collection, and considered as excellent in easily recognizable.

10.5 Sum Up & Major Issues

Summary and the major issues emerged from the present chapter are given as follows:

- Main revenue-raising mechanism relates to “Road Use”, viz. fuel levy, bridge tolls, and weigh bridge fee, or to “Road Access”, i.e. license fee;
- Charging road users should consider appropriately on the following criteria:
    - Vehicle Usage (fuel charges, tolls and weigh-distance charges);
    - Payments relate to Vehicle Use: (vehicle license fees, registration fees, vehicle inspection fees and vehicle transfer fees);
    - Payment related to Vehicle Acquisition (import duties, excise taxes and sales tax/VAT); and
    - For Local Access (usually financed by General Tax Revenue).
- The “International Transit Fees”, which charge foreign vehicles for use of the road network, should be paid into the Road Fund;
- The “Overloading Fines”, it is legitimate to pay fines of overloading into the Road Fund;
- The Fuel Levy should be specified as a discrete charge added to the price of fuel, rather than a percentage of the fuel price;
- The “Weight-Distance Charge” or “Mass-Distance Charges”, might replace the fuel levy on diesel in long term depending on the large size of non-transport users;
- The specific beneficiaries of the road maintenance interventions should pay for the maintenance cost proportionately, e.g. the agriculture cess; and
- Many Road Funds in Africa are now reconsidering road tolls especially on roads that are given concessions to private investors.

Table 10.5: Administrative Characteristics of Different Road User Charging Instruments

Charging Instrument	Potential Role	Related to Road Use	Separate from General Taxes	Easily Recogni-zable	Administrative Characteristics			Suitability for Africa****
					Collection Cost (%)	Avoidance of Evasion	Ease of Collecting by Contrast	
Tolls	User Fee	Yes	Yes	Excellent	10-20	Moderate	Simple	Low
Vehicle License Fee	Vehicle Access Fee	No	Yes	Good	10-12	High	Moderate	High
Heavy Vehicle L. Fee	Vehicle Access Fee	Not directly	Yes	Good	Not known	Unknown	Simple	High
Fuel Levy	User Fee	Partly	Can be	Good	Negligible	Low	Simple	High
Weight-Distance Fee*	User Fee	Yes	Yes	Excellent	5	Moderate	Moderate	Low
International Transit Fee	Foreign User Fee	Should be	Yes	Good	10	High	Simple	High
Parking Charges**	Control Access	Partly	Yes	Good	>50	High	Simple	Low
Cordon Charges***	Congestion Charges	Partly	Yes	Moderate	10-15	Unknown	Simple	Moderate
Area License	-do-	Can be	Yes	Moderate	10-15	Unknown	Simple	Moderate
Electronic Road parking	-do- or User Charges			Good	<10	Unknown	Simple	Low

Source: Management and Financing of Roads, by Ian G. Heggie,
* A simpler for of "weigh-distance fee" is the "vehicle-km fee". It employs the same basic principles, but relates fees more simply to vehicle type and distance.
** These are difficult to administer in Africa and currently generate little revenue.
*** These are only suitable when the road network lends itself to cordon pricing.
**** This defines their suitability as general charging instruments.

11. ROAD FUND REVENUE IN ETHIOPIA – A REVIEW

11.0 ROAD FUND REVENUE IN ETHIOPIA – A REVIEW

11.1 Background

This chapter aims at describing the Ethiopian Road Fund with its objectives, functions, sources of revenue, the responsibilities of the Board and the Secretariat. The chapter also presents the extent of revenues being collected from road users through different sources with a brief review on the magnitude and limitations of the sources. Among others, the chapter indicates the training requirement for the ORF staff for technical capacity development and also the road agencies and private contractors for effective and efficient implementation of the ORF financed projects and also the overall capacity development.

The present chapter analyzes the prevailing Road Fund Revenues, and further scope of generating more revenues in view of the growing road networks and maintenance needs of the country.

11.2 Road Fund Activities in Ethiopia – An Overview

11.2.1 The Proclamation

The Proclamation to provide for the establishment of the Road Fund in Ethiopia was issued on March 6, 1997 with "the objectives of the Fund shall be to finance the maintenance of roads and road safety measures"[1]. The Road Fund Office was opened in June 1998 in Addis Ababa as "Road Fund Administration Office (RFAO)".

11.2.2 Sources of the Fund

The Proclaimed Revenue Sources of the Fund are given as follows:

Sources of the Ethiopian Road Fund:

(a) Budget allocated by the Government;
(b) Road maintenance fuel levy;
(c) Annual vehicle license renewal fee based on axle load;
(d) Overloading fine; and
(e) Any other road tariff levied as may be necessary.

11.2.3 Organs of the Fund

(1) The Fund shall have: (a) A Board constituting members representing the Government, Regions and road users; and (b) An autonomous office having its own juridical personality; and

(2) The Board shall be accountable to the Prime Minister.

11.2.4 Management of Road Fund

Road Fund Board (Public/Private Partnership) and Board Membership are by Appointment of Representation:

[1] Proclamation No. 66/1997: A Proclamation to Provide for the Establishment of Road Fund.

- Chairperson;
- Six Federal Government Representatives by appointment;
- Five Regional Representatives as Members by appointment;
- Four Private Sector Representatives by election –
  - 2 Dry Cargo Transport Owners representatives;
  - 1 Liquid Cargo Transport Owners representative; and
  - 1 Passenger Transport Owners representative.

11.2.5 Members of the Board[2]

- The number of members of the Board and procedures governing the manner of their representation shall be determined by the Government;
- The Chairman of the Board shall be designated by the Government;
- The term of office for any member of the Board shall be for two years; provided, however, that he may be reassigned for additional terms of office by the organ which nominated him;
- Any organ which has assigned a member of the Board may, at any time and for reason, recall and replace him by another;
- In the case of reduction in the number of members of the Board due to the death or resignation of a member or due to any other reasons, the vacant post shall be filled within three months;
- The competence of the Board shall not be affected by such reduction in the number of its members; and
- Any member of the Board shall not engage in any activity that may be directly or indirectly conflicting with its capacity as a Board member. When the member encounters a conflict of interest, either direct or indirect, he shall disclose such conflict to the Board and withdraw from all meetings of the Board at which such matters are discussed.

11.2.5.1 Power & Duties of the Board

The Board shall have the Powers and Duties to:

- Administer the Fund;
- Issue directives to define collection and disbursement procedures of the Fund;
- Ensure the timely collection and deposit of accrued revenues of the Fund;
- Review before approval, the annual road maintenance programs of the Road Agencies; advise towards the integrated and coordinates designing of the programs;
- Submit to the Government yearly proposals regarding works to be finalized by the Fund; and upon approval, allocate the Fund on the basis of the programs;
- Ensure transparency and accountability in the disbursement of the Fund;
- Receive and review management reports of the Road Agencies and supervise the preparation of consolidated reports regarding utilization of the Fund;
- Initiate financial and technical audits of the road maintenance and road safety measure activities, review audit reports and ensure that the necessary actions are taken according to the recommendations thereof;

[2] Proclamation No. 66/1997 on the Establishment of Road Fund in Ethiopia.

- Recommend to the Government additional sources and level of tariffs required to finance road maintenance programs;
- Advise the Government on policy matters related to the fund and the maintenance of roads;
- Cause the consolidation and publication of audited annual accounts of the Fund; and
- Establish advisory committees when it finds it necessary, and supervise and coordinate their activities.

11.2.6 Office of the Road Fund (ORF)

As per the Proclamation (66/1997), the powers, duties and functions are presented as follows:

- The Office of the Road Fund shall have its head office in Addis Ababa; and
- The Office shall have a Head to be appointed by the Government upon the recommendations of the Board and necessary staff.

11.2.6.1 Powers & Duties of the Office

The Office shall have the powers and duties to:

- Follow up and ensure the proper implementation of decisions and directives of the Board;
- Maintain the accounts and records of the Board;
- Keep all records of the affairs and meetings of the Board;
- Follow up the timely collection and deposit of accrued revenues of the Fund;
- Prepare and submit to the Board annual financial reports to the Fund;
- Initiate public relation actions and regular publications on the revenues and utilization of the Fund, importance of road maintenance, consequences of omitted maintenance, users savings from good quality road and the like and disseminate the publications thereof; and
- Own property, enter into contract, sue and be sued in its own name.

11.2.6.2 Powers & Duties of the Head Office of the Fund

(i) The Head of the Office shall, subject to the general directives of the Board, plan as well as direct and administer the activities of the Office.

(ii) Without limiting the generality of Sub-article (i) of this Article, the Head of the Office Shall:

- o Exercise the powers and duties of the Office specified under Article 13 of this Proclamation;
- o Employ and administer the employees of the Office in accordance with directives to be issued by the Board following the basic principles of the federal civil service laws;
- o Prepare and submit the Board the annual budget and work program of the Office; implement same upon approval;
- o Effect expenditure in accordance with the approval budget and work program of the office;

- Represent the Office in all its dealings with third parties;
- Prepare and submit to the Board, annually and whenever required, activity reports of the Office;
- Perform such other duties as may be given to him by the Board.

(iii) The Head of the Office may delegate part of his powers and duties to the employees of the Office to the extent necessary for the efficient performance of the activities of the Office.

(iv) In case of delegation to an official to act on behalf of the Head of the Office, for more than thirty (30) days, prior approval by the Board is required.

11.2.6.3 Budget

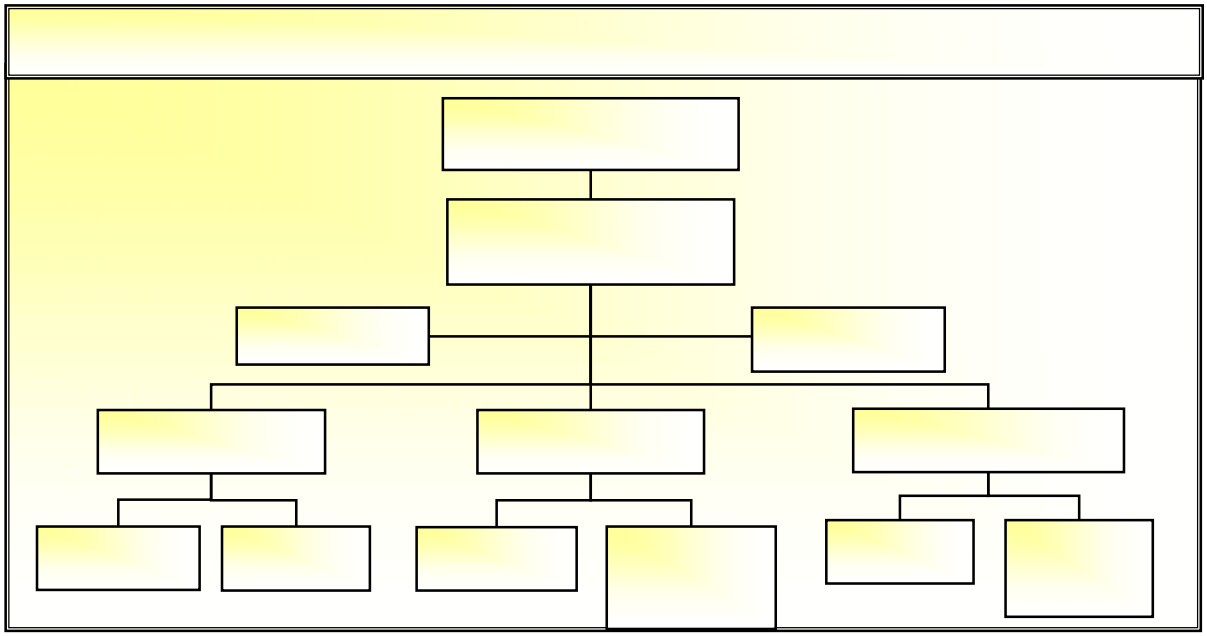
- The budget of the Office shall be allocated by the Government; and
- The fiscal year of the Fund shall commence on the 1st of Halme and shall end on the 30th of Sene, [i.e. July 8 to July 7].

11.2.6.4 Auditing

- Without prejudice to the powers conferred by law to the Auditor General, the accounts of the Fund shall be audited annually by external auditors designated by the Board.
- The auditing shall be carried out in accordance with internationally accepted auditing principles and procedures; and the audit reports shall be submitted to the Board and the Ministry of Finance for their comments.
- Technical Audits shall be carried out annually on selected activities.

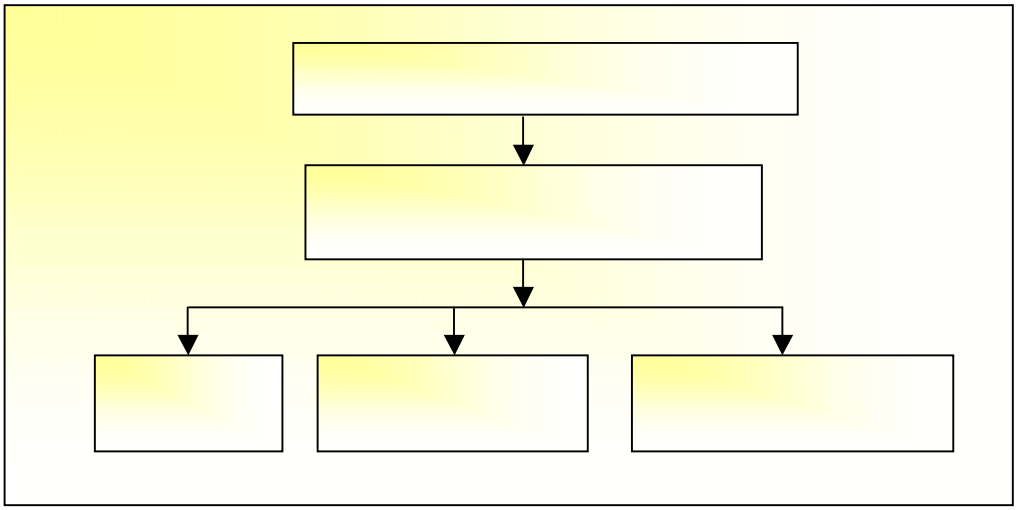
11.2.6.5 Current Staff

Currently the approved staff of Office of the Road Fund is 21 professionals including the Director General, of which the Finance Department with 6 staffs, the Planning and Programming Department with 5 staffs, and Financial and Technical Audit Department with 9 staffs.



Moreover, the Office obtains administrative support from a unit organized under the Ministry of Transport. Organizational Charts (old and existing) of the Office are shown in Figure 11.1 and Figure 11.2.

Figure 11.2: Organizational Structure (Existing)



It may be noted that the number of approved staffs are 24 (21 professional and 3 secretaries), of which there are only 17 working staffs (15 professional and 2 secretaries), so seven positions are vacant[3]. The vacant positions are:

- Planning, Programming and Coordinating Expert;
- Revenue Collection and Payment Work Expert;
- Senior Technical Audit Expert;
- Finance Audit Expert;
- Technical Audit Experts (2); and
- Office and Administration Officer Rank-I.

11.2.6.6 Review of the Staff Requirements

(i) Current

After having reviewed the existing organizational structure of the ORF, and the types of work to be carried out, the Study identifies that in view of the requirements of the specialized engineering discipline, there is a need for an independent Engineering Department at the ORF, which could be headed by a Senior Technical Audit Expert; that is an approved position and presently vacant.

Under the Engineering Department, three Technical Audit Experts are approved, but only one position is filled in.

Hence, in view of the requirements, these positions should be filled in immediately, and a proper training, particularly to get familiar with several functional areas of road maintenance, eligibility criteria, unit costing, monitoring and evaluation, etc., should be organized.

The above requirements should be considered as most essential in order to carry out varied activities of the ORF. It would be highly desirable that ORF should have the above-mentioned technical expertise in-house. However, in case, somehow, it is not possible to develop such expertise at the ORF, particularly in short-term, it is suggested that the

[3] Source: The Office of Road Fund (September 2011).

activities required from the Engineering Department should be outsourced to a competent consulting group, so that the technical tasks could be carried out without any problems and delays.

Besides the above, on the basis of consultations with the senior officials of the ORF, the Study identifies that there is need for the Public Relation Services at the ORF, which could provide the services, such as, advertisements and communications, and public related issues. For Legal Services, the ORF can hire individual Legal Service Expert from time to time, as per the requirements.

(ii) Additional

In order to monitor the ORF financed projects effectively and efficiently, and also ensuring proper implementation of the projects in view of value for money, particularly addressing the outcomes of present Study, the Consultants highlight the following functional areas and requirements, which would require in-house expertise for undertaking the above tasks:

- To check the list of road segments and the type of maintenance interventions proposed under each road agencies, e.g. roads with routine or periodic maintenance tasks with proper references and the inventory details;
- To check the road maintenance activities, as per the eligibility criteria established in the present Study, and assess its correctness by making practical visits to the field from time to time to monitor and evaluation;
- To review and update maintenance unit rates and adjust the budget allocated for road agencies at least once or twice a year, so that real maintenance activities and related costs could be observed. This is a continuous practice, which would ensure the effective implementation of the ORF financed projects, and also adjusting the discrepancies in the costs, if any;
- Assist the road agencies in some technical issues and organize training and other capacity building programs for both high and low level maintenance technicians, equipment operators, mechanics in garage, etc., as per the requirements; and
- To operate E-RUCS efficiently for undertaking several activities and analysis, such as, updating inventory and condition of roads, required maintenance interventions and costs, adjustment of road users charges under different scenarios, etc.

It is very crucial to strengthen the Engineering Department at ORF by adding more technical audit experts/staffs. Based on the growing volume of the network and geographical proximities, the Study proposes the following additional Technical Audit Experts/Staffs at ORF, who would be responsible for the above-mentioned activities, in a phased manner depending on the scale and requirements, and the lessons learnt:

- One Technical Audit Staff for each of the regions of Northern, Western, Central, Eastern and Southern in ERA Districts (five Technical Audit Staffs);
- One Technical Audit Staff for Each of the RRAs, viz. Oromia, Tigray, Amhara and SNNP Road Agencies including the Municipalities under each region (four Technical Audit Staffs);
- One Technical Audit Staff responsible for the regions of Benshangul Gumuz and Gambella and the Municipalities under the each regions (one Technical Audit Staff);
- One Technical Audit Staff responsible for the regions of Afar, Hareri and Somali and the Municipalities under the each regions (one Technical Audit Staff);

A total of 11 additional Technical Audit Staffs are proposed under the Department of Technical Audit to properly follow and make the maintenance works successful.

11.3 Road Fund Revenue – Existing

11.3.1 General

As stated earlier, for Establishment of Road Fund in Ethiopia, the Proclamation No. 66/1997 issued on March 6, 1997 came into being with the objectives that:

"The Fund shall be to finance the maintenance of roads and road safety measures".

The Road Fund Office (ORF) was opened in June 1998 in Addis Ababa as "Road Fund Administration Office (RFAO)". As per the Proclamation, the "Sources of Fund" suggested are presented in Table 11.1 with the status of the specific source of the Fund whether "effected" or "not effected".

Table 11.1: Source of the Road Fund in Ethiopia

Source of the Fund	Status		Remarks
	Effected	Not Effected	
Budget allocated by the Government	→		***
Road maintenance fuel levy	→		***
Annual vehicle license renewal fee based on axle load		→	But under active consideration
Overloading fine	→		Collected$, but not yet part of the Road Fund
Any other road tariff levied as may be necessary, i.e. Transit Fees	→		Ethio–Djibouti Corridor

***Collected by EPE as VAT, Municipal Tax, and the Fuel Levy; $ collected as minor offence on road, but not transfer to ORF.

Among other sources of the Road Fund: (i) the Overloading Fines, though it is collected as minor offence, the proceeds do not come to the ORF; and (ii) the Annual Vehicle License Fees are not yet part of the Fund. The Government Budget is contributed from the revenue collected through the VAT[4], and Municipal Tax, and the Fuel Levy go to the ORF. In brief, within the framework of the Road Fund Proclamation (1997), the Fund is generating revenues through the Levies on Fuel (VAT, Municipal Tax and Fuel Levy), Transit Fees and Interest Income through the Treasury Bills/Bonds.

11.3.2 Budget Allocated by the Government to the Road Fund

The revenues collected through VAT on the petroleum products (petrol and diesel), as described in Section 11.3.3, go to the ORF. Contribution of the VAT on fuel products, in terms of per liter, has been growing yearly mainly due to increase in the retail petroleum price as well the quantity sold/consumed. The VAT on goods and services, widely collected in Ethiopia, is a major source of the Government Revenues.

It may be noted that the VAT is not a committed source of income to the Road Fund; however, the current practice is expected to continue in coming years as well. The GoE allocates about 50% of the revenues collected through VAT on the fuel products to the Road Fund. The magnitude of the revenue is directly related with the demand for transport services

[4] As per the prevailing practices, only about 50% of the VAT collected through sales of petrol and diesel, is transferred to the ORF.

and movement pattern on the country's roads consuming more petrol or diesel, this part of revenue should therefore keep on increasing in coming years.

11.3.3 Levies on Fuel

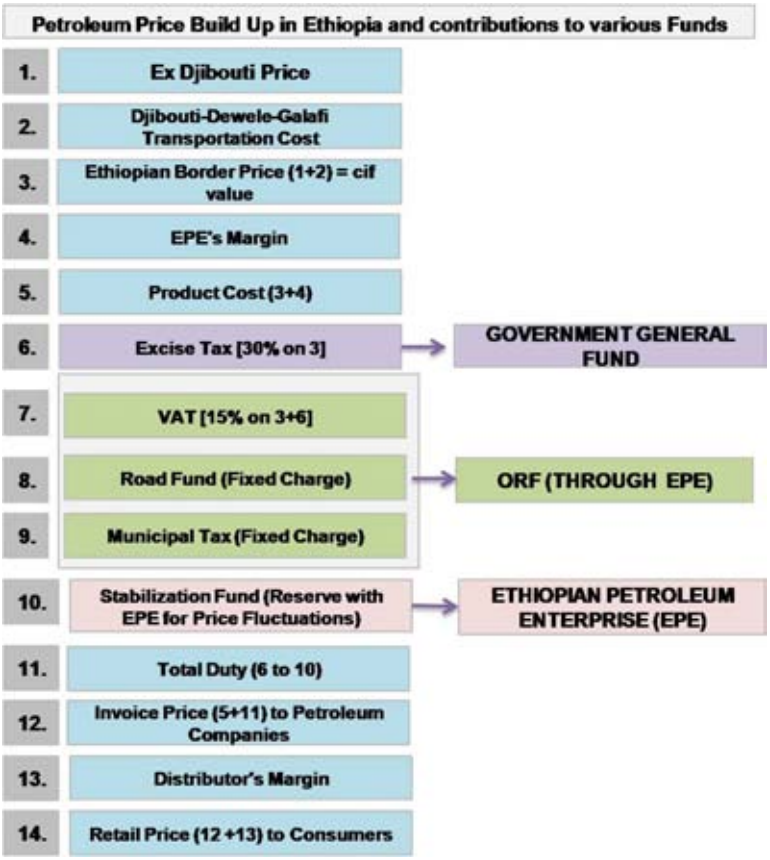
The Road Fund Revenues from the total levies on fuel consisting of: (i) Fuel Levy, Value Added Tax (VAT), and Municipality Tax, are collected and credited directly from the Ethiopian Petroleum Enterprise (EPE) into the Road Fund Account regularly on monthly basis, creating a stable basis for the Road Fund. The Excise Tax and Stabilization Fund are part of the levies on fuel, but proceeds from these two do not go to the ORF.

Table 11.2: Incidence of Taxation on the Petroleum Products in Ethiopia

Description	Petrol/ MGR	Kerosene	Automotive Diesel Oil	Light Fuel Oil	Heavy Fuel Oil
Excise Tax (30%) on Total Border Price	■	--	--	--	--
VAT (15%) Total Border Price & EPE**	▲	--	▲	□	□
Road Fund Fuel Levy (Fixed Rate/Liter)	▲	--	▲	--	--
Municipal Tax (Fixed Rate/Liter)	▲	--	▲	--	--
Stabilization Fund	e	e	e	e	e

(▲) Goes to the Road Fund; (■) Goes to the Government's General Fund; and (□) Shows that the Fund does not get directly transferred into the Road Fund.; (e) Fund for oil price fluctuation remain with EPE; ** Margin of Ethiopian Petroleum Enterprise; Only part of the VAT, about 50% goes to the ORF.

Figure 11.3: Petroleum Price Build Up in Ethiopia & Road Fund



The retail price of fuel is fixed by the Ministry of Trade and Industry, and those prices are revised every three months. The Stabilization Fund is a reserve in case of oil price fluctuations, particularly on petrol. The Stabilization Fund registered in August 2004 as high as 40% of the Excise Tax. As per the discussions with the Officials of the EPE, the

requirement of the Stabilization Fund is also periodically reviewed in view of the balance available and to take care of future oil price implications. The derivation of retail build-up prices of POL is presented in Table 11.3.

Table 11.3: Retail Price Build-up in Addis Ababa in April, 2011 (ETB/Liter)

No.	Description	Petrol/MGR (Ex-Sudan)	Petrol/MGR (E10)	ADO	LFO	HFO
1	Ex-Djibouti / Aljeily Price	13.6002	13.6002	16.3679	12.6711	12.4631
2	Djibouti-Dewele/Galafi/ Aljeily-Metemma Transport	0.5977	0.5977	0.1395	0.1521	0.1521
3	**Total CIF Value (1+2)**	**14.1979**	**14.1979**	**16.5074**	**12.8232**	**12.6152**
4	Excise Tax [30% on (1+2)]	2.3975	2.3975	0.00	0.00	0.00
5	VAT [15% on 1+2+6]	1.5584	1.5584	1.2761	1.2282	1.1391
6	Municipal Tax	0.0200	0.0200	0.0200	0.00	0.00
7	Road Fund Levy	0.0950	0.0950	0.0800	0.00	0.00
8	Stabilization Fund	3.0913	3.0913	-0.9367	-0.6734	-0.5463
9	EPE's Margin	0.0677	0.0677	0.0717	0.0711	0.0711
10	**EPE Invoice Price at Alieily/Djibuti (1+4+5+6+6+7+8+9)**	**20.8301**	**20.8301**	**16.879**	**13.297**	**13.127**
11	Sudan (Aljeily)-Metemma Transport	0.5977	0.5977			
12	Djibouti Addis Transport			0.7550	0.8230	0.8230
13	Metemma –Sululta Transport		0.7207			
14	MGR Price at Sululta (10+11+13)		22.1485			
15	Ethanol ex. factory price at Fincha/Metehara (with VAT)		7.640			
16	Ethanol Fincha/Metehara – Sululta/Addis Transport Cost		0.4489			
17	Ethanol Price at Sululta/Addis Ababa (15+16)		8.0889			
18	Throughput Fee		0.0400			
19	Sululta Ethanol – MGR Blended Fuel (E10) Price		20.7826			
20	Sululta/Addis Transport (E10)		0.0414			
21	Metema- Addis Ababa Transport	0.7412				
22	Distributors Margin	0.061	0.076	0.056	0.050	0.050
23	Distributors Price	22.23	20.90	17.69	14.17	14.00
24	Retailers' Margin	0.040	0.040	0.040	0.00	0.00
25	**Addis Ababa Price (23+24)**	**22.27**	**20.94**	**17.73**	**14.17**	**14.00**

Source: Ethiopian Petroleum Enterprise (EPE).

Of the total levies on fuel (Fuel Levy, VAT and Municipal Tax), the EPE transferred ETB 1.32 billion to the ORF in 2009-10, which accounted for 99.8% of the total ORF fund. The prevailing fuel charges on different petroleum products in terms of Ethiopian Birr (ETB)/liter for 1997-98 and April 2011 are presented in Table 11.4 and Table 11.5 for a comparison.

Table 11.4: Charges – Fuel Levy, VAT & Municipal Tax (1997-98)

(ETB/liter)

Product	Excise	Stabilization	Fuel Levy	VAT	Municipal Tax	Total**
MGR (Petrol)	0.3616	0.09	0.0950	0.1880	0.0200	0.3030
ADO (Diesel)	--	0.09	0.0800	0.0126	0.0200	0.1126
LFO	--	0.14	--	0.1086	--	0.1086
HFO	--	--	--	--	--	--
Oil & Lubricants	--	--	--	--	--	--

Table 11.5: Charges – Fuel Levy, VAT & Municipal Tax (April 2011)

(ETB/liter)

Product	Excise	Stabili-zation	Fuel Levy	VAT	Municipal Tax	Total**	Retail Price#	Road Fund (%)
MGR (Petrol)	2.3975	3.0913	0.095	1.5584	0.02	7.1622	20.94	8.0%
ADO (Diesel)	--	-0.9367	0.08	1.2761	0.02	1.3761	17.73	7.8%
LFO	--	-0.6734	--	1.2282	--	1.2282	14.17	8.7%
HFO	--	-0.5463	--	1.1391	--	1.1391	14.00	8.1%
Oil & Lubricants	--	--	--	--	--	--	--	--

Source: Ethiopian Petroleum Enterprise. **Fuel Levy + VAT + Municipal Taxes; # at Addis Ababa.

It may be noted that the Fuel Levy, i.e. ETB 0.095/liter for MGR (Mogas Regular–Petrol), and ETB 0.080/liter for ADO (Automobile Diesel Oil–Diesel) are fixed, i.e. not yet revised, since the commencement of the Road Fund in 1997 (Tables 11.4 and 11.5), whereas the VAT on different petroleum products are collected @15% of the ex-petrol pump prices, which has been revised over period of time in line with the fuel prices, and the Municipal Tax is also fixed at ETB 0.02/liter of petrol and diesel.

Table 11.6 summarizes the tax components in the prices of petrol and diesel. Excise Tax is applicable in case of petrol, not in diesel price. The share of taxes in the retail prices of petrol and diesel is recorded as 19% and 8% respectively.

Table 11.6: Contribution of Different Taxes (April 2011)

(ETB)

Description	Petrol / MGR		Automotive Diesel Oil	
	Amount	Percent	Amount	Percent
Excise Tax	2.3975	58.89%	--	--
Stabilization Fund	3.0913	--	-0.9367	--
Fuel Levy (Road Fund)	**0.095**	2.33%	**0.080**	**5.81%**
VAT	1.5584	38.28%	1.276	**92.73%**
Municipal Tax	0.02	0.49%	0.020	**1.45%**
Total Duty/Liter (ETB)	**4.0709**	100.00%	**1.376**	**100.00%**
Retail Price ETB/liter	**20.94**	**(19%)**	**17.73**	**(8%)**

Note: Figures given in brackets refer to the total tax components (%) in Retail Price.

11.3.3.1 Fuel Sales

It is interesting to note that the traffic growth in Ethiopia has been recorded at 10% pa on an average, and the sales in petrol decreased until 2000-01, thereafter it started increasing. This phenomenon could be related to the increase in diesel based vehicles, particularly the utility and fuel-efficient vehicles, and probably getting petrol unofficially from neighboring countries where petrol is cheaper than Ethiopia[5].

[5] Road Funding and Road User Charges in Ethiopia (November 2004). As per 2002 figures, Ethiopia had lower fuel prices than Djibouti, Kenya, or Uganda but higher petrol prices in Eritrea, Somalia or the Sudan.

Table 11.7: Import/Consumption & Retail Price of POL in Ethiopia

(million liter)

Product	1997-98	2000-01	2003-04	2006-07	2009-10	GR**
Petrol (MGR)	182.4	177.9	197.1	195.4	211.7	0.6%
Kerosene	280.9	292.8	379.1	507.7	668.7	5.4%
Diesel (ADO)	561.6	714.6	820.0	1,072.1	1,465.7	7.7%
Light Fuel Oil	123.8	54.6	47.8	44.5	11.3	-12.2%
Heavy Fuel Oil	--	72.2	95.1	121.3	105.2	7.27%
Retail Price in Addis Ababa (ETB/liter)						
Petrol (MGR)	2.51	4.30	4.18	7.56	11.23	12.5%
Kerosene	1.40	2.00	2.00	4.12	8.05	14.6%
Diesel (ADO)	1.76	2.62	2.72	5.44	9.34	14.2%
Light Fuel Oil	1.49	2.23	2.30	4.19	9.49	14.6%
Heavy Fuel Oil	--	2.14	2.19	4.11	8.83	15.3%

Source: EPE. ** Annual growth rate (%) since 1997-98 using Semi-log Method.

11.3.3.2 Contribution of Fuel Levies to the Road Fund

As stated before, out of the taxes/levies collected on the petroleum products, only VAT (partly), Fuel Levy for Road Fund and Municipal Tax go to the Road Fund. As on April 2011, ETB 1.67/ltr from petrol sales; and ETB 1.37/ltr from diesel sales are collected by the EPE, which accounts for 13% of the sale prices. Table 11.8 presents the contribution of different taxes/levies.

Table 11.8: Different Taxes & Road Fund (June 2011)

Description	Petrol/MGR		Automotive Diesel Oil	
	Amount	Percent	Amount	Percent
VAT	1.5584	93%	1.2761	93%
Fuel Levy for Road Fund	**0.095**	**6%**	**0.08**	**6%**
Municipal Tax	0.02	1%	0.02	1%
Total Duty / liter	**1.6734**	100%	**1.3761**	100%
Retail Price / liter (ETB)	20.94		17.73	
Road Fund Fuel Levy to Retail Price	**0.45%**		**0.45%**	

The contribution of VAT is considerably high (about 93%) in the total taxation on fuel as compared to the Road Fund Fuel Levy (about 6%). The share of Fuel Levy in the retail prices of petrol and diesel have been recorded at very low level, i.e. at 0.45%. In present case, the VAT is collected at the rate of 15% on the border price plus the Excise Tax for both the products, viz. petrol and diesel, whereas the Fuel Levy is charged at ETB 0.095/ltr for petrol and ETB 0.08/ltr for diesel. In case of Municipal Tax, ETB 0.02/ltr for petrol and diesel is charged.

11.3.3.3 Road Transport Taxation & Road Financing

The Study on Road Funding and Road User Charges in Ethiopia (2004) has worked out the contribution of fuel and motor vehicle taxes to the Road Fund in Ethiopia and the general taxation revenues. The results obtained are presented in Table 11.9. Road transport sector as a whole contributes to general taxation through the various taxes levied on imports[6].

The above report identifies the transport users (74%) and non-transport users (26%) of diesel, which shows that the non-transport users contribute ETB 54 million (15.1%) to the

[6] The analysis was based on 2000-01 figures.

Road Fund. Other fuels and oil users contribute ETB 71 million (i.e. 20%) to the Road Fund. Put together, non-transport users of diesel and other fuel and oil contribute to the extent of 35% (ETB 125 million) to the Road Fund in Ethiopia (Table 11.9).

Table 11.9: Contribution of Fuel to Road Fund & General Taxation

(ETB in million)

Description	Import Value	Road Fund	General Taxation
Petrol	343	78	
Diesel used in transport sector	1,008	153	
Sub-Total (i)	**1,351**	**231**	**107**
Diesel used in non-transport sector	355	54	
Other Fuels & Oil	380	71	
Sub-Total (ii)	**735**	**125**	******
Grand Total	**2,086**	**356**	******

Source: Road Fund & Road User Charges in Ethiopia (2004); ** Not exactly known.

11.3.4 Transit Fees

Ethiopia is a land-locked country, and served mainly by the Djibouti Port for sea borne traffic. The Djibouti Port may also serve nearby several land-locked countries by the surface transport through Ethiopia, for which, there are “Transit Fees”, which need to be paid to the Government of Ethiopia.

In the Proclamation (66/1997), there is no special or particular mention on the transit fees, as one of the sources of the Fund. However, the transit fees qualify under “any other road tariff levied as may be necessary”, as one of the instruments to collect revenue for the Road Fund. The practice is logical and being generally practiced throughout the world including the African countries (Chapter 9). Transit Fees, which are usually collected for the freight and passenger movements between the neighboring countries and Ethiopia, in present case, depend on the bilateral agreements with the specific country.

11.3.4.1 Djibouti Route

Following the bilateral agreements, Ethiopian trucks pay, on an average, US$ 15 for a round trip to enter Djibouti, while Djibouti operators pay the same to enter Ethiopia. A bank in Djibouti collects the revenue and gives out tickets to the operators, and charges 10% as commission for the service. The tax is collected by two nominated agents in Ethiopia: (i) for Djibouti, by Comment Transport Enterprise; and (ii) for the Sudan by Wogagen Bank. A 10% commission on the gross amount is paid to the agents. The money, thus, collected goes to the Road Fund (Table 11.10).

Table 11.10: Revenue Collected in Transit Charges from Djibouti Route (ETB million)

Year	1997-98	-	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
Total Revenue	--	-	0.20	0.10	0.60	0.30	0.30	0.20	0.70
% to Road Fund	--	-	0.04	0.02	0.17	0.03	0.03	0.02	0.05

Source: The Office of Road Fund.

On the basis of current ETB/US$ exchange rate, i.e. about 16.8, ETB 226.8 is received per vehicle as transit fees and assuming that the ORF receives 90%. As per an estimate[7], then the price of both diesel and petrol in Djibouti was much higher than in Ethiopia, hence, Djibouti vehicles entering Ethiopia were expected to buy their fuel in Ethiopia and contribute

[7] Road Funding and Road User Charges in Ethiopia (2004).

to the Road Fund via that practice, and the practice might be continuing in present context as well.

It is considered that a Transit Charge on foreign vehicles fulfils the same purpose as a vehicle standing charge levied on domestic vehicles[8]. So, the estimation of the Transit Charges should be in line with the recovering the 'fixed routine and periodic maintenance costs, in terms vehicle/km to calculate the total charges implications for different types of vehicles on paved road for this specific case.

The distance from border with Djibouti (Galafi) to Addis Ababa is 750 km approx. The Transit Fees need to be estimated for the round trip of 750 km for Djibouti route for different types of vehicles, e.g. heavy trucks and articulated vehicles for their respective costs covering the fixed routine and periodic maintenance, and to be compared with the prevailing Transit Charges for its revision or so.

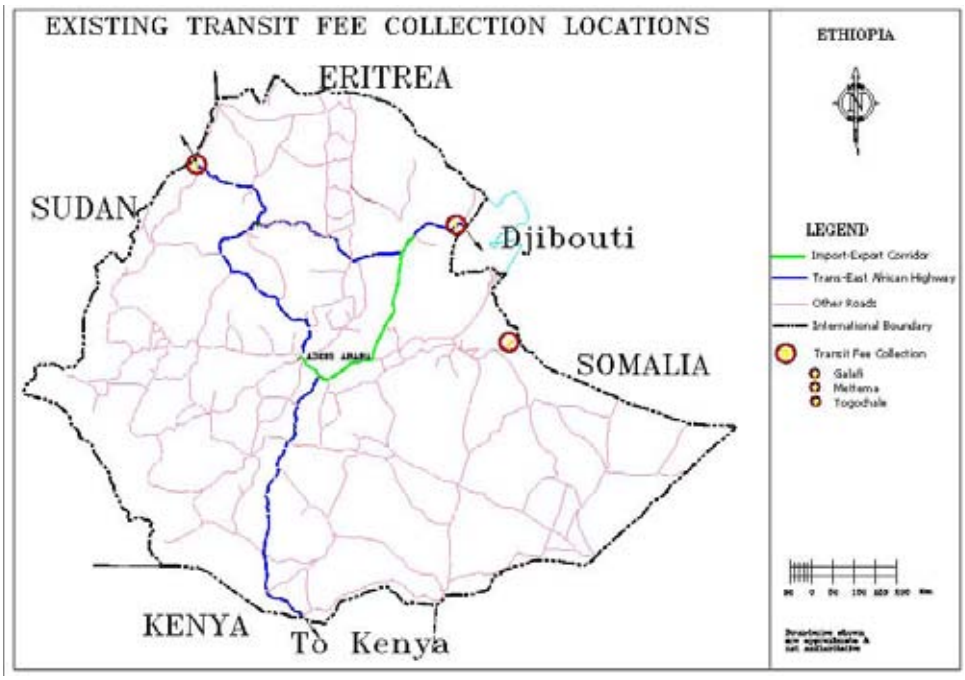
The revenues collected through the Transit Fees during recent years are presented in Table 9.10. As per 2009-10 estimates, a sum of ETB 0.7 million was collected as the Transit Fees, which contributed less than 1% to the total Road Fund revenue. However, the above figure is more than double than the collection of 2003-04, which was merely ETB 0.2 million. During six years, i.e. 2003 to 2009, the annual growth in Transit Fees collection was recorded at more than 23%, and the level could be observed even higher in future with introduction of more routes for Transit Fees collection in the country.

Currently the transit fees are collected on the following routes:

(i) Addis Ababa–Adama–Awash–Mille–Galafi, the main corridor of import-export via Djibouti;

(ii) Addis Ababa–Gonder–Metema going to Sudan[9]; and

(iii) Addis Ababa–Adama–Awash–Jijiga–Togochale going to Somaliland.

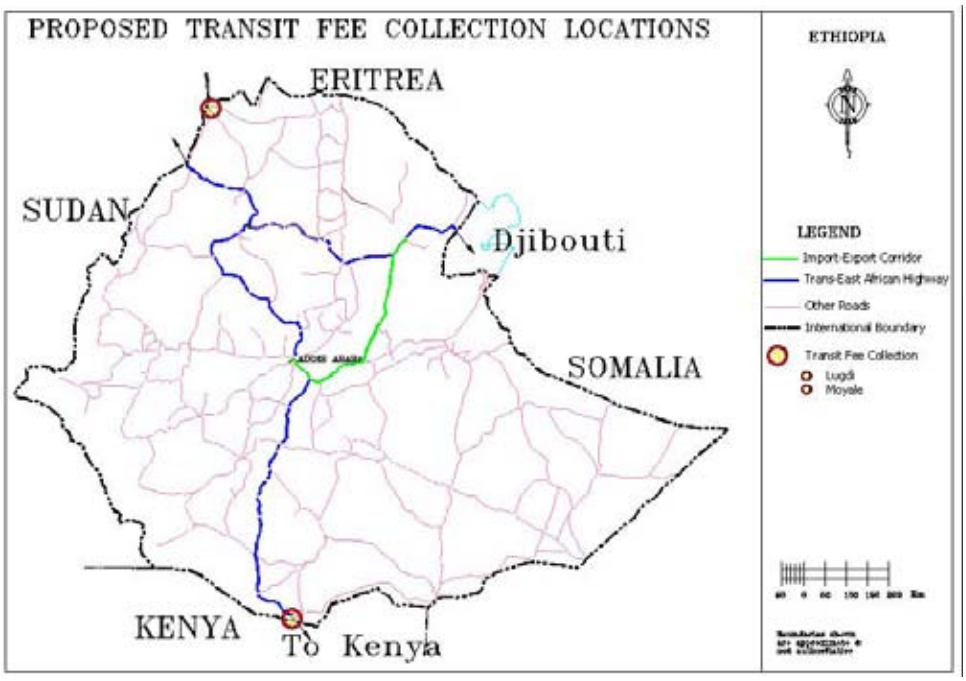


[8] Ibid.

[9] Ibid, for transit to Sudan, there is a bilateral agreement in place which has not yet been implemented.

In addition to the above, after having finished the construction works, the following roads would also facilitate the export-import traffic and the transit traffic: (i) Humera–Lugdi Road to Sudan; and (ii) Ageremariam–Moyale to Kenya[10].

The revenue level of Transit Fees is expected to increase in years to come with the introduction of additional transit routes through Ethiopia, and also due to rationalization in the structure of the prevailing Transit Charges.



11.3.4.2 Passenger Transport

The agreement with Djibouti and Sudan covers only freight vehicles; there is no agreement for the through movement of passenger vehicles[11].

11.3.5 Interest on Treasury Bills

Any sum of the money of the Road Fund remains idle or unutilized is usually invested in short-term Treasury Bills to earn interest on the same. However, there have been instances the surplus money was deposited for two years[12], which should not be encouraged, as such practices would limit the capability of the Fund to finance more road maintenance works in near future[13].

The National Bank of Ethiopia (NBE) notifies the auction at an interval of twice a month, with maturity period of 28 days, 91 days, and 182 days; the investors are supposed to bid, and out of the total face value of the bids received, on the basis of highest/lowest price offered in terms of ETB/100, the weighted average price (WAP) as ETB/100 is arrived at. Though, the

[10] Ibid, currently no agreement on cross-border traffic with Kenya, currently loads are off-loaded and re-loaded at the border to be carried by national carriers in their own country.

[11] Ibid.

[12] "……substantial increase of the cash surplus, part of which being regularly invested in treasury bills, and first time in 2004 in medium term (two year) bonds"; Financial and Technical Audit Services Report (2005).

[13] One of the conclusions of the Study on Road Funding and Road User Charges in Ethiopia (2004) is "despite its general success the Ethiopian Road Fund suffers from an inadequate disbursement rate as unspent funds accumulate".

returns on the Treasury Bills are not usually attractive, the investments are however made to have some returns on the money unutilized. During 2009-10, the ORF earned about ETB 1.0 million as interest income.

Table 11.11: Revenue Collected through Interest on the Treasury Bills (ETB million)

Fund Source	1997-98	-	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
Interest Income	--	-	1.1	9.2	9.0	0.6	1.3	0.7	1.0

It may be interesting to note that during 2004-05 and 2005-06, the interest income touched ETB 9 million each year, which certainly proved a higher level of non-utilization of the Road Fund collected during respective years. The main reason for the above situation was reported to be the institutional capacity constraints with the road agencies causing delays in disbursements.

For an appreciation, difference between the allocated money and the transferred money, which could be considered as "unutilized money" shows that ETB 143 million in 2009-10, and ETB 521 million in 2008-09. The figures illustrating level of unutilized money in previous years do not show any consistent trend to draw any meaningful conclusions. However, as the level of unutilized money is considerably high, it needs to be reduced by taking suitable measures, e.g. mainly reduction in delays in disbursements.

11.3.6 Annual Vehicle License Renewal Fees

The Annual Vehicle License (AVL) Fee based on axle-load, one of the sources suggested in the Road Fund Proclamation (1997), is not yet effective and operational in Ethiopia, which could contribute substantially to the Road Fund for sharing the financial burden of road maintenance costs. Conceptually, the AVL Fee is supposed to cover the fixed cost components of the road maintenance cost, i.e. mainly on the axle-load basis; the cumulative equivalent standard axle-load is considered as one of the key components in predicting the life of a bituminous road.

In view of the supplement funding, the introduction of an annual vehicle charges could be considered as good option both from strictly economic perspective and on equity ground[14]. It has been observed that the road maintenance has relatively high fixed costs, particularly for the low trafficked roads of Ethiopia, and these costs are best financed by such a charge[15].

Keeping the above in view and also following the recommendations of the Road Financing Study (2005), there has been a proposal by GoE to introduce the AVL Fees for different motorized vehicles, which is under consideration of the Council of Ministers. The present Study has revised the estimates and corresponding charges in view of current and future requirements of maintenance. The AVL Fees for different vehicles are presented in Chapter 13.

11.3.7 Overloading Fine

Overloading fine is also part of the Road Fund Proclamation (66/1997), as one of the sources of the revenue. The basic concept behind imposing the "Overloading Fines" is not necessarily generating revenues rather, it is used as a deterrent, so that the road users should not overload their vehicles, and make severe damages to the road surface. For observing traffic discipline and also to protect the road pavement, the overloading fines are imposed on the vehicles carrying more loads than the permitted limits. In fact, the overloaded

[14] Ibid.

[15] Ibid.

vehicles make the damages to the road surface much more than what they pay as overloading fines.

Within the above conceptual framework, the Overloading Fines need to be imposed in the country, as the fines are presently collected as minor offence from the vehicles carrying more loads than the permitted, which are not necessarily following any scientific methods for estimating the fines against damages made; moreover the fines collected are not fixed or uniform.

Presently, the proceeds collected as overloading fines go to the Government General Accounts, instead of going to the Office of Road Fund, so that it could be utilized for several activities with purpose, such as, road safety concerns, tight enforcement on checking overloading and organization of regular campaigns to reduce such practices, etc.

It has been also reported that the vehicles intercepted carrying loads more than the permitted limits, are forced to offload their excess cargo, and penalized by the nearby Courts for the damages they cause. The level of penalty is, however, so small that it does not have a serious effect on persistent offenders[16]. It has also been reported that currently, there are no fixed rates for charging the overloaded vehicles, and moreover, the charges vary from place to place; as the charges decided by the Courts located nearby the place where the vehicles found with overloads than the permitted limits.

The amount collected against the overloading or the offence committed by the vehicles carrying more loads, is expected to be about ETB 1.0 million[17], i.e. not that significant amount in comparison to the Road Fund requirements for maintenance activities. However, the amount should be preferably transferred to the ORF in view of the ERF Proclamation, so that it could be properly utilized for positive purposes, particularly for road safety.

11.3.8 Road Fund Revenues – A Summary

As discussed in the previous sections, the prevailing Road Fund revenues consist of: (i) Levies on Fuel; (ii) Transit Fee; and (iii) Interest Income. The figures illustrating the revenues from different sources are presented in Table 11.12. The total amount got transferred to the Road Fund account in the starting year of the Road Fund, i.e. 1997-98, was estimated as ETB 0.33 billion, which increased to ETB 1.32 billion in 2009-10, i.e. more than four times increase since the commencement of the Road Fund. The contribution of Levies on Fuel with 99%, on an average, has been dominating as the biggest contributor; and the Transit Fees and Interest Income together registered their contributions with less than 1% in the total revenue.

Table 11.12: Summary of Road Fund Revenue

Fund Source	1997-98	-	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Levies on Fuel	328.9	-	515.3	525.6	340.7	1,120.8	1,092.8	1,166.1	1,320.1	1137.2
Transit Fee[1]	--	-	0.2	0.1	0.6	0.3	0.3	0.2	0.7	0.5
Interest Income[2]	--	-	1.1	9.2	9.0	0.6	1.3	0.7	1.0	1.0
Total	**328.9**	**-**	**516.6**	**534.9**	**350.3**	**1,121.7**	**1,094.4**	**1,167.0**	**1,321.8**	**1138.7**
Contribution to the Road Fund (%)										
RF Fuel Levies	100.0	-	99.75	98.26	97.26	99.92	99.85	99.92	99.87	99.87
Transit Fee	--	-	0.04	0.02	0.17	0.03	0.03	0.02	0.05	0.04
Interest Income	--	-	0.21	1.72	2.57	0.05	0.12	0.06	0.08	0.09
Total	***100.0***	***-***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***

[16] Mid Term Review of RSDP II (2005).

[17] About ETB 873,000 collected in the first quarter of the Fiscal Year (July-September 2010).

Source: The Office of Road Fund.
1. Transit Fee (Ethio-Djibouti Corridor), 2. Interest on Treasury Bills/Bonds.

11.3.9 Collection Instruments of the Fund

For the reference, the collection instruments of various revenues of the Road Fund, Ethiopia are illustrated in Table 11.13. All the levies on fuel are collected by the Ethiopian Petroleum Enterprise (EPE), the Transit Fees are collected by Comment Transport Enterprise on Ethio-Djibouti Corridor and Wogagen Bank on Ethio-Sudan Corridor; and the Interest on the Treasury Bills is transferred from the National Bank of Ethiopia.

Table 11.13: Revenue Sources of the Road Fund & the Instruments for the Collection

Revenue Sources	Item	Instrument for Collection
Fuel Levies (contributing to the Road Fund)	Fuel Levy	Collected by the Ethiopian Petroleum Enterprise (EPE)
	VAT	Collected by EPE
	Municipal Tax	Collected by EPE
Transit Fees	Ethio-Djibouti Corridor	Collected by Comment Transport Enterprise
	Ethio-Djibouti Corridor	Collected by Wogagen Bank
Interest on Treasury Bills	Interest	Transfer from the National Bank of Ethiopia

11.4 Road Fund Performance – A Review

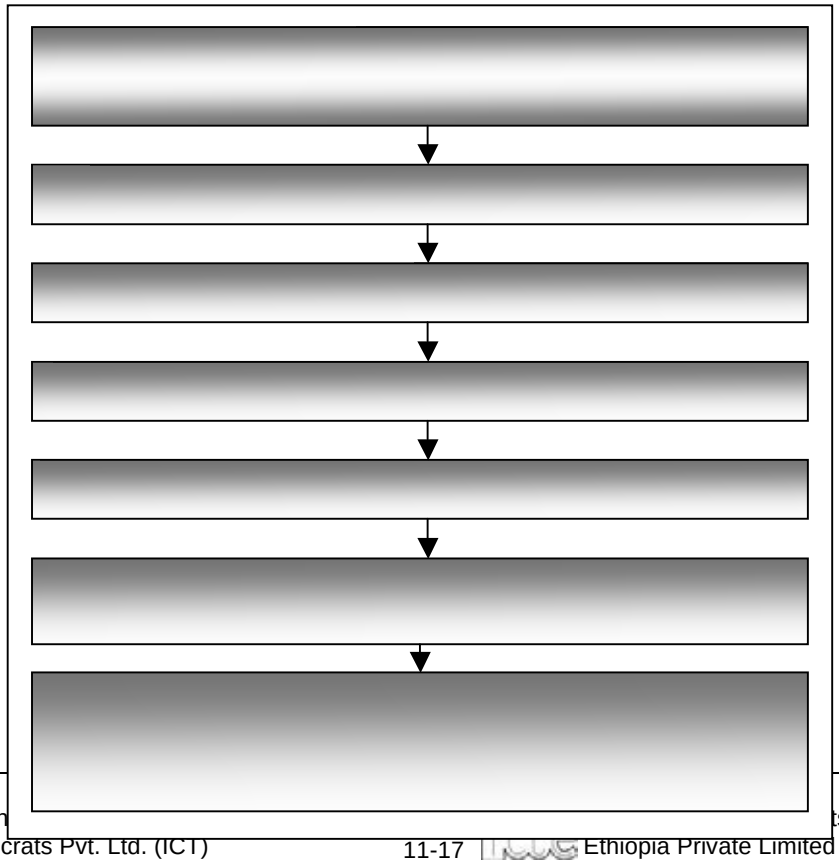
The Performance of the Road Fund, other than the revenue, is classified into the road fund allocation and transfer; the physical performance; the road financing and the Fund contributions, and the performance efficiency. A brief note with the above coverage as per the available facts and figures is in given the sections that follow.

11.4.1 Road Fund Budgeting Exercise

The annual allocation of the Fund is carried out through a budgeting exercise, which monitored by the Planning, Programming and Budgeting (PPB) Department, Office of the Road Fund. The main tasks performed by PPB Department are illustrated in Figure 11.4.

Figure 11.4: ORF's Budgeting Exercise

Planning, Programming and Budgeting Department



Every year, four months before the start of the next budget year, the ORF sends requests to all road agencies to draw up their preliminary budgets. The road agencies, in turn, carry out an analysis of the maintenance needs of the road network under their jurisdiction on a road segment basis. Their budgets are presented in terms of all road segments – cost estimates are prepared for total length of roads in km to be maintained as per the road surfacing required on that particular road segment multiplied by the adopted unit rates.

As reported during the consultations with various road agencies:

- The maintenance needs assessment carried out by road agencies varies from one agency to the other;
- Due to lack of resources, some of the agencies confirmed that they carried out visual roughness inspection surveys to assess the road deterioration levels and the need for re-gravelling or resurfacing;
- Most of the road agencies have expressed their inability to carry out any surveys before drawing up their preliminary budgets for road maintenance; and
- The unit rates adopted for the preparation of the cost estimates also vary from one agency to the other.

The preliminary budgets of all the road agencies are consolidated by the PPB Department, ORF. Along with this exercise, the Department prepares revenue forecasts based on previous years' revenues plus a 10% addition on the same.

The Department also estimates the total road maintenance expense payables to the road agencies at the end of the current budget year. Taking the above into account, the PPB Department estimates the "budget ceiling" comparing the revenue forecasts and maintenance payables with the budgets submitted by the road agencies.

The Department works out several options for budget ceiling taking into account the capacity and rate of execution of the current budget and last year's achievements of the road agencies and these options are then submitted to the Road Fund Board for approval.

Table 11.14 and Table 11.15 have been derived from the document, "Ministry of Works and Urban Development Road Fund Office, 2010-11 Budgetary Year, Road Fund Budget", which show how the Budget Planning is carried out at ORF.

Table 11.14: Budget Planning of ORF (2011)

(ETB in million)

Items	Amount
June 2010 Balance in Bank	602.41
Revenue Estimate of June 2010	99.37
Total	**701.78**
Deducting the Budgeted Amount for 2010	505.90
Remaining Balance that may exist at the end of 2010	195.88
Revenue Estimate in 2011 Budgetary Year	1,311.68
Budget Finance Capacity (2011)	**1,507.56**

Source: The ORF, Ethiopia.

The Budget Finance Capacity for the year 2010-11 has been estimated at ETB 1,508 million, after taking into account the 2010's bank balance and the revenue estimation for the year 2011.

Table 11.15 explains how the ORF's revenue estimation exercise is carried out, taking into account last 11 months' revenue, one month's revenue is estimated by simply dividing the 11

months' revenue by 11. Another 10% is added onto the last year's revenue estimation, in this case worked out to be ETB 1,312 million, which became the revenue estimate for the year 2011.

Table 11.15: ORF's Revenue Estimation Exercise (2011)

(ETB in million)

Type of Revenue	Levies on Fuel	Oil & Lubricant Sales	Transit Charges	Interest Income / Debenture	Total
Revenue Estimation for 11 months	1,089.50	1.70	0.75	1.12	1,093.07
Estimated Amount for Revenue in June	99.05	0.15	0.07	0.10	99.37
Revenue Estimation in 2010 Budgetary Year	1,188.54	1.86	0.81	1.22	1,192.44
10% Addition	118.85	0.19	0.08	0.12	119.24
Revenue Estimation for 2011 Budgetary Year	**1,307.40**	**2.04**	**0.89**	**1.34**	**1,311.68**
Percent	*99.67%*	*0.16%*	*0.07%*	*0.10%*	*100.00%*

Source: The ORF, Ethiopia.

An analysis on the budgeting exercise was presented in the Report on Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (June 2011). For the ready reference, a brief illustrating the major issues is reproduced in the following sections.

- The PPB Department, ORF has limited skilled resources to check on the action plans submitted by the road agencies; which restricts the ORF in checking the maintenance works and the corresponding unit rates properly and discrepancies found in the unit rates of different regions for the same works;
- The Engineering Unit usually prepares the budgets without much consultations with the Finance Unit, so it is difficult to ascertain the authenticity of the Unit Rates, which are not matched with actual past expenditures for various maintenance works; and
- The ORF observes also lack of staff for supervision or audit missions, which makes it difficult to keep a budgetary control over road agencies.

11.5 Distribution of the Fund

11.5.1 Overall Criteria

Following the Proclamation (1997), "the objectives of the Fund shall be to finance the maintenance of roads and road safety measures[18]". The Proclamation does not detail out the activities that need to be covered under the maintenance of roads and road safety measures.

[18] "Road Safety Measures include carrying out of works necessary for the prevention of accident in the use of roads and the placement of traffic control posts and devices on roads".

However, the Road Fund initially planned to distribute the Fund under the following categories of expenditures, viz.:

- Up to 85% for road maintenance activities;
- About 11% for capacity building of the road agencies;
- Up to 3% for traffic safety measures; and
- Nearly 1% for other road fund support services and technical inspections and audits.

The Proclamation (1997) suggests that "disbursement of the Fund shall only be made for the works performed and for goods and services procured as set out in the approved annual program and according to procedures established by the Board". The Board shall, inter alia, have power to "issue directive to define collection and disbursement procedures of the Fund". The ORF decides the upper ceiling of the budget allocation. The ceiling is decided mainly on the basis of budgetary constraints and certain assumptions for the future plan. The budget allocation criteria among the road agencies are presented in Table 11.16.

Table 11.16: Basic Fund Allocation Criteria for the Road Agencies

Road Agency	Road Category	Up to 2004-05	After 2004-05
Ethiopian Roads Authority (ERA)	Federal Roads	70%	65%
Regional Roads Authorities (RRAs)	Regional Roads	20%	25%
Municipal Roads Authorities (MRAs)	Municipal Roads	10%	10%
Total		**100%**	**100%**

11.5.2 Road Fund Allocation & Transfer

Since its inception, the Road Fund collected a sum of ETB 7.9 billion (1997-98 to 2009-10), of which ETB 7.7 billion was allocated for road maintenance purposes, of which ETB 6.9 billion (88%) got transferred to the three Road Agencies. Table 11.17 presents the yearly allocations and transfers of the Road Fund in Ethiopia.

Table 11.17: Road Fund Budget Allocation & Transfer

(ETB million)

Particular	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
Allocated	255.0	255.0	297.5	332.5	588.8	1,045.0	1,456.0	1,647.7	1,425.6
Transferred	233.6	246.0	286.3	423.9	640.5	927.8	1,103.9	1,144.7	1,282.3
Percent	*91.6%*	*96.5%*	*96.2%*	*127.5%*	*108.8%*	*88.8%*	*75.8%*	*69.5%*	*89.9%*

Source: The Office of Road Fund.

About 88.6% of the total Road Fund Allocation, on an aggregate level, was made to the road agencies for the road maintenance, and remaining 11.4% for road safety, capacity building, contingency, etc. Table 11.18 presents the figures on budget allocation to different road agencies and on other activities since 1997-98.

Table 11.18: Road Fund Budget Allocation

(ETB million)

Financial Year	ERA (Federal)	Regional	Municipality	Traffic Safety	Capacity Building	Contingency	Emergency Maintenance	RF Support	Total
1997-98	117.9	30.0	15.0	-	-	-	-	-	**162.9**
1998-99	152.2	40.0	20.0	-	-	-	-	-	**212.2**
1999-00	194.2	40.0	20.0	-	-	-	-	-	**254.2**
2000-01	169.8	48.5	24.3	7.5	-	-	-	-	**250.0**

2001-02	178.5	51.0	25.5	9.0	33.0	-	-	3.0	**300.0**
2002-03	178.5	51.0	25.5	9.0	33.0	-	-	3.0	**300.0**
2003-04	208.3	59.5	29.8	10.5	38.5	-	-	3.5	**350.0**
2004-05	216.1	83.1	33.3	10.5	200.0	-	-	7.0	**550.0**
2005-06	395.3	124.6	48.3	10.5	-	-	-	10.0	**588.8**
2006-07	701.2	171.3	76.3	8.6	-	65.0	-	22.6	**1,045.0**
2007-08	1,014.2	225.3	86.9	12.6	-	85.0	-	32.0	**1,456.0**
2008-09	1,111.9	223.1	94.0	10.0	-	85.0	85.0	38.7	**1,647.7**
2009-10	1,090.6	252.5	97.5	10.0	-	100.0	25.0	29.4	**1,605.0**
Total	**5,728.5**	**1,399.9**	**596.4**	**98.2**	**304.5**	**335.0**	**110.0**	**149.2**	**8,721.8**
Percent	*65.7*	*16.1*	*6.8*	*1.1*	*3.5*	*3.8*	*1.3*	*1.7*	*100.0*
Group (%)	***88.6% for Maintenance Work***			***11.4% for Other Works***					***100.0%***

Source: The Office of Road Fund.

Besides the road maintenance activities, a sum of ETB 900 million (approx), i.e. 11.4% of the total outlays of ETB 8.7 billion, have, so far, been allocated towards:

- Traffic safety (ETB 98.2 million or 1.1%);
- Capacity building (ETB 304.5 million or 3.5%);
- Contingency (ETB 335.0 million or 3.8%); emergency maintenance (ETB 110.0 million or 1.3%); and
- ORF Support (ETB 149.2 million or 1.7%).

The ORF followed the practice of budget allocation for 2009-10 among the RRAs considering the road inventory, which was organized to carry out by a third party, i.e. consultants under the guidance of ERA. With regard to the budget distribution among the MRAs, previous history of their budget utilization, traffic level on the roads, social and economic importance of the respective municipalities were considered[19].

Thereafter, the allocation and distribution criteria for road maintenance are made, e.g. during the last year (2009-10), the allocation was nearly 90% of the ceiling budget, and the rest 10% for safety, capacity and support services as approved by the ORF. After finalizing the upper budgetary limits of the road maintenance activities and additional tasks of the safety, capacity and support services, the funds are allocated among the road agencies, viz. ERA, RRAs and MRAs of the country, responsible for undertaking the maintenance activities under their jurisdiction.

11.5.2.1 Road Fund Allocation: A Review

The observed proportion of the Fund Allocation to different road agencies for last few years is presented in Table 11.19. It may be noticed that the allocation to the ERA varied from 65% to 78%, i.e. well beyond the fixed criteria for ERA, whereas in case of RRAs, it varied from 16% to 25%, and 7% to 10% in case of MRAs. Table 11.19 brings out the share of the total budget allocated among the road agencies, as observed since 2003-04. The allocated shares were recorded on 70%, 20% and 10% respectively up to 2004-05, and since then the varying shares were observed, as ERA got higher level of allocations.

Table 11.19: Fund Distribution to the Road Agencies

Year	ERA	RRAs	MRAs	Total
2003-04	70%	20%	10%	100%
2004-05	65%	25%	10%	100%
2005-06	70%	22%	9%	100%
2006-07	74%	18%	8%	100%
2007-08	76%	17%	7%	100%
2008-09	78%	16%	7%	100%

[19] The Budget Plan for 2009-10 prepared by the ORF (July 2009).

2009-10	76%	18%	7%	100%

Source: The Office of Road Fund.

Analysis the Fund allocated to the road agencies over a period of time shows, in general, a wide variation and inconsistency. The level of allocations to the RRAs and MRAs, in recent years, have been noticed lower that the criteria set for them, whereas, allocations to the ERA have been rather higher than the criteria. For lower level of allocations, in case of RRAs and MRAs could be attributed mainly to the following reasons: capacity of the road agencies for undertaking maintenance activities:

- Components and magnitude of the fund requests initiated by the road agencies; and
- Probable adherence to the activities qualified or eligible for the Fund approval.

With the result, the RRAs and MRAs have been getting lower allocations than their eligibility, and ERA with higher level of fund requirements and proven capability to undertake the maintenance work, has been receiving higher allocations. It may also be noted that due to the capability of the road agency, e.g. ERA to undertake/handle more maintenance works, which resulted in requirement of supplementary budget, comes in form of an intermediate budget, which is allowed by the Road Fund Board, the level of allocations to the ERA is, thus, registered more than the set criteria.

In brief, the phenomenon observed in Table 11.19 shows that the RRAs and MRAs have been receiving lower level of the Fund as compared to their eligibility, and in turn, the road networks in their jurisdiction are not getting adequate finance to carryout proper maintenance activities.

11.5.2.2 Monitoring & Evaluation

(I) Financial Audit

- Road agencies book of accounts is audited by private audit team; and
- Audit Team at the office also examine their book of accounts and follow-up the remedial action taken as per the recommendations and finding of the external audit.

(II) Technical Audit and Follow-up

- Consultants are employed that take measurement of the work done and approve payment certificate prepared by the road agencies;
- Engineering staff at the office takes part in verifying the quality of the work executed on a sample bases;
- Road agencies periodically report on their physical and financial plan accomplishment to the office;
- Regular field visit is made by the office staff; and
- Annual consultative meeting is organized by the office.

As brought out in Section 11.2.6.6, there is a need for an independent Engineering Department at the ORF, which could be handled by a Senior Technical Audit Expert. This would help the ORF, for an effective and efficient monitoring of the fund utilization and evaluation of the ORF financed projects.

11.6 Training Requirements

Following the ToR, the Study also needs to assess and identify the requirements of capacity development of the Office of Road Fund. The training could be organized at several levels as per the need of different functional areas relating to the road maintenance needs

assessment, costing, road users charges, etc. Section 11.2.6.6 reviewing the current staff and the requirements, presents a brief note on the need of additional staff and services at the ORF. In view of the requirements of the ORF, the Study has identified the major areas of training as follows:

- Maintenance Activities for different types of Road Surfaces;
- Adjustment of Road User Charges with application of E-RUCS Software;
- Conducting Maintenance Needs Assessment and Costing;
- Procurement of Works and Contract Management;
- Monitoring and Evaluation of the ORF Financed Maintenance Projects; and
- Derivation and Evaluation of Unit Cost for different Road Surfaces.

For the benefits of the ORF and proper road maintenance planning and implementation; the following trainings may also be organized suitable for the road agencies and/or the private contractors from time to time:

- Maintenance activities for different types road surfaces;
- Maintenance Planning, Road Inventory and Pavement Condition Survey;
- Pricing and Specification (Contract Part);
- Procurement of Works and Contract Management;
- Supervision of Maintenance Works;
- Practical Training on Maintenance Operations; and
- Equipment operation and machine maintenance.

In view of on job training at the well functioning Road Fund, the training could be divided into the general appreciation and specific requirements, such as, implementation of the Annual Vehicle License Fees, Mass Distance Charges, restricting overloading practices and proper usage of weighbridges, etc.

The Study identifies that Namibia, Tanzania and Kenya could be considered as well functioning Road Fund; as an analysis carried out under the Road Maintenance Initiatives (RMI) for the Sub-Sahara African Transport Policy (2007) ranks these countries at much higher level. The analysis was carried out incorporating a number of parameters reflecting design features of good Second Generation Road Funds. These countries, accordingly, could be considered for the on-job training.

11.7 Sum Up & Major Issues

The following sections sum up the present chapter and also the major issues.

11.7.1 The Board & Organization Structure

- The ERF Board has less private sector representation, as only four out of 16 members, which registers less than half of the advised level; and also presentation of rural network is desirable;
- The Board has power to “issue directive to define collection and disbursement procedures of the Fund”;
- The ORF also observes lack of staff for supervision or audit missions, which makes it difficult to keep a budgetary control over road agencies;
- The number of approved staffs in the ORF are 24 (21 professional and 3 secretaries), of which there are only 17 staffs are working (15 professional and 2 secretaries), so seven positions are vacant, which are required to be filled in as soon as possible;

- In order to monitor the ORF financed projects effectively and efficiently, and also ensuring proper implementation in view of value for money, particularly addressing the outcomes of present Study, there is a need for additional in-house expertise for undertaking the various tasks;
- It is crucial to strengthen the Engineering Department at ORF by adding more technical audit experts/staffs; addressing the growing size of the network and geographical proximities; and
- The Study proposes additional Technical Audit Experts/Staffs at ORF, who would be responsible for several technical activities relating to the monitoring and evaluating the ORF financed projects. A total of 11 additional Technical Audit Staffs are proposed under the Department of Technical Audit, in a phased manner depending on the scale and requirements, to properly follow and make the maintenance works successful.

11.7.2 The Road Fund Board, Fund Allocation & Transfer

- The maintenance needs assessment carried out by road agencies varies from one agency to the other;
- Due to lack of resources, some of the agencies confirmed that they carried out visual roughness inspection surveys to assess the road deterioration levels and the need for re-gravelling or resurfacing;
- Most of the road agencies have expressed their inability to carry out any surveys before drawing up their preliminary budgets for road maintenance mainly due to resource constraints;
- The unit rates adopted for the preparation of the cost estimates also vary from one agency to the other;
- It may be noted that the Proclamation (1997) suggests that “disbursement of the Fund shall only be made for the works performed and for goods and services procured as set out in the approved annual program and according to procedures established by the Board”;
- The structure as well as additional/new source of the Road User Charges needs to be rationalized in view of the growing maintenance needs and costs in the country;
- The level of revenue of the Fund has remained largely under the control of the ORF, Ethiopia;
- The Road Fund generally allocates up to 90% of the total budget to the road maintenance activities, which is distributed among the three road agencies, as 65% to the ERA, 25% to the RRAs, and 10% to the MRAs, for maintaining the roads under their jurisdiction;
- The above Fund Allocation criteria for the road agencies are not necessarily based on a systematic method or plan rather more on historical practices and structure of the classified road network of the country. However, the allocation criteria in present context appear to be rational in view of addressing the road maintenance needs of all types under the classified road network, and hence may continue in near future as well;
- Following the RSDPs, particularly RSDP IV, the structure of the classified road network in the country is likely to be changed in coming years with inclusion of the Wereda Roads, which may influence the Fund Allocation Criteria in future. It is, therefore, desirable to review the changing structure of the classified road network on regular basis, and accordingly suitable changes in the best interest of the socio-economic development of the country may be proposed;

- Under the RSDP IV, there is a plan to improve more than 71,000 km of the Wereda Roads with proper engineering standards by 2015 which are presently under unclassified category. These roads would provide links to transport goods and services in rural areas, which would also require maintenance. The development of Wereda Roads would influence the policy and allocation criteria, once it becomes the part of Classified Road network;
- Allocation of the Fund on the "Road Safety Measures" needs to be broadened[20] within the Road Fund Budget for the purpose. The factors affecting the process are type and capacity of road agency for maintenance works, estimated road maintenance needs, and regional social and economic factors;
- Considering the upper limits of the budget allocation set by the ORF for the road agencies; the actual budget transfer takes place in accordance with work progress and invoicing for those works; and
- Since 1997-98, the commencement year of the Ethiopian Road Fund, a sum of ETB 7.7 billion was allocated for road maintenance purposes, of which ETB 6.9 billion (88%) got transferred to the road agencies; and a sum of ETB 900 million (approx) allocated towards the traffic safety measures, capacity building and ORF Support.

11.7.3 The Fund Performance

- Physical performance of the Road Fund, i.e. in terms of km, shows a higher level of target achievements. More than 30,000 km of roads were brought under planning for the maintenance activities during 2009-10, but on an average only 87% of the roads targeted for maintenance could be accomplished, which need to be improved by taking suitable measures;
- The growing level of the proportion of "Good Roads" in the Classified Road Network of the country administered by different road agencies shows an encouraging pattern (i.e. 73% of paved roads and 53% of unpaved roads under ERA and 53% of roads under RRAs are in good condition). The reasons could be obviously attributed to the Road Fund financing of the maintenance activities;
- Earlier studies, viz. Road Funding and Road User Charges in Ethiopia (2004) and Road Financing Study, Ethiopia (2005) brought out that the road maintenance needs assessment in the country was grossly under-funded. Nevertheless, the RSDPs' initiatives, combined with the setting up of the "Second Generation Road Fund" in 1997 with dedicated revenues from levies on fuel have considerably improved the condition of the road network in the country;
- The current revenue level of the Road Fund and its structure of the road user charges will not be in position to meet the growing maintenance needs of existing and new roads of the country. It is reported that the Road Fund is currently able to support the routine maintenance activities with partial support to periodic maintenance;
- The PPB Department, ORF has limited skilled resources to check on the action plans submitted by the road agencies; which restrict the ORF in checking the maintenance works and the corresponding unit rates properly and discrepancies found in the unit rates of different regions for the same works;
- The Engineering Unit usually prepares the budgets without much consultation with the Finance Unit, so that it is difficult to ascertain the authenticity of the Unit Rates, which are not matched with actual past expenditures for various maintenance works;

[20] As brought out in the report on "Guidelines for Approving Eligibility of Maintenance of Works for ORF Financing (June 2011)".

- The Study assesses and identifies the requirements of capacity development of the Office of Road Fund, particularly the need for an independent Engineering Department with the required Technical Staff, so that proper technical, planning, monitoring and evaluation could take place. The arrangement would ensure in-house capacity for effective and efficient monitoring and evaluation of the ORF financed projects; and
- The training could be organized at several levels as per the need of different functional areas relating to the road maintenance needs assessment, costing, road users charges, etc.

11.7.4 Training Requirements

- In view of the requirements of the ORF, the Study has identified the major areas of training, such as, different maintenance interventions; operating E-RUCS software for maintenance needs assessment, costs and adjusting the road users charges; Procurement of Works and Contract Management; Monitoring and Evaluation of the ORF Financed Maintenance Projects; and derivation and evaluation of unit cost for different road surfaces;
- For the benefit of the ORF and proper road maintenance planning and implementation, the following trainings may be organized suitable for the road agencies and/or the private contractors from time to time, viz. Maintenance Planning, Road Inventory and Pavement Condition Survey; Pricing and Specification; Supervision of Maintenance Works; Maintenance Operations; and Equipment operation and machine maintenance; and
- For on-job training, the Study has identified Namibia, Tanzania and Kenya as well functioning road funds based on the analysis carried out by the RMI for the SSATP. The training in these countries would be particularly beneficial in view of implementing additional/new sources of revenue and other related activities, e.g. the Annual Vehicle License Fees, Mass Distance Charges, restricting overloading practices, proper usage of weighbridges, etc.

The subsequent chapters of the Report, viz. Chapter 12 dealing with Road Fund Revenue: Potential Sources; and Chapter 13 on Road User Charges: Analysis & Estimation bring out the details on the scope and need for revisions in prevailing tax structure and additional/new source of revenue, and also the annualized maintenance cost in coming years, and the Fund Gaps.

12. ROAD FUND REVENUE: POTENTIAL SOURCES

12.0 ROAD FUND REVENUE: POTENTIAL SOURCES

12.1 General

This chapter identifies the potential sources of revenue for the Ethiopian Road Fund. The exercise is highly guided and dependent on the internationally accepted practices following the Second Generation Road Fund concept; equitable road user charges determined by the road deterioration model, incremental road user charges, etc. within the overall frame of the Ethiopian Road Fund Proclamation (1997).

The previous chapters and sections, particularly dealing with the sources of revenues are making the building blocks for the identification of the potential and acceptable source of revenues. The need for potential sources of revenue is highly realized in view of the growing road maintenance needs in future on account of both preserving the existing assets and additional roads (new and rehabilitated) of the network and offering quality service.

While identifying the potential sources of revenue for the Road Fund, the Study explores the possibilities of: (i) revision of the prevailing sources of revenue; and (ii) identification of the additional sources of revenue.

12.2 Potential Revenue in Future

Details on the rationale, logic, practices and limitations of the sources of revenue are adequately discussed and presented in Chapter 10, and the existing sources of revenue and their contributions to the Ethiopian Road Fund in Chapter 11. Hence, these issues are not further discussed in this chapter rather the descriptions on the potential revenues are being taken from those chapters to make the same precise and focused.

12.2.1 Business as Usual

“Business as Usual” could be one of the options referring to the minimal external interventions on the prevailing practices and no basic structural changes in sources of revenues of the Road Fund regardless of the growing requirements of the road maintenance needs in the country. This option would, however, observe the growth in revenue level by virtue of growth in transport output with higher vehicle population, higher fuel consumptions and so on. In a nut-shell, the Road Fund revenue would be growing with natural growth of the transport sector activities, but with the constraints of the restricted level and proportion of good roads in absence of higher level road maintenance interventions on account of limited fund.

Ideally speaking, the above option cannot be sustainable in medium to long term maintenance strategy and formulating any transport plans. Negligence of road maintenance due to lack of fund and resource constraints would certainly lead to a much worse condition, such as, loss of the high value road assets over shorter period of time, high vehicle operating costs causing efficient and uneconomic transport system cost leading to overall higher cost to the economy, unreliable transport system causing severe problems in general, and damaging perishable and fragile commodities in particular, etc. Unmaintained roads adversely affect all through, as indicated above, and also breaking down the vehicles frequently and may also resulting in higher incident of road accidents – minor or fatal.

In view of the above, the Business as Usual option is not practical and acceptable, so the need of exploring additional sources of revenue is highly realized.

12.2.2 Revisions of Existing Sources of Revenue

As discussed earlier that the "Existing Sources of Revenue" are (i) Government Budget, i.e. contribution through the VAT collected on fuel; (ii) Levies on Fuel[1] (Road Fund Fuel Levy, VAT (as referred to above) and Municipal Tax); (iii) Transit Fees (Djibouti Corridor); and (iv) Interest on the Treasury Bills.

12.2.2.1 Government Budget

Part of the revenue collected through VAT on the petroleum products (petrol and diesel) goes to the Ethiopian Road Fund. Rate of VAT on petrol and diesel has been fixed at 15% on POL built up cost (Chapter 11). Contribution of the VAT, fixed on *ad Valorem,* which has been increasing yearly mainly due to changes in the petroleum price in the international market. The VAT, widely collected in Ethiopia on goods and services, is a major source of the Government Revenues.

The GoE has been allocating some portion (about 50%) of the revenue collected through VAT to the ORF. Since, the magnitude of the revenue is directly related with the movement on the country's roads consuming more petrol or diesel, this part of revenue should ideally cover major part of the variable cost components of the total maintenance costs.

It may be noted that the VAT is not a committed source of income to the ORF; however, the current practices are assumed to be prevailing in near future as well; while undertaking the analysis, varied levels of VAT contribution are proposed.

12.2.2.2 Levies on Fuel

Details on the Levies on Fuel are presented in Chapter 11. For the purpose of ready reference, some of the tables and figures are given in this section also, so that the potential revenue for the Road Fund could be logically crystallized.

Table 12.1: Charges – Fuel Levy, VAT & Municipal Tax (April 2011)

(ETB/liter)

Product	Excise	Stabili-zation	Fuel Levy	VAT	Municipal Tax	Total**	Retail Price#
MGR (Petrol)	2.3975	3.0913	0.095	1.5584	0.02	1.6734	20.94
ADO (Diesel)	--	-0.9367	0.08	1.2761	0.02	1.3761	17.73
LFO	--	-0.6734	--	1.2282	--	1.2282	14.17
HFO	--	-0.5463	--	1.1391	--	1.1391	14.00
Oil & Lubricants	--	--	--	--	--	--	--

Source: Ethiopian Petroleum Enterprise. **Fuel Levy + VAT + Municipal Taxes; # at Addis Ababa.

(i) Road Fund Fuel Levy

As stated earlier that the "Road Fund Fuel Levies" on petrol (ETB 0.095/liter) and on diesel (ETB 0.080/liter), prevailing currently, have not been changed since 1997, i.e. the commencement year of the Ethiopian Road Fund; whereas the changes in fuel prices recorded in 1997-98 as ETB 2.51/liter for petrol, and ETB 1.76/liter for diesel, which have increased manifold since then. Fuel prices have been observed in 2011, as ETB 20.94/liter for petrol, and ETB 17.73/liter for diesel. The changes in prices have been recorded as 8.34 times on 1997-98 level in case of petrol, and 10 times in case of diesel.

The Road Fund Fuel Levy, which is exclusively dedicated to finance the road maintenance activities, there have not been any changes, regardless of the substantial increase in the unit cost of maintenance components.

[1] Excise Tax and Stabilization Tax are not the part of the Road Fund Revenue.

As discussed earlier, out of the levies on fuel, the Road Fund (RF) Fuel Levy, VAT (partial) and Municipal Tax collected through the sales on petrol and diesel, go to the Ethiopian Road Fund Account. The levels of contribution through VAT (percentage rate) and Municipal Tax are proposed to remain the same in coming years, whereas the rate of RF Fuel Levy on petrol and diesel need to be reviewed and changed in a logical manner, so that it could rationally cover the variable cost components of road maintenance.

For an illustration, the amount transferred to the ORF with details on the sources for the year 2009-10 with monthly distributions are presented in Table 12.2.

Table 12.2: Revenue by Levies on Fuel (2009-10)

(ETB in million)

Month / Road User Charges**	VAT	Road Fund	Municipality	Total
	15%	0.095/0.080*	0.020*	
July	99.09	12.28	3.00	114.38
August	95.30	11.42	2.79	109.50
September	79.21	9.40	2.31	90.95
October	97.03	11.51	2.80	111.34
November	95.71	11.38	2.77	109.86
December	93.28	10.98	2.68	106.94
January	98.60	11.54	2.82	112.96
February	93.68	10.95	2.68	107.31
March	93.68	10.95	2.68	107.31
April	103.25	12.62	3.08	118.96
May	99.09	11.78	2.88	113.74
June	87.60	10.87	2.66	101.12
Total	**1,135.52**	**136.70**	**33.15**	**1,304.36**
Percent	*87.1%*	*10.4%*	*2.5%*	*100.0%*

Source: Ethiopian Petroleum Enterprise (2011). *Petrol/Diesel per liter; **VAT *ad valorem*.

For setting the Road Users Charges, the Study analyzed the revenues being generated through levies on fuel, and deposited in the EPE's Account. For the purpose, the latest figures, i.e. for the month of June 2011, presenting the quantity of petroleum products sold, total revenues collected under the VAT, Road Fund Fuel Levy and Municipal Tax, collected for the Road Fund Account, are illustrated in Table 12.3.

Table 12.3: VAT, Road Fund Fuel Levy & Municipal Tax Collected by EPE (June 2011)

(Amount in ETB million)

Product	Qty Sold[1]	Value Added Tax		RF Fuel Levy		Municipal Tax		Total
		Rate[3]	Amount	Rate[3]	Amount	Rate[3]	Amount	
Gas Oil	116.98	1.2761	149.28	0.0800	9.36	0.0200	2.34	160.98
HFO	9.84	1.1391	11.21	--	--	--	--	11.21
LFO	2.93	1.2282	3.60	--	--	--	--	3.60
MGR (D)	0.22	1.4681	0.32	0.0950	0.02	0.0200	0.01	0.34
MGR (S)	15.80	1.5584	24.62	0.0950	1.50	0.0200	0.31	26.44
DTA[2]			(1.90)					(1.90)
Total			**187.13**		**10.88**		**2.66**	**200.67**
Road Fund Levies			**174.22**		**10.88**		**2.66**	**187.76**
Fund Transfer/Account:								
Taxes Payable to The ORF			***ETB 107.00 million (June 2011)***					
Stabilization Fund			*ETB 93.68 million (June 2011)*					

Source: Ethiopian Petroleum Enterprise / Office of Road Fund (June 2011);
Note: 1=liter in million; 2=Duty Free & Adjustment; (D)=Djibouti; (S)=Sudan; 3=per liter.

The levies on fuel (with VAT contribution) have been the main contributor to the Ethiopian Road Fund, i.e. 99.8% approx. Of the levies on fuel (all types), the contribution of the RF Fuel Levy is very low. Table 12.3 shows that a sum of ETB 187.76 million was collected on account of the Road Fund through VAT (ETB 174.22 million), Fuel Levy (ETB 10.88 million),

and Municipal Tax (ETB 2.66 million), but only a sum of ETB 107 million was transferred to the ORF (June 2011), and ETB 93.7 million was retained for the Stabilization Fund.

An analysis of the figures given in Table 12.3 shows that about 50% of the amount collected against VAT, has been retained. However, the Consultants have been informed that as per the latest guidelines given by the Ministry of Finance and Economic Development (MoFED), the ORF would be receiving monthly a sum of ETB 107 million until further communications or so.

Table 12.4 presents the changing rates of Levies on Fuel in Ethiopia since 1997, i.e. start of the Road Fund. The rates of Road Fund Fuel Levy on petrol and diesel have been somehow remained unchanged. As described earlier, out of the levies on fuel, the Road Fund (RF) Fuel Levy, VAT (partial) and Municipal Tax collected through the sales on petrol and diesel, go to the Ethiopian Road Fund Account.

Table 12.4: Changes in Taxes on Petrol & Diesel since 1997-98

Year	Petrol/MGR (ETB/liter)					Diesel (ETB/liter)				
	Excise	VAT**	Fuel Levy	Muni-cipal	Total	Excise	VAT**	Fuel Levy	Muni-cipal	Total
1997-98	0.362	0.188	0.095	0.020	0.665	--	0.126	0.080	0.020	0.226
1998-99	0.286	0.149	0.095	0.020	0.549	--	0.110	0.080	0.020	0.210
1999-00	0.479	0.249	0.095	0.020	0.843	--	0.166	0.080	0.020	0.266
2000-01	0.604	0.314	0.095	0.020	1.032	--	0.251	0.080	0.020	0.351
2001-02	0.675	0.439	0.095	0.020	1.229	--	0.275	0.080	0.020	0.375
2002-03	0.608	0.395	0.095	0.020	1.117	--	0.285	0.080	0.020	0.385
2003-04	0.648	0.421	0.095	0.020	1.184	--	0.289	0.080	0.020	0.389
2004-05	0.990	0.643	0.095	0.020	1.748	--	0.492	0.080	0.020	0.592
2005-06	0.990	0.643	0.095	0.020	1.748	--	0.492	0.080	0.020	0.592
2006-07	1.259	0.818	0.095	0.020	2.192	--	0.642	0.080	0.020	0.742
2007-08	1.794	1.166	0.095	0.020	3.074	--	1.020	0.080	0.020	1.120
2008-09	1.794	1.166	0.095	0.020	3.074	--	1.020	0.080	0.020	1.120
2009-10	2.085	1.355	0.095	0.020	3.555	--	1.244	0.080	0.020	1.344
2010-11	2.398	1.558	0.095	0.020	4.071	--	1.276	0.080	0.020	1.376
Increase	*2.036*	*1.370*	--	--	*3.406*	--	1.150	--	--	1.150
GR (%)*	**15.7**	**17.7**	--	--	**15.0**	--	**19.5**	--	--	**14.9**

**VAT: Value Added Tax, earlier it was termed as Sales Tax; #as on December 2004; *Growth Rate (%) per annum.

It would be important to note that there are non-transport users of fuel, e.g. diesel used for industrial and agricultural purposes, and they also pay the Fuel Levy, whenever they consume. The extent of such users was estimated for Ethiopia under a study entitled "Road Funding and Road User Charges in Ethiopia (2004)". The study estimated that about 35% of the fuel consumers were non-transport users. While making any changes in the Fuel Levy, the above fact needs to be kept in view.

Table 12.5: Fuel Contribution to Road Fund & General Taxation (2000-01)

(ETB in million)

Description	Import Value	Road Fund	General Taxation
Petrol	343	78	
Diesel used in transport sector	1,008	153	
Sub-Total (i)	**1,351**	**231**	**107**
Diesel used in non-transport sector	355	54	
Other Fuels & Oil	380	71	
Sub-Total (ii)	**735**	**125**	******
Grand Total	**2,086**	**356**	******

Source: Road Funding & Road User Charges in Ethiopia (2004); ** Not exactly known.

Over a period of about 14 years, there have been all around changes in price of almost everything at varied levels, which have considerably affected the cost of road maintenance activities. It may be seen in Table 12.6 that how the retail prices of petrol and diesel have changed since 1997, i.e. more than 8.34 times in petrol and 10 times in diesel.

Table 12.6: Retail Price in Addis Ababa (ETB/liter)

Year	Petrol (MGR)	ADO (Diesel)	Kerosene	Light Fuel Oil	Heavy Fuel Oil
1997-98	2.51	1.76	1.40	1.49	--
1998-99	2.51	1.76	1.40	1.49	--
1999-00	2.95	1.98	1.55	1.94	1.88
2000-01	4.30	2.62	2.00	2.23	2.14
2001-02	4.40	2.72	2.00	2.30	2.14
2002-03	4.40	2.72	2.00	2.30	2.19
2003-04	4.18	2.72	2.00	2.30	2.19
2004-05	5.12	3.63	2.69	3.17	3.07
2005-06	6.58	4.78	3.45	4.19	4.11
2006-07	7.56	5.44	4.12	4.19	4.11
2007-08	9.61	6.90	5.72	5.95	5.83
2008-09	9.15	7.49	6.07	6.69	6.15
2009-10	11.23	9.34	8.05	9.49	8.83
2010-11*	20.94	17.73	14.05	14.17	14.00
GR (%)*	**17.7**	**19.4**	**19.4**	**18.9**	**20.0**

Source: Ethiopian Petroleum Enterprise. *April 2011. *GR (%)=Annual Growth Rate.

Retail prices of the petroleum products are largely guided by the international prices being fully imported commodities, and the levies on fuel as per the Government policies. International prices of petroleum products have been observed fluctuating due to several international factors and level of supplies from the oil exporting countries. The retail price build up in Ethiopia (April 2011) has been presented in Table 11.3 of Chapter 11, with the levies on fuel. The levels of levies on fuel since 1997 have been illustrated in Table 12.4 In order to appreciate the changing retail prices in Addis Ababa (as a case), Table 12.6 compiles the figures relating to petrol, diesel, kerosene, light fuel oil and heavy fuel oil. The annual growth in retail prices of different oil products has been recorded as between 17.7% (petrol) and 20% (heavy fuel oil) since 1997; which can be considered as higher rates of increase, and moreover the average inflation and general price increase. The growth rates in retail prices of petrol and diesel are recorded as more than that of the rates of import/consumption.

Table 12.7 presents the structure of levies on fuel. It is interesting to note that the contribution of VAT in total levies on fuel is estimated at about 93% in both the products of petrol and diesel; whereas the contribution of the Road Fund Fuel Levy records at only 5.7% in case of petrol and 5.8% in diesel. While observing the share of Road Fund Fuel Levy in total retail prices, it registers as about 8%, for both petrol and diesel.

The above analysis certainly illustrates the considerably lower contribution of the Road Fund Fuel Levy, which is the dedicated road user charges to the Road Fund, in comparison with the VAT. Hence, revision of the Road Fund Fuel Levy can be considered as one of the potential sources of revenue.

Table 12.7: Different Taxes & Road Fund (April 2011)

(ETB)

Particular		Petrol (MGR)		ADO (Diesel)	
		Amount	Percent	Amount	Percent
Levies on Fuel	**Road Fund Fuel Levy**	**0.095**	**5.7%**	**0.08**	**5.8%**
	VAT	1.5584	**93.1%**	1.2761	**92.7%**
	Municipal Tax	0.02	**1.2%**	0.02	**1.5%**
Total Duty / litre		**1.6734**	**100.0%**	**1.3761**	**100.0%**
Retail Price (ETB/litre; 2011)		20.94		17.73	
Levies on Fuel Retail Price		**7.99%**		**7.76%**	
Road Fund Fuel Levy to Retail Price		**0.45%**		**0.45%**	

Source: Ethiopian Petroleum Enterprise (April 2011).

The contribution of Road Fund Fuel Levy to the total Ethiopian Road Fund revenue is recorded as 10.4%, and the contribution of other sources is given in Table 12.8.

Table 12.8: Existing Sources of Revenue & Its Level (2010-11)

Sources of Revenue		Unit Base	Amount (ETB) in 2010	Share of Contribution (%)
Levies on Fuel	Fuel Levy*	Per litre	137.37	10.39
	VAT**	15%	1,149.13#	86.94
	Municipal Tax	Per litre	33.55	2.53
Transit Fees		Per vehicle	0.66	0.05
Interest on Treasury Bills		RoI***	1.04	0.09
Total Road Fund Revenue (2010)			**1,321.75**	**100.0%**

#Derived figure; *Road Fund Fuel Levy; **Government's contribution;***Return on Investment.

(ii) Value Added Tax (VAT)

The contribution of VAT has been regarded as significant, i.e. with more than 86.9%. The share of VAT to the Ethiopian Road Fund is considered as the Government's contribution. The prevailing VAT rate on fuel is 15% *ad valorem*. Considering the significant contribution of VAT, the Study would not propose any revision in the rate of VAT to increase the Road Fund Revenue. However, the Study has reviewed the share of transfer of VAT collected to the ORF – current and future, i.e. discussed Chapter 13, also considered in the Road Users Charges analysis carried out under different options.

(iii) Municipal Tax

The present rates of Municipal Tax on petrol and diesel are ETB 0.02 per liter. The amount collected through the Municipal Tax has been estimated as ETB 33.6 million (2010-11), which accounts for 2.5% to the total Road Fund revenue. Considering the size of the contribution and rationale supporting the road user charges through this instrument, the Study does not propose any revision in the rates of Municipal Tax under the analysis.

(iv) Excise Tax

The Excise Tax is applicable only on petrol (MGR) in the country, and the revenue, thus, collected does not go the Ethiopian Road Fund. The contribution of Excise Tax is substantial with ETB 2.3975/liter (30% of the cost) in the retail price build up of petrol, which is about 25.23 times of the current Fuel Levy on petrol (i.e. ETB 0.095/liter). Though the Excise Tax is paid mostly by the road vehicle operators, the revenue collected through this instrument goes to the Government Budget for several development purposes. No structural change on account of the Excise Tax is proposed while reviewing the additional sources of revenue of the Road Fund.

12.2.2.3 Transit Fees

The contributions of the Transit Fees to the total revenue of the Road Fund over period of time have been recorded as 0.02% (minimum) to 0.17% (maximum), in absolute terms. The contributions have been observed as ETB 0.2 million (2003-04) and ETB 0.7 million (2009-10). The annual growth in the Transit Fees has been estimated as more than 23% (Section 11.3.4). The above estimates refer to the existing Djibouti Route, and it is expected that a few additional routes will be operative for foreign vehicles using the Ethiopian road network in the near future; which are not yet finalized.

However, considering the trend, particularly the growth in traffic as well as the revenue through Transit Fees on the Djibouti Route, would continue to grow in near future more or less on the line of the past trend. Assumed that there are no changes in the current rate of the Transit Fees, and the international traffic would continue to grow in view of economic development of the country, and also probability of more traffic through new routes, a growth rate of 25% pa in the Transit Fees may be observed in the future. However, the Study has reviewed the prevailing transit fees[2] in view of the fixed cost components in the maintenance by vehicle type as illustrated in Chapter 7 (Tables 7.17 and 7.18). The exercise is based on the fixed cost and annual performance of the specific vehicle type providing per vehicle-km cost implications.

12.2.2.4 Interest on Treasury Bills

Due to high cash balance, particularly during 2004-06, the level of interest earnings on the treasury bills were recorded nearly 2% of the total revenue of the Road Fund. Since then, the situation has been changing and the proportion of cash in hand has been observed on reducing.

Table 12.9: Interest on Treasury Bills (ETB in million)

Year	Interest on Treasury Bills	Total Road Fund Revenue	Share of Interest Earning on Previous Year Revenue
2003-04	1.10	516.60	--
2004-05	9.20	534.90	1.78%
2005-06	9.00	350.30	1.68%
2006-07	0.60	1,121.70	0.07%
2007-08	1.30	1,094.40	0.12%
2008-09	0.70	1,167.00	0.06%
2009-10	1.00	1,321.80	0.09%

Source: The Office of Road Fund, Ethiopia.

The high cash balance is generally considered as not good sign of operational efficiency of the Fund, which usually takes place due to delays in the financial disbursement. In the past, the delays in financial disbursement was noticed as one the biggest weaknesses in the operation of the Fund[3].

However, considering the recent years' phenomenon, the level of cash in hand appears to be on an acceptable level, i.e. 0.06% to 0.12%. For a comparison, the level of cash in hand in Namibia is projected as 3.9% for 2010-11, but the same has been planned to reduce to very low or minimum level by 2014-15. For the purpose of the Study, the contribution from the

[2] In Tanzania, transit fees are as follows: vehicles up to and not exceeding 3 axles at US$ 6 for every 100 km; and more than 3 axles at US$ 16 for every 100 km (Source: feedback obtained through the Questionnaire sent to the Road Fund, Tanzania).

[3] Road Financing Study, Ethiopia (2005).

interest on the treasury bills should be proposed to the restricted to the level of 0.05% of the previous year's revenue, and in order to observe the efficiency, it could be expected that no increase in the level of cash in hand.

12.2.3 Additional / New Sources of Revenue

12.2.3.1 Annual Vehicle License Fees

As discussed in earlier chapters, the Annual Vehicle License (AVL) Fees, which basically cover the fixed cost components of the road maintenance cost, are not yet functional in Ethiopia, hence no contribution to the Ethiopian Road Fund so far, despite of the mention in the Proclamation (1997).

Therefore, with logic of (i) covering fixed cost component of the maintenance costs; and (ii) rationalizing the levies on fuel (by reducing burden on levies on fuel), in view of different types of vehicles, the Study proposes to introduce the AVL Fees regime in the country. It may be noted that previous studies, viz. Road Financing Study, Ethiopia (2005) and Road Funding and Road User Charges in Ethiopia (2004) have also made their estimates on maintenance cost and road user charges with the AVL Fees for different motor vehicles.

The proposed AVL Fees should cover the fixed cost of the maintenance, and be derived incorporating the transport outputs generated by different categories of vehicles plying on different class of roads in country's road network. This exercise would ensure the proper representation of the extent of vehicle and pavement utilization of different types, so that the concept of equity could be observed.

Table 12.10: Annual Vehicle License Fees as Proposed in Earlier Studies

(ETB/Vehicle)

Vehicle Category	RUCS (2004)	RFS (2005)	Recommended*
Car petrol	429	445	125
Car diesel	564	605	
Station wagon petrol	4,783	6,329	1,600
Station wagon diesel	5,137	6,926	
Minibus petrol	2,250	1,709	400
Minibus diesel	2,250	1,709	
Large bus, diesel	6,807	5,585	1,400
Light truck petrol	4,719	2,555	650
Light truck diesel	4,719	2,555	
Medium truck diesel	10,115	5,982	1,500
Heavy truck diesel	15,863	10,675	2,700
Articulated truck diesel	16,265	16,129	4,000

Source: ERA's Road User Charges Study (2004), and Road Financing Study, Ethiopia (2005).
*Based on 25% of the derived Annual Vehicle License Fees under the RFS, Ethiopia (2005).

The Road Financing Study (2005) recommended the AVL Fees in Ethiopia as presented in Table 12.10. The recommended fees were 25% of the derived fees, which were to take care of the fixed cost components of the maintenance cost, and also comparable with the fees estimated by the Road Funding and Road User Charges in Ethiopia (2005), excepting the charges for the freight carrying vehicles.

Under the present Study, the figures relating to the fixed cost components in the maintenance cost as presented in Table 7.18 for different vehicles have been used for calculating the AVL Fees. The aspect has been presented in chapter 13.

12.2.3.2 Weight-Distance Charges (Mass Distance Charges)

The system of Mass Distance Charges (MDCs) is one of the efficient forms of tax/charges relating to the road damage cost by heavy commercial vehicles. However, this requires a high degree of technology and proper monitoring instruments. Also this would be viable when there is a well-established truck movement in the country. In this context, it would be desirable to wait for a later period for its consideration as a viable form of road user charging instrument in Ethiopia[4]. A brief note on the rational and need, modus operandi of introducing the MDCs, etc. prepared on the basis of international practices, particularly recently introduced in Namibia, is given in the following sections.

(i) Rationale & Need

- The need for "weight-distance charges" or "mass distance charges (MDCs)" is realized as the road surface consumption increases more sharply with the increase in gross vehicle weight than it does with the fuel consumption[5];
- Heavy vehicle owners and operators have been contributing towards the Road Fund through different instruments, viz. vehicle registration fees, annual license fees, fuel levies, cross border charges. However, these contributions have not equitably recovered the road surface consumption costs incurred by the heavy vehicles for using road network[6]; and
- The MDCs aim at reducing the inequity as indicated above, by ensuring that the owners/operators should pay their fair share for the maintenance of country's road infrastructure on account of relatively more road surface consumption as compared to light vehicles.

(ii) Modus Operandi of MDCs

- **MDC Registration Form:** If proposed, all the owners/operators of heavy vehicles registered in Ethiopia with V/DT Rating 3,500 kg[7], need to be registered by furnishing the details as required in the specially designed for the purpose known as "MDC Registration Form" either from the ORF or any authorized/designated office. The MDC Registration Form is the form requiring details from the owner/operator on operation of the vehicle, such as, an indication of the distance likely to be travelled in year following the registration. A model Registration Form with explanatory details, based on the Namibia practices, is presented in Annexure 12.1.
- **Classified Road Network:** For making Mass Distance Charges, the vehicles travelling on the classified road network of the country should be accounted for.
- **License Renewal:** if a vehicle operator with an MDC liable vehicle applies for licensing of that vehicle, proof of earlier payment of the Mass Distance Charge or so should be required by the registration authority before the license is issued by such a registering authority.
- **Law Enforcement:** Vehicle operators need to maintain and present their logbook to law enforcement from time to time.

[4] Ibid.

[5] As realized in Uganda, Namibia, etc.

[6] Mass Distance Charges (MDC), Road Fund Administration, Republic of Namibia (2010).

[7] The Cut-off weight is proposed in Namibia; V-Rating: maximum legally allowed mass of vehicle (kg); and D/T Rating: maximum permissible drawing vehicle mass of a power unit (kg).

- **Office of Road Fund[8]:** (i) In accordance with the distance indicated on the Form, determine the first date of liability for payment of MDC for a specific vehicle of an owner/operator and the intervals at which that operator must pay MDC; and (ii) verify that all vehicles, in respect of which the applicant is the registered owner/operator, are listed on the Form. Once the ORF is satisfied that the information is in order, it would issue the owners/operators with a logbook for every vehicle indicated on the Form. Every logbook will be required to have specific serial number that will be registered with the ORF.

- **Maintenance of Logbook:** The owners/operators of the heavy vehicles must ensure that the driver(s) of a specific vehicle keeps the current logbook issued to that particular vehicle in the vehicle at all times. The driver(s) must record the distance travelled in km in that vehicle's specific logbook, when the vehicle on move. The owners/operators are expected to monitor the record of vehicle movement and distances travelled, and also correctly calculate the total amount due to the ORF based on the suggested MDCs for specific type of vehicle.

- **Payment of Mass Distance Charges:** The owners/operators would be required to complete their assessments for the period under review on the prescribed "Assessment Form". Accordingly, the MDCs would be paid to the designated ORF's Bank Account or so.

- **Payment Intervals:** The payment intervals may be proposed as follows:

Distance Travelled	Payment Interval
0-20,000 km/year	Annual Payment
20,001-50,000 km/year	Bi-Annual Payment
50,001-100,000 km/year	Quarterly Payment
>100,000 km/year	Monthly Payment

- **Assessment of MDC:** The owners/operators should submit the Assessment Forms to the ORF or any designated Registering Authority along with the supporting proof/document of the MDCs payment made (Annexure 12.2). After having verified all the documents and amount paid, etc. the ORF would be issuing the owners/operators a Receipt–MDC Assessment.

- **Mass Distance Charges for Different Vehicles**

In order to appreciate the MDCs, as applicable for different types of vehicles in Namibia, the vehicle details and their charges are given in Table 12.11 in US$/vehicle-100 km of travel.

[8] Based on the Namibia experience.

Table 12.11: Mass Distance Charges (i.e. Travelling Distance Charges)

Charges Level	Vehicle Type	Vehicle Description	Not Equipped to Draw	Equipped to Draw	MDC (i.e. TDC) Charges/ 100 km
0	Goods Vehicle	Light delivery trucks	V Value: </= 3,500 kg	D Value: </= 3,500 kg	--
1	Bus	Minibus, designed for 17-35 persons incl. driver	V Value: >3,500 kg or =7,000 kg	D Value: >3,500 kg or =7,000 kg	US$ 0.59 *(ETB 9.9)*
1	Goods Vehicle	Trucks	V Value: >3,500 kg or =7,000 kg	D Value: >3,500 kg or =7,000 kg	US$ 0.59 *(ETB 9.9)*
2	Bus	Minibus, designed for 17-35 persons incl. driver	V Value: >7,000 kg or =16,000 kg	D Value: >7,000 kg or =16,000 kg	US$ 0.75 *(ETB 12.6)*
2	Goods Vehicle	Truck-tractors	V Value: >7,000 kg or =16,000 kg	D Value: >7,000 kg or =16,000 kg	US$ 0.75 *(ETB 12.6)*
3	Bus	Buses, or bus-trains, designed for >35 persons incl. driver	V Value: >16,000 kg	D Value: 16,000 kg	US$ 1.45 *(ETB 24.4)*
3	Goods Vehicle	Trucks	V Value: >16,000 kg or =34,000 kg	D Value: >16,000 kg or =34,000 kg	US$ 1.45 *(ETB 24.4)*
3	Goods Vehicle	Truck-tractors	n.a.	D Value: >16,000 kg or =34,000 kg	US$ 1.45 *(ETB 24.4)*
4	Goods Vehicle	Truck	n.a.	D Value: >34,000 kg or =44,000 kg	US$ 2.90 *(ETB 48.7)*
4	Goods Vehicle	Truck-tractors	n.a.	D Value: >34,000 kg or =44,000 kg	US$ 2.90 *(ETB 48.7)*
5	Goods Vehicle	Truck-tractors	n.a.	D Value: >44,000 kg	US$ 4.35 *(ETB 73.1)*

Source: Mass Distance Charges, Road Fund Administration, Republic of Namibia (2010). n.a.= not applicable
*MDC: US$/100 km (US$/N$=0.15, exchange rate June, 2010); ETB values are based on ETB/US$=16.80.

For implementing the MDCs in Ethiopia, an extensive exercise needs to be carried out, which would aim at consultative process with those who are concerned including vehicle operators and the government officials. As far as MDCs rates for various vehicles are concerned, that would be based on the variable cost components as presented in Table 7.17. The exercise for setting the rates for MDCs needs to be carried out based on the maintenance cost implications, using the Software, i.e. E-RUCS on the road user charges on an iterative basis for different scenarios.

12.2.3.3 Overloading Fines

As discussed in Chapter 8, the “Overloading Fines” cannot be taken as source of revenues of the Road Fund, rather it is a fine/penalty imposed on those vehicles carrying excess load than permitted limits. Hence, Overloading Fines should be taken as deterrent to the practice.

The assessment of such fines has been rationalized in accordance with the “road deterioration model” (Chapter 8).

Though the Overloading Fines are considered as a deterrent, the expected proceeds collected on account of Overloading Fines suggested on the basis of rational estimates, should be deposited into the Ethiopian Road Fund.

12.2.3.4 Other Sources

In addition to the charging instruments discussed above, there are some other forms of Road Tariff/Levies, such as, road toll, and dedicated cess/charges. The viability and acceptability of such sources could be explored, particularly in context of Ethiopia. A brief note is given in the following sections.

(i) Road Toll: Many Road Funds in Africa are now reconsidering road tolls especially on roads that are given on concessions to private investors; e.g. Ghana has a public road which is tolled with the collection contracted out. The economic constraints while implementing a toll system are: (i) the cost of construction; and (ii) the operating a road toll system. These are usually quite high and roads with low traffic are not suitable for tolling. In Ethiopia, where traffic levels are very low, tolling will not be viable. At present, only Addis Ababa–Djibouti Corridor could be a candidate for implementing the Road Tolling System.

(ii) Additional Charges/Cess: With the concept, specific beneficiaries of the road maintenance interventions should pay for the maintenance cost proportionately and rationally. Usually agriculture sector in developing countries, for several reasons, is considered as priority sector, but those who are engaged in producing high value commodities can pay for road maintenance accordingly , as good and maintained road system would ensure the quality transport system for the fragile agricultural products, e.g. in Kenya, the agriculture cess is also considered part of the Kenya Roads Fund Board.

(iii) Performance Based Contracts: The Performance Based Contracts (PBCs), in normal case, cannot be considered as one of the sources of revenue for road fund. However, the PBC plays an active role in the maintenance activities of the country by sharing the maintenance burden required in terms of institutional capacity and immediate financing, besides expected efficiency of the private sector participation. The PBC is applicable for all kinds of maintenance activities based on the existing condition of the road and the performance parameters set by the road agencies[9].

The concept of PBC is based on the cost effectiveness, where the contractors need to meet the maintenance level set by the clients. The PBC in Ethiopia are not yet functional, but based on the experience of the other countries that show maintenance cost savings from 10% to 40%, over traditional contracts; once operational, the PBCs could reduce the financial burden of maintenance due to the expected cost savings, capacity building and higher level of service.

With the consideration of advantages of PBC, the ERA has entrusted a Pilot Study exploring the possibility of introducing the PBCs for maintenance activities initially on the paved roads under ERA. For the purpose, a consultant has been hired, and supposed to identify about 500 km of roads for PBC[10].

The above arrangement, to a certain extent, would reduce the initial financial and institutional burden of the ORF and the road agencies for road maintenance. Since the size of PBC is not yet finalized in the country, and the financial arrangements and implications not known, the present Study, so far, does not consider the likely impact of PBC arrangements in its road maintenance needs and costing.

12.3 Sum Up

In view of the increased road maintenance needs resulting higher maintenance cost over the years, the chapter identifies the potential sources of revenue by revision of the existing sources of revenue and also additional/new sources, as illustrated in Table 12.12. within the Second Generation Road Fund concept and the Ethiopian Road Fund Proclamation. The additional/new sources of revenues have been identified on the basis of international practices with its suitability in Ethiopian conditions, and also conforming the user pay and equitable principle. The above exercise has been mainly guided by the Road Deterioration Model using HDM-4 Analysis.

[9] In Tanzania for gravel roads, the PBCs included at initial rehabilitation phase followed by the maintenance phase for a contract period of five years.

[10] ERA has entrusted 500 km of PBC Contract, out of which 300 km are to be prioritized on three major road segments in the country.

The potential sources of revenue with the description and remarks are highlighted in Table 12.12:

Table 12.12: Potential Sources of Revenue

Potential Source of Revenues to the Road Fund			Description & Remarks
Revision in Existing Source of Revenue	Government Budget		Partial Contribution mainly through VAT collected on Fuel
	Levies on Fuel	Road Fund Fuel Levy	Need to be increased
		Municipal Tax	No changes in rates proposed
	Transit Fees		Need to be rationalized and suitably revised
	Interest on Treasury Bills		Should be restricted up to 0.05% to the RF
Introduction of Additional / New Source of Revenue	Annual Vehicle License Fees		Need to be introduced to cover Fixed Cost
	Mass Distance Charges (MDCs)		Need to be introduced to make the charges rational for heavy vehicles
	Heavy Vehicle Charges (Occasional)		Additional Charges on Very Heavy Vehicles (not considered)
	Overloading Fines		Based on Rational Fines, as deterrent only
	Road Toll		Not yet operational, so not considered
	Additional Charges / Cess		Agricultural Cess (for example) on high value commodities (not considered)
	Performance based Contracts (PBC)		Concept under pilot project. financial arrangements and implications not yet known, so not considered

Outcomes of the present chapter have been used in finalizing different Road Users Charges with the help of E-RUCS Software developed under the Study (Chapter 15). The aspect of establishing Road Users Charges has been duly discussed in Chapter 13.

13. ROAD USER CHARGES : ANALYSIS & ESTIMATION

13.0 ROAD USER CHARGES: ANALYSIS & ESTIMATION

13.1 General

This chapter analyzes the Road User Charges based on the existing and also potential sources of revenue for the Ethiopian Road Fund (ERF) for meeting the costs of road maintenance activities in the country. The exercise incorporates the effects of revisions of prevailing sources as well as additional/new sources of revenue, which could adequately finance the maintenance tasks on a sustainable basis. The above analysis has been carried out with the application of "E-RUCS Software" specially developed for estimating the road maintenance needs, cost and the road user charges under varied conditions and scenarios (Chapter 15).

The Road User Charges (RUCs) being analyzed and proposed are highly guided by: the needs for additional fund for the road maintenance of the "classified roads" found in maintainable condition in the country; best international practices with high probability of its acceptance in the Ethiopian condition; rational and equity derived on the basis of Road Deterioration Model using HDM-4 analysis; user pay concepts, and preserving the national assets to avoid heavy losses in case of negligence in road maintenance, particularly in view of inadequate road user charges, which may result in huge maintenance fund gap.

The exercise basically aims at meeting the maintenance needs of the classified roads (maintainable), but it also estimates the maintenance needs of the Wereda Roads under another scenario, as the Wereda Roads which are presently under the unclassified roads category are likely to be brought under the classified roads category.

Table 13.1: Road Inventory with Condition including Wereda Roads (2010)

(km)

Road Agency	Paved Road			Unpaved road			Total Classified
	Maintainable	V-Poor	Total	Maintainable	V-Poor	Total	
ERA	7,476	--	7,476	14,373	--	14,373	21,849
RRAs	--	--	--	24,620	2,324	26,944	26,944
MRAs	1,285	--	1,285	3,204	67	3,271	4,556
Total	**8,761**		**8,761**	**42,197**	**2,410**	**44,607**	**53,349**
Percent	*100%*	--	*100%*	*95%*	*5%*	*100%*	
Wereda**	--	--	--	9,568	--	9,568	
Total with Wereda	**8,761**	**--**	**8,761**	**51,765**	**2,410**	**54,175**	**62,917**

Source: The Consultants' Estimates. **Proposed to be part of the Classified Roads in the country, the road network refers to the planned as per the RSDP IV during 2011, which is assumed to be in maintainable condition.

It may be noted that the results of Road User Charges analysis would enable the decision and policy makers to appreciate the need, effects and implications of the proposed revisions in the current as well as acceptance of additional/new sources of revenue to the Ethiopian Road Fund to meet the maintenance costs expected in next 5 to 10 years.

13.2 Road User Charges & Revenue

13.2.1 Levies on Fuel

Within the framework of the Ethiopian Road Fund Proclamation and also the current practices, levies on fuel are charged as follows: 15% VAT on the total border price including Excise Tax on petrol and diesel, and the margin of Ethiopian Petroleum Enterprise (EPE); the

Road Fund Fuel Levy (ETB 0.095/liter for petrol, and ETB 0.080/liter for diesel); and the Municipal Tax (ETB 0.020/liter for petrol and diesel).

Table 13.2: Revenue through Levies on Fuel (2009-10)

(ETB in million)

Month / Road User Charges**	VAT	Road Fund	Municipality	Total
	15%	0.095/0.080*	0.020*	
July	99.09	12.28	3.00	114.38
August	95.30	11.42	2.79	109.50
September	79.21	9.40	2.31	90.95
October	97.03	11.51	2.80	111.34
November	95.71	11.38	2.77	109.86
December	93.28	10.98	2.68	106.94
January	98.60	11.54	2.82	112.96
February	93.68	10.95	2.68	107.31
March	93.68	10.95	2.68	107.31
April	103.25	12.62	3.08	118.96
May	99.09	11.78	2.88	113.74
June	87.60	10.87	2.66	101.12
Total	**1,135.52**	**136.70**	**33.15**	**1,304.36**
Percent	*87.1%*	*10.4%*	*2.5%*	*100.0%*

Source: Ethiopian Petroleum Enterprise (2011). *Petrol/Diesel per liter; **VAT *ad valorem*.

For setting the Road Users Charges, the Study analyzed the revenues being generated through levies on fuel, and deposited in the EPE's Account. For the purpose, the latest figures, i.e. for the month of June 2011, presenting the quantity of petroleum products sold, total revenues collected under the VAT, Road Fund Fuel Levy and Municipal Tax, collected for the Road Fund Account, are illustrated in Table 13.3.

Table 13.3: VAT, Road Fund Fuel Levy & Municipal Tax Collected by EPE (June 2011)

(ETB million)

Product	Qty Sold[1]	Value Added Tax		RF Fuel Levy		Municipal Tax		Total
		Rate[3]	Amount	Rate[3]	Amount	Rate[3]	Amount	
Gas Oil	116.98	1.2761	149.28	0.0800	9.36	0.0200	2.34	160.98
HFO	9.84	1.1391	11.21	--	--	--	--	11.21
LFO	2.93	1.2282	3.60	--	--	--	--	3.60
MGR (D)	0.22	1.4681	0.32	0.0950	0.02	0.0200	0.01	0.34
MGR (S)	15.80	1.5584	24.62	0.0950	1.50	0.0200	0.31	26.44
DTA[2]			(1.90)					(1.90)
Total			**187.14**		**10.88**		**2.66**	**200.66**
Road Fund Levies			**174.22**		**10.88**		**2.66**	**187.74**
Fund Transfer/Account:								
Taxes Payable to The ORF		*ETB 107.00 million (June 2011)*						
Stabilization Fund		*ETB 93.68 million (June 2011)*						

Source: Ethiopian Petroleum Enterprise / Office of Road Fund (June 2011);
Note: 1=liter in million; 2=Duty Free & Adjustment; (D)=Djibouti; (S)=Sudan; 3=per liter.

Table 13.3 also shows that a sum of ETB 187.74 million was collected on account of the Road Fund through VAT (ETB 174.22 million), Fuel Levy (ETB 10.88 million), and Municipal Tax (ETB 2.66 million), and only ETB 107.00 million was transferred to the ORF, and ETB 93.66 million was retained for the Stabilization Fund.

Further analysis of the figures given in Table 13.3 shows that as much as about 50% of the amount collected against VAT on the sales of petrol and diesel has been retained under the Stabilization Fund. However, the Consultants have been informed that as per the latest guidelines given by the Ministry of Finance and Economic Development (MoFED), the ORF would be receiving monthly a sum of ETB 107 million until further communication or so.

For the purpose of "Gap Analysis", i.e. difference between the road maintenance costs and the level of revenues collected from the road users through VAT, Fuel Levy and Municipal Tax, the Study has assumed that the Levies on Fuel would be collected in tune of ETB 2.2 billion during the current year. The derivation of this estimate is based on the total collection of the month of June 2011, as reference, and the same is multiplied by 12 for a yearly projection. This figure is indicative for appreciating the prevailing level of yearly collection of road user charges through the Levies on Fuel (including VAT), so that any changes/revision, as per the total/annualized maintenance costs, could be worked out and suggested. It is important to note that the current level of ORF's revenue would be ETB 1.284 billion per year, as per the current guidelines of the MoFED, regardless of the level of levies on fuel collection as well as fund requirement for the maintenance needs of the country.

13.2.1.1 Levies on Fuel & VAT: A Review

The rationale, need and international practices for the Government support to the Road Fund have been discussed in the Final Report on Review of Existing Road Revenue and Recommendation for New Sources of Revenue (September 2011); where it has been stated that the government support could be part of the road fund with clear objectives and purpose, mechanism and time-frame for the support; short- or long-term support[1].

It is highly realized that the Government's support would also be required particularly for maintaining low level rural roads with more non-motorized traffic and very small number of motorized traffic with the logic of providing all-weather accessibility to rural population, and making available a dependable road transport infrastructure, for marketing the agricultural produces with greater emphasis on the perishable and fragile commodities.

VAT on petrol and diesel has been the biggest contributor to the Ethiopian Road Fund (Table 13.3). While reviewing the VAT contributions and the Road Fund, it is important to note that the road network in Ethiopia is increasing every year with the RSDPs in general and RSDP IV in particular; and also the sparse settlement pattern of the country requiring more road network to serve better the rural and remote areas. With the proposed inclusion of the Wereda Roads, the country's road network would be increased manifold in near future, but the number of vehicles may not be increasing in the same manner. The present size of motorized fleet may not be sufficient enough to make contributions through its road user charges alone to meet the growing needs of the maintenance cost on a sustainable basis. Moreover, the continuous development of road sector is highly desirable in view of the socio-economic development and also to accomplish several ongoing and proposed development plans in the country.

The facts as mentioned above highlight the need of maintenance fund allocation for socio-economic development, and required changes in the prevailing situation as short-term strategy, the entire proceeds collected through the VAT on petrol and diesel could be transferred to the Ethiopian Road Fund (ERF), if required. Depending on the changing socio-economic scenario in future, the Government could take decisions on reducing the contribution of VAT to the ORF in a phased manner, say after five years, and must include the alternate sources of revenue to substitute the revenue loss due to reducing level of VAT contributions. In case, the alternate arrangements for the ERF revenues are, somehow, not made, the entire VAT proceeds should be transferred to the ORF, in view of the maintenance requirements.

[1] "Although some transfers from general revenues may be necessary during early years, while road revenues build up, road users will probably have to accept the long-term objective of full cost recovery for roads". African Road Funds What Works and Why? (1995), Anne B. de Richecour and Ian G. Heggie, the World Bank.

13.2.2 Other Sources

(I) **Transit Fee:** During 2009-10, a sum of ETB 700,000 was collected as Transit Charges, which accounts for only about 0.05% of the total ERF revenue; and

(ii) **Interest on Treasury Bills:** During 2009-10, a total of about ETB 1.0 million was collected through the interest on the Treasury Bills, registering only 0.08% to the total ERF revenue.

13.3 Multiyear Analysis: A Summary

13.3.1 Road Inventory

Road inventory of the classified roads under different road agencies including the Wereda Roads is presented in Table 13.4[2].

Table 13.4: Year-wise Road Inventory of the Classified Roads in Ethiopia

(in km)

Particular	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ERA (P)	7,476	7,689	8,021	8,359	8,695	8,958	9,234	9,523	9,826	10,144	10,476
ERA (U)	14,373	14,781	15,419	16,068	16,716	17,222	17,752	18,308	18,890	19,500	20,139
Total ERA	**21,849**	**22,470**	**23,440**	**24,427**	**25,411**	**26,180**	**26,986**	**27,831**	**28,716**	**29,643**	**30,615**
RRAs (U)	**26,944**	**28,861**	**31,066**	**33,538**	**36,128**	**38,156**	**40,281**	**42,508**	**44,842**	**47,288**	**49,852**
MRAs (P)	1,285	1,324	1,363	1,404	1,446	1,490	1,534	1,580	1,628	1,677	1,727
MRAs (U)	3,271	3,369	3,470	3,574	3,682	3,792	3,906	4,023	4,144	4,268	4,396
Total MRAs	**4,556**	**4,693**	**4,833**	**4,978**	**5,128**	**5,282**	**5,440**	**5,603**	**5,771**	**5,945**	**6,123**
T. C. Roads	**53,349**	**56,024**	**59,339**	**62,943**	**66,667**	**69,618**	**72,707**	**75,942**	**79,329**	**82,877**	**86,591**
W. Roads	**-**	**9,568**	**24,299**	**40,044**	**55,790**	**71,523**	**74,956**	**78,554**	**82,325**	**86,277**	**90,418**
Grand Total	**53,349**	**65,592**	**83,638**	**102,987**	**122,457**	**141,141**	**147,663**	**154,496**	**161,654**	**169,154**	**177,009**

Source: The Study's Estimates, T.C. Roads=Total Classified Roads, W.Roads=Wereda Roads; P=Paved, U=Unpaved.

Road networks projected as in maintainable conditions under road agencies, viz. ERA, RRAs and MRAs, and also under Wereda Road Offices are summarized in Table 13.5.

Table 13.5: Year-wise Road Inventory of the Maintainable Roads in Ethiopia

(in km)

Particular	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ERA (P)	7,476	7,689	8,021	8,359	8,695	8,958	9,234	9,523	9,826	10,144	10,476
ERA (U)	14,373	14,781	15,419	16,068	16,716	17,222	17,752	18,308	18,890	19,500	20,139
Total ERA	**21,849**	**22,470**	**23,440**	**24,427**	**25,411**	**26,180**	**26,986**	**27,831**	**28,716**	**29,643**	**30,615**
RRAs (U)	**24,620**	**26,537**	**28,742**	**31,214**	**33,804**	**35,832**	**37,957**	**40,184**	**42,518**	**44,964**	**47,528**
MRAs (P)	1,285	1,324	1,363	1,404	1,446	1,490	1,534	1,580	1,628	1,677	1,727
MRAs (U)	3,205	3,303	3,404	3,508	3,616	3,726	3,840	3,957	4,078	4,202	4,330
Total MRAs	**4,490**	**4,627**	**4,767**	**4,912**	**5,062**	**5,216**	**5,374**	**5,537**	**5,705**	**5,879**	**6,057**
T. C. Roads	**50,959**	**53,634**	**56,949**	**60,553**	**64,277**	**67,228**	**70,317**	**73,552**	**76,939**	**80,487**	**84,201**
% of T. Rds	**95.5**	**95.7**	**96.0**	**96.2**	**96.4**	**96.6**	**96.7**	**96.9**	**97.0**	**97.1**	**97.2**
W. Roads	**-**	**9,568**	**24,299**	**40,044**	**55,790**	**71,523**	**74,956**	**78,554**	**82,325**	**86,277**	**90,418**
Grand Total	**50,959**	**63,202**	**81,248**	**100,597**	**120,067**	**138,751**	**145,273**	**152,106**	**159,264**	**166,764**	**174,619**

Source: The Study's Estimates, T. Rds = Total Roads.

The percentage share of the maintainable roads under different road agencies has been worked out and presented in Table 13.6.

[2] Year-wise inventory of the classified roads including Wereda Roads and also the corresponding maintenance costs are presented in Chapter 6 and Chapter 7.

Table 13.6: Year-wise Percentage of the Maintainable Roads to the Total Road Inventory (%)

Particular	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ERA (P)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
ERA (U)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total ERA	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
RRAs (U)	**91.4**	**91.9**	**92.5**	**93.1**	**93.6**	**93.9**	**94.2**	**94.5**	**94.8**	**95.1**	**95.3**
MRAs (P)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MRAs (U)	98.0	98.0	98.1	98.2	98.2	98.3	98.3	98.4	98.4	98.5	98.5
Total MRAs	**98.6**	**98.6**	**98.6**	**98.7**	**98.7**	**98.8**	**98.8**	**98.8**	**98.9**	**98.9**	**98.9**
T. C. Roads	**95.5**	**95.7**	**96.0**	**96.2**	**96.4**	**96.6**	**96.7**	**96.9**	**97.0**	**97.1**	**97.2**
W. Roads	**-**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Grand Total	**95.5**	**96.4**	**97.1**	**97.7**	**98.0**	**98.3**	**98.4**	**98.5**	**98.5**	**98.6**	**98.6**

Source: The Study's Estimates.

13.4 Maintenance Costs

Road Maintenance Costs of the classified road networks and also the Wereda Roads under Low, Medium and High Maintenance Strategies have been worked out and illustrated in Table 13.7, Table 13.8, and Table 13.9 respectively. Details on the level of maintenance interventions are given in Chapter 8.

Table 13.7: Estimated Annual Maintenance Cost of the Classified Roads in Ethiopia
(Low Level Strategy)

(ETB million)

Particular	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
ERA (P)	463.4	286.9	181.7	162.7	234.8	178.8	576.2	964.2	715.0	3,163.1	6,926.8
ERA (U)	716.0	411.6	402.4	727.7	1,081.5	1,483.8	729.3	1,569.1	883.8	2,368.3	10,373.5
Total ERA	**1,179.4**	**698.5**	**584.1**	**890.4**	**1,316.3**	**1,662.6**	**1,305.5**	**2,533.2**	**1,598.8**	**5,531.4**	**17,300.3**
RRAs (U)	**932.6**	**1,260.3**	**322.3**	**337.1**	**353.6**	**463.4**	**2,259.7**	**817.3**	**895.1**	**1,070.1**	**8,711.4**
MRAs (P)	75.5	14.4	27.0	16.3	670.3	18.3	19.3	697.9	46.6	48.5	1,634.0
MRAs (U)	222.2	14.4	67.2	67.3	90.7	429.0	70.1	125.7	128.4	503.2	1,718.3
Total MRAs	**297.7**	**28.8**	**94.2**	**83.5**	**761.0**	**447.3**	**89.4**	**823.6**	**175.1**	**551.8**	**3,352.3**
T. C. Roads	**2,409.7**	**1,987.6**	**1,000.6**	**1310.9**	**2,430.9**	**2,573.3**	**3,654.7**	**4,174.1**	**2,668.9**	**7,153.3**	**29,363.9**
W. Roads	**--**	**--**	**105.3**	**267.3**	**440.5**	**613.7**	**786.8**	**824.5**	**864.1**	**905.6**	**4,807.7**
Grand Total	**2,409.7**	**1,987.6**	**1,105.9**	**1,578.2**	**2,871.4**	**3,187.0**	**4,441.4**	**4,998.6**	**3,533.0**	**8,058.8**	**34,171.6**

Source: The Study's Estimates.

Table 13.8: Estimated Annual Maintenance Cost of the Classified Roads in Ethiopia
(Medium Level Strategy)

(ETB million)

Particular	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
ERA (P)	463.4	286.9	253.7	647.5	2,085.5	1,749.2	583.0	326.3	820.7	671.5	7,887.7
ERA (U)	716.0	411.6	402.4	727.7	1,081.5	1,483.8	729.3	1,569.1	883.8	2,368.3	10,373.5
Total ERA	**1,179.4**	**698.5**	**656.1**	**1,375.2**	**3,167.1**	**3,233.0**	**1,312.3**	**1,895.4**	**1,704.5**	**3,039.8**	**18,261.2**
RRAs (U)	**932.6**	**1,260.3**	**322.3**	**337.1**	**353.6**	**463.4**	**2,259.7**	**817.3**	**895.1**	**1,070.1**	**8,711.4**
MRAs (P)	75.5	14.4	27.0	669.3	17.3	18.3	672.3	44.8	46.6	701.6	2,287.0
MRAs (U)	222.2	14.4	67.2	67.3	90.7	429.0	70.1	125.7	128.4	503.2	1,718.3
Total MRAs	**297.7**	**28.8**	**94.2**	**736.6**	**108.0**	**447.3**	**742.5**	**170.5**	**175.1**	**1,204.8**	**4,005.3**
T. C. Roads	**2,409.7**	**1,987.6**	**1,072.6**	**2,448.8**	**3,628.6**	**4,143.7**	**4,314.5**	**2,883.2**	**2,774.6**	**5,314.7**	**30,977.9**
W. Roads	**--**	**--**	**105.3**	**267.3**	**440.5**	**613.7**	**786.8**	**824.5**	**864.1**	**905.6**	**4,807.7**
Grand Total	**2,409.7**	**1,987.6**	**1,177.8**	**2,716.1**	**4,069.1**	**4,757.4**	**5,101.3**	**3,707.7**	**3,638.7**	**6,220.3**	**35,785.5**

Source: The Study's Estimates.

Table 13.9: Estimated Annual Maintenance Cost of the Classified Roads in Ethiopia
(High Level Strategy)

(ETB million)

Particular	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
ERA (P)	463.4	286.9	181.7	110.7	4,547.9	242.8	236.9	716.7	1,028.5	471.8	8,287.4
ERA (U)	716.0	411.6	548.3	986.4	1,247.8	1,159.9	737.1	1,819.1	1,020.5	1,541.5	10,188.2
Total ERA	**1,179.4**	**698.5**	**730.0**	**1,097.1**	**5,795.7**	**1,402.8**	**974.0**	**2,535.8**	**2,049.0**	**2,013.2**	**18,475.6**
RRAs (U)	**932.6**	**1,260.3**	**346.6**	**451.7**	**469.3**	**1,769.5**	**408.7**	**939.5**	**1,018.8**	**2,,486.4**	**10,083.4**
MRAs (P)	75.5	14.4	27.0	16.3	670.3	671.3	19.3	44.8	699.7	48.5	2,287.0
MRAs (U)	222.2	14.4	71.4	93.4	333.1	97.9	99.6	377.6	132.6	135.5	1,577.8
Total MRAs	**297.7**	**28.8**	**98.4**	**109.7**	**1,003.4**	**769.2**	**118.9**	**422.4**	**832.3**	**184.0**	**3,864.8**
T. C. Roads	**2,409.7**	**1,987.6**	**1,175.0**	**1,658.5**	**7,268.4**	**3,941.5**	**1,501.6**	**3,897.8**	**3,900.2**	**4683.6**	**32,423.8**
W. Roads	**--**	**---**	**105.3**	**267.3**	**440.5**	**613.7**	**786.8**	**824.5**	**864.1**	**905.6**	**4,807.7**
Grand Total	**2,409.7**	**1,987.6**	**1,280.3**	**1,925.8**	**7,708.8**	**4,555.1**	**2,288.4**	**4,722.3**	**4,764.3**	**5,589.2**	**37,231.5**

Source: The Study's Estimates.

It may be noted that the estimated maintenance costs for the years 2011 and 2012, are the same for different maintenance strategies, because it is based on the assumption that in two years time, all the classified roads in maintainable condition will be brought to the good condition, which is a common proposition under all the three strategies to preserve the asset; And after having brought the roads to good condition, maintenance needs assessment has been made based on the Road Deterioration Model employing different maintenance strategies, resulting in different maintenance costs in subsequent years.

The total costs worked out in Table 13.7 to Table 13.9 appear to be increasing and decreasing in a few calendar years in multiyear analysis, which could be considered as incidentally. For better understanding, the reasons for this could be attributed to the several proposed maintenance options and scenarios with different combinations of maintenance proposals[3] incorporated in specific case.

13.4.1 Overall Cost

The maintenance costs presented in Table 13.7 to Table 13.9 are adjusted in view of costs likely to incur on account of capacity development of road agencies, traffic safety measures, other Road Fund support services, technical inspections, audits, unforeseen reasons, etc. To take care of the above expenditures, based on the past experience, a provision of 10% of the anticipated expenditures is made in the estimations, which is used for the maintenance fund gap analysis and the revenue estimations under different scenarios.

13.5 Potential Sources of Revenue

The Final Report on Review of Existing Road Revenue and Recommendation for New Sources of Revenue (September 2011) has identified the potential sources of revenue, through revision in prevailing sources of revenue and also suggesting additional/new sources of revenue. The exercise has been based on the best international practices and its acceptability in the Ethiopian conditions. The level of revision of prevailing sources and identification and acceptance of additional/new sources are guided by the increasing maintenance requirements and costs of the classified roads in the country, and the user pay concept and equitable principle within the Ethiopian Road Fund Proclamation. The existing and potential sources of revenue are reproduced in Table 13.10 for ready reference and analysis.

[3] Refer to chapter 7 of the Report.

Table 13.10: Existing & Potential Sources of Revenue

Potential Source of Revenues to the Road Fund			Description & Remarks
Revision in Existing Source of Revenue	Government Budget		Contribution mainly through VAT on Fuel
	Levies on Fuel	Road Fund Fuel Levy	To be increased
		Municipal Tax	No changes in rates proposed
	Transit Fees		No changes in rates proposed
	Interest on Treasury Bills		Should be restricted up to 0.05% to the RF
Introduction of Additional / New Source of Revenue	Annual Vehicle License Fees		Needs to be introduced to cover part of Fixed Cost
	Mass Distance Charges (MDCs)		Needs to be introduced to make the charges rational for heavy vehicles
	Heavy Vehicle Charges (Occasional)		Additional Charges on Very Heavy Vehicles, not considered
	Overloading Fines		Based on Rational Fees, as deterrent only
	Road Toll		Not yet operational, so not considered
	Additional Charges / Cess		Agricultural Cess (for example) on high value commodities, but not considered
	Performance Based Contracts (PBC)		Concept under the Pilot Project. Financial arrangements and implications not yet known, so not considered

13.6 Road User Charges Analysis

A detailed note on the concept and rationale, and the practices and limitations on all the identified potential sources of the Road Fund revenues has been presented in Chapter 12.

Table 13.10 lists out the existing and potential sources of revenue, which could be considered for the present analysis, particularly in reference to the Ethiopian conditions. However, based on the relative importance and probability of being not acceptable, some of the potential sources of revenues have not been considered in the present road user charges analysis as indicated in Table 13.10.

The sources not considered in the analysis are heavy vehicle charges, road toll, additional charges/cess, and performance based contracts. The main reasons behind dropping these sources are insignificant level of their contributions, probable high cost of collection while administering the charges, ambiguity in the concept for working out the charges, identifying the target groups clearly, proper advocacy, etc. However, some of these sources may be considered in future, as per requirements and changes in socio-economic scenarios.

It may be noted that E-RUCS, the Software developed for the Road Users Charges Analysis, is capable of incorporating any potential sources of revenue, and analyzing the results with their contributions to the Road Fund; so in future, if any of these revenue sources are considered for additional revenue, could be easily incorporated and analyzed.

13.6.1 Sources of Revenues Considered in the Analysis

The Study has identified and analyzed the sources of revenues for the Ethiopian Road Fund (ERF) to meet the road maintenance costs as worked out in the Multiyear Analysis (Chapter 8). The sources of revenue considered in the Road User Charges Analysis are illustrated in

Table 13.10, whereas Table 13.11 describes the revision in the existing sources of revenue, and also exploring the additional/new sources of revenue with brief descriptions and justifications.

Table 13.11: Sources of Revenue Considered in the Road User Charges Analysis

Source		Description & Justification
Revision in Existing Sources of Revenue		
Government Budget		The Government Budget is one of the contributors of the ERF, as per the Proclamation. Earlier, the GoE used to allocate the entire revenue collected through VAT on petrol and diesel to the ORF, but for a last few years, only partial share of the VAT collected is being transferred to the ORF. The level of the revenue is directly related with the movement on the country's roads consuming more petrol or diesel, ideally this part of revenue should cover major part of variable cost components of the total maintenance costs. Though, the RUCs Analysis does not propose any changes in the rate of VAT on petrol and diesel; in view of the merit and requirements of different levels of VAT contributions have been considered in the RUCs analysis.
Levies on Fuel	**Road Fund Fuel Levy**	Road Fund Fuel Levies on petrol (ETB 0.095/liter) and on diesel (ETB 0.080/liter) have not been changed since 1997, i.e. the commencement year of the ERF. The changes in fuel prices have been recorded as more than 7.5 times in case of petrol, and 9.3 times in case of diesel. Regardless of the substantial increase in the unit cost of maintenance components, there have not been any changes in the RF Fuel Levy, which is exclusively dedicated source of fund for the road maintenance activities. The increase in unit costs of the maintenance components, on an average, has increased up to 5-6 times. In view of the above, and growing maintenance needs and costs, the rate of RF Fuel Levy on petrol and diesel need to be revised in a logical manner, so that it could rationally cover the variable cost components of road maintenance.
	VAT	The contribution of VAT has been regarded as significant, i.e. with more than 86.9% to the ERF, which is considered as the Government contribution for the road maintenance. The prevailing VAT rate is 15% *ad valorem*. It may be noted that the VAT is not a committed source of income to the ERF rather it takes care of the Government's contribution to the road maintenance tasks; however, the current practices are assumed to be prevailing in near future as well, in view of the Government obligations for preserving the road assets, also achieving several socio-economic development plans. The share of the revenue collected through VAT is, somehow, restricted to 50% while transferring the money to the ORF; and remaining money stays with the Government. Considering the prevailing significant contribution through the VAT, the RUCs Analysis does not propose any revision in the VAT rate to increase its contribution to the ERF Revenue, but the extant practice expected to continue in future as well.
	Municipal Tax	Present rates of the Municipal Tax on petrol and diesel are ETB 0.02/litre. The amount collected through the Municipal Tax has been estimated as ETB 33.6 million (2010-11), which accounts for 2.6% to the total the ERF revenue. Considering the size of the contribution and rationale supporting the road user charges through this instrument, the RUCs Analysis does not propose any revision in the rates of the Municipal Tax.
Transit Fees		The contribution of the Transit Fees to the ERF has been recorded as 0.02% (minimum) to 0.17% (maximum), in absolute terms, the contributions have been observed as ETB 0.2 million (2003-04) and ETB 0.7 million (2009-10), with the Transit Fees applicable on the foreign vehicles using the country's network. With the assumption that the international traffic would continue to

Source	Description & Justification
	grow, as the trend observed, and also probability of more traffic through new routes in the country, a growth rate of 25% pa in the Transit Fees may be observed in the future.
Interest on Treasury Bills	High cash balance is generally not considered as a good sign of operational efficiency of the Fund, which is usually observed due to delays in the financial disbursement. In the past, the delays in financial disbursement were noticed as one the biggest weaknesses in the operation of the Fund with high cash balance. Considering the recent years' phenomenon, the level of cash in hand appears to be on an acceptable level, i.e. 0.06% to 0.12%. For the purpose of analysis, the contribution from the interest on the treasury bills is proposed to be restricted to the level of 0.05% of the previous year's revenue, and in order to observe the efficiency, it could be expected that no increase in the level of cash in hand.
Additional/New Sources of Revenue	
Annual Vehicle License (AVL) Fees	AVL Fees aim at covering the fixed cost components of the road maintenance cost, i.e. not yet functional in Ethiopia, hence so far no contribution to the ERF, despite of its mention in the Proclamation (1997). With logic of (i) covering fixed cost component of the maintenance costs; and (ii) rationalizing the incidence of levies on fuel, in view of different types of vehicles, the analysis incorporates the AVL Fees regime in the country. Under the present Study, figures relating to the fixed cost components in the maintenance cost are worked out for different vehicles, which have been used for calculating the fees. The RUCs Analysis is based on different levels of AVL Fees to appreciate the requirements and its acceptability as new source of revenue.
Mass Distance Charges (MDCs)	The MDCs aim at reducing the equity as indicated above, by ensuring that the owners/operators of specific vehicles(s), particularly the heavy vehicles should pay their fair share for the maintenance of country's road infrastructure on account of relatively more road surface consumption as compared to light vehicles. This is one of the efficient forms of tax/charges relating to the road damage cost by heavy commercial vehicles, particularly in view of justifying the level of fuel levies for recovering variable cost of the maintenance. Heavy vehicle owners and operators have been contributing towards the Road Fund through different instruments (as per the usual international practices), viz. vehicle registration fees, annual license fees, fuel levies, cross border charges, etc. However, these contributions have not equitably recovered the road surface consumption costs incurred by the "heavy vehicles" for using road network.
Overloading Fines	Overloading Fines, though part of the Proclamation, should not be taken as source of the ERF revenue; rather it is a fine/penalty imposed on those vehicles carrying excess load than permitted limits. Hence, Overloading Fines should be taken as deterrent to the practice. The assessment of the Overloading Fines/Fees has been worked out based on the "Road Deterioration Model". The fines are part of the RUCs Analysis, which may not be taken as potential source of revenue, but rationally utilized for road safety measures, enforcement, etc.

13.6.2 Road User Charges – Analysis Options

For undertaking the RUCs Analysis, the Study has considered a number of options incorporating the revisions in prevailing sources of revenue and additional/new sources of revenue to meet the maintenance needs and costs.

The underlying approach to carry out this analysis is based on the rational and equitable distribution of the charges among different types of road users, and also judiciously recovering the fixed and variable cost components of the maintenance interventions as proposed for different road networks of the country.

Based on the changes made in different road user charges – individually and in combinations, the analyses have been carried out. The entire exercise is based on the E-RUCS application, which, among others, confirms the effectiveness of the Software to be used for the adjustment of the RUCs. Table 13.12 illustrates the extent of revision in the prevailing sources and in additional/new sources, and also its relative contributions to the maintenance cost in terms of the extent of fund gap.

The RUCs analysis has been carried out for different options by changing the contribution levels of different sources of revenue. The RUCs Options have been identified and carried out for the Gap Analysis in maintaining the classified road network (including and excluding the Wereda Roads in Ethiopia).

For illustrations, the fund requirements for meeting the growing maintenance cost of the classified road network; and to bridge the fund gap, the road user charges analysis carried out under different scenarios by revising the existing charges and introducing the additional/new charges using the E-RUCS Software.

Table 13.12: Road User Charges Options to meet the Maintenance Cost
[Maintenance Options & Costs: Low Level Strategies without Wereda Roads]

(ETB in million)

Option		Road Users Charges (RUCs) Option Description***	Fund Gap
Existing Charges	RUCs Option-1 *(No Changes)*	Revenue collected through VAT: 100% Transfer to the ORF; and Existing RUCs, i.e. no changes. This Option refers to the *"Status quo Option" as far as charges are concerned.*	1,002.30*
	RUCs Option-2	100% VAT Transfer to the ORF; and Increase in Fuel Levy	No fund gap
	RUCs Option-3	50% VAT Transfer to the ORF; and Increase in Fuel Levy	-do-
	RUCs Option-4	No VAT Transfer to the ORF; and Increase in Fuel Levy	-do-
Existing & Additional Charges	RUCs Option-5	75% VAT Transfer to the ORF; Annual Vehicle License Fee (25% of the estimated charges) and Increase in Fuel Levy	-do-
	RUCs Option-6	50% VAT Transfer to the ORF; Annual Vehicle License Fee (25% of the estimated charges); Mass Distance Charges (25% of the estimated charges); and Increase in Fuel Levy.	-do-
	RUCs Option-7	25% VAT Transfer to the ORF; Annual Vehicle License Fee (25% of the estimated charges); Mass Distance Charges (25% of the estimated charges); and Increase in fuel levy.	-do-
	RUCs Option-8	No VAT Transfer to the ORF; Annual Vehicle License Fee (25% of the estimated charges); Mass Distance Charges (25% of the estimated charges); and Increase in Fuel Levy.	-do-
	RUCs Option-9	No VAT Transfer to the ORF; Annual Vehicle License Fee (45% of the estimated charges); Mass Distance Charges (45% of the estimated charges); and Increase in Fuel Levy.	-do-

*** Contribution of Transit Charges, Interest on Treasury Bills, Overloading Fines are not included with changes in their levels in options.

For an illustration, Table 13.13 brings out the details on the road users charges estimates under RUCs Option–1, i.e. no changes in existing road users charges, but 100% VAT transfer to the ORF. Detailed working of the Road Users Charges under different RUCs Options has been given in Tables 13.21 to 13.28 at the end of the chapter.

Table 13.13: RUCs Option-1 (Existing Road User Charges with 100% VAT Transfer to the ORF)

(ETB in million)

Particular / Scenario		Classified Road Network (Excluding Wereda Roads)			Classified Road Network (Including Wereda Roads)		
		Low	Medium	High	Low	Medium	High
Maintenance Cost		2,936.40	3,097.79	3,242.39	3417.16	3,578.55	3,723.15
Administrative Cost		293.64	309.78	324.24	341.72	357.86	372.32
Total Maintenance Cost		**3,230.04**	**3,407.57**	**3,566.63**	**3758.88**	**3,936.41**	**4,095.47**
Rate of Levy	VAT (Petrol)	1.558	1.558	1.558	1.558	1.558	1.558
	VAT (Diesel)	1.276	1.276	1.276	1.276	1.276	1.276
	Municipal Tax	0.020	0.020	0.020	0.020	0.020	0.020
	Fuel Level (Petrol)	0.095	0.095	0.095	0.095	0.095	0.095
	Fuel Levy (Diesel)	0.080	0.080	0.080	0.080	0.080	0.080
VAT on Fuel 100%*		2,065.35	2,065.35	2,065.35	2,065.35	2,065.35	2,065.35
Existing Road Fund Levy		128.94	128.94	128.94	128.94	128.94	128.94
Municipal Tax		31.46	31.46	31.46	31.46	31.46	31.46
Transit Charges		0.88	0.88	0.88	0.88	0.88	0.88
Interest on Treasury Bills		1.11	1.11	1.11	1.11	1.11	1.11
Total Revenue		**2,227.74**	**2,227.74**	**2,227.74**	**2,227.74**	**2,227.74**	**2,227.74**
Fund Gap		**(1,002.30)**	**(1,179.83)**	**(1,338.89)**	**(1,531.14)**	**(1,708.67)**	**(1,867.73)**
% Higher than the "Low"		--	17.7%	33.6%	52.8%	70.5%	86.3%

Source: The Consultants' Estimates, *100% transfer to the ORF.

13.7 Proposed Sources of Revenue & Its Impact

Impact of changes in the sources of revenue under given different scenarios has been worked out, and presented with descriptions in Table 13.14 and Table 13.17. This exercise has been carried out only for those sources of revenues, either prevailing or additional/new, which have relatively considerable level of contribution.

Though the contribution of those sources of revenue registering for lower share in the ERF have been accounted for in the total revenue estimates, they are not considered under different scenarios with their changing values; as their incremental contributions to the total revenue would not be that significant.

13.8 Proposed Road User Charges Options Matrix

Table 13.14 summarizes the Road Users Charges Options with the changes in the existing sources and also additional/new sources of revenue. It may be noted that the contributions of Transit Fees, Municipal Tax, Overloading Charges and Interest on Treasury bills have not been considered in the analysis, as their contribution is marginal.

Table 13.14: Road Users Charges under Different Options

RUCs Option	Change in Existing Sources		With Additional Sources		Remarks
	VAT (Rate)	Fuel Levy	Annual Vehicle License Fees	Mass Distance Charges	
RUCs Option-1	No Change in VAT Rate	No Change* Petrol: 0.095 Diesel: 0.080	*No Additional / New Charges Proposed*		VAT: 100% Transfer to ORF
RUCs Option-2	-do-	Required Level* Petrol: 0.837 Diesel: 0.701			VAT: 100% Transfer to ORF
RUCs Option-3	-do-	Required Level* Petrol: 1.596 Diesel: 1.342			VAT: 50% Transfer to ORF
RUCs Option-4	-do-	Required Level* Petrol: 2.342 Diesel: 1.985			VAT: No Transfer to ORF
RUCs Option-5	-do-	Required Level* Petrol: 0.852 Diesel: 0.720	25% of the proposed rate	--	VAT: 75% Transfer to ORF
RUCs Option-6	-do-	Required Level* Petrol: 1.131 Diesel: 0.920	25% of the proposed rate	25% of the proposed rate	VAT: 50% Transfer to ORF
RUCs Option-7	-do-	Required Level* Petrol: 1.481 Diesel: 1.245	25% of the proposed rate	25% of the proposed rate	VAT: 25% Transfer to ORF
RUCs Option-8	-do-	Required Level* Petrol: 1.864 Diesel: 1.565	25% of the proposed rate	25% of the proposed rate	VAT: No Transfer to ORF
RUCs Option-9	-do-	Required Level* Petrol: 1.481 Diesel: 1.245	45% of the proposed rate	45% of the proposed rate	VAT: No Transfer to ORF

*ETB/liter.

Table 13.15 provides the AVL fees estimates for different motorized vehicles, which cover the fixed cost components of the maintenance cost. For the analysis of RUCs, the AVL fees have been considered, to cover 100%, 50% and 25% of the fixed cost components.

Table 13.15: Different Levels of Annual Vehicle License Fees to Cover the Fixed Cost of Maintenance

(ETB/Vehicle)

Vehicle Category	100%	50%	25%
Car - Petrol	660	330	165
Car - Diesel	972	486	243
Utility Vehicles - Petrol	6,934	3,467	1733
Utility Vehicles - Diesel	7,596	3,798	1899
Mini Bus - Petrol	2,359	1,179	590
Mini Bus - Diesel	2,352	1,176	588
Large Bus - Diesel	8,756	4378	2189
Small Truck - Petrol	3,868	1,934	967
Small Truck - Diesel	3,862	1,931	965
Medium Truck - Diesel	9,884	4,942	2,471
Heavy Truck - Diesel	15,353	7,677	3,838
Very Heavy Truck - Diesel	27,368	13,684	6,842

Source: The Consultants' Estimates.

It may be noted that numbers of two-wheelers have been increasing in the country, as it increased up to 32,000 in 2010-11, i.e. about two-fold increase over last decade estimate. AVL fees on two-wheelers, as one of the sources of the Road Fund revenue, were not considered in the previous studies, namely, "Road Funding and Road User Charges in Ethiopia (2004)" and the "Road Financing Study in Ethiopia (2005)". However, the present Study makes estimation on the likely contribution of these two-wheelers to the Road Fund Revenue through the AVL fees, if considered.

For the purpose, considering the likely road damages caused by the two-wheelers are relatively low, which is usually observed as less than half, as compared to the damages caused by the cars; such observations have been made in other developing countries, e.g. India. In view of this, AVL fee, ETB 80/two-wheeler could be considered for the revenue, i.e. about 50% of the AVL fees for cars, on the basis of suggested 25% of the fixed cost components (Table 13.15), which would generate about ETB 2.5 million per year based on the present numbers of two-wheelers in the country. Being a small size of contribution, this estimate has not been incorporated in calculating the road user charges in the Study. However, the E-RUCS has provision to incorporate any such inclusions as per the requirements.

Table 13.16 provides the Mass Distance Charges (MDCs) estimates for heavy vehicles, which cover the part of variable cost component of the maintenance cost. For the analysis of RUCs, the MDCs have been considered, to cover 100%, 50% and 25% damages made by heavy vehicles as derived by HDM-4.

Table 13.16: Mass Distance Charges (MDCs) for Different Vehicles

(ETB/100 km)

Level of Charges	Vehicle Type	Rate/Vehicle		
		100%	50%	25%
Level 1	Mini Bus (Petrol)	7.10	3.55	1.78
	Mini Bus (Diesel)			
	Small Truck (Petrol)			
	Small Truck (Diesel)			
Level 2	Large Bus (Diesel)	16.60	8.30	4.15
	Medium Truck (Diesel)			
Level 3	Heavy Truck (Diesel)	19.60	9.80	4.90
Level 4	Very Heavy Truck (Diesel)	23.50	17.75	5.86
Level 5	Over dimensional/abnormally Heavy Vehicle	50.00	25.00	12.50

Source: The Consultants' Estimates.

For better understanding, Table 13.17 illustrates the description and impact on Road Users under different Road Users Charges Options.

Table 13.17: Description & Impact on Road Users under Different Road Users Charges Options

Option	Outcome	Impact on Road Users
RUCs Option-1	There is a big fund gap; The MoFED may not be willing to transfer all the revenue collected through VAT to the ORF; and Fuel Levy is very small; hence, it needs to be upgraded substantially.	No additional charges proposed, Existing Situation
RUCs Option-2	No fund gap; The MoFED may not be willing to transfer all the revenue collected through VAT to the ORF; Fuel Levy has been reasonably increased ➔This may be the most preferred option, with 100% transfer of VAT to the ORF, slight change in Fuel Levy, and no additional sources proposed.	Fuel Levy Proposed*: Petrol: 0.837 Diesel: 0.701
RUCs	No fund gap;	Fuel Levy Proposed*:

Option	Outcome	Impact on Road Users
Option-3	Observing *status quo, the* option may be acceptable to the MoFED, as 50% of VAT transfer is proposed; and Fuel Levy increased to cover the fund gap.	Petrol: 1.596 Diesel: 1.342
RUCs Option-4	No fund gap; As no VAT transfer to the ORF is proposed, affecting the entire burden on the Fuel Levy; So, may not be acceptable in view of very high fuel prices.	Fuel Levy Proposed*: Petrol: 2.342 Diesel: 1.985
RUCs Option-5	No fund gap; The MoFED needs to agree to transfer 75% VAT to the ORF; Fuel Levy reasonably increased; Annual Vehicle License (AVL) Fees have been proposed with only 25% of the estimated charges, which would be sharing the increasing burden on Fuel Levy.	Fuel Levy Proposed*: Petrol: 1.131 Diesel: 0.920 AVL Fees: 25%** MDCs: Nil
RUCs Option-6	No fund gap; The proposed option with 50% VAT transfer to the ORF will be acceptable to MoFED in view of *status quo*; Fuel Levy is proportionately increased; AVL Fees and Mass Distance Charges (MDCs) have been proposed with only 25% of the estimated charges, which would be sharing the increasing burden on Fuel Levy. ➔The option could be considered as a preferred choice with introduction of the AVL Fees and MDCs after a few years, e.g. 2015.	Fuel Levy Proposed*: Petrol: 1.131 Diesel: 0.920 AVL Fees: 25%** MDCs: 25%***
RUCs Option-7	The proposed option with 25% VAT transfer to the ORF will be highly acceptable to MoFED; Fuel Levy proposed is on higher side; AVL Fees and MDCs have been proposed with only 25% of the estimated charges, which would be sharing the increasing burden on Fuel Levy The option distributes the burden of the costs judiciously on the additional/new sources of revenue. and The option could be considered for long-term plan.	Fuel Levy Proposed*: Petrol: 1.481 Diesel: 1.245 AVL Fees: 25%** MDCs: 25%***
RUCs Option-8	No VAT transfer to the ORF will be highly acceptable to the MoFED; Fuel Levy proposed is on higher side as it shares the higher burden; AVL Fees and MDCs have been proposed with only 25% of the estimated charges, which would be sharing the increasing burden on Fuel Levy; and The option would take time in implementation, and may not be easily feasible in the near future.	Fuel Levy Proposed*: Petrol: 1.864 Diesel: 1.565 AVL Fees: 25%** MDCs: 25%***
RUCs Option-9	No VAT transfer to the ORF; Maintenance Costs shared proportionately by Fuel Levy, AVL Fees and MDCs; This option may be considered in future, and suitable for long-term.	Fuel Levy Proposed*: Petrol: 1.481 Diesel: 1.245 AVL Fees: 45%** MDCs: 45***

* Fuel Levy in ETB/Liter; ** Charges worked out for the AVL Fees (Table 4.9); and *** Charges worked out for the MDCs (Table 4.10), ➔Preferred Option.

Impact on fuel price (petrol and diesel) with different levels of the fuel levy has been given in Table 13.18, so that the road users could appreciate the same.

Table 13.18: Fuel Retail Price with the Proposed Fuel Levy under Different Road User Charges

(ETB/liter)

Particular		Op-1	Op-2	Op-3	Op-4	Op-5	Op-6	Op-7	Op-8	Op-9
Levy Proposed	Petrol	0.095	0.837	1.596	2.342	0.852	1.131	1.481	1.864	1.481
	Diesel	0.080	0.701	1.342	1.985	0.720	0.920	1.245	1.565	1.245
Retail	Petrol	20.94*	21.68	22.44	23.19	21.70	21.98	22.33	22.71	22.33

Price	Diesel	17.73*	18.35	18.99	19.64	18.37	18.57	18.90	19.22	18.90

Source: The Consultants' Estimates. *Prevailing Retail Prices in Addis Ababa for MGR E10 and ADO (April 2011).

13.8.1 RUCs Analysis with Wereda Roads

In case, the Wereda Roads are brought out under the category of "Classified Roads" of the country, the Road User Charges would be proportionally higher, in line with the increase in the maintenance cost with Wereda Roads. A straight forward method for a quick understanding of the inclusion of the Wereda Roads in the analysis has been used. The changes in the proposed Road User Charges would be in tune of the level as presented in Table 13.19.

Table 13.19: Percentage Increase in Fuel Levy without & with Wereda Roads

(ETB per liter)

Particular		Road Users Charges Option								
		Op-1	Op-2	Op-3	Op-4	Op-5	Op-6	Op-7	Op-8	Op-9
Proposed Fuel Levy without Wereda Roads	Petrol	0.095	0.837	1.596	2.342	0.852	1.131	1.481	1.864	1.481
	Diesel	0.080	0.701	1.342	1.985	0.720	0.920	1.245	1.565	1.245
Proposed Fuel Levy with Wereda Roads	Petrol	0.095	1.226	1.986	2.744	1.241	1.487	1.870	2.246	1.870
	Diesel	0.080	1.029	1.670	2.311	1.048	1.253	1.573	1.894	1.573
% Increase in Fuel Levy with Wereda Roads	Petrol	--	46.5%	24.4%	17.2%	45.7%	31.5%	26.3%	20.5%	26.3%
	Diesel	--	46.8%	24.4%	16.4%	45.6%	36.2%	26.4%	21.0%	26.4%

Source: The Study's Estimates.

As presented in Chapter 8, with the inclusion of Wereda Roads in the classified road category, the maintenance costs would be increasing by 15% to 17% pa on the costs estimated without Wereda Roads. The estimated Road User Charges meeting the requirements of additional maintenance costs on account of the Wereda Roads show the need for additional increase of fuel levy from 16% to 48% depending on different RUCs Options (Table 13.19) provided the contribution of VAT and other sources remain the same.

13.9 Adjustment of RUCs

Following the requirements of the ToR, the E-RUCS Software is developed with the capability of incorporating several internal and external influencing factors to all the functional areas of the RUCs analysis. Though the Software is capable to incorporate any changes in different parameters, it is advisable that the users should use the system for analyzing the road maintenance related activities, costs, etc. under different road agencies[4], and the road users charges derivations.

A brief note on the application of the adjustment factors is given in Table 13.20.

Table 13.20: Application of the Adjustment Factors of the Road Users' Charges in E-RUCS

Adjustment Area	Description & Application in E-RUCS
General	Design of the E-RUCS Software has been essentially made to incorporate several internal and external factors influencing the Road Maintenance Needs and Costs, and the Road Users Charges. The Software is fully equipped with the Baseline and Multiyear Data in different functional areas. However, for almost all the areas, the Software is developed to consider any changes either by changing the given values or by using multipliers to appreciate effects of any changes for individual parameters or combination of the additional parameters; and obtain the results with the revised/changed values. The exercise may be particularly useful for

[4] Classified and Unclassified Road Categories; or any other special category of the User's choice for any such analyses.

Adjustment Area	Description & Application in E-RUCS
	undertaking sensitivity checks on any changes.
Baseline Road Length & Road Condition	Surface-wise road inventory by Districts under ERA; Regions under RRAs; and Municipalities under MRAs with their present surface conditions are incorporated in the Software. Any changes, as per the User's requirements of the analysis, could be incorporated in the designated input areas.
Forecasted Road Length & Road Condition	For the purpose of Multiyear Analysis, the road length for next 10 years by surface under ERA, RRAs and MRAs, and expected condition as predicted by the Road Deterioration Model and also in view of the proposed maintenance intervention, are entered in the Software. However, any changes in the road length and road condition could be made, as per the objective of the analysis.
Economic Growth Range	The effect of macro-economic indicators, particularly the GDP and sectoral growth rates are reflected in the transport demand and growth, in present type of studies, mainly reflected in the traffic forecast. The E-RUCS is capable to accommodate any growth rates for different types of motorized vehicles, viz. freight and passenger.
Oil Price Fluctuation	Fluctuations in oil price are highly dependent on the international market situation. Contributions of VAT on petrol and diesel are related to its import price plus the Excise Tax, so any fluctuations in oil price would directly affect the level of VAT collection, i.e. one of the prime sources of the Ethiopian Road Fund. In order to address the issues of oil price fluctuations, the contributions of VAT, in terms of per litre of petrol/diesel, need to be given to the E-RUCS.
Bio-Fuel Availability[5]	In present context, the use of bio-fuel is observed in the country on a limited scale, which may continue in near future as well. It may be noted that the charges being levied on the road users are primarily based on the Road Deterioration Model, i.e. consumption of the road pavement surface by specific types of vehicle, regardless of the type of fuel those vehicle consume or required to operate. However, the levies for covering the damages are collected through the consumption of petrol and diesel. As per the prevailing practices in the country, a small proportion of ethanol is mixed with fuel (e.g. petrol), and also taxed for fuel levy, etc. accordingly. However, in future, in case, a major shift towards bio-fuel takes place; if the overall policy of the Government suggests in favour of bio-fuel, the levies on the same (VAT, Fuel Levy and Municipal Tax) would be imposed in line of equivalent consumption of petrol and diesel required for generating transport output. While using the E-RUCS to incorporate the changing usage of bio-fuel, the values would be given to the Software in the suitable slots.
Foreign Currency Exchange Rates	Foreign currency exchange rates would be affecting several maintenance cost components, e.g. imported machineries, bitumen, etc., and also the import price of petrol and diesel, and related taxes, viz. Excise Tax and VAT, and in turn the retail price. Though it is difficult to predict any changes in the foreign exchange rates in future, the E-RUCS has sufficient provision to make such changes/adjustments to estimate the maintenance costs, fund gap and level of revisions required in specific sources of revenue.

[5] Any major shifts from fossil-fuel (petro-fuel) to bio-fuel for vehicle operation, might take a fairly long period in African countries, including Ethiopia, as it requires changes in policy and clear guidelines, and also structural change in landuse and cropping pattern, in view of food security and requirements. The Status of Bio-Fuels in Ethiopia: Opportunities and Challenges, Ethiopian Institute of Agricultural Research (2009), brought out through a presentation on Bio-Fuel that expected production of ethanol as 83 million liter (2010-11), depending on the policy and program, would be higher in years to come. A Report on Bio-fuel Status in Ethiopia (2008) noted that "Phenomenon of farmers switching to bio-fuel production from food is expected, if the value of such crops surpasses the later".

Adjustment Area	Description & Application in E-RUCS
Inflation / Deflation	Inflation/deflation directly affects the level of prices in the economy, e.g. the costs of maintenance would be considerably affected by such macro-economic conditions; which would accordingly also influence the necessary changes/adjustments in the road users' charges. E-RUCS has been designed in such a manner that all the major data inputs, either from the cost side or from the user charges side, may be adjusted by using suitable inflators/deflators.
Changes in Emission & Carbon Regulation	To appreciate the direct effects of changes in Emission and Carbon Regulations in the analysis, that could be considered as rational changes in the vehicle fleet modernization followed by structural changes in the fleet composition to observe higher transport sector efficiency and economy, and also reduce the pollution level, etc. The E-RUCS is fully capable to take care of any changes in the vehicle composition, and incorporate major operating behaviour, e.g. fuel consumption, performance in terms of annual run, etc., which would fairly reflect the changes in emission and carbon regulation.
Vehicle Fleet Growth	Estimating the future traffic level (freight and passenger) that is one of the important components of the Multiyear Analysis. In view of the same, the E-RUCS has full capability to incorporate the given appropriate traffic growth rate factors (vehicle-wise), reflecting any changes in the socio-economic performance indicators.
Effect of Regulatory Reforms	The E-RUCS has provisions to influence major input data, relating to the maintenance cost components, traffic level and composition, and sources of revenue, through several adjustment slots to incorporate the effect of regulatory reforms. The users need to translate specific component, which is affected by any reforms, in terms of the E-RUCS data input/components. While undertaking the above exercise, there could be some problems to address the intangible/qualitative issues emerging from any such reforms in future. To mitigate such problems, the users would be required to generate the proxy representing the relevant parameters/variables to reflect the changes and accordingly apply into the E-RUCS. However, the Study expects, there would be no or rare occasions to undertake such exercise and analysis.
Effect of Taxation Reforms	The E-RUCS has been designed to make any changes in the existing taxes, i.e. sources of revenue, and/or additional/new sources of revenue. In case of any structural changes in taxation in transport sector and/or directly influencing the road users' charges, would be effectively attended in the Software, and the suitable adjustment in the RUCs, as per the requirements could be proposed.
Coverage of Road Maintenance (Classified Roads and/or Unclassified Roads)	The E-RUCS covers the entire classified roads by surface type under different road agencies. The Software has also considered the Wereda Roads (presently unclassified roads, but likely to be brought under the classified roads category). The E-RUCS is capable of appending any number/length of roads under additional road agency, if comes in future, etc.; and accordingly the estimation of "road users charges" to cover the maintenance cost only for classified roads and also including the Wereda Roads.
Maintenance Service Levels (Range of Targeted IRI)	The E-RUCS is designed to consider and incorporate the user's preference of the maintenance interventions and related costs. However, the present Study has considered three levels of maintenance interventions, viz. Low; Medium; and High, and accordingly the maintenance standards and strategies, and costs are proposed, which, in turn, influence the levels of road users charges. Any exogenous changes in the maintenance levels could be made, and thus, the required road users' charges be obtained.

13.10 Discussion & Comments

13.10.1 Transport Operators

During the consultancy services, the Study Team had several consultative meetings with the representatives of the transport operators, namely Ato Haileleul Olana and Ato Alemayehu

Eshete. The meetings were also organized before undertaking the Road Users Charges analysis, highlighting the need for the road maintenance, need for financial arrangements and potential sources of revenue, e.g. Annual Vehicle License (AVL) Fees and the Mass Distance Charges (MDCs). The concept and practice of the MDCs is new, so the implications of the same were also discussed.

After having obtained the results of the Road Users Charges analysis, the Study Team organized a meeting with the representatives of the transport operators at the Office of Road Fund, and made a brief presentation. Prima facie, they appreciated the outcomes of the analysis, and also endorsed the introduction of MDCs, if required, as they realized the need of road maintenance and its financing for smooth road transport system. The Study Team was advised that additional comments, if any, on the Road Users Charges analysis would be communicated by the representatives. During the workshop on the Study held on 19 October 2011, the proposed rates of AVL Fees and MDCs were also presented and discussed.

13.10.2 The Ministry of Finance & Economic Development (MoFED)

The Study Team had discussions with the Officials of the Ministry of Finance and Economic Development on the results obtained on the Road Users Charges analysis, which worked out the sources of revenue to meet the maintenance needs of the country. The analysis has been carried out under different scenarios with revision of the existing sources and also with additional/new sources. At the outset, the Officials of MoFED, appreciated and highlighted the importance of road maintenance in order to preserve the national assets. It was also underlined that the planned road development in the country, as brought out in the RSDP IV, should be duly supported with the maintenance plan.

The discussions also included the rationale and logic of the current practices of transferring the VAT to the ORF, which is collected on the sales of petrol and diesel. As per the current practice, about 50% of the total VAT collected on petrol and diesel gets transferred to the ORF, and the remaining portion goes to the Government Budget for other sectoral expenditures, as per the Government Policy.

The Study has brought out as many as nine scenarios with varied levels of source of revenue to address the maintenance fund gap. While discussing several scenarios with the MoFED, the Study Team realized that it would be rather difficult for the MoFED to increase the share of VAT while transferring the money to the ORF in view of their own estimates and policy.

In their opinion, it should not be difficult to revise the dedicated Fuel Levy to certain level, as the same has not been revised since its inception in 1997; and is also the dedicated fund for the road maintenance. Any incremental changes in the Fuel Levy, say ETB +/-1 per liter of petrol and diesel should be easily acceptable, and also some gradual changes from time to time could be made in view of the requirements. Hence, RUCs Option-3, i.e. 50% VAT transfer to the ORF and acceptable changes in the Fuel Levy could be considered as an acceptable option. This option does not include any additional/new sources of revenue.

Regarding the RUCs Option with additional/new sources of revenue, the Officials of MoFED favored Option-6 in long term, which refers to the introduction of “Annual Vehicle License Fees” and “Mass Distance Charges” with maintaining the level of VAT transfer up to 50%, and also marginal increase in the Fuel Levy.

13.11 Implementation Plan

The Study has, inter alia, brought out several estimates relating to the maintenance needs assessment with road inventory and pavement condition surveys, updating the maintenance unit costs, adopting appropriate maintenance strategies and policies for different types of road pavement, adjustment of the road users charges with revising the existing and considering additional/new sources of revenue for the Ethiopian Road Fund, and application of the E-RUCS Software. The above would require an implementation plan with indicative

cost implications. For the purpose, the Final Report has also brought out an Implementation Plan illustrating the above-mentioned issues with indicative cost estimates. The Implementation Plan, which has been elaborated in Annexure 13.1, would be helpful to the Office of Road Fund for crystallizing the future line of action.

13.12 Sum Up & Major Issues

The analysis of Road Users Charges has been carried out in view of minimum and rational changes in the existing sources, and the additional/new sources identified of revenue for the Ethiopian Road Fund, which could eliminate the fund gap on a sustainable basis.

While undertaking the exercise, it was kept in view that the proposed options could be accepted for short to long-term time horizon, and also its adaptability in the effective manner.

The RUCs analysis has been carried out under several options and scenarios, and for illustration, nine different options have been presented, of which four options consider the changes in existing sources of revenue, and remaining five options also incorporate the effects of additional/new sources of revenue.

Summary, findings and major issues relating to the Road Users Charges analysis and estimates are presented in the following sections.

13.12.1 With the Existing Sources of Revenue

The Road Users Charges considering the extant practices, i.e. no inclusions of additional/new sources of revenue, the analysis mainly aimed at not disturbing the proven major sources of revenue, i.e. levies on fuel (VAT, Road Fund Fuel Levy and Municipal Tax). It has also been realized that collection of levies on fuel is relatively easy, transparent and cost effective, besides no realization on new taxation, i.e. only marginal impact.

- In view of the requirements of road maintenance needs and costs, and also the socio-economic development of the country, a regular Government support would be required, e.g. the levies on fuel collected from the road users need to be transferred to the ORF; as it has been observed that only 50% (approx.) of the total VAT collected on fuel is transferred to the ORF;
- While analyzing the Road Users Charges, under the existing sources of revenue, i.e. no consideration of any additional/new sources of revenue, if the current practice of 50% VAT transfer to the ORF prevails, the increase in Road Fund Fuel Levy would be required up to ETB 1.60/liter for petrol, and ETB 1.34/liter for diesel. It may be noted that the prevailing rates of Road Fund Fuel Levy are: ETB 0.095/liter on petrol and ETB 0.080/liter on diesel, which have not been changed/revised since its introduction in 1997;
- If the entire amount collected through VAT is transferred to the ORF, the level of Fuel Levy would be restricted to ETB 0.84/liter for petrol, and ETB 0.70/liter for diesel to meet the maintenance requirements, i.e. nominal increase in the Fuel Levy; and
- The analysis has identified RUCs Option-2 as the preferred option with no considerations of additional/new sources. Option-2 aims at 100% transfer of VAT to the ORF, and rational changes in Fuel Levy, as the Fuel Levy rates have not been revised so far.

13.12.2 With Additional/New Sources of Revenue

In order to rationalize the Road Users Charges and reducing the growing burden on the levies on fuel, the Study has explored additional/new sources of revenue. Considering higher damages made by heavy vehicles to road surface, which is usually not recovered by the Fuel Levy collected through the fuel sales/consumption, the Study has accordingly incorporated the need for additional sources. The exercise is mainly based on the Road Deterioration Model, which would share the burden of levies on fuel judiciously:

- The Annual Vehicle License (AVL) Fees and the Mass Distance Charges (MDCs) in particular are identified as potential sources of revenue. These sources of revenue are widely used including African countries. Since these two sources of revenue are new, it may take some time in acceptance, its implementation and also the institutional arrangements, specially for the MDCs; and
- With the additional/new sources of revenue, RUCs Option-6, which considers AVL Fees and MDCs (only 25% of the estimated charges for covering the respective damages) is the preferred option; after its acceptance, it would require a few years to develop a proper mechanism to administer the same.

Depending on the Government's policy and guidelines, and also introduction of additional/new sources of revenue with revised level of existing sources of revenue, the transfer of the proceeds collected as VAT on petrol and diesel to the ORF could be reduced in a phased manner, if required, after a few years considering the time taken for adopting the additional/new sources of revenue.

For an illustration, the Study would propose that first, AVL Fees, which are already under consideration, should be introduced as soon as possible, and the MDCs, which requires special preparation and collection mechanism should follow, say after a couple of years.

To make the above-mentioned additional/new sources of revenue operational, it may take two to three years, so the reduction process of transferring VAT to the ORF may take place from 2015 onwards in phased manner, i.e. on a progressively reducing share of VAT to the ORF, as per the requirements, availability of alternate source(s) of revenue and the Government's policy and guidelines.

13.12.3 Other Issues & Concerns

- In the Government 5-year's Growth and Transformation Program (GTP), new URRAP Roads, i.e. Wereda Roads would be developed and brought into the existence. These roads would make the network more coherent and required, particularly for rural areas for their socio-economic development. Hence, the importance of considering the maintenance cost for the Wereda Roads in future is high, and accordingly should be considered while formulating the required maintenance policy and plans.
- Reducing share of the VAT, while transferring to the ORF for undertaking maintenance activities, and increasing burden on Fuel Levy would highly affect majority of the population – directly or indirectly; as any increase in fuel prices will have an impact on costs of transporting goods and services, and hence every walks of life.
- Considering the role of VAT, which is not a committed source of revenue to the ORF; it may be proposed to reduce the contribution of VAT to the ORF for maintenance activities in future, which is based on the Government priorities and policy, in a phased manner, if the alternate sources of revenue, such as, AVL Fees and MDCs are accordingly introduced with an acceptable level; as the introduction of AVL Fees and MDCs in view of rationalizing the road user charges, would also affect the transport costs in general.
- Under the present Study, the E-RUCS has been developed to work out the maintenance costs, maintenance interventions, and suitable road user's charges under varied conditions and scenarios. To obtain more realistic maintenance cost estimates, road inventory and pavement condition data need to be collected on a regular basis through proper field investigations and surveys. There is a need to enforce the road agencies to collect such data on a regular basis, so that realistic road maintenance needs assessment could be established, and for the purpose, suitable financing arrangement on sustainable basis is required.

Table 13.21: RUCs Option-2
(Existing Road User Charges with 100% VAT Transfer & Revised Fuel Levy)

(ETB in million)

Particular / Scenario		Classified Road Network (Excluding Wereda Roads)			Classified Road Network (Including Wereda Roads)		
		Low	Medium	High	Low	Medium	High
Maintenance Cost		2,936.40	3,097.79	3,242.39	3417.16	3,578.55	3,723.15
Administrative Cost		293.64	309.78	324.24	341.72	357.86	372.32
Total Maintenance Cost		**3,230.04**	**3,407.57**	**3,566.63**	**3,758.88**	**3,936.41**	**4,095.47**
Rate of Levy	VAT (Petrol)	1.558	1.558	1.558	1.558	1.558	1.558
	VAT (Diesel)	1.276	1.276	1.276	1.276	1.276	1.276
	Municipal Tax	0.020	0.020	0.020	0.020	0.020	0.020
	Fuel Level (Petrol)	*0.837*	*0.962*	*1.08*	*1.226*	*1.351*	*1.472*
	Fuel Levy (Diesel)	*0.701*	*0.812*	*0.910*	*1.029*	*1.140*	*1.238*
VAT on Fuel 100%		2,065.35	2,065.35	2,065.35	2,065.35	2,065.35	2,065.35
Revised Road Fund Levy		*1,130.75*	*1,308.24*	*1,467.07*	*1,659.28*	*1,836.78*	*1,995.68*
Municipal Tax		31.46	31.46	31.46	31.46	31.46	31.46
Transit Charges		0.88	0.88	0.88	0.88	0.88	0.88
Interest on Treasury Bills		1.61	1.70	1.78	1.88	1.97	2.05
Total Revenue		3,230.05	3,407.63	3,566.54	3,758.85	3,936.43	4,095.41
Fund Gap		0.01	0.06	(0.09)	(0.03)	0.03	(0.05)

Source: The Consultants' Estimates.

Table 13.22: RUCs Option-3
(Existing Road User Charges with 50% VAT Transfer & Revised Fuel Levy)

(ETB in million)

Particular / Scenario		Classified Road Network (Excluding Wereda Roads)			Classified Road Network (Including Wereda Roads)		
		Low	Medium	High	Low	Medium	High
Maintenance Cost		2,936.40	3,097.79	3,242.39	3417.16	3,578.55	3,723.15
Administrative Cost		293.64	309.78	324.24	341.72	357.86	372.32
Total Maintenance Cost		**3,230.04**	**3,407.57**	**3,566.63**	**3758.88**	**3,936.41**	**4,095.47**
Rate of Levy	VAT (Petrol)	1.558	1.558	1.558	1.558	1.558	1.558
	VAT (Diesel)	1.276	1.276	1.276	1.276	1.276	1.276
	Municipal Tax	0.020	0.020	0.020	0.020	0.020	0.020
	Fuel Level (Petrol)	*1.596*	*1.721*	*1.842*	*1.986*	*2.117*	*2.232*
	Fuel Levy (Diesel)	*1.342*	*1.453*	*1.551*	*1.670*	*1.780*	*1.879*
VAT on Fuel 50%		1,032.67	1,032.67	1,032.67	1,032.67	1,032.67	1,032.67
Revised Road Fund Levy		*2,163.40*	*2,340.90*	*2,499.80*	*2,692.04*	*2,869.51*	*3,028.54*
Municipal Tax		31.46	31.46	31.46	31.46	31.46	31.46
Transit Charges		0.88	0.88	0.88	0.88	0.88	0.88
Interest on Treasury Bills		1.61	1.70	1.78	1.88	1.97	2.05
Total Revenue		3,230.03	3,407.61	3,566.59	3,758.93	3,936.49	4,095.60
Fund Gap		(0.01)	0.04	(0.04)	0.06	0.08	0.13

Source: The Consultants' Estimates.

Table 13.23: RUCs Option-4
(Existing Road User Charges with 0% VAT Transfer & Revised Fuel Levy)

(ETB in million)

Particular / Scenario		Classified Road Network (Excluding Wereda Roads)			Classified Road Network (Including Wereda Roads)		
		Low	Medium	High	Low	Medium	High
Maintenance Cost		2,936.40	3,097.79	3,242.39	3417.16	3,578.55	3,723.15
Administrative Cost		293.64	309.78	324.24	341.72	357.86	372.32
Total Maintenance Cost		**3,230.04**	**3,407.57**	**3,566.63**	**3758.88**	**3,936.41**	**4,095.47**
Rate of Levy	VAT (Petrol)	1.558	1.558	1.558	1.558	1.558	1.558
	VAT (Diesel)	1.276	1.276	1.276	1.276	1.276	1.276
	Municipal Tax	0.020	0.020	0.020	0.020	0.020	0.020
	Fuel Level (Petrol)	*2.342*	*2.486*	*2.608*	*2.744*	*2.876*	*2.990*
	Fuel Levy (Diesel)	*1.985*	*2.093*	*2.191*	*2.311*	*2.421*	*2.520*
VAT on Fuel 0%		-	-	-	-	-	-
Revised Road Fund Levy		3,196.11	3,373.42	3,532.53	3,724.59	3,902.16	4,060.99
Municipal Tax		31.46	31.46	31.46	31.46	31.46	31.46
Transit Charges		0.88	0.88	0.88	0.88	0.88	0.88
Interest on Treasury Bills		1.61	1.70	1.78	1.88	1.97	2.05
Total Revenue		3,230.06	3,407.46	3,566.65	3,758.81	3,936.47	4,095.37
Fund Gap		0.02	(0.11)	0.02	(0.07)	0.06	(0.09)

Source: The Consultants' Estimates.

Table 13.24: RUCs Option-5
(Existing Road User Charges With 75% VAT Transfer, AVL 25 % & Revised Fuel Levy)

(ETB in million)

Particular / Scenario		Classified Road Network (Excluding Wereda Roads)			Classified Road Network (Including Wereda Roads)		
		Low	Medium	High	Low	Medium	High
Maintenance Cost		2,936.40	3,097.79	3,242.39	3417.16	3,578.55	3,723.15
Administrative Cost		293.64	309.78	324.24	341.72	357.86	372.32
Total Maintenance Cost		**3,230.04**	**3,407.57**	**3,566.63**	**3758.88**	**3,936.41**	**4,095.47**
Rate of Levy	VAT (Petrol)	1.558	1.558	1.558	1.558	1.558	1.558
	VAT (Diesel)	1.276	1.276	1.276	1.276	1.276	1.276
	Municipal Tax	0.020	0.020	0.020	0.020	0.020	0.020
	Fuel Level (Petrol)	*0.852*	*0.983*	*1.104*	*1.241*	*1.359*	*1.494*
	Fuel Levy (Diesel)	*0.720*	*0.830*	*0.928*	*1.048*	*1.160*	*1.256*
VAT on Fuel 75%		1,549.01	1,549.01	1,549.01	1,549.01	1,549.01	1,549.01
Revised Road Fund Levy		1,159.81	1,337.18	1,496.08	1,688.35	1,865.77	2,024.82
Municipal Tax		31.46	31.46	31.46	31.46	31.46	31.46
Transit Charges		0.88	0.88	0.88	0.88	0.88	0.88
Interest on Treasury Bills		1.37	1.46	1.54	1.63	1.72	1.80
AVL 25%		487.60	487.60	487.60	487.60	487.60	487.60
Total Revenue		3,230.13	3,407.58	3,566.56	3,758.93	3,936.44	4,095.57
Fund Gap		0.09	0.02	(0.06)	0.06	0.04	0.11

Source: The Consultants' Estimates.

Table 13.25: RUCs Option-6
(Existing Road User Charges with 50% VAT Transfer,
AVL 25%, MDC 25%, Overloading Charges & Revised Fuel Levy)

(ETB in million)

Particular / Scenario		Classified Road Network (Excluding Wereda Roads)			Classified Road Network (Including Wereda Roads)		
		Low	Medium	High	Low	Medium	High
Maintenance Cost		2,936.40	3,097.79	3,242.39	3417.16	3,578.55	3,723.15
Administrative Cost		293.64	309.78	324.24	341.72	357.86	372.32
Total Maintenance Cost		**3,230.04**	**3,407.57**	**3,566.63**	**3758.88**	**3,936.41**	**4,095.47**
Rate of Levy	VAT (Petrol)	1.558	1.558	1.558	1.558	1.558	1.558
	VAT (Diesel)	1.276	1.276	1.276	1.276	1.276	1.276
	Municipal Tax	0.020	0.020	0.020	0.020	0.020	0.020
	Fuel Level (Petrol)	*1.131*	*1.229*	*1.351*	*1.487*	*1.625*	*1.740*
	Fuel Levy (Diesel)	*0.920*	*1.035*	*1.133*	*1.253*	*1.362*	*1.461*
VAT on Fuel 50%		1,032.67	1,032.67	1,032.67	1,032.67	1,032.67	1,032.67
Revised Road Fund Levy		1,490.71	1,668.11	1,827.21	2,019.28	2,196.72	2,355.75
Municipal Tax		31.46	31.46	31.46	31.46	31.46	31.46
Transit Charges		0.88	0.88	0.88	0.88	0.88	0.88
Interest on Treasury Bills		1.28	1.37	1.45	1.54	1.63	1.71
AVL 25%		487.60	487.60	487.60	487.60	487.60	487.60
MDC 25%		152.39	152.39	152.39	152.39	152.39	152.39
Overloading Charges		33.00	33.00	33.00	33.00	33.00	33.00
Total Revenue		3,229.98	3,407.47	3,566.66	3,758.82	3,936.35	4,095.46
Fund Gap		(0.06)	(0.10)	0.03	(0.06)	(0.06)	(0.00)

Source: The Consultants' Estimates.

Table 13.26: RUCs Option–7
(Existing Road User Charges with 25% VAT Transfer,
AVL 25%, MDC 25%, Overloading Charges & Revised Fuel Levy)

(ETB in million)

Particular / Scenario		Classified Road Network (Excluding Wereda Roads)			Classified Road Network (Including Wereda Roads)		
		Low	Medium	High	Low	Medium	High
Maintenance Cost		2,936.40	3,097.79	3,242.39	3417.16	3,578.55	3,723.15
Administrative Cost		293.64	309.78	324.24	341.72	357.86	372.32
Total Maintenance Cost		**3,230.04**	**3,407.57**	**3,566.63**	**3758.88**	**3,936.41**	**4,095.47**
Rate of Levy	VAT (Petrol)	1.558	1.558	1.558	1.558	1.558	1.558
	VAT (Diesel)	1.276	1.276	1.276	1.276	1.276	1.276
	Municipal Tax	0.020	0.020	0.020	0.020	0.020	0.020
	Fuel Level (Petrol)	*1.481*	*1.612*	*1.727*	*1.870*	*1.995*	*2.116*
	Fuel Levy (Diesel)	*1.245*	*1.355*	*1.454*	*1.573*	*1.684*	*1.782*
VAT on Fuel 25%		516.34	516.34	516.34	516.34	516.34	516.34
Revised Road Fund Levy		2,007.10	2,184.47	2,343.50	2,535.64	2,713.14	2,872.04
Municipal Tax		31.46	31.46	31.46	31.46	31.46	31.46
Transit Charges		0.88	0.88	0.88	0.88	0.88	0.88
Interest on Treasury Bills		1.28	1.37	1.45	1.54	1.63	1.71
AVL 25%		487.60	487.60	487.60	487.60	487.60	487.60

MDC 25%	152.39	152.39	152.39	152.39	152.39	152.39
Overloading Charges	33.00	33.00	33.00	33.00	33.00	33.00
Total Revenue	3,230.05	3,407.50	3,566.61	3,758.85	3,936.43	4,095.41
Fund Gap	0.01	(0.07)	(0.02)	(0.03)	0.03	(0.05)

Source: The Consultants' Estimates.

Table 13.27: RUCs Option-8
(Existing Road User Charges with 0% VAT Transfer,
AVL 25%, MDC 25%, Overloading Charges & Revised Fuel Levy)

(ETB in million)

Particular / Scenario		Classified Road Network (Excluding Wereda Roads)			Classified Road Network (Including Wereda Roads)		
		Low	Medium	High	Low	Medium	High
Maintenance Cost		2,936.40	3,097.79	3,242.39	3417.16	3,578.55	3,723.15
Administrative Cost		293.64	309.78	324.24	341.72	357.86	372.32
Total Maintenance Cost		**3,230.04**	**3,407.57**	**3,566.63**	**3758.88**	**3,936.41**	**4,095.47**
Rate of Levy	VAT (Petrol)	1.558	1.558	1.558	1.558	1.558	1.558
	VAT (Diesel)	1.276	1.276	1.276	1.276	1.276	1.276
	Municipal Tax	0.020	0.020	0.020	0.020	0.020	0.020
	Fuel Level (Petrol)	*1.864*	*1.989*	*2.110*	*2.246*	*2.378*	*2.499*
	Fuel Levy (Diesel)	*1.565*	*1.676*	*1.774*	*1.894*	*2.004*	*2.102*
VAT on Fuel 0%		-	-	-	-	-	-
Revised Road Fund Levy		2,523.47	2,700.97	2,859.87	3,051.93	3,229.50	3,388.40
Municipal Tax		31.46	31.46	31.46	31.46	31.46	31.46
Transit Charges		0.88	0.88	0.88	0.88	0.88	0.88
Interest on Treasury Bills		1.28	1.37	1.45	1.54	1.63	1.71
AVL 25%		487.60	487.60	487.60	487.60	487.60	487.60
MDC 25%		152.39	152.39	152.39	152.39	152.39	152.39
Overloading Charges		33.00	33.00	33.00	33.00	33.00	33.00
Total Revenue		3,230.07	3,407.66	3,566.64	3,758.80	3,936.46	4,095.44
Fund Gap		0.03	0.09	0.01	(0.08)	0.05	(0.03)

Source: The Consultants' Estimates.

Table 13.28: RUCs Option-9
(Existing Road User Charges with 0% VAT Transfer,
AVL 45%, MDC 45%, Overloading Charges & Revised Fuel Levy)

(ETB in million)

Particular / Scenario		Classified Road Network (Excluding Wereda Roads)			Classified Road Network (Including Wereda Roads)		
		Low	Medium	High	Low	Medium	High
Maintenance Cost		2,936.40	3,097.79	3,242.39	3417.16	3,578.55	3,723.15
Administrative Cost		293.64	309.78	324.24	341.72	357.86	372.32
Total Maintenance Cost		**3,230.04**	**3,407.57**	**3,566.63**	**3758.88**	**3,936.41**	**4,095.47**
Rate of Levy	VAT (Petrol)	1.558	1.558	1.558	1.558	1.558	1.558
	VAT (Diesel)	1.276	1.276	1.276	1.276	1.276	1.276
	Municipal Tax	0.020	0.020	0.020	0.020	0.020	0.020
	Fuel Level (Petrol)	*1.481*	*1.612*	*1.727*	*1.870*	*1.995*	*2.499*
	Fuel Levy (Diesel)	*1.245*	*1.355*	*1.454*	*1.573*	*1.684*	*2.102*
VAT on Fuel 0%		-	-	-	-	-	-
Revised Road Fund Levy		2,007.10	2,184.47	2,343.50	2,535.64	2,713.14	2,872.04
Municipal Tax		31.46	31.46	31.46	31.46	31.46	31.46
Transit Charges		0.88	0.88	0.88	0.88	0.88	0.88
Interest on Treasury Bills		1.02	1.11	1.19	1.28	1.37	1.45
AVL 45%		879.63	879.63	879.63	879.63	879.63	879.63

MDC 45%	274.91	274.91	274.91	274.91	274.91	274.91
Overloading Charges	33.00	33.00	33.00	33.00	33.00	33.00
Total Revenue	3,228.00	3,405.46	3,564.57	3,756.80	3,934.39	4,093.37
Fund Gap	(2.04)	(2.11)	(2.06)	(2.07)	(2.02)	(2.10)

Source: The Consultants' Estimates.

14. CONSEQUENCES OF NEGLIGENCE IN ROAD MAINTENANCE

14.0 CONSEQUENCES OF NEGLIGENCE IN ROAD MAINTENANCE

14.1 General

The need for undertaking timely road maintenance has been widely realized for conserving the asset and also for ensuring uninterrupted efficient and effective road transport system. It has been often noticed that in socio-economic development plan, the construction of new roads get due consideration, but when it comes on preserving the asset by proper maintenance plan and adequate financial support, it does not get the required importance. And with the result, i.e. "due to negligence in road maintenance", the road network gets deteriorated considerably and even completely. In such conditions, the network requires severe maintenance or rehabilitation demanding much higher financial allocations, causing higher transport cost, en-route damages and inconvenience to the road users.

With the above brief background, this chapter aims at addressing and estimating the "consequences of negligence in road maintenance" through several methods and parameters, so that the message could be strongly highlighted and appreciated by those who are directly or indirectly involved at higher levels in decision making process for the road maintenance plans, strategies and arranging sustainable financial support.

The exercise has been carried out in such a manner, so that tangible or quantitative inferences could be drawn, which would be appreciated in a much better way for any decision making process relating to the road maintenance. The need for such analysis and communication through facts and figures were also felt during the road maintenance initiatives (RMI).

The normal dialogues with technocratic vocabularies, in terms of routine, recurrent, and periodic maintenance, optimal grading and re-gravelling cycles, etc., may not have that impact on the non-technical officials involved in the maintenance decision making process. Hence, any technical proposals with the need of road maintenance may not get through.

The present analyses illustrating the dire consequences of the negligence in road maintenance are based on the assumptions, which are fairly close to the reality, and relevant to the Ethiopian conditions, and methods used are straight forward, and also guided by the international practices with similar conditions.

The results, thus, obtained could be easily appreciated and used for giving due importance to the road maintenance, and particularly arranging the finance for the same through several effective instruments. The consequences, with facts and figures, would advocate in more effective way for revenue generation through the proposed way from the road users for their own benefits, otherwise, the road user would need to pay much higher cost on maintenance in future for restoration of the lost transport system due to negligence in maintenance.

14.2 Analysis Coverage

In order to appreciate and estimate the consequence of negligence in road maintenance, as per the availability of data, the exercise has considered the following major areas:

- Valuation of the road asset in Ethiopia;
- Road rehabilitation costs;
- Higher Vehicle Operating Costs;
- Higher Road User Charges;
- Higher Transport Cost (Economic Movement, etc.); and
- Road Safety Concerns.

14.3 Negligence in Road Maintenance

If any road network is not properly and timely maintained, the network starts deteriorating much faster, and due to further negligence, the road may be completely destroyed, which would require rehabilitation, etc. at much higher cost than the maintenance.

In a nutshell, the entire asset developed over a period of time with huge capital costs would be lost only in a few years in absence of timely and proper maintenance support.

Besides the above, the vehicle operators would incur much higher transport cost on an unmaintained road network, and in turn, the overall road transport system cost would be uneconomical, and also make adverse impact on the overall socio-economic development process. Poor roads/unmaintained road system adversely affects in passenger and freight movement, particularly while transporting the fragile and perishable agricultural products for their marketing.

*Many rural roads in Africa are **"returning to bush"** because of inadequate maintenance. This is not helped by development loans which encourage construction of new roads and rehabilitation of existing infrastructure rather than better value ongoing maintenance[1].*

There are other difficulties found in case of rural roads[2]:

(i) Managed by local government administrations whose weak financial, institutional and human resource base renders the sustainability of all public investments immensely difficult; and

(ii) Local administrations also feel the full effect of a number of fundamental characteristics that inhibit Africa's development.

Another characteristic is the geography and population dynamics, which refers to the sparseness and poverty of its population means that it is inherently difficult to support the maintenance of all types of infrastructure. There are vast distances with very few people to generate the revenues necessary to sustain maintenance.

Table 14.1: Without Maintenance the Loss of Road Assets

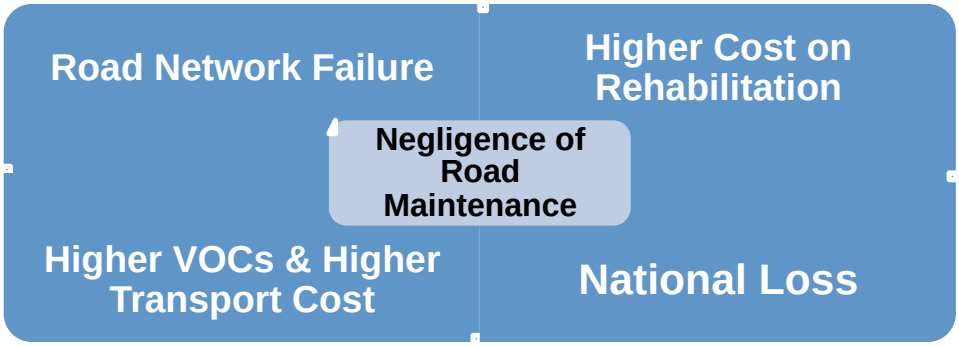
Road Type	Description
Bitumen Surfaced Roads	Will be unusable in 10-12 years
Gravel Roads	Normally of the order of 6-8 years
Earth Surfaced Roads	As little as 3-5 years

Source: Sustaining Africa's Rural Road Networks: The Asset Management Approach (1999).

It may be difficult to establish the consequences of negligence in road maintenance, particularly to make the non-technical people and also the decision makers realize; as the technical details and probable impact on the road users in future may not be appreciated before the likely consequences.

[1] "Sustaining Africa's Rural Road Networks: The Asset Management Approach", by John Howe (1999), World Transport Policy and Practices.

[2] Ibid.



In view of the same, the Study analyzes different areas of impact with different supporting estimates and arguments for the level of consequences of negligence in road maintenance in possible tangible manner, which have been presented in the paragraphs that follow.

14.3.1 Value of the Road Assets in Ethiopia

In order to highlight and make strong realization of the very need of road maintenance towards preserving the national asset, it is important to develop proper tools, preferably tangible, so that any analysis and communications on the subject could be effective. The experience gained during the Road Maintenance Initiative and elsewhere indicates that operational model needs to be more strongly focused on conservation of the asset base, i.e. created by progressive investment in a road network; and the language and process of dialogue needs to be changed. It would be more effective, if the conservation of the inherent asset value of the network is expressed in "money terms". The concept is based on the following[3]:

- Valuation of the asset of the road network, as carried out for any company's asset;
- Lack of maintenance will result in the deterioration of the network by physical attrition due to effects of climate and traffic, which implies a continuous decrease in its asset value; and
- Investment in the rehabilitation of currently unusable routes or the addition of completely new roads, etc. which would be much more than the maintenance cost, if not carried out on time.

Considering the Classified Road network of Ethiopia, i.e. 53,349 km including the Municipal Road Network, as illustrated in Table 14.2, the Study has estimated the value of road asset (asphalt, gravel and urban roads). The estimates have been made following the method suggested in the "Sustaining Africa's Rural Road Networks (1999)":

Table 14.2: Valuation of the Road Asset & Financing of Road Maintenance in Ethiopia

Road Surface	Length		Asset Replacement Value		Total Network Value	Annual Maintenance Requirement		Yearly Expenditure Road Maintenance	
	km	%	$/km	$ million	%	% of Asset Value	$/km pa	$ million	%
	(1)	(2)	(3)	(4=1*3)	(5)	(6)	(7)	(8=4*7)	(9)
Asphalt	7476	14%	529,412	3,958	36%	1.2%	6,353	25	36%
Gravel	41,317	77%	139,393	5,759	52%	4.9%	6,830	39	56%
Urban Roads	4,556	9%	281,144	1,281	12%	1.6%	4,498	6	8%
Total	**53,349**	**100%**	**206,153**	**10,998**	**100%**	**3.1%**	**6,391**	**70**	**100%**

Source: The Consultants' Efforts.

[3] Ibid.

In view of the "Asset Management Approach" with the related figures of Ethiopia, Table 14.2 presents the derivation of the values of different road types, and annual maintenance cost implications, other details and underlying assumptions relevant to the Ethiopian conditions.

Assumptions:

Particular		Description
Cost for Construction of Roads (per km)		Asphalt Road: varies from ETB 7 to 11 million, and average of ETB 9 million is considered
		Cost of Gravel Roads varies from ETB 1&1/2 million for rural to ETB 4 million for Federal Roads
		Cost of Earth Roads varies from ETB 0.7 to ETB 1 million
		Cost of Urban Roads, based on four-lane varies from ETB 15 to ETB 20 million
Mainten-ance Cost (per km)	**Periodic**	Paved: ETB 699,463 (Every 8 years)
		Unpaved: ETB 363,930 (Every 4 years)
		Earth: ETB 110,000 (Every 2&1/2 years)
		Urban: ETB 1,069,880 for Paved and ETB 606,550 for Unpaved (Every 10 years)
	Routine	Paved: ETB 23,924 (once a year)
		Unpaved: ETB 11,148 (three times a year)
		Earth: ETB 6,000 (three times a year)
		Urban: ETB 57,940 for Paved and ETB 24,804 for Unpaved (once for paved and twice for unpaved per year)

Source: The Consultants' Efforts.

14.3.2 Road Rehabilitation Cost

It has been adequately discussed and argued that, if timely road maintenance – routine and periodic, is not carried out, it would cost much more to the national economy, as it would require rehabilitation. Towards the same, the Study carried out the analysis based on certain assumptions relevant to the Ethiopian conditions. The methods followed to undertake the analysis are described as follows:

(i) Asset value of road is considered as total length of the road network multiplied with the construction cost;

(ii) Asset value for non-maintainable road 40% of the construction cost (non-maintainable roads also have asset value of 40% of the total asset value);

(iii) Total asset value is sum of both maintainable and non-maintainable roads;

(iv) Level of non-maintainable roads has been assumed as 5% of the total road network;

(v) Annual maintenance costs consist of both periodic and routine, in terms of per km;

(vi) Rehabilitation cost is taken as 60% of construction cost, in terms of per km;

(vii) For paved roads, it is assumed that without maintenance up to 10 years, the road network will become unusable; and

(viii) Rehabilitate road length with the cost of 10 years maintenance cost.

Table 14.3: Case – Paved Road (Year 1)

Particular	Length (km)	Cost (US$)/km	Total Cost (US$ million)
Asset Value of Road in Maintainable Condition	7,102	529,412	3,760
Asset Value of Road in Non-Maintainable Condition	374	211,765	79
Total	**7,476**	**--**	**3,839**

Assumptions & Analysis:

Description	Figure/Remark
Level of Non-Maintainable Condition (Assumption)	5%
Annual Maintenance Cost (per km)	US$ 6,550
Rehabilitation Cost (per km)	US$ 317,647
Rehabilitation – Maintenance Expenditure Ratio	**4.85**
Total Maintenance Cost for 10 years	US$ 465.2 million
Rehabilitate Road Length	1,465 km

Table 14.4: Case – Paved Road (Year 10)

Particular	Length (km)	Cost (US$)/km	Total Cost (US$ million)
Asset Value of Road in Maintainable Condition	7,102	211,765	1,504
Asset Value of Road in Non-Maintainable condition*	(-)1,091	211,765	(-)231
Asset Value Rehabilitated Road	**1,465**	**317,647**	**465**
Total			**1,738**

* Road Length = Non-Maintainable Road–Rehabilitated Road Length.

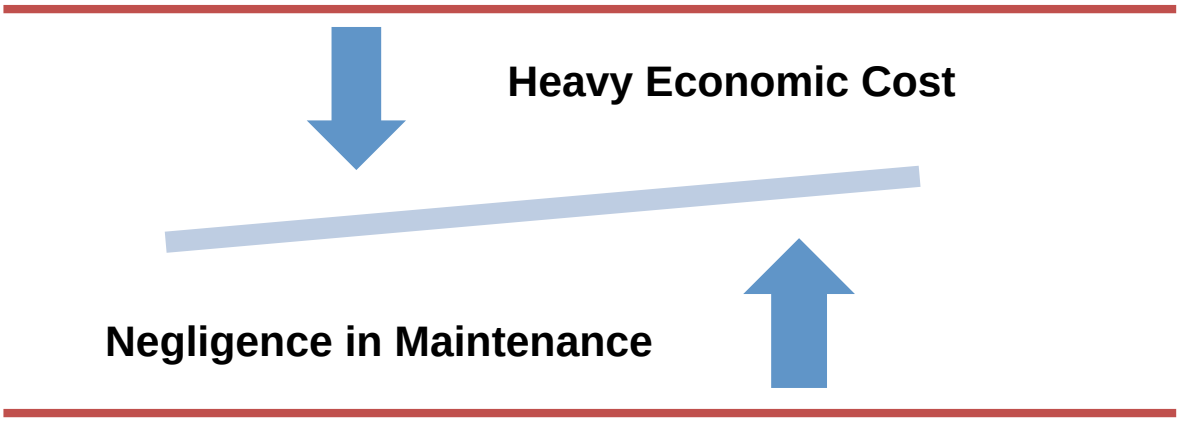
Results:

(i) **Asset Value after 10 years without maintenance = US$ 1,738 million** (after spending the maintenance cost on rehabilitation);

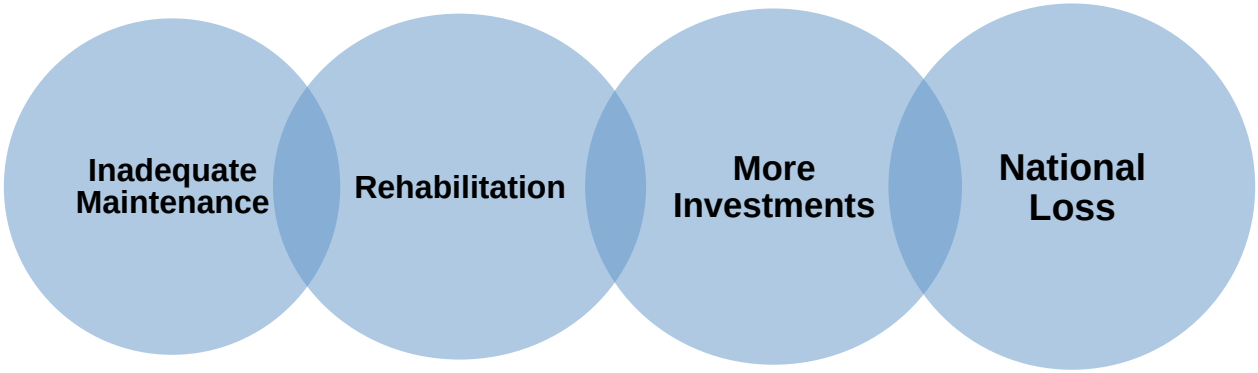
(ii) **Net Asset Loss*, due to "Non-Maintenance after 10 years" = US$ (-) 2,100 million;** and

(iii) **Rehabilitation - Maintenance Expenditure Ratio = 4.85.**

*Difference of: (i) Total Asset Value in: Year 1 (US$ 3,839 million; and (ii) Year 10 (US$ 1,738 million).

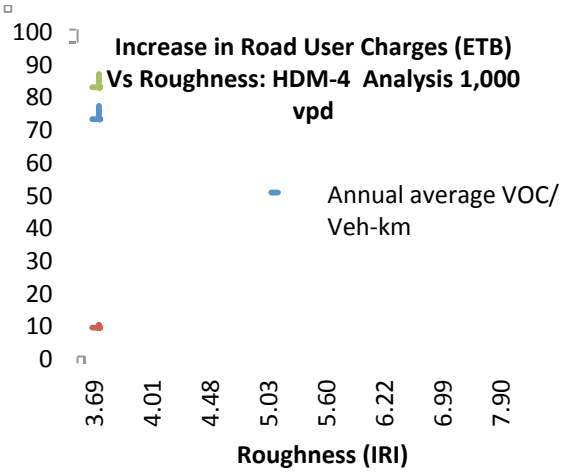


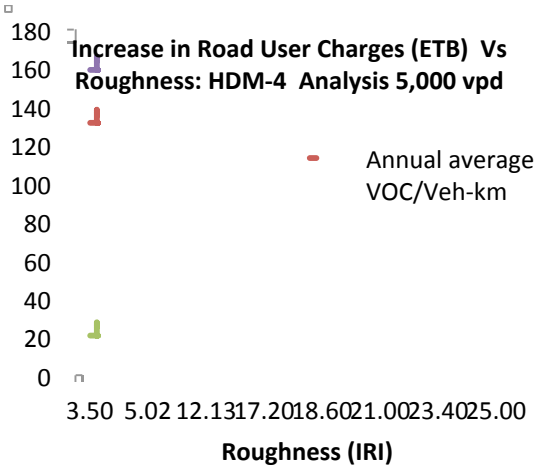
The above analyses are based on the assumptions fairly close to the reality, and relevant to the Ethiopian conditions. The results of the above exercise aim at the proper appreciation of the need and importance of timely maintenance interventions, otherwise, there would be huge loss to the national economy, as the rehabilitation cost of the non-maintained road network would be up to five times than the maintenance cost, besides the road users would incur several tangible and intangible costs while transporting goods and services and inconvenience on poor and very poor road networks.



14.3.2.1 Higher Vehicle Operating Costs

On poor pavement surface, the road users incur higher vehicle operating costs (VOCs), which are reflected in slower speed, more travel time, higher fuel consumption, reduced vehicle performance (vehicle-km), higher wear and tear of tyres and spare parts, frequent vehicle break down, etc. All these increase the VOCs and efficiency, and decrease reliability of the unmaintained road. Also the transportation of fragile and perishable commodities becomes more difficult affecting the socio-economic development adversely, particularly for remote and isolated rural areas.





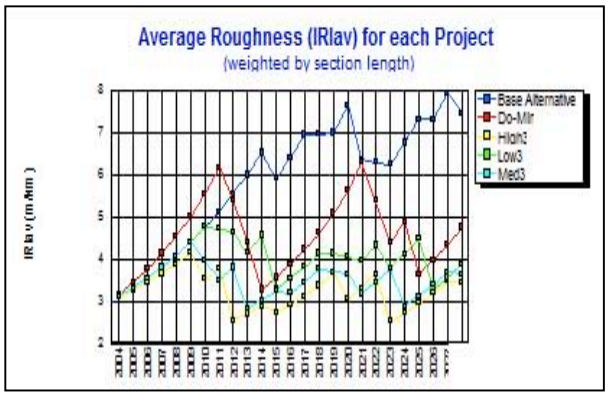
In order to reckon the impact of unmaintained road condition on the VOCs, the Study undertakes the analysis illustrating the same in the Ethiopian condition supported with the relevant international experience.

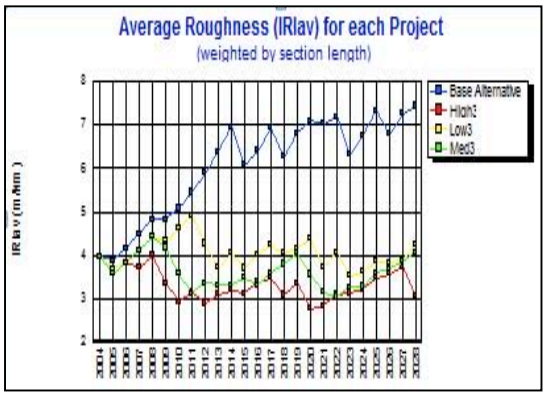
Table 14.5 presents the savings in VOCs and value of time w.r.t. the deteriorating road condition, as depicted in terms of roughness (IRI). The exercise has been carried out through the HDM analysis on 1,000 vpd and 5,000 vpd cases. It can be observed in Table 14.5, that due to road deterioration, substantial increase in VOCs and value of time have been recorded.

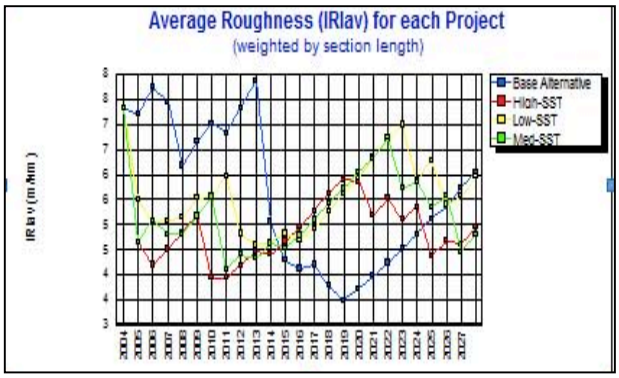
Table 14.5: Road User Cost & Expected Savings on Good Roads (ETB)

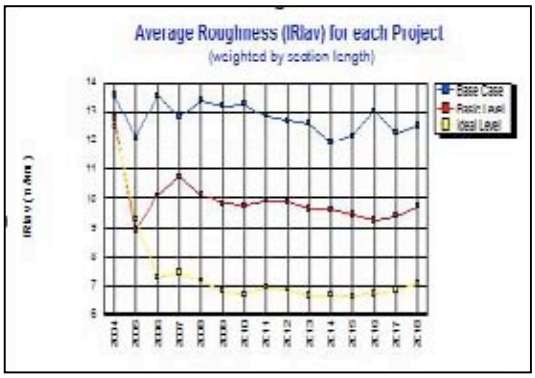
Year	IRI	Annual Average Cost/Vehicle-km*			Annual Average Cost/Vehicle-km**		
		VOC	Travel Time	Total Road User Cost	VOC	Travel Time	Total Road User Cost
2010	**3.69**	**61.15**	**8.78**	**69.93**	**62.29**	**8.78**	**71.08**
2011	3.81	61.66	8.78	70.44	65.10	8.81	73.90
2012	4.01	62.41	8.79	71.20	69.89	8.94	78.83
2013	4.23	63.23	8.79	72.02	81.30	10.93	92.23
2014	4.48	64.13	8.79	72.92	98.80	15.78	114.58
2015	**4.74**	**65.07**	**8.80**	**73.87**	**106.90**	**17.99**	**124.90**
2016	5.03	66.05	8.81	74.87	112.06	18.48	130.54
2017	5.28	66.95	8.83	75.78	117.26	19.49	136.75
2018	5.60	68.03	8.85	76.88	122.98	20.66	143.64
2019	5.90	69.01	8.88	77.90	128.18	22.01	150.19
2020	**6.22**	**70.05**	**8.93**	**78.97**	**131.71**	**23.86**	**155.57**
2021	6.61	71.26	9.00	80.26	134.74	24.86	159.60
2022	6.99	72.42	9.10	81.52	135.91	25.87	161.78
2023	7.45	73.78	9.25	83.03	136.58	26.71	163.30
2024	7.90	75.12	9.46	84.58	137.76	27.38	165.14
2025	**8.40**	**76.61**	**9.74**	**86.35**	**138.26**	**27.55**	**165.82**

Source: The Consultants Estimates. *Based on 1,000 vpd; and **Based on 5,000 vpd.



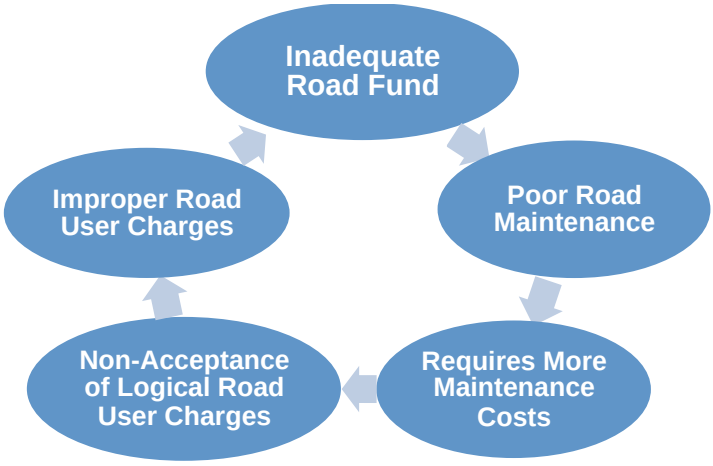






14.3.2.2 Higher Road User Charges

Under the road user pay concept, the maintenance costs of the road need to be paid by the road users, and due to negligence of the timely routine and periodic maintenance, the road network would be deteriorating at higher rate in years to come; which would cost more for undertaking the severe maintenance or rehabilitation in case of very poor pavement condition. This situation would compel the road users to pay more for the road maintenance to achieve the level of good road pavement.



The above argument alerts those who are engaged in making decisions on the maintenance policy and arranging finances, particularly through the road users charges fixed for covering the routine and periodic maintenance costs. The need for this argument is realized; because, it may so happen that in present context, due to any reasons, the road user charges, rationally estimated to cover the maintenance cost (periodic and routine), not implemented, would cost much higher in the future, when the road network might deteriorate at substantial level requiring much higher level of maintenance interventions or rehabilitation. In a nutshell, the negligence in road maintenance would be much dearer to the national economy. The following estimates present the above phenomenon supported with proper illustrations.

Table 14.6: Derivation of Rehabilitation-Maintenance Ratio

Road Condition	**Paved Road** (Cost in ETB/km)			**Unpaved Road** (Cost in ETB/km)		
	Maintenance	Rehabilitation	R/M Ratio	Maintenance	Rehabilitation	R/M Ratio
V/Good	797,843	5,400,000	6.8	426,710	1,421,807	3.3
Fair	908,185	5,400,000	6.0	477,547	1,421,807	3.0
Poor	1,070,781	5,400,000	5.0	701,742	1,421,807	2.0

Source: The Consultants' Estimates; R/M Ratio=Rehabilitation-Maintenance Ratio.

14.3.2.3 Higher Transport Cost & Its Impact on Economy

Unmaintained road network increases the VOCs, and in turn, the total road transport system costs of the country in general, and in the specific road influence area in particular. Inefficient and unreliable road network due to lack of maintenance affects adversely the movement of passenger and goods for domestic and international traffic. Developing country like Ethiopia with growing agricultural economy, the need for movement of agricultural surplus produced for marketing, particularly the perishable commodities, is highly desirable. Otherwise, en-route loss and spoilages of such perishable commodities would be considerably high, and in long run, due to loss while transporting the products for marketing, the producers may change the cropping pattern or shift to some other occupations.

Similarly, while transporting the industrial products and bulk cargo, and import-export items, the travel time and transport costs are important factors influencing the movement pattern, hence due to bad road conditions, such movement would be highly affected.

All these situations would affect the national economy adversely, and citizen of the country would incur higher costs also on the prices of consumer items due to higher transport cost, which would also influence the overall demand and consumption structure.

14.3.2.4 Road Safety Concerns

The negligence in road maintenance will have serious road safety concerns as viewed in the following a few aspects:

(i) Road Surface: Repeated axle load movements in a road will change the surface undulations of pavement. If the road is not properly maintained, cracking, rutting and potholes will be developed in pavement over a period of time. Such defects in pavement will greatly affect the safety of Vulnerable Road Users (VRU), especially the safety of two wheelers and other non-motorized traffic.

(ii) Traffic Control Devices: Traffic control devices are the lifeline for the safety of road during operation. If they are not maintained diligently, the safety performance will be greatly affected. For example, the retro-reflective signs installed at relatively high cost will require washing at regular interval, which is generally carried out as part of routine maintenance regime. Any lapse in this matter will substantially reduce the reflectivity of signs and will lead to road accidents due to poor performance of traffic control devices, particularly during night. Deformation and change in orientation of traffic control devices are quite normal during the operation of a highway and any negligence in restoring to the original state, which is supposed to be carried out as part of maintenance activity will not only annul the intended purpose for which it was installed, but sometime will become yet another safety hazard.

(iii) Visibility: Visibility is one factor which has direct bearing on safety of road. The branches of trees grown into the roadway and vegetation protruding into the visibility funnel of road are serious safety issues. These are generally removed as part of a routine maintenance program and the cost of such maintenance activity is nominal. But any failure in improving the visibility of road will lead to fatal accidents especially on an undivided road.

(iv) Drainage: The negligence in clearing off lined and unlined drains of road and lacking in keeping the line and grade of shoulders will lead to water ponding and stagnation in roadway and will pose big safety hazard to all road users. This is more serious in case of rolling and hilly terrain. The width and grade of shoulder are, therefore, strict determinant of roadway capacity and safety, as it provides the sense of openness and confidence to the drivers.

It must be impressed that the above aspects can be addressed without much financial burden. Negligence in maintaining such essential safety aspects of road not only create an unpleasant appearance and increase in the VOCs; but are also dangerous to the motor vehicles, non-motorized traffic, and pedestrians, which would be great loss to the national economy. In some countries, there are provisions for accident coverage on account of injuries to a motor vehicle accident caused by uneven pavement, one may be able to win compensation for his medical expenses, missed days of work, and other losses.

The insurance companies and the lawyers engaged in such practices, particularly in developed countries, observe the “Consequences of Negligent Road Maintenance” in the following manner. The responsibility for maintaining a road or highway may fall on a private contractor, local government, or federal agency. If any of these parties fail to monitor roadway conditions and repair damage as it occurs, innocent people may suffer from accidents like:

- Changes in tire traction caused by sudden changes in pavement texture;
- Steering errors caused by sudden dips, bumps, or texture changes in the road;
- Pedestrian trip and fall accidents, which can cause or contribute to car accidents; and
- Driver distraction caused by unexpected and severe pavement changes.

Defects like these often cause or contribute to major motor vehicle accidents. Unfortunately, insurance settlements are not always adequate to compensate victims for their many related losses.

14.4 Sum Up & Major Issues

The adverse impacts of negligence in road maintenance have been analyzed with tangible evidences, e.g. Valuation of the Road Asset in Ethiopia; Road Rehabilitation Costs; Higher Vehicle Operating Costs; Higher Road User Charges; Higher Transport Cost (Economic Movement, etc.); and Road Safety Concerns.

The affected areas mentioned above set a logical and convincing argument to give due importance to the timely road maintenance interventions. It has also been realized that in absence of proper, regular and sustainable financial support, mainly based on the road user charges, for the maintenance, it may cause inadequate maintenance strategy and interventions. Such situation would lead to further deterioration in the road pavement, requiring much higher maintenance cost, causing higher VOCs, inconvenience to road users, etc. Eventually, the higher maintenance costs, would result in substantially higher road user charges in comparison with the base year road user charges.

15. E-RUCS & SOFTWARE USER'S MANUAL

15.0 E-RUCS & SOFTWARE USER'S MANUAL

15.1 General

Ethiopian Road User Charge System (E-RUCS), i.e. computer Software, has been specially developed under the present consultancy services for adjusting the Road Users' Charges to meet the road maintenance needs and costs worked out under different conditions. The E-RUCS has been developed as per the requirements of the ToR, which, inter alia, estimates the multiyear road maintenance requirements, maintenance intervention costs, and impact on road user charges and its analysis under several assumed scenarios.

The E-RUCS is a user friendly software, which requires data inputs relating to the road inventory, maintenance interventions, costs and road users' charges, and generates outputs as per the user's requirements.

The Software is designed to provide with the decision making tools by incorporating different levels of road inventory with pavement conditions under different road agencies, varied maintenance costs, and different sources of road user charges with changes in existing as well as additional/new sources of revenue for the Ethiopian Road Fund.

15.2 Purpose & Applications

The E-RUCS is fully capable of managing road inventory data and related information, computing and generating outputs on maintenance needs assessment, proposed interventions, maintenance cost, and analyzing road user charges. However, the present chapter mainly describes and utilizes the application of the software for analyzing the road user charges for immediate understanding and illustration.

As stated earlier, the E-RUCS Software is developed to estimate the road maintenance needs, maintenance intervention costs, and the road user charges to cover and/or identify the maintenance fund gaps under different scenarios and options. The Software will generate reports providing details relating to different road agencies, e.g. the Districts of ERA, Regions of RRAs and Municipalities of MRAs, and also for the roads located at varied terrains, viz. plains, hilly and mountainous.

15.3 User's Manual

The E-RUCS, among others, is used to facilitate for adjustment of user charges. The Manual presents an overview of the process of defining user charges, application of the Software, and managing road settings.

The following steps need to be considered during the data entry and the report generation:

- Defining User Settings;
- Defining Road Settings;
- Defining Road Maintenance Cost Settings;
- Defining Revenues;
- Generating Reports; and
- Managing Road Survey Results.

A brief note on the above is given in the following sections.

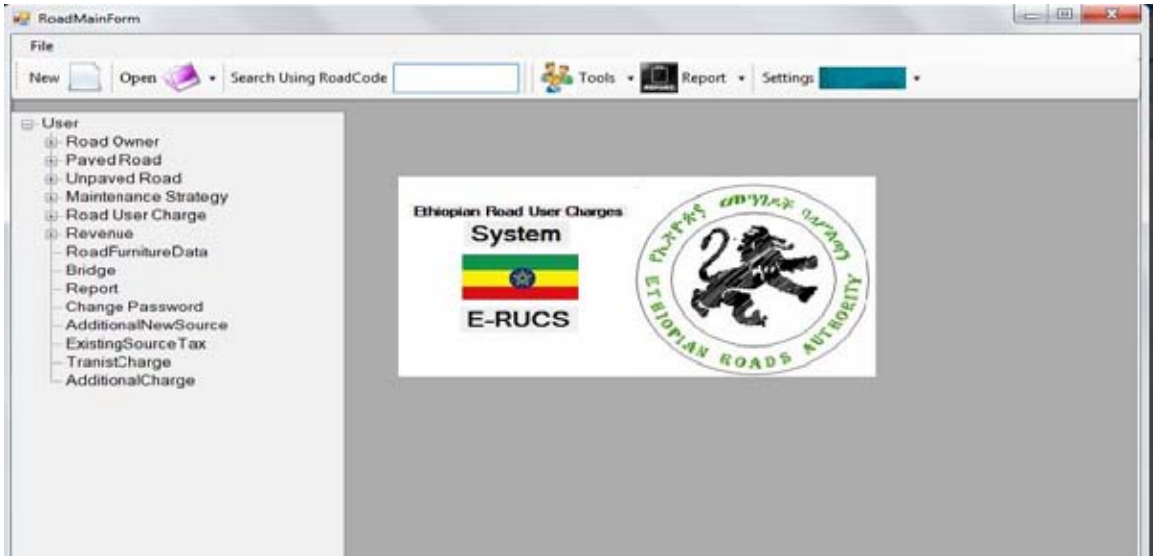


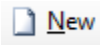
Figure 15.1: E-RUCS Main Interface

15.3.1 Basic Buttons

The following buttons provide the same functionalities in all forms:

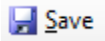
- **New**

Such button used to enter a new record.



- **Save**

This button is used to save a new record or to save an updated record.

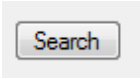


- **Delete**

To delete a selected record, such button has to be clicked.

- **Search**

This button is used to search a record. However, a search parameter has to be filled in before clicking the button.



15.3.2 Defining User Settings

Before accessing the System, a user has to be created by system administrator, and user level also needs to be granted. The steps followed during creating a user are shown below:

1. From main form, select tools menu; and
2. Choose tools > create User Account.

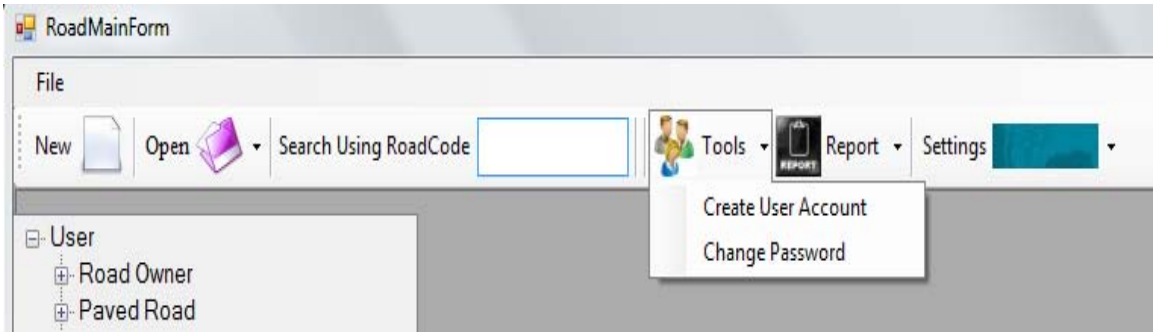


Figure 15.2: Accessing User Interface

3. in the necessary information as shown in Figure 15.3.

Figure 15.3: User Management Interface

4. Click “Save” button and Close the form.

Once the user is created, the “User Name” and the “Password” are used to access the system.

15.3.3 Defining Road Settings

Road Settings are the information to be entered into the database as an input for the main data entry process. Such settings are categorized and presented under the menu “Settings”. Figure 15.4 shows that how the Road Settings are organized and presented.

There are many settings to be defined during data entry. To illustrate, once the setting is identified, the necessary information has to be filled in before the main data entry proceeds.

To display each setting:

- Choose Setting > /one of the setting;
- Click “New” button:
- Enter the information required: and
- Click “Save” button and Close the form.

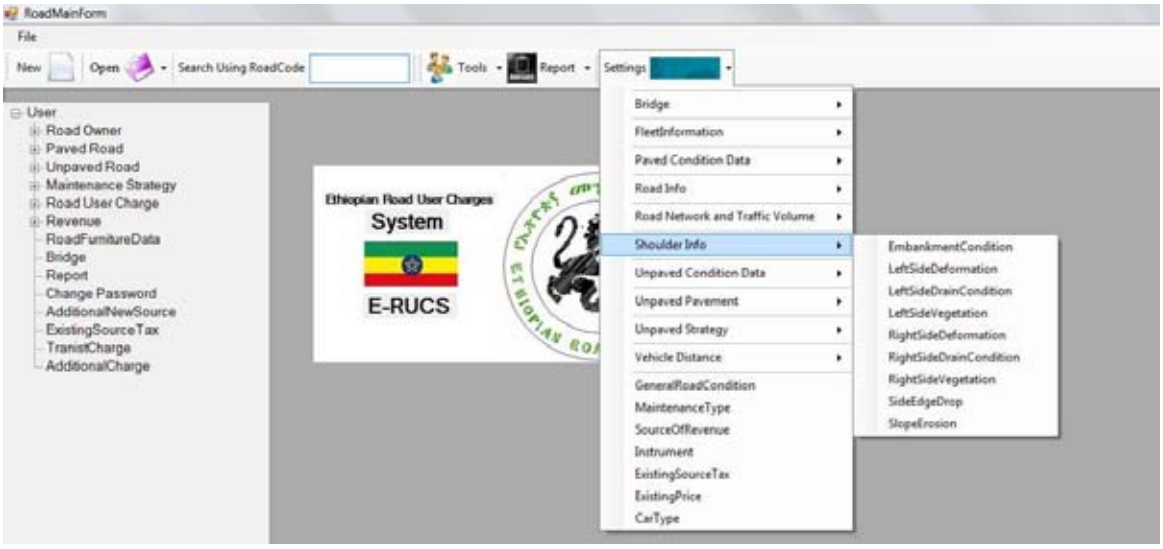


Figure 15.4: Road Setting Menu

Figure 15.5 illustrates the sample road setting that is used to illustrate how cross section setting is defined.

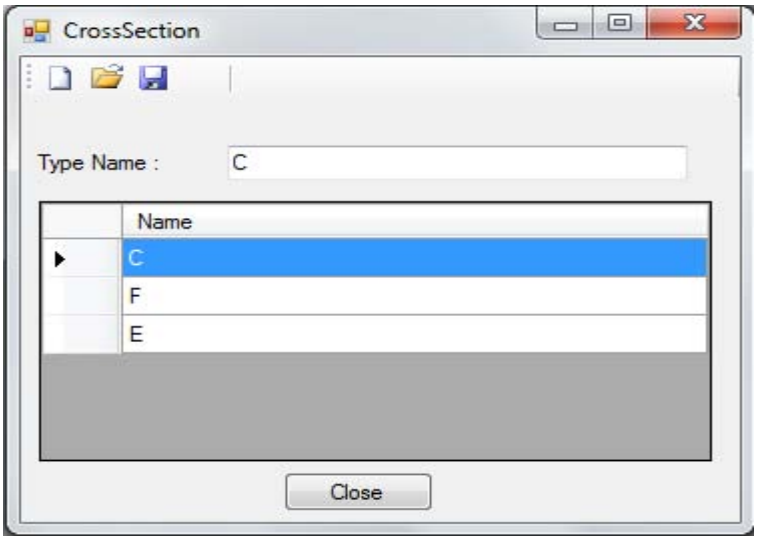


Figure 15.5: Cross Section Entry Form

15.3.4 How to Update Road Settings Data?

To update the data:

1. Select the data to be updated;
2. On the input box, make the changes on the area where changes are required; and
3. Click “Save” button and Close the form.

15.3.5 Defining Road Maintenance Cost Settings

Road Maintenance Cost Settings are used as an input for the Maintenance Cost Report generation. The settings include:

(i) Road unit cost; and

(ii) Road length by terrain type.

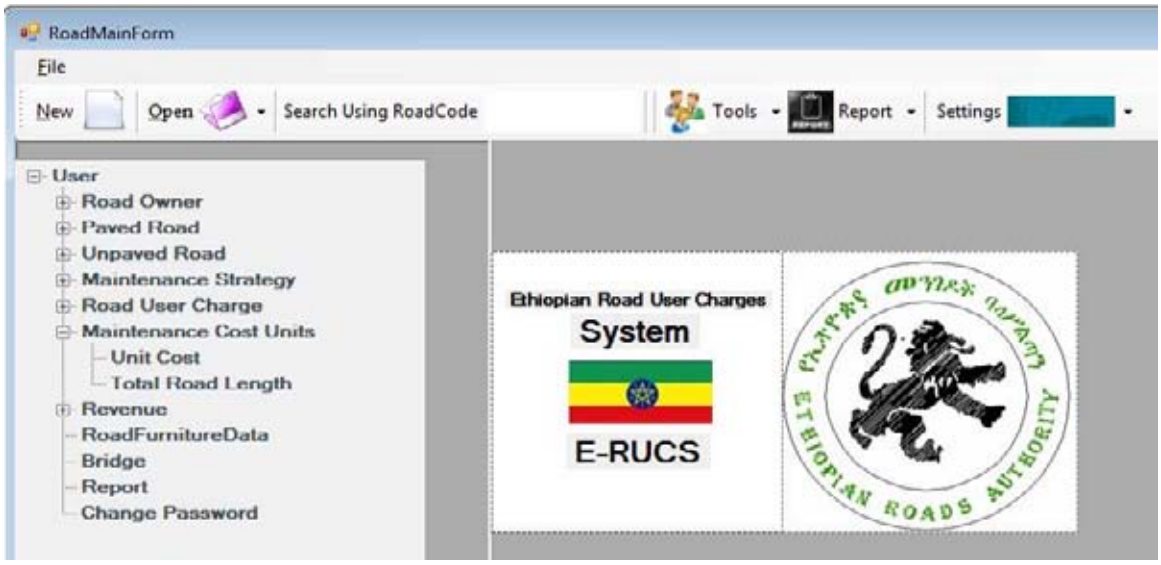


Figure 15.6: Maintenance Cost Units Menu

Both settings can be accessed under Maintenance Cost Unit Menu. As shown in Figure 15.6, both the maintenance settings can be accessed.

15.3.5.1 Unit Cost

In this form, maintenance unit cost will be defined and entered along with its percentage application. The percentage will help to identify how much of the unit cost needs to be applied. Each type of unit cost shall be entered under maintenance, road condition, and road type category.

How to record a new entry?

1. User > Maintenance Cost Units > Unit Costs;
2. Click New Button;
3. Fill the necessary Information; and
4. Save the Form.

Figure 15.7: Maintenance Unit Cost Form

15.3.5.2 Total Road Length

Entries relating to the road length can be done by terrain type under the category of road type and road condition.

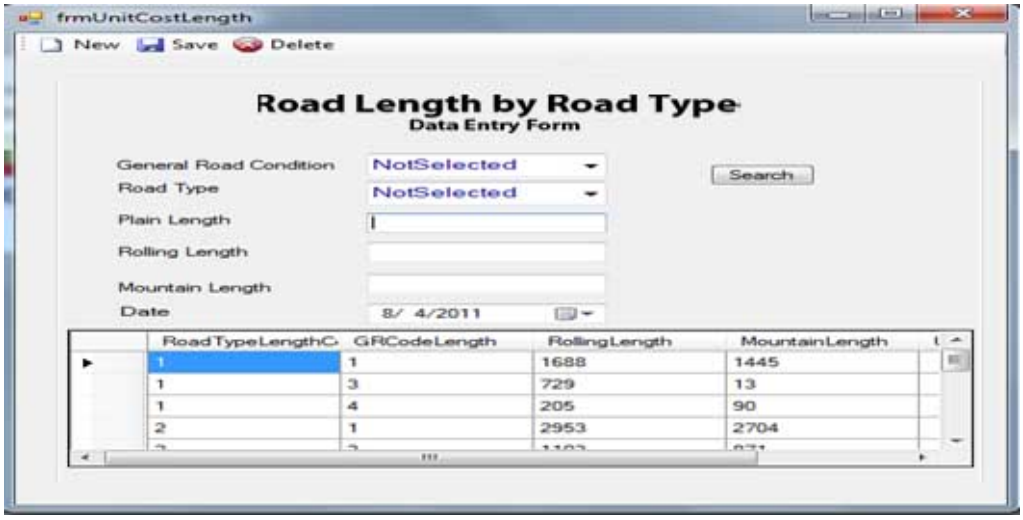


Figure 15.8: Road Length Entry Form

How to record a new road length data entry?

1. User > Maintenance Cost Units > Total Road Length;
2. Click New Button;
3. Fill the Necessary Information; and
4. Save the Form.

15.3.6 Defining Revenues

In E-RUCS, revenue is defined as the sum of different source units. These units include:

- Existing Sources;
- Additional/New Sources;
- Transit Charge; and
- Others, as per the Software User's Choice and Requirements (Lump Sum).

As discussed earlier, the setting for these units must be defined before the revenue data to be considered for data entry.

15.3.6.1 Existing Sources of Revenue

Before the data entry for the existing revenue begins, a user must make sure that the inputs for the process of existing revenue source are set in place. These inputs are:

➲ **Vehicle Fleet Information**

This table includes all the necessary information including fleet size, vehicle-kilometer, etc.

The steps to be followed are?

- Road User Charge > Vehicle Fleet Information.

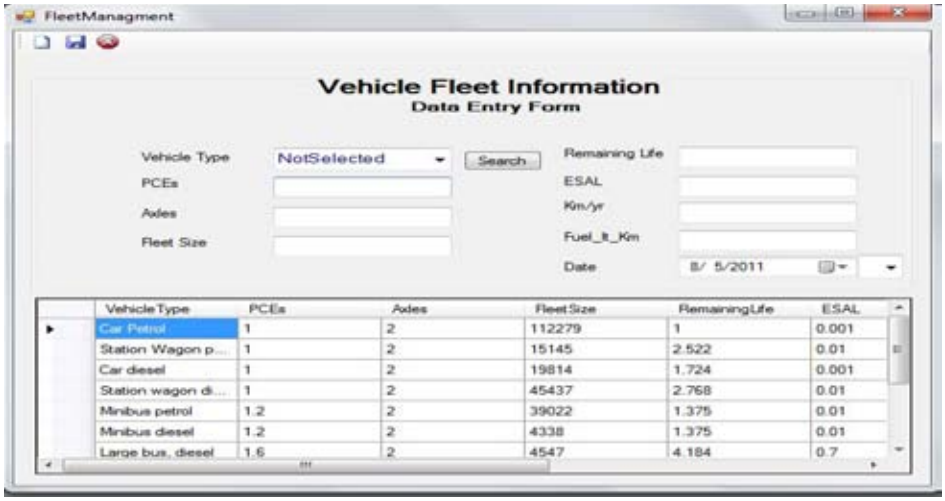


Figure 15.9: Vehicle Fleet Information Form

➲ Annual Distance Traveled

In this setting annual distance traveled by vehicle has been presented under different road categories.

The steps to be followed are:

- Road User Charge > Annual Distance Travel;
- Fill the data; and
- Save the entry.

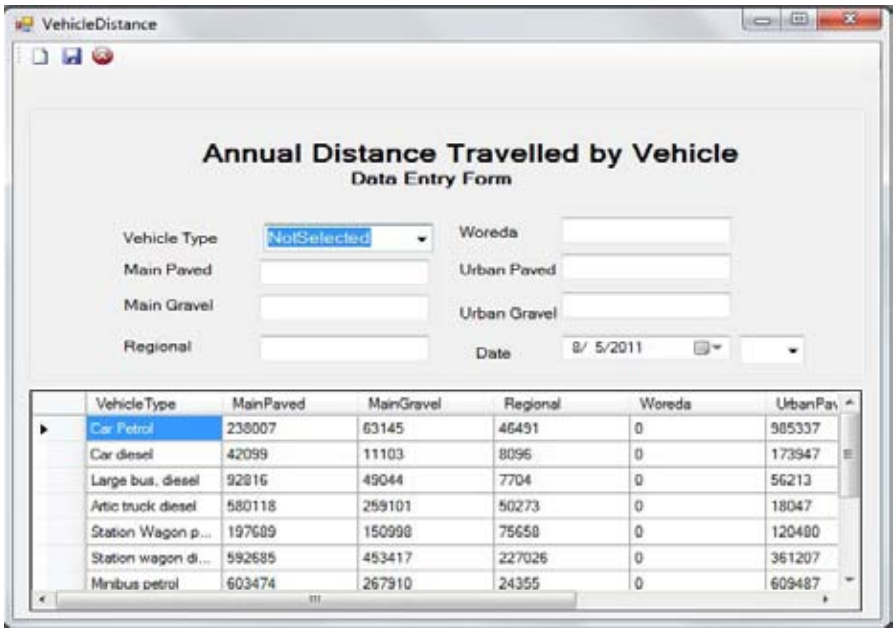


Figure 15.10: Annual Distance Traveled Data Entry Form

The Form for data entry and to update the existing revenue has been shown in Figure 15.11.

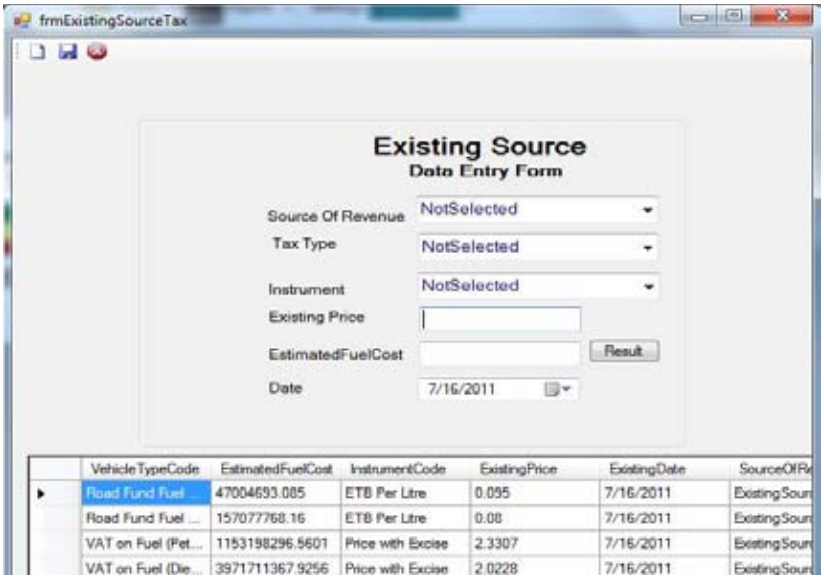


Figure 15.11: Existing Source Data Entry Form

As shown in Figure 15.11, the existing sources of revenue can be calculated during data entry by clicking the "*result*" button.

15.3.6.2 Additional / New Sources of Revenue

Additional/new sources include different sources of revenue, such as, Mass Distance Charges, etc.

The steps followed to find these revenue types are:

- User > Revenue > Additional Revenue;
- Click *new* button;
- From the drop down button select source of revenue, Vehicle type, Instrument respectively;
- Enter the existing price;
- Select data entry date; and
- *Save* the entry.

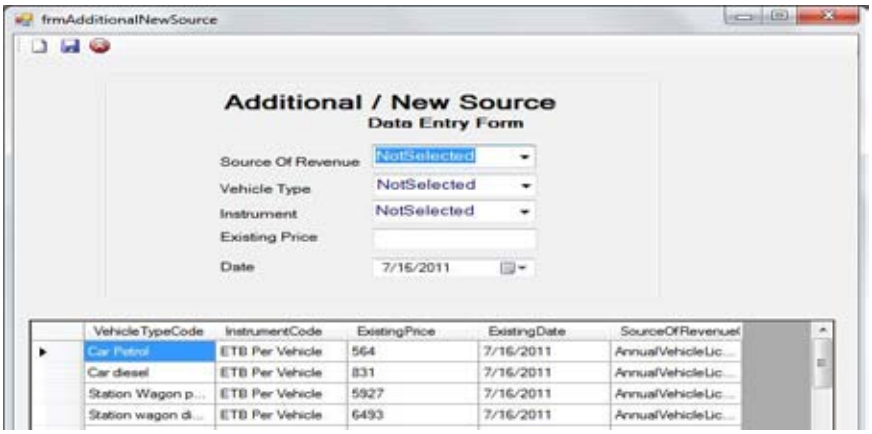


Figure 15.12: Data Entry Form for Additional/New Sources

15.3.7 Report Generation

The report generation interfaces are as follows:

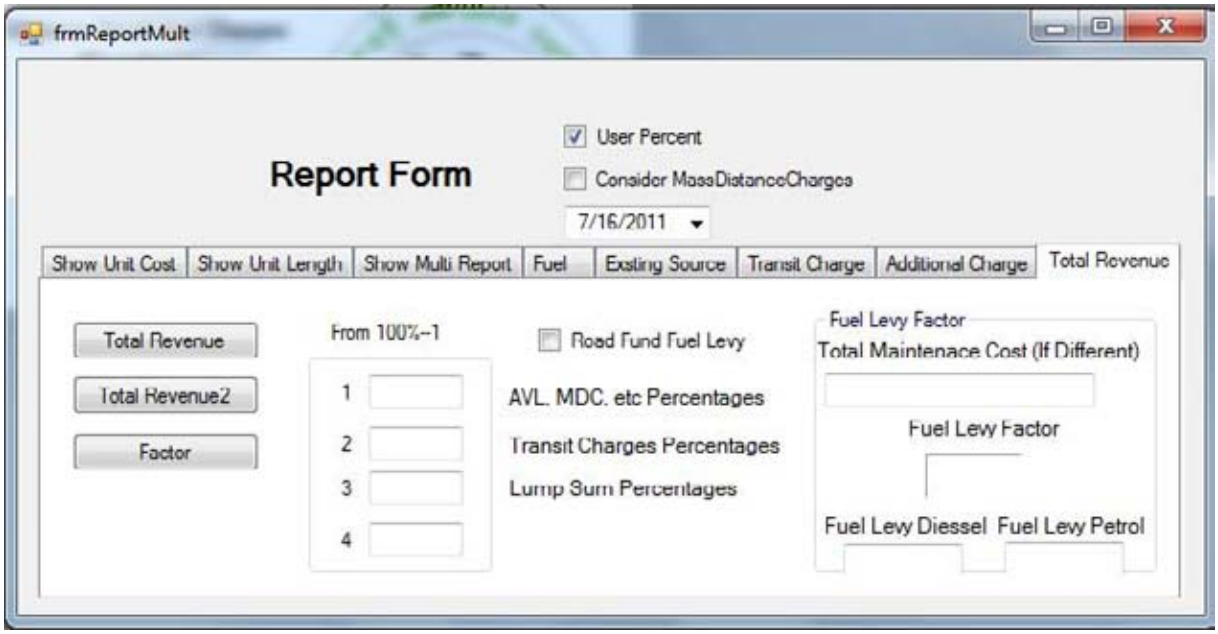


Figure 15.13: Main Report Form

I. Main Report Form

This form includes 8 tabs for different reports. The reports included in this form are:

- Unit Cost;
- Unit Length;
- Total Maintenance Cost;
- Actual Revenue from fuel based on consumption;
- Revenue from fuel based on consumption due to increase in transport output, in terms of vehicle-km over the years;
- Transit Charges;
- Additional / Lump Sum Charges; and
- Total Revenue.

Sample Report generation

- **Unit Cost:** this tab includes two means of generating unit cost report. By selecting "Use Percent" check box, a report in each category of unit cost can be generated and it is based on the percentage stated during unit cost data entry. If the check box is not selected, only a raw unit cost will be generated.
- **Unit Length:** road length tab is used to generate road length by road terrain.
- **Total Maintenance Cost:** Total maintenance cost can be calculated directly or by selecting "use percent" check box; the maintenance cost can be calculated based on the percentage specified.

- **Revenue from Fuel:** mainly three types of reports can easily be generated. Fuel consumption by each vehicle category, fuel consumption (in monetary terms, i.e. Ethiopian Birr) based on the total consumption, and fuel consumption prediction derived by a specified factor.
- **Transit Charges:** this tab is used to generate revenue earned from transit charges based on vehicle category.
- **Additional Charges:** In these categories only revenues which are entered in the system as lump sum will be generated in this tab of the report form.
- **Total Revenue:** based on heterogeneous value entered on the right side of input box or maintenance cost calculated under the maintenance cost tab, the deference between total maintenance costs can be generated in this part of the report. Also based on the input boxes at the middle of the report form, different scenarios can be calculated; in such a way, fuel levy factor changes can be fixed/set by manipulating other revenue factors.

II. Additional Revenue

In this report category, only Annual Vehicle License (AVL) Fees and Mass Distance Charges (MDCs) based revenue will be managed. Total revenue earned from AVL Fees and MDCs and a revenue factor for the MDCs and AVL for revenue scenario can also be generated.

During selection of report types, the following items need to be considered:

- **Type of Report**: such category is always considered where the type of report is to be selected. During selection, some of the unrelated report types are automatically disabled;
- **Percentages**: on report selection form there are four percentage input boxes. These percentages input boxes are used to enter different percentages which can be considered to estimate the level of revenue under different scenarios; and
- **Date**: is also required to be specified during the Report Generation.

Steps to be followed during any type of Report Generation are:

1. Report >Select the type of report;
2. Specify date; and
3. Click show button.

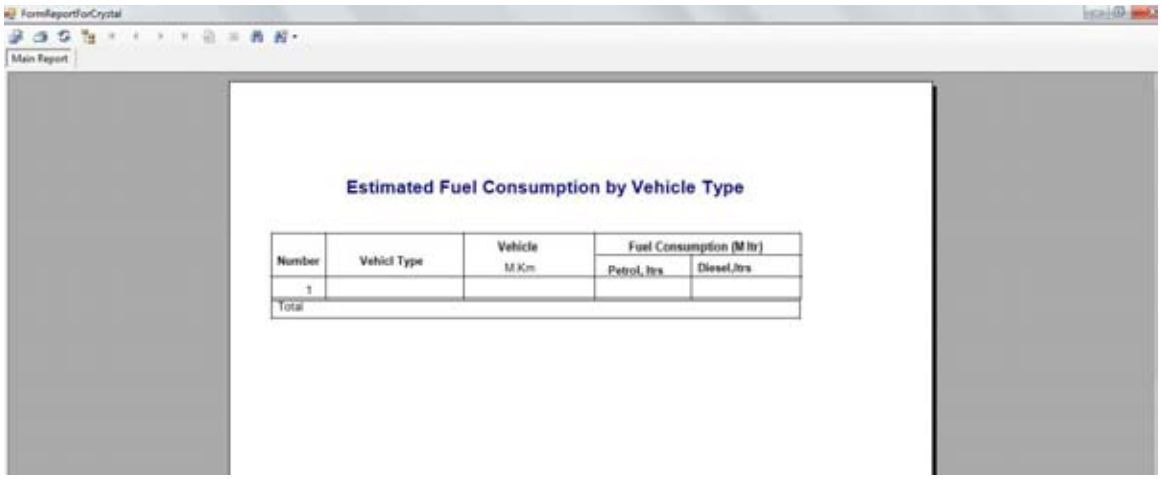


Figure 15.14: Sample Report Type

Some of the important generated report menus:

- **Export Report**

  - This menu is used to export a report in different formats.

- **Print Report**

  - Used to print a report.

- **Refresh**

  - Used to refresh a report.

- **Page navigation**

  - This menu is used to navigate to different pages of a report.

15.4 Application of the E-RUCS

The E-RUCS Software has been extensively used for analyzing the "Road User Charges" during the present consultancy services under different scenarios incorporating several changes in the sources and levels of charges for the Road Fund revenue estimations to meet the road maintenance costs with different levels of maintenance interventions[1].

The E-RUCS could also be used for managing road inventory data and related information, computing and generating outputs on maintenance needs assessment, required maintenance interventions, maintenance cost, and adjusting road user charges, etc.

15.5 Road Inventory Sub-system

Though E-RUCS is developed mainly for road user charges analysis, it has also a great role on managing road inventory and pavement condition. The condition data entry and management are mainly based on the data collection formats developed and used under the present consultancy services. The data entry steps are in the hierarchical way from the most common road features to features of specified road segments based on road types mainly paved and unpaved. Also the report for each road segment types can be generated from data entry form.

15.6 Frequently Asked Questions (FAQs)

- **What are road settings?**
  - Road settings are data entry settings, which are prerequisites for data entry of other tables.
- **How to access road settings?**
  - From the tool bar, click on road settings menu > select the appropriate setting name.

[1] Computer Model & Multiyear Road Maintenance Needs Assessment (Final Report, November 2011).

- **How to change password?**
  - From the user menu, select "change password" menu, and when the form is displayed, enter the old password first and enter your new password in the password text box and conformation text box. Finally save the form.
- **How to search a road?**
  - If road information is filled in to the database, a quick search can be done through "search using road code" menu under the tool bar. Please enter full or partial road code.
- **How to make road condition data entry?**
  - Road (under E-RUCS) is categorized as paved and unpaved road, based on hierarchy of menus under each road category.
- **What is road owner?**
  - Road owner is the proprietor of a road (authorized body for construction and management of road). In E-RUCS, road owner shall be managed in two ways:
    - Road Agency; and
    - District / Authority.
  - During data entry, a specific district / authority will be attached as owner for the specified road.
- **What is a specific transit fee report tab?**
  - Transit Fee/Charges can be entered based on individual vehicle types or a total amount as lump sum. In this part of the report, the former data entry report is to be handled.
- **What is tools menu?**
  - Tools menu includes administrative jobs, which are to be handled by the system administrator. These activities includes:
    - Creating users;
    - Changing password;
    - Setting backup path; and
    - Taking backup.

The E-RUCs Software has been extensively used in the present Study for estimating various road users' charges under different scenarios and options. Chapter 13 demonstrates the functional efficiency of the E-RUCS, and presents the results obtained for carrying out the road users' charges analysis.

16. WORKS FINANCED BY THE OFFICE OF ROAD FUND & MAINTENANCE COSTS: REVIEW & EVALUATION

16.0 WORKS FINANCED BY THE OFFICE OF ROAD FUND & MAINTENANCE COSTS: REVIEW & EVALUATION

16.1 General

One of the major components of the present Report is to review the works financed by the Office of Road Fund (ORF) in terms of effectiveness, efficiency and economy for quality of maintenance–routine and periodic, appropriate planning and prioritization on sample basis.

As per the ToR, the Consultants are required to carry out the above exercise for last three years. For this analysis, Monthly, Quarterly and Annual Progress Reports and Payment Certificates submitted by the road agencies to the Office of Road Fund, subsequent discussions with the road agencies, data and information given in the Financial and Technical Audit Report, 2005 have been used as database for the above exercise.

To meet the requirement on sample basis, the Study has reviewed maintenance works carried out in (i) two major districts of ERA (i.e. Alemgina and Sheshemane), (ii) three RRAs located in north, central and southern part of the country (i.e. Oromiya, Tigray and SNNP), and (iii) one MRA (Addis Ababa City Roads Authority, i.e. AACRA [as more than 50% of MRA roads fall under the jurisdiction of AACRA]. The ORF's Monthly Progress Reports and the Payment Certificates for various maintenance activities have been collected for recent years, which have been reviewed as per the requirements.

Besides reviewing and evaluating the works financed by the ORF, the chapter also investigates further working of the maintenance costs in Ethiopia, so that the real costs of maintenance activities could be captured. For the purpose, the chapter particularly evaluates economy, efficiency and effectiveness of road agencies while undertaking maintenance works and corresponding unit rates and total cost implications with additional facts and figures to capture the real costs. The exercise also assesses the impact of equipment cost for paved and unpaved roads for maintenance works and the practices being followed by the road agencies with own force and the private contractors, and also leasing companies in the country.

16.2 Review of Works Financed by the ORF

16.2.1 Performance & Efficiency in Maintenance Work

The physical performance in terms of length of roads portray that a tremendous maintenance work has been carried out by the Road Agencies with the help of ORF funding, as more than 250,500 km of roads brought under maintenance activities from 1998-99 to 2009-10[1]. On an average, the ORF funds more than 19,000 km of different roads annually for maintenance work in the country. It may, however, be noted that country has a substantial backlog in road maintenance task, as about 21,500 km (44%) of roads are in still fair/poor conditions or just on the verge of becoming very bad roads, which would lead to the non-maintainable condition. This situation can be improved and road asset can be saved by timely and proper maintenance efforts. The efforts would help in general socio-economic development of the country, particularly to the rural people and economy.

In view of quality checks for the maintenance activities, the Financial and Audit Department (ORF) carry out the following tasks: (i) accomplishment report review; (ii) surprise visit to the

[1] Source: Office of Road Fund.

sites for quality check; and (iii) retaining the private consultants for the maintenance activities. The staff often conducts the visual inspections of the work sites, which provides with more subjective inferences. However, it is observed that the staff is found often busy more in "desk work" rather than visiting the sites.

In order to evaluate the performance and efficiency of the Road Maintenance, the level of objective achievements can be analyzed following the methods used in one of the World Bank's reports on Findings[2]. Evaluation criteria may be based in terms of four parameters: (i) quality of the road network; (ii) operational efficiency; (iii) efficiency in resource allocation; and (iv) development of local construction industry.

16.2.1.1 Quality of Road Network

The condition of classified road network in Ethiopia shows that the share of road network in "good condition" which was 22% in 1997; presently as per RSDP IV document (2011), proportions of different types of roads in good condition are as follows: asphalt road 73%; gravel road 53%; and rural roads 53%. Though, this is a significant achievement, as per the proposal of RSDP IV with increase of the road network to more than 136,000 km, maintenance requirement will also increase and will be a great challenge.

As far as allocation of the funds for maintenance of roads under various categories in the country is concerned, up to 2009-10, about 72% of the maintenance budget assigned to the federal roads under ERA, 19% to the rural roads under RRAs, and 9% to the urban roads under different Municipalities. It may be noted that 50% of the total allocation to the Municipalities went to Addis Ababa. It is observed that though, funds are available, due to capacity constraints of the Road Agencies, monitoring process and controlling maintenance quality have been felt difficult.

16.2.1.2 Operational Efficiency

For having a proper system to evaluate the operational efficiency of the Road Agencies, the disbursement figures show that in some cases the monies allocated not fully utilized mainly due to the lack of their absorptive capacity, particularly in case of regional and urban road agencies and the unutilized amount invested in the Treasury Bills[3]. This phenomenon shows that the money collected for the ORF is not fully disbursed due to certain constraints.

Lack of proper and functional maintenance equipment has also been reported to be a serious hindrance achieving the maintenance targets in Ethiopia[4]. The discussions with the Road Agencies on the above reveal that generally they do not face problems with the disbursement of fund, rather they observe capacity constraints to utilize the allocated funds, particularly the problem being faced with availability of machines or considerable delays in repair of available machines, if found not functional. The presence of non-availability of proper machines impedes the work progress significantly. It has also been reported that nearly 50% of the machines, agencies get on rent which sometimes delays the projects. This phenomenon, in general, leads to inefficiency in the whole operation.

Qualitative assessment of the performance and efficiency, of course, supports that the improvement in: (i) selection process of the roads need to be maintained; (ii) contract management; and (iii) disbursements arrangements, have resulted in a considerable reduction in road maintenance cost as well as timely completion of works.

[2] "Implementing Second-Generation Road Funds", Findings Report 206, (2002), Ajay Kumar, Senior Transport Economist, Africa Region, World Bank.

[3] Details are presented in Chapter 5 of the Report Guidelines for Approving Eligibility of Maintenance Works for ORF Financing (June 2011).

[4] Based on Monthly Progress Reports of road agencies pertaining to maintenance and also discussions with officials of RRAs.

The operational efficiency is dependent on several factors, which can be improved considerably through improvement in different functional areas of the road agencies, e.g. proper planning, financial management (allocation, disbursement and revenue collection), technical areas (appraisal, monitoring and evaluation), reporting procedures, etc. as well as by reviewing them from time to time. This is a continuous process. The ORF is also allowed to spend up to 1% of the fund on miscellaneous activities, e.g. organizational improvement, so this amount can be judiciously utilized for the above purposes.

It may be interesting to note that the "employees' turnover" at the Road Agencies[5] has been observed as a significant event. As reported, the salary structure at the road agencies is not competitive, which results in the high turnover, and also not lucrative enough to the attract professionals from the open market or from other departments. This situation adversely affects the road agencies in two ways; first, the trained manpower leaves the job; and second, restricts to increase the professional manpower, as the professionals do not usually like to join government agencies. This further increases the capacity problem of the road agencies.

ERA has taken measures to improve its effectiveness in a number of areas in the past few years[6], with a focus on:

(i) Establishing efficient commercial operation. Performance contract agreements have been developed between the ORF and ERA, which has resulted in improved accountability and efficiency in resource use. Payments are no longer made on a cash flow basis, but on submission of payment certificates (based on the agreed unit rates), approved by a supervisor; and

(ii) Maintaining effective public information systems and transparency through independent financial audits and dissemination of information.

The operational efficiency is further likely to improve by introduction of the institutional reforms in the Road Agencies in Ethiopia. For example, the ERA is now set for carrying the maintenance activities by establishing commercial operations in maintenance districts and jointly implementing performance contract agreements with the ORF.

At that stage, the Ethiopian Roads Authority would be dealing mainly with regulatory, planning, policy formulation, contract administration and setting design standards. In case of the RRAs for rural roads, two units namely planning and regulatory unit, which would be dealing with planning the works and second, operational enterprise for execution of works in order to structure effectively the identification, formulation and implementation process of their projects. The above decentralization of the maintenance activities would certainly lead to higher efficiency for the available resources.

The constraints to maintain the regional road network is not necessarily, so much because of lack of financial resources, rather a lack of capacity in the construction industry and willingness of experienced engineers to work in distant regions[7]. The implementation of the reform study recommendations in terms of improved incentives and placement of staff is at different stages. A number of initiatives are underway by different donors to develop the capacity of the RRAs, especially with regards to planning and contract administration[8].

[5] The issue, as raised in Road Financing Study, 2005 is also valid in present context, as brought out in the Launch Conference of RSDP IV (2011).

[6] "Project Appraisal Document", Second Phase of the Sector Development Program (2003), the World Bank.

[7] Ibid.

[8] Ibid.

16.2.1.3 Efficiency in Resource Allocation

The ORF fixes the maximum budget on the basis of fund available as balance, and the current year revenues, thereafter the fund allocations to the Road Agencies take place as per the set overall criteria. The basic allocation criteria of the budget earmarked by the ORF for carrying out the road maintenance activities was 70%, 20% and 10% to the ERA, RRAs and Municipalities respectively till 2004, which was revised as 65%, 25% and 10% respectively for these Road Agencies.

The revision was based mainly on the increase in road length under RRAs as well as their technical capability. However, initially these allocation criteria were started mainly on the basis of requirement of the Road Agencies with their capacity of undertaking the work and also observing the trend of the maintenance activities. There is also a provision of "supplementary budget", i.e. up to 15% of the allocated budget to a specific road agency, based on the actual requirement.

The prevailing Maintenance Action Plan (MAP) sets the overall targets of the maintenance activities in the country, and in turn, the ORF gets the targets to follow. Of the targets set, generally, about 72% budget of the entire road network has come under ERA. It may be noted that ERA has relatively higher capacity to undertake the road maintenance tasks. In fact, while allocating the resources or formulating the maintenance plan at a road agency level, capacity constraints have been playing an important role.

For allocating funds among the RRAs, the ORF follows length of the road in a specific RRA as allocation criterion. This practice may not be suitable for relative socio-economic considerations in the road maintenance activities of various RRAs. The allocation criteria should be rather made broad to appreciate, inter alia, the current and future economic development potential of the region. Hence, the ORF needs a systematic method to rationalize the allocations, which requires socio-economic development aspect also into consideration while allocation of Fund.

For maintaining the urban roads in Ethiopia, the municipalities are allocated 10% of the total budget of the Fund, of that about 50% is given to the city of Addis Ababa and remaining 50% to other municipalities of the country. For allocating the Fund, other towns/municipalities are selected on the basis of traffic level, dry cargo traffic, presence of warehouses, etc., besides the population size of the city.

In general, to observe better quality of road network, operational efficiency, and effective resources allocation, it is important to enhance the institutional and technical capabilities of the Road Agencies and also the local contractors for undertaking more maintenance work.

16.2.2 Current Unit Rates for Maintenance

The Consultants organized several meetings with the senior management and engineering staff of the ERA's DRMCs, different RRAs and Addis Ababa City Roads Authority (ACCRA). It is emphasized that adequate pricing of road maintenance works was one of the major concerns of all the road agencies. The following issues related to the prevailing unit rates applied to the maintenance works were identified:

- The unit rates presently used for maintenance works were fixed in 2006-2007, which are no longer valid in present scenario, as major components which govern the unit rates of maintenance activities like, fuel cost, cement and steel prices and conversion rate of US$/ETB are changed significantly in recent years. So it is very difficult to undertake the maintenance activities using these rates, and it is one of the major reasons, the local contractors are not motivated to take the maintenance activities because of unviable rates;

- Considering the inefficiency of most of the routine maintenance activities due to the limited scope and intermittent nature of this type of work, the current level of unit rate do not allow for the economical rental of road maintenance equipment; and
- Also the Financial and Technical Audit Services (2005) concludes that the current rate of overhead costs included in ERA unit rates appears to be too high, i.e. 35% of the direct cost.

16.2.3 Review of the Road Maintenance Activities Carried Out

This section presents the review of monthly, quarterly and annual progress reports relating to the road maintenance activities undertaken by the road agencies, which are submitted to the ORF. The reports provide consolidated details on cost, type of works, quality and effectiveness, hence, selected for exercise comprising review of maintenance works.

The reports describe the financial and physical progress of maintenance activities, unit rates used for maintenance activities, problems encountered in executing the works and finally the observations of the present Study on the work done.

The summary and major issues related to the exercise undertaken are given as follows:

- In view of quality checks for the maintenance activities, the Financial and Audit Department, ORF carries out the following tasks: (i) accomplishment report review; (ii) surprise visit to the sites for quality check; and (iii) retaining the private consultants for the maintenance activities. The staff often conducts the visual inspections of the work sites, which provides with more subjective inferences.
- Lack of proper and functional maintenance equipment has also been reported to be a serious hindrance achieving the maintenance targets in Ethiopia.
- The operational efficiency is likely to improve by introduction of the institutional reforms in the Road Agencies in Ethiopia which would lead higher efficiency for the available resources.
- Using the rates for undertaking the maintenance activities, as fixed in 2006-07 are no longer valid, which is one of the major reasons the local contractors are not motivated to take the maintenance works.
- There are some discrepancies observed in Monthly Progress Reports and related payment certificates, related to unit rates, work planned and work executed:
    - In the Progress Report submitted by Oromiya Region, there is a discrepancy in the planned amount for each of the maintenance projects, contract network length (4,484.1 km in the financial statement and 3,965.8 km in the progress report) and the financial accomplishment for each of the maintenance projects.
    - In Tigray RRA, some municipalities resorted to transport cobblestone from too far to the worksite, e.g. Alamata Municipality transported cobblestones from Mekelle, which is about 137 km. This could have a negative impact on the progress and total project cost; fearing possibility of failing to complete the work, Adwa Municipality transferred the amount budgeted for cobblestone into a new unplanned work item, i.e. selected material re-gravelling; and Axum Municipality shifted the amount budgeted for periodic maintenance into cobblestone work, due to shortage of equipment/machinery that could have been resulted efficiently if managed, during planning stage instead of shifting the budget later during execution.
    - The SRRA planned to carry out 284 km periodic maintenance work and 1,164 km routine maintenance work in the fiscal year 2009-10. In the physical status, it was noted from the MPR that 1,164 km had been planned for execution in routine maintenance works with a budget about ETB 7.53 million. However, in a summary

(SRRA Progress Report, June 2009-10), an amount (ETB 9.09 million) was utilized for a length of 460 km only.

- The MPR of Sheshemane District shows that in the fiscal year 2009-10, an additional amount of ETB 2.4 million was budgeted, when compared with the previous year, 2008-09. However, when the utilized amount is analyzed, there was a decrease of ETB 2.85 million in 2009-10 as compared to 2008-09 figure.
- As per the MPR of Alemgena, the district accomplished what had been planned for 2008-09 fiscal year. However for 2009-10 fiscal year, the district performed well on regular term maintenance, but not on intensive, as accomplishment was 51.7%, and temporary term maintenances, as 14.4%.
- Considering the financial progress, as presented in the MPR, the AACRA almost accomplished what was planned for 2008-09 fiscal year, whereas in 2009-10, it accomplished more than that planned.

- In general, the Employer's Representative engaged for supervising the maintenance work by the road agencies indicated some problems, such as, shortage of sufficient machineries/equipment and necessary spare parts, old aged machineries, and less performance of length-person crew, Non-availability of suitable materials near the work sites, etc.

16.3 Maintenance Costs: Review & Evaluation

Before finalizing the core activities of the present Study, the Consultants assumed an additional verification assignment to investigate economy, efficiency and effectiveness of road agencies while undertaking maintenance works and corresponding unit rates, and total cost implications. This exercise in particular is important in view of fund constraints and also value for money.

In due course, the impact of equipment costs for paved and unpaved roads have been assessed, and the prevailing practices analyzed by taking two sample road agencies and one private contractor and also leasing companies in Addis Ababa. The Consultants organized data collection as well as interviews with the above entities.

The interview format was designed to contain the questions on:

- rationale for calculating overhead, unit cost of construction materials, wage rate;
- spare parts and their effect on unit rates;
- equipment layoff time and its effect on unit rate;
- taxes and profit impact on unit rate calculation;
- quality monitoring mechanism; and
- Stakeholders' understanding of efficiency and techniques applied to be efficient, etc.

16.3.1 Private Contractors

16.3.1.1 Overhead Calculation: The Rationale

During the discussions with one of Grade-I contractors in Addis Ababa, who has ample experience in different sectors of the construction industry, including:

- Road construction, upgrading and rehabilitation;
- Real estate and building;
- Rental of construction equipment; and

- Production of construction materials, such as, asphalt mix, crushed aggregate, concrete pipes and tilesand participates in road construction works throughout the country.

According to the contractor, the overhead elements include all expanses of indirect construction inputs and supporting activities, viz, warehouse, finance, management, garage, etc.

The contractors reveal two kinds of overhead calculation methods, as per current practices, viz.:

i. Whenever the contract project is won by the contractor, it is the normal practice to calculate the detailed overhead elements, which are relatively specific for the particular project and finding out the total share of the input and distributing into the unit rates of individual activities. However, it should be noted that, since the contractors are engaged in different sectors, some overhead inputs have a nature of cross sectors involvement, as a result of that the overhead to different activities are apportioned to that particular project; and

ii. When the size of project is small or leasing of equipment to any client, contractor includes 10-20% lump sum mark up for overhead. Whenever the number of leased equipment is few (like one or two), the overhead percentage will be on higher side (i.e. 15-20%); however, when considerable numbers of equipment are leased, the percentage decreases to the minimum side.

In both the above-mentioned cases, it is stated by the contractors that the percentage rate of overhead is highly flexible; and is dependent on the type of project and anticipated competition for winning any specific contracts.

16.3.1.2 Rationale for Calculating Rental Cost of Equipment

The contractors appraised the consideration of the following points during estimations:

- Expected life time of equipment to calculate owning or replacement cost;
- Operation costs, such as, common and known expenses like spare parts, repair and maintenance services, lubricants, etc;
- Operator salary, daily allowance and relevant expense, the contractors prefer to use their own equipment operators for the wellbeing of the equipment;
- In most cases additional cost for time keeper salary and per diem, who will record the equipment operation hour and serve as communication agent between the client and the contractor;
- In some cases, fuel consumption costs will be included in rental rate calculation to accommodate those clients who need to avoid the logistics of providing fuel, such as, purchasing fuel, transporting, storing, etc.;
- In most cases provision of low-bed for transporting the equipment is the responsibility of the client, but some clients prefer to get transportation service from the supplier;
- Insurance costs; and
- Overhead costs.

The methodology of calculating rental cost is mostly based on directives from the equipment manual, such as, fuel and oil consumption per hour for different types of performance (low, medium and high), service time of fast moving parts, viz. fuel filter, air filter, hoses, time belt, blades, chains, tyres, etc.

In renting business, there will be backup services to be provided on site and included in the contract agreement. If a contractor or supplier of the equipment couldn't give the backup services (after rent services) or replace the equipment within the stipulated time (usually three days), the client has the choice to look for other supplier. When the supplier does not have similar type of equipment for replacement and at the same time he wants to proceed with the contract, the supplier, by himself, go to other suppliers and provides the equipment even if the rate is higher than the agreed rate.

It is also stated that before making bids or giving quotations to the clients, the contractors do a market price assessment and act accordingly. As mentioned above, the contractors use to play the amount of overhead in this exercise to win a rental business contract.

In most cases, rates are given on hourly basis, except in the case of dump truck, where the unit of measurement is m^3-km. In this arrangement, both parties have comparative or win-win advantages. This means that, if the rental arrangement is on hourly basis other than m^3-km, the client may be disadvantaged since the productivity depends on operator's behavior. While in m^3-km arrangement, the operator is naturally forced to produce more to get or to be paid more.

According to the contractor, since the scope or scale of his own construction contract project and renting business is so large, he usually maintains stock of major spare parts enough for his equipment fleet. This arrangement has great advantage in backup or after rent services to create good will in the business.

There are some tax holiday events for importing equipment and spare parts, which are restricted to minimum equipment fleet threshold for that particular grade of contractors. In common practice, such tax holiday advantage doesn't help the market to adjust the price in the rental business. But during bidding, to win the contract, the contractors use this advantage to reduce its cost as that of the overhead.

16.3.1.3 Idle Time

Concerning renting time, there are three types of equipment hours in renting business, which are as follows:

- *Operation Hour:* Actual active hour of the equipment, which is payable as per record;
- *Down time:* This time includes all breakage, service time and holidays and weekend (Sunday) times, which is not payable; and
- *Idle time:* Although the machine is operable, due to client's scheduling and arrangement, the machine could be idle in any of the six working days. This time has a minimum provision of payment as per the agreement and type of machine. Equipment, viz. dozer, grader, excavator and dump truck will have an eight hour per day payment arrangement for being idle. While equipment like roller, the idle payable time is 5 hours/per day, since the operation of the equipment is activity dependant.

16.3.1.4 Cost of Construction Material Produced by Contractors

The construction material cost is dependent or includes:

- Market cost of raw material;
- Operation cost for the plant, which includes labor and equipment;
- In some cases, cost of transport is considered, if the client requires provision of the material at his own site. Otherwise, mostly customers bring their own transport vehicle;

- Overhead; and
- Tax and profit.

In case of the contractor's own project, to avoid double counting of overheads, contractor excludes the overhead of supporting staffs and other administrative expense from material cost. This is one of the advantages of such contractors over other contractor, who has no such plan to win bids and be competitive.

16.3.1.5 Professional & Skilled Manpower

According to the contractors, they mainly focus on key skilled personnel or professionals. The problems on hiring such key professionals are their limited number. This situation inflates the market cost of the manpower, which has its own effect on project costs.

One of the factors, which affect the manpower cost in the market, is the client's requirement of higher qualification, which is sometimes not necessarily important compared to the type of activities. Contractors also underlined that there would be a necessity for extra payment for professionals or skilled personnel who would be assigned in remote areas.

Another important point sited by the contractors is the absence of some skilled positions in the client's imposed qualification requirement, and they are found to be very crucial especially in equipment intense projects, e.g. mechanics, experience heavy machinery operators, etc.

Performing multiple activities by single skilled personnel is more difficult in road projects than building contracts, which are by their nature confined in one station and easy for attending activities at a time, so that there is a possibility of optimizing manpower costs. In road projects, it would, however, be difficult to conduct close supervision on different activities along a road stretch.

16.3.1.6 Efficiency

As per the definition of the private contractors, efficiency is to deliver the appropriate service on time with quality, with no additional cost. However, there are many factors influencing the efficiency, as reported.

Some of the factors that highly influence the contractors to be efficient in the market are:

- Higher construction material cost due to inflation, and other construction elements that have influence on the maintenance work to proceed ahead and finish the contract on time;
- Management problem to timely mobilize equipment and schedule activities to reduce idle time of equipment and manpower. Most of the time, traditional methods of management and operation will suffer with high cost;
- Problems of adoption and proper use of technology to operate and be efficient. Good knowledge of the equipment to repair when it is broken or damaged;
- Insufficient number of professional or skilled manpower in the road sector affects the timely completion of projects in the planned period;
- Remoteness of the project has its own impact on the timely accomplishment of the project and make the cost higher;
- Trend of contractor's tending towards piecemeal procurement of goods rather than bulk purchase; and
- Lower unit rate, which is caused by unfair competition to win project will affect quality and timely completion of projects and sometimes, it could end up with

termination of projects that is in turn the cost of the client. Current practices in the maintenance sectors seem victim of such unfair competition.

On the other side, client's inefficiency has its own effect on contractor's productivity, which in turn comes as a cost on the client including:

- Delay in payments to the contractor will affect the financial status of the project to proceed ahead;
- Improper or incomplete design will take its own time for correction; and
- Timely approval of works.

16.3.1.7 Quality of Works

In practice, the burden of quality control is on the shoulders of consultants or clients' supervisors. But professionals under contractors establish internal quality control trend before handover of finished works.

Sometimes owners of the companies want to compromise quality due to less wage rate or qualification of manpower. Although professionals in such companies refuse such compromises.

16.3.1.8 Profit

According to the contractors, 15-20% of the project cost is considered for profit. But the contractor always assesses the reputation, capacity and goodwill, which are also the contenders in the bid.

16.3.2 Road Agencies – Own Force Crews

16.3.2.1 Introduction on Alemgena District Maintenance & Construction Enterprises

Ethiopian Roads Authority has 10 maintenance districts; Alemgena is one of these Districts. After the separation of regulatory and operation departments of ERA, following BPR Studies in Government organizations, Alemgena District reformed itself in to two major brigades, Construction and Maintenance Brigades, and District Headquarters support office. There are seven maintenance sections under Alemgena District. Currently Alemgena District is engaged in construction and upgrading of roads using capital investment.

On the other hand, it is getting finance from the ORF for periodic and routine maintenance of roads. Despite the reform of the district in to corporate level, contemporary costing of projects and supporting activities are not in the form of profit oriented arrangement rather it follows the former trend of force account operations.

Unit rates for capital projects accommodate market price of construction materials, rental equipment and revised salary scale of government staff. However, the district still applies the 2007 unit rates of the ORF for periodic and routine maintenance of roads although it is using rental equipment particularly for periodic projects. Equipment Rental is usually done by operation headquarters officials at Addis Ababa as part of technical support or backstopping for districts. This arrangement would be transferred to individual Districts as entrepreneurship on market basis gets enhanced.

16.3.2.2 Overhead Calculation: The Rationale

According to the district officials, overhead element of individual activities is taken as 15-20% of the direct costs of labor, equipment and material inputs. This proportion of the overhead will be distributed and built in the unit rate of each activity. The district overhead element is in

line with the 15-20% considered by the 2007 unit rates of the Road Fund. On the other hand, the District Engineer underlined that whatever be the amount and calculating methodology for overhead element of unit rates for routine and periodic maintenance activities, there is no room for considering the contemporary overhead element until a new revision of existing unit rates is initiated by the ORF.

16.3.2.3 Equipment Rental Rate

In ERA, Equipment Rental Rate has two major components, i.e. owning cost and operating cost. Operating cost includes fuel, lubricant, and maintenance and repair expenses of machines, while owning cost assumes the total investment price divided to the life time of the machine. As explained above, the overhead is considered in the unit rate of maintenance activities, but not on Equipment Rental Rate to avoid double costing. No tax or profit element is considered in this exercise.

Current maintenance budgeting system has no opportunity to consider market cost of inputs to calculate equipment rental unit rate until a new revision of existing unit rates is initiated by the ORF. As a result, the District Engineer highlights that negative cash flows are common in maintenance accounting reports and high level management body opts to provide the service for the road users and preserve the asset in spite of the cost overruns in most activities. DRMCs are sometimes forced to use capital project's resources for emergency interventions, materials production and backlog clearances, which again obscures the real cost of asset preservations.

Contrary to this, there are also seldom practices of executing projects, with defects beyond routine or periodic maintenance using the ORF finance. For such extraordinary activities, agencies argue that they engage themselves in such operation, when the periodic maintenance interventions are due:

- to maintain round the year and throughout pass-ability;
- to preserve the road asset;
- to minimize VOC or transport costs efficiently and provide safe movement over such routes or sections;
- as current Ethiopian context shows that the upgrading and new road construction programs seem not getting saturated or reduced, so that rehabilitation works could be fully handled by capital investment. Until that such extraordinary activities are unavoidable unless the road fund proclamation includes such rulings which could address road development of that sort; and
- as the district officials suggest that, in the road maintenance sector, considering, at least, market cost of inputs in the existing unit rates of the ORF is of a paramount importance to sustain asset preservation, better and safe service to the road users and smooth transition of the districts to market oriented enterprises.

16.3.2.4 Idle Time

In practice, the own force equipment fleet are old in age or model, large in number, and less efficient in performance. As a result, machines used by the own force crew are characterized being in downtime rather than being idle. In ERA districts, unlike private contractors, currently there is no room for project by project costing using contemporary market price and common provisions for idle time within the unit rates of individual maintenance activities. Regarding own-force capital projects, costing of activities is mostly done for all working days, which are assumed to be enough to finish that particular activity irrespective of interruptions due to any reasons, which makes machines idle. In other words, machine's idle hours are not payable except in the form of prolongation cost for approved time delay claim cases, which is not a representative argument for mainstream own force capital projects.

In road maintenance projects, routine or periodic, if districts opt to use rental equipment cost, including idle time provisions, beyond the rates established in 2007, is the risk of the districts, which are usually reflected in the form of negative cash flow and activity cost overrun.

16.3.2.5 Construction Material

Like the private contractors, Alemgena District produces its own construction materials like pipes, aggregate, asphalt mixes, concrete, etc. The construction material cost includes market cost of raw materials, operation cost for the plants (including labor and equipment) overhead and cost of transport. However, for own force maintenance projects, whatever the contemporary cost of construction materials is, districts budget will be calculated based on the approved unit rates of the ORF. To cope up cost overruns and provide maintenance services, in some instances, districts utilize the advantage of capital projects in the vicinity of roads under maintenance to get construction materials and perform emergency works using one enterprise freedom even though extra cost couldn't be recovered.

16.3.2.6 Professional & Skilled Manpower

As any government organizations, the Districts get their professionals and skilled personnel through the headquarters based on known salary scales. Presently, the Districts have limited freedom of hiring lower grade workers. The Districts do not have the option to recruit professionals or highly required skilled personnel in response to onsite needs. In such cases, the only way is using contract employment or short time skilled personnel consultancy service from the market through application to head office. Districts have the right to transfer workers from section to section or from project to section or from project to project as the case may be.

The Districts follow usual governmental instruments to motivate workers and reach some form of productivity. In this regard, overtime arrangements are mostly used for increasing efficiency and productivity and, at the same time, raise monthly income of workers. Camping services are other types of motivation mechanism for government workers and helps to retain staffs on road projects particularly technicians.

16.3.3 Economy, Efficiency & Effectiveness

The road users pay for the road service measured in terms of availability of the good roads from the road agencies or the private sector. Although it is not common to value road availability in money terms, road service availability could be given a financial value corresponding to the forgone benefits of road users plus the abnormal vehicle operating cost.

To address the road service availability issue, every party or stakeholder in the maintenance sector should strike a balance between Economy, Efficiency and Effectiveness during remedial interventions, i.e. cost, quantity with time and quality. It is very clear that in running public or private organization, there should be a balance of efficiency, i.e., the way resources are employed, and effectiveness, i.e. the extent to which the desired goals are achieved.

To measure effectiveness in a tangible manner is rather difficult due to commonality in understanding of the parameters. As these parameters are quite difficult to measure, Road Agencies (Oromia and Alemgena Districts Road Maintenance Corporation/Enterprises) Engineers, measure their efficiency by timely maintenance of planned roads to avail service for the road users, which is a common interest of public agencies. Achieving such goals, amid of low maintenance unit rates, however results in cost overruns making negative cash flows indifferent in public road enterprises.

At this juncture, the maintenance districts, now enterprises, challenge the situation in such a way that if the Government doesn't reconsider the true road maintenance cost requirements,

at the same time persist in bringing in new network to the system, then, the National Road Maintenance Strategy will be in a problem, because:

- None of the above indicators, i.e. Economy, Efficiency and Effectiveness, could be achieved by the new public enterprises;
- Deterioration of the road asset will be wide in coverage, fast in time, serious in depth and eventually lead to high cost of restoration/rehabilitation;
- The private sector will not be attracted to the sector, which devoid the comparative advantage of competition; and
- The sector will remain as a scapegoat for high transport cost, weak or inefficient mobility and negative impacts to the general macro economy of the nation.

Under the present analysis, to address the above-mentioned core issues, the Consultants have proposed and submitted reports on revised unit rates and additional revenue sources treating different scenarios. Further to this, although the reports are submitted months before, the Consultants took an initiative of organizing a taskforce to collect the current market price of equipment rentals and review/validate/test the revised unit rates so that frontline stakeholders of the study could make an informed decisions-beyond-doubt.

16.3.4 Unit Rate Development – Current Approach

The task force has reviewed the existing activity calculation sheet developed by the ERA and later on adopted by the ORF to establish the existing unit rates. As shown in Table 16.1, major routine and periodic maintenance activities for both paved and unpaved roads are selected and list of labor, material and equipment types are identified. Having these lists, a market survey is conducted in Addis Ababa, where main supplier of equipment and industrial construction materials are found.

Table 16.1: Selected Major Activities for Paved & Unpaved Roads from the ERA's Daily Cost Calculation Sheet

Code	Activity Name	Required Human Power		Required Material		Required Equipment		Average Daily Prod'n
		Type	Number	Type	Qty	Type	No	
313	Asphaltic Concrete Overlay	Labour Foreman	1	Hot mix production (Central plant)	260 m^3	Asphalt Paver, Crawler (5 - 7 m)	1	**225 m^3**
		Labourer III	6			Roller, Vibrator, 2 drums (10 - 12 Ton)	1	
		Sta. Equipment Operator IV	1			Dump Truck, 6 x 4(9 m^3)	3	
		Equipment Operator II	2			Roller Pneumatic(10 Ton)	1	
		Sta. Equipment Operator II	1			Asphalt Kittle, trailer mounted (1500 - 2000 Lt.)	1	
		Driver III	3					
317	Gravel Resurfacing (Selected Material)	Labour Foreman	8	Selected material (Gravel road surfacing)	345 m^3	Motor Grader (145 -160 HP)	1	**315 m^3**
		Labourer II	24			Roller, Vibrator, 2 drums (10 - 12 Ton)	2	
		Equipment Operator IV	8			Dump Truck, 6 x 4(9 m^3)	3	
		Equipment Operator III	8			Loader, Wheel(2.0 - 2.5 M^3)	1	
		Equipment Operator II	16			Water Truck(10000 -13000 Lt.)	1	
		Driver III	32					

Source: ERA's Daily Cost Calculation Sheet, 2007.

Based on the above list, the task force has discussed and requested current pr the three components; labor, material and equipment. In due course, the team understanding that in the last 4-5 years, particularly the last two years, the equipment rental rate with fuel has been critical. In regard to manpower the made salary increment two times and the team tried to review its effect. Altho requirement for maintenance activities is not as that of the construction projects of asphalt and crushed aggregate is also assessed.

Table 16.2: Summary of Current Equipment Rental Rates & Comparison of Fuel Equipment Rental Rate Collected from Private Contractor

Equipment type	Make & Model	Rated Capacity	HP	Average Rental Rate/hr		Comparison o Equipme	
				With Fuel	Without fuel	Fuel cost of machine s per hr (ETB)	Pr of th re w
Dozer	Cat D8R		305	1,279	697	582	
Dozer	Cat D7G		200	837	482	355	
Motor Grader	Cat 140 H		165	732	448	284	
Wheel Loader	Cat 950 G	2.9 m^3	180				
Wheel Loader	ZL-50G	2.9 m^3	212				
Wheel Loader	XGMA, XG953 sII	3m^3	217	680	345	335	
Wheel Loader	ZL-30FL	1.5 m^3	123	377	180	197	
Backhoe Loader	Cat 442D	1.0 m^3	98	382	212	170	
Chain Excavator	Cat 322C	1.3 m^3	162			289	
Chain Excavator	Kom PC-220	0.94 m^3	168	661	372	0	
Compactor Vib. Smooth Sin.Dr/S. foot	Cat CS-533D	10.5 T	138	437	214	223	
Compactor Vib. Smooth Double drum	HAMM HD-10	11 T	131			217	
Compactor Tyred	HAMM GRW -15	15 T	115	504	287	0	
Compactor Smooth drum	HAMM HD-12	5 T	26	127	79	48	
Asphalt Paver	Day F141C	9 m	190	1,138	782	356	
Curb ston Machine	Masinza		98	547	341	206	
Fork Lift / Telescopic	ETP 150	3.5 T	80	235	130	105	
Fork Lift	FD 35	3.5 T	65	162	73	89	
Low bed Tractor	VolvoNl10	64 Ton	300				
Low bed Tractor	Fiat 720E 443	70 T	414				
Low bed Tractor	Fiat190-30	60 T	300	580	203	377	
Low bed trailer	MMI	45 Ton					
Low bed trailer		70 Ton					
High bed trailer		25 Ton		136	116	20	

Equipment type	Make & Model	Rated Capacity	HP	Average Rental Rate/hr		Comparison of Fuel Cost against Equipment Rental Rate		
				With Fuel	Without fuel	Fuel cost of machines per hr (ETB)	Proportion of fuel to the total rental rate with fuel (%)	Proportion of fuel to the total rental rate without fuel (%)
Dump Truck	Nissan CWB450H	12 m^3	286					
Dump Truck	Fiat 330-36/30	16m^3	300					
Dump Truck	Styer	15m^3	285	542	201	341	62.91	169.60
Water Truck	Fiat 190-30	12,000 Lit	200	268	72	196	73.16	272.51
Water Truck	Fiat 240-30	16,000 Lit	300	400	107	293	73.30	274.52
Water Truck	Styer 00Z5250GSS	16,000 Lit	285	419	156	263	62.71	168.13
Fuel Truck	Fiat 110	8,000 Lit	200	300	86	214	71.26	247.99
Fuel Truck	Fiat 240-36	16,000 Lit	300	467	142	325	69.55	228.37
Mixer Truck	Nissan CWB450H	7 m3	286	598	281	317	52.96	112.56
Asphalt distributor Truck	Fiat190-30, with Massenza 40-F10/M burner	12,000 Lit, 300HP, & 4.5-9 kg/h, 70hp	370	695	297	398	57.20	133.64
Cargo Truck	Nissan PKC210	6.3 Ton	202	396	127	269	67.93	211.79
Cargo Truck	Isuzu NPR	3.5 Ton	150	315	109	206	65.41	189.08
Half Crane Truck	Fiat 190E-30	3.5 Ton	341	689	286	403	58.53	141.11
Crane Truck	Grove TMS 250	25 Ton	202	572	295	277	48.48	94.08
Dumper	Piccini1500AR		19	60	31	29	47.95	92.13
Mixer (Stationary)	Piccini BIO500B	500 Lit	25	83	44	39	46.88	88.24
Small Drum Roller	Dyn LP750	1 Ton	6.6	88	63	25	27.98	38.86
Plate compacter	Dyn LT-800	85 Kg	2.5	25	17	8	33.52	50.43
Wagon Drill With air Compressor		4,500kg	90	563	383	180	31.92	46.90
Air Compressor		250 CFM	65	185	83	102	55.08	122.62
Air Compressor		350-400 CFM	90	275	131	144	52.34	109.80
Concrete Vibrator			4	22	14	8	34.30	52.21
Single Cab (Diesel)		1Ton, 100-130hp	120	206	91	115	55.96	127.06
Single Cab (Diesel)		1Ton,80-100hp	90	160	73	87	54.12	117.94
Double cab (Diesel)		1ton,100-130hp	120	227	109	118	52.07	108.63
Double cab (Diesel)		1 ton, 80-100 hp	90	185	94	91	48.97	95.96
Mini bus (Diesel)		8-12seat,80-100hp	90	193	101	92	47.69	91.15
Asphalt Plant	LJB 1550	90-	260K	10,44	4,742	5,702	54.60	120.26

Equipment type	Make & Model	Rated Capacity	HP	Average Rental Rate/hr		Comparison of Fuel Cost against Equipment Rental Rate		
				With Fuel	Without fuel	Fuel cost of machines per hr (ETB)	Proportion of fuel to the total rental rate with fuel (%)	Proportion of fuel to the total rental rate without fuel (%)
		120TPH	w	4				
Crusher (Mobile) Jaw, Cone & Screen	PEGSON 1000MAX	150 Tph	465	1,930	924	1,006	52.13	108.88
Crusher Jaw, impact& Screen	China PE-750x1060	150TPH		864	734	130	15.03	17.69
Crusher Jaw with feeder (Reppi)	China PE-600x900	100TPH		236	200	36	15.06	17.73
Crusher Jaw (with out screen)		50 tph	50	187	92	95	50.74	102.99

As mentioned in the previous sections, fuel provision by machine owners has a difficult logistic component. Consequently, most of the road agencies use their fuel distribution facilities to fill rental machineries, although they will recover or reduce the contemporary fuel cost from the agreed rental rate.

As shown in Table 16.2, fuel cost of machineries cover significant portion the total rental rate with fuel, i.e. l5-73% of the rental rate. Particularly the range of proportion of fuel cost for major maintenance equipment is 31% to 71.3% or an average of 51%. On the other hand, evidences show that market price of fuel has significantly increased since the last revision of unit rates for maintenance activities in 2007. Therefore, it would be more logical for the Consultants to review or test the effect of this dramatic price change on the existing unit rate keeping all assumptions constant. This review will partly address long time grievance of the road agencies and test the appropriateness of the revised unit rates by the Consultants.

Two major periodic maintenance activities, for paved and unpaved roads, are selected from ERA Daily Cost Calculation Sheet. The activities include gravel resurfacing and asphalt overlay tasks which are common for periodic maintenance projects as shown in Tables 16.3 (a & b) and 16.4 (a & b). The comparison or review of Equipment Component of the selected activities is made for costs collected from leasing companies, private contractors and ERA revised rental rates.

Table 16.3(a): Ethiopian Roads Authority

Activity Daily Cost Calculation

(All Cost in ETB)

Activity No :	313	**Date:**	Oct. 2006
Activity Name :	**Asphalt Concrete Overlay**	**Unit :**	m^3

I/ Labour

Code	Type	Hours Per Crew Day	Hourly Cost (indexed)	Daily Cost	% for Operation
1	Labour Foreman	8.00	5.83	46.61	5.51
34	Labourer III	48.00	5.11	245.41	28.99
21	Sta. Equipment Operator IV	8.00	14.39	115.14	13.60
14	Equipment Operator II	16.00	8.70	139.17	16.44
19	Sta. Equipment Operator II	8.00	7.59	60.69	7.17
10	Driver III	24.00	9.98	239.44	28.29
			Sub - total	**846.47**	**0.23**

II/ Equipment

Code	Type	Capacity	Hours Per Crew Day	Repl. Hrs.	Hourly Cost		Daily Cost		% for Operation
					Oper. C.	Repl. C.	Oper. C.	Repl. C.	
40	Asphalt Paver, Crawler	5 - 7 m	8.00	8.00	283.48	268.79	2,267.86	2,150.35	18.33
31	Roller, Vibrator, 2 drums	10 - 12 Ton	8.00	8.00	247.15	117.95	1,977.20	943.59	15.98
3	Dump Truck, 6 x 4	9 m^3	24.00	24.00	292.20	83.06	7,012.70	1,993.33	56.68
33	Roller Pneumatic	About 10 Ton	8.00	8.00	119.79	86.96	958.32	695.68	7.75
42	Asphalt Kittle, trailer								

Code	Type	Unit	Quantity	Unit Price		Daily Cost		% for Operation
				Oper. C.	Repl. C.	Oper. C.	Repl. C.	
M13	Hot mix production (Central plant)	m^3	260.00	1,343.12	160.19	349,210.58	41,648.13	100.00
			Sub - total			**349,210.58**	**41,648.13**	**96.35**
Total Cost Per Crew Day						**362,429.21**	**47,711.01**	**100.00**

Table 16.3 (b): Comparison of Direct Machine Cost for Asphalt Overlay Periodic Maintenance Activity (ETB)

Code	Type	Capacity	Hours Per Crew Day	Existing Road Fund Daily Machine Costs		Revised Market Cost		Revised ERA Cost	
				Rental Rate/hr	Total Daily Cost	Rental Rate/hr (As of September 2011)	Total Daily Cost	Rental Rate/hr	Total Daily Cost
40	Asphalt Paver, Crawler	5 - 7 m	8.00	552.28	4,418.21	1,503.00	12,024.00	652.96	5,223.68
31	Roller, Vibrator, 2 drums	10 - 12 Ton	8.00	365.10	2,920.79	551.00	4,408.00	513.90	4,111.20
3	Dump Truck, 6 x 4	9 m3	24.00	375.25	9,006.04	638.15	15,315.60	562.74	13,505.76
33	Roller Pneumatic	About 10 Ton	8.00	206.75	1,654.00	485.45	3,883.60	276.00	2,208.00
42	Asphalt Kittle, trailer mounted	1500 - 2000 Lt.	8.00	54.50	436.00	185.30	1,482.40	62.00	496.00
Total Machinery cost for Asphalt Over lay (before Over head increase of 15%)					**18,435.04**		**37,113.60**		**25,544.64**
% Increase							**101.32**		**38.57**

Table 16.4 (a): Ethiopian Roads Authority
Activity Daily Cost Calculation
(All Cost in ETB)

Activity No :	317	**Date:**	Oct. 2006
Activity Name :	**Gravel Resurfacing (Selected Material)**	**Unit :**	m^3

I/ Labour

Code	Type	Hours Per Crew Day	Hourly Cost (indexed)	Daily Cost	% for Operaton
1	Labour Foreman	8.00	5.83	46.61	5.64
33	Labourer II	24.00	4.47	107.17	12.97
16	Equipment Operator IV	8.00	16.82	134.53	16.28
15	Equipment Operator III	8.00	9.98	79.81	9.66
14	Equipment Operator II	16.00	8.70	139.17	16.84
10	Driver III	32.00	9.98	319.25	38.62
			Sub-Total	**826.55**	**3.28**

II/ Equipment

Code	Type	Capacity	Hours Per Crew Day	Repl. Hrs.	Hourly Cost		Daily Cost		% for Operation
					Oper. C.	Repl.c.	Oper. C.	Repl. C.	
26	Motor Grader	145 -160 HP	8.00	8.00	186.09	194.07	1,488.69	1,552.56	9.44
31	Roller, Vibrator, 2 drums	10 - 12 Ton	16.00	16.00	247.15	117.95	3,954.40	1,887.19	25.07
3	Dump Truck, 6 x 4	9 m^3	24.00	24.00	292.20	83.06	7,012.70	1,993.33	44.46
28	Loader, Wheel	2.0 - 2.5 M^3	8.00	8.00	251.35	178.22	2,010.77	1,425.74	12.75
5	Water Truck	10000 -13000 Lt.	8.00	8.00	163.22	48.75	1,305.79	390.01	8.28
				Sub-Total			**15,772.35**	**7,248.83**	**62.56**

III/ Material

Code	Type	Unit	Quantity	Unit Price		Daily Cost		% for Operation
				Oper. C.	Repl. C.	Oper. C.	Repl. C.	
M16	Selected material (Gravel road surfacing)	m^3	345.00	24.97	13.98	8,613.99	4,823.66	100.00
			Sub-Total			**8,613.99**	**4,823.66**	**34.17**
Total Cost Per Crew Day						**25,212.89**	**12,072.50**	**100.00**

Table 16.4 (b): Comparison of Direct Machine Cost for Gravel Resurfacing Periodic Main Activity (ETB)

Code	Type	Capacity	Hours Per Crew Day	Existing Road Fund Daily Machine Costs		Current Market Cost		Revised ERA Cost	
				Rental Rate/hr	Total Daily Cost	Rental Rate/hr (As of September 2011)	Total Daily Cost	Rental Rate/hr	Total Daily Cost
26	Motor Grader	145 -160 HP	8.00	380.16	3,041.25	916.00	7,328.0	476.88	3,815.04
31	Roller, Vibrator, 2 drums	10 - 12 Ton	16.00	365.10	5,841.59	494.00	7,904.0	513.90	8,222.40
3	Dump Truck, 6 x 4	9 m^3	24.00	375.25	9,006.04	575.00	13,800.0	562.74	13,505.76
28	Loader, Wheel	2.0 - 2.5 M^3	8.00	429.56	3,436.51	693.20	5,545.6	568.44	4,547.52
5	Water Truck	10,000 - 13,000 Lt.	8.00	211.98	1,695.80	406.00	3,248.0	522.28	4,178.24
Total Machinery cost for Gravel Resurfacing (before Over head increase of 15%)					**23,021.19**		**37,825.6**		**34,268.96**
% Increase							**64.31**		**48.86**

As mentioned in the previous sections, the Consultants have prepared and submitted revised unit rates. The present exercise showed that Consultants' revised unit rates are within tolerable difference compared to the above contemporary cost of equipment component of the two major periodic activities. Table 16.5 indicates that average of the three approaches compared to the existing road fund machine component of the two activities. Accordingly the review exercises showed an increase of about 54% for Gravel Resurfacing and 67% for Asphalt Concrete Overlay maintenance activities.

Table 16.5: Summary of the Three Approaches for Calculating Contemporary Direct Machine Cost (in ETB)

Activity	Unit	Existing Road Fund Daily Machine Costs	Consultant Proposal for Daily Machine Costs	Current Market Price for Daily Machine Costs	Revised ERA Daily Machine Costs	Average Current Daily Machine Costs	Percent Increase from Existing
Gravel Resurfacing	m^3	23,021.19	34,241.2	37,825.60	34,268.96	35,445.25	**54**
Asphalt Concrete Overlay	m^3	18,435.04	29,540	37,113.60	25,544.64	30,732.75	**67**

16.4 Summary & Findings

The level of economy, efficiency and effectiveness of road agencies in maintenance works and corresponding unit rates and total costs have been investigated. The exercise has also assessed the impact of direct equipment cost both for paved and unpaved roads for the maintenance work and the practices followed by the road agencies using own forces and the private contractors as well as leasing companies in Addis Ababa.

In ERA, despite the reform of the maintenance districts into corporate level, contemporary costing of projects and supporting activities are not in the form of profit oriented arrangement, rather it follows the former trend of force account operations. Unit rates for the capital

projects accommodate market price of construction materials, rental equipment and revised salary scale of Government.

However, the ERA's Districts as well as the RRAs still apply the Unit Rates of 2007, as fixed by the ORF for periodic and routine maintenance activities, although they are using rental equipment from the market, particularly for periodic maintenance projects.

In view of the above situation, the road agencies argue that appropriate budget should be allocated first, at least considering the current rental rates of equipment and fuels, before evaluating effectiveness and efficiency of road agencies in maintenance operations.

It is reported that the road agencies measure their efficiency by timely maintenance of planned roads to avail service for the road users, which is a common interest of public agencies. Achieving such goals, amid low maintenance unit rates, however, result in, cost overruns making negative cashflows in different public road enterprises.

ERA's Maintenance Districts and RRAs own force crews, now enterprises, challenge the situation in such a way that if the ORF doesn't reconsider the practical road maintenance cost requirements, rather, it persists in bringing-in new network to the system, then, the National Road Maintenance Strategy will be in a problem in view of the following: none of the indicators of Economy, Efficiency and Effectiveness would be achieved by the new public enterprises; deterioration of the road asset will be wide in coverage, fast in time, serious in depth and eventually lead to high cost of restoration/ rehabilitation; the private sector will not be attracted to the sector, which, in turn, blocks the comparative advantages of competition; and the sector will remain as a scapegoat for high transport cost, weak mobility and negative impact to the general macroeconomy of the nation.

On the other hand, based on the market survey on direct costs of equipment required for the operation of the above two major maintenance activities, comparisons are made between the unit rates fixed by ORF (2007), revised rates as estimated in the present Study, and revised rates exercised by ERA's Districts in 2010.

Results of the analysis show that the current market unit rates of the two major activities are increased by more than 50% for gravel resurfacing, and more than 65% for the asphalt overlay from the ORF rates as fixed in 2007. This exercise generally indicates that the estimates made under the present Study are in line with the current market rates, and reflect a similar picture of the existing situation.

17. OWN FORCE VS OUTSOURCING: A COST BENEFIT ANALYSIS

17.0 OWN FORCE VS OUTSOURCING: A COST-BENEFIT ANALYSIS

17.1 General

The present chapter carries out the cost-benefit analysis of the "Own Force" Vs the "Outsourced" options for carrying out maintenance activities - periodic and routine, in terms of unit cost, total maintenance cost of different interventions and related advantages and disadvantages.

The objective of the above exercise is to appreciate whether the "Own Force" or "Outsourced" maintenance options are more economical and benefiting in performing maintenance activities in Ethiopia, particularly in long term; to propose the future line of action, and also present indicative benefits by using the recommended approach.

17.2 PPP in Road Maintenance Contracts during RSDPs

The Private Public Partnership (PPP) in the road maintenance activities has counted an experience not more than two decades. In Ethiopia, the Government is the major or sole client for civil works and services. For years, the state has been executing capital projects using its own construction crews. During the previous government, all size of projects used to be implemented by own force accounts only.

When the Road Sector Development Program (RSDP) commenced in 1997, the challenges facing the road sector were immense. The total road network was only 26,550 km, of which more than half was in a poor condition. Only 22% of the network at that time was in a good condition, and the remaining large volume of network required heavy maintenance, but due to financial constraints, roads in poor and very poor condition didn't get enough attention and got further deterioration.

Table 17.1: Contracts Awarded to Contractors & ERA's Own Force

(ETB in million)

Year	Local Contractors		Foreign Contractors		Own Force		Total Value
	Value	%age	Value	%age	Value	%age	
1998	-	-	311.0	100.0	-	-	**311.0**
1999	180.3	5.1	3,350.7	94.9	-	-	**3,531.0**
2000	93.5	100.0	-	-	-	-	**93.5**
2001	55.8	5.3	619.0	59.3	369.9	35.4	**1,044.7**
2002	141.9	21.9	395.6	61.1	110.4	17.0	**647.9**
2003	569.1	68.4	172.5	20.7	90.1	10.8	**831.7**
2004	501.3	62.6	286.4	35.8	12.8	1.6	**800.5**
2005	1,019.0	40.5	1,460.6	58.1	34.0	1.4	**2,513.6**
2006	3,248.2	45.6	3,356.4	47.1	525.7	7.4	**7,130.3**
2007	1,584.4	19.8	4,866.1	60.7	1,567.7	19.6	**8,018.2**
2008	7,090.1	58.6	4,952.5	40.9	64.7	0.5	**12,107.3**
2009	2,776.1	17.6	12,660.1	80.4	312.2	2.0	**15,748.4**
2010	4,060.2	62.8	745.4	11.5	1,660.1	25.7	**6,465.7**
Total	**21,319.9**	**36.0**	**33,176.3**	**56.0**	**4,747.6**	**8.0**	**59,243.8**

Source: "RSDP 13 -Years Performance" and RSDP IV Document, 2011.

Table 17.2: Contracts Awarded to Contractors & ERA's Own Force (RSDPs)

(ETB in million)

Contractors	Total Contract Amount	% Share
Local Contractors	21,319.9	36%
Foreign Contractors	33,176.3	56%
Own Force	4,747.6	8%

Source: "RSDP 13 -Years Performance" and Consultant Summary.

Since the commencement of RSDP-I in 1997, the Government has however introduced series of policy and institutional reforms and gradually opened its doors for market economy. Since then, a lot of affirmative actions have been taken to involve the private sector in the road construction and maintenance industry. Accordingly, the number of road projects awarded to local contractors increased significantly during the last decade. The total value of construction contracts awarded to local contractors throughout the RSDPs estimated at ETB 21 billion, i.e. 36% of the total contracts value.

Although, the road maintenance sector is part of the RSDPs and the Office of Road Fund (ORF) budget contribution was significant, participation of the private contractors in executing maintenance contracts was not noticed up to the expectation in the construction and rehabilitation of road projects.

The practice of outsourcing road maintenance works funded by the ORF began in 2002 with the financing of two periodic maintenance projects. In 2003-04, there were six works contracts and six associated supervision contracts for a total cost of ETB 250.44 million (US $ 25 million) supervised by an external consultant, which were equipment-based contracts.

ERA started outsourcing maintenance activities long time ago, but most of the routine maintenance works generally suitable for "Labor Based Technology (LBT)" are still done by ERA's force account. The Rural Road Authorities (RRAs) are also handling the activities by internal crews, except Tigray Rural Roads Authority (TRRA). Though, LBT had been formally introduced since 1983, the practice for LBT contracts appeared in recent years following the length-person[1] demonstration works in selected ERA districts and regional maintenance offices.

It may be noted that ERA trained more than 100 labor-based contractors to increase the implementation capacity of the road maintenance sector followed by trial routine maintenance contracts with fixed rate on 20 km section of asphalt and gravel roads.

In 2006-07, TRRA had planned five road maintenance contract projects with a contract value of about ETB 4.3 million (US$ 0.36 million) covering 103 km stretches:

- Two of the projects of routine maintenance activities were directly awarded to cooperatives organized under the Woreda (District) Council, where the projects were located; and
- The other three projects were periodic maintenance contracts, openly advertised based on World Bank-ERA-ILO contract documents used some-years ago for the execution of more than 18-Emergency Recovery Program (ERP) Labor based periodic maintenance projects at a cost of ETB 20 million (US$ 2.5 million) stretched all over Tigray regional state.

In recent years, more than 40 routine maintenance projects packaged all under ERA's maintenance districts floated for open bidding to be executed by Labor Based Technology (LBT) where 30-40 contractors applied for each package. The projects were financed by the ORF to be administered by ERA.

[1]Length-Person: A person who is hired for performing labor-based maintenance activities like ditch cleaning, etc. for a given stretch of road in terms of km.

Despite all these efforts, most of the country's road asset is still under the administration and management of force accounts.

17.3 Proposed Strategies in RSDP IV for PPP

As per the RSDP IV Performance Report, the Government has devised the following strategies favoring the local private sector to enter into the road construction and maintenance activities:

- Revising and easing entry requirements into the industry**;**
- Identifying contractors with capacity constraints and assisting plans to improve;
- Increasing the number of local contractors from the current 15 to 100 by 2014-15;
- Strengthening the performance based contracting arrangements;
- Familiarizing, by demonstration, contractors on the latest construction technologies and their application; and
- Increasing the number of local consultants from 25 (present situation) to 50 by 2014-15.

Further to this, ERA in its thirteen years (1997–2010) performance assessment of the program and setting visions, strategic directions and future plans for the road sector, introduced RSDP-IV with the following strategies of building the capacity of state owned contractors and consultants including:

- Undertake a capacity assessment of state owned contractors and consultants;
- Reorganize state owned contractors and consultants under the Ministry of Urban Development and Construction; and
- Develop systems to regularly review performance and improve their working systems.

It may be observed that introduction of such different strategies by the Government is the result of the prevailing conditions and due to the following imperative factors:

- ***Balancing or stabilizing the road sector market****:*avoiding or regulating price fixation or monopoly of the rule of game by a few local or foreign firms;
- ***Addressing special needs:*** peripheral or border projects, security logistics, emergencies, political responses for urgent public development requests, provisions and up-keeping of road infrastructures for other *mega projects*, etc; and
- ***Timely Asset Preservation:*** *As discussed above, the participation of the private sector in road maintenance activities doesn't satisfy the demand compared to the size of existing road network of the country; therefore it would be reasonable for a responsible government to devise strategies to build the capacity of state owned contractors and consultants for Timely Asset Preservation.*

17.4 Approach & Methodology for Cost-Benefit Analysis

The Study carried out the analysis using the following approach and methods:

- Cost-Benefit analysis of road agencies' using "Own Force" maintenance activity in comparison to "Outsourced" periodic and routine maintenance in terms of different expenses;
- Comparison or Review of Unit Rates for Own Force and Contractor Projects; and
- Qualitative Comparison for performance of the two contracts.

In view of the above analysis and exercise, the following sample districts have been selected and data have been collected for comparisons:

- Activities and costs of term maintenance contracts in Shashemene District;
- Labor-based maintenance contracts from Alemgena District; and
- Unit rates for term and periodic maintenance projects by Own-force and Private Contractors in Alemgena District.

The underlying assumptions, while undertaking the cost-benefit analysis of Own Force vs Private Contractors are described as follows:

- **Direct Project Costs:** The cost comparisons are made on the direct costs, which consist of labor, materials and equipment. The overhead/administrative costs are not part of the analysis due to difference in the estimate concepts and other ambiguities, which may not be comparable;
- **Financial and Economic Costs:** All the cost components incorporated in the analysis are based on the market prices, which are usually referred to as "Financial Costs", as these costs are comparable, and also used while cost estimates and maintenance financing. The "Economic Costs", which refer to the opportunity costs, i.e. generally net of taxes and duties, considered to adjust the market imperfection, etc., are not considered in the analysis; and
- **Social Costs:** These costs usually refer to the cost to society, such as, encouraging employment generating technological choice or income generating options to unemployed labor force; cost to environment, road safety, etc. These costs are normally intangible in nature, unless specialized expertise is deployed for the purpose. However, in the present case of maintenance interventions, and making comparisons between own force and outsourcing, the cost implications could be compared for creating similar service, i.e. by maintaining the roads. Rather, it would be desirable that the executing agencies responsible for maintenance work either through the own force option or the private contractors should be given clear guidelines to follow and address the above-mentioned social issues and, hence observing the cost efficiencies accordingly with social responsibilities.

Within the framework and requirements of the ToR, and also the Project resources with expertise available, the Study has collected and analyzed data and information, and arrived at the conclusions illustrating the merits and the demerits of own force and outsourcing options to the extent possible in tangible and intangible manner.

The results, thus, drawn based on the exercise would clearly enable the planners and decision makers to appreciate both the models for undertaking the maintenance activities, particularly in long-term.

17.5 Term Maintenance Contracts Vs Own Force (Shashemene)

"Term Maintenance Contract" is a routine maintenance handled by private contractors/force account for a certain period of time for a given stretch of road.

Shashemene District is one of the ten road maintenance districts of ERA, located at 250 km from Addis Ababa in the town of Shashemene. In 2009-10, the District undertook routine, periodic, and term maintenance activities in the SNNPR, and partly in Oromia and Somali Regional States. The district was found suitable for this exercise as it has outsourced and undertaken a number of maintenance projects by private contractors and its force accounts.

The District Roads Maintenance Contractor (DRMC) of ERA, has six maintenance sections with a total network length of 2,491 km, of which 384 km paved and the remaining 2,107 km unpaved. It consists of 9 trunks, 19 links, 8 access and 10 collector roads as part of its road network. Table 17.3 presents the physical maintenance plan and coverage for 2009-10.

Table 17.3: Maintenance Coverage: Shashemene District (2009-10)

Section	No. of Road Segment	Pavement Type		Term Maintenance By Private Contractor (km)	Periodic By DRMC (km)	Routine By DRMC (km)	Labor Based Contract (km)
		Gravel (km)	Asphalt (km)				
Dilla	13	375	225	-	67	591	59
Dodolla	9	282	159	-	-	-	-
K/Mengist	7	391	-	-	-	258	-
Negele	7	439	-	379	-	-	-
Robe	8	474	-	-	40	324	42
Ginner	7	330	-	-	-	330	45
Total	**51**	**2,291**	**384**	**379**	**107**	**1,503**	**146**

Source: 4th Quarter Progress Report Shashemene District Engineering Division (DED), June 2010.

Following the plan, at the end of the budget year, the actual accomplishment of the district was 1,257.8 km of routine maintenance and 89.3 km of periodic maintenance (which is nearly 7% of the routine maintenance). The corresponding cost at the same period was ETB 23.6 million for routine maintenance, on an average of ETB 18,768 per km, and ETB 46.6 million for periodic maintenance, i.e. ETB 521,868 per km.

The term maintenance contract, outsourced to local contractor, amounts to ETB 20 million for 379 km in Negle section. The cost was revised and increased to ETB 39.9 million at the end of the fiscal year.

Table 17.4: Maintenance Cost by Type of Contractor: Shashemene District (2009-10)

(ETB million)

Maintenance Type	Contractor	Length (km)	Total Cost	Cost/km
Routine	Own Force	1,257.8	23.6	18,768
Periodic	Own Force	89.3	46.60	521,868
Term Maintenance	Private	379	39.9	105,277

Source: The Consultants' Estimate.

If assumed a hypothetical own force crew and award 379 km of roads for maintenance, it would be possible to estimate the total project cost as worked out in Table 17.5.

Table 17.5: Maintenance Coverage & Cost for a Hypothetical Own Force Crew

(ETB million)

Maintenance Type	Contractor	Length (km)	Total Cost	Cost/km
Routine Maintenance (Negle Section)	Hypothetical Own force Crew	352	6.61	18,768
Periodic Maintenance (Negle Section)	Hypothetical Own force Crew	27	14.11	521,868
Total		**379**	**20.72**	

Source: The Consultants' Estimate.

From the argument given in Table 17.5, one could say that a hypothetical own-force crew would complete 27 km (7% of 379 km) periodic maintenance and 352 km of routine maintenance of the Negele maintenance section at a cost of ETB 14.1 million for periodic and 6.61 million for routine maintenance or at a total cost of ETB 20.72 million.

The above comparison shows that the hypothetical own force, which could maintain 379 km of roads with ETB 20.72 million is cheaper by ETB 19.2 million, for the same length of roads (379 km) from private contractor, which amounts with ETB 39.9 million, i.e. 93% less than the term maintenance, i.e. direct project execution cost.

It is, therefore, possible to say that Own Force is cheaper than Private contractor using the above analysis.

17.6 Labor-Based Maintenance Contracts Vs Own Force (Alemgena)

ERA recently signed labor-based contracts in Alemegena District to be managed by the District Engineering Division (DED) in 2010-11. Based on the available contract document of these projects, Table 17.6 presents comparison of actual BOQ items, unit rates, total cost of activities by the winning contractors and what would be the possible project direct cost, if a hypothetical own force crew would undertake maintenance of these routes based on existing unit rates of the ORF.

While preparing Table 17.6, the following assumptions and adjustments are made to compare the project costs between own force and private contracts:

- Contractor's unit rates of some activities, such as, site inspection, are taken as similar with that of the own force in order to not jeopardize the comparison due to difference of unit of measurement;
- Unit rates of some own force activities, like shoulder balding, are changed to equivalent or similar unit of measurement in the contractor's BOQ; and
- The total cost comparison between own force and contractors is done in two ways:
    I. Based on the direct result of the rates and the corresponding quantities of each activity; and
    II. By deducting the 15% of the sum from the contractors' rate, which is VAT and no contingencies are considered for comparison in any of the scenarios.

Subsequent to these assumptions, unlike the term maintenance case, the computation in Table 17.6 shows that the hypothetical own force crew is more expensive than any of the contractors' cost. The own force crew cost is expensive by an average amount of ETB 9,500/km from each contractor's price assuming direct cost of activities would be applied.

Two interesting issues are observed in the above computations:

I. Almost 62-70% of the total contract cost for both Contractor-B and own force crew is accumulated on one activity, i.e. shoulder repair. This does not seem normal for LBT routine maintenance projects; and

II. Although the own force cost is more by 182% as compared to that of Contractor-B, unit rate of four activities of own force crew are less by 15-92% from the later. These activities cover 22% of the Contractor's Cost. Similarly, Contractor B provided more unit rates (3-147%) for 6 activities from that of Contractor-A, but the total contract cost of the later is more by 37% from the former nearly for similar length of projects.

Finally, having such unit rate and total cost difference for nearly the same length (46 km and 48 km) of roads with the same type of contract (LBT) in one district for the same budget year, could provoke the following questions:

- How far the quality of maintenance will be compromised on such projects?
- Is true condition survey conducted on these projects? If so, when?
- Emerging LBT contractors, are they informed of the true nature of road project procurements and their subsequent executions?
- How far the Office of Road Fund is prepared for those activities with high unit rates before revised rates are approved? Or the bottom line principle is not to exceed ERA's or any road agency's yearly allocated budget, whatever higher the cost of the individual unit rates or total project price is?

Table 17.6: Cost Comparison Between LBT Contractors & a Hypothetical Own Force Crew in Alemgena District

(Amount in ETB)

Activity	Unit	Own Force (ERA)			Out Sourcing (OS)						Difference (OS-OF)	
					Contractor-A (Ginchi - Busa , 48 km)			Contractor-B (Atat - Mazoria - Kose, 46 km)			Contractor-A	Contractor-B
		Unit Rate	Total Cost for 48 km	Total Cost for 46 km	Quantity	Unit Rate	Total Cost (ETB)	Quantity	Unit Rate	Total Cost (ETB)		
Site Inspection and removal of obstacles and debris (DWs)	DWs	900(5074)	21,600.0	121,776.0	24.0	**900.00**	21,600.0	24.0	**5074.00**	121,776.0	0.0	0.0
Spot Repair - Selected	m^3	88.00	62,304.0	82,448.1	708.0	**58.75**	41,595.0	936.9	**60.60**	56,776.7	-20,709.0	-25,671.3
Culvert Cleaning	m^3	66.82	16,036.8	7,825.3	240.0	**50.50**	12,120.0	117.1	**39.00**	4,567.3	-3,916.8	-3,258.0
Ditch Cleaning - Manual	m^3	5.50	264,000.0	64,412.4	48,000.0	**3.00**	144,000.0	11,711.3	**2.00**	23,422.7	-120,000.0	-40,989.7
Scour Damages Repair	m^3	117.63	14,115.6	459,201.6	120.0	**96.25**	11,550.0	3,903.8	**22.28**	86,976.2	-2,565.6	-372,225.4
Motored Masonry Repair	m^3	459.53	82,715.4	71,755.6	180.0	**299.40**	53,892.0	156.2	**650.00**	101,497.5	-28,823.4	29,741.9
Dry Masonry Repair	m^3	252.21	75,663.0	19,692.6	300.0	**142.50**	42,750.0	78.1	**300.00**	23,424.0	-32,913.0	3,731.4
Bush and Gross Clearing	m^2	0.26	3,120.0	1,465.6	12,000.0	**0.25**	3,000.0	5,637.1	**2.00**	11,274.1	-120.0	9,808.5
Shoulder Trimming (Shoulder Blading)	m	0.23	139.0	904.5	600.0	**0.24**	144.0	3,903.8	**2.83**	11,047.7	5.0	10,143.2
Shoulder Repair (Shoulder Rehabilitation)	m^3	48.03	691,632.0	374,997.1	14,400.0	**40.11**	577,584.0	7,807.6	**30.40**	237,349.8	-114,048.0	-137,647.3
Environmental Protection (DWs)/Gabion structures	m^3	426.00	36,210.0	36,210.0	85.0	**291.50**	24,777.5	85.0	**48.00**	4,080.0	-11,432.5	-32,130.0
DWs=Day Works.	**Total**		**1,267,535.8**	**1,240,688.8**			**933,012.5**			**682,192.1**	**334,523.31**	**558,496.68**

Table 17.7: Comparison of Unit Rates for Own-Force & Private Contractors in Alemgena District

(Amount in ETB)

ERA Activity Code No.	Activity	Unit	Contractor-C Mojo Section Term Maintenance		Contractor-D Addis-Mojo- Awassa Paved Road Term Maintenance		Own Force Crew-1 Addis-Tatek Paved Road Periodic Maintenance		Own Force Crew-2 Alemgena-Butajira Paved Road Periodic Maintenance		Own Force Crew-3 NuraeraJct-NuraeraUnPaved Road Periodic Maintenance	
			Unit Rate	% age of total Cost	Unit Rate	% age of total Cost	Unit Rate	% age of total Cost	Unit Rate	% age of total Cost	Unit Rate	% age of total Cost
313	Asphalt Concrete Overlay	m^3	4,710.95	52.20	2,950.00	41.38	2,109.27	-	-	-	-	-
212	Asphalt Patching (DBST)	m^2	-	-	-	-	50.24	-	49.74	29.70	-	-
214	Asphalt Patching (Hot Mini - Mix)	m^3	3,050.00	0.35	3,000.00	14.13	2,511.75	-	-	-	-	-
218	Pothole Reinstatement (Hot Mini Mix)	m^3	3,300.00	0.24	3,500.00	12.62	-	-	-	-	-	-
241	Shoulder Rehabilitation	m^3	125.00	6.32	115.00	2.38	99.81		94.29	-	-	-
317	Gravel Resurfacing (Selected Material)	m^3	-	-	-	-	-	-	-	-	192.03	-
222	Gravel Provision - Selected Material (Extra-Over)	m^3	92.00	18.56	-	-	-	-	-	-	-	-
110	Spot Repair Gravel Road - Selected Material	m^3	140.00	2.40	-	-	-	-	-	-	-	-
219	Pothole (Base failure repair)	m^3	402.50	0.45	380.00	5.03	-	-	307.11	-	-	-
413B	Borrow Production Placing	m^3	-	-	-	-	-	-	-	-	74.33	67.31

Source: Compiled by the Consultants using Data collected from ERA's Alemgena District.

17.7 Review of Unit Rates: Own Force Vs Outsour (Alemgena)

DRMC,Alemegena has been conducting term and periodic maintenance pr private contractors and own force crews. Table 17.7 presents unit rates co major, but similar activities on both paved and unpaved roads.

From Table 17.7, the first impressive observation could be drawn about the asphalt concrete overlay activity given across three projects of private contract force. This activity covers 52.2% and 41.4% of the total value of Mojo Sectio Mojo-Awassa private contractor term maintenance projects. The former project completed or terminated. But the later one is ongoing, although its unit rate is from its predecessor.

It is difficult to prove whether this reduction of cost on such major activity is a res competition benefitting the client or a "get the contract first and share the risk l of the private sector players.

However, unit rates of asphalt concrete overlay activity in both projects are mor the Addis-Tatek own force project by 123% and 40% respectively. In this cas must be some regulating mechanism of such discrepancies by the ORF, whic from the common practice of balancing the allotted budgets for road agencies. could guarantee the "value for money" during wide participation of the priv maintenance contracts. The same seems true with asphalt patching, shoulder and pothole (base failure) even though the difference is small.

Another observation is that activities like Borrow Production Placing (Activity Co own force projects covering 67% the total project value is not a maintenance ac is an earthwork activity. Not only this, the rest 30% (approx.) of the project apportioned for such type of non-maintenance earthwork related activities.

Therefore, the ORF should revise its eligible maintenance activity criteria to externalities or exceptional pressures or stay tuned to its value of financing only roads.

17.8 Qualitative & Quantitative Comparisons

During the last thirteen years of RSDPs, the private sector consumed the major program budget, i.e. 56% by foreign contractors, 36% by local contractor and t 8% has been paid for own force. However, the role or share of which entities network development and asset preservation takes the shape of a reverse pyr mainly due to the 73% contribution to the national network development by the which is an own force dominated sector.

As explained in previous sections, different direct cost comparisons resulte conclusions making decisions difficult. Therefore, a qualitative approach wil compare the merits and the demerits of own-force and private contractors' in asset preservation activities of the national network. To be more comprehe issue, the Consultants also made continuous discussions with the following o road agencies,

- Senior Officials of ERA Asset Management Division;
- Alemgena DED Manager;
- Gonder DED Manager (former);
- Oromia Road Construction Enterprise –Senior Maintenance Officials;
- BenishanguelGumez Rural Roads Authority–Dibatie Maintenance Office

- Different officials of ERA, RRAs and MRAs during the Verification Survey of representative road segments in all regions of the country.

Subsequent to the above discussions, the summary of ideas is outlined regarding both types of contracts and presents in the following sections.

17.8.1 Favoring Own Force

- Using Own Force is a phenomena or a ground reality, which has been primarily moving the national road sector development activities for years;
- Nothing prevents any client from entering into agreements for works with force account teams using the same standard documents. These agreements will be very similar to the contracts awarded to private contractors at least in their technical parts;
- Force account brigades will be more efficient, if they are given agreements for works including detail description, set of technical specifications to be enforced, BOQ with set of unit prices and a supervision team independent from the management of the force account teams to carry out the control of quality and quantities;
- In recent years, these arrangements are happening in the form of DED (ERA), private consultants by package and separation of the Cooperatives or Enterprises from Regulating Authorities;
- Experience shows that road maintenance activities are often emergency oriented. No one could argue that own force teams are quick solutions to sustain the road users services in case of some natural calamities, landslides, repair of road due to heavy rain/flood, etc. The flexible nature of the own-force team is irreplaceable except with performance based maintenance contracts;
- Although the work culture of own-force team is difficult for independent supervision, establishing sufficient or real unit rates as per the requirement of the specification would result in more responsible quality works as the team is free of maximizing profit;
- Peripheral or border area projects, special need maintenances, public requests of road maintenance, logistics support for security and mega development projects are better handled by own force team; and
- Roads are like kids; they want a “PARENT EYE” to watch. In this regard ownforce teams are nearer to bear ownership or guardianship responsibility through their established system and satellite maintenance networks than any private contractor arrangement.

17.8.2 Favoring Private Contractors

- A brigade or a division of several own-force brigades is not an independent contractor and doesn’t enjoy the legal status and the financial independence a contractor enjoys. Fast and stable cash flow is better handled by a private contractor, and it is the bottomline for implementing maintenance activities without any bureaucratic and cumbersome procedures;
- Private contractors are more responsive to independent supervisors than force accounts. Private contractors know pros and cons of instructions and they are better prepared to fulfill labor, material and equipment required by the contract specification. Penalties can be imposed on private contractors, but not on own-force team unless for symbolism and completeness of documents;

- Maintenance of roads particularly paved roads is more skill and equipment dependent. Private contractors are more comfortable to handle and provide such contract or sub-contract arrangement relatively in a very short time than own-force teams or brigades;
- It does not require special emphasis that construction of roads will be in vain unless followed by timely maintenance. Among others, RSDP IV plans designing and construction of more than 71,500 km of Wereda Roads under the URRAP. Wereda Offices are emerging organizations literally with little or no capacity to construct and maintain the developed asset. It is not easy to fill this gap except for the private sector. With this understanding the Government started organizing engineers, surveyors, superintendants as independent contractor and consultanting firms together with promising capacity building packages. These firms are expected to use local knowledge and resources in the form of labor-based technology or appropriate mix of intermediate equipment;
- "Length-person" arrangements are the last form of private contractors, but prove enormous advantage in up-keeping road assets. Length-persons are more effective and potential petty contractors, if only managed through private contractor modality. Recruiting farmers on a monthly salary arrangement and mixing with the own-force crew payroll is not a success story. This is observed from the discussion made with Alemgena DED; and
- Based on the analysis, Table 17.6 on Alemegena District, private contracts would save ETB 334,523 and ETB 558,496 for 46 km and 48 km of roads respectively, which is on an average of ETB 9,500 per km. This is very significant when one contracts out large size of LBT projects.

17.9 Sum Up

As per the global trend and also in a number of countries in Africa, "Outsourcing" is considered to be more efficient than the Own Force option with added advantages described as follows:

- Better Accountability;
- Increased efficiency of private sector;
- Readily available expertise in private sector on demand/as per the requirements;
- Availability/Adaptability of modern technique and equipment;
- Clause of penalties, in case, project is not executed within the time schedule and standards set;
- Flexibility of changing the executing agency in case of failures;
- Long term liability of the staff is avoided;
- Accountable/Efficient Management and lower overhead cost; and
- Sharing of risks associated with the maintenance work.

However, success of performance depends on proper supervision.

It is also observed that since the out-sourcing model in Ethiopia is operational on a very limited scale and not yet fully utilized, there is no real competition in the market. It is a proven fact world-wide that once a large number of contractors are available in the country, cost of the project execution could be expected to be lower by about 15% or more than the present level.

In view of the policies and guidelines also given in the RSDP IV, particularly the encouragement of the private sector participation and capacity building development, Outsourcing will be best option of the future maintenance activities.

It is advised that for better efficiency in long term, the role of the government agencies should be limited to the policy making, planning, standardization of policy; and the responsibility of implementation of the projects should be left to the private sector.

However, presently, both the models of own force and outsourcing should continue till the private sector is strong and capable enough to take the entire load of the maintenance activities of the country. On the same time, emergency works should be taken care of by the own force in order to avoid the delays in bidding for hiring the private sector.

In general, when contract is awarded, for both private and own force contractors, labor-based construction or length-person option should be encouraged appropriately, as it has several advantages. Details are discussed in the previous report on the Guidelines for Approving Eligibility of Maintenance Works for ORF Financing, and also in RSDPs Documents, particularly in 13 Years Performance Report.

However, there are some important issues[2], particularly relevant for maintenance cost savings, are listed as follows:

- Labor-Based option minimizes construction and maintenance costs: Based on the average cost for one km built using equipment-based methods, 2.5 km could be built using labor-based method;
- About 45% of the cost of labor-based road works goes to labor wages, and only 22% while using equipment-based method; and
- Employment opportunity is relatively high. Over five times more direct employment is created, while opting for labor-based, as compared with equipment-based methods.

[2] RSDP IV Document (2011).

Annexures

Section 5. Terms of Reference

Consulting Services for Maintenance Needs Assessment and Updating of Road Financing Study

1. Acronym

AACRA= Addis Ababa City Roads Authority
DFID=Department for International Development
ERA = Ethiopian Roads Authority
ERF= Ethiopian Roads Fund
FDRE= Federal Democratic Republic Ethiopia
MRA = Municipality Roads Authority
ORF= Office of Roads Fund
RRA= Rural Roads Authority
SME=Small Micro Enterprises
WB= World Bank

2. Introduction

The Government of the Federal Democratic Republic of Ethiopia has given a high priority for the country's Road Sector development program, as road facilitates the overall development of the country. As such, considerable investments have been made to improve the Road Network.

To ensure the sustainability of the Road Sector in serving the socio, political and economic development of the country, the government has been committed to successfully implement the four building blocks of the Road management initiative which started since 1997. The Road Management Initiatives has identified the owner, management responsibility and financing aspects of the Road Sector development.

Accordingly, the Ethiopian Road Fund comes into picture as the result of these initiatives in 1997 by Proclamation 66/1997.

Since its establishment the fund has contributed a lot in availing road maintenance budget for highways, rural roads and municipal Road maintenance expenditures

The objectives of the fund among other things include ensuring

i) Sufficient resources are available for the road maintenance of highways, rural roads and municipal roads;
ii) Road users participate in the management of the sector to improve decision making and consumer willingness to pay.
iii) Financial discipline is strengthened to ensure that the publics get value for money.
iv) Road users pay more equitably for the damage they inflict on roads.

At present, revenue is generated from

(a) Road maintenance levy added to the price of all transport fuels, and value added tax on fuel that has been decided to be channeled to the fund, by decision of the Council of Ministers.

(b) Transit fee paid by foreign vehicles/tracks inter into the country crossing the border. Besides, even though some revenue items such as;

i. Annual license fee collected from all types of vehicles

ii. Overloading fines and the like have been defined on the proclamation, as the sources of funding, due to some technical and administrative proeedures, the magnitude of the fee, and the time is not decided accordingly hence, these iten have not been collected by the road fund to date.

Due to the radical increase in the road network and maintenance costs, it has becom apparent in recent years that the level and focus of available funds are insufficient to cover the whole network and preserve the Road asset value of the country. Consequently, there is an urgent need to determine the appropriate level and direction of investment needed to ensure that an adequate and stable source of funding is available to facilitate efficient and effective planning and delivery of road maintenance in the country.

Moreover, reviewing and assessing the past practices of the Road Fund in terms of revenue collection, expenditures and disbursement. This should help to redefine the purpose and define the details of expenditure categories that would be eligible for financing and ensure the available budget is properly ntilized in such a way that give Road users value for money.

3. Study goals and Objectives

The objectives of this consultancy service are as follows:

- To review Road Financing practices of Ethiopian Road Fund, to Road agencies (ERA, RRA&MRA) and Road Safety coordinating office in the last 5 years.
- To review the efficiency and effectiveness of Road Financing of ERF to RRA's, MRA's, ERA and Road safety office, for maintenance of Roads & Road Safety measures.
- To prepare a multiyear Road maintenance need forecast for the coming 10 years, including review of the existing revenue sources, revenue level in order to understand(identify) the budget gaps for Road maintenance of (ERA,RRA,MRA and Road safety measures) each year and in the coming 10 years
- To review the potential maintenance needs of the unclassified roads
- Establish a system that helps to adjust road users charge to reflect the road maintenance expenditure based on fee for service principle.

4. Scope of service

4.1 Review the type of maintenance and Maintenance cost related head office and administrative costs of the RRAs, MRAs, and ERA in view of the principles of 2nd Generation Road Fund that focus mainly on routine, periodic and some portion of Road Safety measures, and based on best practices of Road Financing and accepted principles as well as the Proclamation of Road Fund, propose and develop a policy document in which the categories of work eligible for financing are clearly defined and which ensure fee for service, efficient and effective uses of the available funds.

4.2 Working and communicating closely with the consultant which is assigned to conduct the Strategic Review of the Road Sector Development, the Consultant shall review (and if necessary revise) the substantiation basis of the data on the future road maintenance needs forecast for the classified roads (federal and regional roads) prepared by the said consultant. The consultant shall also communicate with a consultant firm which has conducted the study on the "Development of Wereda & Community Road Maintenance Policy & Asset Management Strategy" financed by DFID, obtain and review the study deliverables; and utilize these in conducting the services. Assess and develop the multi-year road maintenance need for the coming 10 years by showing needs of each year, including review of the existing revenue sources and level and there by identify the budget gaps for Road maintenance for each year and the coming 10 years of (RRA, ERA and MRA as well as Road safety measures.

4.3 With the assistance of ERA and ORF, work and communicate closely with the project team of (i) Productive Safety Net Project (PSNP); (ii) Protection of Basic Services - Local Investment Grant (PBS/LIG); and (iii) Universal Rural Access Road Program (URRAP: temporary naming); review the unclassified roads related activities under these projects/program, and analyze the realism-based maintenance needs of the unclassified road in the coming 10 years.

4.4 Establish or setup a system that help to adjust road users charge to reflect the road maintenance expenditure based on the fee for service principles of the 2nd generation Road Fund. The "system" must have a user friendly computer model which is capable to calculate and analyze the required road user charge level responding to various external scenarios. The model may. if applicable, be developed building on the RONET.

4.5 Review the existing procedures of approval of maintenance need presented by the Road Agencies to the Road Fund, technical and Financial Audit Procedures, Followed by the Road Fund and develop new ones and revise the existing according to the need to ensure value for money.

4.6 Assess the existing material and human resource capacity of the Road Fund Office and propose a capacity building program that will addresses the identified

capacity gap. Consider and recommend on job trainiug at some, well functioning Road Funds.

5. Specific Tasks and Activities

The key tasks will be as follows:-

5.1 Review & assess the present financing of Road Fund

5.1.1 Some analytical review of past data of road condition deterioration pattern of the actual roads of different classes or types of surface may need to be conducted in collaboration with Network branch of ERA by use of HDM-4 Model.

5.1.2 Review the past experience of Road Fund financed Road maintenance expenditures of the RRA's, MRAs and ERA including the Head Office, expenses and recommend eligible expenditures that should be covered by the fund and develop operational guide lines that clearly show the border line of eligible and ineligible expenditures.

5.1.3 The categories of work eligible for financing should clearly show routine maintenance, periodic maintenance, emergency maintenance and Road Safety measures. Besides detail activities entailed in each of the types of eligible items of expenditure should be stated based on accepted principles i.e. routine maintenance and what it entails etc.

5.1.4 Recommend the criteria that should be used to identify the type of roads that would be eligible to receive fund from the Road Fund. E.g. Roads under maintainable condition, Roads that have not got maintenance in the last three years based on the accepted standard of frequencies of the required maintenance activities such as 3 or 4 years for periodic maintenance separately for gravel & Asphalt Roads etc.

5.1.5 Review the components of direct and indirect cost of maintenance that used to be covered by the Road Fund finance and recommend and describe the direct and indirect components that should be covered by the fund. Consider the fact that Road agencies are carrying out several road activities like contract administration of new construction, rehabilitation and alignment works. Accordingly, propose the amount of expenses that should be covered by the Road Fund including the head office expenses of each agency (ERA,RRA,MRA and Road Safety Office), in a way that fairly reflect and be related to the extent of Road Fund Financed to Road maintenance activities.

5.1.6 Review and evaluate on sample basis the periodic and routine maintenance works performed by the RRAs, MRAs, ERA for the last 3 years as appropriate to check the effectiveness, efficiency and economy in terms of cost per kilometer, quality of maintenance, appropriate planning and prioritization as well as frequency of intervention based on accepted standards, etc. And based on the consultant's findings recommend the required procedures and measures to be included in the policy document or operational guidelines in order to avoid any mismanagement of resources in the future.

5.1.7 Review the existing unit rate or per kilometer cost of routine, periodic and emergency maintenance and propose the actual unit rate for the above activities of ERA, RRAs, MRAs based on eligible expenditures and the market price.

5.1.8 Review the cost benefit analysis of ERA, RRAs, MRAs- own force maintenance activity compared to outsourced periodic and routine maintenance in terms of overhead, maintenance equipment, and other related expenses and recommend the best approach by taking into account the context of the country in terms of private contractors, SME etc and recommend what should be done in the future and the amount of budget that will be saved by using the recommended approach of either own force or contract out.

5.2 Forecast for Road Maintenance

5.2.1 Conduct Road inventory of classified RRAs, MRAs and ERA's Road network and sample Road condition surveys to forecast the required maintenance needs of the coming 5 years detailed analysis with 10 years of rough estimates and maintenance need of each year. The Consultant shall, work closely with the above-mentioned URRAP program team in the ERA; collect and analyze the available road statistic of the current unclassified roads which have been developed under DFID financed study on the "Development of Wereda & Community Road Maintenance Policy & Asset Management Strategy" ,PSNP, PBS LIG and RSDP, and conduct sample road condition survey sufficient to obtain necessary data in making a rough estimates of the current maintenance needs and the required maintenance needs of the coming 10 years which will be used as inputs for the computer model referred to in subsection 5.3.2 of this TOR to be developed by the Consultant.

5.2.2 Besides the sample condition survey, road inventory and per kilometer cost of maintenance of these roads, consider the implication of the proposed policies and recommendations of this study in determining the forecasted maintenance needs.

5.2.4 Set some three scenarios in predicting the failure deterioration forecast of the road condition (i.e increased potential asset recovery costs). e.g estimation of the level of loss if (i) the current level of annual growth of revenue say 7% p.a); is maintained (II) if the revenue growth is assumed 10% p.a, and (iii) if 15% p.a ... etc apply also the same forecast method to the past and current road condition trend to test the accuracy/reliability of the model.

5.2.5 When propose and recommend the level of charges and new charges, consider the macro economic implications of each change in consultation with the Ministry of Finance and Economic Development of FDRE and relevant institutions. Also consider the vehicle population, type and other important variables.

5.2.6 On sample basis assess the impact of overloading in terms of damages it caused on the roads and the costs incurred due to overloading and propose the overloading fines that reflect the real costs of damage caused by those who violate the limits permitted to be loaded on tracks. Moreover, assess the collection mechanism of overloading fines and recommend the best way that ensures efficiency & effectiveness.

5.2.7 Assess the locations of weigh bridges and recommend the appropriate locations that will decrease the extent of damages by controlling the overloading at relative destinations say on or near the port and potential export destinations.

5.3 Diversify the Revenue

5.3.1 Review the existing Road Fund revenues and their level and recommend the new sources of revenue such as axle load based distance related charges for heavy track, toll tax and annual Vehicles License renewal fees and Parking Fees etc. based on experience of best practices of countries like Namibia and the like as well as revision of the existing sources like fuel levy etc in such a way that the charges reflect the Road maintenance needs shown by the study results.

5.3.2 Establish or setup a user friendly computer model which is capable to calculate and analyze the required road user charge level to cover the required road maintenance costs of roads under the jurisdiction of ERA. RRAs & MRAs as well as unclassified roads responding to various internal and external scenarios: e.g. baseline road length and road condition. forecasted road length and road condition. economic growth range. oil price fluctuation. bio-fuel availability. foreign currency exchange rates. inflation/deflation. changes in emission and carbon regulation. vehicle fleet growth. various kinds of regulatory reforms.

various kinds of taxation reforms, coverage of the roads to be maintained (classified rods only or including unelassified roads), maintenance service level (such as the range of targeted IRI), etc. The model may, if applicable, be developed building on the Road Network Tool - RONET - developed by the World Bank.

5.3.3 Based on the result of road financing study recommend the necessary measures that need to be taken if roads are to serve in a better condition and also show the consequences in terms of future maintenance or rehabilitation cost, road users charge, vehieles operating costs, economie movement etc that will be incurred for the failure of taking appropriate revision of road users charge to avail maintenance budget; show the implication of the consequences of neglecting maintenance each year in terms of further costs of maintenance, vehicle operating costs etc.

5.4 Develop a system for appropriate utilization of the Fund

5.4.1 Prioritization of maintenance intervention and financing to ensure value for money (preventive, routine, periodic of Roads under maintainable condition) etc…

5.4.2 Develop Road Maintenance plan appraisal procedures that would be used by the Road Fund Office to prioritize presented maintenance needs of the Road Agencies.

6. LIAISON WITH EMPLOYER

The Consultant shall maintain close liaison with a project counterpart to be designated by ERA and Office of Road Fund (ORF). A formal joint meeting shall be arranged by the Consultant at least once a month to facilitate monitoring of the services; the Consultant is also responsible for the formal minutes of such meetings. These meetings will be convened by the counterpart.

It is expected that the consultant would work intensively with Road Fund office staff and ongoing study consultants (AFRICON on PMS, BCEOM on sector-wide capacity building)

For smooth coordination and to obtain timely feedbacks from major stakeholder there will be a technical committee setup comprising staff's from ORF, ERA, RRA (eg Oromia,) MRA (eg. AACRA), transporters association and donors (e.g WB, DFID) as deemed necessarily.

7. Duration of the Services

The duration of the service is to extend for 12 months period after singing of the contract.

8. ADDITIONAL RESPONSIBILITIES OF THE CONSULTANT

All of the Services are to be executed in Ethiopia. The Consultant shall provide, in Ethiopia, his own office facilities, accommodation, transport and all other facilities, equipment, utilities, consumables, staff, support staff and any other resources necessary for the complete execution of the Services. The costs of provision of each and all the aforesaid shall be detailed in the Consultant's financial proposal.

The client has allocated provisional sum in Form FIN-5: Breakdown of Reimbursable Expenses for the purchase of 3 PCs, 3 UPS, 2 printers and software, and cost for local transportation and workshops. The following minimum specification requirements shall be fulfilled while purchasing the computer and printer.

Desktop Computer

- Processor: Intel(R) Core(TM2)Duo CPU
- Processor speed >=4GHz
- Genuin Intel chipset
- >=1066 MHz system bus speed (front bus speed)
- 2 GB system memory expandable to 4 GB
- 250 GB hard disk drive
- 1.44 MB 3.5" Floppy drive
- More than 4 USB port, serial & parallel ports
- USB mouse & keyboard
- DVD/CD-RW Combo Drive internal with software decode
- 17"LCD flat monitor with at least 64 MB AGP graphics controller with 100MHz & above dedicated graphics card memory.
- Fast Ethernet 10/100/1000 MBps network card with RJ Connecter
- Genuine MS Windows XP sp2 professional with original CD (OEM)
- Speakers

Printers

Type	Requirement
Printer type	Laser jet
Printing speed	26ppm
Memory	32MB
Resolution	1200X1200dpi
Paper size	A4/A3

IV. Appendices

APPENDIX A – DESCRIPTION OF SERVICES

Note: This Appendix will include the final Terms of Reference worked out by the Client and the Consultants during technical negotiations, dates for completion of various tasks, place of performance for different tasks, specific tasks to be approved by Client, etc.

APPENDIX B - REPORTING REQUIREMENTS

The consultant would be expected to work closely with office and shall prepare and submit the following documents:-

a) Inception Report
b) Monthly and Quarterly Progress Reports.
c) Workshops Reports.
d) Guideline for Approving Eligibility of Maintenance of Works for ORF Financing.
e) Multiyear Road Maintenance Need Assessment Report.
f) Report of Review of Existing Road Revenue and Reeommendation for New Source of Revenue.
g) Guideline for Adjustment of Road Users Charge.
h) Final report.

(a) The Inception report

The Inception report shall confirm the mobilization status of the consultant and conform the methodology and work plan to be adopted, initial findings and proposed solutions, together with any action required by employer to facilitate the successful implementation of the service. The inception report would be submitted after 45 days of the commencement of assignment.

(b) Monthly Progress Report

Progress report shall be prepared monthly using standard report format to detail progress against programme in respect of all project elements. The report should cover the activities done within the reporting period. The quarterly report shall also include the consultant's recommendations as to resolution of the consultant's the report shall include a section detailing the statues against the work plan of the consultants service, the staffing, each element of the TOR and the invoice costs and the payment situation. It also include an executive summary; copies of key correspondence and minutes of meetings applicable to the report period. Each report shall be submitted within 10 days of the end of each report period.

(c) Workshop Report

The consultant is expected to organize two (2) workshops and present during submission of the draft inception and draft final reports for wide audience including policy makers, experts in the field and donors. The consultant shall prepare as appropriate the necessary documents and materials for workshop and training to be conducted during the service period. In addition, the consultant shall report its assessment on the result of the workshop. The client has put provisional sum for conducting the workshop.

(d) Guideline for Approving Eligibility of Maintenance of Works For ORF Financing

The report shall include at least the following;

- Review of the roads works financed by ORF in the last three years in terms of cost, type of work, quality and effectives.
- Review of the existing approval system of road financing.
- Cost benefit analysis for roads financed by ORF and constructed by force account of ERA,RRA and MRA in comparison with works executed by private contractors.
- Proposed criteria for works to be consider for financing by ORF and the detailed approval procedures.
- List of eligible and non-eligible expenditures for roads financed by ORF.

(e) Computer Model and Multivear Road Maintenance Need Assessment Report.

The report shall include at least the following:

- the computer model software, its user's manual, and outputs used as the base in preparing the user charge level analyses
- The study on deterioration pattern of sample roads with help of HDM4 or other similar software.
- Maintenance needs assessment of ERA, RRAs, MRA as well as unclassified roads for each year of the coming 10 years. The study can be detailed for the first 5 years and rough for the next 10 years.

(f) Report of Review of Existing Road Revenue and Recommendation for New Source of Revenue.

The report shall include at least the following:

- Review the existing Road Fund revenues and recommendation for tl ıew sources of revenue.
- The study shall consider the experience of best practi ıf countries Namibia and the like as well as revision of the existing sources.
- The study on shall also identify the gab between the ne l he poss venues.

(g) Guideline for Adjustment of Road Users Cha

The report shall include at least the follow.ı

- A guideline to setup a system tha ' ıc ju t the ıer ch ·ased on the market prices of fuel and other rele ıı ıf oad enues.
- The forecast of the road users ın the ·ecaste the possible source of revenue proposed.

(h) Final Report

A draft report is to be submitted prior to 6 weeks the completion of the service and will contain detailed of the executive summary, mobilization, Demobilization, Description of service; service implementation; financial cost details; details of work executed and the technical employed, the overall findings and conclusions; draft manuals procedures and etc...

Final Report on Road Financing Study is basically the revised Draft Final Report, based on the comments made by Clients and funding agency. The report shall include the comments and the Consultant's responses to them in the annexes.

Summary of Reporting

The consultant will submit the following documents by hand courier in the number tabulated below and in accordance with the sehedule stipulated herein. All reports shall be prepared in English Language.

No.	Report	ERA (no.)		IDA (no.)	
		draft	final	draft	final
1	Inception Report	5	5	2	2
2	Progress Report	-	3	-	1
3	Workshops Reports		3		1
3	Guideline for Approving Eligibility of Maintenance of Works For ORF Financing.	5	5	2	2
4	Computer Model and Multiyear Road Maintenance Need Assessment Report	5	5	2	2
5	Report of Review of Existing Road Revenue and Recommendation for New Sources of Revenue.	5	5	2	2
6	Guideline for Adjustment of Road Users Charge.	5	5	2	2
7	Final Report	5	5	2	2

The consultant shall submit with the final report 3 electronic copies of the study in non-rewritable compact disc (CD).

Annexure 1.2

Compliance Matrix on the Comments on "Draft Final Report"

Reference	Comment	Consultants' Clarifications & Compliance
Sources of revenues of the Road Fund	The traditional sources of revenue for the road fund emanates mainly from fuel levies, though considered sustainable for financing of road maintenance the total amount needed in will ultimately be small compared to the volume of maintenance work in the future. Roads that are built during the first and second RSDP are by now requiring huge maintenance works and some even may require major rehabilitation work. In addition the report has also identified in part 5.5 "road inventory & pavement condition –II. regional roads" that…*there has been budget and capacity constraint realized…..on account of inadequate maintenance work*". Under the current funding source the need for addition funding becomes more evident. This study should therefore look in to additional option and sources of road fund. Such possibilities may include vehicle licensing and introduction of bridge and road toll collected by the road fund.	Two dedicated chapters "Road Fund: Sources of Revenue (Chapter 10)" illustrating the concept, rationale and practices and limitations of various Road Users Charges and "Road Fund Revenue: Potential Sources (Chapter 12)" have been included in the present Final Report. These chapters duly cover the review of existing road users charges and explore new/additional sources of revenue for bridging the fund gap.
Weighbridges in Ethiopia (7.5)	a) As indicated in the report, there are 9 weighbridges located at different sites in Ethiopia, among which seven stations are "fully" operational while two stations namely Kombolcha and Shashemene have suffered from road re-alignment and redirection of traffic to other routes which makes them practically less operational. As part of condition study (7.5.3) there is a need to investigate the situation at these locations and come up with alternative suggestions as to how to effectively utilize them or reason for relocating the sites or abandon them all together in favor of other convenient locations. The condition with Dengego holds the same truth with respect to volume of vehicles inspected at this location and road traffic safety issues attached to it. b) Under 7.5.3, the study looked in to situations in Alemgena and Modjo. One of the problem with these stations (this holds true to other stations as well) are mainly ▪ Land encroachments in the perimeters of the weighing stations hampering the movement of heavy goods vehicles in the weighing stations. The development of street vendors and provision of shopping outlets remains a critical issue on safe traffic movement. ▪ Unless it is an overstatement all weighbridges are to measure axle	The Consultants appreciate the comment. All the issues raised, related to operation of weighbridges on the classified roads in the country have been suitably elaborated in Section 8.5 in Chapter 8. The text includes mitigation measures for overloading practices including off-loading of different overloaded vehicles with different commodities covering both dry and liquid cargo. The above issue has also been addressed in the "Computer Model and Multiyear Road Maintenance Needs Assessment Report (November 2011).

Reference	Comment	Consultants' Clarifications & Compliance
	loads of 8 tons and 10 tons for front and rear axles respectively which is in accordance with the regulation provided. Such report would be only appreciated had there been any variations in axle load measurement limits. ▪ Goods off-loaded due to axle load measurements are responsibilities of the truck-owner according to the regulation and there is no provision for ERA to provide warehouses at weighbridge stations for off loaded goods. Hence focus should be on how to efficiently evacuate such off loaded goods. ▪ It is an understatement that to say "due to lack of awareness, truck drivers are overloading construction materials…" There is clear evidence that those vehicles carrying construction materials (sand) from the vicinities of Modjo are common operators on that route, and if there is a repeated off-loading of construction materials the situation at the station would be different in handling these materials. It seems therefore the evaluation of the condition at the station far from the reality. As evidence suggests that, in Ethiopia it is not only goods vehicles that are often overloaded. The problem of axle overloading also includes those fuel cargo vehicles. The analysis may have overlooked this spectrum of overloading. Consideration of fuel vehicles to roads will have the same impact as those of goods vehicles and the subsequent overloading charges shall form part of the Road fund revenue source as well.	
Weighbridge construction (7.5.2.)	a. Discussion on issue of charges and overloading fines are misplaced and should be discusses under a different heading than under "weighbridge under construction". b. Unless it is prescribed by concerned officials from ERA and the existence of predetermined site location selected in other (documents) studies, identification of the location of weighbridges should be established based on defined criteria that could objectively help decision making as to the future of locations. It is true that capturing or intercepting traffic moving in and out of major consumption centers like Addis Ababa and on transit corridors, is critical to look into such elements as; ▸ Traffic volume on specific route	A separate section dealing with "weighbridges under construction" has been added in the present Report (Section 8.5.2). In view of growing incidences of the overloading on the road network of Ethiopia as well as to protect the road asset from the overloading practices, the present Study identifies the appropriate places for establishing additional weighbridges, and also recommends suitable measures to reduce the practices of overloading substantially. The need for additional weighbridges has been identified on the Ethiopian road network at strategic places with high possibility of intercepting the overloaded trucks/vehicles.

Reference	Comment	Consultants' Clarifications & Compliance
	▸ Axle overloading spectrum on critical routes ▸ The concept of strategic routes ▸ Seasonality traffic movement and Other strategies may help in future selection weighbridge locations.	With the above consideration, additional weighbridges have been proposed on the strategic locations. The exercise is mainly based on the volume of traffic and movement and loading pattern, and where overloaded trucks are expected, accordingly need and probability of intercepting overloaded trucks is more like near major industrial/agricultural locations.
Critical overview of the structure of the Road Fund	**Regular auditing**: There are needs for ORF to establish a regular technical audit system and clearly stated in the road fund legislation. Technical audits are the most critical activities of the office of the road fund, however there is no clear evidence that technical audit reports on maintenance works are carried out and less verification on the cost effectiveness of the work performed. This is a result of a combination of weak structural arrangement of the Office followed by inadequate planning, technical specifications, procurement and execution, and deficient supervision and control of road maintenance works which could be a reflection structural arrangement of the office embedded in the legislation provided for its establishment. The first step to achieve this is usually to amend the road sector legislation to enable the road fund to have a strong institutional structure. The ORF should therefore have to strongly establish itself in such a way that the responsibility of programming the activities of maintenance work with an appropriate allocation of resources. This responsibility involves an empowerment to sequence of tasks as; 1. Inventory: recording the basic characteristics and components of each section of the road network. 2. Inspection: examining the road and measuring its condition. 3. Determination of maintenance requirements: analyzing why defects are occurring and deciding what maintenance activities are needed to correct them. 4. Resource estimation: costing the activities of the maintenance program in order to determine the overall budget. 5. Identification of priorities: deciding the work that has to take priority. 6. Monitoring: checking the quality and effectiveness of the work.	The comment is highly appreciated, as the issues raised have been discussed with the Clients from time to time and also during several Presentations/Workshops. The need of technical audit of the ORF operations in particular has been emphasized in different areas during different stages of the Study and discussed with the Clients during the Study, and duly highlighted in the Reports submitted earlier and also in the present Report (Section 11.2.6). The ORF should have adequate technical capacity, viz. appreciation of Road Inventory and Pavement Condition Surveys in view of Maintenance Needs Assessment and funding requirement for the maintenance of road networks under the Road Agencies, and also priorities of execution because of resources constraints; and monitoring and inspection of the road maintenance works for completing the maintenance works efficiently and economically. In present Report, the texts elaborating the training requirements of different professionals from the ORF, Road Agencies and the private contractors and also covering the additional staff requirement have been added in Section 11.6, Chapter 11.

Reference	Comment	Consultants' Clarifications & Compliance
Issue of implementation	The report shall address implementation issues in a summarized manner where action plan and implementation action plan with required investments are indicated separately or in one and; • Shall have what is to be implemented in priority order. • Shall have when it is to be implemented, i.e. Time table. • Shall have the institution that is responsible for particular action of implementation. • What investment/ report is required and; • Means of verification.	The Implementation Plan for the recommended options for sources of revenue has been covered in Section 13.11, Chapter 13.
On road financing study	▪ Using HDM-4, the impact of overloading on road deterioration is estimated and using the same new overloading fine has been set. The report however does not present the input and output result of HDM-4 is in the report. As part of complete reporting formalities the HDM-4 input-output analysis shall be presented in the report. ▪ Please provide the additional road maintenance cost due to prevailing overloading of vehicles in Ethiopia. ▪ The new overloading fine ratio set by the consultants is 0.13 per vehicle per time per km. The new overloading fine is not compared with the existing overloading fine. The new overloading fine is given as rate and not lump sum. This makes the application of the overloading fine difficult, since the total amount of the overloading fine needs to be declined as the product of the fine rate and the size of overloading and distance travelled with excess road. ▪ In this case, the difficulty is setting information about the distance to overload has travelled. The weigh bridge station works has to depend on the driver to set the distance to vehicle travelled with its overloading.	The required inputs and outputs of the HDM-4 analysis have been presented in Annexure 8.1 as soft copy. Results of the overloading charges analysis and related additional road maintenance cost due to prevailing overloading practices in Ethiopia has been summarized in Table 8.22 and details in Annexure 8.3. The above exercise shows that in order to cover the additional maintenance cost due to the overloading, the overloaded goods vehicles would be required to pay ETB 0.13/veh/ton-km to cover the damages they make. Revenue generated by the overloading fines may be expected in the range of ETB 33 million pa with the assumption that only 50% of overloaded vehicles are likely to be tapped, and similar fleet structure of the motorized vehicles. The proposed overloading charges may be worked out and imposed in different slabs of travel-km of overloaded vehicles. For illustration, the overloading charges can be grouped under the following vehicle-km slabs: 0-50 km, 50-200 km, 200-500 km, 500-1,000 km and >1,000 km. There should be a definite mechanism to charge the overloaded vehicles, though the revenue generated through the overloading fines should be treated as deterrent only. The above illustration is included in Chapter 8 (Section 8.4.8) Different countries following the COMESA practices treat

Reference	Comment	Consultants' Clarifications & Compliance
	▪ The new overloading fine should be compared with COMESA overloading fine ratio.	and collect the overloading fines in different ways. The practices followed by different countries have been elaborated in Table 8.18.
	▪ Mass distance charge (Page 7 – 20): - the impact of vehicle weight on road deterioration is analyzed using HDM 4. But the output of HDM 4 analysis is not given in the report. So please provide additional road maintenance cost caused by heavy roads and passenger vehicles.	For MDCs, inputs and outputs of the HDM-4 analysis have been attached as Annexure 8.4.
	▪ Page 7 – 22, maintenance need assessment and cost:- Detail methodology of maintenance need assessment is not presented except maintenance strategy used in the analysis. Maintenance assessment is a network based analysis forecast of road deterioration. The input and output of the network analysis using HDM 4 has to be given as annex of the main report and summary of the output in body.	For Multiyear Maintenance assessment cost has been provided in Annexure 8.1 as soft copy.
	▪ Page 7 – 12, optimum maintenance standard, for paved roads. The high level maintenance strategy for overloading is when roughness is greater than or equal to 4.5 IRI. According to this strategy for overlay, surface treatment on granular base has to be carried out when the condition of asphalt concrete road is at good level. This maintenance strategy is not consistent with the country's interest. The medium and low level strategy for overlay are when roughness is greater or equal to 6 IRI respectively. When roughness of asphalt concrete is 5 IRI, it should be within a range of good level and the same with roughness of 6 IRI. It is difficult to imagine that NPV is highest for maintenance intervention based on this strategy since VOC is marginal. In other words, if overlay is carried out when roughness is 4.5 IRI (high level strategy), roughness is 4.5 IRI for low strategy; roughness decrease from 6 IRI to 4.5 IRI which means that roughness declined by 1.5 IRI only and VOCs is also marginal. ▪ ERA's strategy for overlay and reseal and re-gravelling is when road condition (roughness) is at four levels.	Optimum Maintenance Interventions have been worked out using HDM-4 by specifying a series of maintenance alternatives including ranges of traffic level, pavement condition for different pavement types, for different regions with varied terrains and climate, etc., and proposed for next 10 years for the road networks under the road agencies. Though, in reality, a true optimum level of maintenance interventions is difficult to achieve without intensive investigations, due to the level of interaction of the numerous deterioration parameters and work standards/effects. The Study has adopted different intervention levels based on internationally accepted standards to set a deterioration model for the country. The alternatives have been examined using the HDM-4 Strategic Analysis Module to produce a set of 'Optimum Section Alternatives', with the alternative giving the highest NPV being chosen as the best alternative for each matrix cell. The analysis shows that for Asphalt Mix on Granular Base (AMGB), the maintenance strategy of Overlay when Roughness>= 4.5 IRI and reconstruction/rehabilitation when Roughness >=8 IRI yields the highest NPV with the

Reference	Comment	Consultants' Clarifications & Compliance
		interval between overlays varying for different traffic levels and terrains. Alternative maintenance interventions, as presented in Table 8.1 of the present Report, ensure that roughness of the roads with asphaltic pavement in the country assumed to be less than 6, 5 and 4.5 IRI during the entire analysis period of the Study, i.e. up to 2020, based on the suggested level of maintenance strategy, viz. low, medium and high. So the periodic maintenance is recommended whenever the roughness of the pavement exceeds the IRI as indicated in Table 8.1.
Maintenance strategy for reseal	So maintenance cost estimated for paved road network based on this strategy is grossly only estimated and difficult to accept.	In continuation to the compliance of previous comment, in case of DBST, using HDM-4 analysis, at low level maintenance strategy, periodic maintenance is recommended when area of carriageway cracking reaches 30%; whereas for medium and high levels of maintenance, periodic maintenance is worked out at 20% and 10% of carriageway area under cracking respectively.
Road User Charges	Are the new charges on fuel levy obtained from the road user charge module? Road user charge software and its application to set the proposed new charges should be submitted to Road Fund and the consultant should train professionals of Road Fund Office with application of the module.	Entire Road Users Charges Analysis has been carried out using the E-RUCS Software developed during the Study. Software has been delivered to the Clients and installed on the System as per the consultancy agreement. In order to familiarize the officials of ERA and ORF about the application of the Software, a training was organized by the Consultants on 21 October 2011, which was highly appreciated by the participants.

CONSULTANCY SERVICES FOR MAINTENANCE NEEDS ASSESSMENT & UPDATING OF ROAD FINANCING STUDY, ETHIOPIA

Consultants: Intercontinental Consultants & Technocrats (ICT), India & International Consultants & Technocrats Ethiopia PLC (ICT-E)

Workshop on the Draft Final Report

[19 October 2011, i.e. Wednesday at 09:00 hr at Ibex & Nyala, Hilton, Addis Ababa, Ethiopia]

List of Participants:

Sl. No.	Name	Designation	Organization	Email / Mobile	Signature
1.	Yenenesh Assfa	W/GM	ERCC	Aseta_Yenenesh@yahoo.com	
2.	Fiona Collie		W.B.	fcollie@worldbank.org	
3.	Yared Yemma	Transport H/D Planner	ERCC	Yemmayared@gmail.com	
4.	Rashid Mohammed	DG	ORF	~~rashmohammed@~~ rashmohammed@yahoo.com	
5.	Faruk Ali	Director Finance	ORF	farukali@yahoo.com	
6.	Mamo Uche	Maintenance Division Manager	ORCE	Uche_Love@yahoo	

Sl. No.	Name	Designation	Organization	Email / Mobile	Signature
7.	Kassahun Deressa	Head, Pin & Tec. Mn	Office R.F		
8.	Abebe Tadesse	Planner	MoFED	atadessef@mofed.gov.et	
9.	Hana Bahiru	Sl. expert	Ethiopia RF.		
10.	Nigatu Tadesse	Road study M&E Expert	BGRRA	Setnit77@yahoo.com	
11.	Giuseppe D'Ago	ATTACHE'- EU Delg. to Eth	EU	giuseppe.d-ago@ec.europa.eu	
12.	Alemayehu Tegeri	Dept Head Road Fd	Road Fund	alemayehu.tw@y.com	
13.	Abiy Getamin	Reporter	Press	abraw20@yahoo.c	
14.	Mumina Wa-Kyendo	Transport Engineer	AfDB	m.wa-kyendo@afdb.org	
15.	Yohannes Sahile	A/Planning Expert	MoT	ysahile@yahoo.com	
16.	Yoshi Kawasumi	Hwy Eng.	World Bank	ykawasumi@worldbank.org	

Sl. No.	Name	Designation	Organization	Email / Mobile	Signature
17.	OBONG OBOYA	Manager	GRRA	Obongoboya@gmail	
18.	Dejene Ersa	Senior Economist	ORF	erssad@yahoo.com	
19.	Wendirad Gedw	Process owner	Ministry of Transport	Wendiradg1@yahoo.com	
20.	Eteferahu Tenaw	Expert	" "	eteraw@yahoo.com	
21.	RAJEEV SAPRA	Urban Tpt specialist AATMP	ICT	0920886185	
22.	ERLSO GALBADO	Transport Engineer	AfDB	0911663025	
23	YORDANOS ABRAHAM	Expert	MOTR	0911302481	
24.	Mahammed Saleh	Board m	Africa Tr.	0911232837	
25.	Solomon Deba	E/Leader	ERA-TL	0910-67-82-67	

Sl. No.	Name	Designation	Organization	Email / Mobile	Signature
26.	RIBKA TESSEMA	Senior F/Auditor	Road Fund	ribkat2000@yahoo.com	
27.	Demesew Gebreselassie	Public officer	Transport Ministry	dgeresus@yahoo	
28.	Tesfay G/Kiros	Bureau Head	Constr. Road & Bras.	0914723213	
29.	G/Anania Tsadik	Div. Manager	ERA	ananiaba@yahoo.	0911608233
30.	Fekadu Shumet	Pl. D. head	MOT	fekshu@yahoo.com	0913064662
31.	Demiketh Mengesha	Division head	A.A	Demeketh mengesha@yahoo	0911678385
32.	Tesfaye Gebreb	Reporter	ENA	0913041321	
33	Daniel Mengeste	Planning & prog.	ERA	0911685678	
34.	Abdulkerim Abrar	Team Leader	ERA	0911345538	
35.	Molondwossen Girma	Dept.	AACRA	0911239649	

Sl. No.	Name	Designation	Organization	Email / Mobile	Signature
36.	SAURABH SHARMA	Country Manager	ICT	ICTAA@Rediffmail.com	
37.	Mohammed Nuru	Highway Eng.	ICT	Mohammedgirsal@yahoo.com	
38.	Kodhus Begum	SW Eng	ICT	09114503	
39.					
40.					
41.					
42.					
43					
44.					
45.					

Sl. No.	Name	Designation	Organization	Email / Mobile	Signature
46.	Hailayesus A		WB.	hadamti@worldbank.org	
47.	Nebil Mohammed	Manager.	Harari Road Authority	nebilli@yahoo.com	
48.	Yoshinori OBATA	Expert	JICA	obatay2006@yahoo.co.jp	
49.	Mulugeta Demisse	RC Porter	Consultant	0912-607037	
50.	SATYAKAM	TL, RFS-Ethiopia	ICT	0920-113865	
51.	Rajeev Kumar Mokkaiya	Road/TPT Plan-RFS	ICT	0910-902375 rajeevmakkaiya11@gmail.com	
52.	Selamawit Gualu	Highway Engineer	ICTE	0911644295	
53	Hamant Yemane	Office Manager	ICTE	0911367137.	
54.	Zemen Gessesse	Draftsperson	ICTE	0911386472	
55.	Mawhood Akhtar	Laboratory manager	ICTE.	0911680187	

CONSULTANCY SERVICES FOR MAINTENANCE NEEDS ASSESSMENT & UPDATING OF ROAD FINANCING STUDY, ETHIOPIA

Consultants: Intercontinental Consultants & Technocrats (ICT), India & International Consultants & Technocrats Ethiopia PLC (ICT-E)

Workshop on the Applications of E-RUCS (ERA & ORF Participants)

[21 October 2011, i.e. Friday at 09:00 hr at ICT, Addis Ababa, Ethiopia]

List of Participants:

Sl. No.	Name	Designation	Organization	Email / Mobile	Signature
1.	Sebie Kife	Senior Network Administrator	ERA	SBLKFL@gmail.com 251-920221054	
2.	Helen Mekatibeb	Computer System Technician	ERA	0912-16 30 29 helenmekatibeb@yahoo.com	
3.	Alemayehu Tefera	Dept. Head	Road Fund	alemayehu_tw @ yahoo.com	
4.	Ermias Shewangizaw	Economist	ERA	ermulaman@gmail.com	
5.	Yodit Getachew	Economist	ERA	judajude2005@yahoo.com	
6.	Sadia Beshir	Economist	ERA	Sadiyabeshir@gmail.com	

Sl. No.	Name	Designation	Organization	Email / Mobile	Signature
7.	KONJIT ALEMU	Lead Economist	ERA	0911-63-95-29 konj-alemu@yahoo.com	
8.	Dejene Ensa	Senior Expert	ORF	0911 97 70 28 enssad@yahoo.com	
9.	Getachew Assefa	Senior Ex.	ORF	Getachew95@yahoo.com	
10.	Abebe Eshetu	Economist	ORF	abeshetu@hotmail.com 0911015396	
11.	Selamawit Gualu	Highway/ maintenance Expert	ICTE	0911644295	
12.	Tewodros Tadesse	Quantity Surv.	ICTE	0911246076	
13.	Rajeev Sapra	Urban Tpt Specialist	ICT	0920886185	
14.	SATYAPRAKASH	TL, RFS. Ethiopia	ICT	0920113865	
15.	RAJEEV K. MAKHIJA	Road/TPT Planner RFS, Ethiopia	ICT	0910902375	
16.	SAURABH SHARMA	Cont. Manager	ICT	0930003881	

Sl. No.	Name	Designation	Organization	Email / Mobile	Signature
17.	Kidus Begum	SW Gm.	AFI	01114203829	
18.					
19.					
20.					
21.					
22.					
23					
24.					
25.					

Annexure 2.1

GDP by Economic Activity at Constant Prices (ETB '000)

Economic Activity	2005-06	2006-07	2007-08	2008-09	GR (%)
Agriculture, Hunting and Forestry	**44,048,683**	**48,210,785**	**51,823,351**	**55,115,714**	**6%**
Crop	28,261,276	31,376,815	33,883,532	36,077,300	6%
Animal Farming	11,841,028	12,773,848	13,709,294	14,675,366	6%
Forestry	3,946,378	4,060,122	4,230,525	4,363,048	3%
Fishing	**13,948**	**15,022**	**20,132**	**25,472**	**16%**
Industries	10,561,012	13,841,567	15,276,136	22,934,626	21%
Mining and Quarrying	393,819	417,483	446,075	456,160	4%
Manufacturing	**4,829,876**	**5,232,876**	**5,606,908**	**6,299,128**	**7%**
Large and Medium Scale Manufacturing	3,232,754	3,539,288	3,833,049	4,396,973	8%
Small Scale & Cottage Manufacturing	1,597,123	1,693,588	1,773,859	1,902,155	4%
Electricity and Water	1,984,384	2,254,501	2,613,064	2,498,624	6%
Construction	3,352,933	5,936,707	6,610,089	7,381,586	22%
Distributive Services	**32,172,698**	**37,312,622**	**43,477,517**	**49,679,079**	**11%**
Whole Sale and Retail Trade	11,648,980	13,670,481	15,634,849	17,655,009	11%
Hotels and Restaurants	2,259,504	2,822,491	3,438,052	4,401,049	18%
Transport and Communication	5,383,741	5,885,995	6,706,400	7,139,958	7%
Financial Intermediation	1,967,431	2,264,388	2,828,908	3,500,511	15%
Real Estate	7,433,916	8,565,094	10,048,264	11,660,100	12%
Education	2,577,571	3,125,116	3,637,245	4,025,738	12%
Health and Social Work	901,555	979,057	1,183,799	1,296,714	10%
Other Services	**5,575,002**	**5,834,271**	**6,639,664**	**7,908,731**	**9%**
Public Administration and Defense	3,766,815	3,881,563	4,482,829	5,263,770	9%
Other Community, Social and Personal	1,573,842	1,712,808	1,903,629	2,030,146	7%
Private Households with employed Persons	224,345	239,900	253,206	254,815	3%
Total	**94,371,317**	**105,214,267**	**117,596,800**	**129,367,763**	**8%**
Less FISIM	896,834	1,018,267	1,301,365	1,627,263	16%
Gross Value Added at current Basic Prices	**93,474,483**	**104,196,000**	**116,295,435**	**127,740,500**	**8%**
Taxes on Products	7,433,901	7,953,307	8,531,560	7,712,997	1%
GDP at Constant Market Prices	100,908,384	112,149,363	124,826,996	135,450,497	8%

Source: Central Statistical Abstract, 2009.

Roads Covered in Verification Survey Carried out in the Month of January 2011

Road No.	Road Name	Length	Date																				
			11-Jan	12-Jan	13-Jan	14-Jan	15-Jan	16-Jan	17-Jan	18-Jan	19-Jan	20-Jan	21-Jan	22-Jan	23-Jan	24-Jan	25-Jan	26-Jan	27-Jan	28-Jan	29-Jan	30-Jan	31-Jan
Federal Roads																							
C31	Muketuri - Lemi	50.0		G1																			
A3-4	Lumame -D/Markos	37.0			G1																		
E43	Ginchi-Busa-Tulubolo	50.0			G2																		
A1-3	Adama-Metehara	89.0				G2																	
B51-1	Lemen - Butajira	74.0					G2																
C52-2	Butajira-Zeway	50.0					G2																
A7-2	Zeway - Shashemene	90.0						G2															
C33-1	Kossober -Chagni	56.0					G1																
B31-2	Mota - Zema R.Bridge	32.0						G1															
B31-2	Zema R.Bridge-Adet	43.0						G1															
D81	Wondo -Dilla	37.0							G2														
B51-4	Doyogena-Areka-Sodo	70.0									G2												
A3-9	Maksegnet - Azezo	28.0								G1													
A3-10	Azezo Airport - Gondar	13.0									G1												
E33	Azezo - Gorgora	49.9									G1												
A7-5	Arbaminch-Wezeka	62.0										G2											
C70-2	Konso-Delbena River	28.0										G2											
B30-2	Debark-Dagusit-Zarema	32.0											G1										
C73	Konso - Yabelo	103.0												G2	G2								
C23-1	Adwa-Abadi(Workamba)	70.0														G1							
E52	Atat Jun-Kose	44.6																G2					
C51-1	Atat Jun-Wolkite	14.0																G2					
A2-11	Mekelle-Wukro-Negash	50.0															G1						
A5-5	Saja - Asendabo	64.0																	G2				
B52-3	Jima - Meteso-Chida	78.0																		G2			
C54	Limu junction - Kosa*	40.0																			G2		
D23-1	Korem-Tsilary	70.0																		G1			
A6-1	Jima - Agaro	40.0															G2						
E57	Agaro-Gera Agri Development	50.0															G2						
B42-2	Dedessa River bridge-Bedele	36.0																G2					
B42-1	Nekemte-Dedessa River bridge	57.0																G2					
B32-4	Nekemte-Gutin	64.0																	G2				
B40-1	Mekenajo-Nejo	56.0																	G2				
	Dongoro-Kingi	13.3																		G2			
A1-7	Mille-Semera	68.0																				G1	
A2-10	Adigudem-Maichew	22.0																	G1				
D11	Asyita Jun-Asyita	51.1																					G1
Regional Roads																							
D41.22	DebreTsige-Fital	23.6			G1																		
D41.01	Bishoftu-Sendafa	59.1			G2																		
R-A3-6/1	Tilili-Gish Abay	30.8					G1																
AML5B	Leku -Telamo Kentisse - Bokasso -Yirgalem	28.0						G2															
AMR5	Tulu-Hantate-Shigasha	30.0								G2													
E601	Alaba-Denboya-Hossina	50.0									G2												
	Lera-Kose	23.0																					

Roads Covered in Verification Survey Carried out in the Month of January 2011

Road No.	Road Name	Length	Date																				
			11-Jan	12-Jan	13-Jan	14-Jan	15-Jan	16-Jan	17-Jan	18-Jan	19-Jan	20-Jan	21-Jan	22-Jan	23-Jan	24-Jan	25-Jan	26-Jan	27-Jan	28-Jan	29-Jan	30-Jan	31-Jan
	Aletawondo-Yirgalem	14.0							G2														
AJL1	Gebelmeno-Kabura-Segen	19.0											G2										
SAR10	Chano-Chuncha	20.0																					
R-A3-9/3	Maksegeit-Degoma-Arebay	44.0								G1													
TCAADG-01	Axum-Adet-Debregenet	34.7													G1								
E923-1	Mekele-Dengolat-Samre	36.0																	G1				
HS1	Hossaina-Gembicho	32.5															G2						
R-A2-8/2	Kobo-Zobel	40.0																		G1			
E204	Zobel-Kelawan	22.0																		G1			
D46.28	Guliso-Chekorsa-Bila	34.0																					
E808-1	Kingi-Kamashi	36.0																					
E808-2	Kamashi-Agalometi	25.0																					
Municipalities																							
DM	Debre Markos Town	1.5				G1																	
AW	Awassa Town	9.8								G2													
BD	Bahir Dar Town	9.0							G1														
SS	Shashemene	38.2							G2														
GO	Gondar Town	7.7										G1											
SH	Shire	1.0												G1									
So	Sodo Town	1.5										G2											
AX	Axum	1.5													G1								
ADW	Adwa	1.5													G1								
ADI	Adigrat	1.5															G1						
MK	Mekele	12.5																G1					
WK	Miichew	1.5																		G1			
AL	Alamata	1.5																		G1			
KO	Kobo	1.1																			G1		
WO	Woldiya	1.0																				G1	
SE	Semera	2.1																					G1
NE	Nekemte	5.0																			G2		
JI	Jima	4.8											G2										

* Roads which replace other sample roads due to under construction or some other reasons

Annexure 6.1 IB

Roads Covered in Verification Survey Carried out in the Month of February 2011

Road No.	Segment Name	Length	Date																											
			1-Feb	2-Feb	3-Feb	4-Feb	5-Feb	6-Feb	7-Feb	8-Feb	9-Feb	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	23-Feb	24-Feb	25-Feb	26-Feb	27-Feb	28-Feb
Federal Roads																														
B11-1	Eliwuha-Bati	49.0	G1																											
B11-2	Bati-Combolcha	42.0		G1																										
D22	Robit-Rasasefiberet(Awash)	34.0				G1																								
A2-3	Debresina-Robit	32.0				G1	G1																							
C21	Debrebirhan-Jihur	84.0																												
A9-1	Melkasa-Asella	61.0									G2																			
B90-3	Robe - Gasera	42.0													G2															
B90-3	Gassera - Delosebro	45.0														G2														
B90-3	Delosebro -Ginir	35.0															G2													
C83-1	Goba - Delomena	112.0																G2												
C90	Robe - Goro	60.0																	G2											
A1-5	Awash junction - Gedamitu	90.0								G1																				
A10-1	Mieso - Arebereketi	35.0										G1																		
A10-a	Dengego - Diredawa	20.0											G1																	
C100	Diredawa - Harmukali	41.0													G1															
D102	Harer- Jarso	34.0														G1														
D102	Jarso - Bombas	47.0															G1													
C105	Jijiga - Teferi ber	80.0																	G1											
Regional Roads																														
	Kasageta-Hida	30.0	G1																											
D47.06	Edo Sorofta-Arebegona	63.0										G2																		
D42.01	Bekoji-Chole	51.0											G2																	
E504-1	Kebribeyah-Hartishiek	30.0																		G1										
	Bonga-Sirimezhenger	32.0																									G2	G2	G2	
D51-1	Gambella-Abobo	43.0																												
E47.10	Ginir-Mecha	51.0																												
E47.04	Robe-Senbitu	14.0																												
BA10	Midrekebde J - Midrekebde Gedam	19.0																	G2											
	Jijiga-Tulu Tulu Gulad	28.0																												
BZ3	Koshe J - Tora	23.0																	G2											
Municipalities																														
KO	Kombolcha	5.0		G1																										
DE	Dessie	5.5			G1																									
DB	Debrebirhan	1.4				G1																								
AA	Addis Ababa	140.0																						G2	G2	G2	G2	G2	G2	G2
DM	Adama Town	7.0														G1						G1								
AD	Harer	6.0															G1				G1									
AT	Asebe Teferi (Chiro)	1.5																												
AW	Dire Dawa	15.0												G1																
BD	Jijiga	1.5																												
GM	Gambella Town	1.9																		G1							G1	G1	G1	

Annexure 6.1 IC

Roads Covered in Verfication Survey at Addis Ababa City

Name of The Road	length	Type
Lebu Sq - Sebeta	15.2	Paved
Mexico - EELPA- Gotera	3.7	Paved
Shiping Lines-Pissa- Arada Bld	2.4	Paved
Belair - Total	2.4	Paved
Sidist Kilo - Minilik Hospital	2.1	Paved
Arat Kilo - Ferenciay Legasion	3.17	Paved
Bole - Meskel Square	4.3	Paved
Pissa Degol -Kara	14.8	Paved
Holland Embassie - Weybla Mriam	5.83	Paved
Torhailoch - Winget	5.13	Paved
Ayertena Square - Total - Torhailoch	5	Paved
Kality Square - Ayertena	11.15	Paved
Bole - Kality Square	8.11	Paved
Megenagna RoundAbout - Bole	4	Paved
Sidist Kilo - Raguel	8.06	Paved
Total - Semen Mazegaja - Georgies	4.2	Paved
Mexico -Mekanisa	5.5	Paved
Abune Petros - Winget	5.6	Paved
Gotera - Meskel Square	2.65	Paved
Meskel Square - Megenagna	4.8	Paved
Megenagna - Ayat	8.1	Paved
Gotera - Kality	8.2	Paved
Total Lengh of Paved Roads =	**134.4**	

Behire Tsige Park - Fafa food Company	2	Unpaved
Pepsi - Cement Factory - Buna Board	2.04	Unpaved
Entoto Kella - Asko	7	Unpaved
Raguel - Kella	3.2	Unpaved
CMC -Mosque - Goro School	3.6	Unpaved
Woreda 11 Office - CMC	2	Unpaved
Abo Church - Worku Sefer - Water works	1.76	Unpaved
Total Lengh of Unpaved Roads =	21.6	

Total lengh of roads = 156

Annexure 6.2

Consultancy Services for the Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia
ROAD INVENTORY DATA (PAVED ROADS): ERA/MRAs

Sheet No: ERA /MRA_PV_ | | | Date of Survey: | | | |

District Code & Name: | | | Section Name: |

Road No: | | Road Name: | | From km: | | To km: | |

Segment No: | | Segment Name: | | From km: | | To km: | |

Direction of Survey: | | Design Standard: | DS 1 | DS 2 | DS 3 | DS 4 |

GPS Reference: (Start of Segment)	N	
	E	
GPS Reference: (End of Segment)	N	
	E	
Compiled By:		

Chainage (km)		Geometry		Cross Section	Left Drain	Left Shoulder		Carriageway Surface		Right Shoulder		Right Drain	Name of Nearest Village/ Town	Other Features (if any)	Comments
From	To	Vertical	Terrain			Width	Type	Width	Type	Width	Type				

Note: The survey data should be recorded every 2 km interval for a better appreciation of Pavement condition.

Codes for filling the formats:

Geometry - Vertical: 0 for Flat, 1 for Grade Uphill > +5%, 2 for Grade Down hill > -5%
Geometry - Terrain: F for Flat, R for Rolling, M for Mountaineous
Cross Section: C for Cut, E for Embankment, X for mix of cut and fill, F for Flat
Drain: PMU for Primary Unlined, PML for Primary Lined, S for Secondary, N for not existing, Specify if others
Shoulder: P for Paved, G for Gravel, E for Earthen, N for Not existing
Carriageway: A for Asphalt, B for DBST, C for Crused Stone, S for Natural Gravel, O for Others (Specify)
Others: RW for Retaining Wall, GW for Gabion Wall, GP for Guard Post, Others (Specify)

Consultants' Project Office: Intercontinental Consultants and Technocrats Pvt. Ltd., House No. 2082, Higher 17, Kebele 03/05, P.O. Box 279 (code 1110), Addis Ababa, Ethiopia.
Tel: +251-11-6187256, +251-11-6187257, +251-11-6510196

Consultancy Services for the Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia

Annexure 6.2

ROAD INVENTORY DATA (UNPAVED ROADS)

Sheet No; | | | Date of Survey: | | | |

Road Agency: ERA(1) / RRA(2) / MRA(3) / Unclassified(4) | |

District Code & Name: | | | Section Name: | |

Road No: | | Road Name: | | From km: | | To km: | |

Segment No: | | Segment Name: | | From km: | | To km: | |

Direction of Survey: | | Design Standard: | DS 5 | DS 6 | DS 7 | DS 8 |

GPS Reference: (Start of Segment)	N	
	E	
	Elevation	
GPS Reference: (End of Segment)	N	
	E	
	Elevation	

Compiled By:	

Chainage (km)		Geometry		Cross Section	Left Drain	Left Shoulder		Carriageway Surface		Right Shoulder		Right Drain	Name of Nearest Village/ Town	Other Features (if any)	Comments
From	To	Vertical	Terrain			Width	Type	Width	Type	Width	Type				

Note: The survey data should be recorded every 2 km interval for a better appreciation of Pavement condition.

Codes for filling the formats:

Geometry - Vertical: 0 for Flat, 1 for Grade Uphill > +5%, 2 for Grade Down hill > -5%

Geometry - Terrain: F for Flat, R for Rolling, M for Mountaineous

Cross Section: C for Cut, E for Embankment, X for mix of cut and fill, F for Flat

Drain: PMU for Primary Unlined, PML for Primary Lined, S for Secondary, N for not existing, Specify if others

Shoulder: P for Paved, G for Gravel, E for Earthen, N for Not existing

Carriageway: B for DBST, C for Crused Stone, S for Natural Gravel, O for Others (Specify)

Others: RW for Retaining Wall, GW for Gabion Wall, GP for Guard Post, Others (Specify)

Consultants' Project Office: Intercontinental Consultants and Technocrats Pvt. Ltd., House No. 2082, Higher 17, Kebele 03/05, P.O. Box 279 (code 1110), Addis Ababa, Ethiopia.
Tel: +251-11-6187256, +251-11-6187257, +251-11-6510196

Consultancy Services for the Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia
ROAD CONDITION DATA (PAVED ROADS) for Carriageway and Road Geometry

Sheet No: ERA/MRA_PV_ _____ Date of Survey: _____

GPS Reference: (Start of Segment) N ____ E ____ Elev ____

District Code & Name: _____ Section Name: _____

GPS Reference: (End of Segment) N ____ E ____ Elev ____

Road No: _____ Road Name: _____ From km: _____ To km _____

Segment No: _____ Segment Name: _____ From km: _____ To km _____

Last Construction/ Reconstruction Year: _____ Last Rehabilitation (Overlay) Year: _____ Last Resurfacing/ Resealing year: _____

Direction of Survey: _____

Average No of Curves/km _____
Average Rise+Fall (m/km) _____

Speed of the Traffic Stream (km/hr)	<30	30-45	45-65	60-80	>80
Design Standard:	DS1	DS2	DS3	DS4	

Traffic Range: (AADT)			
200-1,000	1,000-5,000	5,000-10,000	>10,000

Compiled By: _____

Chainage (km)		Carriageway		Cross Section	Riding Quality	Potholes (Severity Level)	Deformation Due to Rutting /Cracking / Undulation (Severity Level)	Patching (Severity Level)	Edge Break (Severity Level)	Raveling (Severity level)	Geometry		Name of Nearest Village	Other Features (If any)	General Condition of the Road (VG/G/F/P/VP)
From	To	Width	Type	(C/E/X/F)	VG/G/F/P/VP						Average Gradient Difference	Terrain (Flat/Rolling/ Mountainious)			

Note: The survey data should be recorded every 2 km interval for a better appreciation of Pavement condition.

Codes to Fill the Format:

Cross Section: C for Cut, E for Fill, X for Cut and Fill mixed and F for Flat
Riding Quality: Very Good (VG) for speed >80km/hr, Good (G) for Speed >60 and <80km/hr, Fair (F) for speed >45km/hr and <60km/hr, Poor (P) for speed >30km/hr and <45km/hr, Very Poor (VP) for speed <30km/hr
Potholes: 1 for Less than 5 Potholes per 100 m with diameter less than 30 cm, 2 for 5 to 20 Potholes per 100 m with diameter less than 30 cm or less than 5 Potholes per 100 m with diameter over 30 cm, 3 for More than 20 Potholes per 100 m
Deformation: 1 for depth less than 5 cm, 2 for depth between 5 and 10 cm and 3 for depth greater than 10 cm
Patching: 1 for 0 to 10% of the area in 2 km , 2 for 10 to 50% of the area in 2 km , 3 for More than 50% of the area in 2 km
Edge Break: 1 for Just started or 50 m/1 km of edge break, 2 for 50 to 500 m/km edge break and 3 for over 500 m or more than 0.5 m width of road broken
Ravelling: 1 for localized & Roadbase not Visible, 2 for continuous or localized but roadbase visible, 3 for continuous and roadbase visible
Gradient: 0 for Average Gradient Difference < 5%, 1 for Average Gradient Difference > +5% and 2 for Average Gradient Difference > -5%,

Consultants' Project Office: Intercontinental Consultants and Technocrats Pvt. Ltd., House No. 2082, Higher 17, Kebele 03/05, P.O. Box 279 (code 1110), Addis Ababa, Ethiopia.
Tel: +251-11-6187256, +251-11-6187257, +251-11-6510196

Consultancy Services for the Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia
ROAD CONDITION DATA (PAVED ROADS) for Shoulders, Embankment and Side Drain

Sheet No: ERA/MRA_PV_ [ ] Date of Survey: [ ]

District Code & Name [ ] [ ] Section Name: [ ]

GPS Reference: Start of Segment	
	N
	E
	Elev.

Road No: [ ] Road Name: [ ] From km: [ ] To km: [ ]

Segment No: [ ] Segment Name: [ ] From km: [ ] To km: [ ]

GPS Reference: End of Segment	
	N
	E
	Elev.

Last Construction/ Reconstruction Year: [ ] Last Rehabilitation (Overlay) Year: [ ] Last Resealing year: [ ]

Direction of Survey: [ ]

Average No of Curves/km [ ]

Average Rise+Fall (m/km) [ ]

Speed of the Traffic Stream (km/hr):	<30	30-45	45-65	>65
Design Standard:	DS1	DS2	DS3	DS4

Traffic Range: (AADT)			
200-1,000	1,000-5,000	5,000-10,000	>10,000

Compiled By:	

Chainage (km)		Shoulder						Embankment		Road Side Drain Condition		Other Features (If any)
From	To	Type	Deformation Extent (Severity level)		Vegetation Extent (Severity Level)		Edge Drop (Severity Level)	General Condition	Extent of Slope Erosion	Left (G/F/P/N)	Right (G/F/P/N)	
			Left	Right	Left	Right		(G/F/P)				

Note: The survey data should be recorded every 2 km interval for a better appreciation of Pavement condition.

Codes to Fill the Format:

Deformation: 1 for depth less than 5 cm, 2 for depth between 5 and 10 cm and 3 for depth greater than 10 cm

Vegetation: 0 for No vegetation, 1 for vegetation less than 0.5 m in height, 2 for vegetation higher that can be cleared manually, 3 for vegetation higher than 0.5 m that requires mechanical clearing

Edge Drop: 1 for depth less than 5 cm, 2 for depth between 5 and 10 cm and 3 for depth greater than 10 cm

Enbankment or Extent of Soil Erosion: 0 for No erosion, 1 for embankment slightly washed, 2 If erosion creates channelized gullies

Drain Condition: 1 for ditches that can be normally maintained, 2 for ditches that are silty or filled in a half or scoured and 3 for ditches that are severely filled in or scoured, N for No Drains

Consultants'Project Office: Intercontinental Consultants and Technocrats Pvt. Ltd., House No. 2082, Higher 17, Kebele 03/05, P.O. Box 279 (code 1110), Addis Ababa, Ethiopia.
Tel: +251-11-6187256, +251-11-6187257, +251-11-6510196

Consultancy Services for the Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia
PAVEMENT CONDITION DATA (UNPAVED ROADS)

Sheet No: _____ Road Agency: ERA(1) / RRA(2) / MRA(3) / Unclassified(4) _____ Date of Survey: Day _____ Month _____ Year _____

District/Region Code & Name: _____ Section Name: _____

Road No: _____ Road Name: _____ From km: _____ To km: _____

GPS Reference: (Start of Segment) N _____ E _____ Elev _____

Segment No: _____ Segment Name: _____ From km: _____ To km: _____

GPS Reference: (End of Segment) N _____ E _____ Elev _____

Direction of Survey: _____

Surface Material Characteristics	Type ERA					
	1	2	3	4	5	6

Design Standard ERA			
DS 5	DS 6	DS 7	DS 8

Rise + Fall (m/km): _____

Traffic Range: (AADT)			
25-50	50-100	100-200	>200

Year of Last Re gravelling: _____
Re gravelling Thickness (mm): _____

No. of sharp and Mild Horizontal Curves _____

Speed of the Traffic Stream (km/hr):

<20	20-30	30-40	40-60	>60

Compiled By: _____

Chainage (km)		Carraigeway Condition				Road Side Drain Condition		Others
From	To	Present Gravel Thickness (mm)	No of Spot damage or potholes	General Condition of the Pavement (G/F/P)	Riding Quality VG/G/F/P/VP	Left (G/F/P/N)	Right (G/F/P/N)	

Note: The survey data should be recorded every 2 km interval for a better appreciation of Pavement condition.

Codes to Fill the Format:
Riding Quality: VG - Speed >60km/hr, G for speed >40km/hr and <60km/hr, F for speed >30km/hr and <40km/hr, P for speed >20km/hr and <30km/hr, VP for speed <20km/hr
Road Side Drain: G for No Scour or silt, F for some scour or Silt, P for highly scoured or Silted and N for No Side Drain

Consultants' Project Office: Intercontinental Consultants and Technocrats Pvt. Ltd., House No. 2082, Higher 17, Kebele 03/05, P.O. Box 279 (code 1110), Addis Ababa, Ethiopia.
Tel: +251-11-6187256, +251-11-6187257, +251-11-6510196

Annexure 6.2

Consultancy Services for the Maintenance Needs Assessment and Updating of Road Financing Study, Ethiopia
STRUCTURE/ ROAD FURNITURE DATA

Sheet No :

Road Agency: ERA(1) RRA(2) / MRA (3) Unclassified(4)

Date of Survey:

District/Region Code & Name:

Section Name:

Road No:

Road Name:

From km:

To km:

Segment No:

Segment Name:

From km:

To km:

Direction of Survey :

GPS Reference: (Start of Segment)	N	
	E	
	Elevation	

GPS Reference: (End of Segment)	N	
	E	
	Elevation	

Compiled By:	

Chainage (km)	Culvert Detail					Bridge Details				Road Furniture					
												Condition			
From Station	To Station	Type of Culvert (**P**ipe/**S**lab/**B**ox/**O**thers)	Outlet Scoured (in no)	Silted/Blocked (in No.)	Structure Damaged (in No)	No. of Bridges	Type of Bridges	Span Size (m)	Structure Damaged	Type	Number	Dirty	Damaged	Missing	Other Features (if any)

Annexure 7.1

Maintenance Cost for Classified Road Network in Scenario - 1

Pavement Condition	Maintenance Type	Plain			Rolling			Mountainous			Total Cost
		Length	Unit Cost	Total Cost	Length	Unit Cost	Total Cost	Length	Unit Cost	Total Cost	
ERA Paved											
V.G./Good	Routine	2,596	10,874	28,228,904	1,688	11,418	19,273,584	1,445	11,635	16,812,575	64,315,063
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	429	28,273	12,129,117	729	29,687	21,641,823	13	30,252	393,276	34,164,216
	Periodic	-	682,371	-	-	699,481	-	-	707,999	-	-
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	281	716,490	201,333,690	205	734,455	150,563,275	90	743,399	66,905,910	418,802,875
Total	-	-	-	**241,691,711**	-	-	**191,478,682**	-	-	**84,111,761**	**517,282,154**
ERA Unpaved											
V.G./Good	Routine	2561	4,471	11,450,231	2953	4,516	13,335,748	2704	4,560	12,330,240	37,116,219
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	2,135	11,625	24,819,375	1,103	11,741	12,950,323	871	11,976	10,431,096	48,200,794
	Periodic		343,523	-	-	346,547	-	-	351,456	-	-
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	1,032	345,240	356,287,680	516	348,280	179,712,480	498	353,213	175,900,074	711,900,234
Total	-	-	-	**392,557,286**	-	-	**205,998,551**	-	-	**198,661,410**	**797,217,247**
RRA Unpaved											
V.G./Good	Routine	4,795	4,471	21,438,445	3,588	4,516	16,206,996	2,353	4,560	10,729,680	48,375,121
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	3,206	11,625	37,269,750	3,500	11,741	41,093,500	2,030	11,976	24,311,280	102,674,530
	Periodic	-	343,523	-	-	346,547	-	--	351,456	-	-

Annexure 7.1

Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	1,030	345,240	775,479,111	912	348,280	693,014,208	633	353,213	485,432,365	1,953,925,684
Total	--	-	-	**834,187,306**	-	-	**750,314,704**	-	-	**520,473,325**	**2,104,975,335**
MRAs Paved											
V.G./Good	Routine	462	10,874	5,023,788	548	11,418	6,257,064	41	11,635	477,035	11,757,887
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	48	28,273	1,357,104	98	29,687	2,909,326	7	30,252	211,764	4,478,194
	Periodic	-	682,371	-		699,481	-		707,999	-	-
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	7	716,490	5,015,430	34	734,455	24,604,243	0	743,399	-	29,619,673
Total	-	-	-	**11,396,322**	-	-	**33,770,633**	-	-	**688,799**	**45,855,754**
MRAs Unpaved											
V.G./Good	Routine	1,422	4,471	6,357,762	205	4,516	925,780	293	4,560	1,336,080	8,619,622
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	550	11,625	6,393,750	36	11,741	422,676	106	11,976	1,269,456	8,085,882
	Periodic	-	343,523	-	-	346,547	-	-	351,456	-	-
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	179	345,240	61,797,960	114	348,280	39,529,780	4	353,213	1,412,852	102,740,592
Total	-	-	-	**74,549,472**	-	-	**40,878,236**	-	-	**4,018,388**	**119,446,096**

Annexure 7.2

Maintenance Cost for the Classified Road Network in Scenario - 2

Pavement Condition	Maintenance Type	Plain			Rolling			Mountainous			Total Cost
		Length	Unit Cost	Total Cost	Length	Unit Cost	Total Cost	Length	Unit Cost	Total Cost	
ERA Paved											
V.G./Good	Routine	2,596	10,874	28,228,904	1,688	11,418	19,273,584	1,445	11,635	16,812,575	64,315,063
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	343	28,273	9,703,294	583	29,687	17,313,458	10	30,252	314,621	27,331,373
	Periodic	86	682,371	58,547,432	146	699,481	101,984,330	3	707,999	1,840,797	162,372,559
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	281	716,490	201,333,690	205	734,455	150,563,275	90	743,399	66,905,910	418,802,875
Total	-	**-**	**-**	**297,813,320**	**-**	**-**	**289,154,647**	**-**	**-**	**85,873,903**	**683,946,280**
ERA Unpaved											
V.G./Good	Routine	2561	4,471	11,450,231	2953	4,516	13,335,748	2704	4,560	12,330,240	37,116,219
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	1,708	11,625	19,855,000	882	11,741	10,360,258	697	11,976	8,344,877	38,560,635
	Periodic	427	343,523	146,684,321	221	346,547	76,448,268	174	351,456	61,223,635	284,356,224
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	1,032	345,240	356,287,680	516	348,280	179,712,480	498	353,213	175,900,074	711,900,234
Total	-	**-**	**-**	**534,277,232**	**-**	**-**	**279,856,754**	**-**	**-**	**257,798,826**	**1,071,933,312**
RRA Unpaved											
V.G./Good	Routine	4,795	4,471	21,438,445	3,588	4,516	16,206,996	2,353	4,560	10,729,680	48,375,121
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	2,565	11,625	29,815,800	2,800	11,741	32,874,800	1,624	11,976	19,449,024	82,139,624
	Periodic	641	343,523	220,266,948	700	346,547	242,582,900	406	351,456	142,691,136	605,540,984

Annexure 7.2

Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	2,059	345,240	775,479,111	1,824	348,280	693,014,208	1,265	353,213	485,432,365	1,953,925,684
Total	-	**-**	**-**	**1,047,000,304**	**-**	**-**	**984,678,904**	**-**	**-**	**658,302,205**	**2,689,981,413**
MRAs Paved											
V.G./Good	Routine	462	10,874	5,023,788	548	11,418	6,257,064	41	11,635	477,035	11,757,887
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	38	28,273	1,085,683	78	29,687	2,327,461	6	30,252	169,411	3,582,555
	Periodic	10	682,371	6,550,762	20	699,481	13,709,828	1	707,999	991,199	21,251,788
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	14	716,490	10,030,860	67	734,455	49,208,485	-	743,399	-	59,239,345
Total	-	**-**	**-**	**22,691,093**	**-**	**-**	**71,502,838**	**-**	**-**	**1,637,645**	**95,831,575**
MRAs Unpaved											
V.G./Good	Routine	1,422	4,471	6,357,762	205	4,516	925,780	293	4,560	1,336,080	8,619,622
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	440	11,625	5,115,000	29	11,741	338,141	85	11,976	1,015,565	6,468,706
	Periodic	110	343,523	37,787,530	7	346,547	2,495,138	21	351,456	7,450,867	47,733,536
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	358	345,240	123,595,920	227	348,280	79,059,560	8	353,213	2,825,704	205,481,184
Total	-	**-**	**-**	**172,856,212**	**-**	**-**	**82,818,619**	**-**	**-**	**12,628,216**	**268,303,048**

Annexure 8.2

Axle Load Data (ERA, 2009-10)

Weigh Station	Position of the Axle	Axle load in tons										
		1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12
Alemgina	Front	-	2	9	158	1,622	3,149	2,781	155	21	4	-
	Rear	-	5	16	93	401	1,124	2,436	5,239	10,871	113	122
Dengego	Front	-	-	6	622	1,686	2,772	3,211	325	2	2	-
	Rear	-	-	45	156	471	1,396	3,206	5,123	17,128	1,576	223
Awash	Front	-	3	16	622	3,920	8,873	14,466	548	106	18	8
	Rear	6	47	50	279	1,033	3,593	12,814	21,812	60,613	13,453	3,707
Holeta	Front	-	4	109	1,555	5,477	2,976	2,882	183	19	2	-
	Rear	-	21	11	72	221	1,014	3,645	6,883	16,056	3,273	1,902
Jima	Front	-	-	11	98	581	815	544	23	1	-	-
	Rear	1	7	12	33	135	296	536	1,240	2,287	565	162
Combolcha	Front	-	-	4	14	455	1,045	4,645	186	-	-	-
	Rear	-	-	5	4	4	22	251	1,519	12,102	13,110	780
Modjo	Front	-	2	21	490	6,830	29,827	26,488	851	44	6	-
	Rear	2	14	31	74	306	1,901	9,487	43,947	117,711	6,927	439
Sululta	Front	-	5	24	266	1,122	3,234	4,826	128	23	11	-
	Rear	-	-	11	31	93	261	925	3,811	10,959	9,754	1,466
Shashemane	Front	1	-	18	271	1,698	2,592	2,502	26	4	-	-
	Rear	24	36	76	239	942	1,804	2,634	5,535	11,515	103	164

Axle Load Data (ERA, 2009-10) (contd.)

Weigh Station	Position of the Axle	Axle load in tons										
		12 - 13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23
Alemgina	Front	-	-	-	-	-	-	-	-	-	-	-
	Rear	319	459	179	107	78	40	13	1	-	-	-
Dengego	Front	-	-	-	-	-	-	-	-	-	-	-
	Rear	273	125	31	2	-	-	-	-	-	-	-
Awash	Front	-	-	-	-	-	-	-	-	-	-	-
	Rear	3,442	3,322	2,733	1,437	653	274	90	38	7	3	-
Holeta	Front	-	-	-	-	-	-	-	-	-	-	-
	Rear	1,571	283	172	356	163	30	8	2	1	-	-
Jima	Front	-	-	-	-	-	-	-	-	-	-	-
	Rear	142	88	63	52	11	6	-	2	-	-	-
Combolcha	Front	-	-	-	-	-	-	-	-	-	-	-
	Rear	238	138	41	10	11	5	-	-	-	-	-
Modjo	Front	-	-	-	-	-	-	-	-	-	-	-
	Rear	381	495	421	260	135	83	32	6	4	-	-
Sululta	Front	-	-	-	-	-	-	-	-	-	-	-
	Rear	587	798	363	139	59	35	9	19	-	-	-
Shashemane	Front	-	-	-	-	-	-	-	-	-	-	-
	Rear	217	112	98	66	45	13	6	3	-	-	-

Source: Compiled by the Consultants using the axle load data collected from ERA's Pavement Management Branch, 2009/2010 Annual Axle Load Control Report.

Annexure 7.3

Maintenance Cost for Classified Road Network in Scenario - 3

Pavement Condition	Maintenance Type	Plain			Rolling			Mountainous			Total Cost
		Length	Unit Cost	Total Cost	Length	Unit Cost	Total Cost	Length	Unit Cost	Total Cost	
ERA Paved											
V.G./Good	Routine	2,596	10,874	28,228,904	1,688	11,418	19,273,584	1,445	11,635	16,812,575	64,315,063
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	343	28,273	9,703,294	583	29,687	17,313,458	10	30,252	314,621	27,331,373
	Periodic	86	682,371	58,547,432	146	699,481	101,984,330	3	707,999	1,840,797	162,372,559
Poor	Routine		-	-	-	-	-	-	-	-	-
	Periodic	141	716,490	100,666,845	103	734,455	75,281,638	45	743,399	33,452,955	209,401,438
Total	-	**-**	**-**	**197,146,475**	**-**	**-**	**213,853,010**	**-**	**-**	**52,420,948**	**463,420,433**
ERA Unpaved											
V.G./Good	Routine	2561	4,471	11,450,231	2953	4,516	13,335,748	2704	4,560	12,330,240	37,116,219
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	1,708	11,625	19,855,500	882	11,741	10,360,258	697	11,976	8,344,877	38,560,635
	Periodic	427	343,523	146,684,321	221	346,547	76,448,268	174	351,456	61,223,635	284,356,224
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	516	345,240	178,143,840	258	348,280	89,856,240	249	353,213	87,950,037	355,950,117
Total	-	**-**	**-**	**356,133,892**	**-**	**-**	**190,000,514**	**-**	**-**	**169,848,789**	**715,983,195**
RRA Unpaved											
V.G./Good	Routine	4,795	4,471	21,438,445	3,588	4,516	16,206,996	2,353	4,560	10,729,680	48,375,121
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	3,206	11,625	37,269,750	3,500	11,741	41,093,500	2,030	11,976	24,311,280	102,674,530
	Periodic	-	343,523	-	-	346,547	-	-	351,456	-	-

Annexure 7.3

Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	824	345,240	310,191,644	730	348,280	277,205,683	506	353,213	194,172,946	781,570,274
Total	-	**-**	**-**	**368,899,839**	**-**	**-**	**334,506,179**	**-**	**-**	**229,213,906**	**932,619,925**
MRAs Paved											
V.G./Good	Routine	462	10,874	5,023,788	548	11,418	6,257,064	41	11,635	477,035	11,757,887
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	48	28,273	1,357,104	98	29,687	2,909,326	7	30,252	211,764	4,478,194
	Periodic	-	682,371	-	-	699,481	-	-	707,999	-	-
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	14	716,490	10,030,860	67	734,455	49,208,485	-	743,399	-	59,239,345
Total	-	**-**	**-**	**16,411,752**	**-**	**-**	**58,374,875**	**-**	**-**	**688,799**	**75,475,426**
MRAs Unpaved											
V.G./Good	Routine	1,422	4,471	6,357,762	205	4,516	925,780	293	4,560	1,336,080	8,619,622
	Periodic	-	-	-	-	-			-	-	-
Fair	Routine	550	11,625	6,393,750	36	11,741	422,676	106	11,976	1,269,456	8,085,882
	Periodic	-	343,523	-	-	346,547	-	-	351,456	-	-
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	358	345,240	123,595,920	227	348,280	79,059,560	8	353,213	2,825,704	205,481,184
Total	-	**-**	**-**	**136,347,432**	**-**	**-**	**80,408,016**	**-**	**-**	**5,431,240**	**222,186,688**

Annexure 7.4

Maintenance Cost for Classified Road Network in Scenario - 4

Pavement Condition	Maintenance Type	Plain			Rolling			Mountainous			Total Cost
		Length	Unit Cost	Total Cost	Length	Unit Cost	Total Cost	Length	Unit Cost	Total Cost	
ERA Paved											
V.G./Good	Routine	2,596	10,874	28,228,904	1,688	11,418	19,273,584	1,445	11,635	16,812,575	64,315,063
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	386	28,273	10,916,205	656	29,687	19,477,641	12	30,252	353,948	30,747,794
	Periodic	43	682,371	29,273,716	73	699,481	50,992,165	1	707,999	920,399	81,186,280
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	141	716,490	100,666,845	103	734,455	75,281,638	45	743,399	33,452,955	209,401,438
Total	-	**-**	**-**	**169,085,670**	**-**	**-**	**165,025,028**	**-**	**-**	**51,539,877**	**385,650,575**
ERA Unpaved											
V.G./Good	Routine	2561	4,471	11,450,231	2953	4,516	13,335,748	2704	4,560	12,330,240	37,116,219
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	1,922	11,625	22,337,438	933	11,741	11,655,291	784	11,976	9,387,986	43,380,715
	Periodic	214	343,523	73,342,161	110	346,547	38,224,134	87	351,456	30,611,818	142,178,112
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	516	345,240	178,143,840	258	348,280	89,856,240	249	353,213	87,950,037	355,950,117
Total	-	**-**	**-**	**285,273,670**	**-**	**-**	**153,071,413**	**-**	**-**	**140,280,081**	**578,625,163**
RRA Unpaved											
V.G./Good	Routine	4,795	4,471	21,438,445	3,588	4,516	16,206,996	2,353	4,560	10,729,680	48,375,121
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	3,206	11,625	37,269,750	3,500	11,741	41,093,500	2,030	11,976	24,311,280	102,674,530
	Periodic	-	343,523	-	-	346,547	-	-	351,456	-	-

Annexure 7.4

Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	1,030	345,240	387,739,556	912	348,280	346,507,104	633	353,213	242,716,183	976,962,842
Total	-	**-**	**-**	**446,447,751**	**-**	**-**	**403,807,600**	**-**	**-**	**277,757,143**	**1,128,012,493**
MRAs Paved											
V.G./Good	Routine	462	10,874	5,023,788	548	11,418	6,257,064	41	11,635	477,035	11,757,887
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	48	28,273	1,357,104	98	29,687	2,909,326	7	30,252	211,764	4,478,194
	Periodic	-	682,371	-	-	699,481	-	-	707,999	-	-
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	7	716,490	5,015,430	34	734,455	24,604,243	-	743,399	-	29,619,673
Total	-	**-**	**-**	**11,396,322**	**-**	**-**	**33,770,633**	**-**	**-**	**688,799**	**45,855,754**
MRAs Unpaved											
V.G./Good	Routine	1,422	4,471	6,357,762	205	4,516	925,780	293	4,560	1,336,080	8,619,622
	Periodic	-	-	-	-	-	-	-	-	-	-
Fair	Routine	550	11,625	6,393,750	36	11,741	422,676	106	11,976	1,269,456	8,085,882
	Periodic	-	343,523	-	-	346,547	-	-	351,456	-	-
Poor	Routine	-	-	-	-	-	-	-	-	-	-
	Periodic	179	345,240	61,797,960	114	348,280	39,529,780	4	353,213	1,412,852	102,740,592
Total	-	**-**	**-**	**74,549,472**	**-**	**-**	**40,878,236**	**-**	**-**	**4,018,388**	**119,446,096**

Annexure 8.3

Increment Damages due to Overloading and Annual Revenue Calculation from Overloading Fees

(in ETB)

Year	Existing Case		Extra Damages due to Overloading	
	Base Case	Project Case	Base Case	Project Case
2011	2,027,387	2,027,387	2,027,401	2,027,401
2012	1,121,690	1,121,690	1,121,690	1,121,690
2013	1,124,138	1,124,138	1,124,294	51,941,716
2014	1,127,113	51,941,744	1,127,459	1,121,690
2015	1,889,206	1,121,690	1,889,672	1,121,690
2016	1,889,429	1,121,690	1,889,909	1,121,690
2017	1,889,822	51,941,690	1,890,326	51,941,690
2018	1,890,184	1,121,690	1,890,710	1,121,690
2019	3,153,480	1,121,690	3,154,024	1,121,690
2020	1,890,682	51,941,690	1,891,238	51,941,690
2021	3,284,209	1,121,690	3,284,819	1,121,690
2022	1,891,736	1,121,690	1,892,356	51,941,690
2023	3,427,723	51,941,690	3,428,405	1,121,690
2024	3,167,328	1,121,690	3,168,016	1,121,690
2025	1,894,072	1,121,690	1,894,833	51,941,690
2026	3,300,382	51,941,690	3,301,216	1,121,690
2027	1,895,551	1,121,690	1,896,398	1,121,690
2028	3,445,748	51,941,690	3,446,681	51,941,690
2029	3,185,324	1,121,690	3,186,265	1,121,690
2030	1,898,828	1,121,690	1,899,867	51,941,690
Total	**45,394,033**	**328,262,003**	**45,405,578**	**379,079,541**

Damages in ETB	Incremental damages due to overloading					
	per year/100 km	per year/km	per year/ veh/km	per year/veh/ km/ton	per day/veh/km/ ton (without Overheads)	per day/veh/km /ton (with overheads)
	2,540,877	25408.77	168.27	23.844	0.065	0.131

A. Veh. Utilization	overloaded Vehicles	Revenue	50% of Revenue	
3,985,652,000	514,946,238	67,278,593	33,639,296	**ETB**

Annexure 8.4

Derivation of Mass Distance Charges (MDCs) Rates for Different Vehicles

Incremental Cost of Road Damage Due to Heavy Vehicles

(in ETB)

Year	Existing Scenario		Scenarios with MDCs in place			
	Base Case	Project Case	Project Case	Project Case	Project Case	Project Case
			S. Truck	M. Truck	H. Truck	Trailers
2011	2,027,387	2,027,387	2,027,410	2,027,445	2,027,416	2,060,286
2012	1,121,690	1,121,690	1,121,690	1,121,690	1,121,690	1,139,862
2013	1,124,138	1,124,138	51,941,717	51,941,721	51,941,718	52,783,177
2014	1,127,113	51,941,744	1,121,690	1,121,690	1,121,690	1,139,862
2015	1,889,206	1,121,690	1,121,690	1,121,690	1,121,690	1,139,862
2016	1,889,429	1,121,690	51,941,690	1,121,690	51,941,690	52,783,146
2017	1,889,822	51,941,690	1,121,690	51,941,690	1,121,690	1,139,862
2018	1,890,184	1,121,690	1,121,690	1,121,690	1,121,690	1,139,862
2019	3,153,480	1,121,690	51,941,690	1,121,690	51,941,690	52,783,146
2020	1,890,682	51,941,690	1,121,690	51,941,690	1,121,690	1,139,862
2021	3,284,209	1,121,690	51,941,690	1,121,690	1,121,690	1,139,862
2022	1,891,736	1,121,690	1,121,690	51,941,690	51,941,690	52,783,146
2023	3,427,723	51,941,690	1,121,690	1,121,690	1,121,690	1,139,862
2024	3,167,328	1,121,690	51,941,690	1,121,690	51,941,690	52,783,146
2025	1,894,072	1,121,690	1,121,690	51,941,690	1,121,690	1,139,862
2026	3,300,382	51,941,690	1,121,690	1,121,690	1,121,690	1,139,862
2027	1,895,551	1,121,690	51,941,690	1,121,690	51,941,690	52,783,146
2028	3,445,748	51,941,690	1,121,690	51,941,690	1,121,690	1,139,862
2029	3,185,324	1,121,690	51,941,690	1,121,690	51,941,690	52,783,146
2030	1,898,828	1,121,690	1,121,690	51,941,690	1,121,690	1,139,862
Total	**45,394,033**	**328,262,003**	**379,079,552**	**379,079,591**	**379,079,559**	**385,220,676**

Mass Distance Charges (MDCs) Rates for Different Vehicles

	Yearly Difference in Project and Base Case for MDCs	Yearly Revenue (ETB/Veh/100 km)	MDC Rates/ '00 veh-km
Small Truck / Mini Bus	2,540,879	2584.82	7.10
Medium Truck / Bus	2,540,877	6078.65	16.65
Heavy truck	2,540,878	7157.40	19.61
Trailers	2,847,934	8578.11	23.50

Questionnaire for Road Fund Board (Country……..……..)

I. Road Fund Board

1. The Road Fund Board was established by the Proclamation in Year: ……

2. Objectives of the Road Fund as per the Proclamation

i. ……
ii. ……
iii. ……
iv. ……

3. Sources of Revenue suggested in the Road Fund Proclamation

i. ……
ii. ……
iii. ……
iv. ……
v. ……

4. Sources of Revenue Effected to contribute to the Road Fund

i. ……
ii. ……
iii. ……
iv. ……
v. ……

➔*Any reasons for the Sources suggested in the Road Fund Proclamations, which are not yet effected to make the contributions (if that is the case)*

……

……

5. Structure of the Road Fund Board

[Details on Members & Private Sector Representation]

No. of Board Members……; Board with Private Sector (No.) ……

Staff Size (No.): ……; Total Road Fund Resources (US$ million) ……

Any other Details:

……..

Annexure 9.1

II. Sources of Revenue prevailing to contribute to the Road Fund

[Information needs to be furnished as per the prevailing Sources of Revenue; the followings are given as examples]

i. Government Budget Allocation for the Road Fund

Source	Brief Description

Any Supporting Note:……

ii. Fuel Levies** (US$/Unit): Retail Price (US$/liter): **Petrol: ……, Diesel: ……**

Product	Fuel Levy	VAT	Municipal Tax	Other	Total
MGR (Petrol)					
ADO (Diesel)					
LFO					
HFO					
Oil & Lubricants					

MGR: Mogas Regular-Petrol; ADO: Automobile Diesel Oil; LFO: Light Fuel Oil; HFO: Heavy Fuel Oil.

➔***Please indicate the Fuel levy based on: (i) Fixed Rate/liter (not ad valorem); (ii) As percentage of Sales Price; (iii) others ……..., as per the case.*

Please Tick (X), if the part of the Road Fund, and the % goes to the Road Fund:

Product	Fuel Levy	VAT	Municipal Tax	Other	Total
MGR (Petrol)					
ADO (Diesel)					
LFO					
HFO					
Oil & Lubricants					

iii. Overloading Fines:

Please furnish the details by vehicle type on the Overloading Fine, e.g. US$/per ton, offloading the overloaded commodities, etc. in case freight carrying vehicles:

Type of Vehicle				
Fine (US$/Unit)				

Rationale & Methods adopted for imposing the Overloading Fines:……....

……

iv. Transit Fees:

Foreign Vehicles entering in the country, and also passing through the country need to pay Transit Charges (US$/Vehicle or Unit):

Vehicle Type						
Transit Charges						
Driver						
Cleaner						
Other						

Rationale & Methods adopted for determining/collecting Transit Charges:

……

……

v. Annual Vehicle License (AVL) Fees:

In order to cover part of the road maintenance cost; are Annual Vehicle License Fees prevailing in your country, if yes the AVL Fee US$/Vehicle (for different types of vehicle).

Vehicle Type						
AVL Fees						
Any Other Charges						

Rationale & Methods adopted for determining the Annual Vehicle License Fees:

……

……

vi. Mass Distance Charges [Weight Distance Charges]:

In order to cover part of the road maintenance cost, particularly recovering the cost of surface deterioration; are Mass Distance Charges (MDC) prevailing in your country, if yes the Charge in terms of US$/Vehicle (for different types of vehicle, commodities and loads).

Vehicle Type						
MDC						
Any Other Charges						

Rationale & Methods adopted for determining Mass Distance Charges, Mode of the Collection:

……

……

vii. Any Other Source(s) of the Road Fund

Source	Brief Description

viii. Percentage of the Road User Charges directly transferred to the Road Fund:

100%	80% - 100%	50% - 80%	Less than 50%

III. Fund Allocation Criteria

i. Fund Allocation for Different "Purposes"

Purpose		Percent
Road Maintenance to Road Agencies		
Other Activities & Operation	**Capacity Building**	
	Road Safety Measures	
	Road Fund Overhead & Administration	
	Other……	
	Other……	
Total		**100%**

ii. Fund Allocation for the "Road Maintenance to Road Agencies"

A. What is the Basic Approach followed while making the Allocation?

(a) **Formula Based**, i.e. by set percentage based: ……

(b) **Need Based**, i.e. proper needs assessment: ……

(c) **Combination of Both the above:** By percentage……

B. If the Fund Allocation to the Road Agencies is Formula Based

Road Agency Responsible for Maintaining	Percent
Federal Road Network / Primary Road Network	
Regional Road Network	
Municipal / Urban Road Network	
District Road Network	
Community / Unclassified Road Network	
Other ……	
Total	**100%**

C. If the Fund Allocation to the Road Agencies is Need Based, please describe:

(a) What Approach & Methods Followed:……

(b) Do the Road Agencies have the in-house capability to undertake the Need Assessment: ……

iii. Percentage Coverage of Routine Maintenance Needs:

Less than 30%	30% - 60%	60% - 90%	More than 90%

iv. Percentage Coverage of Periodic Maintenance Needs:

Less than 30%	30% - 60%	60% - 90%	More than 90%

IV. Fund Utilization

i. Kindly furnish the information on the Funds Allocated on the Specific Head & Its Level of Utilization:

Purpose		US$	% Utilized
Road Maintenance to Road Agencies			
Other Activities & Operation	**Capacity Building**		
	Road Safety Measures		
	Road Fund Overhead & Administration		
	Other……		
	Other……		
Total			

ii. Please indicate whether the following Audits are undertaken with frequency:

(a) Technical Audit: Yes / No; If yes, **Frequency:** Annually / Bi-Annually / ……

(b) Financial Audit: Yes / No; If yes, **Frequency:** Annually / Bi-Annually / ……

V. Road Fund Effectiveness

i. Time taken in the following operation (No. of days on an average):

(a) Between Request from the Road Agency to Pay Bill & Approval of the RFA: ……

(b) Transfer of the Fund from the RFA to the Road Agency: ……..

ii. Other Issues:

(a) Percentage of Bill Rejected: Federal:……..; Regional: …….; Urban: …….

(b) …….

VI. Private Sector Involvement & PPP Route

i. What is the percentage of Maintenance Work Carried out by?

a. Own Force Account:……..%; and b. Private Contractors:……%

ii. Is there a system of Toll Levy on any Road Corridors? If yes: ……..

Type of Vehicle						
Toll (US$/Unit)						

Approach & Method followed for determining the Toll Rates: ……

……

iii. "Performance Based Maintenance Contract (PBMC)", is it in practice in your country? Yes / No; If yes, kindly furnish the following information:

(a) PBMCs are undertaken for: Paved Road: ☐ Unpaved Road: ☐

(b) PBMCs are usually economical than Traditional Contract: Yes / No; if Yes: …..%

(c) Rate of PMBCs (US$ / km / month): Paved Road:…..……; and Unpaved:……..…

(d) Share of the PBMCs in the Total Maintenance Cost: Paved: …..…%; Unpaved…...%

Any other details on the Performance Based Maintenance Contracts: ……

……..

iv. Other PPP Options, e.g. "Shadow Toll", is it in practice in your country? If yes:

Name/Type of the Option:

……

Approach & Method followed for the Option:

……..

……

Thanks for your cooperation please.

Questionnaire for Road Fund Board (Country TANZANIA)

I. Road Fund Board

1. **The Road Fund Board was established by the Proclamation in Year:** 1998 [Roads Tolls (Amendment) No. 2 Act of 1998]

2. **Objectives of the Road Fund as per the Proclamation**

   i. Collect revenue.

   ii. Disburse funds to road agencies.

   iii. Monitor utilization of the moneys from the Fund.

3. **Sources of Revenue suggested in the Road Fund Proclamation**

   i. Fuel levy.

   ii. Transit fees.

   iii. Overloading fees.

   iv. Heavy vehicle license fees

   v. Any other source at the rate or rates to be determined by Parliament from time to time.

4. **Sources of Revenue Effected to contribute to the Road Fund**

   i. Fuel levy.

   ii. Transit charges.

   iii. Overloading fees.

   iv. ……

   v. ……

   Heavy vehicles license fees were abolished by the Government from July 2005 for the convenience of transporters business.

5. **Structure of the Road Fund Board**
   [Details on Members & Private Sector Representation]

   No. of Board Members Nine (9); Board with Private Sector (No.) Five (5). Chairperson (non civil servant) is appointed by the Hon. President.

   Staff Size (No.): Fifteen (15); Total Road Fund Resources (US$ million) 203.

II. Sources of Revenue prevailing to contribute to the Road Fund

[Information needs to be furnished as per the prevailing Sources of Revenue; the followings are given as examples]

i. Government Budget Allocation for the Road Fund

Source	Brief Description

Any Supporting Note:……

ii. Fuel Levies** (US$/Unit): Retail Price (US$/liter):

Product	Fuel Levy	VAT	Municipal Tax	Other (Excise duty)	Total
MGR (Petrol)	13 (FIXED)			22	35
ADO (Diesel)	13 (FIXED)			20	33
LFO					
HFO					
Oil & Lubricants					

MGR: Mogas Regular-Petrol; ADO: Automobile Diesel Oil; LFO: Light Fuel Oil; HFO: Heavy Fuel Oil.

Please Tick (X), if the part of the Road Fund, and the % goes to the Road Fund:

Product	Fuel Levy	VAT	Municipal Tax	Other	Total
MGR (Petrol)	X (100%)				
ADO (Diesel)	X (100%)				
LFO					
HFO					
Oil & Lubricants					

iii. Overloading Fines:

Please furnish the details by vehicle type on the Overloading Fine, e.g. US$/per ton, offloading the overloaded commodities, etc. in case freight carrying vehicles:

Type of Vehicle				
Fine (US$/Unit)				

Rationale & Methods adopted for imposing the Overloading Fines:……...

Tanzania implements a system of administrative penalties for overloading aimed at imposing fees that are commensurate with the economic costs of the overload. At present, overloading fines range between $ 50 (less than 1,000 kg overload) to $ 2,500 (more than 10,000kg overload).

iv. Transit Fees:

Foreign Vehicles entering in the country, and also passing through the country need to pay Transit Charges (US$/Vehicle or Unit):

Vehicle Type	Up to but does not exceed 3 axles	More than 3 axles
Transit Charges	$6 for every 100km	$16 for every 100km
Driver		
Cleaner		
Other		

Rationale & Methods adopted for determining/collecting Transit Charges:

……

v. Annual Vehicle License (AVL) Fees:

In order to cover part of the road maintenance cost; are Annual Vehicle License Fees prevailing in your country, if yes the AVL Fee US$/Vehicle (for different types of vehicle).

Vehicle Type	<500 cc	501-1500 cc	1501-2500 cc	>2500 cc		
AVL Fees	$32	$64	$96	$128		
Motor Vehicle Registration Fees	$96					
Motor cycle Registration Fees	$29					

Rationale & Methods adopted for determining the Annual Vehicle License Fees:

PLEASE NOTE THAT THE ANNUAL MOTOR VEHICLE LICENSE FEES AND REGISTRATION FEES DO NOT COME TO THE ROADS FUND. THEY GO TO THE MINISTRY OF FINANCE & ECONOMIC AFFAIRS TO THE CONSOLIDATED BUDGET.

vi. Mass Distance Charges [Weight Distance Charges]:

In order to cover part of the road maintenance cost, particularly recovering the cost of surface deterioration; are Mass Distance Charges (MDC) prevailing in your country, if yes the Charge in terms of US$/Vehicle (for different types of vehicle, commodities and loads).

Vehicle Type						
MDC						
Any Other Charges						

Rationale & Methods adopted for determining Mass Distance Charges, Mode of the Collection:

CURRENTLY, THIS IS NOT A SOURCE OF THE ROADS FUND

……..

vii. Any Other Source(s) of the Road Fund

Source	Brief Description

viii. Percentage of the Road User Charges directly transferred to the Road Fund:

100%	80% - 100%	50% - 80%	Less than 50%
	X		

III. Fund Allocation Criteria

i. Fund Allocation for Different "Purposes"

Purpose		Percent
Road Maintenance to Road Agencies		
Other Activities & Operation	**Capacity Building**	
	Road Safety Measures	
	Road Fund Overhead & Administration	
	Other……	
	Other……	
Total		**100%**

ii. Fund Allocation for the "Road Maintenance to Road Agencies"

A. What is the Basic Approach followed while making the Allocation?

(a) **Formula Based**, i.e. by set percentage based: ……

(b) **Need Based**, i.e. proper needs assessment: ……

(c) **Combination of Both the above:** By percentage……

Allocation is done to the main roads (Managed by road agency called TANROADS) and local roads (Managed by the Local Authorities) using a formula determined by the maintenance needs. The existing formula allocates 70% to the main roads and 30% to the local roads and was determined way back in 1996. Since the current formula has been in use for more than 15 years, there have been a number of changes to the road network that include: increased road network length from 85,000km to the current 91,049km; increased maintenance needs due to changes in road types, road condition, and road lengths; and re-classification of roads where more than 4,000km of district roads have been upgraded to be national roads. Currently, the Roads Fund Board with assistance from DANIDA is conducting a study that is reviewing the formula. The new formula, if different from the current one, could become applicable in FY 2012/2013.

B. If the Fund Allocation to the Road Agencies is Formula Based

Road Agency Responsible for Maintaining	Percent
Federal Road Network / Primary Road Network (Trunk roads)	70
Regional Road Network	
Municipal / Urban Road Network	30
District Road Network + Feeder roads	
Community / Unclassified Road Network	
Other ……	
Total	**100%**

C. If the Fund Allocation to the Road Agencies is Need Based, please describe:

(a) What Approach & Methods Followed:……

(b) Do the Road Agencies have the in-house capability to undertake the Need Assessment: ……

After allocating funds to the main and local roads using the formula of 70:30, allocations within the respective road agencies are done based on the maintenance needs.

The road agencies are supposed to use a computerized Road Management System to determine the maintenance needs. TANROADS has put in place an RMMS developed over several years and comprises of the Road Mentor & HDM-4 which determine the needs for the main roads. The RMMS for the Local Authorities was developed since 2002 and is called DROMAS. Unfortunately, this system is not functioning due to technical problems. The needs for the local roads are determined by technical staff at the Local Authorities assisted by the Ministry responsible for Local Governments.

iii. Percentage Coverage of Routine Maintenance Needs:

Less than 30%	30% - 60%	60% - 90%	More than 90%
		X	

iv. Percentage Coverage of Periodic Maintenance Needs:

Less than 30%	30% - 60%	60% - 90%	More than 90%
	X		

IV. Fund Utilization

i. Kindly furnish the information on the Funds Allocated on the Specific Head & Its Level of Utilization:

Purpose		US$	% Utilized
Road Maintenance to Road Agencies			
Other Activities & Operation	**Capacity Building**	827,000	
	Road Safety Measures	999,000	
	Road Fund Overhead & Administration	4,137,000	
	Weighbridge operations	3,077,000	
	RMMS	399,000	
	Road Inventory	830,000	
	Supervision & Monitoring	8,970,000	
Total		**19,239,000**	

ii. Please indicate whether the following Audits are undertaken with frequency:

(a) **Technical Audit:** Yes √; If yes, **Frequency:** Annually √

(b) Financial Audit: Yes √; If yes, **Frequency:** Annually √

V. Road Fund Effectiveness

i. Time taken in the following operation (No. of days on an average):

(a) Between Request from the Road Agency to Pay Bill & Approval of the RFA:

Once the Budgets are approved and a Performance Agreement is signed at the beginning of a financial year, funds are automatically disbursed on a monthly basis to the Road Agencies to which the road agencies prepare and account for the use of the funds using quarterly progress reports. Flow of funds can be interrupted if the Road Agency does not submit a quarterly progress report.

(b) Transfer of the Fund from the RFA to the Road Agency:

1 - 7 days from date funds enter the Roads Fund account.

ii. Other Issues:

(a) Percentage of Bill Rejected: Federal:……..; Regional: ……; Urban: …….

(b) …….

VI. Private Sector Involvement & PPP Route

i. What is the percentage of Maintenance Work Carried out by?

a. Own Force Account:1%; **and b. Private Contractors:**99%

ii. Is there a system of Toll Levy on any Road Corridors? If yes: No.

Type of Vehicle						
Toll (US$/Unit)						

Approach & Method followed for determining the Toll Rates: ……

iii. "Performance Based Maintenance Contract (PBMC)", is it in practice in your country? Yes / No; If yes, kindly furnish the following information:

(a) PBMCs are undertaken for: Paved Road: ☐ Unpaved Road: ☒

(b) PBMCs are usually economical than Traditional Contract: Yes / No; if Yes: …..%

(c) Rate of PMBCs (US$ / km / month): Paved Road:…..……; and Unpaved:……..….

(d) Share of the PBMCs in the Total Maintenance Cost: Paved: …..…%; Unpaved…...%

Any other details on the Performance Based Maintenance Contracts: ……

Currently PMMR in Tanzania is applied on a pilot basis to 3 regions covering a total of 1,076km of unpaved roads for a contract period of 5 years. There are 6 packages and contractors are required to assure certain pre-defined service levels at all times during the five years contract period. Payments are on monthly equal installments and there are deductions if there is inadequate compliance to the pre-defined service levels. The total contract sum for the works contracts is around $19.8 million. The contracts included an Initial rehabilitation phase followed by the maintenance phase. The works are carried out by local contractors and there are local consultants.

iv. Other PPP Options, e.g. "Shadow Toll", is it in practice in your country? If yes: ….

Name/Type of the Option: ……

Approach & Method followed for the Option: ……..

There are no PPP projects such as Toll roads etc. However, legislation was recently enacted on PPPs (in 2010) and its regulations are already in place. A central PPP unit is currently being established.

Thanks for your cooperation please.

Questionnaire for Road Fund Board (Country Ghana)

I. Road Fund Board

1. **The Road Fund Board was established by the Proclamation in Year:**
   1997 the five hundred and thirty sixth act of the parliament of the republic of Ghana in entitled : The Road Fund Act, 1997

2. **Objectives of the Road Fund as per the Proclamation**

   i. To Finance routine, periodic maintenance and rehabilitation of public roads in the country.

   ii. To assist the Metropolitan, Municipal and District Assemblies in the exercise of their functions relevant to public roads under any enactment

3. **Sources of Revenue suggested in the Road Fund Proclamation**

   i. Such proportion of government levy on petrol, diesel and refined fuel oil as may be determined by the Cabinet with the approval of Parliament

   ii. Bridge, ferry and road tolls collected by the Authority

   iii. Vehicle License and inspection fees

   iv. International transit fees, collected from foreign vehicles entering the country; and

   v. Such monies as the Minister responsible for Finance in consultation with the Minister may determine with the approval of Parliament

4. **Sources of Revenue Effected to contribute to the Road Fund**

   i. All the sources of revenue have been effected and well implemented

5. **Structure of the Road Fund Board**
   [Details on Members & Private Sector Representation]

   No. of Board Members thirteen 13 (including Chairman); Board with Private Sector (No.) Five (5). Chairperson (non civil servant) is appointed by the Hon. President. Staff Size (No.): Fifteen (15); Total Road Fund Resources (US$ million) 203.

II. Sources of Revenue prevailing to contribute to the Road Fund

[Information needs to be furnished as per the prevailing Sources of Revenue; the followings are given as examples]

i. Government Budget Allocation for the Road Fund

Source	Brief Description
	Not Applicable

Any Supporting Note: Not Applicable to GRF

ii. Fuel Levies** (US$/Unit): Retail Price (US$/liter):

Product	Fuel Levy	VAT	Municipal Tax	Other (Excise duty)	Total
MGR (Petrol)	0.04				
ADO (Diesel)	0.04				
LFO					
HFO					
Oil & Lubricants					

MGR: Mogas Regular-Petrol; ADO: Automobile Diesel Oil; LFO: Light Fuel Oil; HFO: Heavy Fuel Oil.

Please Tick (X), if the part of the Road Fund, and the % goes to the Road Fund:

Product	Fuel Levy	VAT	Municipal Tax	Other	Total
MGR (Petrol)					
ADO (Diesel)					
LFO					
HFO					
Oil & Lubricants					

iii. Overloading Fines:

Please furnish the details by vehicle type on the Overloading Fine, e.g. US$/per ton, offloading the overloaded commodities, etc. in case freight carrying vehicles:

Type of Vehicle				
Fine (US$/Unit)				

Rationale & Methods adopted for imposing the Overloading Fines:……

iv. Transit Fees:

Foreign Vehicles entering in the country, and also passing through the country need to pay Transit Charges (US$/Vehicle or Unit):

Vehicle Type		Applicable
Transit Charges		---
Driver		---
Cleaner		---
Other		---

Rationale & Methods adopted for determining/collecting Transit Charges: User Charges.

Go though act 793 for fees and charges (Miscellaneous)

v. Annual Vehicle License (AVL) Fees:

In order to cover part of the road maintenance cost; are Annual Vehicle License Fees prevailing in your country, if yes the AVL Fee US$/Vehicle (for different types of vehicle).

Vehicle Type	<500 cc	501-1500 cc	1501-2500 cc	>2500 cc		
AVL Fees						
Motor Vehicle Registration Fees						
Motor cycle Registration Fees						

Rationale & Methods adopted for determining the Annual Vehicle License Fees: User Charges.

Go though act 793 for fees and charges (Miscellaneous)

vi. Mass Distance Charges [Weight Distance Charges]: Not Applicable

In order to cover part of the road maintenance cost, particularly recovering the cost of surface deterioration; are Mass Distance Charges (MDC) prevailing in your country, if yes the Charge in terms of US$/Vehicle (for different types of vehicle, commodities and loads).

Vehicle Type						
MDC						
Any Other Charges	Registration fees					

Rationale & Methods adopted for determining Mass Distance Charges, Mode of the Collection:

Not Applicable

vii. Any Other Source(s) of the Road Fund

Source	Brief Description

viii. Percentage of the Road User Charges directly transferred to the Road Fund:

100%	80% - 100%	50% - 80%	Less than 50%
Yes			

III. Fund Allocation Criteria

i. Fund Allocation for Different "Purposes"

Purpose		Percent
Road Maintenance to Road Agencies		
Other Activities & Operation	**Capacity Building**	
	Road Safety Measures	
	Road Fund Overhead & Administration	
	Other……	
	Other……	
Total		**100%**

ii. Fund Allocation for the "Road Maintenance to Road Agencies"

A. What is the Basic Approach followed while making the Allocation?

(a) **Formula Based**, i.e. by set percentage based: ……

(b) **Need Based**, i.e. proper needs assessment: ……

(c) **Combination of Both the above:** By percentage……

B. If the Fund Allocation to the Road Agencies is Formula Based

Road Agency Responsible for Maintaining	Percent
Federal Road Network / Primary Road Network	
Regional Road Network	
Municipal / Urban Road Network	
District Road Network	
Community / Unclassified Road Network	
Other ……	
Total	**100%**

C. If the Fund Allocation to the Road Agencies is Need Based, please describe:

(a) What Approach & Methods Followed:……

(b) Do the Road Agencies have the in-house capability to undertake the Need Assessment: ……

iii. Percentage Coverage of Routine Maintenance Needs:

Less than 30%	30% - 60%	60% - 90%	More than 90%

iv. Percentage Coverage of Periodic Maintenance Needs:

Less than 30%	30% - 60%	60% - 90%	More than 90%

IV. Fund Utilization

i. Kindly furnish the information on the Funds Allocated on the Specific Head & Its Level of Utilization:

Purpose		US$	% Utilized
Road Maintenance to Road Agencies			
Other Activities & Operation	**Capacity Building**		
	Road Safety Measures		
	Road Fund Overhead & Administration		
Total			

ii. Please indicate whether the following Audits are undertaken with frequency:

(a) **Technical Audit:** If yes, **Frequency:**

(b) Financial Audit: If yes, **Frequency:**

V. Road Fund Effectiveness

i. Time taken in the following operation (No. of days on an average):

(a) Between Request from the Road Agency to Pay Bill & Approval of the RFA:

(b) Transfer of the Fund from the RFA to the Road Agency:

ii. Other Issues:

(a) Percentage of Bill Rejected: Federal:……..; Regional: ……; Urban: …….

(b) ……..

VI. Private Sector Involvement & PPP Route

i. What is the percentage of Maintenance Work Carried out by?

a. Own Force Account: and b. Private Contractors:

ii. Is there a system of Toll Levy on any Road Corridors? If yes: .

Type of Vehicle						
Toll (US$/Unit)						

Approach & Method followed for determining the Toll Rates: ……

iii. "Performance Based Maintenance Contract (PBMC)", is it in practice in your country? Yes / No; If yes, kindly furnish the following information:

(a) PBMCs are undertaken for: Paved Road: ☐ Unpaved Road: ☐

(b) PBMCs are usually economical than Traditional Contract: Yes / No; if Yes: …..%

(c) Rate of PMBCs (US$ / km / month): Paved Road:……..……; and Unpaved:……..…

(d) Share of the PBMCs in the Total Maintenance Cost: Paved: ……..…%; Unpaved……%

Any other details on the Performance Based Maintenance Contracts: ……

iv. Other PPP Options, e.g. "Shadow Toll", is it in practice in your country? If yes: ….

Name/Type of the Option: ……

Approach & Method followed for the Option: ……..

Thanks for your cooperation please.

Mass Distance Charges **Registration Form**	**Official Seal**	**Office of Road Fund, Ethiopia**

ORF Account Number: ……..

1. Operator Particulars

Name	
Postal Address	
ID Number	
Telephone	
Fax	
Mobile	
E-mail	

2. Business Particulars *(if different from above)*

Name of Business	
Business Registration	
Postal Address	
Telephone	
Fax	
E-mail	

3. Declaration

I certify that the particulars and vehicle identification data furnished in this registration form are correct.

……	……	……
Name	Signature	Date

4. Vehicle Identification Data

	Vehicle License Number	Vehicle Register Number							Operator's Estimated Km/annum on Ethiopia National Road Network	V-rating (kg)	D/T Rating (kg)
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

NB: For additional vehicles, please attach list of vehicles reflecting the same information as above.

5. Vehicle Identification Data

	Vehicle License Number	Vehicle Register Number	Total km traveled on Ethiopian Roads	Rate ETB 100	Total Paid ETB
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

NB: For additional vehicles, please attach list of vehicles reflecting the same information as above.

Mass Distance Charges **Explanatory Notes**	Official Seal	Office of Road Fund, Ethiopia

MDC Registration Form

a. Logbooks will be dispatched to the registering authority (office).

b. The vehicle license number and vehicle register number are required for correct identification purposes.

Sample Vehicle License Number:

Sample Vehicle Register Number:

c. V-Rating: Maximum legally allowed mass of a vehicle (given in kg).

d. D/T rating: Maximum permissible drawing vehicle mass of a power unit (given in kg).

e. Operators should list all the vehicles subject to MDC charges.

f. Each Operator will be allocated on ORF Account Number, this number should be entered on the deposit slip when making payments in respect of the MDC's.

g. The column marked "Operator's Estimated km/annum on Ethiopian Road Network" will be used by the ORF to categorize and allocate payment intervals per vehicle. The payment intervals will be as follows:

i) 0-20,000 km/yr	**Annual payments** of MDC's (Assessments are submitted once a year on the date prescribed by the ORF).
ii) 20,0001 km/yr - 50,000 km/yr	**Bi-Annual payments** of the MDC's (Assessments are submitted twice a year on the dates prescribed by ORF)
iii) 50,001 km/yr -100,000 km/yr	**Quarterly payments** of MDC's (Assessments are submitted four times a year on the dates prescribed by ORF)
iv) >100,000 km/yr	**Monthly payments** of the MDC's (Assessments are submitted on a monthly basis on the dates prescribed by the ORF)

"Ethiopian Road Network" means the road network consisting of every federal road, regional road and municipal road.

h. The allocated ORF Account Number, payment intervals and payment dates will be forwarded to the operator in writing. The logbook will be dispatched to the registering authority for each vehicle.

i. In the event that an operator wishes to amend the payment interval allocate to him/her, the ORF should be notified in writing with a motivation. Should the desired payment interval be approved by the ORF, such payment interval shall come into effect during the next financial cycle.

Mass Distance Charges **Assessment Form**	**Official Seal**	**Office of Road Fund, Ethiopia**

Official Stamp

Assessment Form	
Log Sheets	
Proof of Payment	

_____
Signature

ORF Account Number:…… Official

1. Operator Particulars

Name	
Postal Address	
ID Number	
Telephone	
Fax	
Mobile	
E-mail	

2. Business Particulars *(if different from above)*

Name of Business	
Business Registration	
Postal Address	
Telephone	
Fax	
E-mail	

3. Calculation of MDC payable

Note that there are severed penalties for false declarations.

Period: Month:_____ Year: _____ to Month: _____ Year: _____

MDC Due/Payable **ETB …….**

I certify that the particulars in this assessment are correct.

……	……	……
Name	Operator Signature	Date

……...tear off here……..……tear off here……..……..tear off here……..tear off here……..

SAMPLE

Official Stamp

Receipt MDC Assessment ORF Account Number ……....

This certifies that the MDC Assessment for the abovementioned vehicle has been submitted with all the supporting documents.

Period: Month: ____Year:_____ to Month: ____ Year: ____ _____

Official Signature

Mass Distance Charges **Explanatory Notes**	Official Seal	Office of Road Fund, Ethiopia

MDC Assessment Form

a. The ORF Account Number allocated to the operator by the ORF should be reflected on this form.

b. The summarized total MDC payment liable should be entered under "3. Calculation of MDC payable", the period for which the payment is being effected should correspond with that allocated to the operator by the ERA.

c. For administrative reasons, one form should be completed for vehicles for which the payment interval is the same. E.g. Vehicles for which the payment interval is bi-yearly should be submitted on the same assessment form. Vehicles for which the payment interval is quarterly should be submitted on the same assessment form etc.

d. The tear off section will serve as confirmation of submission of the self-assessed MDC charge, and shall be completed by the designated official upon submission.

e. The vehicle license number and vehicle register number are required for correct identification purposes.

Sample Vehicle License Number: _____

Sample Vehicle Register Number: _____

SAMPLE

Proposed Implementation Plan, Schedule & Cost Implications

Item	Prerequisite	Proposed Start Time*	Implemented By	Approximate Cost (ETB)**	Frequency/Remark
Inventory & Condition Surveys	-	Starting from April-May 2012	ERA, RRAs, & MRAs	See the cost below	At least once a year
Update of Unit Rates		Starting from End of January 2012	ORF, Department of Technical Audit and representative of Road Agencies	ETB 180,000 See the cost below	Once a year, 2013 and onwards
Maintenance Cost Estimate	Inventory and Condition	Starting from June 2012	ERA, RRAs & MRAs	--	Every Year, Cost is Distance or Region Based
Data collection on Traffic, Vehicle-km and Fuel Cost		Starting from May 2012	ORF, Planning Department	See the cost below	Once a year
Overloading Fine$		Starting from 2012, June	ERA	- do -	Every year starting from 2012
Mass Distance Charges (MDCs)$		Starting from 2014-15	Federal, Road Transport*	- do -	Throughout the year after 2014-15
Annual Vehicle License Fee (AVL)$		Starting from 2013	Federal, Road Transport,*	- do -	Throughout the year from 2013
Application of E-RUCS		In 2012	ORF, Department of Planning /and Technical Audit	-	Every year on June 2012, and/or whenever needed

* Year/Month may be revised, as per the decisions/approval; ** Costs refer to as indicative costs, which may be changed in future depending on the scope of services and price indices; $ If approved as additional/new sources of revenue for the ORF.

Notes:

1. Inventory & Condition Surveys

- At the start, for the application of E-RUCS, the ORF should allocate money and outsource the task to complete the data needs for the system;
- The government should allocate money for the Inventory and Condition Surveys on a regular basis;
- After establishment of the base data from the whole inventory and condition using the prepared formats in Road Financing Study, Inventory and Condition Surveys should be done once a year by ERA District Engineer's Offices, RRAs and MRAs;
- For regions where capacity is a problem for implementation of the Inventory and Condition Surveys, outsourcing can be considered as an option
- To complete the data need of the E-RUCS, for the Inventory and Condition Surveys for entire country, the Draft Budget requirement for 50 km (assuming it is completed by one

day) of the Inventory and Condition Surveys for different districts and regions are as follows:

District/Region	Approximate Cost/50 km (ETB)	Professional Required (No.)	Remark
ERA-Alemgena / Central Oromia	4,500	3	Considering One rental car, fuel and professional day salary and per diem
ERA-Jima/South Western Oromia/Gambella	6,500	3	- do -
ERA-Nekemte/Western Oromia/BGumuz	6,500	3	- do -
ERA-Sodo/SNNPR	6,000	3	- do -
ERA-Shashemene/Southern Oromia	6,500	3	
ERA-Diredawa/Eastern Oromia/ Somali	6,500	3	- do -
ERA-Kombolcha/Afar	6,000	3	- do -
ERA-Adigrat/Tigray	6,500	3	- do -
ERA-Gonder/Amhara	6,000	3	- do -
ERA-D/Markos	4,500	3	- do -

2. Updated of Unit Rates

- At the beginning, the ORF can use the Unit Rates of Road Financing Study (2011);
- In 2013, Establish a three-tier team with a leading professional from Technical Audit Department (ORF) and consists of the members from ERA Districts and RRAs and one external consultant;
- Every year data should be collected by assessing market rental value of machineries, materials, manpower, fuel and other information; and
- The cost required to update the Unit Rates of Maintenance Cost (ETB) is given as follows:

Item	Facilities	Professional Per diem	Total Cost
Updates of Unit Rates	=2 cars*20 days *1,000/day=40,000	10 professionals *200/day*20days=40,000	80,000
For External Consultant as Adviser		100,000	100,000

3. Maintenance Cost Estimate

- This exercise should be done based on the updated Unit Rates by each ERA Districts and RRAs and MRAs.

4. Data Collection on Traffic, Vehicle-km and Fuel

- 2 Professionals from Technical Audit and Planning Department of ORF

Item	Facilities	Professional Perdiams	Total cost
Data collection on the above	=1 car*15 days *1000/day=15,000	2 professionals *200/day*25days=10,000	25,000

5. Overloading Fine

- Revenue should be collected through representative or employee of ORF from ERA weighbridge locations;
- Establish one independent office at each location; and
- Fees will be directly transferred to the ORF account through this representative or employee of ORF.

6. Mass Distance Charges (MDCs)

Option-1: Quick implementation, use professionals of ORF

- Establish one office under ORF and at Major Corridor Control Sites;
- Require Work Visit to one or two African countries of similar experience of MDCs;
- Hire required number of revenue staffs in each major corridors site offices (At least on Major Trunk Roads, say 10); and
- Provide adequate training.

Option-2: Requires an Independent Sudy for preparation and full-fledged implementation

- Hire Consultant; and
- Require Work Visit to one or two African countries of similar experience of MDCs.

7. Annual Vehicle License Fee (AVL Fess)

- Establish Independent offices at Federal Road Transport and Regional Road Transport Bureaus; and
- Hire at least one Revenue Officer in the each office.

8. E-RUCS

- For the start, use data from the Road Financing Study (20110;
- If required, training can be organized by the Software Developer; and
- Possible to use with present data.