HDM-4 and Asset Management

Dr Eric E. Stannard
CEO
HDMGlobal
e.e.stannard@bham.ac.uk

What is HDM-4?

- HDM-4 is a decision-support tool for the investigation of road investment choices.

- It provides tools for the following planning and management activities:

❑ Programming road works	❑ Predicting road network performance
❑ Estimating funding requirements	❑ Project appraisal
❑ Budget Allocations	❑ Policy impact studies

- Can be used as part of an Asset Management toolkit

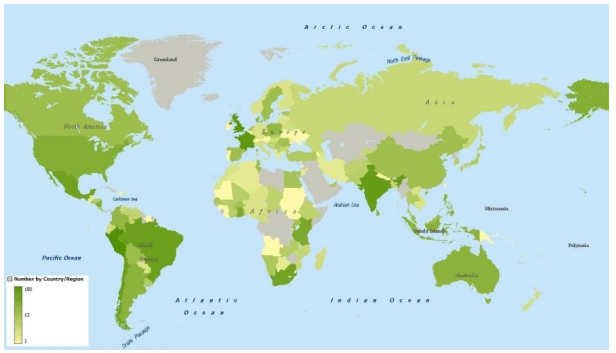
HDM-4 Background

- PIARC retains the copyright for HDM-4 on behalf of all the stakeholders
- PIARC signed a concession agreement with HDMGlobal in 2005, 2010, and 2015 to provide the following HDM-4 services:
  - Sales
  - Technical Support
  - Training, dissemination and user forums
  - Software maintenance and development

HDM-4 Version 2 – Sales & Training

Over 2,400 licences have been sold to over 110 different countries, users include:

- Government departments
- Construction agencies
- Research institutions
- Funding/development banks
- Individual consultants
- Universities and training
  - organisations



- 45+ training courses and seminars given by HDMGlobal
- India accounts for ~7% of licence sales (Asia ~20%)

HDM Background

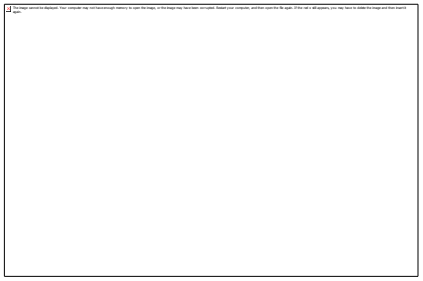
- HDM origins in Highway Cost Model studies in 1970’s
- HDM-III Structured Empirical-Mechanistic Models, 1987
- HDM-4 starts in 1994 with major sponsors and many additional contributors
- Extensive HDM-4 development and applications by road authorities, and other organisations and individuals
- Version 1.0 released by PIARC in 2000
- Management and development concession awarded to HDMGlobal in 2005
- Version 2.0 released in 2005

HDM-4 Software

Runs on Windows Operating System

Operates in three languages: English / French / Spanish

- Comes with:

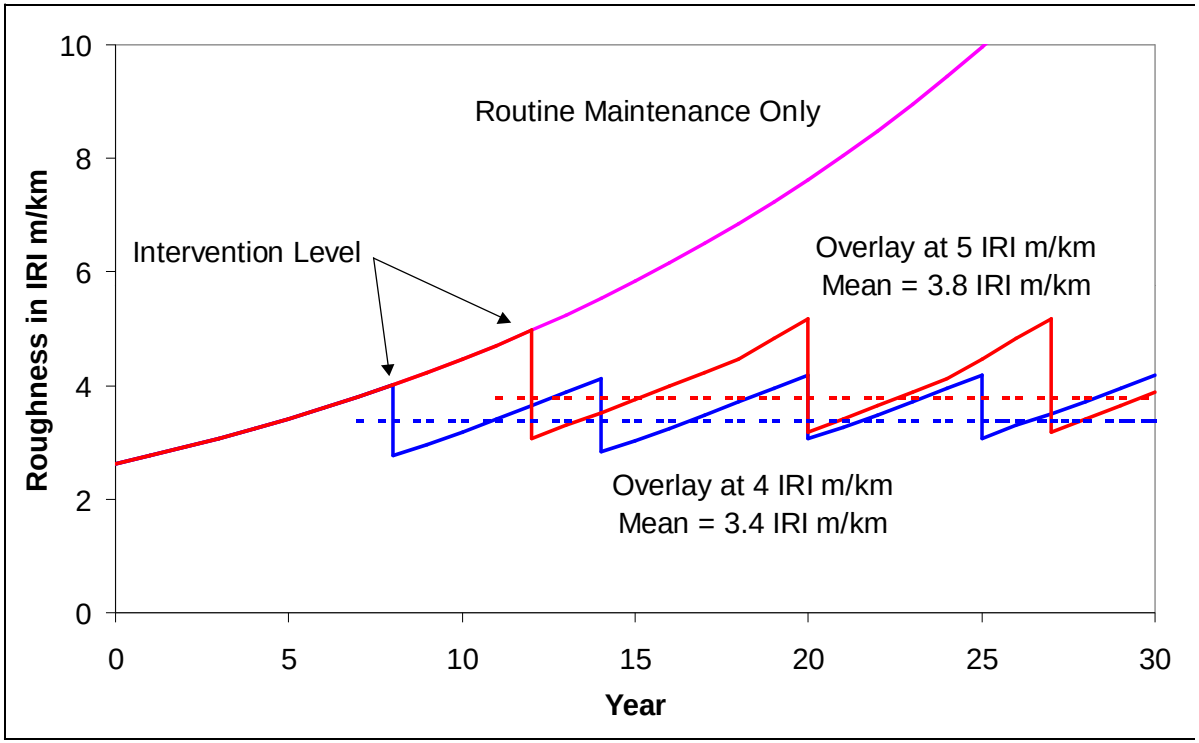


  - Example case studies to demonstrate typical applications
  - Comprehensive documentation
  - Periodic software updates
  - Technical support from HDMGlobal
  - Online user-forums hosted on LinkedIn for user interaction

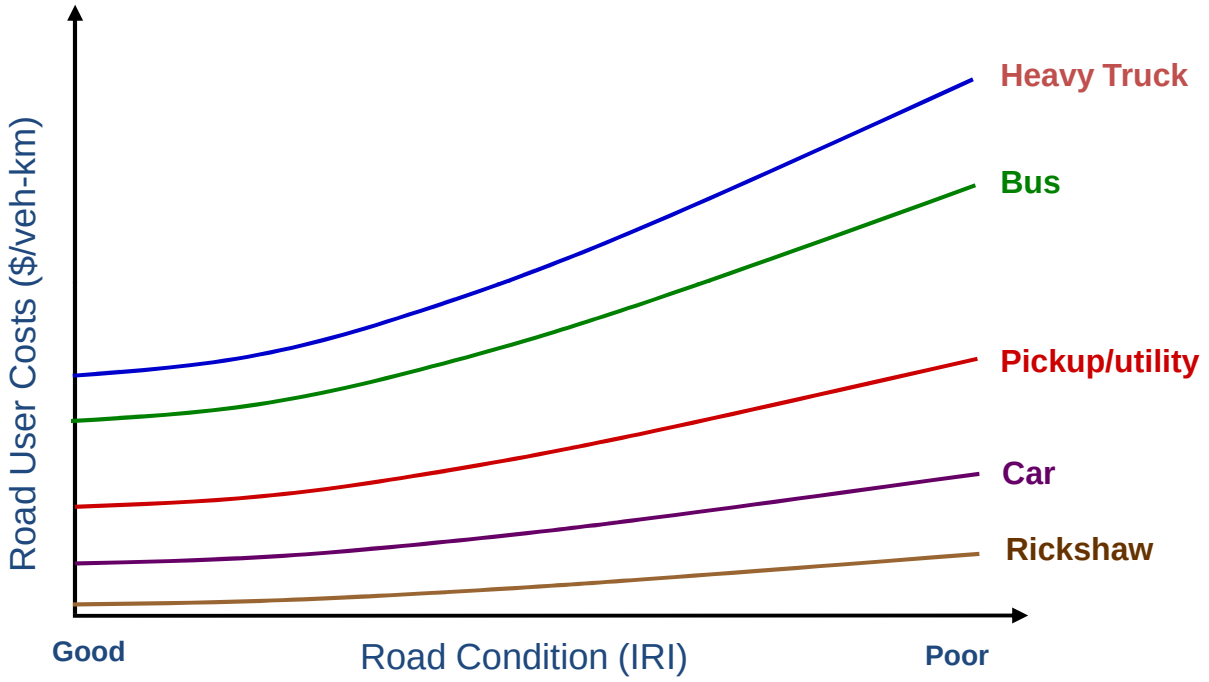
HDM-4 Analytical Framework

- Based on the concept of life cycle analysis
- Predicts road network performance as a function of:
  - *Traffic volumes and loading*
  - *Road pavement type and strength*
  - *Maintenance standards*
  - *Environment / Climate*
- Quantifies benefits to road users from:
  - *Savings in vehicle operating costs (VOC)*
  - *Reduced road user travel times*
  - *Decrease in number of accidents*
  - *Environmental effects (vehicle emissions)*

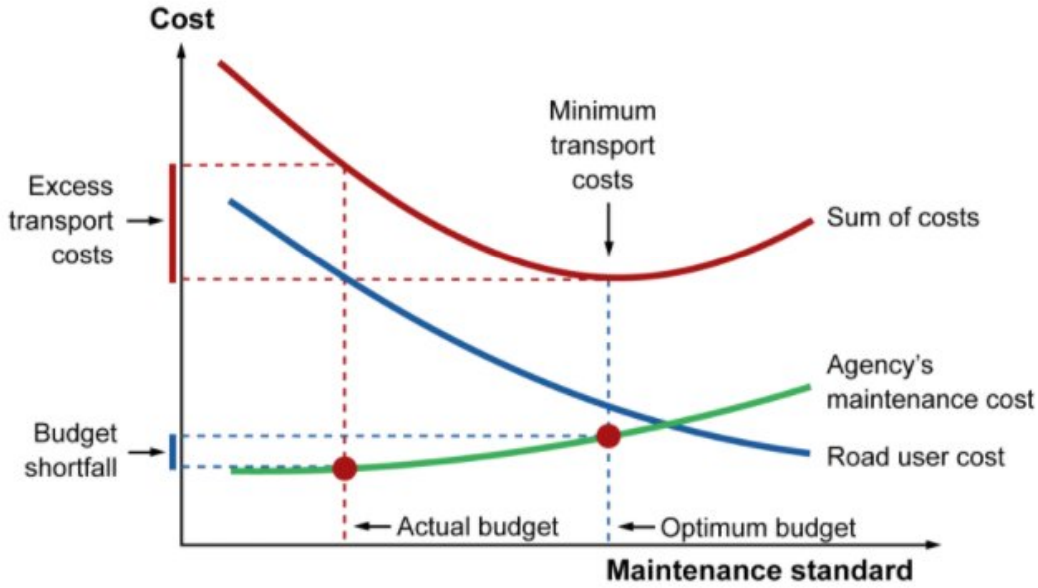
Maintenance, Improvements, and Investment Alternatives



Impact of Road Condition on Users



Outcome: Optimising Total Transport Costs



Source: PIARC Asset Valuation Manual: https://road-asset.piarc.org/en/data-and-modeling-lifecycle-planning/case-studies

HDM-4 Analysis Types

- **Strategic Analysis:** prepare medium to long term planning estimates of funding needs for road network development and maintenance. The impact of different Budget Scenarios can be estimated together with the Asset Value of the network.
- **Programme Analysis:** prepare a rolling work programmes of optimum pavement maintenance and/or road improvement projects which can be carried out within specified budget constraints.
- **Project Analysis:** estimate the economic or engineering viability of road investment projects by determining the pavement performance, road agency and user costs, and the resulting the economic indicators.

HDM-4 Analysis Types

- **Research and Policy Studies**: used to conduct a number of road sector policy studies including:
  - Funding policies for competing needs, e.g. feeder versus main roads
  - Impacts of road transport policy changes on energy consumption
  - Impact of axle load limits
  - Pavement maintenance and rehabilitation standards

How Does HDM-4 Support Asset Management?

- The PIARC Asset Manual states that lifecycle analysis is an integral part of modern AM with the following aims:
  - Identify long-term investment for road infrastructure assets and develop an appropriate maintenance strategy
  - Predict future performance of road infrastructure assets for different levels of investment and different maintenance strategies
  - Determine the level of investment required to achieve the required performance
  - Determine the performance that will be achieved for the available funding and/or future investment
  - Support decision making, make a case for investing in maintenance activities, and demonstrate the impact of different funding scenarios
  - Minimize costs over the lifecycle while maintaining the required performance

The HDM-4 Analysis types provide the tools to enable a user to meet all of these aims

Overview – Summary

- HDM-4 is based on a well established economic analysis framework based on life cycle analysis of the pavement
- Models derived from large scale field experiments conducted world-wide, but local adaptation essential
- International standard tool for road sector planning and management
- Provides a common framework for meeting the objectives of lifecycle planning as defined in the PIARC Asset Management Manual
- Can be utilised to support development of an Asset Management, and Financial Plan, as well as a rolling maintenance programme