RURAL ROADS AS STIMULANTS OF ECONOMIC DEVELOPMENT

By Prof. T. Rwebangira

ABSTRACT

Investment in rural roads is believed by many to be a solution to economic and social development problems in rural areas. This perception is indeed true as there is a link between transport and poverty that is not always acknowledged. This paper sets out to show that although theoretical and even empirical evidence is hard to come by, still investment in rural roads can be an effective weapon in our fight against poverty. This is a possible if the engineers and planners at programme and project levels meet certain preconditions. These preconditions are requiring engineers to review their design standards so as to allow the implementation of rural road infrastructure projects by labour-based construction methods. In addition engineers and planners must review their focus on roads and cars. They are challenged to look at tracks footpaths and footbridges as these provide the basic infrastructure for agricultural production on a daily basis. The paper makes it clear that rural communities place a high priority on accessibility to services and opportunities; as such investing in rural roads that provide basic access will always have a high economic impact. A range of other issues are discussed, all concerned with the poverty impact of rural roads investment. The challenge is to create an environment around these investments that will improve the income of the rural communities as well their employment prospects. Finally some recommendations on how engineers can meet this challenge are enumerated.

1. INTRODUCTION

Inadequate rural transport infrastructure and lack of mobility pose important constraints to rural development in Tanzania and much of Sub-Saharan Africa. During the last, few decades per capital incomes and food production of most of these countries have declined. Since approximately 80% of Tanzanians live in rural areas and are engaged in agriculture, a solution has to be found to this problem, such a solution must be agriculture based.

Poor transport conditions are generally regarded as one of the main constraints against rural development. Without access to jobs, health, education and other amenities, the quality of life suffers, and without access to resources and markets, growth stagnates and poverty reduction cannot be sustained. Since 1970, the World Bank has spent 13-16% of its total investment expenditure on transport investment with a marked bias towards the construction of rural roads. The exclusive focus on roads and motorised vehicles has recently come under criticism because it neglects the transport needs of the rural household. Many researches in rural transport services now believe that the plans, projects and existing policies in the transport sector do nothing or little for the rural poor. This is because the majority of the rural population in Tanzania moves on foot and to a lesser extent by cycling on paths and trails away from the rural road network and undertakes very few motorised trips.

2. OVERVIEW OF THE PAPER

2.1 Transport and Development: A Conceptual/Theoretical overview

Transport investments make up a large share of the public expenditure of many developing countries, including Tanzania. This leads to the question of the impacts of this expenditure on the country's development. Many economists are in agreement that transport is a crucial element for the increase of welfare in society. However, they do not agree on the impact of investment in transport infrastructure on development, as a result no general theory exists which assesses the economic and social impacts of transport investment. Below are some of the widely held views on the impact of transport investment on development.

VOIGT Fritz (1959): The author sees the role of transport similar to an introduction of a BIG PUSH in an otherwise stagnant situation. This "Big Push" is due to the introduction of an efficient transport system and overcomes stagnation by increasing the marginal productivity of capital in central locations, which gives incentives for new investments.

The resulting spill-over effects have stronger impacts than the transport infrastructure itself, the attraction of purchasing power in the centres induces an expansion process with increasing demand, rising income, population growth and rural exodus. VOIGT judges the negative effects caused by the growing spatial disparities to be smaller than the benefits. His conclusion is that a transport system by itself is able to create special impulses for an economic growth process and therefore transport investments should be undertaken even if they are not economically viable.

HIRSCHMAN (1958): The author classifies investment into two main groups namely investment in directly productive activities and investment in social overhead capital. Transport investment falls under social overhead capital. Two strategies then emerge, first one can invest in directly productive activities and use the existing transport infrastructure more intensively until bottlenecks occur, thereafter investment in social overhead capital have to be undertaken. The second strategy favours investment in the provision of infrastructure, which is expected to induce directly productive activities. Hirschman concluded that the first strategy, called development by shortage is more likely to succeed than the second one, which is more wasteful and uncontrollable.

WILSON (1973): Wilson was the first among many authors, who in the early 1970's started to see transport investments only as a necessary but not sufficient precondition for development. Two things are distinguished here in relation to transport investment namely:

- the creation of economic opportunity and,
- the response to economic opportunity.

The first depends on the quality and quantity of resources in the area served, the actual change in transport rates and service quality and commodity price levels. On the other hand factors influencing the response to new economic opportunity are; the awareness of its potential, the availability of finance, the magnitude of possible benefits relative to alternative investment opportunities. Wilson further argues that economic impact spill over effects do exist and are much stronger than the direct reduction in user costs. Access to a transport system creates awareness that serves to induce a larger number of people to take advantage of new economic potential. However, Wilson notes that roads in particular can cause dis-equilibrium even a decline in income for markets that have been protected by high transport costs.

New Growth Theories: After Aschauer (1989) observed a high productivity rate for public infrastructure projects in the U.S.A., the debate on the effect of transport investment on economic development was started again. A number of international studies were carried out using multivariate regression in order to estimate the impacts of different public investments on production. The results revealed that infrastructure investments have the biggest production elasticity of about, 0.16. The growth is achieved by increasing the social return on private investment, without raising private investment activities themselves. These studies were criticised because they did not consider the variation in quality or utilisation and none of them could exclude that a common factor influences both infrastructure and growth. In addition, they could not determine whether investments were the cause or the consequence of the growth.

2.2 Summary of Conceptual/Theoretical Overview

Impact Assessments: In Tanzania investment in transport has always been regarded as a direct stimulus to development. For most road investment projects elaborate and detailed feasibility studies are always carried out before a decision is made on the investment. On the other hand there are very few Evaluation studies on the Social and

Economic Impacts of these investments. From the few available reports, it seems that project impacts are hard to measure, because they take a long time to be realised. When they are finally identified, it is found out that they are difficult to separate from the effects of other complimentary investments and are subject to fluctuations. Impacts from the transport of people were found to be greater than those from the transport of goods. In general, most impact assessments reported a general improvement of access to social services, but only small improvements concerning income or its distribution.

Other factors that can be noted concerning the economic appraisal and impact assessment of rural roads in Tanzania include the following:

- Project impacts at the time of planning are generally overestimated because they are based on opportunities to be created and not those that will be taken.
- Initial transport provision generates stronger effects than the upgrading of existing infrastructure.
- Without proper follow up measures, rural road projects will favour those social groups, which are already better off than others.
- It is still problematic to select user cost savings as the only criterion for the evaluations while spill over effects might have much bigger impacts.

2.3 Non Motorised transport in rural areas

The rural road infrastructure network in Tanzania gives only restricted access to many areas, the road network links to many remote villages are either non-existent or in extremely poor condition. During the rainy season, many villages are cut off from motorised access. Persons and goods can only be transported by walking, causing high transport costs in terms of time and money. The limited time budgets and physical condition of the travellers are the main restrictions. However even in the dry season the overwhelming majority of trips are undertaken by walking. Where the terrain is benign and incomes allow animal transport is used and the economic prospects are more helpful. A transport evaluation of rural roads in Uganda estimated that 75% of the trips were undertaken by walking, 22% by bicycle and only 2% with motorised vehicles (Riverson, 1991). An evaluation in Ghana on rural roads with less than 25 vehicles per day revealed that 90% of the goods were transported by head load (Barwell/Dawson 1993). In Makete district it was found that more than 90% of the trips and 80% of the tonne-km could be regarded as internal transport in and around the village and done by walking, cycling or head loading.

In addition to the above observations, most of the transport demand for performing the basic economic activities relies on the local transport infrastructure system on which rural people gain access to markets and social services. Farmers walk to and from their fields on paths and footbridges, carrying implements, fertiliser, fuel wood, water, and harvested crops. Community roads and paths constitute the first and last leg of most trips to the markets and towns. Yet, planners in government and donor agencies do not consider these infrastructures, which provide an essential link with the designated network as well as form the major circulatory system in any rural district as part of the transport system. Action to correct this situation and the contribution of the engineering community will be discussed in section 4 and 5.

2.4 Choice of Construction Technology

Given the financial constraints of road maintenance budgets and the low rural incomes and high unemployment, labour based construction and maintenance can be a rational solution. The World Bank recommends consciously considering labour based works if the minimum wage is below US $ 4.0 per day. Treating choice of road construction and maintenance as a rational process implies that decision-making will take place in an unbiased way. In Tanzania, however a number of factors have conspired to deny any all attempts of a rational technological choice process for maintenance and road construction.

The factors that have contributed towards the failure to adopt and implement labour based road construction methods in Tanzania are in three main groupings namely:

- The wrong notion of Technology
- Biases in the technological choice process
- No Choice Situation

2.4.1 Wrong Notion of Technology: Experience over the last three decades or so has shown that terms such as 'technology', 'appropriate" technology' or 'technology transfer' are much more complex than they might seem at first consideration. Most of the definitions of technology are too simplistic since they convey the idea of technology as a benign or neutral process. The failure to appreciate the true nature of technology and thus the difficulty inherent in its transfer lies behind the numerous examples of waste and failure to benefit from its application. The fact is that simply shipping in equipment with some spares, even accompanied by skilled mechanics and operators for a stay that can be measured in a few years or months, is not enough to transfer the technology.

Technologies are embedded in, and contain, social values, institutional forms, and culture even as they reflect resource endowments and the organisation of production. Western equipment-intensive technology was devised primarily to save labour in the face of rising wage costs; it could hardly be appropriate for districts or regions troubled with a large labour surplus and very low wage rates. Moreover, technology in western countries has grown up over several generations along with a vast array of supporting services. These include modern transport and communications, cost accountancy, marketing and so forth, which make it inappropriate for districts or regions lacking these paraphernalia. The 'appropriate technology' movement, which stressed the importance of fitting a technology's resources requirements to' local resource endowments, grew out of a recognition of the misfit of physical characteristics of imported technologies to recipient environments.

2.4.2 Bias in the choice process:

In Tanzania as in most developing countries the evolution of the road construction industry has suffered from a long-standing, and thus deep-rooted, bias in the choice of technology. Much of the bias has a colonial origin since the people who were, responsible for starting and executing road construction programmes were from industrialised countries. The resulting emphasis was naturally on the equipment intensive methods with which they were familiar and which rapidly became the accepted way of doing things.

Bias towards and near total reliance on equipment-based, high-technology construction methods has survived in the post-colonial period for a number of reasons (Edmonds 1990): the desire of politicians and engineers to emulate the more advanced countries, the tendency among international consultants and contractors to favour construction methods with which they were familiar, and the biases inherent in the tied-aid stipulations of international and bilateral assistance agencies, the concern of the latter being to help exports from their own countries. A particularly important, factor was the educational background of the technical leadership in most developing countries. Often acquired in engineering schools that advocate the latest technological methods, this background conditioned planners and engineers to favour the use of heavy equipment in all circumstances. Equipment-based methods were perceived to have productivities, costs, and performance that were predictable; they were associated with high quality results; and they were surrounded by an aura of technological progress. Hence, the use of equipment in construction was particularly attractive and in some cases unavoidable, since financing would not otherwise have been forthcoming.

In Tanzania the most common biases are the following:

Economic: Often the price tags placed on foreign imported goods bear no relationship to their actual value to the economy. This is due to a tax regime which favours imported goods over locally produced ones coupled with a weak tax enforcement mechanism allowing a lot of imports to come in untaxed. Another equally important factor is high wage rates through the mandated minimum wage, which do not reflect the actual cost of labour, resulting in an economic framework, which favours the choice of imported goods against the use of local resources.

Institutional: The systems and procedures related to the administration and organisation of infrastructure projects is generally modelled on those used in the developed countries. Consequently, they are not designed to fit the environment in which they operate. The recruitment and payment, for example, of large groups of unskilled labour is something, which most public works departments have difficulty coping with. The procurement process including the packaging of contracts clearly favours the equipment-based methods.

Attitudinal: Whilst this factor has no basis in either fact or reason it is often the most important element in the effective application of a new technology. Most people who oppose the adoption and use of labour based construction fall in this category. Because the technology has not been part of either the education or experience of those who are asked to apply it then there is little motivation to give it a real trial.

2.4.3 No Choice Situation: Much of the bias against labour-based technologies is, of course, founded in ignorance either of the alternatives available or of the lessons of history. The result is what has been called the 'no choice situation'. Many people sincerely believe that there is only one optimum way of doing things, or that it is only necessary to get the 'prices right' for the market to ensure that the correct technological solution is selected. Neither of these views is true, but too often, those least implicated in the outcome of those decisions make the choice of technology and the means of obtaining it.

One reason for the no choice situation lies in the narrowness of our engineering education. Equipment-intensive methods are enshrined in the curricula of our universities and other technical institutes. Even today, almost twenty years after the successful completion Rural Access Road Programme in neighbouring Kenya and with successful labour-based programmes in a number of African countries, labour-based methods are not taught in the majority of our technical institutions.

2.5 Intermediate Means of Transport

Intermediate Means of Transport are defined as those means of transport, which are intermediate between the traditional means of walking and head loading and conventional motor vehicles. Intermediate Means of Transport are more appropriate for local transport, because they:

- Are relatively cheap to purchase
- Have a low level of maintenance
- Can operate on paths, tracks and trails, which are inexpensive to construct and maintain,
- Are designed for small and medium loads
- Can often be produced locally
- Need less foreign exchange

Table 1: Performance Characteristics of Basic Rural Transport Vehicle

Vehicle	Load (Kg)	Speed(Km/h)	Range (Km)	Terrain
Carrying Pole	35	3-5	10	Unlimited
Wheelbarrow	180	3-5	3-5	Reasonably flat, tolerates rough surface
Handcart	180	3-5	3-5	Reasonably flat, smooth surface
Bicycle	80	10-15	40	Reasonably flat, paths
Bicycle and	150	10-15	40	Relatively flat, wide paths

Vehicle	Load (Kg)	Speed(Km/h)	Range (Km)	Terrain
Trailer				
Tricycle	150-200	10-15	40	Reasonably flat, wide paths
Pack Animal	70-150	3-5	20	Unlimited
Animal Drawn cart	1000-3000	3-5	50	Reasonably flat, wide track
Luggage on a Bus	15	30-60	>100	Wide track
Motorcycle 125 cc	150-200	30-60	100	Moderate Hills
MC 125 cc + Trailer	250-400	30-60	100	Moderate Hills, wide paths
Tractor	10000	10-15	50	Moderate hills, wide track
Pickup	1000	30-60	>100	Wide track
Truck	10000	30-60	>100	Wide track

Source: Barwell/Hathway/Howe (1982)

While motorised traffic can carry bigger loads over longer distances, the IMT are appropriate if many trips with shorter distances have to be undertaken. They enable the household to extend the distance over which agriculture can be practised and they release the household's time requirements, which can be used for productive activities.

3.0 ORGANISATION/MANAGEMENT OF THE RURAL ROADS IN TANZANIA

3.1 Rural roads Infrastructure:

Roads in Tanzania are classified into three major groups namely Trunk roads, Regional roads and District and Feeder roads. The respective length of these networks as per the data available is as follows:

- Trunk roads 9,934 km
- Regional roads 18,934 km
- District roads 20,000 km
- Feeder roads 27,550 km
- Urban roads 2,450 km

In terms of administrative responsibility Trunk and Regional roads are under the management of the Tanzania Roads Agency (TANROADS), while the rest of the classified network is under the management of the President's Office Regional Administration and Local Government (PORALG).

3.2 Condition of the roads:

The condition of the rural road infrastructure in Tanzania varies widely across regions because of the factors namely traffic, rainfall and maintenance arrangements. The most recent condition survey for the Trunk and regional roads is shown below.

Table 2: Condition of Trunk and Regional Road Network as of December 2004

	Good(%)	Fair(%)	Poor(%)
TRUNK TOTAL	48	38	15
Paved	61	31	8
Unpaved	39	42	19
REGIONAL TOTAL	38	36	7
Paved	70	25	5
Unpaved	37	36	27

Source: TANROAD Quarterly Report for the 2nd Quarter 2004/2005

The above table indicates that the condition of the network of trunk and regional roads is overall in fair to good condition. This situation is a result of the recent institutional changes as well as the availability of reliable maintenance funding through the Road Fund.

3.3 Funding for Rural Roads

A snapshot of funding available for rural roads development and maintenance can be seen from the data for the current budget year 2004/2005. These figures are not exhaustive especially the development funds from MoW. Nevertheless they give a

picture of the amount of money available and therefore can be used in our discussion of poverty reduction.

Table 3: Road Maintenance and Development Budget (2004/2005) Mio. Tshs

TANROADS	PORALG	MOW	TOTAL
45,788.352	28,865.00	53,602.90	128,256.252

Source: Reports to Road Fund Board (2nd Quarter 2004/2005)

3.4 Choice of Implementation Technology

From the reports available Contractors using equipment-intensive methods are implementing all development projects for the rural trunk and regional roads. For the maintenance, mostly local contractors using equipment intensive approach implement projects under both TANROADS and PORALG. Overall Force account units accounted for less than 1% by value of all works under TANROADS up to 31st December 2004. The adopted strategy is to reduce the number of contracts and force account packages in order to effectively supervise maintenance works. This has very serious consequences for the general poverty reduction efforts.

4.0 RURAL ROADS AS STIMULANTS TO ECONOMIC DEVELOPMENT

The discussion and arguments presented earlier in section 1 and 2 indicated that there is evidence of a theoretical and empirical nature to link Rural transport investment and economic development and hence poverty reduction. However the linkage is not direct and in most cases it is not easy to prove. There are a number of preconditions that have to be satisfied in order to realise the economic and social benefits of investment in rural roads infrastructure. In the following section we will look at the impact and potential impacts of rural roads investment in Tanzania.

4.1 The impact of improved access on economic development

One of the agreed impacts of rural roads investment is that it creates special impulses for an economic growth process. This is strongest in areas where transport services are introduced for the first time. The introduction of a rural road in an area that was previously inaccessible awakens a special spirit in the population that leads to wider participation in economic activities. Impact evaluation data is not available in Tanzania for this phenomenon but this type of impact has been widely observed in Makete Integrated Rural Transport Project (MIRTP). In order to realise this impact on a wider scale in Tanzania the following should be observed.

- Rural Road Transport Investment should aim at providing basic access,
- Initial Investment costs should be kept as low as possible with the option to upgrade if a positive response is elicited,
- The current road design standards are unrealistically high and inflexible and should be greatly simplified,
- Ownership of the infrastructure should be vested in the community.

4.2 Impact of Improved Tracks and Paths on Economic activities

Rural Households carry a considerable transport burden, which requires substantial quantities of time and effort. The majority of trips are undertaken in and around the village by walking on local footpaths and trails. Transport constraints at this level can significantly hamper the growth of agricultural production. Therefore a rural road investment strategy should aim at the improvement of paths, trails and tracks. The study in Makete and the VTTP projects have ample evidence of economic impacts of investments in tracks, trails and footpath development. Infrastructure investment at this level releases a substantial amount of time, which is put into agricultural production. As a result the investment led to a shift from a subsistence economy towards a market-oriented economy.

In practical terms, this calls for the reallocation of resources in such a way that the unclassified road network should also get a share of central government allocation.

4.3 Impact of Reduced Transport Costs

One of the most widely accepted impacts of rural roads investment is the reduction in the cost of transport on the improved road. The reduction in transport costs is due to the reduction in vehicle operating costs and time costs. A number of evaluation reports are available which show the impact on travel time as well as on the vehicle operating costs. What is not certain is the distribution of the benefits of reduced transport costs. Due to the lack of a competitive environment in the rural transport market the benefits of reduced transport costs are usually retained by the operators and not passed down to the producers and the general population. This makes these benefits unavailable for investment in agriculture or any productive activities at the local level.

On the other hand the reduction in transport costs results in improved agricultural marketing and therefore minimises the post harvest losses. It does not however encourage the development of Small and Medium Enterprises (SME's) as it now becomes easy to evacuate crops and other raw materials to a central processing facility in a nearby township or export them unprocessed.

In order to make sure that investment in rural road upgrading which reduces transport costs also act as stimulants to the local economy we need to undertake the following parallel actions.

- Investment in agricultural production,
- Creation of a competitive transport market'
- Use Labour-based technology in the implementation of the project.

4.4 Impact of Labour-Based Road Construction

If sufficient local labour is used in the construction and maintenance of rural roads, then the impact of investing in rural roads is direct and immediate. A labour based road project can be defined as one in which a high proportion of the project cost is spent on the wages for unskilled and semi-skilled labour. With this definition most current projects do not qualify as labour based and as a result the immediate project benefits do not go into stimulating the local economy. In Tanzania despite repeated efforts, the use of labour-based method in road engineering has not taken root for reasons that were explained earlier.

For rural roads construction and maintenance, the labour-based approach can perform all activities except compaction, production of high quality aggregate grading and production of high quality premixes. To realise this ambition we need to overcome the current problems, which include mostly biases in technology choice and the presence of decision makers who believe that there is no choice as far as construction technology is concerned.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Engineers have a very important role to play in creating an environment that can enable rural roads to play their part in poverty alleviation. Engineers owe it to themselves to understand the proper notion of technology and all the implications of technology transfer. As Engineers we need to be creative and courageous enough to want to redirect technology so that it serves the ordinary Tanzanian rather than destroy him. The following are some areas where we can contribute to the realisation of our common goal that of poverty reduction and increased economic development.

- Sensitisation of decision makers and Politician to the fact that there are alternative ways of implementing rural road projects that are in fact more beneficial that equipment based approaches. We should design and implement

alternative solutions that work and can improve incomes and employment for the rural populations.

- Review our Universities and technical Schools Curricula to include subjects on technology choice and the need to fit any technology resource requirement to local resource endowments.

- Design and Manufacture equipment and high quality tools for use in Labour based road construction and maintenance.

- Since engineers are responsible for the management of rural roads we should undertake more impact evaluations in order to better understand the economic impacts of our design and construction standards.

- Carry out intensive research on materials for the construction of low volume rural roads.

- Design and manufacture intermediate transport vehicles that can be used to free rural people, especially women from the burden of head loading.

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