

## LOW-VOLUME ROADS: PROBLEMS, NEEDS, AND IMPACTS

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### ENGINEERING

#### Materials

In many parts of the world there are large areas where roadbuilding materials which meet standard specifications are in short supply or simply not available at all. There is considerable scope in the construction of low-volume roads for using marginal quality materials or materials which are available in the vicinity of the road. Considerable work has been carried out in this area by the Overseas Unit of TRL (Transport Research Laboratory), and others, who have developed appropriate specifications and methods of use based on empirically derived performance data. There is considerable scope for extending this work to cover a wider range of materials and a wider range of climatic and loading conditions. For example, with increasing tire pressures there is evidence to show that road 'damage' is not properly taken into account using standard methods and more empirical research into the relationship between tire pressures, contact areas and road damage is needed.

#### Structural Design

Associated with the use of lower standards of materials is the need for suitable structural designs which are commensurate with the specifications derived for the materials themselves.

#### Maintenance Management

While the problems of managing road maintenance for the primary road networks of developing countries have been well documented and much effort is currently being devoted to improving this, the results of such work are unlikely to be directly applicable to the low-volume roads which comprise the majority of the network. Management techniques will need to be modified for this purpose and there is considerable scope for developing the elements of such a system. For example, it is unlikely that many countries will be able to afford a condition responsive system for the maintenance of the lower classes of road, especially gravel and earth roads, and therefore better predictive models will be required to schedule maintenance activities.

#### Unpaved Roads

Over eighty percent of roads in developing countries are unpaved and are likely to remain so for the foreseeable future. The trafficability of such roads remains an important area for research, especially in wet areas. Granular material to provide all-weather surfaces is a dwindling natural resource in many countries and techniques for making better use of this resource are needed.

#### Miscellaneous

Environmental considerations will enforce the inclusion of safety components at the design stage and greater emphasis will have to be placed on engineering modifications to minimize adverse environmental impacts, even for the lowest class of road. For example, the control of dust from unpaved roads is seen as an important issue in some areas.

### TRANSPORT PLANNING

#### Basic Statistics

To assess priorities for planning rural road networks in the poorest developing countries there is a need for more background information concerning how far people live from basic vehicular access, engineered seasonal roads and all-weather roads. The economic benefits of bringing such access 5 kilometers nearer to rural populations are typically two orders of magnitude greater than that of upgrading the same length of earth track to gravel standard. It would be valuable to know how current road programs are directly affecting rural accessibility and whether stated policies are being implemented effectively.

#### The Use of Transport Demand and Agricultural Supply Elasticities in Road Planning

In the economic appraisal of low-volume roads the most difficult components to estimate are the development benefits associated with generated traffic or induced agricultural production. In the literature, much attention

has been given to methods of appraisal but in practice very little work has been done to empirically relate forecasted changes in traffic and agricultural production with changes in transport costs and the relevant elasticities of transport demand and agricultural supply. Various estimates of these elasticities have been calculated for different purposes in the past and they could be usefully employed in this area.

### **The Opportunity Cost of Labor and Traveling Time**

There are many rural road (and bridge) projects where project viability hinges on the value of time. Although this topic is hardly new there are still many uncertainties associated with valuing time in the poorest developing countries. Where new vehicle access is provided the alternative transport modes will usually be very labor intensive (walking or the use of animal transport). Bridge projects which replace driftnets impact personal time values by shortening waiting times. The following issues need to be addressed:

1. Seasonality: The demand for labor varies with the agricultural cycle and affects the value of time.
2. The valuation of time spent in different activities (i.e. walking, headloading, riding, and waiting): Intuitively time spent carrying a heavy load should be valued more than that spent walking or waiting. More thought needs to be given to this area.

3. Itinerant traders and self-employed people: In many countries the self-employed often form a substantial part of the traveling public. Because they are traveling on business it is usual to value time at the full wage rate. For this group the standard categorization of working and non-working time is inappropriate.

4. Government servants' time: In many countries, civil service numbers have been expanded as a form of social welfare - hence the wage rate may not be a good proxy for the opportunity cost of labor.

### **The Use of Tariffs and Fares to Predict Changes in Vehicle Operating Costs**

Research shows that there is far more inter-country variability, in vehicle operating costs (VOCs) than is often claimed. Despite the research that has been carried out in this area, VOC modeling is still very weak. Simple ways are needed to ensure that the VOC models chosen for road appraisal, and any additional calibrations applied, produce realistic results. One way of checking VOC model formulations is to compare results with competitive freight tariffs and bus fares. At the Sixth International Low-Volume Roads Conference held in 1991, TRL showed one way of using freight tariffs (from Pakistan) for this purpose. More work in this area is required.