ISSUES RELATED TO PLANNING AND ADMINISTRATION OF LOW-VOLUME ROADS

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RURAL ROAD PLANNING

The main objective of rural road planning is to develop investment programs that will allocate available resources based on prioritization of road improvement and maintenance activities. To accomplish this, a comprehensive socioeconomic analysis of the costs and benefits related to the level of accessibility and the economic life of the road is carried out. The economic analysis requires estimating the economic costs and benefits associated with the proposed technical solutions, which are then ranked and scheduled according to economic indicators such as net present value, internal rate of return and first year rate of return. Socioeconomic evaluation criteria distinguish between roads in areas of substantial economic activity, where the level of traffic is considerable, and roads in areas with little or no traffic.

In areas of substantial economic activity, benefits are quantified in terms of savings to users and in the economic costs of transportation, and projects usually involve the improvement of existing roads or the construction of new roads when alternative roads or other modes are available to traffic.

In areas where there is little or no traffic, benefits are quantified in terms of the net increase in the economic value of the production of goods and services through lower costs of inputs, lower costs of marketing and higher farm gate prices. When benefits are estimated from road user savings, these come mainly from reductions in vehicle operation costs, accidents, and road maintenance due to better road conditions.

In rural areas where the traffic volume is low (less than 50 vehicles per day) but a road is a component of an area development program, a socioeconomic methodology that takes into account the relationship between road accessibility, agricultural and forestry production, and social services has been developed to evaluate the costs and benefits of investment in the entire area development program and in the road improvement component of the program. When the most economic type of roadway and corresponding agricultural/forestry social investment go hand in hand, rural road investment is most efficient, and the principal benefits achieved are:

1. Reducing transport costs by the use of larger, more economical motor vehicles;
2. Increasing the amount of agricultural land in production, including the planting of trees in unfarmed semi-arid lands for timber production;
3. Increasing yield per unit area through the introduction of modern farming equipment, fertilizers, pesticides and technical assistance; and
4. Improving all-weather accessibility, which reduces storage requirements and related inventory costs, as well as permitting the harvesting of crops when they are ready for market, regardless of weather conditions.

The purpose of economic evaluation is to ensure that benefits outweigh total maintenance costs incurred over the life of the road. When the internal rate of return exceeds the opportunity cost of capital, road investment is generally considered to be economically justified.

An example of the planning, design, and administration of 320 kilometers of paved roads, and 500 kilometers of dirt roads used mainly for timber production, is presented in this circular. This case study also includes an analysis of social considerations, such as the distribution of project benefits between different social groups, including local laborers, farmers, road users and the forestry industry, and a discussion of women's roll in project planning and administration.

The current preference in the administration of a rural network is to improve the maintenance of the existing road network rather than to construct new roads. The tendency is that local government (state/province and municipality) will assume most of the administrative responsibility while central government provides technical support in planning, financing and project monitoring. To optimize an expenditure on road improvement, it is necessary first to identify which road segments play a principal role in connecting production centers with markets in a transportation system comprised of roads, highways, railroads, river navigation and ports.

Each road section is identified and its engineering properties evaluated, including road geometry, subgrade,

pavement, drainage facilities, bridges, low cost water crossing, local construction and maintenance materials. Knowledge-based expert systems can be useful in screening, verifying and revising field data, and in improving the consistency and quality of decisions on the planning of rural roads.

Another important issue is the application of environmental procedures in the administration of low-volume roads. A proposed project may have a beneficial, neutral, moderately negative, or significantly negative impact on the environment.

For example, road maintenance projects that improve surface and drainage conditions, or which result in improvement of dust control may be classified as beneficial or neutral, and road improvements that require wet-land replacement or erosion control may be classified as moderately or significantly negative. The conclusions of the environmental analysis are implemented in the special provision of the construction documents to minimize or eliminate any damage or risk to people or to the environment.

Assessing Road Surface Conditions

The Pavement Condition Index (PCI) and the International Roughness Index (IRI) are used to describe road surface conditions. The PCI represents the type and severity of some nineteen different types of distress, including:

- Potholes,
- Rutting,
- Weathering/raveling,
- Lane/shoulder drop,
- Bumps/sags,
- Depression,
- Corrugation,
- Shoving,
- Swelling,
- Bleeding, and
- Polished aggregate.

The most common maintenance activities used to improve surface conditions are:

- Pothole filling,
- Crack/joint sealing,
- Patching (skin to full depth),
- Shoulder refill,
- Seal coat/fog-seal, and
- Surface treatment with aggregate and thin asphalt overlay.

To predict pavement performance in terms of PCI and IRI, the relationships between the different types of surface distresses and maintenance activities are developed. Once the PCI, IRI, and traffic projections over the lifetime of the road network are known, vehicle operation costs and maintenance needs can be calculated and used to efficiently allocate and use resources on road improvement and maintenance.