Rural Road Maintenance and Improvement

Chris Hoban
John Riverson
Albert Weckerle

March 1994

Best Practice

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**RURAL ROAD MAINTENANCE AND IMPROVEMENT**

Abstract: Roads are important to all aspects of economic and social development of rural communities. Two recent reviews of rural road components in World Bank projects show they have frequently failed to achieve sustainable maintenance. Problems include inadequate policy and coordination for rural roads, excessive attention to road improvements without provision for maintenance, and inadequate monitoring of results achieved. Breaking out of this pattern will require major shifts in the design of rural roads assistance.

Rural roads serve district or local access transport activities, rather than regional or national functions. Many of these roads have an earth or gravel surface and have low volumes of motorized traffic, which is sometimes exceeded by pedestrian, cycle and animal traffic flows. Responsibility for funding and administration is often divided between national, regional and local government agencies, and involves different ministries concerned with public works, agriculture, rural development and local government. Rural roads are major public assets, with a total length which in most countries is about five or more times the length of the inter-urban road network. They provide important economic and social benefits through improved access to markets, farm inputs, jobs, education and health services. Deficiencies in the rural road network are often a significant constraint on rural development.

Two recent World Bank reports have investigated past experience in transport and agriculture projects with rural road components, and drawn some lessons for future practice. The Operations Evaluation Department (OED) report, "Rural Roads Maintenance: Review of Completed World Bank Operations" reviewed about 85 completed projects around the world. A separate Africa Technical Department report on "Rural Roads in Sub-Saharan Africa: Lessons from World Bank Experience" focuses on issues identified from 127 projects in Africa.

Both reports found that substantial problems remain in achieving sustainable maintenance of rural roads, and that there is a need for improvement in Bank lending and policy support in this sector. Rural roads were found to suffer from a serious lack of overall policy framework, clear country sub-sector strategies and coordination. As a result, planning for rural roads has been driven by a multiplicity of objectives and institutions with lack of continuity and lack of attention to sustainability, and generally poor use of resources. Efforts to improve rural roads were not balanced by attention to sustainable, network-wide maintenance. Country capacities to plan, fund, implement and monitor rural road works were very often inadequate, and efforts to improve institutional capacities had not always been successful. However, some important lessons and cautions can be drawn from the reviews which provide a basis for further application and testing in future rural road projects. Such applications have already begun in Sub-Saharan Africa, through assistance to various countries to develop national rural road and transport policy frameworks and supporting sub-sectoral strategies.

**Policy and Institutional Framework**

The reviews emphasized the need for each country to develop a coherent Rural Road Strategy, involving all agencies and institutions with an interest in rural roads at the national, regional, district and local community level. Apart from road agencies and local government,
these include organizations dealing with agriculture, mining, tourism, transport and rural development. Formulation of this strategy should engage these institutions, and perhaps donor and lending bodies, in a discussion aimed at identifying issues and ways to resolve them.

The strategy should clarify the ownership of rural roads, and the responsibilities of various institutions for development, maintenance and priority-setting. Countries which have been more successful in rural road management have often established in one agency a central focal point for policy and strategy formulation and inter-agency coordination.

**RESOLVING THE RURAL ROADS INSTITUTIONAL ISSUE**

**Ghana’s Approach**

Ghana’s Department of Feeder Roads (DFR) provides a central focal point for rural roads policy and strategy formulation, and manages and coordinates programs funded or initiated by the Regional Administrations, Local Governments, Department of Social Welfare and Community Development, Ministry of Agriculture, Cocoa Marketing Board, and international donors. The DFR operates alongside separate highway and urban roads agencies under the Ministry of Roads and Highways. However, it works through its own Regional and District Engineer’s offices to supervise feeder roads development projects, often executed through private contractors, as well as organize and supervise maintenance activities by small contractors and communities.

The Rural Road Strategy should also address the overall level of funding for rural roads, and the balance between development, rehabilitation, and maintenance. Efforts to improve the standard of rural roads should identify how this improvement can be sustained, taking account of the capacity of various institutions to fund, manage, execute, and supervise road maintenance. Objectives and plans for training, technical assistance, and local revenue generation should be included. This assessment should pay particular attention to the lessons of past experience and past failures in road maintenance, and avoid over-optimistic predictions of improvements in maintenance capability.

**Planning for Sustainable Rural Road Maintenance**

The first priority of rural road spending should always be to maintain those roads which are functionally important and currently in reasonably good condition. This approach has been consistently shown to give greatest returns in maximizing rural accessibility, but is frequently overlooked in favor of more expensive works to rehabilitate or upgrade road sections in worse condition or build new roads. To assist in maintenance planning, it is important to define a "core network" of roads to be maintained in good condition, with procedures for condition monitoring and maintenance programming.

Routine and periodic maintenance should therefore be identified as a specific component of rural road spending priorities, with defined tasks and budgets, and routine reporting of measures of achievement. It is important that routine maintenance funds be tied to specific outputs, and not simply allocated to staff and equipment costs. Drain clearing, grading and shape correction are typical works categories for unpaved roads, while pothole patching, shoulder repair, and resealing are examples of additional tasks for paved roads.
The second priority for rural roads spending should be to selectively add roads to the maintainable core network through rehabilitation and upgrading, including through spot improvements to drainage and badly damaged road sections. Since maintenance of the core network takes highest priority for road funding, additional roads should only be added to this network through upgrading or rehabilitation when the capability and resources have been established for their maintenance. Selection criteria should take account of traffic flows and functional importance. If budgets are limited, it may be necessary to exclude some roads, even in good or fair condition, from the core network. This implies a "disinvestment" in these routes, typically due to low traffic flows or low functional importance.

Separate provision should be made for emergency maintenance works required to keep lower-quality roads open and serviceable. Some funding is essential for such works, recognizing that they often provide only short-term benefits until more extensive rehabilitation works are undertaken. However it is most important to ensure that routine maintenance resources are protected and not diverted to these activities, if necessary by reducing spending on upgrading and rehabilitation.

Responsibility for "non-core" roads would then revert to communities and local residents, possibly supported by small grants and technical assistance. If community roads are short (not more than 5-10 km), do not cross major obstacles (e.g. rivers or swamps), and lead to good quality roads, then local efforts should lead to substantial improvements in accessibility to transport services. For such roads, improvement works should be primarily labour-based. Because improvements require local initiative, the likelihood of sustained maintenance is high.

Processes for Rural Road Planning and Priority-Setting

Establishing budgets and priorities for rural road works requires not only a methodology, but also a process through which key constituencies can be involved. This suggests the need for simple prioritization criteria which allow participation of various government agencies, commercial interests and local communities.

Participation and Consultation

Local participation in rural road priority-setting may be achieved through local government bodies, local branches of central government agencies, local business representatives, or more direct forms of community consultation. In addition to priority-setting, local and district governments should be encouraged to participate in all stages of assessing rural road needs and resources. Whichever form is used, local involvement is essential for two reasons:

- Centralized data on rural road condition and traffic flows are often unreliable, due to large distances, low traffic volumes and seasonal variations in both traffic and condition of earth and gravel roads. Local agencies and communities generally have information which could not be collected in any systematic way on the utilization, importance and problems of different roads, and hence the relative benefits of different spending options.
Sustainability of rural road improvements requires local "ownership" of priorities if ongoing maintenance is to be successful. Local interest in the works program may also encourage more financial responsibility, accountability and oversight of work output and quality, which is difficult to achieve through centralized agencies for a widely dispersed road network.

LOCAL PARTICIPATION IN RURAL ROAD PRIORITY-SETTING
Uganda, Kenya and Ghana

In various African countries, such as Uganda, Kenya, and Ghana, District Development Committees (DDCs) have been set up as part of District Administrations or Local Governments. DDCs typically include district representatives of government departments such as Public Works, Agriculture, Education, Health, Tourism, Community Development and the Water Authority, as well as some local elected officials and Members of Parliament. The committees usually discuss proposals submitted by the various sectoral departments and agencies and set priorities, but works are executed by the individual government departments or their contractors. The authority exercised by the DDCs is sometimes limited by their reliance on central government funds and agency resources. In Kenya, service charges on tea and other producers provide a local revenue base in some districts which is also prioritized by the District Development Committee, thus providing greater local autonomy in road decision-making.

Technical Screening Methods

The participatory process needs to be backed by sound technical advice, which may be provided by guidelines and constraints set by higher levels of government, and experience and data from district and local engineers and planners. The primacy of maintenance of a core network should be a key constraint, and a precondition of further investment, with specific allocations for emergency maintenance. Prioritization may then be assisted by information on road function, road condition, traffic flow and composition, critical bottlenecks (both locations and times), and constraints on mobility for personal, social, economic, health, education or other purposes.

Economic screening and evaluation methods should be used to optimize rural road spending according to rational and well-explained criteria. These are generally of two types:

- Vehicle operating cost calculations and pavement life-cycle analysis identify changes in road and transport costs. These are most appropriate for higher-volume rural roads.
- Producer’s surplus methods identify benefits of increased economic activity resulting from improved accessibility. (see, for example, Beenhakker et al., 1987)

Where neither of these approaches is feasible or appropriate, development objectives may be used to justify road projects. It is important that these are expressed in terms of quantifiable and monitorable indicators, such as travel time to major towns, transport costs of defined products, frequency of specified bus services, or access to specific services such as health or education.
RURAL ROAD PLANNING AND SELECTION CRITERIA

India

India has undertaken a major effort to provide access roads to rural villages and communities. The planning methodology developed for this purpose combines simple benefit-cost criteria with "sufficiency ratings" which take account of population, road function and social benefits. Among other criteria, points are allocated for connections to hospitals, markets and schools, and the extent of existing all-weather access (Kumar & Tillotson, 1989; CRRI, 1990). These are considered along with local priorities in project selection and prioritization.

Budget planning at higher levels of government generally considers district priorities along with data on road inventory and the determinants of community demand for rural roads, such as population, area, local production and key transport-related activities. National priorities for regional development and support of specific economic activities may also influence budget allocations. Technical information on terrain, materials, and hydrology may influence the costs, priorities and budget requirements of specific districts, roads or work types. Development of national and regional rural road budgets depends on the weightings applied to these factors, which are largely determined through the political process.

Planning and programming of rural road activities should always look beyond individual projects, and consider all of the road spending needs of the region or district under consideration.

Design Standards

Design standards and maintenance practices should be reviewed to determine their sustainability over the whole network, and the priorities to be applied under constrained budgets. This analysis may require clarification of ownership and maintenance responsibilities of some categories of road, to avoid subsequent "orphaning" of newly-improved roads.

This process should ensure a rational balance between investment, rehabilitation and maintenance of rural roads, provided that design standards are also appropriate. Both of the review studies discussed earlier in this note emphasized that design standards are an economic choice, and that many rural road projects have adopted excessive standards of alignment, width and pavement for the traffic requirements. Rural road improvement proposals should therefore evaluate options for reduced design standards, which may offer substantial accessibility benefits with much lower construction costs and long-term maintenance requirements. Where budgets are limited, design standards for low-volume roads should emphasize reliability and durability rather than width and speed. Drainage is an important aspect in ensuring durability and reliability or roads.

All-weather vehicular access may not be essential or affordable in all areas, and serviceability may need to be defined in terms of access by different types of road user in different seasons. In Bangladesh, for example, accessibility in the rainy season is limited to a small proportion of the rural road network. In some countries, gates or barriers have been used to close roads due to inadequate carrying capacity in the rainy season.
FUNDING COMMUNITY RURAL ROAD PROJECTS THROUGH SOCIAL DEVELOPMENT FUNDS

Bolivia

The Emergency Social Fund was created in Bolivia in 1986 to protect the poor during a period of macroeconomic stabilization and adjustment. It provided quick-dispersing funds for small, technically simple projects carried out by a variety of public, private and voluntary agencies, focusing on two criteria: benefits to the poor, and technical soundness. Hospitals, schools, sewerage works, homes and daycare centers are examples of projects supported, along with a number of road improvement projects. For roads, a standard checklist was developed, along with standard costs for specific work types, and a simple, standard benefit-cost formula. Similar approaches have now been adopted in many other countries, including Peru, Guatemala and Nicaragua.

Implementation Issues

Both of the World Bank studies found that local and district government bodies are frequently very weak in equipment, know-how and resources for the execution of road maintenance activities. Thus, even with clear national strategy, funding and prioritization of rural road spending, there is a major need for strengthening the implementation capabilities of local institutions and district branches of central government agencies. In many countries, past efforts to improve local institutional capacity through technical assistance have met with little success, and pilot efforts are being pursued to find alternatives. The following approaches have met with some success:

- *Local revenue generation*, even on a small scale, has the potential to increase the accountability of local governments and the community "ownership" of rural road spending priorities, outputs and quality. However it is often necessary to provide supplementary funding from national or regional sources, because of the limited revenue base of local governments and the centralized collection of most road user charges. A transition to higher local funding is desirable for long-term sustainability of maintenance. Equity is an important consideration in determining local funding responsibilities, as lower-income areas may have less ability to generate such resources.

- Conventional practice has been to avoid *foreign financing* of routine and periodic maintenance, since sustainable development requires sound local revenue sources. However donor and lending agencies are increasingly becoming involved in these activities to assist in building a "maintenance culture". Typical interventions are funding institution building and innovative pilot programs, sometimes funding maintenance itself on a reducing scale, and very often including basic maintenance tasks within the definition of project activities to be monitored, reported and discussed.

- *Labor-based construction* methods are often highly appropriate for rural road works, and suited to the limited equipment and technical skills of local agencies. Labor-based works typically retain a larger proportion of roads spending in the local community, create employment for women and unskilled workers, and reduce road costs. Where equipment is required, maximum use should be made of locally-available equipment such as ox carts and tractors with trailers.
• Contracting of road maintenance activities, usually to local workers, cooperatives or small local contractors (e.g. for grading and regravelling), can increase productivity of and accountability for road work, encourage innovation in works methods, and reduce costs. Standard, simple contract documents and consistent specifications should be developed for local conditions, with monitorable indicators of work output.

• The use of project management contractors can increase the speed and efficiency of contract preparation, bidding, selection, supervision and payment compared with government procurement procedures, thus streamlining the contracting process and providing specialist expertise to supplement local government staff capabilities. The AGETIP agencies in Senegal, Benin and Niger, for example, have substantially improved contract management at the local government level in these countries, while still allowing local government control of priorities and works quality.

• District engineers specializing in rural road support can also assist local government and communities in road planning, design standards, contract management and works supervision. These, along with project management contractors, can supplement the scarce management skills generally available for rural road projects, and should provide training to project managers, foremen, workers and contractors. Guidelines on construction standards, works quality monitoring and maintenance practices may also be required from district engineers or central government rural roads departments.

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**IMPROVING THE MANAGEMENT AND DEVELOPMENT OF RURAL ROADS**

**Bangladesh**

Facing particular problems of many water crossings and recurrent floods, Bangladesh has many rural roads in poor condition, resulting in high rural transport costs and a major constraint on agricultural development. In recent years, the World Bank has assisted the Local Government Engineering Department (LGED) in developing a project monitoring and evaluation system, a central maintenance system, construction and maintenance standards, and appropriate implementation technologies. LGED, with high levels of commitment and enthusiasm, has been able to reduce implementation delays and achieve quality targets. Further efforts are now being taken to develop sustainable management systems to overcome delays in works execution and payment, and to provide supervision and training. Incentives for maintenance staff are also being considered. Simplified appraisal methodologies have been developed, and these are being further simplified for use at the sub-district (Thana) level. LGED has secured adequate funding of a “core” rural roads (Feeder Roads Type B) which currently amount to no more than five percent of the 100,000 km rural road network. With the assistance of external resources, efforts are continuing to provide all-weather access on the core network, through strengthening of road embankments, minimum compaction, improved culverts and drainage systems.

In the design and execution of unpaved rural road projects it is important to recognize two major differences from paved road management concepts. First, the life cycle of earth and gravel roads is much shorter than for paved roads, with substantial changes in condition and serviceability within a given year, depending on seasons and maintenance frequency, and in some cases a major deterioration in pavement strength over several years. Second, the types of work involved in unpaved road maintenance, rehabilitation and construction are often similar, so that distinctions between work categories have different implications from those for paved roads.
Monitoring and Evaluation

The OED report showed that many rural road programs in the past were unable to demonstrate to what extent objectives and targets had been met, thus limiting accountability and opportunities for lesson learning. This problem arose partly because development objectives and expected benefits of rural road programs were only vaguely defined, and not expressed in terms of quantifiable indicators. While this note recommends the use of prioritization criteria which permit local participation in decision-making, this should not preclude a clear definition of the objectives of rural road programs, or the calculation of expected benefits according to the selected criteria. Where possible, economic benefits should be calculated using measures of vehicle operating costs or producers’ surplus. Where these are not feasible or appropriate, benefits could be reflected by changes in such indicators as:

- number of people served by trafficable roads
- travel time to a major center
- local cost of a defined list of goods
- frequency of visit by health or other services to local communities
- number of people with access to electricity and telephone services
- days per year with vehicle access

Past monitoring problems are also partly due to the difficulty of maintaining reliable data on rural road condition, traffic, and serviceability. As there are few examples of successful monitoring and evaluation, some experimentation may be required to find feasible and sustainable monitoring methods which match local capabilities and provide meaningful indicators of road service level and availability throughout the year. Incentives for monitoring may need to be strengthened in project design and annual reviews, and independent audits should be considered to verify reports on a sample basis.

AUDITING RURAL ROAD EXPENDITURES AND OUTPUTS
Kenya

International donor agencies have supported Rural Access Roads and Minor Roads Programs in Kenya for almost 20 years. Since 1991, donors have established a joint, program-wide independent audit system for evaluating the efficiency, accountability and value for money of these programs. The annual financial and technical audit has been carried out by Price Waterhouse Kenya using a local engineering subcontractor. Apart from confirming effective spending and deterring misuse, the audits have highlighted specific financial and technical practices which could be improved, and have followed up on the implementation of corrective measures. At a cost of around 2 percent of the works program, the audits are considered by donors and the government to be highly successful.

Where post-project evaluations or Project Completion Reports (PCRs) are produced, they should present empirical evidence of road service quality for the time between works completion and reporting, accompanied by a description of how service quality was determined and what the possible margin of error could be. Claims about project benefits and economic rates of return should be tested against the reliability and comprehensiveness of underlying monitoring data. If road quality could not be established satisfactorily, this should be highlighted in the road performance evaluation. Assessment of rural road maintenance capacities upon project
completion may allow insights into prospects for future rural road maintenance, but it is no substitute for measuring road service quality. What really counts for rural economies and beneficiaries is not the potential for rural road maintenance, but actual conditions of roads.

**SUSTAINABLE RURAL ROAD MAINTENANCE - CHECKLIST**

1. **Rural Road Strategy**
   - involve all relevant agencies and organizations
   - clarify ownership and responsibilities
   - identify focal institution for policy coordination & local assistance
   - define level of funding and construction/maintenance balance
   - assess capacity to fund, manage and supervise maintenance
   - prepare plans for maintenance capacity building

2. Define "core network" of roads to be maintained by road agencies and local government, and encourage community efforts to maintain non-core roads.

3. First priority: maintain those roads which are functionally important and currently in reasonably good condition.

4. Incorporate routine and periodic maintenance as a specific component with measurable outputs. Separate provision for emergency maintenance works.

5. Involve local representatives in priority setting, aided by technical data and expert advice on constraints, benefits and cost-effectiveness of alternatives.

6. Evaluate projects in the context of all rural road spending for the district or region.

7. Select appropriate design standards, specifications and rural road performance targets according to budget constraints. Emphasize function (reliability and durability) over fixed standards of width and speed.

8. Consider innovative methods to build capacity for effective maintenance, and utilize labor-based methods, small contractors and local equipment as much as possible.

9. Identify monitorable indicators of road service, and consider independent audits.

10. Ensure full road sector participation in rural road projects initiated by agriculture and rural development agencies.

**Rural Road Components in Non-Transport Projects**

In both studies, problems of excessive construction standards and inadequate attention to maintenance were particularly acute in rural road components of agriculture or rural development projects. It is strongly recommended that such projects should not proceed without:

- Development of an overall rural road strategy involving roads and local government ministries, and defining capability and responsibility for future maintenance
Involvement of transport professionals in project design and implementation as outlined in this note.

Specifically, rural roads components of non-transport projects should adopt:

- Screening and evaluation criteria which are used for comparable road sector projects.
- Design standards, work specifications and procurement procedures developed in consultation with road agencies.

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