

Policy Foundation for Good Roads in Sub-Saharan Africa

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A well-maintained road network is of paramount importance to the development of sub-Saharan Africa. Practically 90 percent of land commerce is dependent on roads. Significant achievements have been made in expanding the road networks across the continent. But, building the infrastructure of institutions and trained manpower to maintain them has proven difficult. Ineffective maintenance has led to widespread and accelerating road deterioration—amplified in recent years because the large number of roads built in the 1960s and 1970s have reached the end of their useful lives and need rehabilitation or reconstruction. The road maintenance and rehabilitation problem has been exacerbated—as are almost all the region's problems—by the current economic difficulties in sub-Saharan Africa. Roads, however, are so much an engine of growth that making economically justified expenditures to ensure their continued serviceability deserves priority attention in government spending. There has been a growing realization that road building and road maintenance are not in balance. Policies that favored construction over maintenance clearly have to be changed in favor of approaches that look at road expenditures as a whole within a policy framework that enhances transport availability at minimum overall social cost—to government road agencies, and, more important, to road users. The state of road networks in sub-Saharan Africa is reviewed and a classification of countries relative to future road development policies is proposed on the basis of road conditions and past experience with road maintenance. Three critical policy issues are identified in terms of achieving well-maintained and serviceable road networks in sub-Saharan Africa: (a) a national commitment to adequate and reliable financing and budgeting for roads, (b) accountability in the use of public funds for roads in terms of tangible physical performance, and (c) institutional reform and provision of incentive mechanisms to improve efficiency. These policy issues are amplified and recommendations on appropriate funding, planning and programming mechanisms, improved management of road maintenance operations, and institutional reform and development of human resources are provided.

The sub-Saharan Africa road networks (excluding roads in the Republic of South Africa) have an aggregate length of over 1 million km, with about 110,000 km of paved roads. These networks have a low spatial density (about 5 km per 100 km² of land area compared with 10 to 30 km per 100 km² in Latin America and Asia) and over 95 percent of the road system consists of low-volume roads, i.e., with an average daily traffic (ADT) of less than 400. Between 1971 and 1987, the total length of the road networks in sub-Saharan Africa increased by over 200 000 km, with the paved roads increasing by over 55 000 km (Table 1). But, creating the necessary infrastructure of institutions and trained manpower to main-

tain these networks has proven difficult. Ineffective maintenance consequently has led to widespread and accelerating road deterioration. Two main factors have amplified this problem. The pace of road building peaked in the early 1960s and 1970s, creating thousands of kilometers of highways that are now reaching the end of their design life at the same time. The turndown in regional economic growth has meant that this bulge in the need for road rehabilitation and replacement has coincided with a severe cutback in the financial resources needed for the task (1).

THE ECONOMIC BACKGROUND

The plight of roads in sub-Saharan Africa, however, is not independent of the general economic situation in the region. The sub-Saharan countries are confronted with negative economic growth, declining agricultural production, and a heavy burden of external debt. In most countries, gross domestic product (GDP) and income per capita have been stagnating or declining for more than a decade. In 1987 alone, real GDP per capita declined 4.7 percent, whereas population growth continued at a rate that adds 20 million people each year. The net flow of capital to the region declined from an average of U.S. \$14.0 billion a year during the period 1980 to 1982 to U.S. \$8.5 billion a year during the period 1984 to 1986. Total external indebtedness now exceeds U.S. \$100 billion and debt service, even after rescheduling, consumes about 30 percent of export earnings. Per capita investment in real terms declined by half during 1980 to 1987, while imports, in constant dollars, fell by 35 percent. As a result of all these factors, the average African is poorer today than in 1970. This situation is clearly unacceptable and hard policy choices must be made by African governments to reverse the trend.

The transport sector—particularly roads—is a critical element in the strategy to increase agricultural production and incomes in sub-Saharan Africa. There are telling examples where transport bottlenecks have put the brakes on growth, especially in agricultural production. The overarching objectives for transport policy can be captured in two words: efficiency (and thus lower costs) and sustainability. Nowhere are policy reforms more needed than in the roads sector. If farmers and manufacturers are to take advantage of overall reform initiatives they must have a dependable road system. Without efficient transport—and in sub-Saharan Africa transport means, more than anything else, roads—there can be no supply response to support renewed economic growth and sustainable development.

TABLE 1 EVOLUTION OF SUB-SAHARAN ROAD NETWORKS^a

	1971 (km)		1987 (km)	
	Total Road Network	Paved Network	Total Road Network	Paved Network
Eastern and Southern Africa	367,800	22,400	503,000	42,400
Western Africa	341,300	30,700	430,900	67,000
Sub-Saharan Africa	719,100	53,100	933,900	109,400

a/ Excluding Angola, Comoros, Djibouti, Mozambique, Namibia, and Zimbabwe for which 1971 data were not available. Also excluded is the road system of the Republic of South Africa.

TABLE 2 ROAD CONDITIONS IN SUB-SAHARAN AFRICA^a

	Percent Good		Percent Fair		Percent Poor	
	1984	1988	1984	1988	1984	1988
Eastern and Southern Africa						
Paved Roads	42	50	32	33	26	17
Unpaved Roads	42	28	30	30	28	42
Western Africa						
Paved Roads	52	54	23	17	25	29
Unpaved Roads	20	19	36	34	44	47
Sub-Saharan Africa						
Paved Roads	47	52	27	25	26	23
Unpaved Roads	33	29	32	32	35	39

a/ Excluding the road networks of Angola, Cape Verde, and the Republic of South Africa.

THE STATE OF ROADS IN SUB-SAHARAN AFRICA

In the immediate post-colonial era, many sub-Saharan countries gave priority to road construction in their development programs; maintenance and creation of effective road administrations, however, received little attention. Foreign donors recognized the priority of road transport in the new nations and gave large amounts for road development. But they offered much less to create the institutional and financial resources needed to protect these investments. The result was a burden of road maintenance that increased much more quickly than the ability to carry it. Other factors have accentuated the problems. The rapid buildup of road networks has resulted in networks with a skewed age distribution, which concentrates major maintenance and strengthening requirements in cyclical periods, periodically requiring a several-fold increase in maintenance outlays, which are often beyond the financial capacity of most sub-Saharan countries.

An assessment of main road conditions on the basis of limited data available for 41 countries shows that in 1988

nearly one-quarter of paved roads were in poor condition and a further quarter in fair condition. The situation is even more serious for unpaved main roads, of which nearly 40 percent were in poor condition and an additional 33 percent were in fair condition. Roads in fair condition are assumed to require rehabilitation involving surface treatment or overlay (paved roads) and regravelling (unpaved roads), with selective repair. Roads in poor condition are assumed to require reconstruction. A subregional breakdown is presented in Table 2, based on country-specific network information assembled and reported by Mason and Thriscutt (2). The indications are that in spite of great efforts made by governments and aid donors, it has only been possible to barely stabilize the situation. Although there has been improvement in the condition of paved roads, particularly in Eastern and Southern Africa, the condition of unpaved networks worsened over the period 1984 to 1988.

Routine and preventive maintenance based on careful monitoring of traffic loads and pavement conditions can protect and prolong the life of important national investments in roads. A comparison of costs for preventive maintenance and reha-

TABLE 3 DISTRIBUTION OF ROAD EXPENDITURES:
CONSTRUCTION VERSUS MAINTENANCE FOR 19 SUB-
SAHARAN COUNTRIES

	Percent Distribution of Road Expenditures	
	1981-82	1986-88
New Construction/Improvements	66%	58%
Reconstruction and Rehabilitation	13%	17%
Resurfacing and Routine Maintenance	20%	25%

bilitation illustrates the point. Routine maintenance can be done for a cost of U.S. \$300 to \$1,500 per kilometer per year and periodic maintenance every 3 to 12 years for about U.S. \$25,000. When maintenance is neglected, the eventual cost of rehabilitation or restoration is about U.S. \$30,000 per km for unpaved roads and U.S. \$200,000 per km for paved roads. These amounts represent a 2.5- to 8-fold increase in expenditures. Also, failing to redirect spending to maintenance, 3 to 4 km of potentially good roads are lost for every kilometer of new construction.

The economic consequences of neglecting maintenance are primarily borne by road users in the form of increased vehicle operating costs (VOCs). For example, the difference between a good road and a poor one may lead to increases in VOCs of 20 to 40 percent—an amount that is from 3 to 10 times the cost of the road itself. Thus, a dollar reduction in road maintenance expenditures can result in an increase of U.S. \$2 to \$3 in VOCs with a high proportion of these cost requiring foreign exchange for spare parts, tires, and replacement vehicles. In reality then, reducing expenditures on road maintenance will not serve the intended purpose of releasing resources for higher priority sectors. Spending a dollar less for road maintenance will perhaps release a dollar for higher priority expenditures such as on education or health in the public sector, but road users, mostly in the private sector, will have two or three dollars less to spend on essential private consumption. Thus insufficient spending on roads and their maintenance exacts hidden costs several times the expenditures on roads.

The governments of the region could save some U.S. \$1.2 billion (of which perhaps U.S. \$900 million is in foreign exchange) in road expenditures a year, nearly 0.85 percent of regional GNP, through well-targeted preventive maintenance programs. Another U.S. \$1.2 billion would accrue as benefits to road users through reduced wear and tear on vehicles as a result of improved road conditions. These figures do not account for the costs imposed on agriculture and industry by increased transport costs, lengthened travel times, or the delayed pace of development. About U.S. \$1.2 billion is needed annually over the next decade to rectify the past neglect of road maintenance and restore all priority roads to good condition. These financial requirements are based on detailed estimates prepared by Mason and Thriscutt (2), and account for restoring and maintaining only the high-priority road network in sub-Saharan countries.

The bias towards new investments is still evident in the road expenditures of sub-Saharan countries, although there has been a discernable shift from new construction to rehabilitation and maintenance during the 1980s, as presented in

Table 3 (3). A number of countries, mainly in Western Africa (Benin, Ghana, Nigeria, and Togo), have belatedly recognized the need to increase allocations for maintenance and rehabilitation.

As shown in Figure 1, countries in sub-Saharan Africa can be placed in four groups, based on their records of road condition and on past experience of their maintenance performance (1).

- Group 1: Botswana, Cote d'Ivoire, Djibouti, Malawi, Niger, and Zimbabwe. These countries have demonstrated a substantial commitment to maintenance, and have the ability to implement their road programs, and raise or attract adequate resources for the highway sector. These countries should have little difficulty in restoring—or preserving their roads in good condition, in some cases, as soon as 1995. They have already shown their ability and willingness to put sufficient resources into road maintenance; continuation of the same policies, sometimes with additional external funding, will be needed.

- Group 2: Benin, Burundi, Central African Republic, Ethiopia, Lesotho, Mali, Madagascar, Mauritius, Rwanda, Swaziland, and Togo. These countries have shown a growing commitment to road maintenance but have yet to build up adequate capacity for implementation. Efforts to improve maintenance look promising, and sufficient resources to undertake the needed maintenance could probably be obtained if spending priorities were adjusted accordingly. These countries should be able to restore their roads to good condition by the end of the century if they can strengthen their commitment to improved maintenance even though considerable technical and financial assistance will be needed in some cases.

- Group 3: Cameroon, Congo, Gabon, Kenya, Nigeria, and Senegal. These countries paid insufficient attention to road maintenance in the past, despite having the capacity and financial resources to contain deterioration of their roads. These countries have the capacity to restore their roads by the year 2000, and could raise the finance required, but they will not achieve that target unless there is a significant change in the priority accorded to road maintenance.

- Group 4: Angola, Burkina Faso, Chad, Equatorial Guinea, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mauritania, Mozambique, Sierra Leone, Somalia, Sudan, Tanzania, Uganda, Zaire, and Zambia. These countries have experienced severe problems in building up institutional capacity and attracting funds for road maintenance. Some of their networks are severely deteriorated, and substantial amount of rehabilitation will be required. These countries will probably not be able to restore their networks to good condition

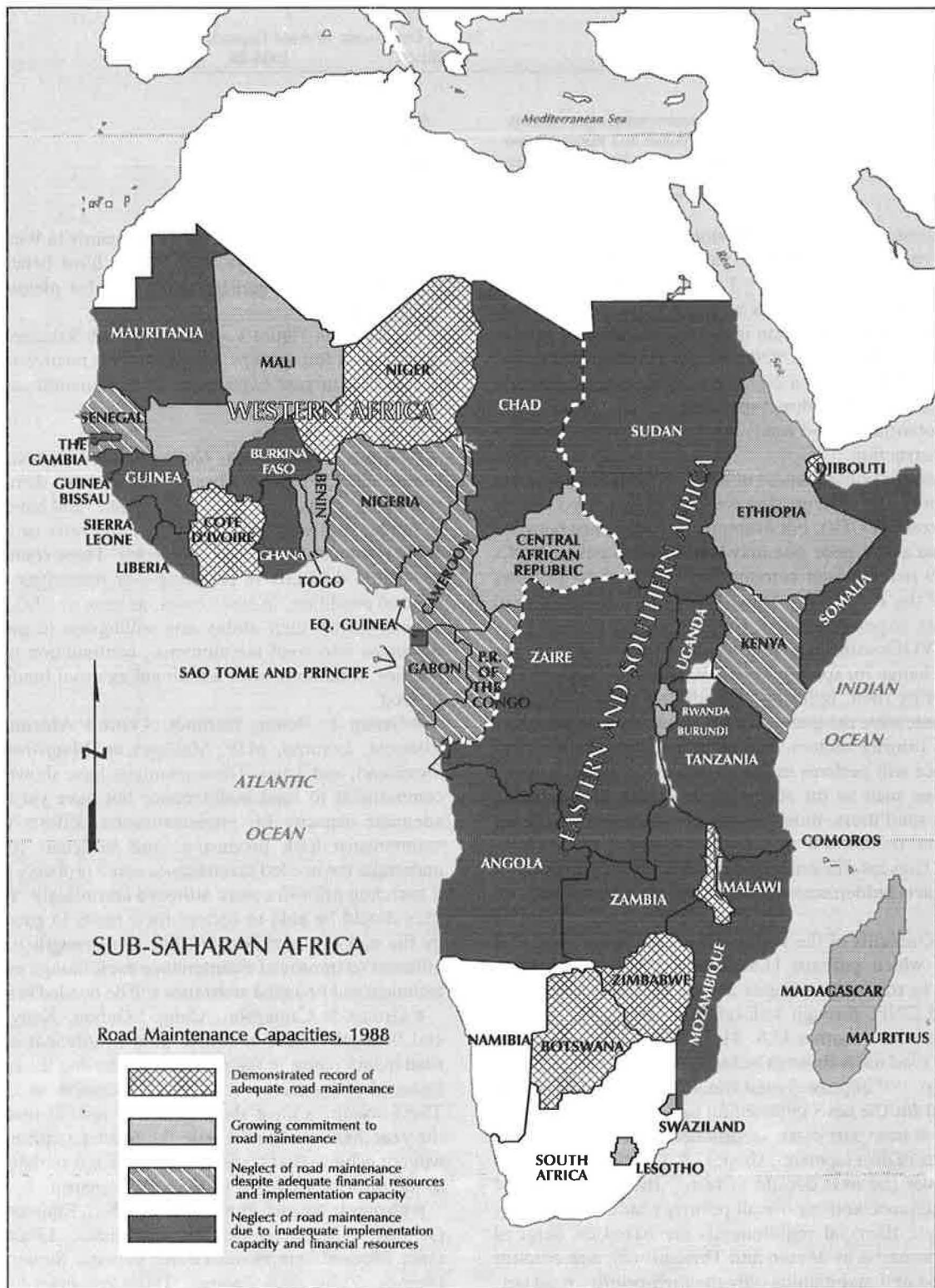


FIGURE 1 Classification of sub-Saharan African countries according to road maintenance capacity.

by the year 2000 because of their economic condition and the size of the backlog of maintenance and rehabilitation. They will have to take difficult decisions concerning priorities of rehabilitation and maintenance that will best serve their short- and medium-term needs, including concentration of maintenance effort on a core road network.

A review of road expenditures in sub-Saharan Africa countries show that some 60 percent (Groups 1, 2, and 3) have been spending (at least over short periods) about 1 percent of their gross national product (GNP), which is enough to restore and fully maintain all their essential roads. In these countries, a redirection of effort away from new works to better maintenance will be essential to avoid road failures on a large scale.

For the remaining 40 percent of countries (Group 4), even stopping all new works until the year 2000 would still require higher levels of road financing than they have previously had. Whether these countries can plan for and manage larger amounts—and whether the donors are prepared to provide extra aid—will depend on the organization and efficiency of their roads administrations.

To summarize, the maintenance and restoration of sub-Saharan Africa's essential road networks would cost about U.S. \$1.2 billion a year over the next decade. This is a large amount of money, but it offers potential national annual savings of twice that magnitude; thus, for every dollar spent on maintenance, governments would save one dollar by avoiding reconstruction costs, and road users would save another dollar in reduced wear and tear on their vehicles. In addition, by carrying out this program of restoration, by the year 2000, most of the essential network would be in serviceable condition, whereas if current trends continue, most of it will have to be rebuilt at high cost.

KEY POLICY ISSUES IN ROAD MAINTENANCE

Past policies that have favored construction over maintenance must be changed in favor of approaches that look at road expenditures as a whole within a policy framework that enhances transport availability at minimum overall social cost—to government road agencies, and, more important, to the road users. The requirements for improved maintenance in sub-Saharan Africa can be disaggregated into three critical issues.

The first issue is a national commitment to maintain a serviceable roads system. A critical requirement is a broader financing and budgeting perspective that sees road building, maintenance, and rehabilitation as a unified process within a multiyear perspective. This perspective recognizes it is not enough to allocate funds for roads—that a real commitment includes dependable flow of funds to allow roads departments to effectively plan and implement their programs.

A second issue is accountability. In the absence of public pressure and lacking a clear understanding of the seriousness of the problem, few governments have given road maintenance a high priority in their budgets. The urgency of the situation has not always been fully appreciated by all donors and lending agencies, some having been readier to provide funds for new construction than for maintenance and restoration. New construction has sharp political visibility, main-

tenance little glamour. Inadequate maintenance in developing countries has various causes, but institutional failure is the only explanation for its wide extent. At the heart of this failure is the absence of public accountability (4).

Accountability should also be turned outward towards the road users who are most immediately and directly affected by road conditions. It is the users, rather than maintenance organizations themselves who bear the immediate costs of poor roads. There is a vast public constituency in Africa for good roads; it should be encouraged to organize as a monitor of national road systems and an advocate for their improvement.

The third major issue is the need to adapt, improve, and reform institutions so they have both the mechanisms and the incentives to increase their efficiency. The staff and managers of those institutions will need new skills to carry out these tasks; development of human resources must go hand-in-hand with the development of sector institutions.

AN AGENDA FOR POLICY REFORM

The main policy objective is to identify possible actions to improve maintenance in the face of funding and organizational constraints. A repetition of past trends will result in poorly serviceable road networks with all the attendant costs and constraints on economic development. To restore the entire network would be beyond the ability of most countries, and may not always be the best use of resources, given the needs in other sectors. Governments will need to show a strong commitment to better road maintenance by putting in place the policy and institutional changes necessary for improved maintenance—in particular the revision of road budget allocations in favor of maintenance and rehabilitation; and restoration of the essential road network to good condition by the year 2000. Policy reforms aimed at improved road maintenance fall into three broad categories: (a) funding, planning, and programming; (b) operation and management; and (c) institutional reform and human resource development.

Funding, Planning, and Programming

The reason most often given for low standards of road maintenance is that there is not enough money, but this is only true for about half the sub-Saharan African countries. In the others, past expenditures on road maintenance and construction could have financed maintenance and road rehabilitation adequately. In some countries, although budgeted funds are adequate, they are not released promptly. As a result, work has to stop, sometimes for several months. This is one reason why budget allocations are underspent although the need and means for incurring expenditure may both exist.

The three areas basic to improving funding, planning and programming for more effective road maintenance are (3,5) as follows:

1. Developing a unified framework for planning and programming public road expenditures over the entire network, whether recurrent, capital, or aid-financed, in particular by programming maintenance on the basis of monitored road conditions and measurable physical outputs;

2. Funding and budgeting procedures that ensure the funds are available as and when required, and that they respond to changing circumstances; and
3. Financial and technical audits to foster accountability.

Unified Planning and Programming

The goals of roads departments must be set in terms of well-articulated outputs. Planning, programming, and budgeting should focus on improving roads in terms of precisely defined and rigorously monitored physical conditions. This process can only be achieved if there is in place an information system that tells planners both the state of the roads system and the results of previous maintenance interventions and expenditures. Successful experience with road management systems in Ethiopia, Ivory Coast, Malawi, Niger, and Zimbabwe suggests that most sub-Saharan countries can muster the resources and skills to install basic information systems to meet their road management requirements.

The first step toward producing a credible roads program, that can win the commitment of governments, transport customers, and foreign donors, is an assessment of all road expenditures—whether capital, current, locally funded or aid-financed—under a unified programming and budgeting framework. In almost all countries, such exercises will demonstrate that road maintenance and reconstruction have economic returns several times that of almost all new construction. In addition, output-based programming provides a basis for monitoring and auditing performance besides allowing the establishment of objectives to guide road agencies in their operations.

As indicated earlier, road expenditure options cannot be competently assessed unless a management information system is regularly providing the roads authority information on road conditions, traffic, and costs for rational decision making. One of the most useful features of such systems is that if funds are insufficient to finance an adequate level of maintenance, a revised program can be drawn up that will limit road deterioration and user cost increases to a minimum within the funds available. At the same time, the total system costs in terms of future road rehabilitation and increased user costs can be estimated, so that the government is made aware of the consequences of underfunding maintenance.

Funding

Maintaining a road network requires that resource flows be regular and dependable as well as adequate in amount. In the past, the expansion of sub-Saharan road networks, often supported by international aid, has not taken sufficient account of this. Improvements in collecting, allocating, and using funds are obvious measures, but even then regular funds for road maintenance may not be assured because of programming and bureaucratic inefficiencies.

Earmarking road user taxes, such as fuel taxes and tolls, with payments made directly to the account of the roads organization rather than through the treasury or finance ministry, is one way of increasing dependability. Alternatively, a special roads fund may be created into which some or all road user

charges and tolls are placed. Either of these mechanisms gives the roads organization some long-term assurance that funds will be reliably available. Thus, a multiyear road rehabilitation and maintenance program can be planned, if necessary with donor cooperation, with the knowledge that funding is secure (5). A number of sub-Saharan countries such as Ghana and the Central African Republic have successfully implemented special road funds targetted at improving road maintenance.

If sufficient resources to maintain the national road network cannot be mobilized, a country may have only two options—each of them only a poor second best: continued deterioration of the entire road system, or a reduction of its network to a size that is affordable. To avoid deterioration of the whole network, when funding is uncertain in spite of all efforts, the best remaining choice may be to plan a core maintenance program that preserves essential roads in the best way possible under the given economic conditions.

Performance Audits

Independent financial audits, operating free of ministerial control, and responsible only to the legislature or the chief executive, are accepted parts of most governments. Financial audits, however, normally check only that funds have been spent for the purposes intended as specified in the budget. There is no check that value has been obtained for the funds expended. The concept of productivity and quality of output is not part of the financial audit's brief, unless the faults are glaring. A technical audit, on the other hand, is concerned that the design of works is correct, that the materials used were appropriate, and that work was done according to accepted standards. Obviously, it is convenient and desirable that financial and technical audits are integrated in a unified performance audit. A technical audit should also be free of administrative control. This means that it should have its own facilities, or at least its own independent staff who may use the road authority's laboratories and equipment. Although the road organization may take the lead in setting up a technical audit, the agreement of other ministries and legislature may be needed (3). Although few developing countries have implemented performance audits to monitor road development and maintenance works, such controls are common in education and railway organizations.

For a technical audit to be effective, technical specifications are necessary, just as financial audit requires government financial regulations. It is desirable for many reasons, apart from audit, to work towards common specifications for all government work. As the roads organization is usually the most active construction ministry, it is appropriate for it to take the lead in suggesting uniform contracts and specifications.

Operations and Management

Effective and efficient management of operations is crucial to addressing sub-Saharan Africa's road deterioration problem. More effective management that produces demonstrable improvements in both the condition of roads and the efficient use of resources is also a key to creating the political com-

mitment necessary to increase attention to—and funding for—maintenance. It can also be a powerful tool for saving money, particularly foreign exchange.

Most road maintenance operations in sub-Saharan Africa are run by large establishments operating by force account with geographically widespread operations that rely heavily on equipment. Maintenance operations planning and execution often overlap, and information systems are not adequate for management to track the quantity and quality of performance or assess and prioritize needs. Maintenance managers have also been overburdened by the need to keep up huge—and often incompatible—equipment fleets and supervise large and far-flung work forces. Improving information flows and streamlining management tasks are perhaps the two key factors in improving management efficiency.

The key policy recommendations covering operations and management are the following:

1. Increasing accountability by separating planning and monitoring functions from works execution,
2. Adapting the size of the mechanical equipment fleet to reflect maintenance needs and increasing the efficiency of equipment use by relying on private vendors for equipment maintenance and servicing,
3. Spinning off management burdens through increased use of contractors, and
4. Adopting appropriate technology and using local resources for self-reliance and sustainability.

Accountability

As discussed earlier, several steps can be taken to improve accountability in road maintenance operations. One is structural—separating monitoring and planning from execution can strengthen both functions. The rationale for such a separation is similar to that commonly found on the financial side of almost all government operations—those who carry out tasks seldom have the time, the training, or the objectivity to judge either financial or operational performance (4). Although separation of operations from planning and monitoring can take many forms, a common approach is to recast the organizational structures to concentrate on supervision and monitoring while spinning operational functions off to contractors.

Efficiency of Equipment Use

Most countries will benefit from reducing and consolidating their equipment fleets to a size and composition they can manage efficiently within the capabilities of available staff, funding, and support services. A smaller fleet with higher availability and utilization rates will save money while increasing productivity and reducing unit costs and management overhead. Equipment maintenance itself can often be consolidated by creating equipment pools as separate single-purpose and self-accounting management units from which the roads authority can hire plant (6).

Outside firms can also be used to reduce a roads authority's equipment maintenance burden. Plant and equipment can be

hired from private sources, or private firms can be contracted to maintain equipment. In countries in which the private sector is not yet capable of entirely taking over such tasks, this process can be combined with pooling some plant maintenance within the roads authority. This combination can have an added advantage of creating a business environment in which the private and public sector compete to foster efficiency.

Private firms may require strengthening to play an expanded role in contracting and equipment maintenance, and governments may well find it economical to provide training in the requisite skills to build up their capability. Standardization of equipment should also be sought for, at least, the road authority's fleet. Many countries need to institute firm policies and the discipline to maintain fleets of standardized equipment. Aid donors should assist in this effort by coordinating their support to individual countries to aid standardization and by providing foreign exchange for spare parts. Streamlining national procurement and supply regulations can also enhance equipment management efficiency.

Use of Contractors

If local contractors can be mobilized to undertake road works, their use can increase efficiency and reduce costs. Market and competitive forces tend to act more strongly on private firms—especially small ones—than on public sector agencies. Their objectives are usually simple survival and profit and are not clouded by political considerations, and their relatively small size increases their flexibility. These factors motivate them strongly to use staff efficiently and maximize the use of labor rather than capital equipment to conserve resources.

Stable markets and supportive policies are among the most important factors in encouraging development of local contracting industries. If contracting firms know they can expect work to be regularly available, they can invest in equipment and manpower that will strengthen their capabilities. Governments should consider offering training programs to private contractors to increase the skills pool.

Reviewing and, in many cases, simplifying contract management procedures such as contract documents and specifications can encourage firms to enter the market, as can improvements in the timeliness and reliability of payment procedures. Increasing use of private firms will increase the contracting authority's supervision and quality control responsibilities (7).

Appropriate Technology and Local Resource Use

Although road maintenance techniques and organizations in most regional countries have been geared to equipment-intensive techniques derived from construction and maintenance practices in developed countries, constraints on resources and the availability of under-employed or unemployed labor will often make the adoption of labor-intensive maintenance techniques economic.

Where labor is available and can be monitored at daily wage rates of up to U.S. \$4.00, contractor or community- or village-based maintenance crews can provide effective low-cost road

repair and maintenance. Considerable political commitment to using local resources such as labor exists in most countries, but this needs to be translated into practical administrative and technical programs. In most cases, it is necessary to phase such programs in through pilot projects of 2 years or more. Decentralizing the supervisory, administrative, contracting, and payment authority required for increased use of labor-based techniques can often increase the efficiency of such operations. This improvement should be accompanied by staff training, and the setting of standards for labor-intensive road works (tools, equipment, and road materials). The availability of local materials—such as timber for bridge-building—can enable significant foreign exchange savings. There is also much scope for adapting design standards to maintenance operations to take advantage of local capabilities and local materials, thus saving foreign resource inputs.

Institutional Reform and Human Resources Development

Institutional and human resources development has been one of the most difficult areas in which to make permanent improvements. Establishing self-sustaining institutions that can manage road maintenance efficiently or use external resources effectively has been difficult. Institutional problems with road maintenance arise because of the inherent managerial complexity, and the geographical dispersion of maintenance operations that require a territorial organization. Institutional progress has been slow despite training and institutional development programs of long standing.

Road maintenance has been only one of many claimants on the region's overstressed education and training facilities. Specialized personnel remain in woefully short supply. It is generally agreed that a minimum of about 30 graduate level engineers and scientists per 10,000 people are needed to service a modern economy. In most sub-Saharan African countries, the actual proportion is less than one-third of this number.

There are many issues, but they may be summed up under two main heading:

1. Institutional reform to increase the efficiency of road maintenance and rehabilitation, and
2. Better management of human resources through motivation, adequate incentives, and efforts to develop a stronger and more competent workforce.

The build-up of a competent core of managerial and technical manpower that can perform effectively in support of institutional objectives is essential. There are two main approaches:

- Create a personnel unit within the road organization to strengthen its capacity for manpower planning, recruitment, training needs analysis, organization of training, management of promotion and career development schemes, and administration of compensation and benefits; and
- Strengthen the ability of line managers to utilize, supervise, motivate, and develop their staff effectively.

To administer these functions effectively, line management in particular will need to acquire management skills such as how to set objectives, allocate work, delegate and follow up, set standards, establish accountability, and provide subordinates needed on-the-job training, recognition, and feedback. The two sets of responsibilities (personnel and line management) should be integrated into a single long-term manpower development and retention program. To effectively implement such a program, roads agencies should introduce changes in hiring, promotion, and termination practices to strengthen motivation, retention of talent, accountability, and performance.

When free to operate semiautonomously (but not only in such cases), the road agency can hire only those people that it actually requires to do its job. It will not become financially overburdened with staff on the payroll that it does not really need. Cuts of unnecessary staff can free money for operations, supplies, and equipment and can improve effectiveness and efficiency in the use of remaining staff. This process enhances the motivation and retention of competent people. Staff can be better managed and utilized because funds become available to secure the equipment and supplies necessary for them to do their jobs. Because staff obtain the means to carry out their responsibilities, they also tend to become more motivated. Agency semiautonomy from the civil service can also allow management to promote staff on the basis of merit and accomplishments rather than just seniority. Staff that do not perform can also be more easily removed from the payroll. This kind of management of human resources in terms of hiring and firing and career advancement is an important tool for increasing the internal accountability and motivation of an organization.

Another approach to improve staff performance is through an organization's compensation and benefits system. A semi-autonomous agency has more flexibility to pay people at the level required to retain the kind of talent it needs, in competition with the private sector. Even without autonomy, a road agency can institute innovative compensation schemes such as pay directly linked to quantities and quality of outputs and results produced (8).

Effective manpower utilization also requires a good system of position descriptions, management by objectives, appropriate workload allocations, and effective staff supervision. These are basic personnel and work management tools. Good utilization of manpower requires appropriate workload and responsibility allocations within units and within the organization. Within a unit, this is the unit line manager's responsibility. Within the organization, any need for overall organizational restructuring should be identified and addressed by general management.

It is also important for an agency to identify training needs, and develop mechanisms to deliver the required training in essential and specific job-related skills. For training and other developmental actions to be effective, they need to take place in a context of improved manpower management and utilization. It is important to remember that if manpower management and utilization are not operative, staff that receive training and are not effectively utilized might opt to leave the organization. If they stay, they may tend to stagnate and not develop in ways that are practical and useful for the organization.

When strong manpower management and utilization are in place, in-service training schemes make an indispensable contribution to staff development. In addition to the educational qualifications and experience that staff bring to the job, they also need to develop additional job-related specific skills and specializations. Careful training needs analyses should be conducted to determine precisely what knowledge and skills are needed by each category of staff. Arrangements should be made for the delivery of suitable, applied, in-service courses targeted to the most essential technical, professional, and managerial topics. Needed courses or course modules can be arranged through external educational institutions or sector training centers; or, they can be developed and offered internally by an in-house training department. Specialized training opportunities in managerial and professional or technical areas related to road maintenance often do not exist in highway agencies in sub-Saharan countries. Therefore, special initiatives may be needed to make the necessary arrangements with an appropriate educational or training institution. In undertaking such initiatives, it is important to remember that this kind of training should not be academic. It should be practical, job-related, and focused on essential skills.

CONCLUSION

The principal policy issues affecting the long-standing and serious problem of inadequate road maintenance in sub-Saharan Africa have been addressed. The single most important factor for restoration of road networks over the next decade is to obtain government commitment to road maintenance. There have been many cases in which the lack of government support has meant the failure of maintenance programs, despite the availability of funds. Attempting to set up a functioning road maintenance system is unlike building a new road, which is normally handed over in a serviceable condition on project completion. In a road maintenance project, mainly an organization and a set of patterns of behavior (systems and procedures) are put in place, all of which can disappear within a short time if there is not the will and commitment to support them. Hence, external aid for road maintenance cannot achieve anything permanent if the governments of the countries concerned are not quite convinced of the need for better road maintenance.

The first step in achieving serviceable road networks in sub-Saharan Africa will be to mobilize public and government support for concentrating scarce resources on properly planned road maintenance, rather than new construction and improvement. When this philosophy takes hold, procedures need to be developed to decide which roads are most in need of early attention, which roads can be left for later rehabilitation, and which roads can be relegated to a minimal level of maintenance. While a suitable program is set up, the best way of executing the program must be decided, taking maximum advantage of the possibilities of contract maintenance and use

of increased incentives. Resource constraints in some countries and lack of interest in others mean that it is unlikely that more than a part of the backlog will be restored by the end of the century. Although some countries will be able to restore all priority roads, others will have considerable difficulty in keeping their present good and fair conditions roads in a reasonable state.

From the viewpoint of the aid agencies and their own resource constraints, it will be important that road maintenance aid is directed first to those countries that have shown commitment to better maintenance by reducing the proportion of roads expenditure spent on new works and setting up rational maintenance planning systems. It is, however, unlikely that roads aid to sub-Saharan Africa countries can be realigned completely into the necessary priority for maintenance in less than 3 years, given the scale of adjustment needed. If there is real commitment on the part of sub-Saharan Africa governments, aid donors in sub-Saharan Africa in general, and the World Bank in particular, should be planning for an increase of up to 50 percent in their financial assistance for roads in sub-Saharan Africa, with the great majority devoted to road maintenance and rehabilitation projects. The onus of reform, however, rests squarely with the sub-Saharan countries as donor assistance, and aid programs cannot substitute for vital and often difficult policy decisions needed to restore the essential road network to serviceable condition by the end of the century, and more important, to implement institutional reforms and procedural changes for cost-effective use of increasingly limited resources for the road sector.

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