

Chapter 10

Roads: Broadening the Agenda

African governments have been addressing the low density and poor condition of their road networks. Institutional reform since the mid-1990s has progressed well, with a remarkable consensus on the content. Most countries have second-generation road funds supported by fuel levies, and many others have autonomous road agencies. Specialist maintenance management agencies have been established, and new forms of contract-based maintenance are being introduced. Although important funding gaps remain, results are discernible. On average, 80 percent of the main road network is in good or fair condition, and the current value of the national road networks is at least 70 percent of their potential. The limited time series available also suggests that a number of countries have improved road conditions over time.

Despite this progress, the reform agenda is incomplete. In many cases, fuel levies have been set too low to be effective, and road funds and agencies do not always meet all good-practice design criteria. Modern contracting and contract management methods are far from universal. Furthermore, while policy makers' attention has focused on the institutions

and financial flows for the interurban roads, other challenges have surfaced that will require different types of solutions.

First, the reforms to the interurban road network have affected rural roads much less. Even though agriculture is viewed as an engine of growth, only one-third of rural inhabitants live within 2 kilometers of an all-season road. Doubling this percentage would be very costly, absorbing more than 1 percent of GDP a year for a decade. The rural environment presents particular institutional challenges for road maintenance.

Second, surface transportation is about more than good roads. Africa continues to be handicapped by very high road freight tariffs, driven primarily by high profit margins rather than high costs (or defective roads). In Central and West Africa particularly, trucking industry cartels and restrictive *tour de role* traffic allocation and dispatching practices are responsible for low vehicle mileage and poor fleet quality. The most urgent reforms are to liberalize trucking while mitigating associated social effects. Without such measures, further improvements in road quality will only translate into higher profit margins for the trucking industry.

Third, Africa's rapidly growing cities face major mobility problems. Urban road density is low by developing-country standards. Moreover, following the demise of large buses in many cities, myriad informal minibuss operators largely dominate urban transport services. Services are costly, and availability is inadequate. Few countries capture sufficient financial resources to develop and maintain the urban road network. Overlapping national, metropolitan, and municipal jurisdictions present serious institutional challenges. Furthermore, the cross-sectoral links between urban transport and land use planning are unexploited.

Road Infrastructure—Lagging Other Regions Somewhat

The region's trunk road network comprises strategic trading corridors linking deep-sea ports to economic hinterlands. These corridors, which carry about \$200 billion of trade a year, include no more than 10,000 kilometers of road. The concept of an intraregional trunk network, or Trans-African Highway, remains a distant reality because of missing links and poor maintenance on key segments. Between 60,000 and 100,000 kilometers of road are required to provide such intracontinental connectivity.

Africa's national road density is substantially lower than that in other developing regions: only 204 kilometers of road per 1,000 square kilometers of land area, with only one-quarter paved, compared with a world average of 944 kilometers per 1,000 square kilometers, with more than half paved. That density is less than 30 percent of the next-lowest region, South Asia. However, Sub-Saharan African road density in relation to population is slightly higher than South Asia's and only slightly lower than the Middle East's and North Africa's.

Relative to GDP, however, Sub-Saharan Africa has a large road network. In Madagascar, Malawi, Mozambique, and Niger, the asset value of the road network exceeds 30 percent of GDP, an indication of the consequently large economic burden of maintenance. As a result,

the road conditions lag somewhat behind those of other developing regions, but not so much for the main trunk road network as for other roads (Gwilliam and others 2008).

With accelerating urbanization, Africa needs to develop intraurban roads, but networks in 14 African cities were found to be substandard (Kumar and Barrett 2007). Road density (paved-road density in particular) lags far behind that in other developing cities. Capacity is generally limited. The majority of roads have one lane in each direction, and where roads are wider, pedestrians and parked vehicles often take up one lane. Intersections are close together and are ill designed for turning. Service lanes are absent, pavement is deteriorating, and street lighting is minimal. Because traffic management is limited, accidents are frequent, with pedestrians accounting for two-thirds of fatalities.

For rural roads, beyond the classified tertiary network, which is typically the responsibility of local government, a vast unclassified network of tracks providing service to rural areas is usually the responsibility of local communities. Nevertheless, African rural communities have by far the lowest accessibility to an all-season road in the developing world. Evidence indicates that physical isolation prevents large areas of the continent from reaching their agricultural potential. With low population density, achieving good overall rural accessibility would imply at least doubling the length of the classified network for most countries (Starkey and others 2002).

Traffic volumes remain low and heavily concentrated on the main road network (table 10.1). In most countries, at least 90 percent of reported traffic on the classified network is carried on the main networks.¹ Except in Nigeria and South Africa, the traffic on the main road network in Africa averages only about 500 vehicles a day.

Rural networks typically carry less than 10 percent of the classified network's traffic; however, in Ethiopia, Malawi, and Nigeria, they carry more than 20 percent. Except in Nigeria, the absolute volumes of traffic on the rural network are very low, averaging about 30 vehicles a day.

Table 10.1 Average Daily Traffic on the Main Road Network

Country type	Classified network	Classified network			Paved network	Unpaved network
		Primary	Secondary	Tertiary		
Low income	236	934	182	28	1,054	50
Lower middle income	341	1,186	303	39	1,474	95
Upper middle income	1,066	5,469	117	24	2,883	5

Source: Gwilliam and others 2008.

Road Infrastructure Institutions and Finance—Promising Developments

The initial thrust of institutional reform has been to create an independent source of funding for road maintenance, based on road user charges, segregated from the general government budget, and administered by an autonomous board.

Funding Arrangements

Donors have played a major role in promoting this institutional framework. Most countries already have such second-generation road funds, and most others, except Nigeria and South Africa, are establishing them. Not all funds have good-practice designs, however, and their performance varies substantially (figure 10.1).

Despite widespread application of fuel levies to fund road maintenance, the level of the fuel levy, hence its utility, varies enormously across countries. The range extends from symbolic levels of about \$0.03 a liter, nowhere near high enough, to about \$0.16 a liter, which covers most road maintenance needs. Many countries have major difficulties in collecting the levies, whether because of evasion (Tanzania) or delayed transfers of revenues (Rwanda), and capture perhaps as little as half the planned resources. Therefore, the road funds in Benin, Côte d'Ivoire, Ethiopia, Gabon, and Zambia still depend on budget allocations for more than three-quarters of their resources rather than being funded largely from fuel levies, as is the intention of road funds.

Toll roads affect barely 0.1 percent of the region's classified road network, almost entirely in South Africa. Toll-road concessions have

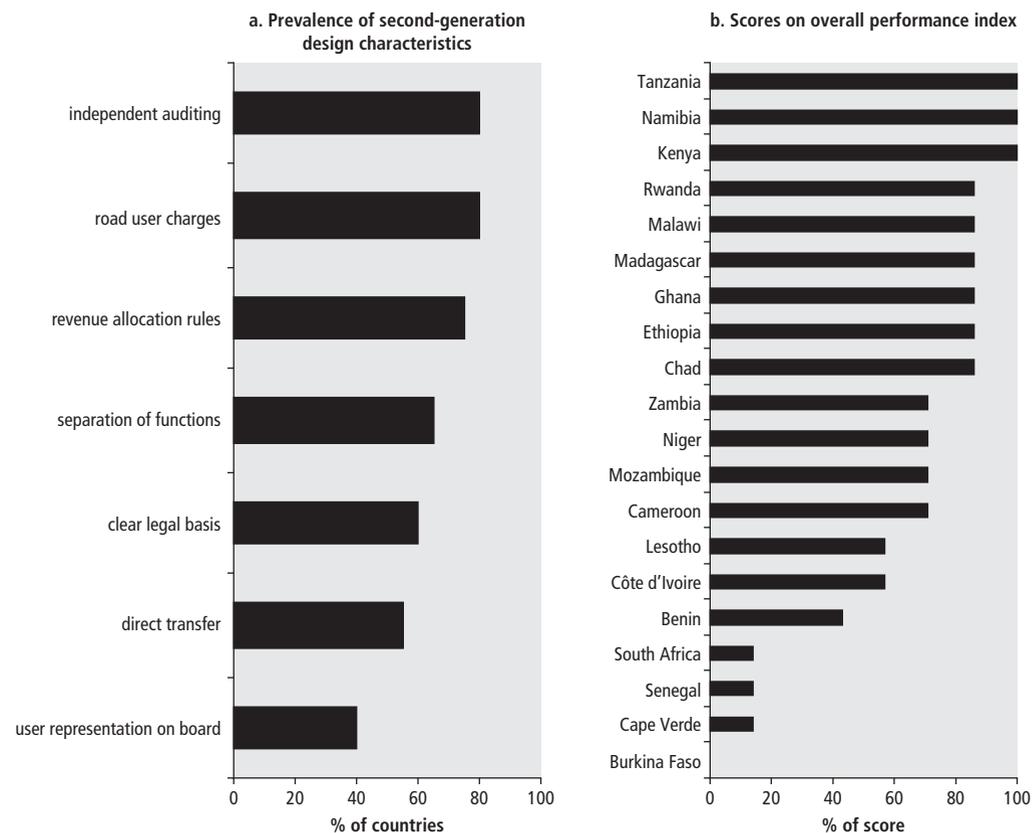
captured fewer than \$1.6 billion in investment commitments, small in relation to the region's needs. Less than 10 percent of the region's road network attracts the 15,000 vehicles a day that are the minimum traffic flow needed to make concessions economically viable. Toll roads have potential only in South Africa and to a lesser extent, in Nigeria.

Implementation Agencies

A second stage of reform has created road agencies, independent from line ministries, with responsibility for contracting out public works. About two-thirds of the 24 countries sampled have a road agency, and others are planning one, but only one-third of the agency boards have private representation. Nigeria, Senegal, and South Africa have a road agency but not a road fund. Autonomy varies from full responsibility for road network management to limited responsibility for road maintenance programs defined by the road department or ministry.

About half of the countries sampled contract out more than 80 percent of maintenance work. Some road agencies are adopting performance-based maintenance contracts, under which a private contractor maintains a public road to achieve and maintain specified condition standards for periods ranging from 3 to 10 years in return for a fixed payment stream. The advantages of such contracts are that they can provide a strong incentive for contractors to undertake effective maintenance, and they can reduce expenditure uncertainties for the road fund. The contracts started in Canada in the late 1980s, and industrialized countries have now adopted them. In developing countries, they were first applied in Argentina in mid-1990, but they rapidly spread

Figure 10.1 Progress with Road Fund Reforms



Source: Gwilliam and others 2008, based on data collected by World Bank 2007.

to neighboring countries so that more than 40,000 kilometers of Latin American roads are now being maintained under such contracts. In Africa, Ethiopia, Ghana, and Zambia have begun to use them.

Cost savings from performance-based maintenance contracts on paved roads have ranged between 10 and 40 percent in industrialized countries and between 10 and 20 percent for several developing countries (Stankevich, Qureshi, and Queiroz 2005). Even where such cost savings were not achieved, the benefits have been substantial. In Chad, the only example in francophone Africa, the cost per kilometer of routine maintenance under a performance-based maintenance contract for a set of gravel roads was significantly higher (\$5,000) than under a traditional maintenance contract (\$1,500) but with the benefit that the contractor was

responsible for maintaining a level of service linked to the condition of the road surface. Under a performance-based maintenance contract, the condition of the road improves steadily, whereas under the traditional approach, the road condition improves for a short period following the work and then starts deteriorating quickly until new maintenance is carried out.

A parallel institutional development, particularly relevant to rural roads, involves delegating project management to specialist agencies. In many countries, these agencies, *agences d'exécution des travaux d'intérêt public* (AGETIPs; public works implementing agency), now manage private consultants and contractors on behalf of the public authority and perform all the necessary functions for contract preparation, implementation, and supervision (box 10.1).

BOX 10.1**The Role of AGETIPs**

Delegating the function of managing the planning, procurement, and implementation of public works to a specialist private agency is well established in French public administration. In many African countries, an AGETIP was attractive to international financial institutions as a means of obtaining more effective implementation of donor-funded works, particularly in rural sectors, where administrative skills were weakest.

Following the creation of the first AGETIP in connection with a donor-financed sites and services project in Senegal in 1989, the greatly improved administration of public works and timely payment enable a substantial increase in the participation of small and medium-size enterprises in public works programs, often using labor-intensive techniques. Roads, particularly rural roads, are an important part of

their work. There are now 19 such agencies in 17 countries, mostly in francophone West Africa. The international association AFRICATIP (Association Africaine des Agences d'Exécution des Travaux d'Intérêt Public) develops and shares best practices among its members.

The agencies play three roles: (a) competent technical agencies using private sector recruitment and payment procedures, (b) managers of special funds, and (c) directors of the planning and programming of the investments of local authorities. They also provide technical manuals and contractor training. Although originally established to facilitate donor financing, they now handle mostly national funds and have become instruments for indigenous business development.

Source: Diou, Henry, and Demy 2007.

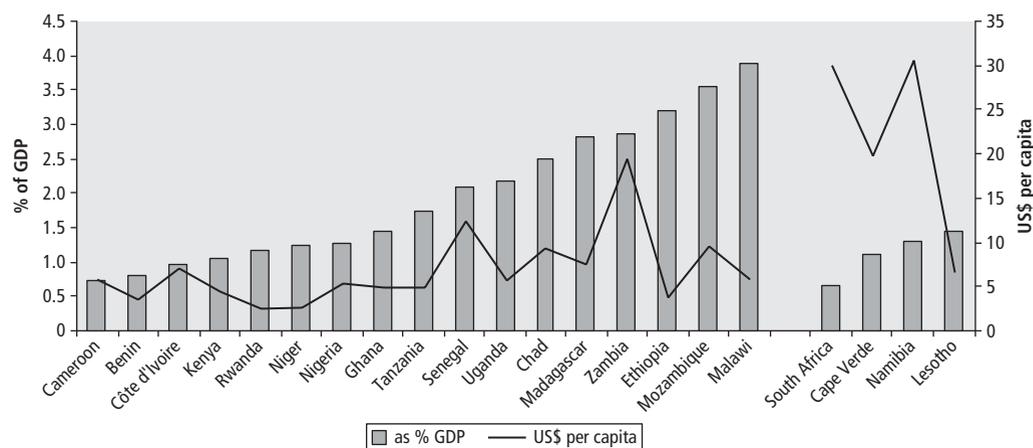
Road Expenditures—More Maintenance, Less Rehabilitation

On average, countries spend \$9,000 a kilometer for main road networks in Sub-Saharan Africa, just below 2 percent of GDP, compared with 1 percent in typical industrial countries and 2–3 percent in fast-growing emerging economies (figure 10.2). Although the effort is high relative to the size of Africa's economies, it remains low in absolute terms, with low-income countries spending no more than \$7 per capita a year. For the main road network, maintenance spending ranges from barely \$200 per kilometer in Chad to more than \$6,000 per kilometer in Zambia. Maintenance spending per kilometer of the main network tends to be about twice that of the rural network.

Paradoxically, low-income countries spend 50 percent more per kilometer overall than do middle-income countries, while countries with road agencies and high fuel levies seem to spend somewhat less than those without. The explanation is a pronounced capital bias

in road spending, with investment accounting for two-thirds of total spending in the resource-rich and low-income countries, particularly those without adequate institutional mechanisms for funding road maintenance. Middle-income countries and those with high fuel levies tend to spend *more* on maintenance *without* incurring higher road expenditure overall. This finding clearly shows that timely attention to maintenance reduces the expenditure needed to sustain the road system in the long term (Harral and Faiz 1988). Aid has partly fueled this capital bias. For example, aid financing covers just over 50 percent of road investment in Senegal and almost 90 percent in Rwanda.

The capital bias would be even more pronounced if capital budgets were fully executed. On average, countries have budgeted 50 percent more on road investment than they spend during a given budget cycle. This underspending produces a capital budget execution ratio averaging about 70 percent. Deficiencies in project planning and delays in procurement processes

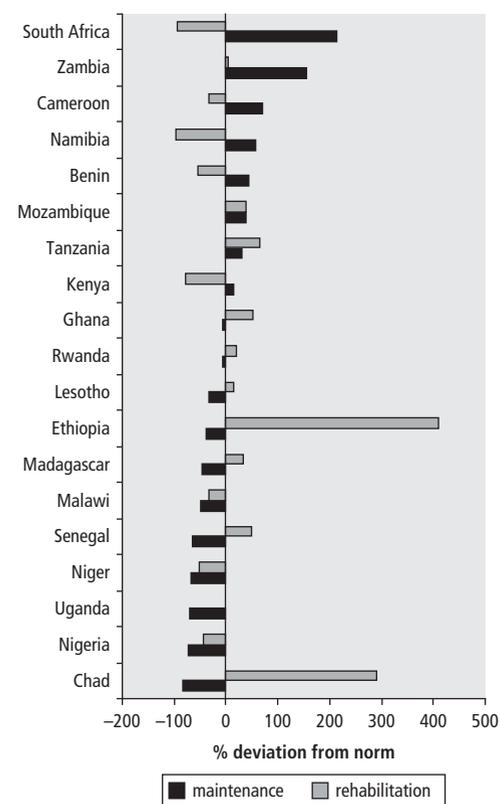
Figure 10.2 Average Annual Spending on Road Transport, by Country, 2001–05

Source: Briceño-Garmendia, Smits, and Foster 2008.

are the main culprits. Middle-income countries and those with road funds and fuel levies fare best in executing their capital budgets.

High capital spending may be justified by large rehabilitation backlogs. Except for Chad and Ethiopia, capital spending for many sampled countries indeed falls well below or is close to what is needed to clear rehabilitation backlogs within (a reasonable) five years. However, such high levels of spending on rehabilitation make sense only when a broader policy is in place to ensure proper maintenance of these roads after they have undergone rehabilitation. In practice, half of the countries sampled are not devoting adequate resources to maintain the main road network, and about half of this subset is not even spending enough for routine maintenance (figure 10.3). In Chad, Niger, Nigeria, Senegal, and Uganda, maintenance spending is less than half the norm.

Unit costs of road construction have recently escalated, with cost overruns on multilateral agency projects rising from 30 percent in 2005 to more than 60 percent in 2007, threatening to dilute further the adequacy of current budget allocations. Inflation has been substantial for the basket of road construction inputs linked to oil prices, but it does not tell the whole story. The lack of effective competition for civil works contracts, with a small number of bidders and

Figure 10.3 Rehabilitation and Maintenance Spending Relative to Norms

Sources: Briceño-Garmendia, Smits, and Foster 2008; Gwilliam and others 2008.

wide price spreads across bids, looks to be the main culprit (Van Zyl, Coetzer, and Lombard 2008). Substantial delays in project implementation also add to the costs.

These higher costs double the importance of ensuring that engineering standards are the most cost-effective possible. Network analysis reveals that on average, about 30 percent of main road networks are overengineered relative to observed traffic volumes, and only 10 percent are underengineered. Particularly where rapidly expanding the extent of the passable road network is desirable, as in the Democratic Republic of Congo, adopting lower standards may be sensible, upgrading only when traffic growth or local bottlenecks make it necessary. About 15 percent of rural networks are underengineered. Greater efforts are needed to adapt road design standards to local conditions and materials to avoid excessive costs in road construction, particularly for low-volume sealed roads.

Road Conditions—Reflecting Quality of Sector Governance

About half of the main network is in good condition, and an additional one-third is in fair condition—whereas only one-quarter of the rural network is in good condition and a further one-quarter in fair condition (figure 10.4).

The large variation in road quality reflects several interacting factors. First is affordability. GDP per capita is most strongly correlated with the percentage of the main road network in good condition, suggesting that richer countries tend to spend more on maintenance. However, no such clear relationship exists for rural roads. Second are some fundamental topographic and climatic influences. Mountainous and wet countries generally have poorer conditions, in both main and rural networks, associated with climate rather than traffic.

Even controlling for income and climate, however, substantial variation still exists in observed road quality across countries, varying with the quality of their road sector institutions and financing framework. Countries with both road funds and road agencies show

substantially better road conditions than do those that lack either. Moreover, both the road fund design and the level of the fuel levy appear to significantly affect the quality of the main road network, although again the effect on rural road quality is much less pronounced. The main exception, South Africa, has very good primary roads without a conventional second-generation road fund, but it does have a very effective road agency and consistent government commitment to finance road maintenance adequately.

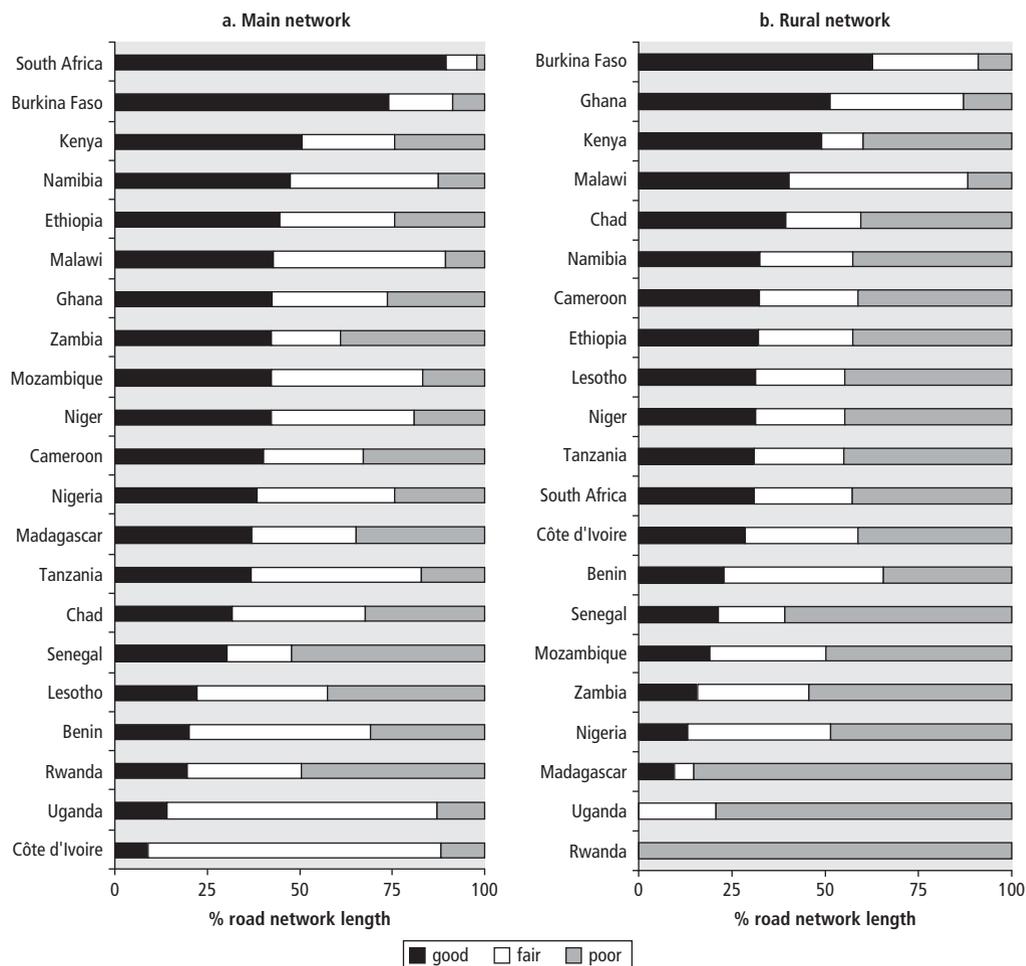
Surprisingly little variation exists in the road network's asset value as a percentage of its potential value if it all were in good condition. All countries realize at least 70 percent of this potential, suggesting that maintenance efforts are fairly well concentrated on preserving the high-value paved-road network. Moreover, the limited time series available suggests that most countries have improved the quality of their roads in recent years.

Good governance is thus critical for safeguarding road quality through good budget finance and a professionally competent public sector implementation agency. Countries with road funds and high fuel levies are substantially more successful at raising finance that translates into higher road maintenance expenditures. Countries with road funds and quasi-independent road agencies show substantially higher quality on main road networks.

Infrastructure Spending Needs—an Average of 1.5 Percent of GDP a Year

A modest set of connectivity objectives might include the following: (a) connecting large cities and international frontiers with a good-quality, two-lane paved road; (b) connecting intermediate cities and the provincial capital with a good-quality, one-lane paved road; (c) increasing to 100 percent the proportion of the rural population living within 2 kilometers of an all-season road in the agricultural areas comprising the 80 percent highest production value within each country; and (d) putting the urban population within 500 meters of a road supporting all-season bus access.

Figure 10.4 Distribution of Road Network Length across Condition Classes, by Country



Source: Gwilliam and others 2008.

On the basis of this package, spending needs for the road sector amount to \$9.6 billion a year, skewed toward capital expenditure (table 10.2). Because of their mature road network, the middle-income countries account for little more than 10 percent of this total. Except in middle-income countries, about two-thirds of spending requirements relate to capital expenditure, with the remainder attributable to operation and maintenance. Thus, overall, the region needs to spend 1.5 percent of GDP on roads, of which 0.6 percent of GDP is needed for road maintenance. However, the burden for low-income fragile states is very high—in excess of 7 percent of GDP.

Existing spending on the sector amounts to \$6.9 billion a year, significantly less than what is needed (table 10.3). Spending in the fragile states is particularly low, barely one-tenth of what is required. The public sector finances two-thirds of road sector spending and more than one-half of road sector investment. In the low-income countries—whether fragile or not—about half of road sector expenditure is donor financed. The contribution of the private sector to road finance in Africa is almost negligible. Financiers from outside the Organisation for Economic Co-operation and Development are not making a major contribution to this sector.

Implementation of efficiency-oriented reforms could raise a total of \$3.8 billion a year,

Table 10.2 Road Sector Spending Needs

Country type	\$ billions annually			Percentage of GDP		
	Capital expenditure	Operation and maintenance	Total spending	Capital expenditure	Operation and maintenance	Total spending
Sub-Saharan Africa	5.98	3.65	9.63	0.93	0.57	1.50
Middle income	0.40	0.46	0.86	0.15	0.17	0.32
Low income, fragile	1.89	0.83	2.72	4.92	2.15	7.07
Low income, nonfragile	1.84	1.23	3.07	1.67	1.11	2.78
Resource rich	1.86	1.14	3.00	0.84	0.51	1.35

Source: Carruthers, Krishnamani, and Murray 2008.

Note: Totals may not add exactly because of rounding errors.

Table 10.3 Financing Flows to the Road Sector

\$ billions annually

Country type	Operation and maintenance		Capital spending				Total spending
	Public sector	Public sector	ODA	Non-OECD financiers	PPI	Total	
Sub-Saharan Africa	1.45	3.22	1.80	0.37	0.05	5.44	6.88
Middle income	0.41	1.21	0.09	0.02	0.05	1.37	1.77
Low income, fragile	0.06	0.19	0.23	0.03	0	0.45	0.50
Low income, nonfragile	0.61	0.58	1.24	0.14	0	1.96	2.57
Resource rich	0.31	1.29	0.23	0.17	0	1.69	2.01

Source: Briceño-Garmendia, Smits, and Foster 2008.

Note: Operation and maintenance includes other current expenditures. ODA = official development assistance; OECD = Organisation for Economic Co-operation and Development; PPI = private participation in infrastructure. Totals may not add exactly because of rounding errors.

largely eliminating the funding gap, except in fragile states. The greatest scope for efficiency gains lies in practicing sound preventive maintenance, which in the medium term would substantially reduce the investments needed to clear the rehabilitation backlog, saving an estimated \$1.9 billion per year. Low ratios of capital budget execution are also holding back public investment in roads. Addressing this issue would capture a further \$1.3 billion annually. Finally, some countries face difficulties in collecting revenues owed to their road funds; solving this problem would capture another \$0.6 billion a year of resources.

Transport Services—the Forgotten Problem

Road sector interventions have traditionally focused on constructing and improving the

“hard” infrastructure. However, what ultimately matters from an economic perspective is the extent to which roads support efficient, reliable, and safe transport services for various kinds of freight, as well as for urban and rural populations. Although the private sector typically provides these services, the government has a critical role to play as regulator and facilitator of service provision. These “soft” transport issues deserve more attention.

Road Freight

The regulation and market structures of the road freight industry, rather than the quality of the road infrastructure, are the binding constraints on performance in the international corridors (Teravaninthorn and Raballand 2008). Although the associated road infrastructure is generally in good condition, the administrative bottlenecks at borders and ports keep the effective velocity of transit along these routes very

low (typically less than 10 kilometers an hour). Even for national traffic, the exceptionally high road freight tariffs in parts of Africa—reaching \$0.13 per tonne-kilometer in Central Africa—are attributable more to high profit margins (60–160 percent) than to any inherent cost disadvantage (table 10.4).

Marked performance differences occur across subregions. Performance is worst in Central and West Africa and best in southern Africa, with East Africa in between. The difference can be explained by industry cartels in Central and West Africa, together with the *tour de role* regulatory framework. That framework is based on market sharing and centralized allocation of freight that limits vehicle mileage and undermines incentives for improving fleet quality. In southern Africa, by contrast, a much larger share of freight traffic is allocated through competitive bilateral contracts between clients and shippers.

Rural Road Transport

Most rural transport takes place near villages. Trips generally involve short distances and small loads carried on paths, typically for marketing, collecting water and firewood, and tending crops and animals. Most trips are walking trips. Nonmotorized transport, such as a bicycle, is often unaffordable, and where mechanical transport is available to the household, it tends to be appropriated by a male household head. Changing this practice may be a demanding cultural task; in some parts of Africa, women's use of bicycles may be considered unseemly. Nevertheless, when enough women begin to use them and the benefits to the whole household become apparent, the practice may rapidly gain social acceptance, as it has in parts of Burkina Faso.

Out-of-village travel by motorized transport, from villages to market towns and from towns to cities, is less common. Supply is typically fragmented and informal, and rural communities are often captive markets for local monopolists.

Urban Road Transport

Buses are the common mode of public transit in most cities (Kumar and Barrett 2007). Except in a handful of cases, however, minibuses are much more prevalent than large buses. About twice as many trips are taken by minibuses and shared taxis than by large buses. The use of motorcycles for commercial transport has also grown very rapidly in recent years, mainly because of the poor state of the roads and the inability of bus companies to meet growing demand. Small-scale suburban rail networks exist in a few cities, but nowhere do they account for more than 2 percent of the market.

Supply is inadequate and tariffs are high. Most African cities have 30–60 public transport vehicle seats per 1,000 residents, but only 6 large bus seats per 1,000 residents (compared with 30–40 in middle-income countries). Low fleet capacity is exacerbated by poor use of the limited vehicle fleet, with vehicles achieving fewer than 200 kilometers a day. The quality of public transport is consequently poor, with long walking and waiting times typically doubling the in-vehicle time. Extreme overcrowding is also common, particularly on large buses. The average cost of a one-way trip, at about \$0.30, is high in relation to household budgets. Regulations that keep fares for large buses below those of minibuses and inappropriate cost benchmarks have contributed to the demise of large buses.

Table 10.4 Overview of Key Road Freight Parameters on Main International Corridors

Corridor	Roads in good condition (%)	Trade density (\$ millions per kilometer)	Implicit velocity (kilometers per hour)	Freight tariff (\$ millions per tonne-kilometer)	Profit margins (%)
Western	72	8.2	6.0	0.08	80
Central	49	4.2	6.1	0.13	70–160
Eastern	82	5.7	8.1	0.07	70–90
Southern	100	27.9	11.6	0.05	20–60

Source: Teravaninthorn and Raballand 2008.

Minibus ownership is generally highly fragmented, with most individual entrepreneurs owning no more than one or two vehicles, generally rented out to drivers. Powerful unions, associations, or syndicates that organize the sector and provide a degree of self-regulation, typically based on equitable sharing of the market in the *tour de role* system, offset the highly fragmented ownership. This approach contributes significantly to poor vehicle use and to long walking times and waiting times at terminals.

Although not confined to the urban transport situation, road safety is also a very serious issue in most African countries. In the early 2000s, nearly 3,000 people were killed on Kenyan roads annually, about 68 deaths per 1,000 registered vehicles, 30 to 40 times the rate in highly motorized countries. Traffic accidents are the third-leading cause of death after malaria and HIV/AIDS, presenting major public health problems in disability and health care costs.

Moving Forward—Broadening the Reform Agenda

The institutional reform agenda needs to be completed and broadened to encompass the demands of urban and rural connectivity. This connectivity is not just about physical infrastructure; it is also about the regulatory framework governing transport services. The recent (and likely continuing) escalation of unit road costs will strain already stretched transport budgets. Road safety also remains a concern. To deliver on these challenges will require continuing emphasis on creating efficient agency structures to manage road programs and strengthen government capabilities for oversight. The agenda comprises the following:

- Completing institutional reforms
- Increasing rural accessibility
- Developing urban transport services
- Liberalizing road freight transport
- Dealing with escalating unit costs
- Improving road safety.

Completing the Institutional Reforms

Countries with road funds are more successful in safeguarding road maintenance expenditures and spending on segments that maximize network value, while those that also have road agencies see greater funding going to better road quality. Although sector reforms are widespread, closer inspection reveals that the quality and depth of those reforms are quite variable across countries.

Road funds need to be designed in line with accepted good-practice criteria. Key areas of deficiency include (a) a lack of user representation on road fund boards, (b) the absence of direct transfer mechanisms to ensure that fuel levy revenues go directly to the fund (circumventing national budgets), (c) a strong legal foundation for road funds to safeguard their autonomy, (d) clear allocation rules for road fund revenues, and (e) a lack of systematic economic analysis guiding resource allocation. Some evidence indicates that the benefits of road funds are larger where countries adopt the full set of good-practice design criteria.

Fuel levies need to be set at an adequate level and supported by an effective revenue collection mechanism. Although many countries have fuel levies, only a subset is high enough (over \$0.10 a liter) to generate revenues commensurate with road maintenance requirements. Even where levies are right, difficulties in revenue collection can prevent their full capture. Effective administration is thus equally important.

Efficient road implementation agencies are a necessary complement to road funds, ensuring that resources are well spent; however, quasi-autonomous road agencies are not yet as widespread as road funds. Moreover, many of them fall short of good practice, particularly in autonomy and user representation on boards. A key element for their success appears to be the adoption of performance-based maintenance contracts, which are still less developed in Africa than in other regions.

Although agencies can overcome constraints of public sector salaries and processes, government structures must still carry out key functions: (a) determining road standards, (b) carrying out road classifications, and (c) setting long-range planning goals. Governments

will continue to formulate transport policy and to regulate and oversee the new road institutions. If they do not perform these functions effectively, the new institutions are bound to suffer. For example, road funds will not get the revenue increases they need, and road agencies will be unable to deliver realistic network improvement programs.

Increasing Rural Accessibility

Providing full road accessibility to 100 percent of Africa's rural inhabitants would entail a vast expansion in the all-season road network, virtually tripling its length. For many countries, this goal is unlikely to be affordable in the medium term, highlighting the need to carefully select and prioritize rural road investments. One way of doing so is to strategically align rural road investments with agricultural development programs at the national level, to prioritize those rural roads likely to have the largest effect on agricultural productivity and market access. Recent analysis of Central Africa suggests that the most attractive rural road investments may lie in areas that are at some distance from major urban markets but still within reasonable reach, because in these cases, rural road investments may be the critical intervention needed to open up market accessibility (Briceño-Garmendía and others 2009a, 2009b). By contrast, road investments in very isolated rural areas may be less attractive because they would not make enough of a difference in overall travel times to provide adequate market access.

Given the vast scale of Africa's potential rural road network, the issue of keeping down unit costs becomes particularly critical. Policy makers face a stark trade-off between the standard to which rural roads are built and the length of the rural network that can be developed for any given budget envelope. This choice raises questions about what kind of rural roads farmers really need. In many rural communities, volumes of production may be well below the threshold needed to justify the use of a truck to collect produce, and simpler roads targeted more at ensuring accessibility for two-wheeled vehicles or animal-drawn carts may be more suitable (Raballand and others 2009). In other settings, ensuring all-season accessibility may

be achievable simply through spot improvements at vulnerable points (such as creeks and riverbeds) without the need to upgrade the surface of the road along its entire length.

Whatever the chosen objective for rural road development, financing will likely remain a challenge. Local governments mobilize only modest revenues of their own, with market and business taxes as the main sources. Intergovernmental transfers are thus the main source of domestic funding for local government spending in many countries. This situation poses three main problems. First, throughout most of Sub-Saharan Africa, less than 5 percent of aggregate public revenue is generally made available to local governments managing rural networks. Second, general budgets rarely allocate adequate funds for maintaining main roads, much less rural roads. Third, capital and recurrent allocations to local governments are usually not fungible, and the allocation for recurrent expenditures may barely cover the salaries of the rural road unit. Moreover, the budget cycle dictates such transfers, so that central-to-local transfers are unlikely to be adequate and timely for maintaining local government roads.

Adequate, steady funding for local government maintenance is more likely to be forthcoming from a dedicated road fund, as long as some formal commitment exists in the road fund law to ensure that it accepts responsibility and provides for local roads. Although 60 percent of road fund revenues is typically allocated to the main interurban road network, countries have, to varying degrees, channeled portions to the maintenance of rural road networks. This approach appears to be effective. Countries that allocate at least \$0.015 of their fuel duties to rural roads have 36 percent of their rural networks in good condition, compared with 21 percent for those that do not.

Building full capacity for all management functions in each local government and community is unrealistic and inefficient. Individual local government networks are small, and the management contract for an individual local government may be too modest to attract competent consulting firms. In Madagascar, the average network for a local government is 140 kilometers; in Cameroon and Nigeria, it is 180 kilometers; and in Tanzania and Zambia,

it is 280 kilometers. All fall far short of the 500–2,000 kilometers needed to justify employing an engineer in a local unit. Joint service committees of local authorities can achieve economies of scale in procurement for the authorities they represent, but they usually require substantial technical assistance from central ministries or from the regional offices of a main road authority. In countries with an autonomous road authority responsible for main roads, local governments can contract with the road authority to manage the roads on their behalf or to assist with planning and procurement.

Some countries centralize the technical responsibility for rural roads. Relying on a road ministry or another central ministry to manage rural roads has the advantage of a formal channel for technical support. However, the disadvantage is that the ministry often operates completely independently of the local government structure and thus is poorly connected to local needs and developments. In principle, a central coordinating unit for local government roads should perform as well as a central government rural roads department. In practice, however, coordinating units for local government roads are not always as strong as they need to be, as is illustrated by the experience of Tanzania and Zambia in the late 1990s.

Delegation of planning, procurement, and management has already been improved in many countries through the establishment of AGETIPs, and the national institutions have benefited from their association in AFRICA-TIP and from donor assistance. Considerable room for improvement exists in the work of the AGETIPs, however, particularly with respect to their technical capacity, the quality of preparatory studies and contract supervision, and delays in project implementation (Diou, Henry, and Demy 2007).

The options are not mutually exclusive. For example, a joint services committee can use private consultants, hired through a contract management agency. The best option for managing local roads depends on many local factors, including the size of the authorities, the nature of the network, and the competence of the private sector or higher public authority units.

Community infrastructure, including mainly unclassified roads and paths for which no level of the formal government accepts responsibility, faces particular problems. Community contributions in cash and kind are suitable primarily for community roads and paths, but in-kind contributions may be inefficient, and other sources of money are necessary. Cost sharing between local communities and other government or external agencies can help raise the volume of resources mobilized and thereby increase the proportion of the network that receives regular maintenance. Well-structured donor financing through rural road projects or through social and community or rural infrastructure funds can support investment in community infrastructure. Cost sharing may also be effective in maintaining community roads. Many local authorities in Africa have more roads to maintain than they can afford, so cost sharing with communities has merit.

Lack of technical know-how often impedes community management. Communities in Sub-Saharan Africa need technical advice (on road design and standards, appropriate materials, work planning) and managerial advice (on financial accounting, contract management, procurement) to perform the responsibilities that come with ownership.

For rural transport services, the main issues are increasing service quantity and keeping services affordable. The priority in transport services in rural areas must be to maintain basic year-round vehicle access for the types of vehicles likely to be operating. The quantity of access is even more important than the quality. Better rural telecommunications can provide the means of more effectively matching vehicles to loads. Given the monopoly power of service providers, communities can organize to increase their bargaining power through a collective lobby. Operating subsidies are usually infeasible, but providing credit for vehicle purchases, possibly through piggybacking on agricultural credit programs, is an option.

Developing Urban Transport Services

Urban public transport requires simultaneous and integrated attention to planning urban structures, building and maintaining infrastructure, and organizing transport

services. In practice, these three primary functions are seldom housed in the same institution, and even where they remain with the central government, several ministries are usually involved. Only a handful of African cities have agencies with metropolitan responsibilities and overarching functions, and even those agencies lack the executive powers to implement their vision and must work through other units of government.

The institutional arrangements for urban roads are frequently complex. Legislation pertaining to roads is usually separate from that governing transport services, and several national and local bodies often share jurisdiction. In Conakry, Guinea, several institutions are responsible for segments of the road network. In Accra, Ghana, responsibility for urban transport has been devolved from central to local government—at least in principle. However, local governments have neither the resources nor the technical know-how to carry out their assigned functions, so the ministry of transportation (through the department of urban roads) is effectively responsible for road maintenance and development.

In the passenger transportation market, the self-regulation of operators associations and cartels has ossified fragmentation of informal operations and wasteful institutionalized procedures. Supply is inadequate and expensive. Two main options exist to remedy this situation: small and medium-size vehicles and, in the largest cities, light rail.

In principle, traditional, disciplined large-vehicle services could be reintroduced, but such attempts—in Dakar (Senegal), Accra, and other cities—have failed. The association of large vehicles with traditional large public monopoly companies made them vulnerable to political intervention and to the failures in cost control that destroyed them in the first place. Moreover, although subsidies may be required to sustain service levels and fare aspirations, open-ended subsidies of a public operator will almost certainly pass the benefit of subsidies to managers and employees rather than to passengers.

For some time, the small and medium-size vehicles must be part of the structure, not least because few governments have the fiscal

resources to reestablish a large-bus sector while the private sector remains wary of investing in large vehicles. The short-term options are thus to rely on self-regulation of the sector, which has usually failed, or to devise competitive structures, either “for” or “in” the market to build private confidence in a managed private market. Attempts can also be made to stimulate increased vehicle size, as in South Africa. This sort of strategy has achieved limited success in some central Asian countries.

In the very largest cities, exclusive road-based track systems, such as bus rapid transit or (more costly) light rail, may have a role. Such developments are being considered in Dar es Salaam in Tanzania and Lagos in Nigeria, but they are still experimental.

Liberalizing Road Freight Transport

Freight tariffs in much of Africa are unnecessarily high because of restrictive regulation and weak competition among truckers. The most damaging aspect of trucking organization is the combination of self-regulation with national protection. Both militate for the interests of the incumbent national operators at the expense of their customers. They create scope for corruption while leaving socially costly problems (vehicle overloading) relatively untouched. Both areas offer alternatives.

Self-regulation is a means of maintaining on-the-road discipline in an excessively fragmented market. It fills a vacuum created by the absence of effective public regulation. By its nature, it concentrates on ensuring an equitable distribution of traffic between members of the association, typically through the wasteful operating procedure of *tour de role* dispatching. The alternative is a combination of freedom of entry and market pricing, with independent enforcement of rules on quality and operating behavior, as in efficient road-haulage markets in Europe and the United States.

National protection appears to secure a “fair” share of traffic for the haulers of each of the national partners in a transit market. It operates through quotas that reduce the use of vehicles and thus increase the costs. It is often supported by enforcing regulated rates, which deny the shipper the opportunity to shop around for a better deal. The alternative is to

combine free entry to the market with rigorous enforcement of national safety and operational behavior rules in all countries. Regulatory systems would combine strict quality control with liberal approaches to pricing and market entry. Moving in this direction would include developing internationally agreed strategies to improve the range of elements on the main transit corridors and to strengthen enforcement on overloading.

Breaking the regulatory status quo in Central and West Africa is difficult because of a coalition of interest groups opposing change. Truckers have strong leverage on high-level authorities because they have enough monopoly power to block trade. Governance issues also intrude because some high-level authorities own or indirectly control trucks or trucking companies and thus benefit from the status quo and current market-sharing schemes.

Deregulating the trucking industry in Central and West Africa is thus more of a political and social challenge than a technical one. The main concern is the potential reduction in the number of trucks to match demand in road transport. That reduction could lead to a drop in trucking employment and profits, because some companies (or owner-operators) would disappear and others would shrink, and these social effects would need to be mitigated. Some chance exists that the coalition of interest groups opposing change in the transport market in most countries in Central and West Africa might not resist reforms if compensation schemes pay, at least partly, for the social costs.

The southern African international transport market is a good model for the rest of the continent because it combines liberalizing entry with enforcing quality and load-control rules applicable to all operators. Operations to and from South Africa are governed by bilateral agreements that provide for sharing information on traffic development and define the types of permits that can be issued. This system restricts the carriage of bilateral trade to operators from the two countries concerned and prohibits cabotage.² It does not establish quotas, however, and it allows rates to be determined by the market to enable direct contracting between shippers and transporters and giving incentives to efficient operators.

Dealing with Escalating Unit Costs

The recent escalating costs of roadwork can be attributed to rising input costs against a backdrop of growing demand for contracting, which appears to have been exploited in an environment of generally low competition for contracts. No one solution exists. Inflation in input costs lies beyond the control of policy makers, but they can take other measures.

A key issue is to ensure effective competition for contracts. Road agencies should actively market contracts to obtain a set of good bidders. If at any stage in the bidding a competitive choice set of bidders does not surface (say, at prequalification), something is seriously wrong, and the agency should consider postponing the process until it has identified and corrected the underlying issues. Continuing the bid without a proper choice set in the hope of achieving an acceptable bid price is an unnecessary gamble.

A better understanding of the underlying cost trends and their links to contract pricing is also critical. Although cost inflation lies beyond the control of sector authorities, they can increase the accuracy of the design cost estimates, improve the allowance for cost fluctuations, and monitor cost increases through the procurement period. To this end, agencies need to understand the cost structure underlying road contracts more clearly and to track international price trends for key inputs over time.

The capacity of project-executing agencies also needs to be strengthened to support the timely implementation of contracts. Delays often result from deficiencies in the planning and procurement of sector agencies, making this a third area for attention.

Whatever the improvements to road agency procurement processes, the unit costs of road infrastructure are likely to remain on an upward path, straining already limited sector budgets. Beyond measures to improve procurement, considering how to design roads to keep costs down is important. Overengineering of roads—beyond the surface type needed for the anticipated traffic volume—is an issue in parts of Africa and represents a waste of resources that should be avoided. Careful economic analysis of road investments can avoid the

overengineering of networks observed in some countries. In addition, experimentation with innovative technologies that keep costs down, for example, by making greater use of locally available materials, deserves consideration.

Improving Road Safety

Governments recognize the seriousness of the road safety problem. The February 2007 Pan-African Road Safety Conference, held in Accra, Ghana, resolved to set road safety as a national health and transport priority. Areas for funding include (a) strengthening prehospital emergency services; (b) mainstreaming safety design issues in road investment programs; (c) collecting reliable road accident statistics; and (d) enacting national legislation to deal with speeding, driving unroadworthy vehicles, failing to use safety helmets, using mobile phones when driving, and driving under the influence of alcohol.

For institutional arrangements, the choice lies between establishing a special agency and broadly injecting safety skills and procedures (such as safety audits on projects and policies) in all relevant agencies. Involving transport, education, and health agencies is a minimum, which probably requires at least a national coordination agency, such as the National Transport Safety Committee in Ghana. To have authority, the agency needs to be directly responsible to the chief minister or the cabinet. The urban equivalent would be a special unit in the mayor's office.

For program composition, the choice lies between a sequence of consistent measures and a comprehensive "big bang" approach. Evidence from various parts of the world suggests that the greatest success is through concentrated, multidimensional programs of action. For example, Japan turned a situation from disastrous to exemplary over a fairly short period by combining more stringent rules on vehicle condition, speeding, and drunk driving with very high-profile publicity campaigns and strict enforcement by traffic police. One of the most successful initiatives in Africa has been the comprehensive program introduced in the Richards Bay area of KwaZulu-Natal, based on a model already introduced in Victoria, Australia.

Above all, enforcement will have to be drastically improved. Eliminating corruption in licensing, enforcing on-road behavior, and inspecting and controlling vehicle conditions are essential. Using technology to eliminate arbitrariness in implementation, together with carefully designed market incentives, has worked well in privatizing vehicle inspections in Mexico.

Notes

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1. These networks typically comprise a centrally administered primary network plus secondary networks, but in Malawi, Nigeria, South Africa, and Uganda, only the primary network is centrally administered and included here.
2. *Cabotage* is the provision of transport within a country by a foreign operator.

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