Chapter 3:

INFRASTRUCTURE DEVELOPMENT

While Africa’s infrastructure needs are extensive, growing interest from private investors, development agencies and governments is creating renewed momentum to address this challenge. Both the volume and range of financing instruments are increasing, and sizeable gains are expected over the medium term. Yet private capital needs to be further mobilized, the capacity of public entities strengthened, procurement rules reformed, and interventions of traditional financiers fine-tuned to capitalize on areas of comparative advantage. This chapter maps Africa’s infrastructure stock, explores the key challenges to infrastructure development, and highlights innovative solutions to address those challenges.

Introduction

Infrastructure contributes to economic activity by lowering the costs of doing business, improving the competitiveness of local production, and facilitating trade and foreign direct investment (FDI). Firms with reliable power supply are able to produce more. Those with access to a world-class highway network can reach their customers faster and cheaper, while those with easy port access are able to source their inputs and export their finished products at a lower cost. Construction of infrastructure has the added benefit of directly contributing to economic output. Hence, in addition to being a factor of production that influences a firm’s production and location decisions, infrastructure contributes to the development of both upstream and downstream industries as well as financial markets.

This positive relationship is supported empirically. African countries with the most advanced manufacturing export industries, such as South Africa and Mauritius, have benefited from world-class infrastructure to support their industries\(^39\). Several studies find a positive correlation between foreign direct investment in Africa (other than investments in extractive industries) and a critical mass of favorable factors, including good quality infrastructure in particular\(^40\). Both volume and quality of infrastructure also appear to be positively correlated with marginal productivity of capital and with private sector investments\(^41\). With adequate infrastructure, African firms could achieve productivity gains of up to 40 %\(^42\). And bringing Africa’s infrastructure stock to the level of Mauritius’ could enhance Africa’s GDP growth by as much as 2.2 % percent per year\(^43\).

Current State of Infrastructure Access\(^44\)

African countries suffer from a critical shortage of infrastructure. Infrastructure coverage lags behind

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40 Basu and Srinivasan 2002; and Asiedu 2002.
41 Ayogu 2007.
42 Escribano and others 2008.
43 Foster and Briceño-Garmendia 2010.
other developing countries, particularly regarding access to electricity, transport networks, water and sanitation, irrigation, and information and communication technologies (Figure 3.1). Power deficits are the continent’s biggest infrastructure challenge: per capita power generation is less than half the rest of the developing world’s and declining. Not only has electricity access stagnated, but supply has also become less stable, with regular outages reported in at least 30 countries by 2007. Power outages are estimated to cost Africa between 1 and 2 % of GDP.

Figure 3.1: Africa’s Infrastructure Stock

![Graph showing infrastructure stock](image)

Note: Electricity generation is measured in kilowatt hours per capita; road density in kilometers per 100 square kilometers of land; paved roads in percentage of total roads; electricity, improved water and improved sanitation access in population percentage; fixed telephone, mobile telephone and internet access in users per 1000 people.

Source: Foster and Briceño-Garmendia 2010; and AfDB 2011 (m).

Transportation bottlenecks are equally critical. While Africa’s road kilometers per capita have been on the rise thanks to the traditionally extensive public investments into the sector, the continent’s highways remain largely fragmented. In addition, road infrastructure in African low-income countries is still plagued by poor quality, as well as low connectivity to ports and international commercial centers. Paved roads account for as little as 5 % or less of total roads in some of the least developed countries and Fragile States. In these markets, poor road infrastructure forces some firms to serve only the local market.

Rail infrastructure is far less developed. Only 33 countries have operational rail networks, which are geared toward long-haul general freight, mineral freight, and non-urban passenger services. Most of these countries operate single track, un-electrified systems. Decades of under-

45 Ramachandran and others 2009.
capitalization, poor management and general neglect of railways on the continent has rendered some networks defunct, while the majority of operational networks experience a variety of capacity, efficiency and safety problems. When they exist, however, railways tend to be linked to ports and carry lower long-haul costs per unit of freight relative to roads.

Maritime transport in Africa suffers from limited berth and storage capacity. African ports struggle to efficiently handle vessels exceeding 2,000 twenty-foot equivalent units (TEUs), compared to East Asian ports, which have enough capacity to handle vessels of up to 11,000 TEUs. In 2007, African vessels accounted for less than 0.6% of the world’s merchant fleet. In the same year, Port Said (Egypt) and the Port of Durban (South Africa) were the only African ports ranked in the top 50 for container traffic, and the continent’s containerized cargo throughput was half the volumes handled by large ports in China and Singapore. Moreover, Africa’s ports are running out of capacity. While port throughput has grown by about 10% annually since 2007, reflecting growing interest from emerging market economies in Africa’s natural resources, capacity expansions have not grown as fast.

Air transport services also remain largely inefficient and expensive. Most African airlines’ fleets are aging, airports struggle to meet international security standards, and air travel within the continent is among the most expensive in the world. The air transport industry, however, is making significant strides. The sector has grown by 5.8% per year between 2001 and 2007. Three major hubs have emerged in Sub-Saharan Africa—Johannesburg, Nairobi, and Addis Ababa—dominating both international and domestic markets. New budget airlines are also gaining ground in deregulated markets such as Nigeria, Kenya, the DRC and South Africa, improving service and reducing prices.46

Access to clean water has improved over the past two decades. While only 49% of sub-Saharan Africans had access to clean water in 1990, the rate had improved to 67% by 2009. Africa still lags behind other developing regions, however. Access to improved water sources is significantly higher in Latin America and the Caribbean (91%) and in South Asia (87%) than in Africa (69%). In addition, 60% of the population has no access to improved sanitation, and only 5% of agriculture is under irrigation.

Access to Information and Communications Technology (ICTs), on the other hand, has not only dramatically improved in the past decade, but also exceeds levels observed in some other developing regions. The proportion of Africans with access to mobile telephones has risen from about 1% in 2000, to over 40% by 2009, well above the access rates for South Asia (33%). Access to internet services is higher in Africa (12%) than in South Asia (6%) but lower than in Latin America (32%) and East Asia (24%).

These measures mask significant regional and cross-country differences. AfDB’s *Africa Infrastructure Index*, which ranks countries on the basis of electricity generation per capita, share of population with access to mobile or fixed phone line, percentage of roads paved and share of population with access to improved water and sanitation, illustrates this diversity (Table 3.1).

There is wide variability in performance across eighteen access, quality, and cost dimensions (Annex 3.1). The infrastructure deficit in low-income countries is worse than in middle-income ones, and fragility further weighs on most dimensions. Differences are particularly marked with regard to power generation, the density of paved roads and access to landline and mobile telephones as well as the internet, but less so for access to improved water and sanitation (Figure 3.2). Low-income countries perform better than middle-income ones on two cost dimensions: charges for general cargo handling and for fixed telephone. This is due to high business telephone prices in South Africa, Morocco and Botswana and to the high cargo handling charges in South African ports.

46 The Economist, 2011
### Table 3.1: Africa Infrastructure Development Index

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**Source:** AfDB 2011 (c).

### Figure 3.2: Access to Infrastructure by Income Level and Fragility

Note: Electricity generation is measured in kilowatt hours per capita; road density in kilometers per 100 square kilometers of land; paved roads in percentage of total roads; electricity, improved water and improved sanitation access in population percentage; fixed telephone, mobile telephone and internet access in users per 1000 people.

**Source:** Foster and Briceño-Garmendia 2010; and AfDB 2011 (m).
The divide between rural and urban areas is generally even more pronounced. Access to improved water, for example, is almost twice as high in cities compared to rural areas\(^\text{47}\). Only one in 10 Africans living in rural areas has access to grid electricity, compared to well over 50% of the urban population. Mobile phones, on the other hand, are shattering the isolation of rural areas, with one out of every two rural Africans now in range of a mobile signal. However, the cost of ICT services, including mobile telephony, remains high in Africa relative to other developing regions (Annex 3.1).

Overall access to infrastructure across African sub-regions is less variable, although some patterns are noteworthy (Figure 3.3). North African countries lead in overall performance, but are out-ranked by Southern African countries on density and quality of rail infrastructure. This is principally due to South Africa’s extensive rail system, which accounts for 32% of the continent’s total rail infrastructure. South Africa is also the only country with a dual track for part of its network and an operating inner-city fast train passenger service. North Africa’s rail network, on the other hand, is largely electrified, while only part of Southern Africa’s network—including in South Africa, DRC, and Zimbabwe—is so.

### Figure 3.3: Access to Infrastructure by Region

![Figure 3.3: Access to Infrastructure by Region](image)

Note: Road density is measured in kilometers per 100 square kilometers of land; paved roads in percentage of total roads; general cargo handling charges in US dollars per ton; rail lines in kilometers; improved water and sanitation access in population percentage; mobile telephone and internet access in users per 1000 people; mobile cellular and fixed broadband tariffs in US dollars per month.

Source: Foster and Briceño-Garmendia 2010; and AfDB 2011 (m).

Southern Africa outperforms the rest of sub-Saharan Africa except when it comes to the quality of roads, and mobile phone and internet user fees, as well as general cargo handling fees, which are the highest on the continent. The latter is explained by South Africa’s relatively high cargo handling...
fees, which are based on cost recovery48. Central Africa, on the other hand, trails other regions on most measures. Performance in landlocked countries is below Africa’s average on all measures. Coastal countries outperform landlocked countries by a factor of three or more on measures such as electricity generation, fixed telephone line access, and airport connectivity. Broadband tariffs in landlocked countries are four times those in coastal countries on average (Figure 3.4a). Infrastructure stock in oil importing countries, while mostly worse than in oil exporting ones, is on par with the continent’s average on measures such as access to clean water, quality of road infrastructure, and access to fixed and mobile telephony (Figure 3.4b).

Figure 3.4: Access to Infrastructure by Location and Oil Resources

![Figure 3.4: Access to Infrastructure by Location and Oil Resources](image)

Note: Electricity generation is measured in kilowatt hours per capita; road density in kilometers per 100 square kilometers of land; paved roads in percentage of total roads; fixed telephone mobile telephone and internet access in users per 1000 people; business telephone, mobile cellular and fixed broadband tariffs in US dollars per month; water outages in hours.

Source: Foster and Briceño-Garmendia 2010; and AfDB 2011 (m).

Constraints to Infrastructure Development

The infrastructure deficit holds Africa back from achieving its economic potential. Power shortages, for example, cost the region 12.5% in lost production time, compared to 7% in South Asia (Figure 3.5). The shortage and poor quality of infrastructure, added to the lack of competition in service delivery, have also resulted in exorbitant connection and user costs when compared to other developing countries. Infrastructure services in Africa cost twice as much on average as in other developing regions and are exceptionally high by global standards (Annex 3.1). In the transport sector, for example, East Asia, South Asia and Latin America enjoy a significant comparative advantage, with East Asian firms saving close to 70% in transportation costs, while Latin America and South Asian firms save approximately 50% relative to their African counterparts (Figure 3.6). These costs weigh heavily on Africa’s competitiveness.

African countries face several constraints regarding infrastructure development and maintenance, including geographical constraints, deficiencies in planning, inadequate financing for project preparation and implementation, poor management of existing infrastructure assets, institutional inefficiencies and regulatory bottlenecks, as well as demand side constraints.

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48 South African ports are operated by state-owned Transnet, which operates on a cost-recovery basis (Foster and Briceño-Garmendia, 2010).
Geographic and Demographic Constraints

Islands and landlocked countries suffer from geography, as do small economies and resource-poor countries. Fifteen countries in Africa are landlocked and depend on regional infrastructure networks for international trade. A quarter of the countries on the continent have a population of 2 million or less, which limits opportunities to capitalize on economies of scale. About half lack conventional energy resources and rely on imports to meet their power needs. The continent’s water resources are also mostly shared, so damming must be negotiated or financed regionally. In addition, a large proportion of the population lives in rural, geographically dispersed settlements. These factors help explain the comparatively higher costs of providing infrastructure services in some
countries, particularly when investments are at the national level.

The cost of broadband internet in landlocked countries reflects their significant disadvantage compared to coastal economies in accessing existing broadband infrastructure (Figure 3.7). Similarly, the isolation and fragmentation of the continent’s five island states translates in higher costs of electricity and broadband internet services (Box 3.1). Electricity generation in African economies with small national power systems can be up to twice as costly as in countries running larger national systems.49

Figure 3.7: Africa’s Optical Fibre Links or Satellite Coverage

Source: AfDB 2009 (k).

49 Foster and Briceño-Garmendia 2010.
Box 3.1: Cost and Market Size—Cape Verde
Power and Seychelles Submarine Cable

Cape Verde’s geography presents challenges for electricity generation, transmission, and distribution. The country consists of ten islands and is both isolated and a small energy market. The construction of the 25.5 MW Cabeolica wind power project, for example, required sites on four islands (Santiago, São Vicente, Sal, and Boa Vista) to be identified. Construction on each island entailed the installation of towers with wind turbines, transformers, a substation, a command center, access roads, and underground transmission lines to connect to the electricity grid on each island. Such requirements make electrification of the country technically complex and very expensive.

Seychelles’ isolation explains its dependence on costly satellite technology. The ongoing Seychelles East African System (SEAS) project will connect global internet exchange centers through a high bandwidth link. SEAS includes construction and roll-out of an optical submarine cable system to link Seychelles (Victoria, on Mahé Island) to Tanzania (Dar-el-Salam). Although the use of submarine cables is the most viable solution, the complexity of the project is compounded by the distance between mainland Africa and Seychelles. The submarine cable will cover about 1,917 km on the sea bed and about 9 km on land. The total cost of the project is US$39 million. The expected cost per user for this project, which will generate large overcapacity, is over US$850, compared to US$44 per user for the Main One submarine cable. The latter stretches from Portugal to South Africa along the west coast of Africa, and will serve 10 mainland African countries when fully operational.

Source: Mutambatsere and Mukasa 2011; and AfDB 2010 (b) and (g).

Deficient Planning, Preparation and Procurement

Africa’s infrastructure suffers from vague sector policies and project selection based on social targets or ad hoc political priorities, rather than on spatial distribution of economic activity and growth prospects. Sector plans often lack adequate detail on pipeline projects, their sequencing, sources of financing and strategies to mobilize funds. As a result, construction of new assets often begins too late to come on stream when needed, and maintenance backlogs are common. In addition, plans across ministries often lack coherence, leading to poor integration of infrastructure. This is particularly problematic in the transport sector, where well-functioning trans-shipment infrastructure is often necessary to ensure optimal benefits from new sub-sector level investments.

Technical, capacity and financing constraints explain the limited number of bankable infrastructure projects in African markets. There is a shortage of financing and skills at the project preparation, procurement, and monitoring levels. For example, although governments in well-functioning markets absorb the costs and risks associated with preparation of infrastructure projects, most African governments and public utilities face financing and capacity constraints in assuming this role. In addition, procurement rules are often not conducive for innovation, especially with regard to financing project preparation. Addressing lapses in the role of government is imperative to catalyzing private capital towards infrastructure.

Inadequate Financing

Addressing the deficiencies in sub-Saharan Africa’s infrastructure will require investments of

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50 Briceño-Garmendia and others 2008.
about US$ 93 billion per year. In most countries, infrastructure investment needs far exceed available public resources. Fragile States would require the equivalent of 37% of their GDP per year, stable low-income countries 23% of their GDP, and sub-Saharan middle-income countries the equivalent of 10% of their GDP. While spending on Africa’s infrastructure had reached US$ 45 billion a year in 2008, the financing burden still falls disproportionately on government budgets, which shoulder 66% of the expenditures, while the private sector covers 20% and traditional development partners and emerging markets (i.e., fast-growing economies outside of the OECD) another 14%.

Doubling existing investment levels will be a significant challenge. Domestic resources are constrained by low savings rates in most African countries, especially oil importers, a narrow tax base, ineffective budget administration, and under-developed capital markets. Traditional official development assistance remains low relative to the continent’s extensive needs, is pro-cyclical, and tends to fluctuate in response to changes in donor’s development aid agendas. Infrastructure financing from emerging markets is growing, but remains largely unpredictable. Private investments in infrastructure, on the other hand, are hampered by regulation and a dearth of bankable projects on the continent. Meeting Africa’s infrastructure financing needs will require innovation to address these barriers.

**Poor Management of Existing Infrastructure Assets**

An estimated 30% of Africa’s infrastructure assets required rehabilitation in 2010. This reflects the historical legacy of underfunding maintenance, which has largely been funded from government budgetary revenue. User tariffs are supposed to cover operation and maintenance in sectors such as electricity and water, while in non-income generating sectors such as roads, these expenditures are financed through the budget. Under-pricing and inefficiencies in bill collection leave most infrastructure utilities cash-strapped and unable to meet their maintenance obligations. Governments also often renego on maintenance in the face of competing demands on fiscal resources. Multilateral Development Banks (MDBs) unfortunately shy away from financing maintenance, a result of changes in their infrastructure financing over the past two decades. Similarly, private sector financing for maintenance is still confined to a sub-set of public-private partnership (PPP) agreements that allocate maintenance obligations to the private partner. In light of the significant financial resources required to cover maintenance expenditures—a third of the aforementioned infrastructure investment needs—innovative ways of financing maintenance are necessary.

**Institutional Inefficiencies and Regulatory Bottlenecks**

Among other factors, budget and utility inefficiencies and restrictive sector regulation have held back Africa’s infrastructure development. Opportunities to improve efficiency in delivering available infrastructure financing exist, however. On average, only two-thirds of the budget allocated to public investment in Africa is utilized. Africa’s infrastructure assets also face high technical and non-technical losses in the form of distribution losses, under pricing, low bill collection rates, etc. It is estimated that up to US$ 17 billion a year could be recovered simply by improving efficiency.

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51 This figure pertains to an investment and maintenance program to develop the following infrastructure in sub-Saharan Africa: (1) 7,000 megawatts a year of new power generation capacity (about half through multipurpose dams); (2) Cross-border transmission lines with a capacity of 22,000 megawatts; (3) Fiber optic cable to complete the intraregional fiber-optic backbone network and continental submarine cable loop; (4) Good quality road network to interconnect capitals, ports, border crossings, and secondary cities; (5) All-season road to access high-value agricultural land; (6) Irrigation infrastructure to more than double Africa’s irrigated area; (7) Infrastructure to meet the MDGs for water and sanitation; (8) Electricity network to raise household electrification rates by 10 percentage points; and (9) Network to provide global systems mobile voice signal and public access broadband to 100 percent of the population (Foster and Briceño-Garmendia, 2010).

52 Foster and Briceño-Garmendia 2010.

53 Briceño-Garmendia and others 2008.

54 Foster and Briceño-Garmendia 2010.
In addition, regulation governing infrastructure sectors restricts the range of financing and/or asset management options. This arises from the public-good nature of most infrastructure services and the fact that most infrastructure industries operate as natural monopolies. The result is poor governance of state-owned enterprises leading to operational inefficiencies, as well as poor regulation of monopolies sometimes resulting in profiteering, especially in transport and the ICT sectors. An uncompetitive pricing model used in the trucking industry, for example, has traditionally contributed to high shipping costs in West Africa. Likewise, a lack of competition on many African routes has led to inflated prices in the air transport sector. Strict regulation has also constrained port development on the continent. At the same time, regulatory reforms have at times produced disappointing results, as evidenced by the poor record of concessions in the water and rail sector.

Finally, the development of cross-border transport corridors without concurrent elimination of non-tariff trade barriers has resulted in a suboptimal utilization of transport infrastructure. Such barriers are often regulatory in nature, such as onerous sanitary and phyto-sanitary compliance requirement. They could also be institutional, such as inefficiencies in trade tax administration. These institutional and regulatory constraints result in sub-optimal use of existing resources and infrastructure assets.

**Demand Side Constraints**

Over 60% of Africans live on less than US$2 a day (Chapter 2). The majority of consumers therefore have little capacity to pay cost-recovery tariffs for infrastructure services, and the uptake of new, lower-cost alternative technologies has been lower than expected. Many African countries face higher-than-usual costs of supplying infrastructure services to their citizens. Cost recovery tariffs on infrastructure services in those high-cost low-income countries are about US$ 8 per household\(^{55}\) per month, which is simply not affordable for the majority of the currently un-served population. Cost recovery tariffs, however, appear to be affordable for most subsistence consumers in Africa’s middle-income countries, and for the more affluent consumers in low-income countries. The challenge is to optimize pricing policies by ensuring cost-recovery from more affluent consumers and improving revenue collection from all consumers, including those who benefit from subsidized rates. Under-pricing infrastructure services currently costs the continent US$ 4.7 billion annually\(^{56}\).

**Developing and Financing Infrastructure**

Developing Africa’s economic infrastructure at the pace necessary to realize its economic potential will require, among other things: (1) improving capacity in line ministries and relevant sector units to prepare sector plans and execute project preparation, procurement and monitoring activities; (2) strengthening institutions to improve efficiency in service delivery; (3) innovation to mobilize sufficient financial resources for capital investments and maintenance; (4) adoption of a regional approach to infrastructure development; and (5) promoting inclusive access to infrastructure services.

**Improving Capacities**

Experience shows that successful delivery of projects requires strong and capable country counterparts who can promote and drive projects. Line ministries in infrastructure sectors, utilities, and PPP units—where they exist—have the responsibility to develop detailed sector plans, lead and finance project preparation, carry out procurement, and monitor project implementation. Where private managers are involved, public partners also perform important regulatory roles. These tasks require diverse and sometimes

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\(^{55}\) Based on a typical modest household consumption of 50 kilowatt-hours of electricity and a high-cost country tariff of $0.16 per kilowatt-hour OR a typical modest household consumption of 10 cubic meters of improved water and a full cost recovery tariff of $0.80 per cubic meter.

\(^{56}\) Foster and Briceño-Garmendia 2010.
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specialized expertise. Weak public sector capacity to identify, design, and supervise infrastructure investments, however, remains a significant binding constraint to infrastructure development in low-income countries. Contractual terms of project preparation are sometimes inappropriate or change midcourse, resulting in poor estimation of technical specifications, costs and budgets. Procurement and contracting processes are also impaired by inadequate investment and financial planning, and low coordination capacity. Enhancing infrastructure planning in Africa will involve, among other things, developing policy, legal and institutional frameworks, and strengthening capacities. Egypt’s power sector offers a recent example of good practice in planning (Box 3.2). Planning authority was vested in one agency to ensure coherence in the planning process. Countries with effective PPP units, such as Senegal, Kenya, South Africa and Uganda, have used these entities to enhance cross-sector planning (Box 3.2). Setting up sub-regional planning units could be envisaged, especially where the skills pool is particularly shallow at the national level.

Box 3.2: Centralizing planning: Egypt’s Electricity Sector and Public and Private Infrastructure Investments in Senegal

Two examples of successful centralized infrastructure planning are in Egypt and Senegal. Egypt’s Ministry of Electricity and Energy and the state-owned Egyptian Electric Holding Company (EEHC) are driving power sector policy reforms and the power generation expansion plans. To address the recent surge in peak demand, Egypt embarked on an aggressive capacity expansion program financed through soft loans to EEHC. The plan is expected to increase production capacity by almost 8 GW over 2007–2014—a 36 % increase.

Egypt also has a longer term plan that guides investments. Going forward, the 2012-2022 power sector expansion plan is to almost double Egypt’s electricity generation output by 2020. The plans detail location, type and size of power plants and associated infrastructure required to meet demand projections, and include detailed financing plans. The US$ 30 billion worth of investments will be financed through long-term concessional debt to EEHC’s and through private financing. Ongoing sector reforms are expected to increase private participation to the point where up to 50 % of electricity will be produced by independent power producers by 2020.

With a similar long term vision, starting in the 1990s, the government of Senegal sought private sector participation in the design, financing and construction of infrastructure projects. To support this strategic shift to public private partnerships (PPP), Senegal began several institutional and structural reforms.

In addition to legislative reforms, multi-sectoral entities were created to support infrastructure procurement through PPPs. These include (i) the Agence Nationale chargée de la Promotion de l’Investissement des Grands Travaux (APIX), under the Presidency, in charge of promoting investment and major works; (ii) La Direction de l’Appui au Secteur Privé (DASP), under the Ministry of Economy and Finance, which mobilizes private sector participation; and (iii) the Infrastructure Council, an independent body that manages PPP project implementation.

The reforms seem to be successful. Between 2009 and 2011, Senegal concluded financing plans for four PPP projects in energy and transport valued at EUR 1.1 billion: the Dakar Container Terminal, the Dakar Toll Highway, the Senegal Coal Power Plant; and the Blaise Diagne International Airport.

Source: AfDB 2010 (i) and Shendy and others 2011.
Efforts to enhance the capacity of sovereign and sub-sovereign entities to perform project preparation, procurement, and monitoring activities are currently dominated by development partners and international finance institutions through technical assistance packages and policy-based concessional lending for public institution reforms and capacity building (Box 3.3).

**Box 3.3: Capacity Building for Infrastructure PPPs in Nigeria**

In Nigeria, efforts to attract private finance into the power and transport sectors through more extensive use of PPPs have been derailed by limited public service capacity to appraise and implement these projects. Challenges include low capacity to complete project preparation and bankability studies, unfamiliarity of staff with relevant legislation, and lack of experience to ensure quality at entry and concession contract monitoring, among other things.

In 2010, with financing from the AfDB, the Infrastructure Concession Regulatory Commission of Nigeria launched a US$31 million capacity building program. The program will (i) familiarize stakeholders in public service, civil society and the private sector on PPP processes; (ii) provide specialized training to key public sector personnel; (iii) prepare project feasibility studies; and (iv) provide hands-on technical support in procurement processes and project management. The program also facilitates setting up mechanisms for competitive procurement processes and establishing rules for handling unsolicited proposals. If successful, Nigeria’s capacity development program will facilitate the processing of key projects in power and transport, including seven major highways and bridges, commuter rail lines in Lagos and Abuja, and the 32 independent power projects already licensed by the electricity sector regulator.

Source: Brixiova and others 2011.

Current approaches to capacity building, however, tend to deliver short-term solutions not extensive enough to ensure that the required skills are developed and retained. There are too many technical assistance facilities and they to provide ad hoc services which limit their effectiveness. Ongoing initiatives must therefore be enhanced with more extensive advisory services from non-profit organizations to complement existing capacity.

Advisory services such as those provided by the International Finance Corporation (IFC) through the Infrastructure Development Collaboration Partnership Fund (DevCo) offer crucial support to governments and private firms in structuring complex infrastructure projects. MDBs could also expand advisory instruments such as the AfDB’s African Legal Support Facility. This Facility seeks to improve the legal environment and contractual terms for the private sector involved in infrastructure development, by building countries’ capacity to negotiate complex commercial contracts. Private participation in project preparation activities through reform of procurement rules is another option (see Section C below).

**Strengthening Institutions**

Strengthening institutions is more than a good idea: it has huge cost savings potential. Addressing institutional inefficiency including misallocation of public funds, under-utilization of budget allocations, and high technical and non-technical losses in delivering infrastructure services could result in additional financial resources equivalent to almost 20% of the continent’s annual financing requirements for infrastructure.

Budgetary processes in most Africa countries, including middle-income countries, require reforms to reduce leakages. Better planning and expenditure monitoring is needed to align budgetary allocations to sector priorities. Streamlining public procurement and disbursement processes would improve budget utilization. Better
timing of upstream project activities, which often is a bottleneck to project disbursements, would also help. Moving from annual to medium-term budgeting for infrastructure investments would also prevent mid-course delays in project execution. In some sectors, planning should be moved from line ministry to sector level. For example, ensuring the integration of the different modes of transport and concurrent investments in transshipment infrastructure requires a sector level approach.

Even larger efficiency gains can be expected from eliminating technical and non-technical losses in infrastructure service delivery. Most technical losses, such as those in power distribution, can be addressed through rehabilitation of old assets and effective maintenance. Lessons from middle-income countries, where performance in asset maintenance tends to be stronger, could be used. For example, Transnet Freight Rail—South Africa’s rail utility—is pursuing an expansion program with a maintenance strategy that seeks to increase the transfer of technology and knowhow to local engineers to reduce maintenance costs (Box 3.4). Some low-income countries are slowly catching-up: in Kenya, for example, a fuel levy is being used to capitalize the road maintenance fund. For assets under private management, performance-based contracts have improved maintenance effectively (for instance, the maintenance of South Africa’s toll highways concession)

**Box 3.4: Transnet’s Maintenance Program: Transferring Know-How**

Under the Department of Public Enterprise’s Competitive Supplier Development Program (CSDP), Transnet aims to localize a reasonable part of the value chain of manufactured goods or services, and promote South Africa as an off-shore site of choice for original equipment manufacturers and multi-nationals’ procurement personnel.

The program ensures key suppliers who handle all maintenance of acquired assets transfer their knowledge to Transnet engineers. Transnet then is leveraging its spending to negotiate capacity building for local suppliers to meet its future manufactured equipment requirements. Specifically, Transnet tenders awarded to overseas suppliers include requirements to source basic components or acquire assembly services from South African firms. So far, two CSDP transactions valued at about US$ 500 million have been secured. One involves transfer of skills and relevant intellectual property to Transnet to produce and market Electro-Motive Diesel spare parts on the African continent. The other involves a technology partnership between Transnet and General Electric for locomotive overhauls and modernizations. Both initiatives have potential demonstration effects for other rail companies on the continent.

Source: Mutambatsere and Mukasa 2011; and AfDB 2010 (h).

The commercialization and private management of state-owned utilities has reduced non-technical losses, such as overstaffing, low bill collection rates or illicit connections. Commercialization includes corporate governance reforms such as providing state-owned utilities management autonomy under performance-based contracts. However, private management requires effective regulation. Progress has been slow in addressing under pricing and best practice cases such as Ghana, with its targeted life-line tariff for electricity users, are few. Besides better subsidy targeting, moving from contractual service delivery to pre-paid systems would also improve revenue collection.

In the transport sector, improving trade tax administration and efficiency of border posts would enhance the economic value of existing infrastructure. Projects to modernize and streamline border processes, such as the recently established one-stop Zambia–Zimbabwe border post at Chirundu are ongoing across the continent. Other options include establishing regional clearinghouses to facilitate cross-border accounting. Examples include the Common Market for Eastern and Southern Africa Clearing House.
**Innovative Financing Instruments**

Africa’s infrastructure has been predominantly financed from public resources. The public sector has been most prominent in water, sanitation and transport, where it contributed above 50% of capital investments in 2001-2006. Private investment, on the other hand, accounted for over 75% of capital investments in Information and Communications Technology (ICT) over the same period.

More recently, infrastructure financing in Africa has been changing and a new mix of sources—including increasingly private and innovative ones—is emerging. There is no “one size fits all” solution. The right financing mix depends on factors such as the country’s level of financial sector development, indebtedness and business environment. As traditional strategies and sources of finance are not enough, closing Africa’s infrastructure gap requires innovations on the part of the public sector, development partners, and the private sector.

African governments can increase and channel private savings to productive uses by facilitating the development of local capital markets, as well as inflows from international capital markets. Instruments such as corporate bonds or government infrastructure bonds are limited to countries with sufficiently developed domestic bond markets, while others, including diaspora bonds and external sovereign bonds, tap into international capital markets or foreign-exchange denominated private transfers (Box 3.5). Other schemes such as sovereign wealth funds and resource-backed infrastructure financing are better tailored for resource exporting countries.

**Box 3.5: Innovative Instruments for Infrastructure Financing**

<table>
<thead>
<tr>
<th><strong>Innovative Government Financing Instruments</strong></th>
<th><strong>Resource-backed infrastructure financing</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Government infrastructure bonds</strong>: These are government bonds issued on the domestic market to finance public infrastructure projects. Since February 2009, Kenya has issued three such bonds with a total value of US$1 billion, which, in turn, paved the way for corporate bond issues by private and state-owned companies. Kenya’s success is partially attributed to its use of incentives, such as allowing the bonds to be used as collateral for bank loans and exempting bond holders from tax on the interest earned.</td>
<td>These are loans for infrastructure backed by natural resources. For example, Chinese investments in Angola, Nigeria, and Sudan are backed by oil, in Gabon by iron, in Ghana by cocoa, and in the Democratic Republic of the Congo by copper. It is critical that African governments negotiate equitable deals that correctly value the resources assigned and environmental externalities. The share of royalties and dividends should also be robust to fluctuations in world commodity prices.</td>
</tr>
<tr>
<td><strong>Sovereign wealth funds</strong>: These are government investment funds capitalized from the proceeds of resource exports. When well designed and implemented, these funds can be a significant source of finance for both domestic and foreign projects. The Libyan Arab African Investment Company, which invested US$ 800 million in 13 African countries in 2008, is a best-practice example.</td>
<td><strong>Remittance securitization</strong>: This is an instrument whereby countries with fairly predictable remittance flows borrow on international markets on the basis of expected future revenues. Securitization allows a country to tap into the foreign exchange component of remittances without interrupting the funds transfer. It requires, however, supportive legislation, a low foreign exchange premium and skills.</td>
</tr>
<tr>
<td><strong>Diaspora bonds</strong>: These are government bonds targeted at a country’s diaspora, but can also be offered to the local population. Ethiopia pioneered diaspora bonds with its Millennium Corporate Bond in 2007. The bond raised capital for the state-owned Ethiopian Electric Power Corporation. Other Sub-Saharan African countries with large diaspora could rise up to US$ 5-10 billion per year through the issuance of such bonds.</td>
<td><strong>External sovereign bonds (ESB)</strong>: This is a foreign-exchange denominated government bond issued in international capital markets. Ghana’s issuance of a US$ 750 million ESB in 2007 was an innovation amongst low-income countries and underscored the importance of achieving macroeconomic stability before attempting to access these markets. After a lull due to the recent international financial crisis, demand for African ESBs is expected to rise in 2011.</td>
</tr>
</tbody>
</table>

57 Biau and others 2008; and OECD 2010.
Chapter 3: Infrastructure Development

Innovative Private Financing Instruments

**Corporate bonds**: These are domestic bonds issued by private firms. South Africa’s private sector has been able to tap local capital markets to finance infrastructure projects in water, transportation, and power. The country’s capital markets are well developed and long-term credit is available, as well as expertise to arrange more complex transactions such as the EUR 2.5 billion Gautrain project.

**Specialized infrastructure funds**: These are funds created by established infrastructure firms, including upstream industries that invest in various infrastructure projects. They provide a mix of financing instruments, such as equity, senior debt, subordinated debt, or mezzanine finance with exposure ranging from about US$ 5 to 120 million per project and longer tenors (up to 15 year). The Emerging Africa Infrastructure Fund is an example.

**Private equity funds**: These funds mobilize financing primarily from both international and local institutional investors and traditional financiers, such as Development Finance Institutions. The Africa Infrastructure Investment Fund, for example, was able to mobilize US$ 5 billion in additional financing in addition to its initial fund of US$ 500 million.

**Commodity-linked debt instruments**: These are domestic notes linked to specific commodities that can be traded on local exchanges. In August 2010, for example, South Africa’s Standard Bank Group offered Rand-denominated notes traded on the Johannesburg Stock Exchange whose returns were linked to the performance of precious metals. The capital was protected and the notes had specific redemption dates. Commodity exporters across Africa could potentially use such instruments to raise funds and hedge against commodity price fluctuations.

Source: Brixiova and others 2011.

While not necessarily innovative, direct and indirect lending by foreign banks has expanded, as foreign investors seeking to diversify their portfolios have taken an increasing interest in African infrastructure. Export credit agencies (ECA) have also been providing the requisite insurance. Airlines have traditionally borrowed on international markets with ECA cover. For example Ethiopian Airlines uses ECA for its ongoing fleet expansion. The same tools are becoming more common in sectors such as rail and ports, thanks to ownership and management reforms. China’s investments into Africa, for example, are channeled mainly through the Export-Import Bank and the China-Africa Development Fund. Such increased use of non-concessional financing for infrastructure investments, however, requires greater diligence in debt management to ensure sustainability.

FDI in infrastructure, especially from investors based in emerging markets, is on the rise. In addition to large institutional investors, infrastructure FDI increasingly includes investors with a stake in the developed asset, such as extractive industries companies that need infrastructure to conduct their operations. The benefits of investments tied to mining can be enhanced if access to developed infrastructure is not limited to the resource extraction operations. New private investors are also emerging in sectors where infrastructure-related revenue streams from off-take agreements are not the main source of revenues. This includes co-generation in the power sector, where electricity is generated as a by-product of sugar and ethanol production in countries like Tanzania, Kenya, and Mozambique, and oil sector gas-powered electricity in Nigeria and Tanzania.

Given the abundance of natural resources, African countries can tap carbon finance markets to finance low-carbon infrastructure (Box 3.6). So far though, access to carbon credits by clean technology projects in emerging markets and developing countries has had mixed results across regions, with Africa lagging substantially behind.
Box 3.6: Tapping Carbon Finance Markets

Africa’s reserves of renewable energy—solar, hydro, wind and geothermal—are the highest in the world. On a global ranking of countries by renewable energy reserves, 17 out of the top 35 countries are African. Given its abundant natural resources, Africa could embark on a low-carbon infrastructure development path. This would unlock financing from carbon-credit markets through the Clean Development Mechanism and other clean technology funds. The former has the advantages of being market-based, legally enforceable and generally more predictable than concessional financing sources. The latter are crucial to reduce the costs and risks of such investments. Examples include the Clean Technology Fund (CTF), which supports the adoption of low-carbon technologies in middle-income countries. CTF is expected to leverage at least five times its value in clean energy solutions, including energy efficiency, renewable energy, and sustainable transport investments.

The Global Environment Facility (GEF) provides grants to low-income countries for projects that promote sustainable development. The challenge for African countries is poor capacity to tap these global funds to adapt to, and mitigate climate change. To facilitate access, the AfDB is leading resource mobilization into the Africa Green Fund, which will provide direct financing towards qualifying projects on the continent.

Source: Duarte and others 2010; and Buys and others 2007.

As the scope of financing vehicles expands, traditional partners must refine their services and enhance their involvement in areas of comparative advantage. In playing its role as financier, the public sector should seek to improve efficiency in the delivery of infrastructure finance. Public savings from efficiency gains can be achieved in part by planning for timely delivery of projects to avoid costly emergency measures, maintaining existing infrastructure to limit expensive rehabilitation, improving efficiency of utilities, and strengthening medium-term expenditure and accounting frameworks and auditing procedures.

African governments should also mobilize domestic resources. Removing exemptions and strengthening tax administration would increase public tax revenues. In low-income countries, where the large informal sectors impede effective direct taxation, excise, value added and other indirect taxes can be relied upon. Post-conflict countries may consider utilizing trade taxes and other simplified direct tax structures, before a balance between indirect and direct taxes can be reached.

To mobilize private savings, formal financial institutions could offer long-term saving instruments, and governments could provide corresponding tax incentives. African governments can also remove regulatory barriers that discourage institutional investors such as pension funds from relying on long-term savings instruments. Moreover, they can help diversify capital markets by developing institutional frameworks encouraging Islamic finance institutions and private equity funds.

African governments also have a critical role to play in providing incentives for private investment in infrastructure projects. Such incentives could include risk mitigation instruments, such as viability gap financing, and addressing the risk of foreign exchange fluctuation through currency hedging, devaluation liquidity schemes, and government exchange rate guarantees, among others. Adding incentives to risky partnerships, such as guaranteed floor returns and tax holidays, could also increase the private investors’ appetite in infrastructure transactions. Such a strategy was recently employed in the Dakar Toll Road project.

58 This is a subsidy that can be used as partial capital cost financing for up-front investment needs to encourage private operators’ involvement in critical infrastructure projects with high economic benefits but low financial returns. Competitive pricing of the viability gap is crucial if such subsidies are to be utilized successfully.

59 AfDB 2011 (a).
Financing from emerging markets for infrastructure development has increased in the past decade. Chinese commitments reached US$ 5 billion in 2009; flows from India averaged US$ 500 million per year between 2003 and 2007; while Arab and Islamic finance institutions reported flow of US$ 2.4 billion and US$ 1.7 billion in 2008 and 2009, respectively. It is unclear, however, what proportion of these flows constituted aid and concessionary financing. Reporting for this new official development assistance (ODA) is still evolving, which makes it difficult to establish the exact volume, source, destination, and/or purpose of these financial flows.

The proliferation of donors has certainly added to challenges of quality, effectiveness and predictability of ODA flows to Africa. Given the relevance of external flows, solid public expenditure management requires that donors improve the predictability of their support and streamline and harmonize their procedures. There is a case to focus on multi-donor initiatives that pool funds for general budgetary support of sector-wide interventions. Outside of the 2002 Monterrey Consensus and subsequent agreements, attempts to adopt common ODA frameworks and streamline processes are ongoing. Such efforts should encompass both traditional and new development partners.

To unlock private infrastructure finance, Africa needs to increase the number of bankable projects. In addition to project preparation championed by MDBs and donors, private investors should develop and bring projects to the market. In most African countries, however, this is constrained by the absence of relevant procurement processes, rules for handling unsolicited proposals, or mechanisms for competitive bidding. In such an environment, the risk that private investors’ proposals losing proprietorship is high. MDBs and the donor community should consider supporting the development of an enabling environment for project identification and development by private partners.

Aside from reforming procurement rules, consolidating project preparation financing from grant facilities could generate immediate gains. Combining official development assistance in upstream project preparation activities with private finance in project preparation can also be seen in the case of Infraco (Box 3.7) where development assistance is channeled through a commercial vehicle that, because of its higher risk tolerance, is able to absorb project preparation costs and risks.

**Box 3.7: InfraCo – Innovation in Project Preparation Finance**

InfraCo is a donor-funded infrastructure development company that acts as an ‘honest broker’ to link finance providers, the private sector, and host governments in low-income developing countries.

InfraCo is mostly involved in early stage project development activities and, as such, shoulders much of the upfront costs and reduces entry costs for private sector infrastructure developers.

After securing in-principle commitments from finance providers to support an investment, InfraCo offers the structured investment opportunity to the private sector through a competitive bidding process and in return will get compensated for its time, effort, and cost in the form of a minority carried interest in the venture. Over time, InfraCo may sell its interest to national, institutional, and public investors.

InfraCo is managed as a private sector infrastructure development company with its capital provided by way of share subscription by the Private Infrastructure Development Group (PIDG) which is made up of the development agencies of Austria, Ireland, the Netherlands, Sweden, Switzerland, and the UK, and the World Bank.

Source: InfraCo Africa.

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60 ICA 2009.
61 Ramachandran and others 2009.
With improvements in investment climate and project processes, private investments are scaling up, including in sectors traditionally dominated by the public sector, such as roads and electricity. Total private investment into African roads grew from a cumulative US$ 1.4 billion in 1990–99, to more than US$ 21 billion between 2000 and 2005. A new wave of private road projects in South Africa, Mozambique, Kenya, Senegal, Cote d’Ivoire adds to the list. The toll road model in particular has now been adopted on the continent under both public (South Africa, Tunisia, Morocco, and recently, Zimbabwe) and private systems (South Africa)62

The strongest recent growth in private investment, however, has been in electricity generation through independent power producers (IPPs) (Box 3.8).

Box 3.8: Private Sector Participation in Power Generation

The evolution of Independent Power Producers (IPPs) demonstrates opportunities for private sector participation as infrastructure financiers and developers on the continent. Cote d’Ivoire was among the first African countries to attract foreign investors via IPP concessions with the Build Own Operate and Transfer (BOOT) model, soon followed by Egypt, and later Ghana, Morocco, Kenya, Tanzania, Tunisia and Uganda, among others. IPP funding on the continent peaked in 1997 with US$ 1.8 billion in private investment. IPPs contributed US$ 5.6 billion, or 75% of cumulative investments in Greenfield power sector projects in sub-Saharan Africa, over the period 1990-2008. The trend parallels the power sector reforms implemented across Africa in the past two decades, which liberalized power generation and facilitated regulated competition in the sector.

Private sector participation in the power sector, while offering encouraging potential, also carries some risks. The expected benefits of private participation of competition, efficiency, cost recovery, and innovation are not always realized. Competitive bidding processes, competitive pricing and intellectual property rights protection are necessary. In Cameroon, for example, private participation has not fostered competition. Market power is concentrated in one public-private entity, AES-Sonel, which limits the potential benefits of regulated competition.

Source: Mutambatsere and Mukasa 2011; and Gratwick and Eberhard 2007.

Promoting a Regional Approach for Infrastructure Development

Africa’s geography demands a regional approach to regional infrastructure development to ensure service efficiency and maximize resources. The continent could save US$ 2 billion a year in energy costs by utilizing the existing regional power pools to their full potential63. For example, developing the continent’s largely untapped hydropower potential through investments in regional infrastructure such as the Grand Inga Project (Box 3.9) would generate financial returns for Africa’s power pools of 20 to 30%, and as high as 120% for the Southern African Power Pool. Similarly, developing a transnational highway network linking all capitals in sub-Saharan Africa could result in trade gains of up to US$ 250 billion over fifteen years64. Developing regional hubs, particularly in maritime and air transport infrastructure (Box 3.10), would also boost efficiency.

62 Brixiova and others 2011.
63 Foster and Briceno-Garmendia 2010.
64 Buys and others 2006.
Inga Falls’ power-generation potential is second only to the Amazon’s. The ambitious Grand Inga Project, worth US$ 80 billion, could develop 39,000 MW of hydropower capacity on the Congo River in the Democratic Republic of Congo. The project’s target power generation capacity is equivalent to a third of Africa’s total electricity generation capacity in 2009. When complete, the dam would have more capacity than the largest hydropower project in the world, the 18,000MW Three Gorges Dam in China, which became operational in 2009.

The project has been identified as a priority by the Southern African Development Community (SADC) and the NEPAD. At completion, the dam is expected to supply power to African consumers in Angola, Egypt, Nigeria and South Africa. While the project is far from reaching financial closing, it has drawn considerable interest from leading players in the energy industry, including power companies and development finance institutions such as the World Energy Council and the World Bank, which are leading project development. Issues surrounding the environmental and the social impact of the project, such as the potential exclusion of poor local households, remain to be addressed.

Source: International Rivers.

For airlines, regional hubs improve efficiency not only in capital investments, but also in operation and asset maintenance. Ethiopian Airlines has emerged as a hub on the east coast and is a major African carrier dominating international and domestic markets along with two other carriers: South African Airways and Kenya Airways.

Ethiopian Airlines’ aviation training center, established in 1956 to train domestic technicians and pilots, has become a regional hub servicing numerous African carriers. As of 2008, Ethiopian Airlines had the highest number of destinations, serving 35 African cities in 26 countries, and accounted for 45 percent of all the seats on routes served by one carrier. They are currently increasing and modernizing their fleet to increase passenger traffic by about 175% by 2018.

Source: Mutambatsere and Mukasa 2011; and AfDB 2011 (d).
depend primarily on political commitment and buy-in at multiple levels of government. It will also depend on the extent to which regional plans are harmonized with national ones in terms of funding priorities, and balancing growth and pro-poor infrastructure investments.

Support for project preparation is making notable progress thanks to technical assistance funds, such as the NEPAD-sponsored Infrastructure Project Preparation Facility (IPPF) (Box 3.11). In addition, the Infrastructure Consortium for Africa (ICA), in partnership with IPPF, EU-Africa Infrastructure Trust Fund, and the Development Bank of Southern Africa, is developing the “Tunnel of Funds” concept, whereby project preparation activities and costs necessary to advance priority regional projects from concept to bankable prospect are identified, and financing packages assembled. The concept is still at a nascent stage, however, and its effectiveness yet to be proven. Facilities to support regional infrastructure projects are also increasingly being established by regional economic communities including the Economic Community of West African States (ECOWAS) and the Southern African Development Community (SADC).

**Box 3.11: The Infrastructure Project Preparation Facility**

The Infrastructure Project Preparation Facility (IPPF) is a multi-donor fund established to assist African countries, regional economic communities and their specialized institutions to (i) prepare high-quality and viable regional infrastructure projects, and (ii) develop consensus and broker partnerships for their implementation through public, private or other sources of finance. IPPF is a NEPAD initiative managed by the AfDB with project preparation financing. The Facility supports regional infrastructure development in the energy, transport, water resources and ICT sectors. In 2010, IPPF contributed about US$ 9 million to 10 projects. IPPF prepared regional infrastructure projects worth around US$ 4.7 billion between 2005 and 2010. While the Facility is a step in the right direction, the US$ 42 million in committed resources—currently standing—are not nearly enough to meet the regional project preparation for the continent.

Innovation in funding regional infrastructure is also required to ensure an equitable allocation of risks and rewards among partnering countries. Investing in regional infrastructure may represent a disproportionately high, even prohibitive, cost for small economies, while geography often dictates that investments be concentrated in one country.

Challenges to the development of regional infrastructure can be addressed by MDBs providing a higher proportion of their financing towards cross-border projects. Progress at the country level includes the creation of national units in Kenya, Malawi, Mozambique, Nigeria, and Tanzania to help develop multinational projects involving private operators and investors. Such projects are inherently more complex, and often require instruments to help reduce the high upfront risk borne disproportionately by private investors. Coordinating PPP regulatory frameworks across sub-regions would facilitate the implementation of such projects.

**Promoting Inclusive Access**

Improving access to infrastructure services across the board is vital to support strong and sustained economic growth in African countries. While countries are pursuing this long-term goal, existing infrastructure services also need to be better shared. As discussed in earlier, access to infrastructure services in Africa remains skewed towards urban and better-off areas. The implication is that micro
and small-scale entrepreneurs, including rural farmers, face worse deficits than medium and large producers.

Ongoing infrastructure investments should therefore strive to reach marginalized populations. Cost-effective mechanisms to do so include (i) incorporating feeder roads in the design of major highways to facilitate market integration and access to basic services for the population in the highway’s catchment area (ii) investing in electrification projects such as the two-phased Rural Electrification Programs in Ethiopia and the project for electrification of 17 rural centers in Benin that extend power distribution networks to rural areas, (iii) tapping major transmission line projects to electrify communities in the line’s catchment area, (iv) investing in information and communication technologies which reach areas with no internet service cost-effectively, such as the Other 3 Billion (O3B) satellites project.

Inclusion also entails addressing the soft side of infrastructure access. This includes reforming current social pricing policies in both low- and middle-income countries to ensure that cost-reflective tariffs are applied to more affluent users, and subsidies targeted to ensure access by poorer consumers.

Opportunities to exploit cost-effective second-best solutions also exist, in particular in the energy sector and in water and sanitation. Off-grid electrification options such as rooftop solar panels are often more cost-effective than unreliable grid electrification, even more so when all the emergency generation costs are accounted for. For generation capacity of 5 kilowatts, off-grid electrification has been shown to be the most cost-effective option. The upfront costs of such technologies, however, are still beyond the reach of most poor households.

Mini-grids are also an option for the electrification of isolated, sparsely populated areas that cannot be reached cost-effectively through grid network extension. Mini-grids could be developed either by national utility companies or in hybrid markets by private developers (Box 3.12) or industrial users. Operating costs are substantially lower where such systems use locally available energy resources and conventional technologies (for instance hydro, biogas and biomass powered systems). Adoption requires integrating these units into the national development plan, and, where the mini-grids are run by private operators, ensuring cost recovery in markets characterized by price distortions and subsidies.

### Box 3.12: Mini grid: The Buseruka Power Plant, Uganda

The 9MW Buseruka hydropower plant, to be run as a 40-year build-own-operate-transfer (BOOT) scheme, will supply electricity to the rural area of Buseruka in Uganda. Total project costs are estimated at US$ 41 million. Project financing is provided by the sponsor Dott Services Ltd (44% of project costs) and by MDBs (56%) as long-term debt. The power generated will be sold through a take-or-pay power-purchase agreement to the national power utility, which will in turn distribute power to local rural customers. Electricity from the plant will reach roughly 1,500 households, 500 businesses, and 150 institutions, which will be charged US$ 0.1235 per kWh—well below the cost recovery tariff for Uganda’s national grid.

Source: AfDB 2011 (l); and Mutambatsere and Mukasa 2011.

In the water sector, standposts for improved water access and latrines have been widely developed on the continent as alternatives to piped water and flush toilets. Yet access to these alternatives has stagnated and coverage rates remain low, mainly due to the reduction in ODA.

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65 Regulated markets in which public sector players co-exist with private developers.
supporting these sectors in the late 1990s and to domestic budgetary constraints. The public-good nature of improved water standposts has also restricted their private provision. Countries such as the Central Africa Republic, however, are experimenting with innovative PPP models to improve access to clean water in small towns based on cost-recovery. Overall, infrastructure development strategies must seek to balance pro-growth with pro-poor investments if the current bias in access between say urban and rural areas is to be redressed.

The Role of Multilateral Development Banks in Infrastructure Development

In addition to financing infrastructure and supporting capacity building on the continent, MDBs have refined their instruments to meet evolving needs and unlock restrictions to individual country’s borrowing. Examples include blended financing packages and risk management instruments to catalyze private finance, building capacity and country systems, and brokering complex regional projects. The AfDB’s extended role in infrastructure development is highlighted in Box 3.13.

Box 3.13: AfDB’s Infrastructure Development Activities

<table>
<thead>
<tr>
<th>Lending</th>
<th>Technical assistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>US$3.7 billion to infrastructure projects in 2010 (60% approvals)</td>
<td>• Fund for African Private Sector Assistance (US$ 16 million per year for private operations).</td>
</tr>
<tr>
<td>• US$ 1.9 billion for transport</td>
<td>• NEPAD Infrastructure Project Preparation Facility (US$ 15 million per year for regional projects).</td>
</tr>
<tr>
<td>• US$ 1.2 billion for energy</td>
<td>• MICs Technical Assistance Fund (US$ 16 million for operations in middle income countries).</td>
</tr>
<tr>
<td>• US$ 650 million for water and sanitation</td>
<td>• Technical Assistant for bond issues in RMCs.</td>
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<tr>
<td>• US$ 50 million for communication</td>
<td></td>
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<tr>
<td>• US$1.7 billion earmarked for regional operations for the period 2011 to 2013</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk management instruments</th>
<th>Support to access climate finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guarantees</td>
<td>• Setting up the Africa Green Fund to mobilize resources.</td>
</tr>
<tr>
<td>• Partial credit guarantee</td>
<td>• Supporting pioneer development of clean energy projects at commercial scale (i.e., Cabeolica wind farm in Cape Verde.</td>
</tr>
<tr>
<td>• Partial risk guarantee</td>
<td>• Financing energy efficiency projects (reached US$ 5 billion for MDBs collectively in 2009)</td>
</tr>
<tr>
<td>• Hedging products</td>
<td>• Improving uptake from existing facilities (i.e., Climate Investment Funds, Global Environment Facility).</td>
</tr>
<tr>
<td>• Currency swaps</td>
<td></td>
</tr>
<tr>
<td>• Interest rate swaps, caps, collars</td>
<td></td>
</tr>
<tr>
<td>• Commodity/index swaps</td>
<td></td>
</tr>
<tr>
<td>• Indexed loans</td>
<td></td>
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</tbody>
</table>

| Source: AfDB 2010 (i). |

The increased role of the private sector in Africa’s infrastructure has been paralleled by changes in the lending policies of MDBs. Countries supported by the International Monetary Fund (IMF), for example, can now borrow externally on non-concessional terms, provided they have solid debt indicators and debt management capacity. Several instruments have emerged to improve the bankability of projects in high risk environments. Some projects can now attract a blend of concessional funding and private investment that either raises the overall return on investment or enhances credit structures to acceptable risk levels. Such financing is

66 Redifer 2010.
required for projects where up-front investment is high and the time until revenues are generated is long. Blended financing is also crucial to improve the bankability of complex regional projects, such as the Kenya-Uganda Railways (Box 3.14).

**Box 3.14: MDBs in the Kenya Uganda Railways Concession**

In 2006, with the support of MDBs, the Kenyan and Uganda governments jointly concessioned their rail networks to a private operator under a 25-year agreement. IFC acted as transaction advisor and, in partnership with AfDB, KfW, FMO and BIO, as a financier of the project. IFC’s early involvement catalysed additional financing from the World Bank Group: Concessional funds from IDA financed the environmental and social impact management plans, including a retrenchment plan for the Kenya Railway Corporation. IDA also provided partial risk guarantees to cover the concessionaire and lender from possible failure by the two governments to fulfill their contractual obligations. IDA support to the residual railway corporations helped prepare them to take on regulator roles. In addition to financing, the AfDB prepared the resettlement action plans covering the full network, both of which were financed by IDA. MDBs were also able to use their convening power to draw new interest and salvage the deal when the concessionaire faced possible termination of the agreement in 2008 after failing to meet performance targets and to pay concession fees.

Source: Mutambatsere and others 2011.

MDBs can also ramp up risk management support. Commercial and political risk premiums can be covered by both debt and equity insurance and by guarantee instruments. While commercial instruments exist, concessional ones such as partial risk guarantees (PRGs) offered by the International Development Agency (IDA) and the African Development Fund (ADF), and political risk insurance offered by the Multilateral Investment Guarantee Agency (MIGA), are more suitable for ADF countries. PRGs, for example, have been shown to generate as much as ten times the value of the guarantee in additional financing. Political risk management instruments also provide governments with incentives to implement reforms that address performance risk. Partial credit guarantees (PCG) have been used to cover losses in the event of a debt service default caused by either political or commercial risk. PCGs improve the borrowers’ access to financial markets by sharing the borrowers’ credit risk vis-à-vis the lenders and guarantors. Full credit guarantees or wrap guarantees may also be applied to provide full debt-service cover.

The AfDB is proposing to cover country risk premiums through first-loss guarantees for a portfolio of transactions supported by the Bank. A portfolio guarantee mitigates the cost of the country risk premium affecting low-income countries and Fragile States. The risk capital freed up could be used exclusively for low-income countries. This option would allow these countries to leverage at least five times the value of the guarantee in additional financing from a non-sovereign pool of lending sources.

MDB-led syndications and B-loans are intended to enable project-level risk mitigation for commercial lenders, spurred by MDBs’ preferred creditor status. But risk capital utilization and institutional constraints may not allow these institutions to take on this role to significantly match market demand. The same holds for direct equity participation in projects. MDBs can mitigate the equity risk premium arising primarily from political uncertainties through direct or indirect equity participation in infrastructure projects. Indirect participation through equity funds focusing on infrastructure is ongoing but on a small scale so

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67 Ramachandaran and others 2009.
68 Preferred creditor status protects the Bank’s properties and assets from requisition, confiscation, expropriation or any other form of taking or foreclosure by executive or legislative action.
far\textsuperscript{69}. MBD sponsorship of such specialized funds can influence geographic reach, and facilitate the adoption of international best practices.

In addition, MDBs are experimenting with participation in infrastructure projects through direct equity, although this is still uncommon. Being an equity partner allows MDBs to participate in the early stages of project preparation and attract funding from other sources to cover project development costs incurred by developers prior to financial closing. Quasi-equity instruments like subordinated loans are more common. The risk of foreign exchange rate volatility can be addressed through currency hedging, government exchange rate guarantees and devaluation liquidity schemes, among others. However, much greater attention needs to be paid to affordability of these instruments in the African context. In 2007, the Board of the AfDB authorized the participation of the Bank in the Currency Exchange Fund (TCX). TCX is a fund established to provide hedging products to its investors in emerging market currencies\textsuperscript{70}.

To address capital market bottlenecks, the AfDB has increasingly become more involved in issuing bonds denominated or linked to African currencies, technical support for bond issues, participating in currency swap markets. MDBs have also traditionally supported financial markets development through policy-based lending.

MDBs can also provide investment services to institutional investors, who are attracted to infrastructure investments’ long-horizon and steady returns, but often lack sufficient local knowledge and information of on pipeline transactions. The AfDB provides such investment services to the Japan International Cooperation Agency (JICA), and opportunities exist to extend these services to a range of similar investors.

MDBs play a critical role assisting countries to access special envelopes of financing, such as climate finance. For example, the donor-funded Clean Technology Fund leverages at least five times their value in clean energy solutions, including energy efficiency, renewable energy, and sustainable transport investments. Africa’s perspective must be taken into account when decisions on disbursements of global funds for climate change adaptation and mitigation are made. To help facilitate access to these funds, the AfDB is setting up the Africa Green Fund to receive and manage resources to address climate change on the continent.

IFIs, as investors in infrastructure development, can also play a role in improving maintenance particularly in low-income, low-capacity environments. This could be achieved by, among other things, establishing a sound maintenance framework as a prerequisite to major capital investments. They can also play a countercyclical role to support maintenance activities during periods of economic recession. During the recent economic downturn, for instance, MDBs including the AfDB and the World Bank targeted the preservation of strategic assets by providing soft loans or grant facilities for maintenance.

**Conclusion**

Infrastructure deficits are condemning African firms to operate at sub optimal levels. The development and maintenance of Africa’s infrastructure is constrained by unfavorable geography, low public service capacity to execute upstream activities and monitor project implementation, inadequate financing for project preparation and implementation, poor management of existing infrastructure assets, institutional inefficiencies and regulatory bottlenecks.

Addressing Africa’s infrastructure gap would not only improve private sector development, it will further boost the continent’s economic growth, foster regional integration, and improve integration of the continent into the global economy. This requires resources to the tune of 10\% of Africa’s GDP, of which only half is currently being spent. Innovation and reforms are therefore essential complements to traditional strategies and sources of finance.

Investment priorities should be driven by location of economic activity, aiming first to deliver strong, sustained and shared growth. Sector plans and

\textsuperscript{69} Brixiova and others 2011.

\textsuperscript{70} Brixiova and others 2011.
strategies must seek to engage the full range of potential partners. This involves enhancing the capacity of public entities, reforming regulation, and strengthening institutions to handle innovative financing and procurement methods. Developing local capital markets is crucial to mobilize excess savings from domestic, regional and international markets towards infrastructure. Institutionalizing and coordinating emerging markets’ engagement is essential to improve the predictability of financial flows. In light of their geography, most African countries must also actively seek regional cooperation for cost-effective infrastructure development.

Africa’s traditional partners should refine their modus operandi to reflect comparative advantages. MDBs, in particular, have a unique opportunity to augment efforts in capacity building, catalyzing private capital and brokering complex regional projects-areas of clear comparative advantage. The role of the AfDB is further explored in Chapter 8.
Annex 3.1: Infrastructure Stock by Region

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