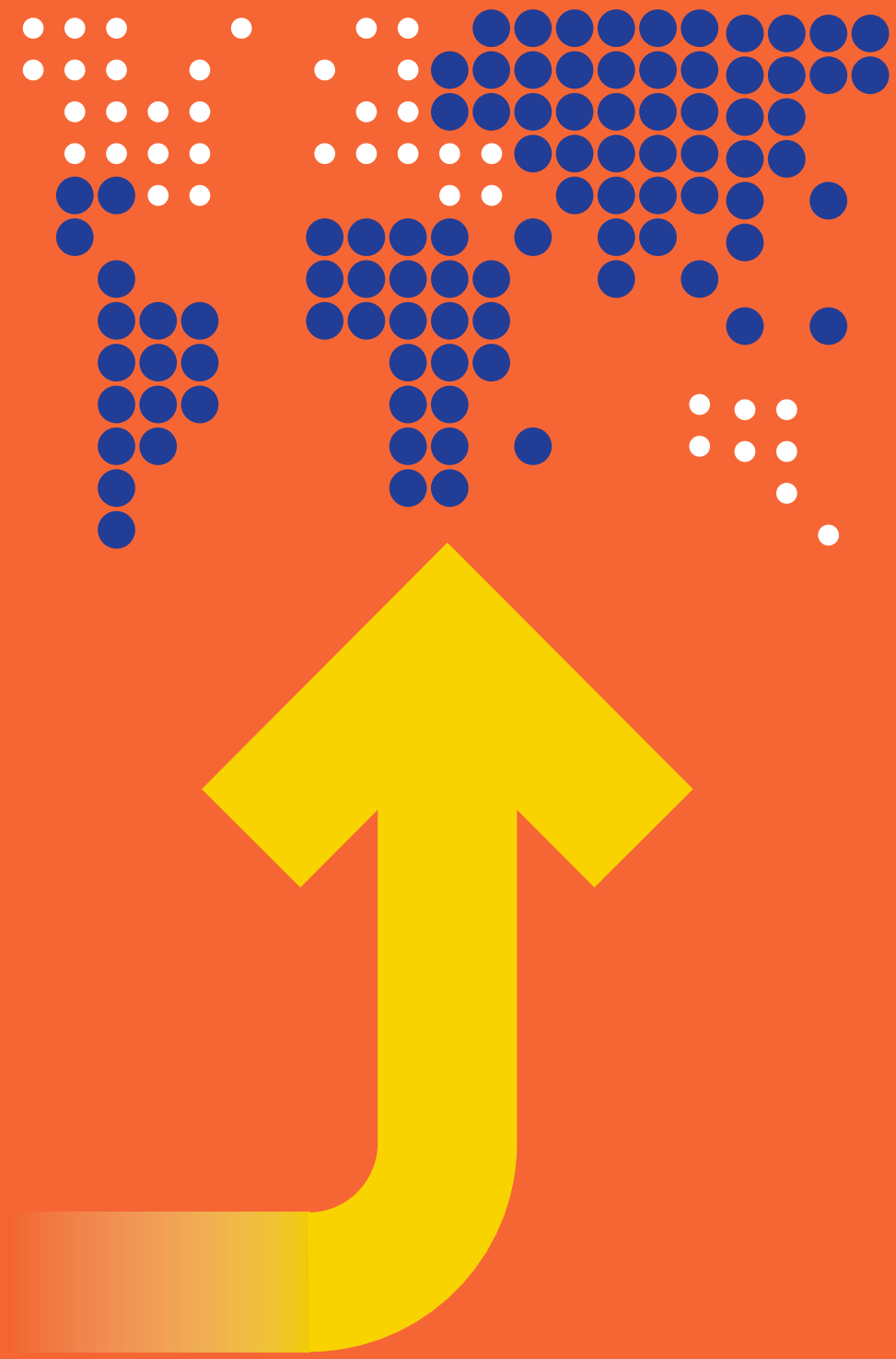


March 26-27, 2017 Abidjan, Côte d'Ivoire

2017 AFRICA EMERGING MARKETS FORUM

Background Paper

Africa's Infrastructure Deficit: Closing the Gap

James Bond

JICA

Emerging Markets Forum
A nonprofit initiative of the Centennial Group

Africa's Infrastructure Deficit: Closing the Gap

James Bond

Preface

Dear participants,

This paper is one of ten papers which are expected to form a book focused on imagining Africa four decades from now. Of these ten papers, five will serve as background papers for sessions at the Fifth Africa Emerging Markets Forum:

- *Imagining Africa 40 Years from Now*
- *Demographics and Urbanization: Planning Cities That Work*
- *Building Human Capital: Improving Education Quality*
- *Transforming Rural Africa: Growing a Productive Agriculture Sector*
- *Africa's Infrastructure Deficit: Closing the Gap*

Another paper, *New Threats to Africa's Stability and Growth*, will also be distributed at the Forum. The remaining four papers are available on the EMF website:

- *The Impact of Commodity Terms of Trade in Africa: Curse, Blessing or Manageable Reality?*
- *Africa's Inclusive Growth Challenge*
- *Economic Diversification of African Economies*
- *Regional Economic Integration in Africa*

Following this Forum, the papers will be revised and published as chapters in a book which will be widely distributed to African leaders and policymakers, among other stakeholders. As such, we will welcome your comments and feedback during and after the sessions.

Harinder Kohli
Founding Director & Chief Executive
Emerging Markets Forum

Table of contents

This paper was prepared by James Bond with research assistance from Alden LeClair.

Executive summary

Africa is the least endowed region in the world in terms of infrastructure. It also does not perform well on the quality of infrastructure services delivered to users. Infrastructure is scarce, and its performance is generally poor: costly, erratic, and undependable. Africa's low infrastructure endowment is particularly prevalent in Sub-Saharan Africa (SSA), above all a reflection of this region's low GDP per capita income levels and low population density. Poor quality of infrastructure services results from weak operational and financial management and from chronic financial weakness in the sector, as users do not pay full cost for services they receive and governments often do not pay their share. Spending needs are not met, assets are not well maintained, and the sector suffers from a deficit in management skills. However, it will not be enough simply to increase financing flowing to infrastructure investments. New sources of financing, and systemic changes to the way infrastructure services are delivered to improve their quality, will also be needed to ensure that Africa's infrastructure is operated efficiently and maintained effectively.

Role of infrastructure in development

Getting infrastructure right is essential; it underpins development of the domestic economy, contributes to inclusive growth, and enables regional integration. Low cost infrastructure services are key for export competitiveness and economic diversification. Africa's combination of low infrastructure endowment and poor quality of infrastructure services relative to other developing regions holds back the continent economically and explains in part Africa's lag in regional integration.

Electricity

Sub-Saharan Africa is starved for electricity. Both access to electricity and per capita power consumption are lower in Africa than in other regions. Yet the paradox is that Sub-Saharan Africa is rich in energy resources, and huge renewable resources remain untapped. North Africa has made better progress, and its electricity sector is broadly on par with the rest of the world. But much of Sub-Saharan Africa (with a few notable exceptions) is a "continent in the dark."

Transport

Transport infrastructure (roads, rail, airports, and ports) is significantly less developed than in other regions of the world, and transport costs are twice the level of other developing countries (up to four times as high in landlocked countries). Road densities are low; rail networks (except for South Africa) are underdeveloped and poorly maintained; and although air transport is growing strongly, it is expensive, connections are patchy, and safety is a problem. African ports are small, port services are costly, and shipments are often delayed. Poor transport links contribute to the balkanization of the continent.

Information and communications technologies

Mobile telephony is an African success story. Africa has undergone a revolution in mobile telephony due to the introduction of new technologies and private provision of these services. The number of subscribers in Africa has grown at a rate more than twice the global average during this decade, and mobile communications is transforming the economies of certain countries (e.g. Kenya) through mobile banking and other services. But internet penetration via fixed broadband links remains inadequate.

Water and sanitation

Africa still lags the rest of the world in provision of clean drinking water and improved sanitation facilities. In Sub-Saharan Africa, only half the population enjoys access to safe drinking water and the gap is widening due to urbanization. Improved sanitation (septic tanks and improved latrines) reaches less than one-fifth of Africa's population and less than one-tenth in rural areas.

African policy makers need to consider both how to increase funding for infrastructure investments and how to improve the quality of services delivered from infrastructure.

Policy directions for development of Africa's infrastructure

African policy makers need to consider both how to increase funding for infrastructure investments and how to improve the quality of services delivered from infrastructure.

Infrastructure financing needs

Financing for infrastructure in Sub-Saharan Africa tripled over the past decade, reaching $83.5 billion in 2015. African national governments themselves provided one third, through their fiscal resources; multilateral and bilateral partners provided 30%; government-to-government lending, almost entirely from China, one-quarter and private sources less than one-tenth. Current annual spending needs are estimated to be $120 billion (2016 dollars) simply to maintain current endowment levels.

Diversifying funding sources

Future financing needs cannot be met through fiscal revenue, development assistance, and government-to-government loans alone. Policy makers must call to a much greater extent on private sector financing, both from direct investors and from institutional investors who manage pension funds and insurance assets.

Private investors and lenders are wary of financing infrastructure in Africa because of the poor creditworthiness of the sector. This is an outcome of inadequate tariffs, poor payment by governments for the services they receive, and weak operational and financial management. For the sector to become financially viable, users must pay the full cost for the service they receive. Policy makers must establish tariff mechanisms that cover costs and adjust to changing circumstances, government departments have to avoid accumulating arrears to utilities (e.g. through the use of prepaid cards), and better operational management must be sought, for example from increased participation in the sector from private operators.

Finally, policy makers must be more aggressive in pursuing private provision of many infrastructure services (notably, electricity, water supply, rail, ports, airports, and broadband internet), and creating African infrastructure as an asset class able to attract funding from institutional investors.

Africa's Infrastructure Deficit: Closing the Gap

Africa's infrastructure – An overview

Africa's infrastructure lags the rest of the developing world

Infrastructure endowment

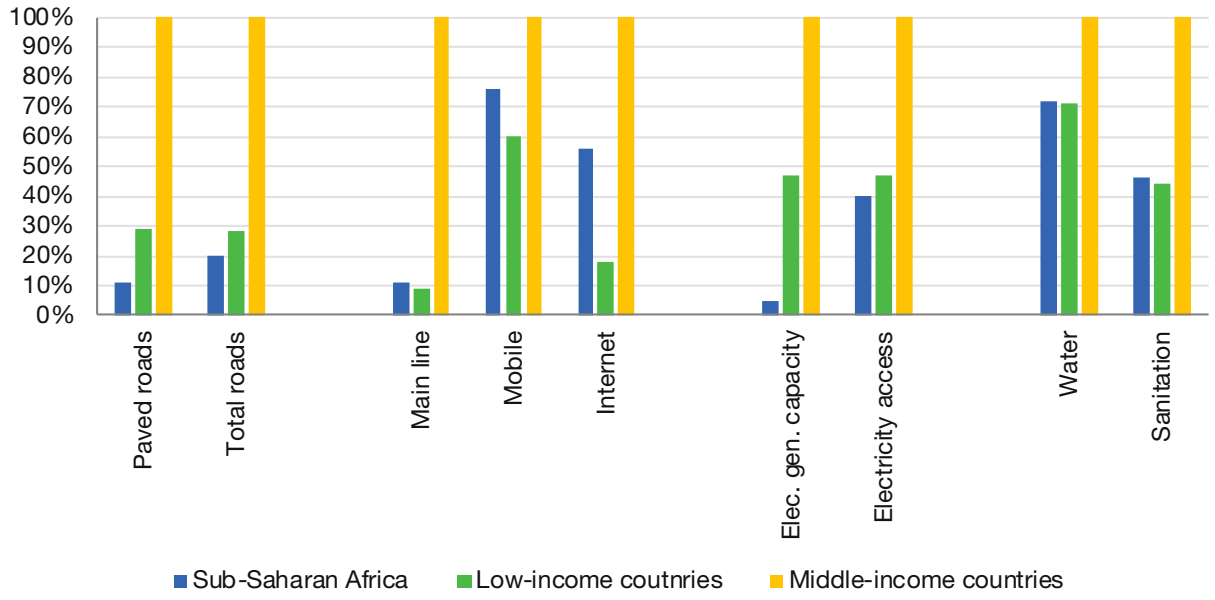
As a continent, Africa is the lowest income region in the world and is characterized by a large number of small low-income countries (54 in total). Of the 30 World Bank-classified low income countries in the world, 25 are in Sub-Saharan Africa (SSA). This presents a challenge for infrastructure development. Overall, the African continent is by all measures the least endowed region of the developing world in terms of infrastructure endowment, even compared to low-middle-income countries in other regions (Figure 1).

Quality of infrastructure services

Countries in Africa are far from homogeneous, and their infrastructure problems and solutions vary across the continent. Infrastructure stocks are closely correlated with income,[1] and in this regard Africa's low infrastructure endowment reflects above all its low GDP per capita income levels. However, infrastructure performance across countries – that is, the delivery of services related to physical infrastructure stocks (transport services, communication services, delivery of quality electricity and water services) – is generally not strongly related to income levels. Some countries with low infrastructure endowments deliver relatively good infrastructure services, whereas other countries with greater amounts of physical infrastructure may deliver

1. Indeed, cross-country and time series analyses demonstrate that per capita GDP and infrastructure stocks rise in almost lock step across the world: an increase of one percent in per capita GDP is met by an increase of one percent in infrastructure stocks. It is not clear, however, what the causality mechanism is (World Bank. 1994. *World Development Report 1994: Infrastructure and Development*).

Figure 1: Africa's infrastructure endowment (Middle-income countries = 100)



Source: Gwillian et al. (2008); World Bank (2016)

Africa does not perform well on either the endowment of physical infrastructure or on the quality of infrastructure services delivered.

far poorer infrastructure services. The quality of infrastructure services delivered depends on intangible elements (the "service content" of infrastructure) which relate to levels of skills and human capacity, the efficiency of public administration, and the service focus of the business environment. For example, the ease of obtaining an electric power connection can vary significantly from one country to the next irrespective of the density of electric power networks and, in countries with more extensive electricity networks, it is not necessarily easier to obtain a connection. The cost of transporting merchandise on a road network is not simply a function of the road density of the country; informal roadblocks will significantly degrade the quality of transport services by increasing cost and time for the transporter.

Africa does not perform well on either the endowment of physical infrastructure or on the quality of infrastructure services delivered. Performance of infrastructure in Africa is generally poor: costly, erratic, and undependable.

Implications for infrastructure financing

As indicated above, Africa has both low infrastructure endowments and inefficient supply of services related to this infrastructure stock. The implication of this dual weakness is that it will not be enough simply to increase financing flowing to infrastructure investments in Africa. Simply increasing finance for infrastructure would address the problem of low physical stock but not improve its efficiency in delivery of services. Systemic changes to the way infrastructure services are delivered, a greater focus on maintenance of existing capital stocks, and an enhanced attention to managerial capacity for the operation of these stocks will also be needed to ensure that Africa's infrastructure is operated efficiently and maintained effectively. Better operation and maintenance will ensure that capital stocks, whatever the level, deliver quality infrastructure services to the continent's citizens.

Infrastructure's role in development

Adequacy of infrastructure helps determine one country's success and another's failure in diversifying production, expanding trade, coping with population growth, reducing poverty, or improving environmental conditions. Good infrastructure raises productivity and lowers production costs, but it has to expand fast enough to accommodate growth. The kind of infrastructure put in place also determines whether growth does all that it can to reduce poverty.[2] Rural roads, for example, linking rural and urban markets, or rural water supply will do more for inclusive growth than other infrastructure services targeting higher income populations.

Africa's combination of low infrastructure endowment and poor quality infrastructure services relative to other developing regions means that the continent has additional development hurdles to overcome. These development hurdles include:

- Products and services tradeable on international markets have higher costs than those exported by other regions (Box 1). This reduces the international competitiveness of African exporters and limits sectors that African firms can compete in.
- Domestic markets, e.g. for agricultural produce, are less developed. Local suppliers are not always able to meet demand, e.g. because electric power is not readily available. Products are more expensive for consumers.[3]
- Infrastructure contributes to inclusive growth. The absence of infrastructure means that the fruits of growth are not widely shared throughout the country. For example, the absence of transport linkages between rural and urban markets reduces opportunities for the evolution of agriculture from subsistence to market-based.

2. World Bank (1994)
3. In past decades, localized famines in countries like Ethiopia and Malawi persisted despite local food surpluses elsewhere. This was due to the inadequacy of transport infrastructure able to channel the surpluses to famine areas.

A sometimes overlooked but critically important factor in the development of infrastructure services is the importance of technology choice within infrastructure sectors.

Box 1: Importing and exporting are costly in Africa

To import a 20-foot container in Sub-Saharan Africa:

- Average cost: $2,793
- Average time: 38 days

To import a 20-foot container in Singapore:

- Average cost: $440
- Average time: 4 days

For the 16 landlocked countries in Africa, the cost of trading is 50 times higher and the volumes of trade are 60% lower than in African coastal countries.

Source: The Infrastructure Consortium for Africa (2015)

- Regional integration requires both a coordinated set of rules across the region, and physical interconnections such as road, rail, and electricity transmission lines between and within countries. It is not enough simply to create regional institutions and coordinate tariffs and regulations at a regional level. Countries need to be connected by road, rail, electricity, and communications networks. These are absent or weak in much of the continent. Africa's low infrastructure endowment means that these physical interlinkages are tenuous at best.

Technology choice

A sometimes overlooked but critically important factor in the development of infrastructure services is the importance of technology choice within infrastructure sectors. For example, mobile telephony has better corresponded to the communication needs of Africa's population than fixed line communication. The introduction of mobile phones – a then-new communications technology – two decades ago allowed a very significant increase in voice and texting communication compared to what would have been the case with landlines. Similarly, in the electric power sector, new renewable technologies such as solar electricity allow for a new paradigm of electric power delivery (mini-grids or solar home systems) rather than traditional grid delivery through an incumbent monopoly utility, which has not been a success on the continent. In urban transport, hybrid systems involving mini-buses, linking to large buses or rail, are making inroads into traditional transport service delivery models. In some cases, however, earlier technology choices constrain later choices. Also, it seems that the African continent has had more success with decentralized approaches and multiple operators (e.g. mobile) than with centralized approaches.

Overall, astute adoption of new technologies permits very significant possibilities for poorly endowed countries because of the ability to leapfrog the older technologies prevalent in more developed countries. Again, mobile phones are a striking example of this phenomenon. Decision-makers should be sensitive to the technological choices of infrastructure-related decisions.

Electric power

Electricity consumption and access

Africa generally, and Sub-Saharan Africa in particular, is starved for electricity. The region's power sector is significantly underdeveloped, whether gauged by energy access, installed capacity, or overall consumption. African countries struggle to sustain GDP growth in part because of the lack of electricity.[4] Measured in terms of gross electricity generated[5], Africa represents 3.2% of total world genera-

4. Castellano, A., Kendall, A., Nikomarov, M., & Swemmer, T. (2015). "Powering Africa." McKinsey.
5. i.e before transmission and distribution losses.

The paradox is that Africa is rich in energy resources, and huge renewable resources (solar, wind, hydroelectric, and geothermal in the Rift Valley) remain untapped.

tion, slightly more than Germany (2.7%) and two-thirds the level of Japan (4.3%) (Figure 2).

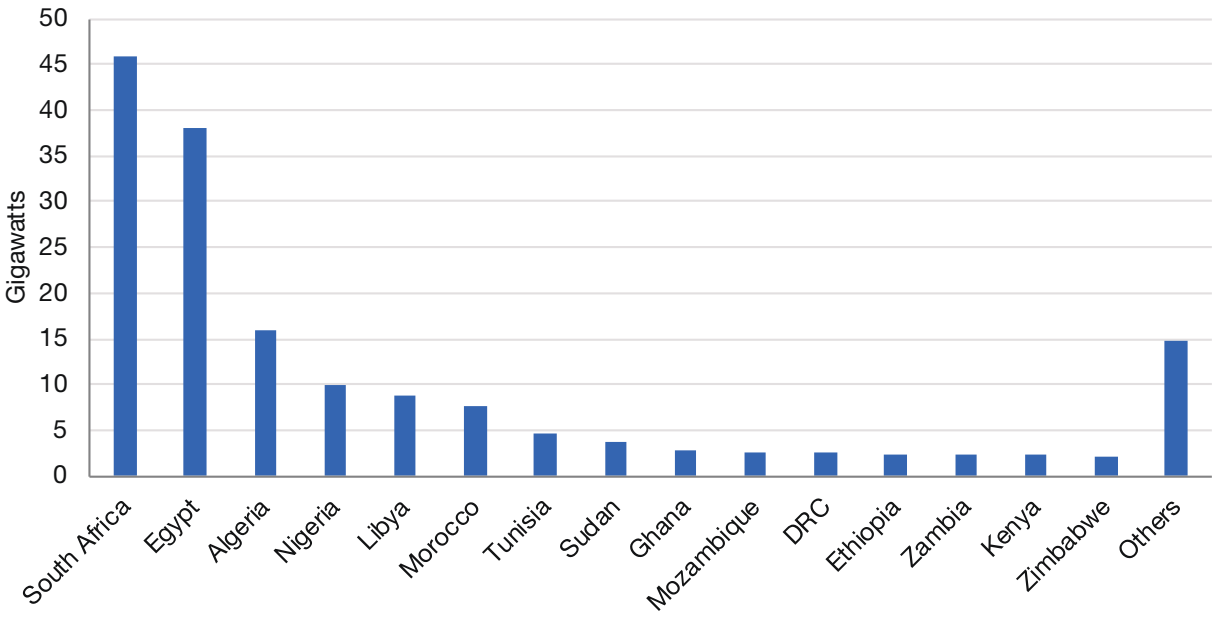
On-grid power generation capacity in Africa was 167 GW in 2015, of which close to one-third was located in South Africa. One-third of this capacity is powered by coal (mainly South Africa and Botswana) while one-fifth is hydroelectricity. Modern renewables account for less than 2% of the total, but they have also grown significantly in recent years. Insufficient, unreliable, or inaccessible grid supply has resulted in widespread private ownership of small oil-fueled generators and increasing focus on developing mini- and off-grid power systems based on renewables (Table 1).

The paradox is that Africa is rich in energy resources, and huge renewable resources (solar, wind, hydroelectric, and geothermal in the Rift Valley) remain untapped. Sub-Saharan Africa started late with renewable energy although these sources are particularly appropriate for mini- and off-grid systems and more relevant for low-density populations such as those in Sub-Saharan Africa's rural areas. In North Africa, the situation concerning renewables is different. In February 2016, Morocco commissioned the world's largest concentrated solar power plant, the Noor 1 Complex, near the city of Ouarzazate, with a capacity of 160 MW. This plant will produce enough energy to power over one million homes by 2018 and reduce carbon emissions by an estimated 760,000 tons per year.[6] The plant was built and is being managed by a consortium led by Saudi Arabia's ACWA Power, which will sell the electricity produced for $0.19/kWh. The project is co-financed by the World Bank and the European Investment Bank. Noor 1 is expected to be followed by two subsequent phases with a total final capacity of 2000 MW.

Infrastructure services delivered by the electricity sector cannot be measured by total gross generation alone, which is an indicator of overall electricity consumption.

6. Climate Investment Funds (CIF).

Figure 2: Electricity generating capacity in Africa



Source: CIA (2016)

In many, if not most, Sub-Saharan African countries the generation segment of the sector is theoretically open to private investment in the form of Independent Power Producers (IPPs), but they must sell to the incumbent public sector operator, which is for the most part insolvent.

Table 1: Access to electricity and power consumption

Region	Access to electricity (% of population)	Access to electricity, rural (% of rural population)	Access to electricity, urban (% of urban population)	Electric power consumption (kWh per capita)
Sub-Saharan Africa	35	15	72	496
Africa	44	26	70	846
Best, Africa	Algeria, Egypt, Libya, Mauritius, Morocco, Seychelles, Tunisia, Gabon (100)	Algeria, Egypt, Libya, Mauritius, Morocco, Tunisia, Gabon (100)	Algeria, Egypt, Libya, Mauritius, Morocco, Seychelles, Tunisia, Gabon (100)	South Africa (4407)
Comparators	79	68	97.4	844
Best, Comparator	Kyrgyz Republic, Moldova, Uzbekistan (100)	Kyrgyz Republic, Moldova, Uzbekistan (100)	Kyrgyz Republic, Moldova, Uzbekistan, Vietnam (100)	Uzbekistan (1611)
East Asia & Pacific (developing)	96	93	98	2720
Latin America & Carib. (developing)	96	86	99	1849
South Asia	78	69	97	640
Low & middle income countries	81	69	95	1666

Source: World Bank (2016)

Access to electricity is also an important indicator (or indeed more so) of the quality of the service delivered. In the case of electricity access, North Africa is for the most part on a par with the rest of the world, with electrification rates of more than 99%. Sub-Saharan Africa however is significantly underserved compared to other regions. More than 630 million people in Sub-Saharan Africa are without access to electricity; two out of three Sub-Saharan Africans have no access to electricity at all. In urban areas in Sub-Saharan Africa, electrification reaches 63% compared to a worldwide average of 95%. In rural areas, electrification is only of the order of 19% compared to a worldwide average of 71%. For those who do have electricity access in Sub-Saharan Africa, average residential electricity consumption per capita is equivalent to around half the average level of China or one-fifth of Europe, and nearly 730 million rely on the traditional use of solid biomass for cooking. Sub-Saharan Africa is literally a "continent in the dark" (Table 2).

The reasons for Sub-Saharan Africa's electric power scarcity are multiple. Africa has almost universally chosen a public-sector model for the delivery of electricity. Côte d'Ivoire is a notable exception, with a privately owned and managed enterprise, Compagnie Ivoirienne de l'Électricité, operating under a concession system. The results of the Ivorian system have been very good, but there are questions about how easy it would be to replicate the example in other Sub-Saharan countries.[7] In many, if not most, Sub-Saharan African countries the generation segment of the sector is theoretically open to private investment in the form of Independent Power Producers (IPPs), but they must sell to the incumbent public sector operator, which is for the most part insolvent. Poor creditworthiness of power

7. An attempt to replicate the model in Guinea was unsuccessful, for example.

The consequences of low electricity access rates in rural areas constrain the possibilities for inclusive growth.

Table 2: Electricity access, regional aggregates (2013)

Region	Population without electricity (millions)	Electrification rate (%)	Urban electrification rate (%)	Rural electrification rate (%)
Developing countries	1200	78%	92%	67%
Africa	635	43%	68%	26%
North Africa	1	99%	100%	99%
Sub-Saharan Africa	634	32%	59%	17%
Developing Asia	526	86%	96%	78%
China	1	100%	100%	100%
India	237	81%	96%	74%
Latin America	22	95%	98%	85%
Middle East	17	92%	98%	79%
Transition economies & OECD	1	100%	100%	100%
World	1201	83%	95%	70%

Source: IEA (2015)

utilities and their inability to pay for electricity delivered by the IPPs have severely constrained the amount of private financing available.

In essence, the centralized utility model of public sector ownership and operation has not been good at mobilizing financing for electricity investments (generation, transmission, and distribution) nor has it been good at operating installed assets. Sub-Saharan Africa's power utilities also have not pursued the most appropriate technologies and have in many cases preferred large investments in conventional equipment over more distributed investments in renewable technologies. Perhaps most importantly, these utilities have been unable to assure adequate maintenance of existing assets, which have often fallen into disrepair and are operating at a fraction of their installed capacity.

Sector issues

Low electricity access: The consequences of low electricity access rates in rural areas constrain the possibilities for inclusive growth. Lack of electricity reduces the ability for transformation and cold storage of agricultural products, and hence constrains incomes in rural areas; it eliminates the supply of clean lighting and thus reduces the productive period to daylight hours only, with negative consequences for cottage industries and after-hours learning. Nearly 730 million rely on the traditional use of solid biomass (mainly fuelwood and charcoal) for cooking. Each year nearly 600,000 premature deaths in Africa can be attributed to household air pollution resulting from the traditional use of these solid fuels.

In urban areas, low electrification rates constrain the development of industries such as manufacturing and of a modern service sector. Many middle-income Africans, desperate for electricity, install high-cost diesel generators in the absence of supply from the formal system. Such generators are polluting and the cost of electricity produced is multiples of what electricity from a modern sector with appropriate technology would cost. Such added costs reduce competitiveness for African firms (Box 2).

Inefficient system operation: Systems in Sub-Saharan Africa are in many cases poorly run. (North African power utilities, on the other hand, have a significantly better track record at operation and maintenance.) The most egregious weakness concerns the commercial aspects of the operation, notably inadequate billing of electricity consumed and low rates of collection of outstanding bills.

Distributed electricity generation and supply models based on renewables would in many cases be a useful addition to existing centralized systems, particularly to accelerate access in rural areas where population densities are low.

Box 2: Nigeria—A failed electric power system

Nigeria, with a population of 175 million, has installed generating capacity of an estimated 8,000 MW, of which only around 4,000 MW can function at any given time given poor operation and maintenance. At 125 kWh per capita, Nigeria's electricity consumption is one of the lowest in the world. (South Africa, with a population of about a quarter of Nigeria's, has 45,000 MW installed and functional, nine times superior.) The Nigerian middle class has installed an estimated further 10,000 MW of expensive, polluting diesel generators to make up for failings of government utility. Inefficiencies in Nigeria's power sector have traditionally been a major constraint to growth, costing the economy as much as $100 billion per year according to government estimates.

Nigeria ranks among the worst performers in the world when it comes to power, according to the World Bank's most recent *Doing Business* report. Nigeria is placed 180th out of 190 countries surveyed in terms of ease of getting electricity, behind South Africa (111th) and Kenya (106th).

The lack of a reliable supply of electricity is seen as a major impediment to growth in Nigeria's industrial sector, adding to the cost of doing business for many firms. The private sector's backup diesel-fueled generators run at a cost of $0.30-0.50 per KWh, compared to the average grid tariff of $0.13.

Supported by the development community, Nigeria has embarked on a very ambitious reform program to completely overhaul the system and bring in private capital and expertise. It is still not clear whether this reform can work, given its complexity. Notably, the reform does not address the underlying poor financial viability and lack of creditworthiness of local distribution companies

Source: The Infrastructure Consortium for Africa (2015)

Non-technical losses – essentially, theft of electricity – can be very high, sometimes as much as one-third of total electricity generated. Poor billing and collection, as well as theft of electricity, reduces utility income with the result that power utilities are financially weak and often unable to finance maintenance and new investments.

Insufficient maintenance of installed assets, as indicated above, due in part to the fragile financial situation of most of Sub-Saharan Africa's power utilities, has allowed these systems to fall into disrepair. This reduces the life span of investments in the power sector and diminishes the economic return on assets.

Poor technology choice: Sub-Saharan Africa's utilities have traditionally invested in centralized systems using conventional energy sources (e.g. coal, petroleum products, and natural gas), associated with a transmission network for transport of electricity generated to centers of consumption. Distributed electricity generation and supply models based on renewables would in many cases be a useful addition to existing centralized systems, particularly to accelerate access in rural areas where population densities are low. Such decentralized investments represent a real opportunity for African countries, particularly as they could seek greater amounts of private financing.

Inadequate regional integration of national electricity systems: Power trading in Africa started in the 1950s in the form of bilateral agreements between Democratic Republic of Congo and Zambia. Over the past two decades, electricity transmission systems have begun to be more integrated on the African continent with the creation of several regionally integrated systems. However, country systems are integrated only to a very limited extent.

The North African countries created an Association of Power Utilities, the Comité Maghrébin de l'Électricité (COMELEC) established in 1989. The Southern Africa Power Pool (SAPP) was created in 1995, covering South Africa and other Southern Africa Development Community (SADC) countries. It is now the most advanced power pool on the continent. SAPP introduced the Short-Term-Energy Markets (STEM) in April 2001. The Western Africa Power

Transport infrastructure in Africa is significantly less developed than in other developing regions of the world.

Pool (WAPP) was established in 2001 to promote energy trade between member countries. Currently the power trade in WAPP is still under bilateral or multilateral agreements, and energy trade through WAPP has not yet started. The Central Africa Power Pool (CAPP) was launched in 2003 and the Eastern Africa Power Pool (EAPP), in 2005. The two power pools are still in the developmental stage, with more progress for the EAPP.

All four power pools in South, West, Central, and East Africa and COMELEC are recognized, specialized institutions in their respective Regional Economic Communities (RECs). Although all power pools are working to promote energy trade, the level of energy traded in 2009 ranges only between 0.2% (in CAPP) and 7.5% (in SAPP).

Inadequate financing for electricity, is due most notably to the inability of public sector power utilities to generate sufficient cashflow to finance existing investments and roll out new capacity. The combination of regulated tariffs that do not cover long run marginal costs and inadequate billing and collection means that financial returns are not adequate and utilities can afford to finance neither needed investments nor maintenance.

Transport

Roads, rail, airports, ports

Transport infrastructure in Africa is significantly less developed than in other developing regions of the world (Table 3). Transport costs are twice the level of other developing countries and in landlocked countries up to 4 times as high as developing countries. The high cost of transport services significantly reduces African competitiveness and exports, and constrains economic growth.

- Road density in Africa is 152 km/km2, compared to 211 km/km2 for low-income countries worldwide, and 757 km/km2 for middle-income countries. Under one third of African roads are paved compared to over 60% for low- and middle-income countries. Road quality is lower and road transport costs higher than in other regions of the world. Also, non-physical constraints such as road blocks and trucking cartels significantly reduce the efficiency of transport of goods by road.
- Rail could be an alternative, but rail networks outside South Africa are underdeveloped, poorly maintained, and of incompatible gauges. According to the International Union of Railways, in 2014 Sub-Saharan African trains carried about 158 billion tonne-kilometres of freight, or roughly half of what Australia's railways carried. Of that, 84% was in South Africa, which has a modern network. Elsewhere, railways carry a fraction of the volumes of two or three decades ago, due to absence of maintenance and deterioration of networks. However, several new rail regional projects are under consideration or construction, notably in East Africa (Kenya-Uganda, and Djibouti-Ethiopia) and West Africa (Benin-Niger)[8]
- Air transport has grown strongly in Africa in recent years. The availability of air freight services, in particular, has helped boost exports. However, air transport in Africa is expensive, connections are patchy, and safety is a problem. Airports are often inadequate, and landing charges are high owing to the absence of support from concessions enjoyed in many parts of the world. Air traffic control requires major upgrades to improve the continent's baleful safety record. Policy challenges include strengthening regulatory oversight and achieving full liberalization of the air transport sector. In particular, cartelization of national systems and the absence of a regional open skies policy significantly increase the cost of air transport.[9]
- African ports are small compared to their peers worldwide. Only Durban in South Africa, and Damietta/Port Said in Egypt have annual capacities

8. The Economist. (4 June 2016). "Railways in Africa: Puffed out."
9. African Development Bank.

In Africa, not only is there a low overall endowment of transport infrastructure but the African transport sector also does not use its physical assets efficiently.

Table 3: Key transport statistics

Region	Air transport, freight (million ton-km)	Air transport, passengers carried (million)	Air transport, registered carrier departures worldwide (million)	Container port traffic (million TEU: 20 foot equivalent units)
Sub-Saharan Africa	2755	44.9	0.7	1.4
Best, Africa	South Africa (1062)	South Africa (16.6)	South Africa (0.2)	Egypt (8.8)
Best, Comparator	India (1739)	India (82.7)	India (0.7)	India (11.7)
Africa	3232	72.3	1.0	28.0
East Asia & Pacific (developing)	24,458	641.3	5.3	240.9
Latin America & Carib. (developing)	3580	204.4	2.2	39.2
South Asia	37,192	99.1	0.9	20.9
Low & middle income countries	2688	1,157.2	10.7	342.0

Source: World Bank (2016)

equivalent to other developing country ports (4-5 million TEU/year). Only six of the continent's ports are able to accommodate Post and Super Panamax vessels (Durban, Damietta/Port Said, Port Elizabeth, Cape Town, Port Louis, and Tangiers). Many of the ports operate at below capacity due to low berth/docking facilities, weak terminal freight and handling management, and inadequate maintenance and dredging capacity. As a result, port services are costly and shipments are often delayed leading to physical and financial losses.

Issues in the transport sector

The quality of transport services is important in an economy. Transport services underpin all logistics operations, i.e. the detailed coordination of interactions involving many people, facilities, or supplies. Logistics underpin trade and the market economy. Inefficient logistics operations thus constitute a dead weight that reduces growth and overall welfare in the economy. The quality of transport services is a function of both the country's endowment in physical infrastructure and the efficiency with which it is used. In Africa, not only is there a low overall endowment of transport infrastructure but the African transport sector also does not use its physical assets efficiently. This is for several reasons, given below.

"Soft" infrastructure constraints: Not only is physical transport infrastructure less dense and its quality lower than infrastructure in other developing regions of the world, there are significant constraints in policy, regulations, procedures, norms, standards, and certification, which increase the cost and time of transport. Soft infrastructure has not received the same degree of attention as physical stocks from policy makers and development finance institutions although, in recent decades, countries have reduced high tariff levels and tariff complexity. Nevertheless, average tariff levels in Africa remain above those in other developing countries, and there are still many exemptions.

Non-tariff barriers also remain a significant issue and similarly have not received attention proportional to their importance. Non-tariff barriers include the number and complexity of procedures and administrative processes, different and incompatible technical regulations, norms, and product standards, and certification. These allow

Development of transport infrastructure has in most cases been undertaken at national rather than regional levels.

discretion on the part of officials and increase the time and cost of trading. By some estimates some 75% of delays on major transport corridors are due to the shortcomings in soft "behind the border" infrastructure, rather than the constraints due to physical infrastructure[10].

Lack of competition and cartelization of transport services: In many African countries (particularly Sub-Saharan Africa) there is an insufficient degree of competition among transporters. Trucker cartels exist, for example, in West Africa where the added cost hinders development of landlocked countries (Niger, Burkina Faso, Mali). Air transport is controlled by a small number of airlines leading to excessively high ticket prices, and air links between African countries are spotty. Maritime transport is in many cases cartelized as well. Such lack of competition is in certain cases reinforced by national legislation and regulations, e.g. the absence of region-wide open skies policies and requirements that foreign truckers unloading in ports return to their home base empty. A regional approach to transport regulation and competition has the potential of significantly reducing transport costs even with existing physical infrastructure.

National systems rather than regional systems: Development of transport infrastructure has in most cases been undertaken at national rather than regional levels. For example, countries compete for air transport, so that air hubs have not been able to develop (other than South Africa and Ethiopia). Inter-country competition in maritime transport has underpinned the development of a number of small ports dimensioned at the level of national rather than regional requirements, increasing overall port costs. Africa has several landlocked countries (16 in total) and the development of transport corridors into the interior would significantly improve competitiveness of the continent.

10. Harmon, L.M., et al. (2009), as quoted in Tuluy, H. (2017). "Regional Integration in Africa," Fifth Africa Emerging Markets Forum, Abidjan, 26-27 March 2017.

Rural roads provide inclusive growth and accelerate agricultural transformation

Finally, in addition to underpinning trade and competitiveness, transport infrastructure has an important role in supporting inclusive growth. Rural roads play an essential part in connecting rural communities to urban centers, to export points, and to each other. Interconnection of rural areas enables greater participation by poor rural communities in the fruits of growth and accelerates the transformation of agriculture from subsistence to market-based.

Information and communications technologies (ICT)

Fixed line, mobile, and internet connectivity

From a very low base two decades ago, Africa has undergone a revolution in communication technologies. Africa's incumbent fixed line telephone operators, operating for the most part under a utility model, had been unable to deploy fixed lines ("POTS": plain old telephone service) to a sufficient segment of the population. The introduction of new mobile technologies, and a new delivery model based on private investment and operation coupled with competition between operators rather than on incumbent state owned enterprises, completely overturned the situation. The number of subscribers in Africa has grown by 13 percent a year during the first half of this decade—more than twice the global average of six percent. Today, there are nearly as many mobile cellular subscriptions in Africa as the population (Table 4). The rapid growth in the first half of the decade was partly due to starting from a low base, with less than a quarter of the population having a mobile subscription in 2010.

The rapid penetration of mobile telephony in Africa, based on new and more appropriate technologies and private operators operating in a competitive environment, provides a useful model for other infrastructure sectors such as electric power.

Africa's mixed performance with fixed broadband Internet connections, associated with the high cost of Internet usage for those with connections, represents a cost to economy and a missed opportunity.

Table 4: Key global telecom indicators for the world telecommunication service sector, 2014

Indicator	Global	Developed nations	Developing nations	Africa	Arab states	Asia & Pacific	CIS	Europe	The Americas
Mobile cellular subscriptions (millions)	6915	1515	5400	629	410	3604	397	780	1059
Per 100 people	95	121	90	69	110	89	141	125	108
Fixed telephone lines (millions)	1147	511	636	12	33	512	70	245	256
Per 100 people	16	41	11	1	9	13	25	39	26
Active mobile broadband subscriptions (millions)	2315	1050	1265	172	92	920	138	399	577
Per 100 people	32	84	21	19	25	23	49	64	59
Mobile broadband growth (2013-2014)	N/A	11%	26%	43%	19%	21%	15%	12%	16%
Fixed broadband (millions)	711	345	366	3	12	313	40	173	163
Per 100 people	10	27	6	<1	3	8	14	28	17

Source: International Telecommunication Union (2014)

Internet penetration via fixed broadband links has been notably less successful. With 13.9 Internet users per 100 people the continent lags other low- and middle-income developing countries, which stand at 31.1 users (Table 5). Africa's best performer, Mauritius, has rates of Internet usage close to that of developing countries and this connectivity has underpinned the island's strong trade links and international competitiveness.

Mobile telephony: An African success story

Infrastructure services provided by connectivity, particularly mobile communications, have the potential to spur development of other sectors. The most important of these has been mobile banking (Box 3). However, other uses, such as providing market information (e.g. prices for cacao on international markets) or weather-related information, improve the functioning of the market as well.

Internet still lags

Africa's mixed performance with fixed broadband Internet connections, associated with the high cost of Internet usage for those with connections, represents a cost to economy and a missed opportunity. More Africans access the Internet through smartphones than via a fixed broadband connection. Because of poor Internet connectivity African countries find it more difficult to tap into highly attractive openings for trade in services such as call centers, provision of back-office financial services, tourism, although the continent has some clear-cut advantages for such developments (proficiency in English and French, and being on the same time zones as Europe). African firms are also less competitive than their peers because of inability to interconnect efficiently with customers and suppliers in a timely fashion.

Kenya's M-Pesa brought banking-by-phone to Africa. Since its introduction the service has grown into a bona fide payment network.

Table 5: Key ICT statistics

Region	Internet users (per 100 people)	Mobile cellular subscriptions (per 100 people)	Fixed broadband subscriptions (per 100 people)	Fixed telephone subscriptions (per 100 people)
Sub-Saharan Africa	19	71	<1	1
Africa	14	78	1	3
Best, Africa	Mauritius (57)	Gabon (171)	Mauritius (15)	Mauritius (30)
Comparators	23	96	3	8
Best, Comparators	Vietnam (48)	Vietnam (147)	Moldova (15)	Moldova (3)
East Asia & Pacific (developing)	42	101	12	14
Latin America & Caribbean (developing)	47	111	9	17
South Asia	17	75	1	2
Low & middle income countries	31	90	6	9

Source: World Bank (2016)

Box 3: Mobile banking in Kenya—A real success story

Kenya's M-Pesa brought banking-by-phone to Africa. Since its introduction, the service has grown into a bona fide payment network. More than 60 million Africans use basic mobile phones to transfer money from one person to another, take out insurance policies and collect payment from government agencies. Africa's "mobile money" market exceeded $61 billion in 2012—greater than the amount of money sent via mobile in Europe and North America combined. In some months the value of Kenya's mobile money transactions equals or exceeds 60 percent of GDP (source: GSM Association).

Launched in 2007 by carriers Safaricom and Vodacom, M-Pesa's success is based on its simplicity. Customers buy credit on their mobile phone accounts to pay bills or buy products. To transfer money to a person, merchant, or government agency, all they need is the creditor's related phone number. The debits are deducted directly from the mobile phone account, with no need to fuss over a bank account. Customers give debtors their mobile number to use in settling up; when a debt payment comes in, their mobile phone account is credited.

Mobile phones have spread faster than bank branches. Mobile money accounts outnumber bank accounts in Kenya, Tanzania, Uganda and Madagascar. Today, 150 mobile money services such as M-Pesa serve more than 81.8 million customers in Africa, the Middle East and Asia; 41 new mobile money operators launched in these emerging economies over the past year, the GSMA reported. Africa is the world's largest market: In Sub-Saharan Africa, more people have a mobile money account than are signed up for Facebook.

These systems have obvious appeal for people without bank accounts, or what the financial services industry calls the "unbanked." In Kenya, this represents more than 80 percent of the market. For many Kenyans, their first mobile phone contract served to introduce them to the world of debit and credit. With minimal banking regulations in the region, African mobile companies were able to add various retail banking services (insurance, microfinance, remittances) to the traditional pay-as-you-go contract.

Source: Bloomberg (2013).

While electricity, transport, and telecommunications infrastructure supports country competitiveness and trade, and also (perhaps to a lesser extent) inclusive growth, provision of safe water and sanitation is directly responsible for reducing poverty and supporting inclusive growth.

Water and sanitation

Installed water and sanitation capacity

While electricity, transport, and telecommunications infrastructure supports country competitiveness and trade, and also (perhaps to a lesser extent) inclusive growth, provision of safe water and sanitation is directly responsible for reducing poverty and supporting inclusive growth. Serious waterborne illnesses such as diarrhea are leading causes of infant mortality and malnutrition, with impacts that extend beyond health to the productive sectors of the economy through lost work days and school absenteeism. Meeting the Millennium Development Goal (MDG) for access to safe water would produce an economic benefit of US$3.1 billion (in 2000 dollars) in Africa, through time savings and health benefits.

Adequate sanitation (defined as any private or shared, but not public, facility that guarantees that waste is hygienically separated from human contact) also makes a key contribution to public health, particularly in densely populated areas. Adequate sanitation reduces the risk of a broad range of diseases—including respiratory ailments, malaria, and diarrhea—and reduces the prevalence of malnutrition. Access to this standard of sanitation produces direct health gains by preventing disease and delivering economic and social benefits. A reduction in diarrheal illness would produce a gain of 99 million days of school and 456 million days of work for the working population ages 15–59 in Africa.

The international adoption of the MDGs in 2000 created a framework for focusing poverty reduction efforts. MDG 7 calls for reducing by half the number of people without sustainable access to safe drinking water and improved sanitation. The world overall is on track to meet the MDG drinking water target, but Africa lags. The gap is most acute in Sub-Saharan Africa, where only 58 percent of the population enjoys access to safe drinking water, and the gap is widening as the increasingly urban population places a greater strain on existing service providers (Table 6). Of the 828 million people in the world whose water sources remain unimproved, 37 percent live in Sub-Saharan Africa.[11]

Key issues

Access to improved water and sanitation remains inadequate, particularly in rural areas: In rural areas, reliance on surface water remains prevalent, and boreholes are the principal improved source of water, accounting for a further 40 percent of the population. Access to piped water and standposts is very low. Indeed, in many countries, less than 1 percent of the rural population receives piped water. In urban areas, coverage of piped water fell markedly over the past decade owing to rapid population growth but is still the single largest source of urban water. Coverage of standposts saw a similar decline. Overall, about two-thirds of the urban populace depends on utility water. Utilities are the central actors responsible for water supply in urban areas.

For sanitation, traditional pit latrines are by far the most common facility in both urban and rural areas, but more than a third of the population—mostly in rural areas—still defecates in the open. Improved sanitation (septic tanks and improved latrines) reaches less than 20 percent of Africa's population, and less than 10 percent in rural areas. Coverage of improved latrines is no greater than that of septic tanks, despite the significant cost difference between them. Only 10 percent of the population uses a septic tank; coverage in rural areas is practically negligible. In urban areas, septic tanks are much more common than improved latrines, and less than 10 percent of the population practices open defecation.

High water tariffs: African water utilities operate in an environment of high costs. However, overall, Africa's experience in recovering operating costs is positive, with many utilities setting tariffs at levels high enough to recoup

11. Banerjee, S. & Morella, E. (2011). *Africa's Water and Sanitation Infrastructure—Access, Affordability, and Alternatives*. Washington: World Bank.

African tariffs are highest among the developing regions, but African utilities are still not able to adequately fund either capital expenditures or maintenance.

Table 6: Key water and sanitation access statistics

Region	Improved water source (% of pop. with access)	Improved water source, rural (% of rural pop. with access)	Improved water source, urban (% of urban pop. with access)	Improved sanitation facilities (% of pop. with access)	Improved sanitation facilities, rural (% of rural pop. with access)	Improved sanitation facilities, urban (% of urban pop. with access)
Sub-Saharan Africa	66	55	86	30	23	40
Africa	75	65	89	40	32	51
Best, Africa	Mauritius (100)	Mauritius (100)	Egypt, Tunisia, Niger (100)	Seychelles (98)	Seychelles (98)	Seychelles (98)
Comparators	87	81	95	71	64	84
Best, Comparators	Vietnam (96)	Vietnam (95)	Nicaragua (99)	Uzbekistan (100)	Uzbekistan (100)	Uzbekistan (100)
East Asia & Pacific (developing)	93	89	97	75	64	85
Latin America & Caribbean (developing)	94	83	97	81	62	86
South Asia	92	91	95	45	35	65
Low & middle income countries	89	83	95	61	47	76

Source: World Bank (2016)

operations and maintenance costs. In fact, African tariffs are highest among the developing regions, but African utilities are still not able to adequately fund either capital expenditures or maintenance.

Water sector performance: Many African governments have reformed their water supply and sanitation (WSS) systems in the past two decades to provide better services for their citizens. Countries that have pursued institutional reforms have built more efficient and effective sector institutions and achieved faster expansion of higher quality services. The potential dividend of such efforts is large, because addressing utility inefficiencies alone could make a substantial contribution to closing the sector funding gap in many countries. Utilities that have decentralized their WSS services or adopted private sector management have done a better job of eliminating inefficiencies and other hidden costs than those that have not. Unbundling of services can also be beneficial, but unbundling is rare in Africa and exclusively concentrated in middle income countries, whose superior performance can be explained for many other reasons. The reform agenda has had two major thrusts: increasing private participation and improving governance from within. Private sector participation has helped to improve utility performance, with Senegal being particularly noteworthy (Box 4).

Low-cost infrastructure services are key for export competitiveness by reducing transport costs and providing connectivity between suppliers and their markets, and allows for greater economic diversification.

Box 4: Senegal's successful experience with private sector participation

Water supply and sanitation in Senegal is characterized by a relatively high level of access compared to the average of Sub-Saharan Africa. Water supply and sanitation has been provided under a public-private partnership that has been operating in Senegal since 1996, with Senegalaise des Eaux (SDE), a subsidiary of Saur International, as the private partner. SDE does not own the water system but manages it on a 10-year lease contract with the Senegalese government under an affermage contract. Between 1996 and 2014, water sales doubled to 131 million cubic meters per year, and the number of household connections increased by 165% to more than 638,000.

The Senegal experience under the affermage is characterized by significant expansion of access and a large increase in operational efficiency that mainly originated from a reduction of nonrevenue water (NRW).

Expansion of access was mainly related to a massive subsidized connection program sponsored by donors and, in part, to the cash-flow surplus generated by the private operators. The social connection program, implemented with donor support, provided about 129,000 connections (75 percent of all new connections installed) benefiting poor households living in targeted neighborhoods.

Improved efficiency was related to contract innovations geared toward increasing the operator's incentives to perform efficiently. The affermage contract included targets for reduction of NRW and improved bill collection, backed by financial penalties for noncompliance.

Another innovation in Senegal's public-private partnership was the responsibility of the private operator to finance part of the network's rehabilitation using cash flow. This approach provided the operator with more flexibility to identify and reduce water losses, lessening its dependency on the public asset-holding company.

The impact of these innovations on efficiency has been remarkable, making Senegal's affermage a prominent example of private participation in Africa. Today, Senegal can report a level of NRW comparable to the best water utilities in Western Europe. These results also confirm that operational efficiency is perhaps the area in which a private operator can make the most positive and consistent impact.

Source: Adapted from Banerjee, S. & Morella, E. (2011)

Future infrastructure requirements and financing needs

Drivers of physical infrastructure needs

Infrastructure underpins development of the domestic economy and contributes toward inclusive growth. It is also the enabler of regional integration. Low-cost infrastructure services are key for export competitiveness by reducing transport costs and providing connectivity between suppliers and their markets, and allows for greater economic diversification.

While countries in Africa are far from homogeneous, Africa's low infrastructure endowment is above all a reflection of its low GDP per capita income levels. Therefore, estimating future needs of physical infrastructure will depend to a large extent on expected growth in GDP and population over the period. But irrespective of growth assumptions, financing needs for new physical infrastructure and maintenance of existing stocks are likely to be very significant.

Financing needs for infrastructure in Africa

Current infrastructure financing

In 2015, total funding for infrastructure in Africa reached $83.5 billion, an increase of $8.9 billion (11.9%) over 2014. Of this total, African national governments themselves provided the highest share: $28.4 billion (34.1%), through their own, mainly fiscal, resources; multilateral and bilateral partners provided $25.5 billion (30.6%), most of which

Public sector budgets remain both dominant and the primary source of funding for infrastructure in Africa as in other regions of the world.

was on concessional or near concessional terms; government-to-government lending, almost entirely from China, represented $22.0 billion (26.4%); and the private sector provided $7.4 billion (8.9%) (Figure 3). Private sector financing nearly doubled from 2014 to 2015, with the increase focused almost entirely on renewable energy investments in Morocco and South Africa, including the successful bidding round in the country's REIPPP[12] program.

African infrastructure commitments in 2015 were focused mainly in electric power and transport, with roughly similar amounts ($34.7 billion) committed in each of these two sectors. Together, these sectors make up more than four-fifths of total infrastructure commitments in Africa. Historically, electric power has on average attracted more financing than transport, due to an extreme outlier situation in 2010 when very major financial commitments were made for North African energy projects and for the ESKOM Investment Support Project in South Africa.

In geographic terms, Southern Africa (including South Africa) has been and remains the most important destination for infrastructure investments in Africa, attracting $27.6 billion in 2015 (33.1% of the total). This region saw a significant increase in commitments in 2015 compared to 2014, due to an increase in commitments to South Africa from $4.9 billion to $11.7 billion under the REIPPP program, as noted above.

Financing for infrastructure in Sub-Saharan Africa has tripled since 2004. Over this period, financing from international financial institutions (IFIs) increased (especially from the World Bank and the African Development Bank AfDB), and China emerged as a major bilateral source. The most striking feature of this surge is the changing share of financing offered by traditional and non-traditional partners and private sector sources.

The funding increase since 2004 has benefitted a wide range of Sub-Saharan African countries. In absolute terms, the top recipients of external financing have been South Africa, Nigeria, Ghana, Kenya, and Ethiopia.[13] The electricity sector has had the fastest growth across all external financing sources. Excluding telecom, private finance for other sectors, especially energy, is highly concentrated in a few countries. Official Chinese investments are now expanding beyond the country's earlier focus on financing for resource-rich economies only and is reaching sectors in which it has particular technical expertise—such as hydropower—and those that are amenable to private sector participation—such as transport (especially road and rail).

As indicated above, public sector budgets remain both dominant and the primary source of funding for infrastructure in Africa as in other regions of the world. Public sector budgets are critical, as they establish the strategic framework within which support through external financing is coordinated. However, any future increase in financing for infrastructure will need to call to a greater extent on private financing, both as active investors and as providers of long-term capital (notably debt) from financial markets and the banking sector, as the fiscal situations both in African countries and among traditional development partners preclude the necessary increases in public funding.

Future infrastructure financing needs

Worldwide infrastructure spending has been estimated at some $2.5 trillion a year, or 2.8% of Gross World Product.[14] In Africa, infrastructure spending represents about 3.5% of the continent's GDP.

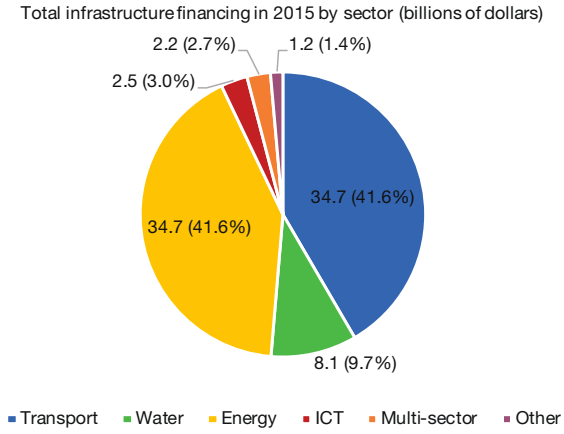
It is not easy to estimate future infrastructure financing needs in Africa, or indeed in any region of the world. Development practitioners advocate a benchmark of 5-6% of GDP for infrastructure financing to sustain growth.[15] Currently, across Sub-Saharan Africa there is a wide variation of the share of GDP devoted to infrastructure financing, with some countries (e.g. Lesotho, Cape Verde, Angola) investing over 8%, while Nigeria invests less than 3% and

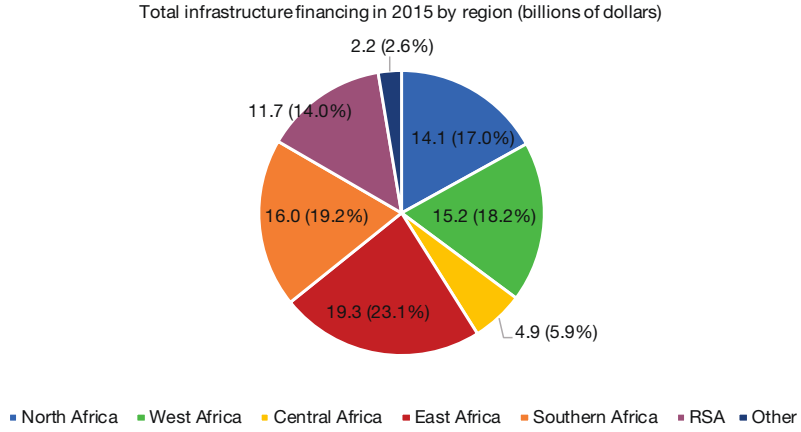
12. Renewable Energy Independent Power Producer Procurement (REIPPP).

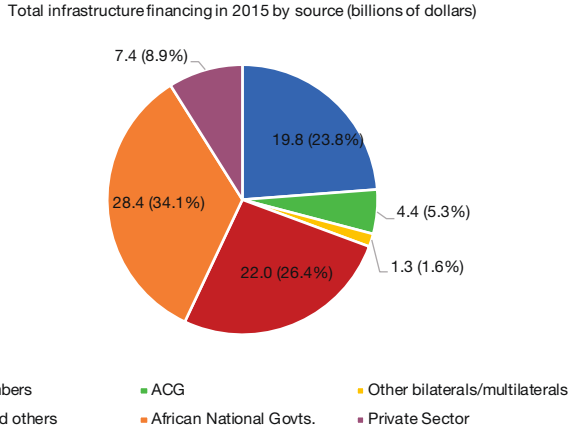
13. Gutman, J., Sy, A., & Chattopahyay, S. (Brookings, 2015): *Financing African Infrastructure – Can the World Deliver?* Washington.
14. McKinsey Global Institute. (2016). *Bridging Global Infrastructure Gaps*,
15. World Bank.

Any future increase in financing for infrastructure will need to call to a greater extent on private financing...as the fiscal situations both in African countries and among traditional development partners preclude the necessary increases in public funding.

Figure 3: Infrastructure financing by sector, region, and source







Source: Infrastructure Consortium for Africa: Infrastructure Financing Trends In Africa – 2015 (2016)
Note: ICA members include G8 countries, the World Bank Group, the African Development Bank (AfDB) Group, the European Commission, the European Investment Bank and Development Bank of South Africa.

For Africa, applying a 5% to 6% benchmark across the continent for future needs would lead to infrastructure spending requirements of around $120 billion to $140 billion per year in the short-term (2015 US$), compared to current infrastructure spending of $83.5 billion.

South Sudan less than 1%. The results do not appear to reflect any direct relationship of budgetary allocation with either infrastructure capacity or needs.[16] For Africa, applying a 5% to 6% benchmark across the continent for future needs would lead to infrastructure spending requirements of around $120 billion to $140 billion per year in the short-term (2015 US$), compared to current infrastructure spending of $83.5 billion.[17][18]

Sources of finance for future infrastructure investments

Potential sources of finance for future infrastructure spending include:

- *Government money*
  - **From domestic resources**: government fiscal resources through the budgetary process
  - **From external resources**: cross-border IFI loans and guarantees, cross-border sovereign and sub-sovereign loans, governments issuing sovereign-guaranteed offshore bonds
- *Private money*
  - **Private sector investors**: conventional equity and debt investments including through Public-Private Partnerships (PPPs)
  - **Institutional investors**: tapping domestic and international financial markets through infrastructure bonds and other securities purchased by insurance companies, pension funds, and the like

As noted previously, the African continent relies heavily on government sources of finance to fund its infrastructure spending. Taken together, governments' own fiscal resources plus offshore public money from DFIs and other governments represent 91.1% of total financing. Private sources in their different forms represented 8.9% of the total in 2015 (a near doubling compared to 2014) and rarely exceeds 5% in a typical year. This private money is largely from private sector investors, both direct and through PPPs, rather than from institutional investors via securities markets. Institutional investors, both domestic and international, contribute a small fraction of the total, although these sources of potential finance represent approximately $80 trillion worldwide.[19] Increasing Africa's annual infrastructure investments by $40 billion to $60 billion per year will require tapping into funds held by institutional investors, thus mobilizing domestic and international savings currently held in insurance companies, pensions, sovereign wealth funds, and private equity funds and endowments.

Obstacles to attracting financing from the private sector

Even in developed markets, there is the belief that the private sector, particularly institutional investors, could be better harnessed to support investment in new infrastructure. In the developing world, this problem is exacerbated, although larger middle income developing countries have started to see a trend toward greater involvement of institutional investors in their infrastructure sectors for larger projects. In Africa, by contrast, these investors are almost invisible in the infrastructure space. The question can be asked why this is so.

Private investors require a return on their investment. It is important to note that this source of potential funding is therefore not appropriate for all infrastructure subsectors but must be reserved for those subsectors able to

16. Gutman, J., Sy, A., & Chattopahyay, S. (Brookings, 2015): *Financing African Infrastructure – Can the World Deliver?* Washington: World Bank, and other recent World Bank data.
17. In 2009, the World Bank issued a comprehensive report on African Infrastructure that estimated that $93 billion per year is needed to meet the infrastructure needs of Sub-Saharan Africa alone.
18. Infrastructure economists estimate magnitudes of investment needs based on countries' existing physical infrastructure stocks and the elasticity of stocks' growth with respect to national income. For most countries, elasticities are close to 1 for most infrastructure sectors. Therefore, as a first approximation, physical infrastructure stocks increase more or less in line with GDP growth.
19. Worldwide assets under management are estimated at $120 trillion, of which $80 trillion by institutional investors and $40 trillion by banks (McKinsey Global Institute, 2016).

African governments and regional securities markets can do more to streamline and harmonize financial sector and business regulations to attract more investment, in general, and from institutional investors, in particular.

generate revenues through user fees (energy, telecoms, ports and airports, toll roads, and toll bridges). Three major obstacles need to be addressed to allow private investors to participate in financing African infrastructure:

1. *Circumscribing investor risk*
    - **Private sector-friendly business environment**: African governments do not always encourage dynamic private sector engagement in their countries. Financial sector regulation and cross-border investment rules on the African continent also often limit investor appetite for infrastructure projects, and many overlapping and contradictory national regulations create barriers to investment.[20] African governments and regional securities markets can do more to streamline and harmonize financial sector and business regulations to attract more investment, in general, and from institutional investors, in particular.
    - **Streamline and standardize Africa's investment frameworks**: Different political, regulatory, and legal frameworks and policies lead to inconsistent regulatory decisions across the continent that balkanize markets and increase investor uncertainty. African governments at a regional level need to establish and enforce a body of laws and regulations that (i) provides for fair and equitable treatment, national treatment, and most-favored-nation treatment of foreign investment; and (ii) provides for resolution of disputes between business and government through binding offshore dispute-resolution mechanisms. Adoption by African countries of the OECD Declaration on International Investment and Multinational Enterprises could be an important first step. African countries need to think of development in terms of multi-country economic corridors and refashion their regulatory frameworks accordingly.
    - **Risk management and credit enhancement at the project level**: For institutional investors, infrastructure investment is an alternative to government securities: they generate higher yield, yet can be relatively low-risk. Risks can be circumscribed and financing costs brought down through credit enhancement mechanisms such as partial risk guarantees, mezzanine investment tranches which absorb first-loss, and political risk insurance. Multilateral Development Banks (MDBs), such as the World Bank, IFC, AfDB, and MIGA, all have these mechanisms in their toolboxes but do not deploy them sufficiently[21] to support Africa's infrastructure. Instead, these institutions seem to prefer deploying their own scarce resources in the form of sovereign loans and credits. These do not crowd in institutional lenders and simply add to governments' sovereign debt burden. Much can be done to strengthen the MDBs' game to crowd in the private sector better.
2. *Developing African infrastructure as an asset class*
    - **Regional exchanges**: In most cases, Africa's national exchanges will be too modest in scope to attract major international players on their own. The major regional securities exchanges need to be strengthened to serve multiple countries in the region and attract large institutional investors (e.g. JSE in South Africa, UEMOA securities exchange

20. Basel III and Solvency II also create barriers to investment: they mandate high-risk capital allocations for infrastructure, which runs counter to the actual profiles of infrastructure investments that (once operational) are often low-risk.

21. With, perhaps, the exception of MIGA.

Unless pipelines of bankable projects are established and made public, involving the private sector will be difficult.

in Abidjan, Nairobi Stock Exchange, Bourse de Casablanca). Multilateral development banks need to step up to play the role of market makers, for example, by financing project preparation to make greenfield infrastructure projects bankable and creating and securitizing pipelines of bundled brownfield assets for listing on the exchanges.

- **Standardization**: Institutional investors require standardized documentation, transparent and recognized credit ratings (the quality of investments must often be of investment grade and above), and consistency of security instruments. Financial terms and risk categories need to be consistent, risk-return reviews and credit ratings established, and market indexes developed. This needs to be done at the supranational level to ensure regional consistency.
- **Pooling in order to tap financial markets**: Many African infrastructure projects are simply too small on their own to attract institutional investors, and this is true also for some countries. Pooling of projects (including across countries), development of investment funds, and securitization will be needed.[22] In particular, experience with private sector financing of infrastructure in the developed world underlines the potential of refinancing brownfield assets through market mechanisms and recycling the freed-up resources into new greenfield projects. A widely recognized and respected market maker such as an MDB will be needed to undertake these tasks.

3. *Pipelines of bankable projects*

- **Project feasibility**: Identified infrastructure gaps have often not been fleshed out into project concepts; feasibility studies have not been undertaken; or the project has not been adequately structured financially to ensure bankability. The essential prior work needs to be financed and undertaken before private sector financing can be secured. Unless pipelines of bankable projects are established and made public, involving the private sector will be difficult.
- **User-fee reservation for debt service**: Where infrastructure subsectors have the potential to generate revenues, these revenues should be used to service the associated debt. In cases where such projects have been adequately prepared, potential revenues have often not been demarcated as user fees and reserved for this purpose. Instead, they are often absorbed through the tariff structure into an often-insolvent public utility, which, because of its precarious financial situation, is unable to service the debt. For the private sector to be able to invest in such cases, either the user fee must be paid into an escrow mechanism established for the purposes of servicing the debt or an external body must step in and guarantee the utility's payment obligations.
- **Brownfield assets will be simpler to finance than greenfield projects**: Even when projects have been well defined and user fees earmarked, the overall riskiness of the project increases the risk spread that investors will require. This can make the cost of financing prohibitively expensive for the investment. To create an infrastructure asset class with a manageable risk profile, a

22. In this regard, a salutary first step has been taken by the African Development Bank with the creation of the Africa 50 Infrastructure Fund to tap into the institutional investor segment.

Depending on the infrastructure sector concerned, African governments need to consider moving away from the existing SOE utility model, just as they did with the telecom sector following the introduction of mobile phones.

clear first step would be to refinance a pool of existing revenue-generating infrastructure assets where construction risk is minimal and cashflows are already well known. Refinancing such brownfield assets would allow the initial investment capital to be freed up and recycled into new infrastructure investments.

To put in place the above prior conditions, action is needed at the supranational and regional level. There is a clear role for one or several MDBs to support the harmonization of regulatory and business environments at the sub-regional level: develop African infrastructure as an asset class; and create pipelines of bankable projects with manageable risk. This could, for example, be achieved through a dedicated African Infrastructure Facility with very clear mission and guidelines.

Key findings for infrastructure financing

Inadequate private financing: Africa does not call on significant private financing of infrastructure and current financing is mostly in the form of sovereign (fiscal revenue or government-guaranteed borrowings) or Official Development Assistance (ODA). In particular, Africa makes almost no call on assets managed by institutional investors although these represent a significant potential source of funding to finance the required increase in spending on the continent.

Private financing will not flow regularly for infrastructure until the different sectors are creditworthy, which in most cases involves moving away from the rigid state-owned enterprise (SOE) utility models to new institutional setups. This has been done successfully in a number of examples, most notably delegation of water and sanitation to a private enterprise in Senegal and a privately-run electric power system in Cote d'Ivoire. Still, this approach does not seem to attract much enthusiasm from the continent's decision makers. However, there is considerable scope to create African infrastructure as an asset class to attract institutional investors and bring fresh funding to the table.

Action agenda

As this paper indicates, Africa needs more infrastructure investment, and it needs better operation and maintenance of its infrastructure stocks to achieve better infrastructure services for its economies and its population from these stocks. These dual but compatible objectives suggest that African decision makers need to focus on three sets of actions.

New models for the delivery of infrastructure services

Depending on the infrastructure sector concerned, African governments need to consider moving away from the existing SOE utility model, just as they did with the telecom sector following the introduction of mobile phones. A model based on multiple privately owned and financed operators is in many cases not applicable (e.g. for road infrastructure), but where technology allows, this model should be considered. Specifically, the following might be considered:

- **Power**: This is the sector with the most potential for tapping new technologies, notably solar and other renewables, in a delivery model that involves privately owned and financed off-grid and mini-grid systems. However, governments must accept dismantling the de facto and de jure monopolies that currently favor the incumbent utility.
- **Transport**: The sector needs to move away from national systems and toward a regional (multi-national) planning and investment program. Notably, governments need to seek real physical integration by developing transport corridors with significant private sector investment (ports, rail, toll-roads) and with bonded transport and storage facilities, such as inland ports.
- **ICT**: Mobile telephony functions for the most part quite well, although better attention could be paid to interconnectivity of competing systems. The most urgent need is to strengthen fixed broadband Internet access by introducing open access

The most glaring area for progress in infrastructure financing is to increase flows of private finance, particularly institutional investors (pension funds and insurance companies).

to trunk-line fiber-optic cables and gateways, encouraging competition. Again, this needs a policy decision from governments to move away from current monopoly situations, in many cases run by the rump of the former fixed line telecoms operator (e.g. in Niger), and to encourage competition and open markets.

- **Water and sanitation**: This sector has had the greatest success in moving to privately run (and to some extent financed) operational models, notably concessions and affermages. Other countries need to consider such institutional setups.

Improved management of assets

New institutional setups, such as those outlined above, will begin to address the poor operation and maintenance records of African infrastructure operators. In the case of concessions and affermages, specific maintenance requirements can be included in relevant contractual documentation, with penalties in case of non-respect. In the case of privately owned assets (telecoms), investors have an economic incentive to operate and maintain their asset correctly.

Cost-reflective tariffs: In addition to new institutional setups, there needs to be a focus on principles to ensure that operation and maintenance are fully funded. Current tariff mechanisms often set prices for consumers below long-run marginal costs, with the result that the investor/operator is not financially viable and is therefore unable to cover its costs. Maintenance, as it can be deferred (unlike direct costs such as salaries), is generally the first cost item to be cut, which leads to deterioration of the physical asset.

Payment by government: Governments and government agencies have a poor track record for paying infrastructure tariffs (electricity and water, in particular) across the continent. This forgone revenue contributes to sector operators' financial hardship and inability to fully finance operation and maintenance. African governments need to consider approaches, such as hard budget constraints and fixed line-items in national budgets, to cover payment for these services. It should be noted that there have been interesting experiences for payment of tariffs by government agencies, e.g. through the use of pre-paid mobile telecoms cards, that could be further explored.

Innovative financing

Need for private financing: The most glaring area for progress in infrastructure financing is to increase flows of private finance, particularly institutional investors (pension funds and insurance companies). The measures outlined above (new delivery models and improved operations and maintenance), associated with cost-reflective tariffs and payment by government for the services it consumes, will go some way toward improving the financial viability of the sector and hence its creditworthiness and ability to attract private financing.

However, the priority for African governments must be to develop domestic financial markets and instruments to channel national savings to long term infrastructure projects. This will involve, in particular, development of domestic debt markets at the regional level, and the creation of African infrastructure as an asset class to attract institutional investors.

Annex: African infrastructure financing commitments, 2015

Table A1: Commitments by region and sector (billions of dollars)

	Transport	Water	Energy	ICT	Multi-sector	Other	Total
North Africa	5,141	2,109	5,144	269	838	632	14,132
West Africa	7,114	1,371	5,412	576	650	72	15,195
Central Africa	2,252	622	1,350	562	135	–	4,921
East Africa	11,779	1,960	5,350	177	26	–	19,293
Southern Africa	2,694	1,452	10,631	704	28	463	15,971
RSA	4,763	509	6,254	12	132	–	11,669
Other	943	94	526	220	409	–	2,191
Total commitments	34,686	8,117	34,668	2,519	2,216	1,167	83,372

Source: Infrastructure Consortium for Africa (2016)

Table A2: Commitments by region and source (billions of dollars)

	ICA	ACG	RDBs	China and others	European non-ICA	National governments	Private sector	Total
North Africa	4093	1921	–	–	691	6199	1229	14132
West Africa	4014	1201	359	4449	14	3879	1280	15195
Central Africa	1308	498	55	482	68	2190	320	4921
East Africa	4702	467	5	7084	74	6915	45	19293
Southern Africa	1793	325	–	7727	8	5364	755	15971
RSA	1740	–	–	2238	23	3855	3813	11669
Other	2191	–	–	–	–	–	–	2191
Total commitments	19841	4412	418	21980	876	28402	7442	83372

Source: Infrastructure Consortium for Africa (2016)

Table A3: Commitments by source and sector (billions of dollars)

	Transport	Water	Energy	ICT	Multi-sector	Other	Total
ICA members	6771	3184	8635	616	634	–	19841
ACG	2072	378	1555	17	392	–	4412
RDBs	174	48	95	76	26	–	418
China and others	9932	268	10748	1032	–	–	21980
Non-ICA Europeans	346	–	458	73	–	–	876
National governments	15278	4125	5962	705	1165	1167	28402
Private sector	114	114	7215	–	–	–	7442
Total commitments	34686	8117	34668	2519	2216	1167	83372

Source: Infrastructure Consortium for Africa (2016)

Note: ICA members include G8 countries, the World Bank Group, the African Development Bank (AfDB) Group, the European Commission, the European Investment Bank and Development Bank of South Africa. ACG: Arab Coordination Group; RDB: Regional Development Bank (Central African States Development Bank, Development Bank of South Africa, ECOWAS Bank for Investment and Development, East Africa Development Bank, West African Development Bank).
Donor financing is assumbed to group ICA members, RDBs, and non-ICA Europeans.

References

Banerjee, S. & Morella, E. (2011). *Africa's Water and Sanitation Infrastructure -- Access, Affordability, and Alternatives*. Washington: World Bank.

Bloomberg. (2013). *What Africa Can Teach Us About the Future of Banking*.

BP. (2015). *BP Statistical Review*.

Castellano, A., Kendall, A., Nikomarov, M., & Swemmer, T. (2015). "Powering Africa." McKinsey.

The Economist. (4 June 2016). "Railways in Africa: Puffed out." *The Economist*.

Gutman, J., Sy, A., & Chattopahyay, S. (2009). *Financing African Infrastructure – Can the World Deliver?* Washington: World Bank.

Gwilliam, K. et al. (2008). "Africa Infrastructure Country Diagnostic: Roads in Sub-Saharan Africa." *AICD Background Paper*. Washington: World Bank.

IEA. (2015). *World Energy Outlook 2015*. Paris: IEA.

International Telecommunication Union. (2014). ICT Statistics.

Ingram, G., Liu, Z., & Brandt, K. (2013). *Metropolitan Infrastructure and Capital Finance*.

Tuluy, H. (2017). "Regional Integration in Africa," Fifth Africa Emerging Markets Forum, Abidjan, 26-27 March 2017.

World Bank. (1994). *World Development Report 1994: Infrastructure and Development*. Washington: World Bank.

World Bank. (2009). *Africa's Infrastructure: A Time for Transition*. Washington: World Bank.

World Bank. (2016). World development indicators.

The Emerging Markets Forum was created by the Centennial Group as a not-for-profit initiative to bring together high-level government and corporate leaders from around the world to engage in dialogue on the key economic, financial and social issues facing emerging market countries.

The Forum is focused on some hundred market economies in East and South Asia, Eurasia, Latin America and Africa that share prospects of superior economic performance, already have or seek to create a conducive business environment and are of near-term interest to private investors, both domestic and international.

Further details on the Forum and its meetings may be seen on our website at http://www.emergingmarketsforum.org

The Watergate Office Building, 2600 Virginia Avenue, NW, Suite 201

Washington, DC 20037, USA. Tel:(1) 202 393 6663 Fax: (1) 202 393 6556

Email: info@emergingmarketsforum.org