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AICD
AFRICA INFRASTRUCTURE COUNTRY DIAGNOSTIC

COUNTRY REPORT

Benin's Infrastructure: A Continental Perspective

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JUNE 2011

Africa's Infrastructure | A Time for Transformation

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A publication of the World Bank.

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About AICD and its country reports

This study is a product of the Africa Infrastructure Country Diagnostic (AICD), a project designed to expand the world's knowledge of physical infrastructure in Africa. AICD provides a baseline against which future improvements in infrastructure services can be measured, making it possible to monitor the results achieved from donor support. It also offers a solid empirical foundation for prioritizing investments and designing policy reforms in Africa's infrastructure sectors.

The AICD is based on an unprecedented effort to collect detailed economic and technical data on African infrastructure. The project has produced a series of original reports on public expenditure, spending needs, and sector performance in each of the main infrastructure sectors, including energy, information and communication technologies, irrigation, transport, and water and sanitation. *Africa's Infrastructure—A Time for Transformation*, published by the World Bank and the Agence Française de Développement in November 2009, synthesized the most significant findings of those reports.

The focus of the AICD country reports is on benchmarking sector performance and quantifying the main financing and efficiency gaps at the country level. These reports are particularly relevant to national policy makers and development partners working on specific countries.

The AICD was commissioned by the Infrastructure Consortium for Africa following the 2005 G8 (Group of Eight) summit at Gleneagles, Scotland, which flagged the importance of scaling up donor finance for infrastructure in support of Africa's development.

The AICD's first phase focused on 24 countries that together account for 85 percent of the gross domestic product, population, and infrastructure aid flows of Sub-Saharan Africa. The countries are: Benin, Burkina Faso, Cape Verde, Cameroon, Chad, Côte d'Ivoire, the Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Uganda, and Zambia. Under a second phase of the project, coverage was expanded to include as many of the remaining African countries as possible.

Consistent with the genesis of the project, the main focus is on the 48 countries south of the Sahara that face the most severe infrastructure challenges. Some components of the study also cover North African countries so as to provide a broader point of reference. Unless otherwise stated, therefore, the term "Africa" is used throughout this report as a shorthand for "Sub-Saharan Africa."

The World Bank has implemented the AICD with the guidance of a steering committee that represents the African Union, the New Partnership for Africa's Development (NEPAD), Africa's regional economic communities, the African Development Bank (AfDB), the Development Bank of Southern Africa (DBSA), and major infrastructure donors.

Financing for the AICD is provided by a multidonor trust fund to which the main contributors are the United Kingdom's Department for International Development (DFID), the Public Private Infrastructure Advisory Facility (PPIAF), Agence Française de Développement (AFD), the European Commission, and Germany's Entwicklungsbank (KfW). A group of distinguished peer reviewers from policy-making and academic circles in Africa and beyond reviewed all of the major outputs of the study to ensure the technical quality of the work. The Sub-Saharan Africa Transport Policy Program and the Water and Sanitation Program provided technical support on data collection and analysis pertaining to their respective sectors.

The data underlying the AICD's reports, as well as the reports themselves, are available to the public through an interactive Web site, www.infrastructureafrica.org, that allows users to download customized data reports and perform various simulations. Many AICD outputs will appear in the World Bank's Policy Research Working Papers series.

Inquiries concerning the availability of data sets should be directed to the volume editors at the World Bank in Washington, DC.

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Acknowledgments

This paper draws upon a wide range of contributions from sector specialists from the Africa Infrastructure Country Diagnostic Team; notably, Heinrich Bofinger on air transport, Alberto Nogales on roads, Rupa Ranganathan on power, Michael Minges on Information and Communication Technologies, Nataliya Pushak on public expenditure, and Alvaro Federico Barra on spatial analysis.

The paper is based on data collected by local consultants and benefited greatly from feedback provided by colleagues in the Benin country team; notably, Cal MacWilliam (Senior Country Economist); and Pierre Pozzo di Borgo (transport), Alexandre K. Dossou (transport), Anca C. Dumitrescu (transport), Lucien Andre Aegerter (railways), and Franklin Koffi Gbedey (energy).

Synopsis

Between 2000 and 2005 infrastructure made an important contribution of 1.6 percentage point to Benin's improved per capita growth performance, which was the highest among West African countries during the period. Raising the country's infrastructure endowment to that of the region's middle-income countries could boost annual growth by about 3.2 percentage points.

Benin has made significant progress in some areas of its infrastructure. The rural road network is in relatively good condition, and about 30 percent of the rural population has access to an all-season road, a level above the country's peers. Air transport connectivity has improved. Also, important market-liberalization reforms designed to attract private capital to the water and information and communications technology (ICT) sectors have boosted performance. In particular, increased competition in the ICT market has contributed to the rapid expansion of mobile and Internet services.

Looking ahead, the country faces important infrastructure challenges. To increase the efficiency of moving goods from and to Benin, the overall condition of the road corridors needs to be improved and the performance of the Port of Cotonou enhanced. In the power sector the country is both economically and financially exposed to a deteriorating stock of infrastructure that the country can no longer afford to maintain; inefficient and unreliable power supplies also take their toll. In the water and sanitation sector, the country needs to improve the quality of its infrastructure to expand access to improved water supply and sanitation services, increase consumption per capita, reduce distributional losses, and strengthen the operation performance of SONEB, the national urban and peri-urban water and sanitation utility. Expanding the Internet market and enhancing the participation of the private sector are the main challenges in the ICT sector.

Addressing Benin's infrastructure challenges will require sustained expenditures of $712 million per year over the next decade, with heavy emphasis on capital expenditure. Almost half of the total relates to the transport sector. At 16.6 percent of Benin's 2005 gross domestic product (GDP), this effort is almost at the level of other Sub-Saharan African countries.

Benin already spends around $452 million per year on infrastructure, equivalent to about 10.5 percent of its GDP. Almost $101 million a year is lost to inefficiencies of various kinds, associated mainly with underpricing in the power and water sectors; poor financial management of utilities; and inefficient allocation of resources across sectors. If Benin could raise tariffs to cost-recovery levels, and reduce operational inefficiencies in line with reasonable developing-country benchmarks, it could substantially boost flows to the infrastructure sectors.

Comparing spending needs with existing spending and potential efficiency gains (and assuming that the inefficiencies are fully captured) leaves an annual funding gap of $210 million per year. By far the largest share of the gap can be traced to the water supply and sanitation sectors. Benin has the potential to close this gap by adopting alternative technologies in water supply, transport and power. Savings from alternative technologies could amount to as much as $227 million per year.

The continental perspective

The Africa Infrastructure Country Diagnostic (AICD) has gathered and analyzed extensive data on infrastructure in more than 40 Sub-Saharan countries, including Benin. The results have been presented in reports covering different areas of infrastructure—ICT, irrigation, power, transport, water and sanitation—and different policy areas—including investment needs, fiscal costs, and sector performance.

This report presents the key AICD findings for Benin, making it possible to benchmark the country's infrastructure situation against that of its African peers. Given that Benin is a poor but stable country (per capita income of $690 in 2008), two sets of African benchmarks will be used to evaluate Benin's situation: nonfragile low-income countries and middle-income countries. Detailed comparisons will also be made with immediate regional neighbors in the Economic Community of West African States (ECOWAS).

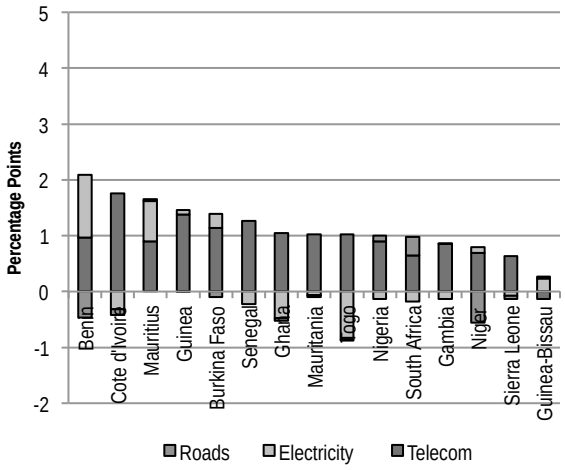
Several methodological issues should be borne in mind. First, because of the cross-country nature of data collection, a time lag is inevitable. The period covered by the AICD runs from 2001 to 2006. Most technical data presented are for 2006 (or the most recent year available), while financial data are typically averaged over the available period to smooth out the effect of short-term fluctuations. Second, in order to make comparisons across countries, it was necessary to standardize the indicators and analysis so that everything was done on a consistent basis. That means that some of the indicators presented here may be slightly different from those that are routinely reported and discussed at the country level.

Why infrastructure matters

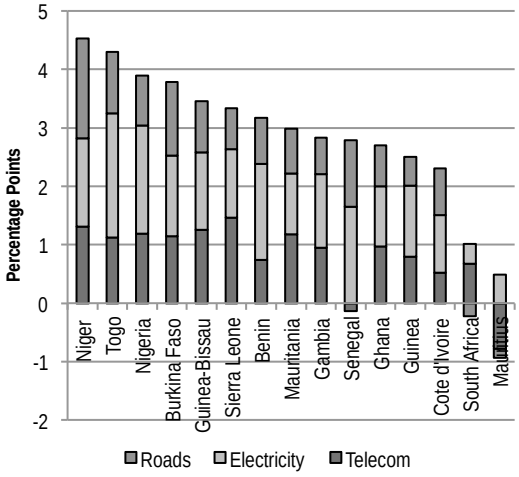
Between 2002 and 2006 Benin's growth rate, at 3.3 percent per year, slowed from the rates of 4.9 percent per year registered between 1997 and 2001. Both levels are less than the 7 percent that would be needed to significantly reduce poverty. Nevertheless, the overall net contribution of infrastructure to Benin's growth in the early 2000s was the highest, at 1.6 percentage points, of the countries of West Africa (figure 1a). As elsewhere, the ICT sector was responsible for most of this contribution, adding almost 1 percentage point to the per capita growth rate, while the road sector actually held back per capita growth by –0.5 percentage points. Looking ahead, if Benin could improve its infrastructure to the level of the middle-income countries of the subcontinent, growth performance could be enhanced by as much as 3.2 percentage points per capita (figure 1b).

Figure 1. Infrastructure has contributed much to economic growth—but could contribute much more

a. Infrastructure's contribution to annual per capita economic growth in West African countries, in percentage points, 2001-05



b. Potential contributions of infrastructure to annual per capita economic growth in West African countries, in percentage points

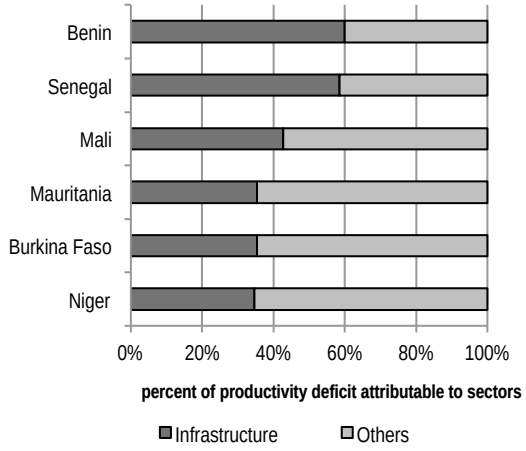


Source: Calderon 2009.

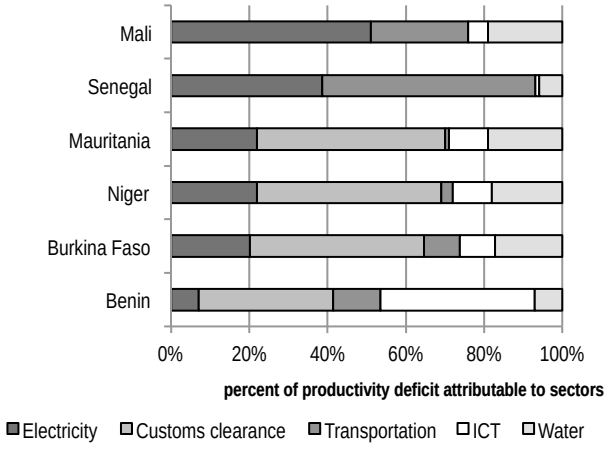
Evidence from enterprise surveys suggests that infrastructure constraints were responsible for about 60 percent of the productivity handicap faced by Beninese firms (figure 2a), with the remainder traceable to poor governance, red tape, and financing constraints. Of the countries of the region, infrastructure constraints were highest in Benin. Customs clearance before export was the constraint that weighed most heavily on the country's firms. The time waiting for phone connections was the second-most-important constraint for increasing productivity (figure 2b). Transport is also a major issue hindering firms' productivity. The average output loss owing to electricity supply problems is about 7.5 percent, a number higher than in most countries in Sub Saharan Africa (World Bank 2005a).

Figure 2. Infrastructure deficits hold back firms' productivity

a. Degree to which infrastructure is perceived by firms as an obstacle to growth



b. Degree to which infrastructure is perceived by firms as an obstacle to growth, by sub-sector



Source: Escribano and others 2009.

The state of Benin's infrastructure

This report begins by reviewing achievements and challenges in each of Benin's major infrastructure sectors, with the key findings summarized in table 1. Thereafter, attention turns to the problem of how to finance Benin's infrastructure needs.

Table 1. Achievements and challenges in Benin's infrastructure sectors

	Achievements	Challenges
Transport	Relatively low cost of moving goods across borders	Reducing delays at the Port of Cotonou
Roads	Adequate road density Relatively good condition of the rural road network and high rural access to all-season road	Improving quality of road network, in particular the segments in regional corridors Better financing for road network maintenance Enforcing the UEMOA axle-load control policy [a]
Ports	Adoption of security plans	Decongesting the Port of Cotonou to improve its performance and competitiveness in West Africa
Railways		Boosting traffic and productivity
Air transport	Turnaround of connectivity trend Renovated fleet	Improving safety conditions Increasing traffic
Water and sanitation	Reduced reliance on surface water and open defecation by extending access to high cost technologies Progress in the financial performance of SONEB	Expanding access to safe water and sanitation in rural areas Improving SONEB's operational performance
Irrigation		Expanding irrigated area through large-scale projects
Power	Increased access to electricity in urban areas Relatively low distributional losses and high collection rates	Increasing the volume, reliability, and quality of the electricity supply Tackling underpricing of services in SBEE and CEB
ICT	Rapid expansion of mobile and Internet markets	Improving institutional environment to enhance sector liberalization and private participation

Source: Authors' elaboration based on findings of this report.

Note: UEMOA = Union Economique et Monétaire Ouest-Africaine; SONEB = Société Natiaonale des Eaux du Bénin; SBEE= Societe Béninese d'Energie Electrique; CEB=Communauté Electrique du Benin

The heavily marked differences in population concentration, rain precipitation, and soil characteristics between the northern and southern (coastal) areas of Benin have defined two distinctive economic regions and shaped a largely imbalanced infrastructure that hinders the development of the country as a whole. The North, with only one rainy season per year and therefore less agricultural potential, has stone formations that come to the surface, creating opportunities for the exploitation of metallic minerals such as chrome, uranium, and manganese. But, the relatively poorer infrastructure of the North makes the cost of transport prohibitive and discourages further prospecting in these mineral deposits. The South, with two rainy seasons per annum and soils capable of preserving the humidity, is characterized by intensive agricultural activity (figure 3c).

Population location and poverty incidence follow the pattern of economic development. Compared with other African countries of similar size and development, Benin is heavily urbanized, with nearly 45 percent of its 8.7 million people living in urban areas, mostly in the southern cities of Cotonou and Porto

Novo, and in the central city of Parakou (figure 3a), where the economic and social situation is relatively well developed compared with the rural areas of the North. On average, Benin's density is 60 inhabitants per square kilometer, but that figure masks important differences across regions. Whereas the northern province of Borgou contains areas with less than 10 inhabitants per square kilometer, in the southern and coastal province of Atlantique most areas have more than 300 inhabitants per square kilometer. Poverty is high with 37 percent of Benin's population living below the poverty line, but in the northern province of Atacora more than 70 percent of the population lives under the poverty line.

The distribution of infrastructure networks clearly reflects Benin's economic development and population distributions. Benin's economy relies heavily on cotton exports (30 percent of total exports during 2007–08) and trade with Nigeria and, to a lesser extent, Togo. Trade with Nigeria represents around 6.5 to 7.5 percent of GDP. The 2009 financial crisis slowed GDP growth to 2.7 percent due to lower cotton prices and weaker demand for exports.

In recent years strong agricultural production, increasing activity in the Port of Cotonou, and high demand from Nigeria, Togo, Burkina Faso, and Niger have been central to Benin's economic growth. As a consequence, Benin has a high density of transport, power, and ICT infrastructure crossing the country lengthwise and integrating the country with regional networks in Burkina Faso and Nigeria (figure 3).

On the transport side, Benin has a binational railway line jointly owned jointly with Niger (Organisation commune Bénin-Niger des Chemins de Fer et des Transports, OCBN). The line between Cotonou and Parakou is part of one of the main transport corridors in the country, linking the north and central part of the country to the main sea port in Cotonou. The country's international airport is located in Cotonou.

The total length of the road network in Benin is about 15,700 km. It consists of about 6,076 km of main roads (interstate roads and national roads), 7,800 km of rural roads, and 1,800 km of urban roads (secondary and tertiary roads in urban areas). Two paved north–south corridors link Cotonou and Niamey (Niger), and Cotonou, Ouadougu (Burkina Faso), and Bamako (Mali). Those axes are complemented with five east–west corridors that connect Togo, Benin, and Nigeria; two of these are paved.

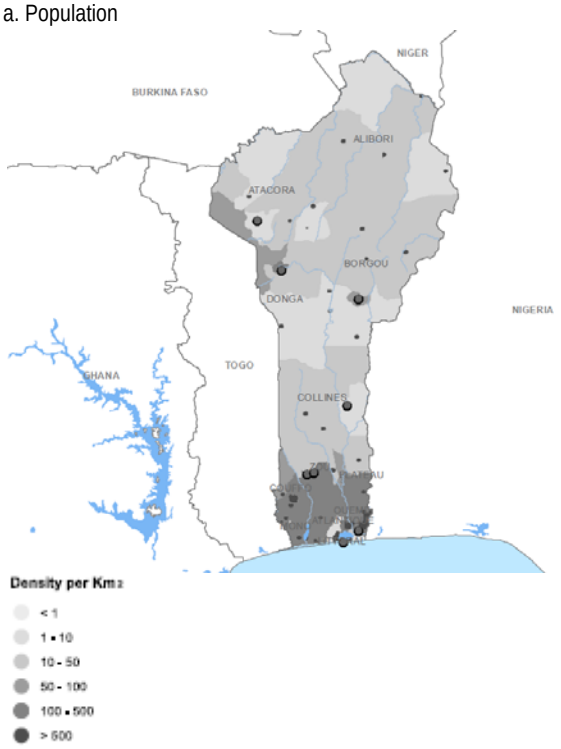
Benin imports its energy from Togo, where it is produced by CEB (*Communauté Electrique du Benin*), a binational company owned by Benin and Togo. Energy is then distributed by SBEE (*Societe Béninese d'Energie Electrique*). Although the SBEE historically has not engaged in power generation, it has met the increasing demand-supply gap in Benin through supplemental diesel generation (both rented and owned).

Water is mainly supplied through boreholes and sanitation through improved latrines.

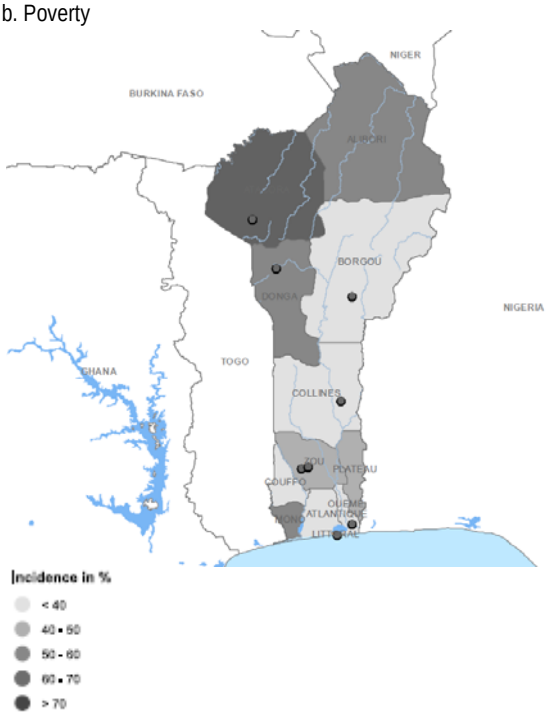
The domestic ICT backbone runs the length of the country from the populated coastal areas in the south up to the northern border with Niger. There are spurs joining fiber optic backbones in Burkina Faso, Niger, Nigeria, and Togo (figure 4c).

Figure 3. Benin's population is concentrated in the South of the country and poverty in the north

a. Population

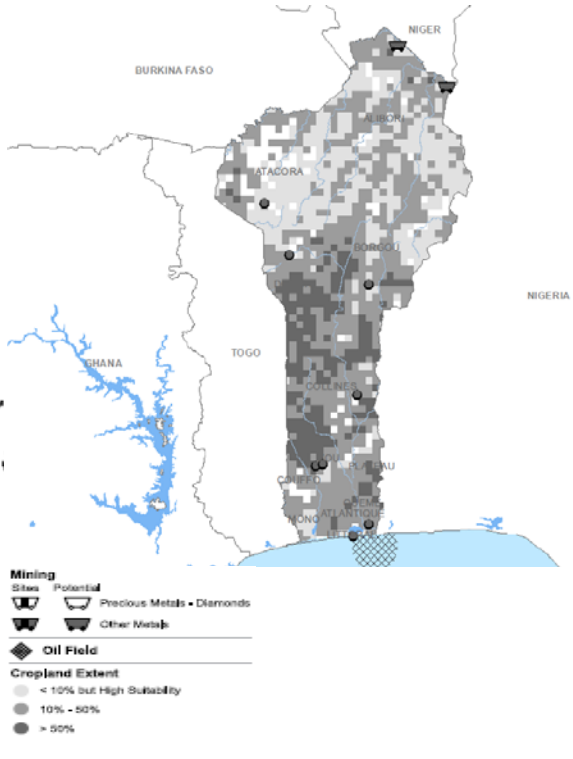


b. Poverty



c. Topography

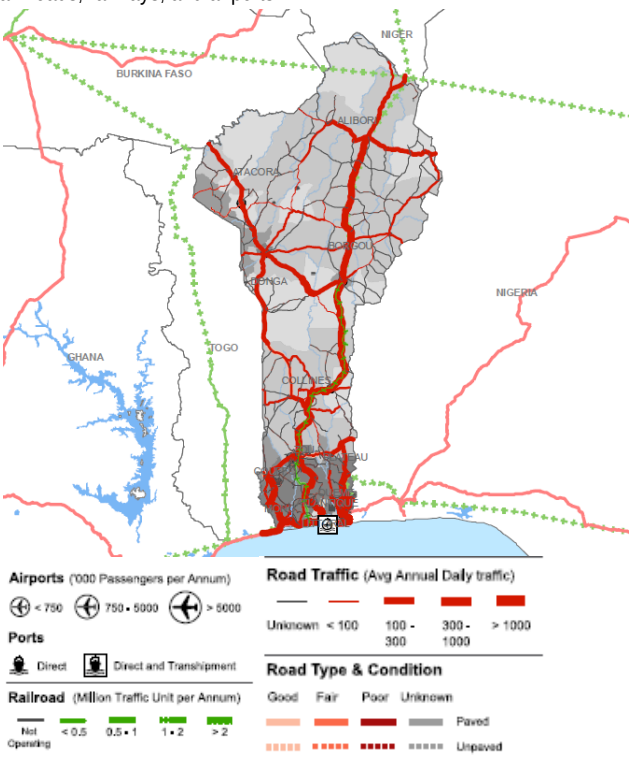
d. Natural resources



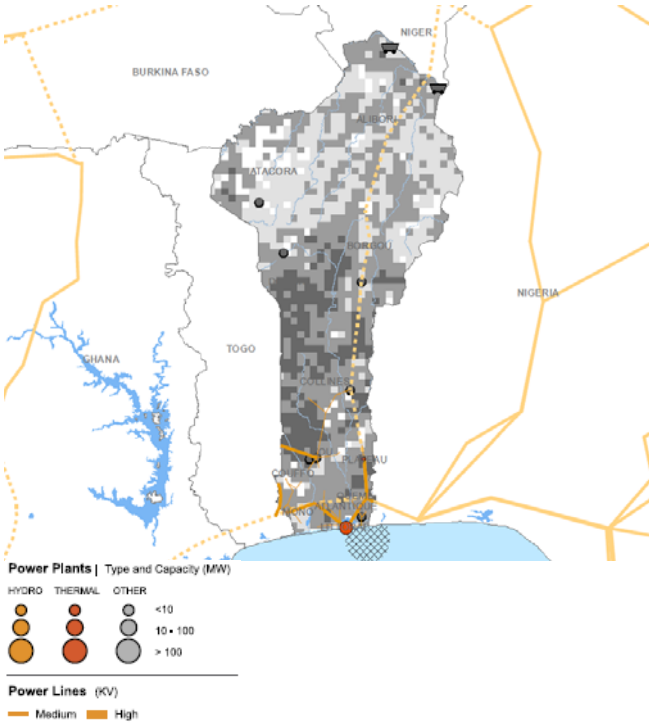
Source: AICD Interactive Infrastructure Atlas for Benin downloadable from http://www.infrastructureafrica.org/aicd/system/files/gha_new_ALL.pdf

Figure 4. Infrastructure networks follow population density and natural resources

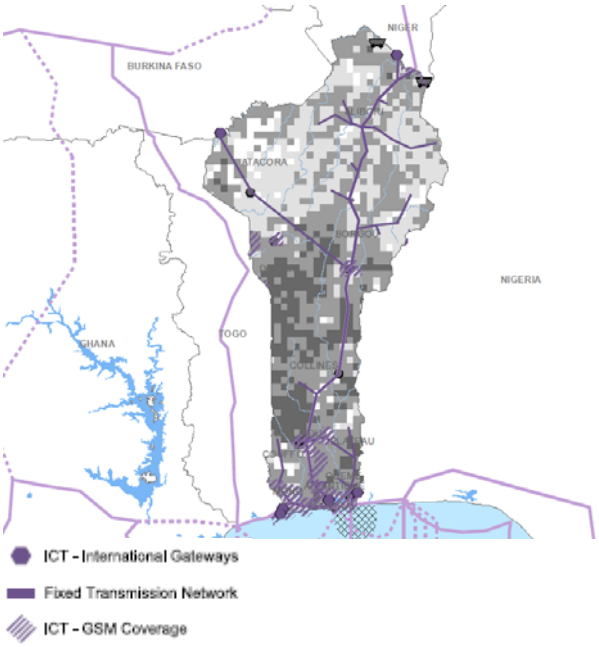
a. Roads, railways, and airports



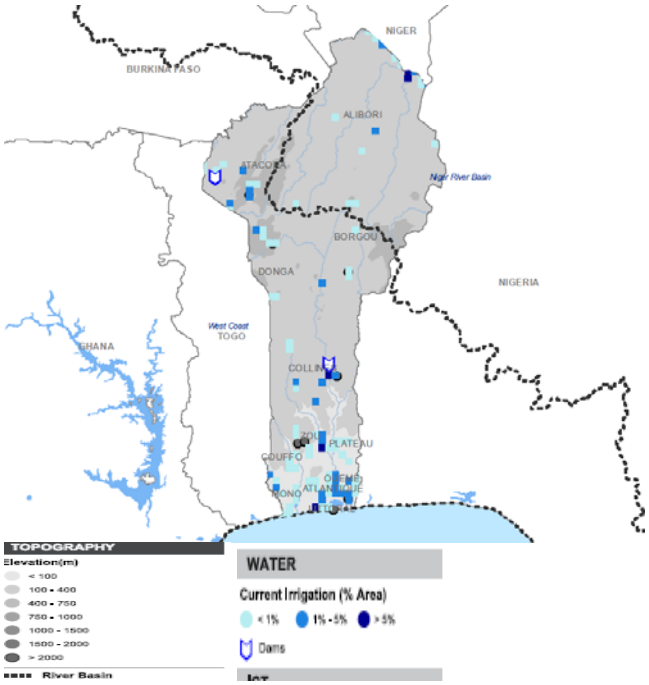
b. Power



c. ICT



d. Water resources



Source: AICD Interactive Infrastructure Atlas for Benin downloadable from http://www.infrastructureafrica.org/aicd/system/files/gha_new_ALL.pdf

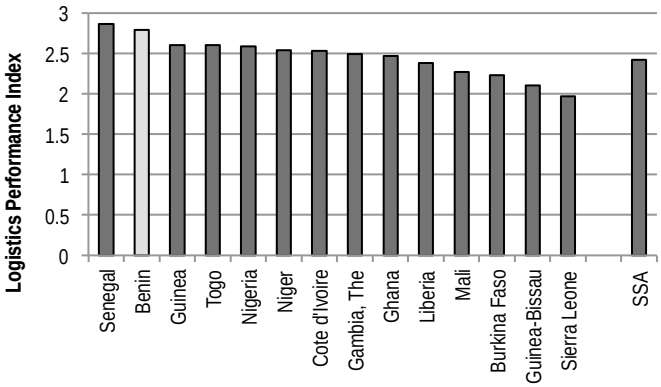
Transport

Owing to its strategic location neighboring Nigeria and providing access to the landlocked countries of West Africa (Burkina Faso, Niger), Benin is a natural hub for the region, with the port of Cotonou as the main entrance. Cotonou is also the starting point of the Benin-Niger Railway (OCBN), which extends 578 kilometers into the interior and ends in Parakou (Benin). From there, goods must be trucked another 380 kilometers to the Niger River, increasing transport costs and transportation time. Firms must wait up to a month to get rail service, and two to four months for the return of containers from Niger. It appears that OCBN would lose market share and would not be competitive if additional costs were not transferred to surface transport carriers in the form of official fees (World Bank 2005a).

There are two paved North–South corridors between Cotonou and Niamey (Niger), and Cotonou, Ouagadougou (Burkina Faso), and Bamako (Mali). Those axes are complemented by five East–West corridors, of which two are paved, connecting Togo, Benin, and Nigeria.

Despite its poor and limited infrastructure, in particular in the port sector, Benin's capacity to efficiently move goods and connect manufacturers and consumers with international markets is among the best in West Africa, trailing only Senegal, according to a recent survey of trade logistics. Feedback on the logistics "friendliness" of the countries in which operators on the ground (global freight forwarders and express carriers) is packaged in the Logistics Performance Index (LPI).[1] Benin's LPI, at 2.79, is above the regional average of 2.46 (figure 5). The components that received the lowest scores by operators in the country were the quality of trade- and transport-related infrastructure (ports, railroads, roads, information technology) and the efficiency of the clearance process (speed, simplicity, and predictability of formalities) by border control agencies.

Figure 5. Benin's Logistics Performance Index is one of the highest in West Africa



Source: World Bank 2010.

The time required to trade across Benin's borders is longer the average experienced by coastal countries in West Africa but better than the average for Sub-Saharan Africa. The time necessary to comply with all procedures required to export goods from Benin is 30 days, versus 24 days in other coastal countries in West Africa. On average 32 days are required to import goods into Benin, above the average for regional coastal countries, at 28 days. The cost to export or import to Benin, at around $1,300 per container, is comparable with the costs faced by Nigeria, but considerably higher than the costs of

[1] The Logistics Performance Index is based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics "friendliness" of the countries in which they operate and those with which they trade. They combine in-depth knowledge of the countries in which they operate with informed assessments of the global logistics environment.

importing to or exporting from Togo and, to a lesser extent, Ghana. Beninese costs are about 60 percent of the average costs in Sub-Saharan Africa (table 2).

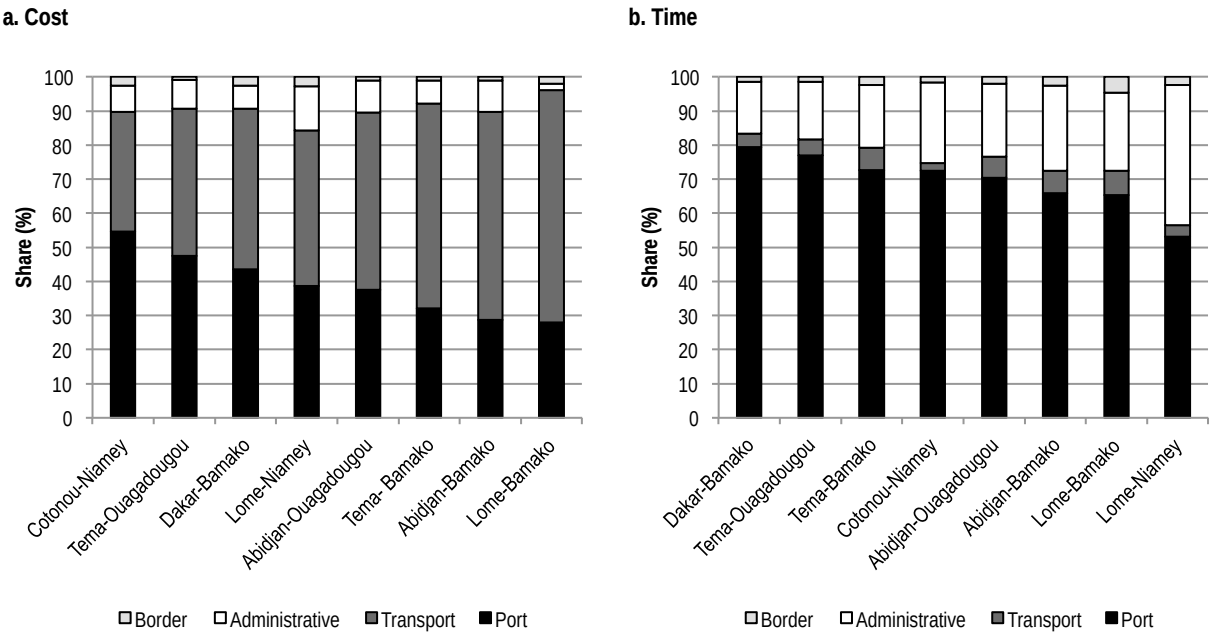
Table 2. Trading across borders in West African countries

Country	C/ L	Documents to export (number)	Time to export (days)	Cost to export ($ per container)	Documents to import (number)	Time to import (days)	Cost to import ($ per container)
Benin	C	7	30	1,251	7	32	1,400
Cote d'Ivoire	C	10	25	1,969	9	36	2,577
Gambia, the	C	6	24	831	8	23	922
Ghana	C	6	19	1,013	7	29	1,203
Guinea	C	7	33	855	9	32	1,391
Guinea-Bissau	C	6	23	1,545	6	22	2,349
Liberia	C	10	17	1,232	9	15	1,212
Mauritania	C	11	39	1,520	11	42	1,523
Nigeria	C	10	25	1,263	9	41	1,440
Senegal	C	6	11	1,098	5	14	1,940
Sierra Leone	C	7	26	1,573	7	31	1,639
Togo	C	6	24	940	8	29	963
West Africa, landlocked		9	44	2,627	10	50	3,443
West Africa, coastal		7	24	1,263	8	28	1,514
Sub-Saharan Africa		8	34	1,942	9	39	2,365

Source: World Bank, Doing Business 2011.
Note: C= coastal; L= Landlocked. Documents to export (import): The total number of documents required per shipment to export (import) goods. Documents required for clearance by government ministries, customs authorities, port and container terminal authorities, health and technical control agencies and banks are taken into account
Time to export (import): The time necessary to comply with all procedures required to export (import) goods. If a procedure can be accelerated for an additional cost, the fastest legal procedure is chosen
Cost to export (import) The cost associated with all procedures required to export (import) goods. Includes the costs for documents, administrative fees for customs clearance and technical control, customs broker fees, terminal handling charges and inland transport.

The time and costs associated with trading across borders reflect the need to do more to improve the quality of Benin's transport infrastructure, in particular in the port sector. High costs in the Port of Cotonou account for the bulk of the cost of importing goods through the Cotonou–Niamey corridor (figure 6a), the highest share among alternative gateways in West Africa. In alternative corridors, which compete directly with the Cotonou–Niamey corridor, the port share is much lower. For instance, in the Lomé–Niamey corridor, ports account for only 39 percent of total costs; in the Abidjan–Ouagadougou corridor, 37 percent. On top of port costs, surface transport (roads and railways) accounts for 35 percent of the cost of moving goods along the Cotonou–Niamey corridor.

Figure 6. Shares of different factors involved in the time and cost of importing through gateways in West Africa



Source: Ocean Shipping Consultants 2008; AICD ports database; Teravaninthorn and Raballand 2009. Ports data are based on indicators from 2006/07.

Similarly, lengthy travel times in the Cotonou–Niamey corridor are mainly associated with inefficient operations in the Port of Cotonou, which is responsible for more than 70 percent of the time required to import to Niamey, similar to the time consumed at the Port of Abidjan within the context of the Abidjan–Ouagadougou corridor. Comparatively, the time spent at the Port of Lomé accounts for 53 percent of the total time involved in transporting goods using the Lomé–Niamey corridor. It is estimated that the delays in the Port of Cotonou impose a cost of around $180 per container. Time-consuming regulatory processes related to customs clearance and technical controls further augment the total time (figure 6b), accounting for about 23 percent of the total time. The average time to clear imports through customs in Benin is more than twice the time required in Sub-Saharan Africa (World Bank and IFC 2009).

Roads

Achievements

Benin's has a well-developed road network with relatively high levels of traffic. The density of the country's classified road network (75 km/1,000 km2) is comparable with that of the average low-income country (88 km/1,000 km2), but only one-third that of the average for the middle-income countries of Sub-Saharan Africa (278 km/1,000 km2). Traffic of more than 2,000 vehicles per day, concentrated in the North–South corridors, is much higher than the average of 1,100 vehicles in nonfragile low-income countries and close to the levels of traffic registered in middle-income countries (table 3).

Table 3. Benin's road indicators

Indicator	Unit	Low-income countries	Benin	Middle-income countries
Classified road network density	km/1000 km2 of land area	88	75	278
Total road network density [a]	km/1000 km2 of land area	132	142	318
GIS rural accessibility index	% of rural pop within 2 km from all-season road	25	28	31
Main road network condition [b]	% in good or fair condition	72	69	86
Rural road network condition [c]	% in good or fair condition	53	66	65
Classified paved road traffic	Average annual daily traffic	1,131	2,041	2,451
Classified unpaved road traffic	Average annual daily traffic	57	63	107
Primary network overengineering	% of primary network paved with 300 AADT or less	30	10	18
Primary network underengineering	% of primary network unpaved with 300 AADT or more	13	34	20
Perceived transport quality [d]	% firms identifying transport as major business constraint	28	42	18

Source: AICD road sector database on 40 Sub-Saharan African countries accessed June 2010.

a. Total network includes the classified and estimates of unclassified and urban networks.

b. Main network for most countries is defined as result of adding the primary and secondary networks.

c. Rural network is generally defined as the tertiary network and does not include the unclassified roads.

d. World Bank–IFC Enterprise Surveys on 32 Sub-Saharan Africa countries.

Benin earns high scores for the condition of its rural roads and for rural accessibility. The rural network, 66 percent of which is in fair or good condition, has reached the average for the middle-income countries, enhancing the reliability of the rural network and increasing the potential for rural accessibility. The GIS Rural Access Index for Benin indicates that about 28 percent of the rural population lives within two kilometers from an all-season road, higher than the average of 25 percent for low-income nonfragile countries. With an average daily traffic of 63 vehicles on rural roads, maintaining the entire rural network with an earth road surface is a policy consistent with traffic levels (table 3).

Challenges

Benin's overall road network is in fragile condition. Sixty-nine percent of its roads are in good or fair condition, a level lower than the 72 percent average for low-income countries (table 3). Furthermore, two-thirds of these roads are in only fair condition. If no routine and periodic maintenance is performed, a large share of the main network will fall into poor condition within a very short time. Also, heavy use by overload trucks of the two highways crossing Benin to and from Togo and Nigeria is causing degradation that is jeopardizing their serviceability.

The poor condition of the road network is manifested in the Benin portion of the Cotonou–Niamey (Niger) and Abidjan (Côte d'Ivoire)–Lagos (Nigeria) corridors, which capture the highest amount of traffic along the corridors. Sixty percent of Benin's part is in poor condition on the Cotonou–Niamey route. Sixty-eight percent of Benin's portion on the Abidjan–Lagos corridor is in poor condition. It is estimated that 27 percent of the trucks that travel the segment of the Abidjan–Lagos corridor between Cotonou and the border with Togo are overloaded, with 60 percent transporting more than 14 tons per axle. This situation leads to a severe deterioration of the corridor, as overloaded trucks cause a disproportionate share of degradation. The incentives for coastal countries to maintain hinterland road

corridors do not seem to be very strong, since their economies are typically concentrated along the coast, making the up-country segments regional public goods (table 4).

Table 4. Road condition along transit corridors in ECOWAS where Benin participates

Corridors	Percentage in condition			Percentage paved	Percentage in traffic band		
	Good	Fair	Poor		<300	300–1000	>1000
Gateways to the sea							
Cotonou–Niamey	**49.5**	**7.9**	**42.6**	**98.5**	**1.5**	**26.4**	**70.0**
Benin	38.1	2.2	59.7	97.8	2.2	15.8	81.5
Niger	77.7	22.3	0.0	100.0	0.0	52.8	41.4
Intra-regional corridors							
Abidjan–Lagos	**50.7**	**28.0**	**20.6**	**98.8**	**0.0**	**0.4**	**43.6**
Benin	26.9	0.0	68.0	92.4	0.0	2.5	90.3
Côte d'Ivoire	0.0	100.0	0.0	100.0	0.0	0.0	100.0
Ghana	75.0	14.5	10.5	100.0	-	-	-
Nigeria	50.0	50.0	0.0	100.0	0.0	0.0	100.0
Togo	0.0	0.0	100.0	100.0	0.0	0.0	100.0

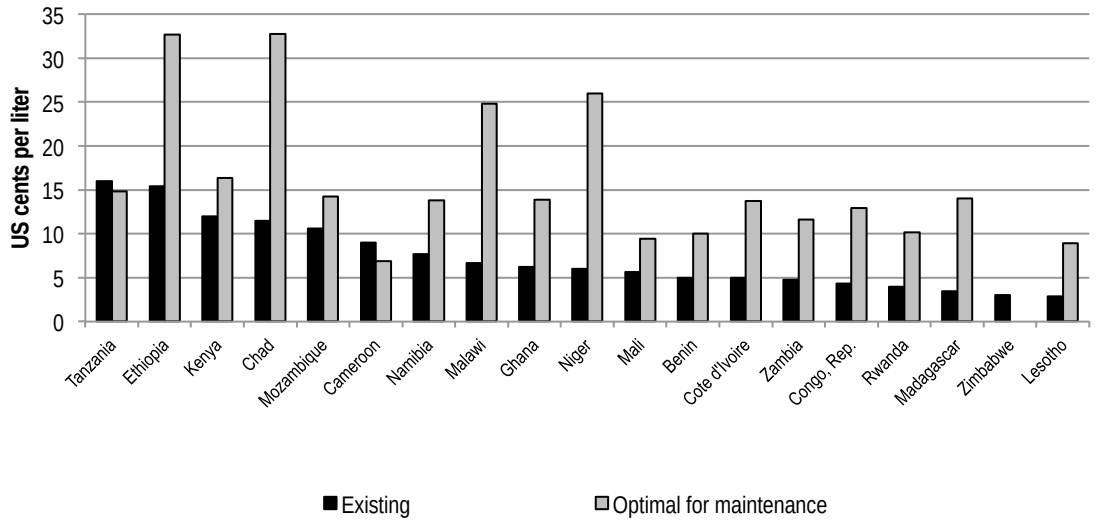
Source: AICD 2010.

Aggravating the problem of relatively poor road network quality in Benin is the large share of its primary network that is underengineered. About one-third of Benin's network technically justifies paving or new construction, as more than 300 vehicles per day use the roads, particularly in highly populated coastal areas. Network underengineering is one of the reasons transport is considered a major business constraint in Benin (table 3).

Road financing is a major challenge in Benin due to its relatively high dependence on general taxation. At an estimated $0.05 cents per liter[2], Benin's fuel levy is among the lowest in Sub-Saharan Africa (figure 7), sufficient to finance total routine maintenance needs but not periodic maintenance, which is only 60 percent covered. The lack of appropriate periodic maintenance has further aggravated the problem of poor quality of roads. With less than one-fourth of its revenues coming from road user charges, the Road Fund in Benin is one of the few in West Africa where road user charges amount to less than 50 percent of total revenues. Public funding will likely continue to be needed despite implementation of road user charges, in particular for secondary and tertiary networks. In fact, 97 percent of the Road Fund's resources are dedicated to the primary network. The goal is to increase road user charges and gradually phase out direct treasury transfers or external funding.

[2] The fuel levy in Benin is based on the price and type of fuel. The levy is 10 percent of the diesel price and 7.2 percent of the gasoline price.

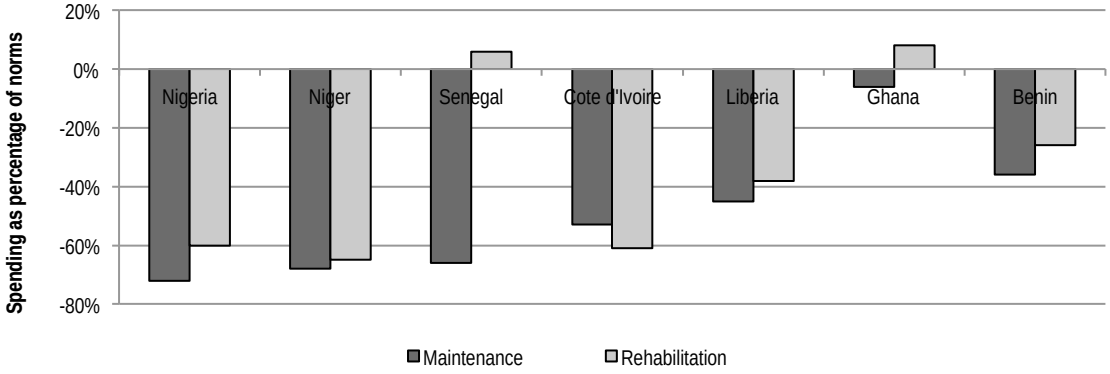
Figure 7. Optimal and existing fuel levy in selected countries of Sub-Saharan Africa



Source: Gwillliam and others 2009.

The challenge of financing road infrastructure in Benin has been made worse in recent years by the poor budgetary situation of the government. Budget allocations have been depressed by poor execution of road investment budgets in 2005 and 2006—budget execution dropped from 90 percent in 2004 to 50 percent in 2005 and 25 percent in 2006. This situation reflects a national context of deteriorating budget performance characterized by declining revenue collection owing to an economic slowdown and significant budgetary pressures. Actual expenditures for roads in Benin reached 2.6 percent of GDP in 2001, and have decreased since then. The figure for 2006 was 0.8 percent (World Bank 2007b). Benin is spending around 36 percent less than what is needed for road maintenance and only 26 percent of the amount required for rehabilitation of the network (figure 8).

Figure 8. Spending on road maintenance and rehabilitation falls well short of rehabilitation needs



Source: Gwilliam and others 2009.
Note: Analysis of adequacy of road maintenance spending can only be performed for primary network under federal jurisdiction.

Ports

Achievements

Port security plans are being put in place in the Port of Cotonou. The steps taken to date have been fairly basic, for example, constructing higher walls around the port, implementing strict controls at port gates, introducing floodlighting at the quayside, requiring all port workers to carry identity cards, and having a port security officer on guard 24 hours a day. These measures enabled Cotonou to earn the ISPS (International Ship and Port Facility Security) code, following a visit by the U.S. Coast Guard.

Table 5. Port indicators for the Port of Cotonou and selected other ports

Port	Unit	Lomé, Togo	Cotonou, Benin	Dakar, Senegal	Abidjan, Côte d'Ivoire	Tema, Ghana	Apapa, Nigeria	Harcourt, Nigeria
Container cargo - total handled	TEU, annual	460,000	158,201	331,191	500,119	420,000	336,308	7,900
Container dwell time	Days	13	12	7	12	25	42	30
Truck turn-round time	Hours	4	6	5	2.5	8	6	24
General cargo vessel pre-berth waiting time	Hours		48	24	2.9	9.6	36	38.4
General cargo vessel turnaround time	Hours		48	60	2.2	48	40.8	45.6
Crane productivity	Containers per hour	—	—	—	18	13	12	—
Crane productivity	Tonnes per hour	23	15	—	16	14	9	8
Container cargo handling charge	US$ per TEU	220	180	160	260	168	155	—
General cargo handling charge	US$ per ton	9	9	15	14	10	8	8
Bulk dry handling charge (ship to gate or rail)	US$ per ton	5	5	5	5	3		
Adequate road access present	0=no; 1=yes	0	0	0		0	0	0
Landlord model is used	0=no; 1=yes	1	0	0	1	1	1	1

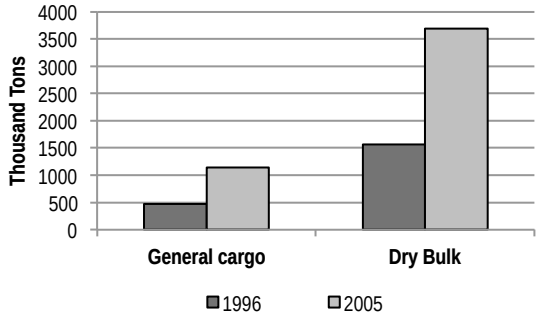
Source: AICD ports database downloadable from http://www.infrastructureafrica.org/aicd/tools/data.
Note: Data are as of 2006.
— = data not available.

Challenges

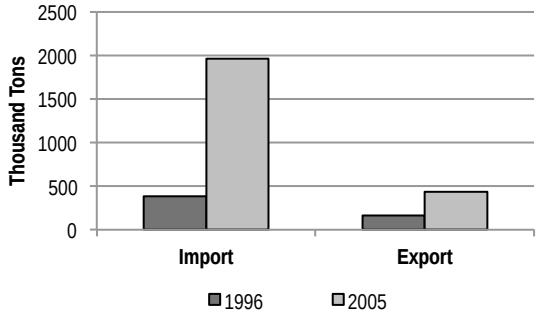
The Port of Cotonou is operating under the pressure of growing demand; by 2005 demand was almost twice the port's designed capacity. Demand for general cargo and dry bulk handling grew 140 percent between 1996 and 2005, from 2.03 million tons handled to 4.84 million (76 percent dry bulk and 24 percent general cargo, figure 9a). The port's design capacity is 2.3 million tons per year, but as of 2005 it was handling an excess of more than 2.5 million tons per year. Between 1996 and 2005 container tonnage (exports and imports) increased 340 percent, from 5.5 million tons in 1995 to 2.4 in 2005 (figure 9b), most due to the large increase in imports destined for Niger and Nigeria. In fact, transit traffic represents 46 percent of all traffic, of which 84 percent is traffic to Niger and Nigeria.

Figure 9. Port of Cotonou's demand

a. Demand by commodity grouping



b. Container tonnage



Source: Ocean Shipping Consultants 2009.

The Port of Cotonou's performance reflects the congested conditions in the port and the lack of proper equipment. Compared with other ports in the region, the Port of Cotonou has the longest pre-berth waiting time for cargo vessels (48 hours). The turnaround time for general cargo vessels was, at 48 hours, the second-highest among West African ports, after Dakar. Similarly, the truck-processing time for receipt and delivery of cargo was one of the longest. The long container dwell time, at 12 days—comparable with Abidjan (Côte d'Ivoire) and Lomé (Togo) (table 5)—can be traced to the fact that in Cotonou almost 85 percent of incoming container traffic is unpacked within the port perimeter (whereas in other ports this process usually takes place outside the port). This situation does not enable an optimal use of the port space and results in heavy truck traffic in and around the port perimeter, which impedes traffic flow. Authorization for the port to work around the clock, granted in early 2007, has increased *de facto* the capacity of the port and improved its performance. The adoption of a landlord model (to replace the port's current status as a tool port, box 1) has the potential to increase performance still further.[3]

Port users inevitably pay a price for the excess of demand over capacity, the port's high labor costs, and the absence of competition in the sector. The Port of Cotonou has the highest bulk dry handling charge, at $5 per ton (table 5). The port charges applied are even higher when weighed against the service levels achieved. They are further inflated from time to time by the application of congestion surcharges in certain cargo sectors. Whereas labor costs in the Port of Cotonou represented 46 percent of the revenues for 2005 (52 percent in 2004), the recommended figure should not exceed 20 percent. Lowering labor costs to a standard level would require reducing the staffing of the port authority from 340 permanent and 409 temporary people to no more than 100 people.

The limited potential for expanding the existing port infrastructure presents the challenge of building new facilities. The development of the Seme-Kpodji Port, 20 kilometers to the south of the existing port, is seen as the way forward, but implementation progress has been slow.

[3] Since 1997 the *Port Autonome de Cotonou* (PAC) has been a government-owned port authority under the jurisdiction of the Ministry of Public Works and Transport. Stevedoring activities are carried out by three operators: (i) the Benin Cargo Handling Company, SOBEMAP (*Société Béninoise des Manutentions Portuaires*), a public company; (ii) COMAN S.A. (*Cotonou Manutention*), a company owned by the Maersk group, and (iii) SMTC (*Société de Manutention du Terminal á Conteneurs de Cotonou*), owned by the Bollore group. Both COMAN and SMTC were awarded a 25-year concession in 2004 to handle containers, while SOBEMAP is responsible for all kinds of cargo and shorehandling activities.

Developing competitive services that meet international standards and making the best investment decisions regarding the introduction of new capacity will be fundamental in meeting the needs of Benin's importers and exporters and in exploiting the role that Benin could play in handling transit cargo for countries such as Niger, Burkina Faso, and Togo.

Box 1. Port administration models: A scale of public and private involvement

Four main categories of ports have emerged over time. The categorization is based on the following characteristics: (i) public, private, or mixed provision of services; (ii) local, regional, or global orientation; (iii) ownership of infrastructure; (iv) ownership of superstructure and equipment; and (v) status of dock labor management.

Service port: These ports have a predominantly public character. The port authority offers the complete range of services required for the functioning of the seaport system. The port owns, maintains, and operates all assets, and cargo-handling activities are performed by labor employed directly by the port authority. Service ports are usually controlled by (or even part of) the ministry of transport and the chairman (or director general) is a civil servant appointed by the ministry.

Tool port: The port authority owns, develops, and maintains the port infrastructure as well as the superstructure, including cargo-handling equipment such as quay cranes. Other cargo handling onboard vessels as well as on the apron and on the quay is usually carried out by private cargo-handling firms contracted by the shipping agents or other principals licensed by the port authority. This division of tasks is related to the essential problem with this type of model: split operational responsibilities. The tool port has a number of similarities to the service port, both in terms of its public orientation and the way the port is financed.

Landlord port: These ports are characterized by their mixed public-private orientation. Infrastructure is leased to private operating companies and /or to industries. The lease to be paid to the port authority is usually a fixed sum per square meter per year, typically indexed to some measure of inflation. The lease amount is related to the initial preparation and construction costs. The private port operators provide and maintain their own superstructure. They also purchase and install their own equipment on the terminal grounds. Dock labor is employed by private terminal operators, although in some ports part of the labor may be provided through a port-wide labor pool system.

Private port: In fully privatized ports, port land is privately owned. This usually requires the transfer of ownership of land from the public to the private sector. The main risk in this type of arrangement is that port land can be resold for nonport activities, thereby making it impossible to reclaim it for its original maritime use.

Source: Adapted from World Bank 2007c.

Rail

Achievements

Efforts have been made to improve the functioning and capacity of Benin's rail system and to bring fresh capital to an investment-starved system. In February 2010, through a competitive process, a concession was granted to a privately owned company. But because OCBN is a joint Niger–Benin venture, Benin requires the agreement and involvement of Niger in any concession agreement—and so far Niger has not been willing to engage in a concession agreement.

Table 6. Railway indicators for OCBN and selected other railways

Latest available year

Indicator	Unit	OCBN Benin Niger	SITARAIL Burkina Faso Cote d'Ivoire	GRC Ghana	TRANSRAIL Mali Senegal	NRC Nigeria
Concessioned company	1-concessioned, 0-non-concessioned	1	1	1	1	1
Network density	km/km2	5.1	2.2	4	5.4	3.8
Network density	km/million pop	66	39	40	77	23
Labor productivity	1,000 traffic units per employee	40	481	84	26	37
Carriage productivity	1,000 passenger-km per carriage	900	862	416		737
Locomotive productivity	million traffic units per locomotive	3	35	7	40	13
Wagon productivity	1,000 net ton-km per wagon	74	1020	458	804	59
Traffic Unit - Freight	million net ton-km	24	670	224	409	77
Traffic Unit - Passenger	million passenger-km	18	25	64	113	174
Freight average yield	US cent/ntkm, average 2000–05	5.8	5.5	4.4	3.3	
Passenger average yield	US cent/pkm, average 2000–05	2	3.3	2.4	2.2	

Source: AICD railways database.

Challenges

Boosting freight and passenger traffic on OCBN's tracks is an important challenge for Benin, as traffic levels are among the lowest in the region. On average, between 2001 and 2005 only 24 million net ton-km and 18 million passenger-km were registered, levels that put the Beninese railways behind other railways in West Africa (table 6). The situation has deteriorated since 2005. Passenger traffic stopped in 2007.

OCBN also needs to enhance its productivity, which lags most railways in West Africa. At 40,000 traffic units per employee, OCBN's labor productivity is comparable with NRC's but behind the labor productivity of SITARAIL and GRC, with 481,000 and 84,000 traffic units per employee, respectively. On average, OCBN locomotives transported 3 million traffic units, the lowest figure of concessions in the region. Similarly, wagon productivity, at 74 thousand net ton-km per wagon, was just a fraction of the figures for SITARAIL, GRC and TRANSRAIL. Only carriage productivity, at 900,000 km per carriage, was comparatively high (table 6).

OCBN's freight tariffs are the highest in the region, with an average of $ 5.8 cents/ton-km. Only SITARAIL has freight tariffs comparable with OCBN's. However, the passenger tariffs, at $2 cents/passenger-km, were the lowest—until passenger traffic was halted in 2007.

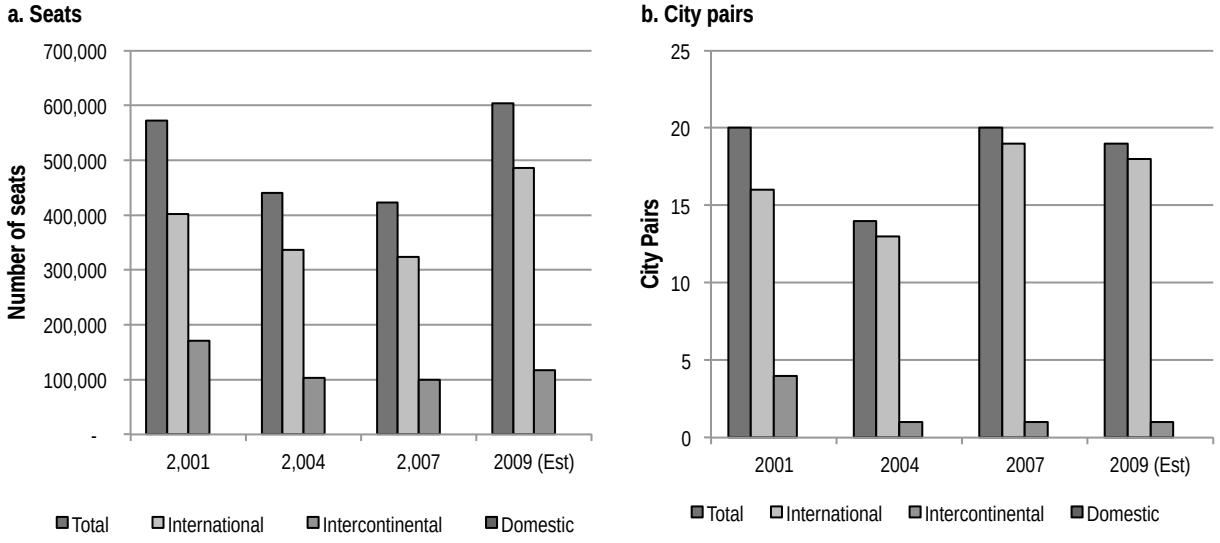
Air transport

Achievements

The Benin air transport market is characterized by significant airline competition. The presence of three local airline companies and several large foreign operators in this medium-sized market seems sufficient to ensure a certain level of competition, even though the carriers share routes rather than compete directly with each other (World Bank 2007b). The relatively high level of competition may be attributable to the regional implementation of the Yamoussoukro decision, which liberalizes international regional air traffic.

Competition in the market has enabled Beninese air transport traffic and connectivity to recover since the global decline in 2004. Total traffic (excluding domestic) surpassed the baseline of 572,433 in 2001, reaching 603,436 in 2009 despite the global recession. Figures show a strong increase from 2007 to 2009, with solid growth in traffic between other countries in Sub-Saharan Africa, in traffic between North Africa and Benin, and in intercontinental traffic (figure 10a). Five of the airlines serving Benin established their routes between 2004 and 2009, including Kenya Airways, increasing the number of international city pairs from 16 to 18. New airlines took over the capacity left by Air Afrique after its collapse in 2001. The total number of city pairs as of 2009 was 19, recovering to precrisis levels (figure 10b).

Figure 10. Evolution of seats and city pairs in Benin



Source: Bofinger 2008. Derived from AICD national database downloadable from http://www.infrastructureafrica.org/aicd/tools/data.
Note: As reported to international reservation systems. No domestic services are represented in the statistics. The capacities shown in panel 10.a reflect the fleet of Air France, Royal Air Maroc, and a dozen other carriers.

Carriers in Benin are using modernized air fleets. The main foreign companies operating in Benin have modernized 88.5 percent their fleets and, as of today, the country is served by a comparably new fleet in the region (table 7).

Table 7. Benchmarking air transport indicators for Benin and selected other countries

Country	Unit	Benin	Togo	Ghana	Nigeria	Niger	Burkina Faso
Domestic Seats	Seats per year	—	—	144,183	9,304,568	N/A	20,245
Seats for international travel within Africa	Seats per year	323,132	219,505	909,819	1,373,745	128,414	244,721
Seats for intercontinental travel	Seats per year	99,268	76,856	832,895	2,487,702	41,717	147,095
Seats available per capita		0.047	0.045	0.082	0.574	0.012	0.027
Herfindahl index, air transport market	%	11.43	18.33	6.28	11.28	18.97	22.89
Quality:							
Seat km in newer aircraft	%	88.5	99.5	96.8	71.4	94.3	93.4
Seat km in medium or smaller aircraft	%	41.2	40.7	14.4	27.6	44.9	46.7
Carriers passing IATA/IOSA Audit	%	0	0	0	28.6	0	0
FAA/IASA audit status		No audit	No audit	Failed	No audit	No audit	No audit

Source: Bofinger 2008. Derived from AICD national database downloadable from http://www.infrastructureafrica.org/aicd/tools/data

Note: Herfindahl-Hirschmann index a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. A HHI of 100 indicates the market is a monopoly, while a lower the HHI the more diluted is the market power as exerted by one company/agent. All data as of 2007 based on estimations and computations of scheduled advertised seats, as published by the Diio SRS Analyzer. This captures 98 percent of world-wide traffic, but a higher percentage of African traffic is not captured by the data

Challenges

Despite the recent turnaround, capacity and connectivity remains low in relative terms owing to poor infrastructure and small market size. The domestic market for air transport in Benin is especially thin and served by a number of small operators such as Aero Benin, Trans Air Benin, and Benin Golf Air. In addition, there are a number of failed airlines,such as Afrique Airlines and Zircon Airways Benin. Compared with West African peers, Benin reported low numbers of seats for international travel within Africa and intercontinental travel, and its seat capacity per capita is one of the lowest in the region (table 7).

The type and condition of the country's air transport infrastructure imposes a big challenge for expansion of the market. Airport infrastructure consists of the international airport in Cotonou, and basic and rudimentary airstrips in remote towns. The deterioration of Cotonou's airport runway surface and its need to be reinforced is a major challenge. Users identify the main infrastructure problems affecting Cotonou airport as: (i) insufficient length of the runway; (ii) insufficient apron space, and (iii) lack of capacity of the passenger terminal at peak hours.

Safety oversight is among Benin's most important challenges. Benin's ICAO safety oversight audit from 2007 reveals that the rate of non-implementation of recommended standards and practices exceeds 80 percent, more than double the global average of 40 percent. There is a need to improve and complete the fence around the airport in order to comply with ICAO's security standards.

Water resources

Benin is less well endowed with water than other countries in similar climatic zones. Only 2,000 square kilometers are covered by water in Benin (out of a total area of 112,622 square kilometers). The most important rivers are the Pendjari River in the North (380 km), the Couffo (170 km), and the Oueme (150 km). Renewable water resources per capita are estimated at about 3,741 cubic meters per year (including cross-border flows), well below the Sub-Saharan African average of 7,000 cubic meters per year. Rainfall averages 1,039 mm per year, but levels vary considerably across regions and over the course of the year.

Most of the water is used for irrigation, followed by water supply. It is estimated that around 45 million cubic meters of water, or 35 percent of the total water use, are dedicated to irrigation. Around 41 million, or 31 percent of total water use, is used for water supply in urban and rural centers. Demand for drinking water has increased over time, in particular owing to the increasing rate of urbanization. The industrial sector, with a consumption of around 14 million cubic meters, accounts for about 23 percent of total water use. Needs for agricultural production, in particular for cotton production, account for 11 percent.

Water resources are threatened by the lack of wastewater collection and treatment. As of today, Benin has no sewerage network. Groundwater resources are threatened by poorly maintained septic tanks, runoff from solid waste dumps, and industrial wastewater.

Irrigation

Irrigation in Benin has great potential. Only 12,258 hectares are irrigated—only 0.5 percent of the total cultivated area in Benin (2,815,000 hectares) (figure 11a). As of 2004, only 4 percent of the country's cultivated area was equipped for irrigation, a level slightly above the Sub-Saharan Africa average of 3.5 percent. An additional 0.7 percent of the cultivated area was water-managed.

Between 1973 and 2003 the irrigated area grew 4.7 percent annually. It is estimated that around 70 percent of the labor force is involved in agriculture, higher than the 59 percent average for Sub Saharan Africa. The agricultural value added per worker, at $536, was below the Sub-Saharan average of $575.

The country's current irrigated area could be increased substantially with modest economic returns. Simulations suggest that with a threshold internal rate of return (IRR)[4] of 6 percent it would be economically viable to develop a further 1,231,846 hectares of land for irrigation, of which 97 percent would be developed through large-scale projects.

For purposes of this discussion, it should be kept in mind that water for irrigation can be collected in two ways: through large, dam-based schemes, or through small projects based on collection of run-off from rainfall. The investment costs of large-scale irrigation development reflect only irrigation-specific infrastructure, such as distribution canals and on-farm system development. The potential for small-scale

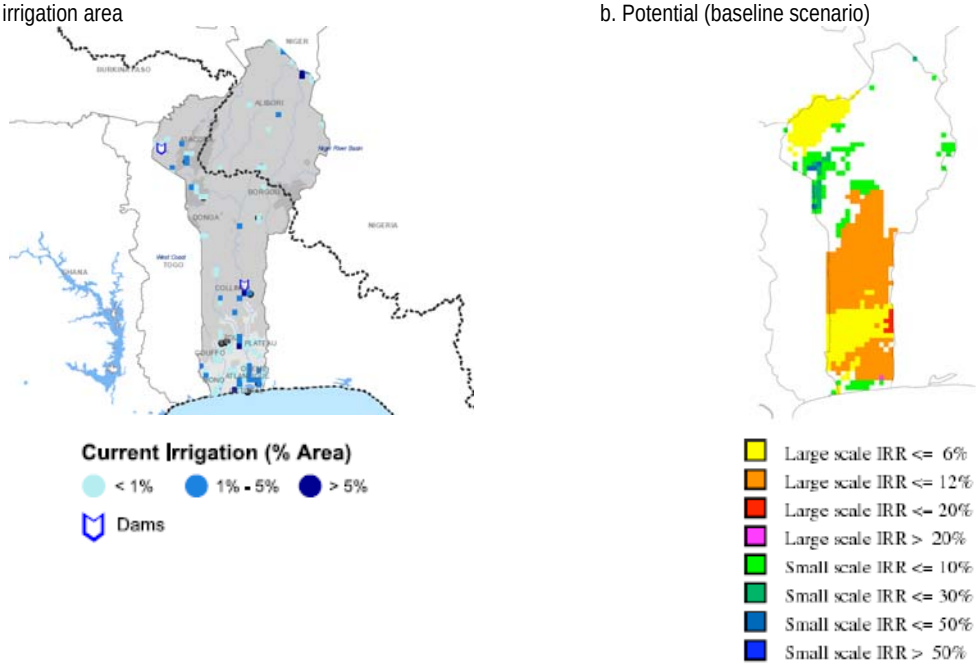
[4] Internal rates of return for irrigation are calculated based on various values for water cost (for dam-based irrigation), three alternative levels of irrigation investment costs, and two time trajectories for investment expenditures. For small-scale irrigation, profitable areas are identified by pixel. For large-scale irrigation, IRRs are calculated for each dam.

irrigation is assessed on the basis of agro-ecological conditions and in terms of market access, since irrigation is typically viable only if the increased yields can be readily marketed.

Figure 11. Benin's irrigation sector

a. Current irrigation area

b. Potential (baseline scenario)



Source: Map of current area is from AICD Interactive Infrastructure Atlas for Benin downloadable from http://www.infrastructureafrica.org. Map of irrigation potential is from You and others (2009: appendix 2).

Note: Baseline scenario was calculated assuming investment cost of $3,000 per hectare, a canal maintenance and water-delivery cost of $0.01 per cubic meter, on-farm annual operation and maintenance costs of $30 per hectare, and a discount rate of 12 percent

If the threshold IRR were raised to 12 percent the economically viable area for irrigation shrinks to 14,620 hectares for small scale-projects, and large-scale projects would not have an IRR higher than 12 percent. The required investment for attaining this expansion is $76 million (table 8). This area with irrigation potential is located in the central and southern areas of Benin (figure 11b).

Benin has the highest potential among West African countries for expanding irrigation area through large-scale projects if an IRR cutoff of 6 percent is assumed, but the associated IRR is one of the lowest (figure 12a). On the other hand, the number of hectares that could be economically developed through small-scale projects is comparatively low, and the associated IRR is average for the West African region (figure 12b).

Table 8. Benin's irrigation potential

Cutoff (%)	Large-scale			Small-scale			Total		
	Investment	IRR	Area increase	Investment	IRR	Area increase	Investment	IRR	Area increase
	US$ million	%	hectares	US$ million	%	hectares	US$ million	%	hectares
0	3091	6	1,583,665	586	8	113,418	3677	7	1,697,083
6	2333	7	1,195,432	188	16	36,414	2521	8	1,231,846
12	0	0	-	76	25	14,620	76	25	14,620
24	0	0	-	23	40	4,437	23	40	4,437

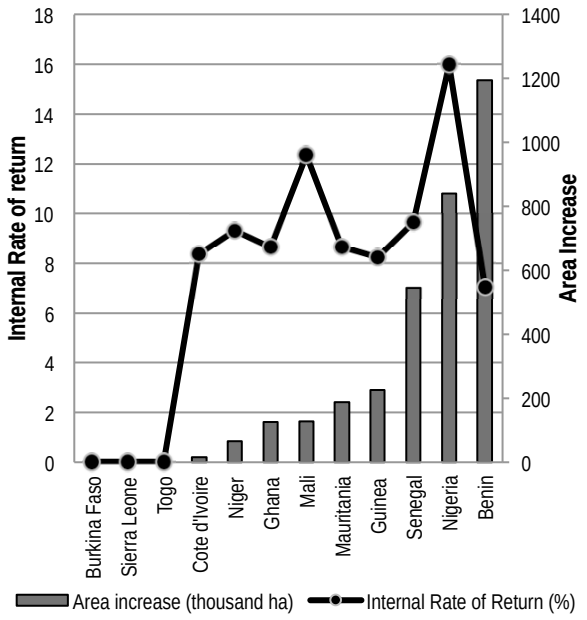
Source: Derived from You and others (2009).

If small-scale projects are implemented, water withdrawals are expected to rise. This, in addition to the contamination of groundwater resources by high amounts of fertilizers and pesticide use in irrigation, will augment the water stress.

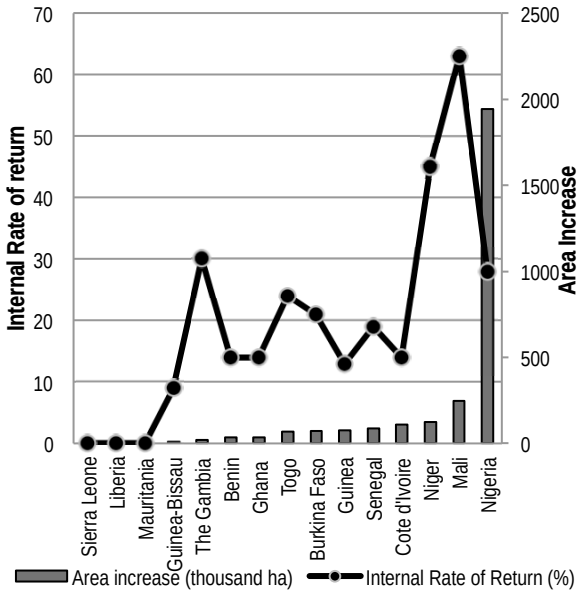
Figure 12. Irrigation potential

6 percent IRR cutoff

a. Large scale



b. Small scale



Source: Derived from You and others (2009).
Note: Charts are based on 6 percent cutoff estimates, at which the estimated area increase for southern African countries not included in the figures is zero.

Water supply and sanitation

Achievements

Benin has made important progress in reducing households' reliance on surface water. At the national level use of surface water declined from 21 percent in 1996 to 13 percent in 2006, a level comparable to the average middle-income country in Sub-Saharan Africa (table 9).

Benin has managed to move its population slowly up the water and sanitation ladder by extending access to high-cost technologies. Access to piped water increased from 27 percent in 1996 to 33 percent in 2006, three times the average access to piped water in comparable low-income countries. Access to standposts almost doubled between 1996 and 2006 from 6 to 11 percent in 2008. On the sanitation side, access to septic tanks was almost nonexistent in 1996 but increased to 4 percent in 2006. Use of improved latrines increased from 18 percent in 1996 to 27 percent in 2006.

Table 9. Benchmarking water supply and sanitation indicators

	Unit	Low-income countries	**Benin**			Middle-income countries
		Mid-2000s	1996	2002	2006	Mid-2000s
Access to piped water	% pop	9	27	30	33	61
Access to stand posts	% pop	17	6	6	11	22
Access to wells/boreholes	% pop	39	46	47	43	5
Access to surface water	% pop	34	21	17	13	11
Access to septic tanks	% pop	5	0	3	4	48
Access to improved latrines	% pop	18	18	21	27	34
Access to traditional latrines	% pop	39	8	5	8	7
Open defecation	% pop	38	74	72	62	11
			2000	2005	2009	
Domestic water consumption	liter/capita/day	72	24	22	24	166
Revenue collection	% sales	93	102	91	91	100
Distribution losses	% production	34	20	26	28	27
Cost recovery	% total costs	56	49	57	75	81
Operating cost recovery	% operating costs	65	69	80	105	145
Labor costs	connections per employee	159	158	209	207	369
Total hidden costs as % of revenue	%	163	139	58	43	140

		2005	2008	Non-scarce water resources	Other developing regions
Average effective tariff	U.S. cents per m3	60	71	60–121	3–60

Source: Demographic and Health Survey and AICD water and sanitation utilities database downloadable from http://www.infrastructureafrica.org/aicd/tools/data. Access figures from Demographic and Health Surveys (1996 and 2006) and census (2002).
Note: A country is considered non-water-scarce if its renewable water resource per capita is greater than 3,000 cubic meter per year.
— = data not available.

These improvements represent progress toward the Millennium Development Goals for 2015 in both water supply and sanitation. Access to improved water increased from around 57 to 67 percent of the population between 1996 and 2006. Access to improved sanitation rose from 18 percent in 1996 to 30

percent in 2006, a 65 percent increase. At this pace, the Millennium Development Goal of 75 percent sustainable water supply coverage in urban areas will likely be met.

Following significant institutional reforms, in particular in the tariff policy, important progress has been achieved in the financial performance of the national utility. In 2003 the water and energy sectors were reformed, and the operation of these services, previously managed by SBEE (Société Béninoise d'Electricité et d'Eau) was separated. SONEB (Société Natiaonale des Eaux du Bénin), a public utility, was created to provide water supply and wastewater treatment for the urban and peri-urban areas of the country. Since the reform, systematic adjustments of tariffs have been carried out. Between 2005 and 2009 operating cost recovery increased from 80 percent to 105 percent (table 9). The overall gap between the average effective tariff and average total costs has declined, but a difference remains. In 2009 the average total cost was reported at $1.10 per m3 and the average effective tariff at $0.72 per m3. The absence of cost-recovery tariffs has led to underinvestment and delays in asset maintenance, which in turn translates into high system losses.

Table 10. Evolution of operational indicators associated with SONEB

	Water delivered (millions of m3/year)	System losses (%)	Collection ratio (%)	Average total cost ($/m3)	Average effective tariff ($/m3)	Total hidden costs ($m/year)	Total hidden costs (% revenues)
2000	24	20	100	1.00	0.42	11	139
2001	25	17	100	0.98	0.41	12	140
2002	28	20	92	1.00	0.46	13	113
2003	30	22	96	1.29	0.55	18	111
2004	30	23	77	0.88	0.60	10	51
2005	31	26	91	0.98	0.60	11	58
2006	33	24	92	1.09	0.61	15	61
2007	34	28	89	1.14	0.66	16	57
2008	37	24	87	1.18	0.71	17	49
2009	39	28	85	1.10	0.72	17	43

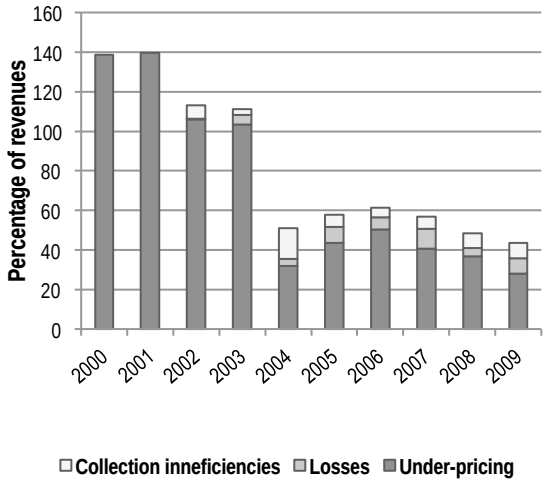
Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).

The adjustment of tariffs has resulted in lower hidden costs. Whereas in 2000 underpricing of water services accounted for all hidden costs, in 2009 it was responsible for just 64 percent of them, still the highest share among the sources of hidden costs considered. During the period, hidden costs decreased from 139 percent of revenues to 43 percent (table 10). Comparing the aggregate average hidden costs of SONEB with those of other West African water utilities indicates that, in 2005 and even more in 2009, SONEB's hidden costs were among the lowest in the region (figure 13b).

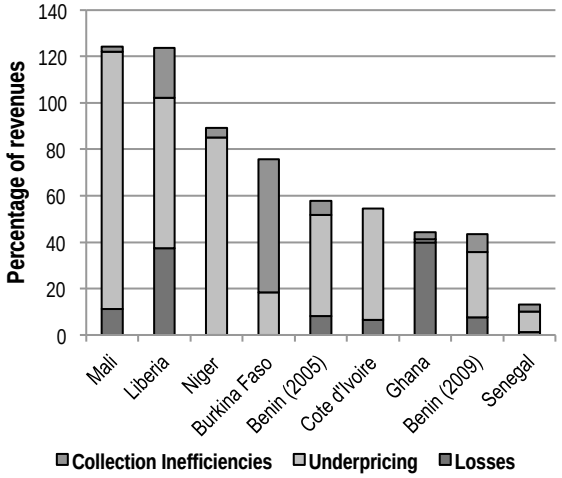
Figure 13. Hidden costs

Percentage revenues

a. Evolution of hidden costs in Benin's water sector



b. Hidden costs of selected water utilities in West Africa



Source: Derived from Baneerjee and others (2008) and Briceño-Garmendia, Smits, and Foster (2009).

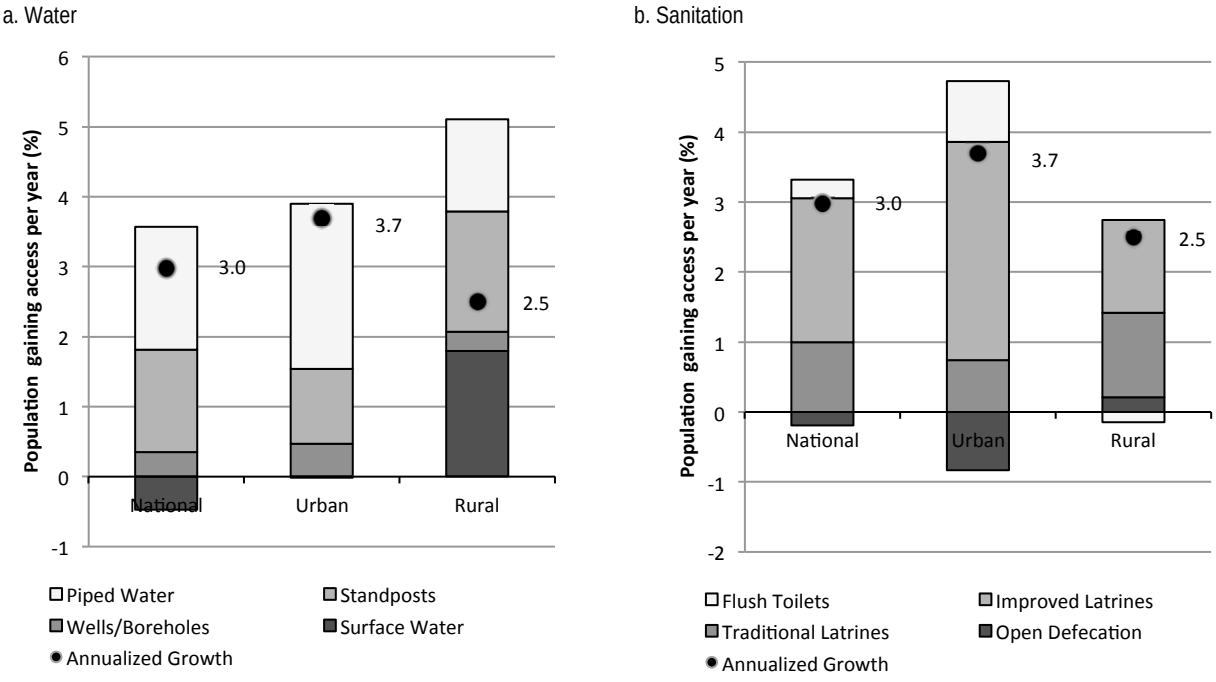
Challenges

In spite of the recovery of SONEB's financial situation, its operational performance has deteriorated over time. Nonrevenue water increased from 20 percent in 2000 to 28 percent in 2009. Collection ratios decreased from 100 percent of billings in 2000 to 85 percent in 2009 (table 10). As a consequence, the share of these inefficiencies in total hidden costs has increased versus underpricing (figure 13b). In addition, since 2000 domestic water consumption per capita has not increased—at 24 liters per day it is only one-third of consumption in comparable low-income countries.

In rural areas the expansion of access to water and sanitation has not kept pace with rural population growth, at 2.5 percent annually, worsening over time. Whereas the combined progress in access to piped water, standposts and wells and boreholes was around 3.3 points per year between 2002 and 2006, the rural population using surface water increased 1.8 points annually. On the sanitation side, the combined progress in access to septic tanks and improved and traditional latrines was around 2.5 points per year, but an additional 0.2 percent of the population per year was practicing open defecation (figure 14).

Figure 14. Increased reliance on surface water and open defecation, as population growth outpaces growth in rural access to water and sanitation

Population gaining access per year between 2002 and 2006



Source: WHO–Joint Monitoring Program 2010; Census 2002; and Demographic and Health Survey 2006.

The sanitation sector lags far behind the water sector, even though some decline in the reliance on open defecation has been achieved at the national level. In 2006 62 percent of the population practiced open defecation versus 74 percent in 1996. Even though the improvement has been significant, the percentage of population practicing open defecation is still extremely high, in particular when compared to low income countries and middle income countries (table 9).

The lack of sewerage systems in Benin is a major challenge given rapid urbanization and increasing industrial growth. Only in Cotonou is there a septic sludge disposal plant, but its capacity is greatly exceeded. Most domestic wastewater is discharged into streets and gutters. The greater Cotonou metropolitan area, including Porto Novo, is home to more than 80 percent of the industries of Benin. In the absence of adequate waste-treatment facilities, industrial wastewater is also discharged into the open, into lagoons, or into the sea. In many cases it is left to filter into the groundwater without treatment (World Bank 2009d).

Power

Achievements

Benin has steadily increased access to power since the middle 1990s, particularly in urban areas. Electrification rates increased from 14.5 percent in 1996 (Demographic and Health Survey 1996) to 25 percent in 2009 (World Bank 2009b). While improvements in access are encouraging, overall access is below the average level of low-income countries, at 33 percent, and only half the level of middle-income countries, at 50 percent (table 11).

Table 11. Benchmarking Benin's power infrastructure

Indicator	Unit	Low-income countries	Benin 2009	Middle-Income countries
Access (national)	% of population	33	25	50
Access (urban)	% of population	71	53	100
Access (rural)	% of population	4	2	32
Installed generation capacity	MW per million people	20	14	799
Electricity consumption	KWH/capita/year	107	72	4,479
Power outages	Days/year	10	24	6
Value lost due to outages	% sales	6.5	7.5	1.6
Firms that indicate that power in a major constraint	% firms	52	70**	31
Reliance on own generators	% firms	41	27	18
Collection rate*	% of billing	92	96	91
Cost-recovery ratio*	% of operating cost	89	72	85
Revenue per unit*	U.S. cents per KWh	14	14	13
System losses*	% generation	24	21	20
Total hidden costs*	% revenue	69	12	0
Effective power tariff	U.S. cents per KWh	**Benin**	**Predominantly thermal**	**Other developing regions**
Residential	at 100 kWh	18	14.5	
Commercial	at 100 KWh		18.8	5.0 – 10.0
Industrial	at 50,000 kWh	11	14.2	

Source: Low-income country figures as of 2005 from the power AICD database, downloadable from http://www.infrastructureafrica.org/aicd/tools/data. For Benin, national access data were taken from World Bank (2009a) and are based on estimates in 2006. Electricity consumption was taken from the CIA Factbook and is for 2007. Power outages were taken from World Bank (2009a) and are for 2009. Value lost to outages was taken from Enterprise Surveys 2009. Firms that indicate that power is a constraint and firms that own generators taken from Enterprise surveys 2004. Collection rate is taken from World Bank 2009a and is for 2009. System losses are for 2009 and taken from World Bank 2009a. Tariff information is for 2009 and is from World Bank 2009a.

* Represents information only for SBEE and does not include information for CEB; ** As of 2004

The power distribution utility in Benin, SBEE, is relatively efficient. Its system losses are modest relative to African peers, and its collection rates are relatively high. Total system losses are estimated at 21 percent, with 17 percent from distribution. While these losses are high relative to the 10 percent international benchmark, system losses are lower than in comparable low-income countries and even with the level of middle-income countries in Sub Saharan Africa (table 11). In other West African countries losses are higher: Togo has been burdened with transmission losses of around 30 percent (2004), Côte d'Ivoire around 23 percent (2008) (Tallapragada and others 2009). SBEE has been able to collect 96 percent of its billing, above the average for low-income peers (table 11).

Challenges

Important differences in access to electricity remain between urban and rural populations. Whereas 53 percent of urban dwellers have access to electricity, only 2 percent of rural residents do. Lack of adequate and reliable supply of electricity has forced more than 60 percent of the population to rely on biomass as

their primary energy source. Traditional fuels such as firewood and charcoal are the most frequently used. Around 97 percent of rural households rely on firewood for cooking. The unsustainable use of biomass in Benin has contributed to a serious decline in forest cover (World Bank 2009a). The geographical shape of Benin makes rural electrification easier, as the country presents good low-cost options for the extension of the electric grid. In 2005 a rural electrification program was launched, aiming at increasing rural access to electricity to 36 percent by 2015 and 65 percent by 2025 (Helio International 2009).

Limited and unreliable power supply hobbles business in Benin. In 2005, 63 percent of firms reported that power was a major constraint to doing business, and around 68 percent of firms reported losses due to limited power supply (ICA 2005). In 2009, firms indicated that around 7.5 percent of value was lost because of to power outages that totaled, on average, 24 days per year (table 11). Power consumption per capita in Benin, at 72 KWh/capita per year, is below the average consumption in low-income countries in Africa and only a hundredth of the average for middle-income countries (table 11).

Long delays in obtaining power and high costs associated with power connections further constrain business activity in Benin. In 2010 it took businesses almost 6 months to obtain a permanent power connection, more than double the average in Togo. Beninese firms spend 150 times per capita income to secure a power connection. In Africa firms spend on average around 61 times per capita income to obtain a power connection.[5] By these standards, costs to obtain a power connection in Benin are more than double those in other African countries.

Low electrification rates in Benin are linked to the insufficient and unreliable supply of power. CEB, (the power generation and transmission company owned by Benin and Togo, with headquarters in Togo) sells power to SBEE (Benin's distribution company). CEB's own production capacity is limited to the Nangbeto hydroelectric power plant (66W) and 40 MW gas turbines in Togo and Benin. As CEB has not made the required investments in its generation capacity, it has been unable to meet growing power demand, depending instead on imports of electricity from neighboring countries such as Ghana, Côte d'Ivoire, and Nigeria. It is estimated that as much as 60 percent of the power consumed in Benin in 2007 was imported by CEB. Between 2005 and 2007, CEB's energy production declined, and available imports from Côte d'Ivoire dipped by more than 30 percent. As these arrangements do not cover fully Benin's needs and supply of hydroelectricity is regularly interrupted by drought, SBEE imports electricity directly from neighboring countries such as Ghana and Côte d'Ivoire, and engages in own energy production using rented and owned diesel generation (around 15 percent of total demand). In 2007, 579 GWh, or 76 percent percent of Benin's energy demand, were met through supplies from CEB, and 180 GWh, or 24 percent, were provided by SBEE mainly from its own diesel generation (World Bank 2009a). To meet the supply gap Benin is undertaking investments in an 80 MW thermal power plant. Also being prepared is a 400 MW regional gas-fired power plant spearheaded by the West African Power Pool to be constructed in Benin. In addition, Benin and Togo are now pursuing the completion of the proposed 147 MW Adjarala

[5] Cost to obtain a connection is recorded as a percentage of the economy's income per capita. Costs are recorded exclusive of value added tax. All the fees and costs associated with completing the procedures to connect a warehouse to electricity are recorded, including those related to obtaining clearances from government agencies, applying for the connection, receiving inspections of both the site and the internal wiring, purchasing material, getting the actual connection, and paying a security deposit. Information from local experts and specific regulations and fee schedules are used as sources for costs. If several local partners provide different estimates, the median reported value is used. In all cases the cost excludes bribes.

hydropower plant in the context of the West African Power Pool. It is expected to provide a good complement to the overall power mix.

The institutional structure of the power market between Benin and Togo imposes a significant financial burden on CEB. Because CEB is, by law, the producer of energy for both Benin and Togo, all power produced by SBEE and CEET (Togo's power utility) must be bought by CEB, which then resells it to these utilities at a price lower than its purchase price. As of 2009, the average effective tariff charged by CEB was $0.11 per kilowatt-hour, against an average cost of $0.19. This situation has resulted in important losses to CEB, which has seen the losses associated with underpricing increase from $33 million in 2005 to $50 million in 2009 (table 12, see "hidden costs from sales to Benin"[6]). Furthermore, SBEE's liquidity problems have created arrears to CEB, which are slowly being paid by Benin's government. These payments were as as high as $23 million in 2007, equivalent to almost 4 percent of 2007 Benin's national budget (World Bank 2009a).

Table 12. CEB's hidden costs

Year	Power billings to Benin and Togo	Share of Benin's billings	System losses*	Average cost	Average effective tariff	Hidden costs from sales to Benin	Hidden costs as a share of revenue	Hidden costs in Benin as a share of CEB revenue
	(GWh/year)	(%)	(%)	($/kWh)	($/kWh)	(US$ million/ year)	(%)	(%)
2005	1,274	40	7	0.16	0.10	33	67	27
2006	1,309	38	6	0.17	0.10	36	75	28
2007	1,294	39	3	0.17	0.11	31	58	23
2008	1,418	41	5	0.19	0.11	44	66	27
2009	1,538	50	5	0.18	0.12	50	55	27

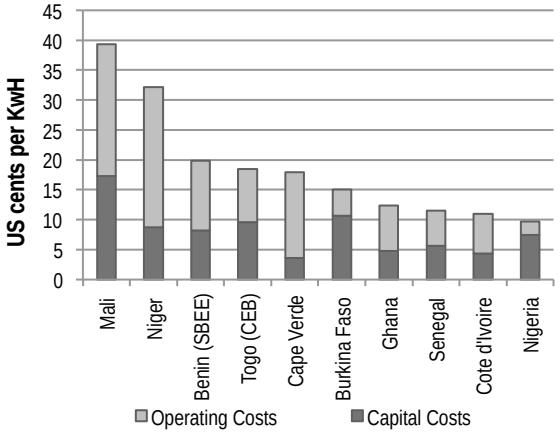
Source: Briceno-Garmendia, Smits, and Foster 2009; World Bank 2009a, SBEE annual report.
* Refers only to distributional losses.

The high cost of production, mainly thermal, compounds the financial problems of SBEE and CEB. At $0.19 and $0.20 per kilowatt-hour, the average costs of power production by CEB and SBEE are among the highest in Africa (figure 15). In both utilities, the high costs of power production are driven by expensive oil-based generation. SBEE incurs costs of between $0.20 and $0.23 per kilowatt-hour when using rented generation infrastructure. However, the way forward looks more optimistic, as prices of inputs are expected to drop between 30 to 60 percent when Nigerian gas becomes available through the West Africa pipeline to run the turbines.

[6] When the mispricing of services, the distributional losses and collection inefficiencies are expressed as percentage of the utility's revenues one is able to calculate how much of the revenue is lost due to these inefficiencies

SBEE is also affected by mispricing of services to the final consumer, though the difference between the average effective tariff and cost of production remains (table 12). Between 2005 and 2008 the average effective tariff charged by SBEE was between $0.17 and $0.18 per kilowatt-hour, near the average for Sub-Saharan Africa. The average operating costs, over the same period, ranged between $0.18 and $0.21 per kilowatt-hour (table 12). On average, SBEE has been able to recover only 72 percent of its operating costs, below the average cost-recovery ratio for low-income and middle-income countries (table 11).

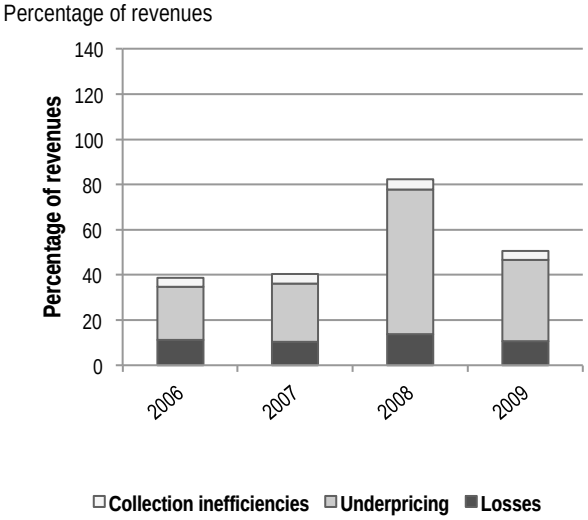
Figure 15. Power production costs by CEB and SBBE in regional context



Source: World Bank 2009a; AICD estimates.

The burden of SBEE inefficiencies, or hidden costs, has increased over time (figure 16). Total hidden costs increased from 39 percent of SBEE's revenue in 2006 to 51 percent in 2009. In absolute terms, this represents more than a two-fold increase in losses, from $32 million in 2006 to $69 million in 2009 (table 13). Hidden costs are mainly driven by underpricing of services and to a lesser extent by distributional losses, particularly in recent years. In 2008 underpricing increased dramatically because of the escalation of productions costs, which were not offset by adjustments in tariffs.

Figure 16. Hidden costs of power generation



Source: Derived from Briceño-Garmendia, Smits, and Foster 2009; World Bank 2009a; SBEE annual report.

Large inefficiencies at CEB and SBEE drained off as much as $72 million dollars in 2008, creating financial instability at the utilities. Those inefficiencies were almost 1.5 percent of the GDP in 2008, with CEB's inefficiencies accounting for 1 percent of GDP.

Looking ahead, simulations suggest that, with further development of regional trade, SBEE's long-run marginal cost would drop to $0.18 per KWh, which could represent a significant improvement over historical levels of $0.26 per KWh (figure 17a) and will be more closely aligned with current tariff levels. The benefit would come mainly from greater availability of more cost-efficient traded power, which would reduce reliance on emergency thermal generation. Nonetheless, costs of power will remain high in absolute terms. For CEB the long-run marginal cost and historical costs would be at the same level (figure 17b); hence there do not seem to be benefits from further trade.

Table 13. SBEE's hidden costs

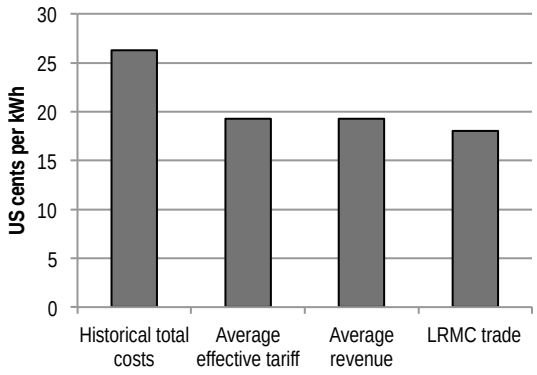
Year	Power billings	System losses	Collection ratio	Average costs	Average effective tariff	Total hidden costs	Total hidden costs
	(GWh/year)	(%)	(%)	($/kWh)	($/kWh)	($mill/year)	(% revenues)
2006	660	18.3	96	0.19		32	39
2007	705	17.0	96	0.21	0.17	37	40
2008	810	16.8	96	0.29	0.18	87	82
2009	920	17.0	96	0.26	0.19	69	51

Source: Briceno-Garmendia, Smits, and Foster 2009, World Bank 2009a, SBEE annual report.
* Refers only to distributional losses.

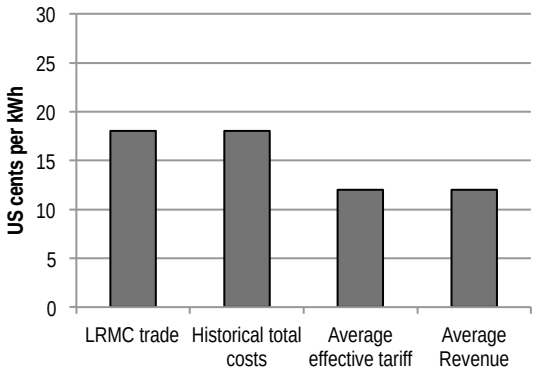
Figure 17. Prospects for long-run cost recovery

Cents per KWh as of 2009

a. SBEE



b. CEB



Source: Rosnes and Vennamo 2009; SBEE annual report for 2009; World Bank 2009a; and World Bank staff estimates.
LRMC trade = long-run marginal cost with additional regional trade in power.

Information and communication technologies

Achievements

Benin has improved the legal and institutional environment for the ICT sector through liberalization and private participation. In 1997 the country enacted a telecommunication law that liberalized the sector. In 2007 a transitory sector regulator, ATRPT (Autorité Transitoire de Régulation des Postes et Télécommunications), was established. The country has achieved a genuinely competitive market with no real dominant player, except in the landline market. Benin's mobile market is one of the most competitive in Africa, with five GSM wireless operators.

Table 14. Benchmarking ICT indicators

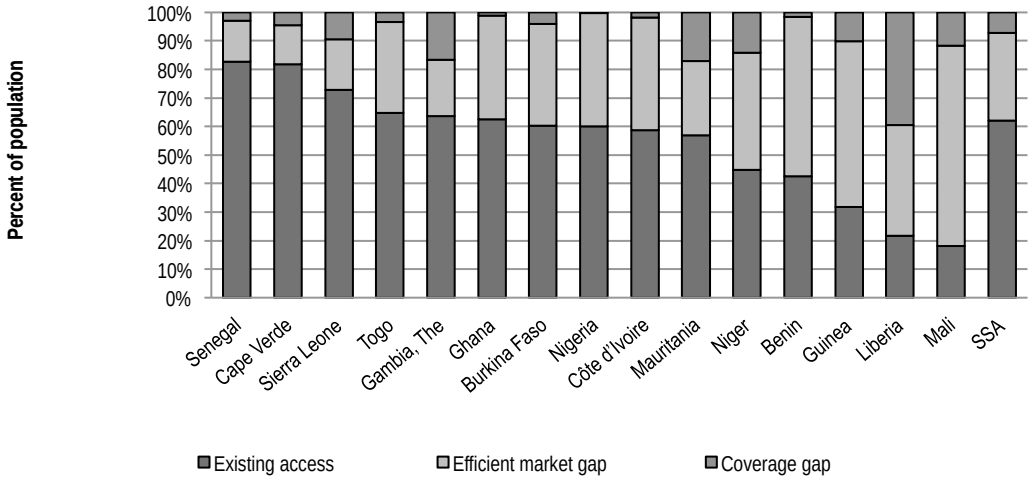
Indicator	Unit	Low-income countries	Benin		Middle-income countries	
		2008	2000	2005	2008	2008
GSM coverage	% population under signal	63	26	43	—	96
Mobile phone	subscribers/100 people	24	1	8	47	95
International bandwidth	bits/capita	24.8	0.3	6.0	19.0	209.3
Internet	users/100 people	3.5	0.2	2.0	6.5	7.0
Landline	subscribers/100 people	0.8	0.8	1.0	1.4	9.2
Price of mobile basket	US$ per month	11.0	15.5	12.4	11.8	9.2
Price of fixed line basket	US$ per month	10.4	11.0	12.0	11.4	11.4
Price of fixed broadband	US$ per month	287	—	116	52	57
Price of a call to United States	US$ per minute	0.7	1.6	0.4	0.4	0.6
Price of an inter-Africa call	US$ per minute	0.9	1.9	0.4	0.4	1.1

Source: Adapted from AICD, OTH, ART, SOCATEL, Orange and World Bank ICT at-a-Glance.

— = data not available

The country has benefited from a huge expansion in coverage and access of mobile communications. Mobile penetration rose from 1 subscription per 100 people in 2000 to 47 in 2008, almost twice the average penetration in low-income countries. However, with only 43 percent of the population under GSM coverage, Benin remains behind the levels of comparable Sub-Saharan peers (table 14). Analysis suggests a large efficiency gap that could be reduced with further regulatory reform that would allow 99 percent of the population to be reached by a GSM signal on a commercial basis (figure 18).

Figure 18. Efficient market gaps for mobile telephone service in West Africa



Source: Mayer and others (2009) using GSM coverage figures for 2005.

Note: Existing access represents the percentage of the population covered by voice infrastructure in the third quarter of 2006. Efficient market gap represents the percentage of the population for whom voice telecommunications services are commercially viable given efficient and competitive markets. Coverage gap represents the coverage gap—the percentage of the population for whom services are not viable without subsidy.

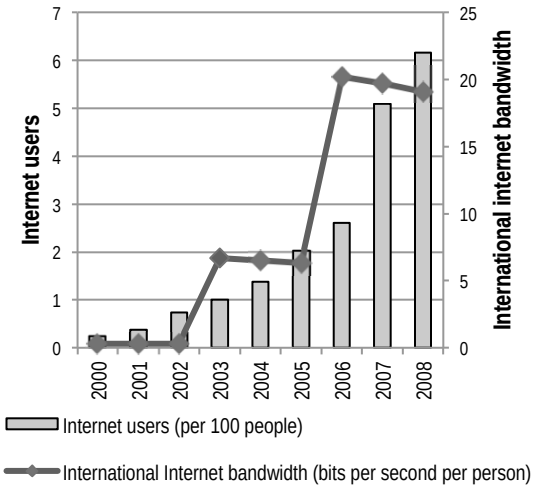
SSA = Sub-Saharan Africa.

The presence of multiple operators in the mobile market has contributed to rapid expansion and an impressive drop in prices. Between 2000 and 2009 the number of connections increased 100-fold—from 39,000 connections to almost 4 million. The price of a mobile basket dropped from $15.5 in 2005 to $11.8 in 2009. Similarly, the price of calls dropped more than 75 percent between 2000 and 2009 (table 14).

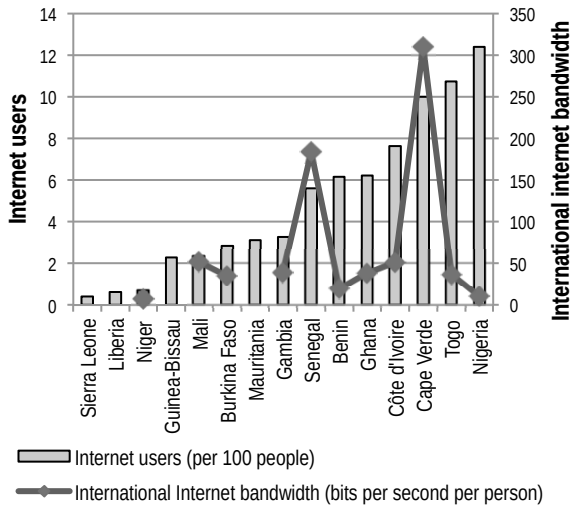
Benin's Internet market has benefited greatly from being connected to the SAT-3 cable and fiber optic lines. Benin Telecom has four transmission arteries operating over optical fibers: Cotonou-Parakou-Mallanville (Niger border), Parakou-Porga (Burkina Faso border), Cotonou-Hilacondji (Togo border), and Cotonou-Igolo (Nigeria border). Internet users increased from 0.2 per 100 people in 2000 to 6.5 in 2009. Internet connectivity increased from 3 to 19 Mbps between 2000 and 2008 (figure 19a). Benin's Internet penetration is above the average for the ECOWAS region (figure 19b). A growing number of users are accessing the Internet via their mobile phones. According the ATRPT, there were 119,477 mobile Internet subscribers in mid-2009, more than eight times the number of fixed Internet subscriptions.[7] Given the popularity of mobile, the launch of third-generation mobile networks is due. 3G mobile networks would enhance high-speed connectivity options and create greater competition in the broadband market.

Figure 19. Benin's Internet market in the ECOWAS context

a. Internet service trends, Benin



b. Internet service, ECOWAS, 2008



Source: World Bank, including AICD analysis.

Another factor driving the expansion of the internet market is a long-standing cybercafe culture, dating back more than a decade (Lohento 2000). According to the national statistical office there are around 200 cybercafes in the country charging on average 344 CFA per hour ($0.72) (INSAE 2010). Most have an ADSL broadband connection, making it cheaper for a user to go to a cybercafe for broadband access than to obtain their own home connection. Dial-up accounts for only 6 percent of fixed Internet subscriptions; most connections are by fixed wireless CDMA or WiMAX (ATRPT 2009.

[7]http://www.atrpt.bj/Observatoire/telecom2009/internet/TABLEAU%20DE%20BORD%20INTERNET%20JUIN%202009.pdf

Wireless technology is also having an impact on the fixed line market; the incumbent operator provides fixed wireless services using CDMA technology, accounting for some 40 percent of all fixed lines in service.

But the full benefit of being connected to the international submarine cable has been muted owing to Benin Telecom's monopoly over the gateway: Although prices are cheaper where there is access to submarine cable, they are even lower when there is a competitive international gateway. For instance, the price of a minute call to the United States could be further reduced from the current $0.40 (table 15).

Table 15. Submarine cable and competition, ICT prices, 2008

US$	Peak 1 minute call within region	Peak 1 minute call to U.S.	Monthly Internet ADSL (256 kbps)
Without submarine cable	0.97	0.96	266
With submarine cable	1.07	0.63	89
Monopoly on international gateway	1.65	1.11	109
Competitive international gateway	0.45	0.28	65

Source: AICD analysis.

Challenges

Benin needs to further reform its ICT sector. The incumbent Benin Telecom remains fully government-owned. The liberalization of the mobile market has not been straightforward, with the government withdrawing the licenses of operators who did not pay a retroactive increase in license fees. The operators eventually accepted the terms of the increase, and their licenses were reissued. The ATRPT was only recently established, and its provisional status creates uncertainty for further market expansion.

Incomplete liberalization and poor infrastructure led to the stagnation of the landline market, which remains under state monopoly control. In the absence of regulation, the price of a landline connection has not declined; it is higher than the average for comparable low-income countries (table 14). Benin Telecom SA is facing major challenges stemming from its strong dependence on the state, which complicates its procurement procedures. Unlike fixed line operators in other countries, Benin Telecom SA does not benefit from a favorable investment code.

Financing Benin's infrastructure

To meet its most pressing infrastructure needs and to catch up with developing countries in other parts of the world, Benin needs to expand its infrastructure assets in key areas (table 16). The targets outlined below are purely illustrative, but they represent a level of aspiration that is not unreasonable. Developed in a standardized way across African countries, they allow for cross-country comparisons of the affordability of meeting targets. The targets can be modified or delayed as needed to achieve financial balance.

Table 16. Illustrative investment targets for infrastructure in Benin

Sector	Economic target	Social target
Transport	Achieve regional connectivity with good quality 2-lane paved road and national connectivity with good quality 1-lane paved road	Provide rural road access to 32 percent of the highest-value agricultural land, and urban road access within 500 meters
Irrigation	Develop additional 14,620 hectares of economically viable small scale irrigation	n.a.
WSS	n.a.	Achieve Millennium Development Goals Clear sector rehabilitation backlog
Power	Develop 4 MW of new generation capacity and 160 MW interconnectors (no-trade scenario)	Raise electrification to 50 percent (100 percent urban and 11 percent rural)
ICT	Install fiber optic links to neighboring capitals and submarine cable	Provide universal access to GSM signal and public broadband facilities

Source: Mayer and others (2008); Rosnes and Vennemo (2009); Carruthers and others (2009); You and others (2009).

Meeting these illustrative infrastructure targets for Benin would cost around $700 million per year over a decade. Capital expenditure accounts for 60 percent of this requirement. Close to 70 percent of needs in the transport, water, and ICT sectors are for capital expenditures. In the power sector, by contrast, about 60 percent of spending needs are related to operation and maintenance of the existing system (table 17).

Table 17. Infrastructure spending needs in Benin, 2006–15

US$ million per year

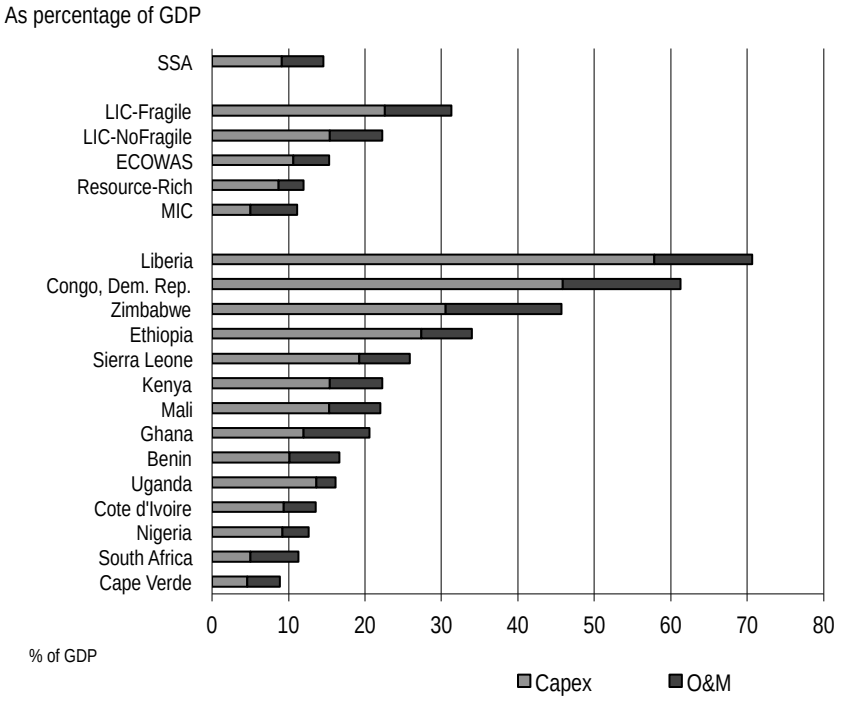
Sector	Capital expenditure	Operations and maintenance	Total needs
Transport	79	37	116
Irrigation	11	nav	11
Water supply and sanitation	193	90	283
Power	92	130	222
ICT	59	22	81
Total	434	278	712

Source: Mayer and others (2008); Rosnes and Vennemo (2009); Carruthers and others (2009); You and others (2009).
Derived from models available on-line at http://www.infrastructureafrica.org/aicd/tools/models.

The greatest spending needs are found in water and sanitation: It will take $283 million per year to meet the Millennium Development Goals in this sector. Power, with the second-highest needs, requires another $222 million per year (table 17). As of 2009 only 25 percent of the national population had access to electricity (53 percent in urban areas and 2 percent in rural areas). To achieve a national access rate of 50 percent, the country needs to expand its generation capacity by 76MW, refurbish 112 MW, and maintain the existing network.

Another $116 million per year are needed annually in the transport sector (table 17). Most of the spending needs are for roads ($91 million), particularly roads to achieve national connectivity and increase rural accessibility. Improvement of the condition of the railways is the major requirement within the rail sector. Similarly, improving the condition and expanding the capacity of the Port of Cotonou accounts for most of the spending needs in the port sector. Requirements for ICT amount to around $81 million a year. About $11 million in capital investment is needed for the development of irrigation (see table 17).

Figure 20. Benin's infrastructure spending needs are fairly average relative to GDP



Legend: LIC – low-income country, MIC – middle-income country, ECOWAS – Economic Community of West African States

Source: Foster and Briceño-Garmendia 2009.

In absolute and GDP terms, Benin's infrastructure spending needs are close to the average for Sub-Saharan Africa. The burden of Benin's spending needs, at 16.6 percent of 2005 GDP of $4.3 billion, is at the level of Sub-Saharan Africa and Benin's West African peers, such as Côte d'Ivoire (figure 20). (Other countries—Liberia, the Democratic Republic of Congo, Zimbabwe, and Ethiopia—have considerably higher burdens.) Of the total, investment would absorb around 10 percent of GDP, about half of what China invested in its infrastructure during the mid-2000s.

Benin already spends a sizable amount ($452 million per year) to meet its infrastructure needs (table 18). Around 60 percent of the total is allocated to capital expenditure and the remaining 40 percent to operations and maintenance. Operating expenditure is entirely covered from the national budget, the resources of state-owned enterprises, and payments by infrastructure users. Around 35 percent of capital expenditure funding comes from public sources. Benin relies on official development assistance (from members of the Development Assistance Committee of the Organisation for Economic Co-operation and Development, OECD) for much of the funding of its basic infrastructure: ODA accounts for 43 percent of all capital spending. The private sector invests another 20 percent, and non-OECD financiers provide around 3 percent.

Table 18. Financial flows to Benin's infrastructure

US$ million per year

	Operations and maintenance	Capital expenditure					Total spending
	Public sector	Public sector	ODA	Non-OECD financiers	PPI	Total CAPEX	
ICT	48	41	0	1	41	83	131
Irrigation	--	--	--	--	--	--	--
Power	71	29	13	1	0	43	114
Transport	41	16	46	6	0	68	109
WSS	15	11	59	0	13	83	98
Total	174	97	118	7	54	277	452

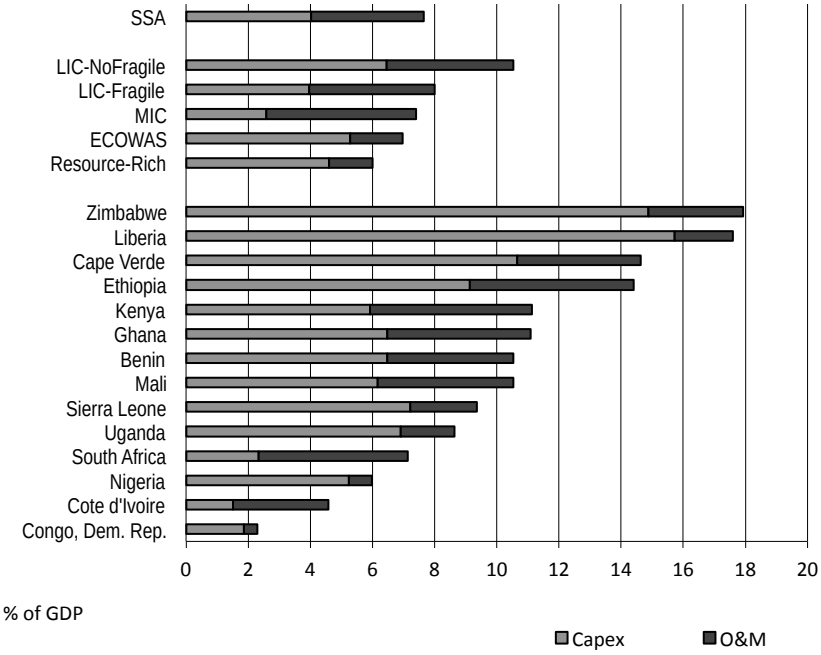
Source: Derived from Foster and Briceño-Garmendia (2009).

ODA = official development assistance; PPI = private participation in infrastructure; CAPEX = capital expenditure; OECD = Organisation for Economic Co-operation and Development.

Note: The public sector figures are averages of actual spending for 2007–09. In the case of SOEs, the average spans 2004–08 and in some cases 2004–09. Funding from external financiers is averaged over the 2002–07 period.

Figure 21. Benin's existing infrastructure spending

As percentage of GDP



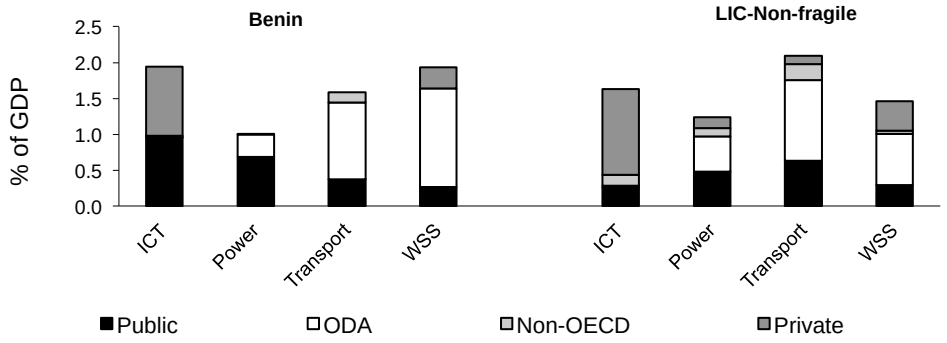
Source: Derived from Foster and Briceño-Garmendia (2009).

Benin's existing spending amounts to almost 10.5 percent of GDP, if 2005 GDP is taken into account (figure 21). This represents an average level of effort, almost at par with the average spending burden for low-income, nonfragile countries. Relative to its peer group, Benin is much more reliant on ODA in capital funding for the water sector.

Benin's ICT and power sector receive larger shares of public funding than those of the low-income countries as a group (figure 22). All considered infrastructure sectors in Benin, except for irrigation, receive comparable funding than non fragile countries. A slightly larger share of infrastructure spending goes to ICT (29 percent), followed by power (25 percent), transport (24 percent), and water and sanitation (22 percent).

Figure 22. Benin's pattern of capital investment in infrastructure and that of comparator countries

Investment in infrastructure sectors as percentage of GDP, by source



Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).
Note: Private investment includes self-financing by households.

How much more can be done within the existing resource envelope?

About $101 million of additional resources could be recovered each year by improving efficiency (table 19). The most vexing problem is underrecovery of the costs of generated power. Every year up to $50 million is lost due to underpricing of power. Underpricing of water services is also substantial, costing Benin $11 million per year. Reducing distributional losses could save another $11 million in power and $3 million in water. Collection of bills for these services needs to be improved. Benin is losing $5 million per year in the power sector and $3 million per year in the water sector because of undercollection of bills for services rendered. Overstaffing in the ICT sector is quite significant. Cutting staff levels to an economically viable benchmark could save an estimated $17 million in ICT.

Underexecution of the capital budget does not seem to be an issue for Benin, based on fiscal data from 2000–05 gathered by the AICD, but there is evidence that the public investment program has slowed down over the past couple years. The general budget execution rate, 97 percent in 2001, dropped to just 55 percent in 2010. Of particular concern is that execution rates for investment spending are persistently below 70 percent, averaging 63.3 percent between 2008 and 2010. The execution rate is lower for donor projects (61 percent) compared with internally financed projects (69.8 percent). The low execution rates on investment projects stem from a low capacity to plan and implement projects and a low capacity in procurement. Aside from addressing low execution rates, an improved approach for a systematic and rigorous analysis and prioritization of projects is needed (World Bank 2011). Detailed data on budget execution rates in the sectors covered in this report are not available after 2006.

Of all sectors, the power sector stands to benefit the most from reducing inefficiencies, followed by water and ICT. The country's resource envelope could be expanded by $67 million if large inefficiencies in the power sector were tackled, in particular underpricing of services.

Table 19. Benin's potential gains from greater operational efficiency

	ICT	Irrigation	Power	Transport	WSS	Total
Underrecovery of costs	n.a.	—	50	0	11	61
Overstaffing	17	n.a.	—	n.a.	0	17
Distribution losses	n.a.	n.a.	11	n.a.	3	13
Undercollection	n.a.	—	5	0	3	8
Low budget execution	0	—	0	0	0	0
Total	17	0	67	0	17	101

Source: Derived from Foster and Briceño-Garmendia (2009).
n.a. = not applicable; —= not available.

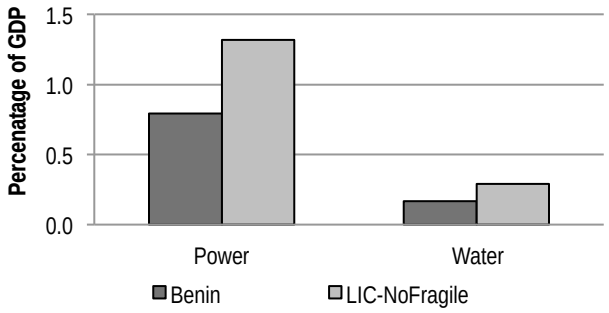
Undercharging for power supplied to the distribution company costs Benin about $50 million each year. In the distribution sector, however, end-user tariffs were very close to cost-recovery levels in 2009. Compared with the average low-income, nonfragile country, Benin's underpricing of power is slight (figure 23).

In the water sector as of 2009, SONEB's average tariffs stood at $0.72 per cubic meter versus an estimated average cost-recovery tariff of $1.10 per cubic meter. The macroeconomic burden, at 0.17 percent of GDP, is lower than that for power. In comparison to the average low-income, nonfragile country, Benin performs fairly well in the recovery of water costs.

How high would consumers' utility bills be if cost-reflective tariffs were applied? For power, with a cost-recovery tariff of $0.19 per kilowatt-hour and a monthly subsistence consumption of 50 kilowatt-hours, the associated utility bill would come to $9.50 per month. With a water-recovery tariff of $1.10 per cubic meter and modest consumption of 10 cubic meters per month, the water utility bill would be $11. Based on the distribution of household budgets in Benin, monthly utility bills at these levels would be affordable by less than 30 percent of the population (figure 24). A more limited level of subsistence consumption of 25 kilowatt-hours per month for power and 4 cubic meters per month for water—enough to meet the most basic needs—would cost $4.80 and $4.40 per month respectively and would be affordable for around 70 percent of the population.

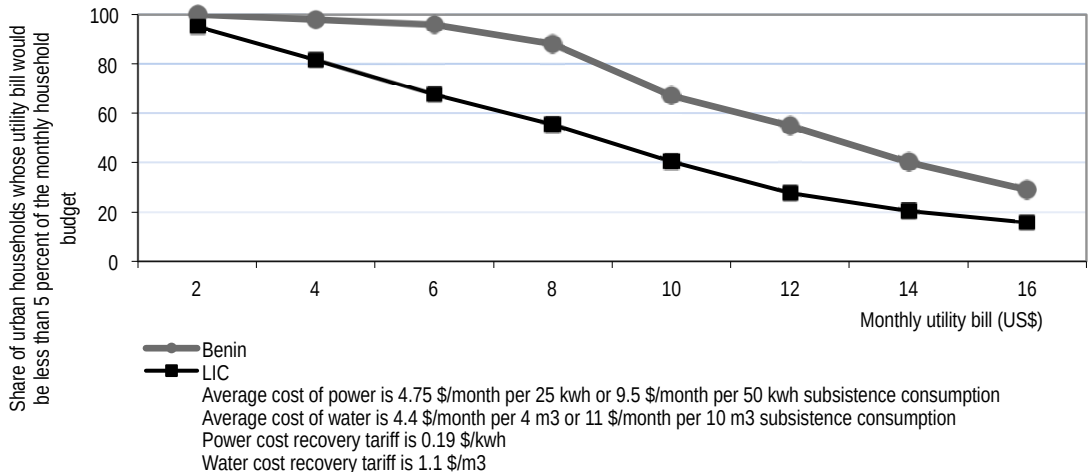
Figure 23. Underpricing of power and water in Benin and other low-income, fragile countries

Financial burden of underpricing as percentage of GDP



Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).

Figure 24. Affordability of power and water in Benin and in other low-income countries



Source: Banerjee and others 2009.

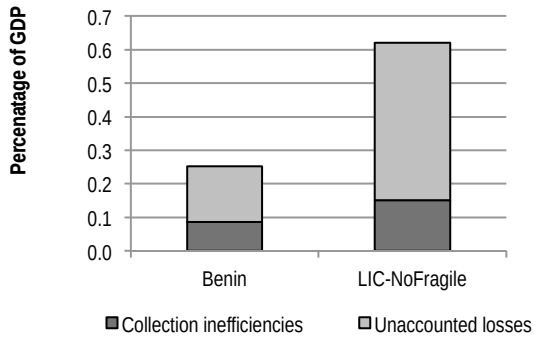
Operational inefficiencies of the power and water utilities cost Benin a further $39 million a year, equivalent to 0.7 percent of GDP. The annual value of inefficiencies in the power sector (at $16 million) is more than twice as much as in the water sector (at $6 million).

Both the power utility, SBEE, and the water utility, SONEB, could benefit from reducing distributional losses and improving bill collection. SBEE's distributional losses of 17 percent in 2009, almost twice as high as the best-practice benchmark of 10 percent, represent a potential savings of $11 million. Nonrevenue water in the water sector stood at 28 percent of total water production in 2009, in comparison to the best-practice benchmark of 20 percent. Nonrevenue water inefficiencies cost Benin about $3 million a year, equivalent to 0.05 percent of GDP. The power utility presently collects 96 percent of its billings. If 100 percent of bills were collected, SBEE could receive additional $5 million a year. The water utility collects 85 percent of its billings, forsaking $3 million a year. Nevertheless, the overall burden of operational inefficiencies in Benin's power and water utilities is lower than for comparable countries (figure 25).

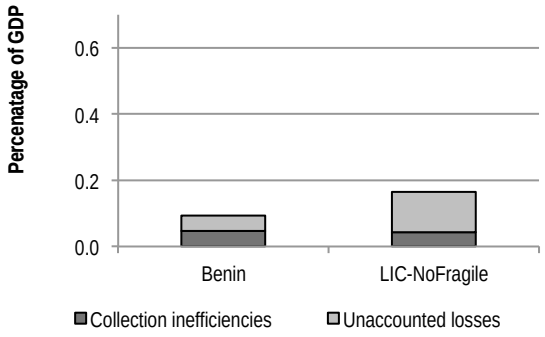
Figure 25. Burden of inefficiency of Benin's power and water utilities

As a percentage of GDP

a. Power sector



b. Water sector



Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).

Annual funding gap

Benin's infrastructure funding gap amounts to $210 million per year, or about 5 percent of GDP, once efficiencies are captured. A funding gap is found in the water, power and, to a lesser extent, transport sectors (table 20). By far, the biggest funding gap, even after accounting for recovery of amounts lost to inefficiency, is found in the water sector.

Table 20. Funding gaps by sector

US$ million

	ICT	Irrigation	Power	Transport	WSS	Total
Spending needs	(81)	(11)	(222)	(116)	(283)	(712)
Existing spending*	81	—	114	105	98	397
Reallocation potential within sectors	0	—	0	5	0	5
Efficiency gains	17	0	67	0	17	101
Overall funding gap	**17**	**—**	**(41)**	**(6)**	**(168)**	**(210)****
Reallocation potential across sectors	50	—	0	0	0	50

Source: Derived from Foster and Briceño-Garmendia (2009).

Note: Potential overspending across sectors is not included in the calculation of the funding gap, because it cannot be assumed that it would be applied toward other infrastructure sectors.

— = data not available.

* Traced to needs

** Assuming complete fungibility across sectors

What else can be done?

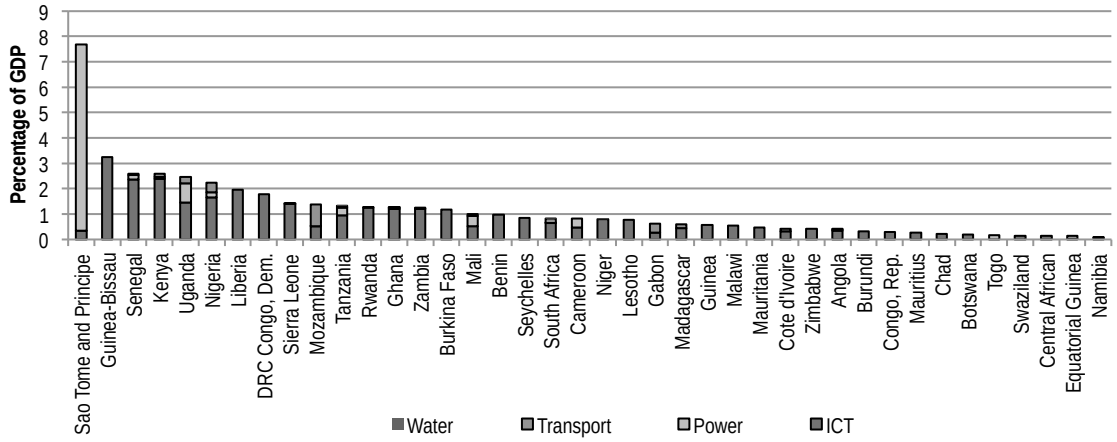
The funding gap can be addressed only by raising additional finance or, alternatively, by adopting lower-cost technologies or less-ambitious targets for infrastructure development.

Benin could attract more private finance into its power and transport sectors. The country has received average levels of private finance for infrastructure, compared with its African peers. In the early 2000s, Benin captured private investment commitments worth around 1 percent of GDP, predominantly in the ICT sector (figure 26). Many countries in Africa have done considerably better, and some have

attracted private investors not only to ICT but also to other sectors. The Democratic Republic of Congo, Liberia, Nigeria, Uganda, Kenya, and Senegal all have captured between 1.8 and 2.5 percent of GDP.

Figure 26. Private investment by sector in various African countries

As percentage of GDP



Source: AICD calculations.

Adopting lower-cost technologies could substantially reduce the cost of meeting infrastructure targets; in fact, it could eliminate the funding gap. The overall savings from adopting alternative technologies to provide a given level of service would amount to $227 million, or as much as 108 percent of the country's total infrastructure funding gap, underscoring the importance of optimal technology choices (table 21).

Table 21. Savings from innovation

US$ million	Before innovation	After innovation	Savings	Savings as % of sector funding gap	Savings as % of total funding gap
WSS, appropriate technology	283	144	139	82%	66%
Power trade	222	178	44	106%	21%
Roads, appropriate technology	116	72	44	696%	21%
Total	621	394	227	108%	108%

Source: AICD calculations.

The greatest saving in both absolute and relative terms would come in the water supply and sanitation sectors. Meeting the Millennium Development Goals for water supply and sanitation with lower-cost technologies than previously used could reduce the associated price tag from $283 million to $144 million each year, reducing the funding gap in the water sector by as much as 80 percent (table 22).

Table 22. Water and sanitation spending needs under pragmatic and base scenarios

US$ million/year

Sector	Base scenario	Pragmatic scenario	Savings
Water and sanitation	283	144	139
Capital spending	193	84	109
Expansion	147	38	109
Rehabilitation	46	46	0
Operation and maintenance	90	60	30

Source: Authors' calculations.
Note: Base scenario: Assumes same distribution of population across modalities as 2006, in both urban and rural areas
Pragmatic scenario: Assumes that additional water supply customers in urban areas all to be served by stand posts. In rural areas, the model assumes that additional water supply customers all to be served by wells/boreholes. In urban areas, additional sanitation customers all to be covered by VIP latrines. In rural areas additional sanitation customers all to be covered by traditional latrines

Furthering power trade and adopting appropriate road technology would reduce spending needs in the power and transport sectors by $44 million each (table 21). If Benin could strategically expand its power trade, this would reduce the resource deficit in the power sector, lowering power needs from $222 million per year to $178 million per year, thus providing the necessary amount to close the funding gap in power. Similarly, meeting transport connectivity standards using less-costly road-surfacing technologies (such as single surface treatments) could reduce the associated price tag from $116 million to $72 million.

Benin will probably have to consider a period longer than a decade to reach the illustrative infrastructure targets outlined here. If efficiency savings could be fully captured, Benin could meet the posited targets in about 14 years. But if Benin does not tackle the inefficiencies of its utilities, the targets may not be reached for 40 years.

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This country report draws upon a wide range of papers, databases, models, and maps that were created as part of the Africa Infrastructure Country Diagnostic. All of these can be downloaded from the project website: www.infrastructureafrica.org. For papers go to the document page (http://www.infrastructureafrica.org/aicd/documents), for databases to the data page (http://www.infrastructureafrica.org/aicd/tools/data), for models go to the models page (http://www.infrastructureafrica.org/aicd/tools/models) and for maps to the map page (http://www.infrastructureafrica.org/aicd/tools/maps). The references for the papers that were used to compile this country report are provided in the table below.

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