



COUNTRY REPORT

Senegal's Infrastructure: A Continental Perspective

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and Carolina Dominguez*

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Africa's Infrastructure | *A Time for Transformation*

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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. The 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 (AFD) 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 first phase of the AICD 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 (AU), 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 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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Synopsis

Between 2000 and 2005 infrastructure made a contribution of 1 percentage point to Senegal's improved per capita growth performance, placing it in the middle of the distribution among West African countries during the period. Raising the country's infrastructure endowment to that of the region's middle-income countries (MICs) could boost annual growth by about 2.7 percentage points.

Senegal has made significant progress in some areas of its infrastructure. In the transport sector, road standards are adequate and their quality average. Senegal has also strengthened the road institutional framework with the creation of the Second Generation Road Fund (FERA) and the Road Maintenance Executing Agency. It has also managed to have a toll road concession granted for the Dakar-Diamniadio Toll Highway. The tariffs in the railway sector are internationally competitive, and there has been improvement in the financial viability of ports. After Nigeria, the country stands as an emerging hub and a major player in air transport.

Also, Senegal has managed to introduce private participation in electricity generation, and the unbundling of the electricity sector is likely to get under way soon, even as the country actively participates in the regional power market. The country is on track to meet the Millennium Development Goals (MDGs) in improved water. In the information and communication technology (ICT) sector there has been an impressive expansion of the mobile and Internet markets.

Looking ahead, the country faces important infrastructure challenges. To increase the efficiency of moving goods to and from Senegal, the overall condition of the road corridors needs to be improved. The poor condition of the classified road network points to a need for more regular maintenance. Traffic along Senegal's railways and through its airports needs to be boosted. In the power sector the country is both economically and financially exposed to a deteriorating stock of infrastructure that it can no longer afford to maintain; inefficient and unreliable power supplies are also taking their toll. In the water and sanitation sector, the country needs to boost the pace of expansion to improve drinking water and sanitation, and close the increasing rural-urban gap in access to improved sanitation. Expanding the Internet market and enhancing the participation of the private sector are the main challenges in the ICT sector.

Addressing Senegal's infrastructure challenges will require sustained expenditure of \$1.792 billion every year over the next decade, with heavy emphasis on capital expenditure. More than half of the total relates to the power sector. At 20 percent of Senegal's 2005 gross domestic product (GDP), this effort is greater than the average for Sub-Saharan Africa at 14.5 percent of GDP.

Senegal already spends around \$911 million per year on infrastructure, equivalent to about 11 percent of its GDP. Almost \$312 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 Senegal could raise tariffs to cost-recovery levels and reduce operational inefficiencies in line with reasonable developing-country benchmarks, it could substantially boost its infrastructure sector.

Comparing spending needs with existing spending and potential efficiency gains (and assuming that the inefficiencies are fully captured) leaves an annual funding gap of \$578 million per year. By far the

largest share of the gap can be traced to the power sector, followed by the ICT sector. Senegal has the potential to close this gap by bringing in more private sector investment and emphasizing projects in infrastructure with a regional dimension, taking advantage of its unique geographical location in the region.

The continental perspective

The Africa Infrastructure Country Diagnostic (AICD) has gathered and analyzed extensive data on infrastructure across almost all African countries, including Senegal. The results have been presented in reports covering various areas of infrastructure—ICT, power, transport, and water and sanitation—and different policy areas, including investment needs, fiscal costs, and sector performance.

This report presents the key AICD findings for Senegal, allowing the country's infrastructure situation to be benchmarked against that of its African peers. Two sets of African benchmarks will be used to evaluate Senegal's situation: nonfragile, low-income countries, and middle-income countries. Detailed comparisons will also be made with immediate regional neighbors in West Africa.

Several methodological issues should be borne in mind. First, because of the cross-country nature of the data collection, a time lag is inevitable. The period covered by the AICD runs from 2001 to 2008. 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, to make comparisons across countries, we had to standardize the indicators and analysis so that everything was done on a consistent basis. This means that some of the indicators presented here may be slightly different from those that are routinely reported and discussed at the country level.

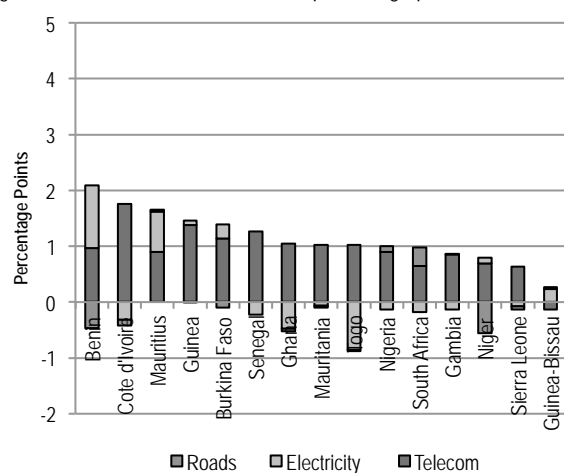
Why infrastructure matters

In common with the rest of the continent, Senegal's growth performance improved markedly between the 1990s and 2000s. The overall improvement in per capita growth rates has been estimated at 1.03 percentage points, mainly from the ICT revolution (1.26 percentage points), while deficient power infrastructure held growth back (by -0.23 percentage points, figure 1a).

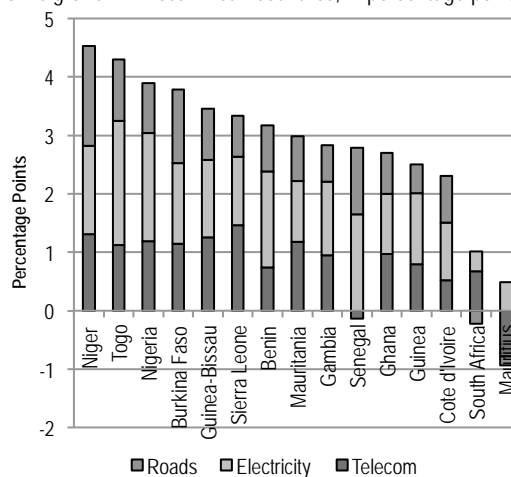
SENEGAL'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

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 contribution of infrastructure to annual per capita economic growth in West African countries, in percentage points



Source: Calderón 2009.

It is in this context that Senegal's sustained growth has been driven not only by groundnut and fish exports and tourism and trade, but also by transport and primarily the development of telecommunication services (World Bank 2007a). Despite its weaker performance in 2006, between 1996 and 2006 Senegal's economy grew at an average annual rate of 4.7 percent, above the average of Sub-Saharan Africa (table 1), but still short of the sustained 7 percent mark per year needed to make important progress on reducing poverty.

Table 1. Economic indicators in Senegal and Sub-Saharan Africa

	GDP growth (1995–2005)	Inflation rate (1995–2005)	Fiscal primary deficit, % of GDP (2000–04)	Gini Index	Aid (\$) per capita (1994–2004)
Senegal	4.7	2.5	2.2	41.3	56.4
Sub-Saharan Africa	3.8	7.0	5.4(*)	47.1	26.6

Source: World Bank 2007a.

Note: (*) West African Economic and Monetary Union (WAEMU) average.
GDP = gross domestic product.

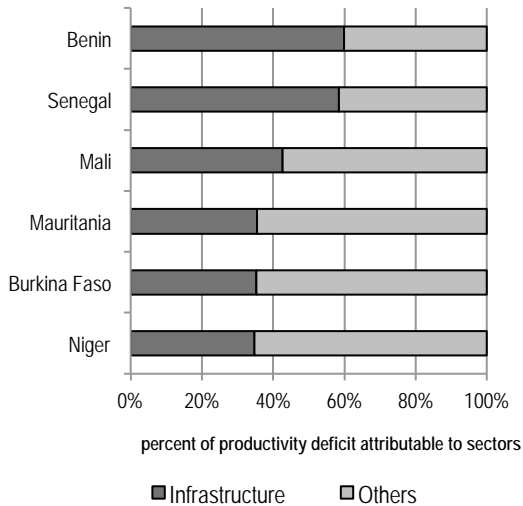
The rate of growth of the Senegalese economy, if the growth fundamentals were to be raised to the level of the leader in the region, Mauritania, would be 2.7 percentage points (figure 1b)—a marked increase from the current infrastructure contribution of 1.03 percentage points. Two-thirds of this would potentially come from improvement in the power generation, transmission, and distribution networks.

While in many aspects Senegal compares favorably with its neighbors in West Africa, poor infrastructure services have had a severe impact on the economy. Inadequate supply of key infrastructure services has contributed to low productivity in the private sector, coupled by rising transportation and electricity costs (World Bank 2007a). Evidence from enterprise surveys suggests that infrastructure constraints are responsible for about 58 percent of the productivity handicap faced by Senegalese firms

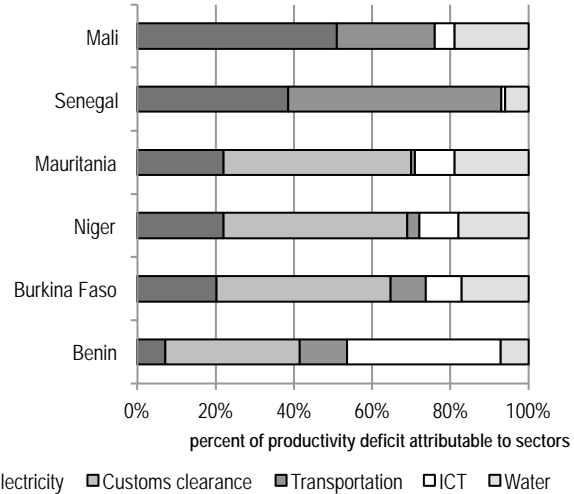
(figure 2a)—among the highest in the region—with the remainder due to poor governance, red tape, and financing constraints. Poor transportation is the infrastructure constraint that weighs most heavily on the productivity of Senegal's firms, with electricity a close second (figure 2b).

Figure 2. Infrastructure deficits constrain firms' productivity

a. Weight of infrastructure deficits among all factors that sap business productivity (percent)



b. Weight of various sectors in productivity deficit attributable to infrastructure (percent)



Source: Escribano, Guasch, and Pena 2010.

The state of Senegal's infrastructure

Senegal has had a privileged position compared to its neighbors with regard to transit, trade, external markets, and political stability. With an economy heavily focused on international markets—in particular trade and tourism—Senegal is highly competitive compared to other African countries. The costs of exporting and importing are considerably lower than in other coastal countries in the region, but significant progress is still needed to achieve the average international competitiveness of developing countries in general.

Most of Senegal's population is concentrated in the Dakar area. The remaining part of the country, by contrast, is sparsely populated and characterized by fragmentary infrastructure coverage. Density varies from about 77 inhabitants per square kilometer (inhabitants/km², 199 inhabitants/square miles) in the west-central region to 2 inhabitants/km² (5 inhabitants/square miles) in the eastern section (figure 3a).

The rapid pace of urbanization—6 out of 10 people are forecasted to live in urban areas by 2015 (World Bank 2007a)—has made it difficult to balance the provision of infrastructure between urban and rural areas in Senegal. Population growth averaged 2.7 percent annually over the period 2000–08, above the average of other low-income countries (2.3 percent per year).

Despite the good economic performance of the past decade, Senegal still remains a poor country. The highest incidence of poverty remains in rural areas (figure 3b). The poorest regions (Ziguichor and Kolda in the south, and Kaolack and Diourbel in the central region) are also those with the lowest access to

water, sanitation, and electricity services, making evident the correlation between poverty and access to basic infrastructure services. Most of the infrastructure is found in the north of the country.

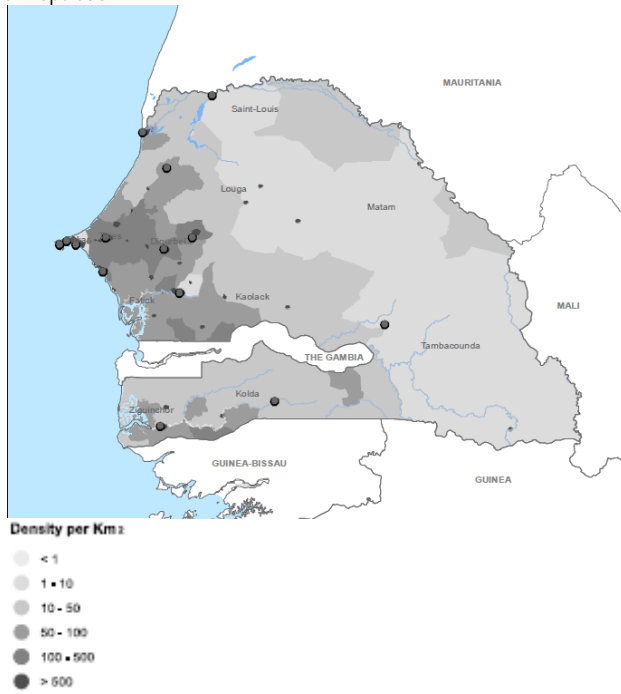
Senegal plays an important role in regional integration and is a key exit to international markets for the subregion. Senegal's main road corridor runs from Dakar to Bamako, bordering Mauritania (figure 4a). This corridor is one of the three international trade corridors in this subregion and became particularly important after the security situation deteriorated in Côte d'Ivoire, forcing a major shift in transit patterns to other subregional corridors. The modernization of the country's one main port and airport, both at Dakar (figure 4a), has improved the subregion's access to international markets. The railway line, shared by Senegal and Mali, runs from Dakar to Bamako, mainly through the southern parts of the country. The deteriorated state of the rail network and equipment, however, has curtailed its capacity to respond to increasing demand. A major power line connects the northern part of the country (figure 4b), and projects are under way to bring power to the south. A fixed transmission network covers the northern and southern parts of Senegal, but there are no major developments in the central part. The country has connected to international networks through satellites and the South Atlantic 3 (SAT-3) submarine cable (figure 4c). Most of the irrigated land is located in the north (figure 4d).

This report begins by reviewing the main achievements and challenges observed in each of Senegal's major infrastructure sectors, with the key findings summarized in table 2. Thereafter, attention will turn to the problem of financing Senegal's outstanding infrastructure needs.

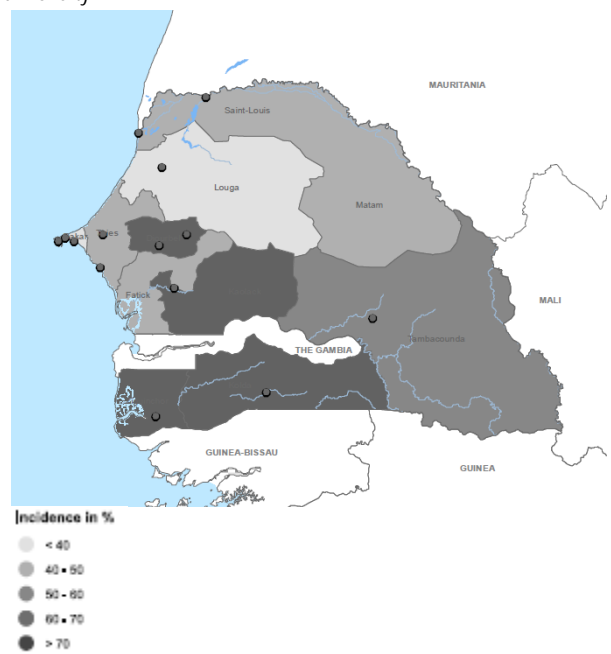
SENEGAL'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

Figure 3. Senegal's population, natural resources, and poverty distribution

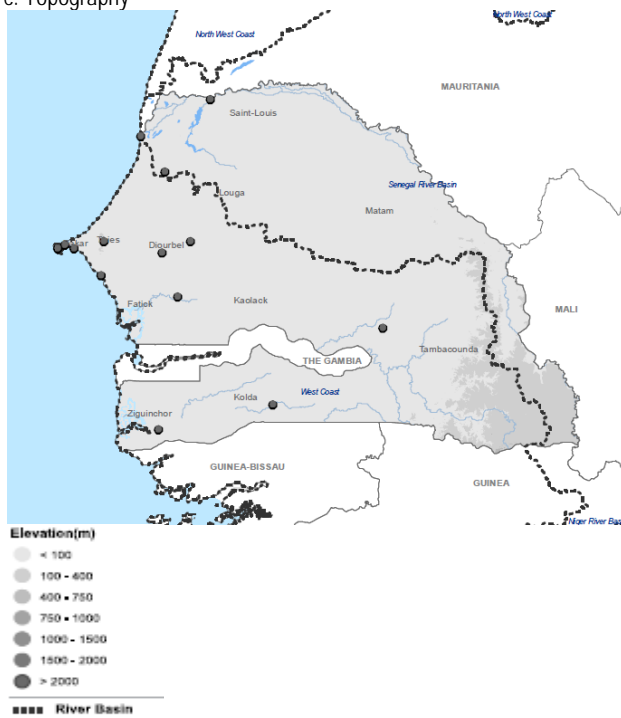
a. Population



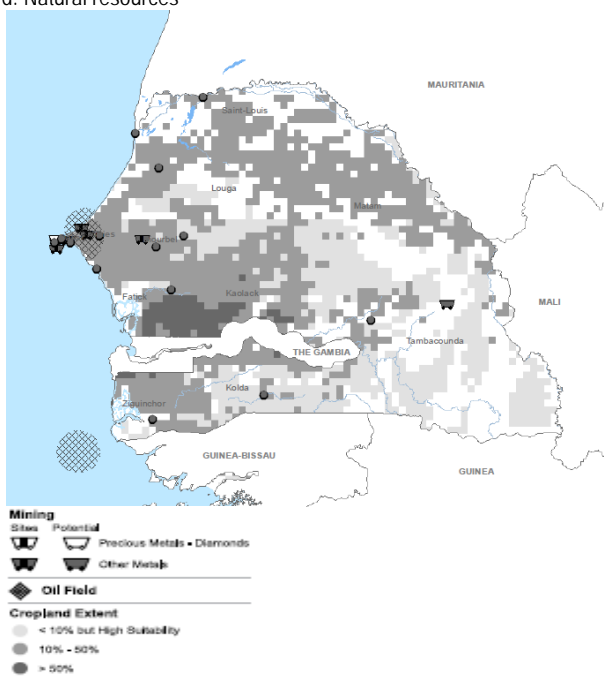
b. Poverty



c. Topography



d. Natural resources

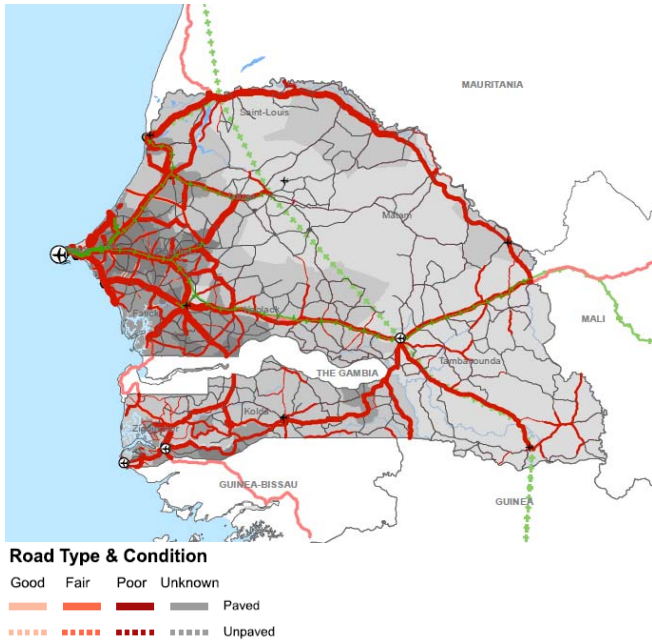


Source: AICD Interactive Infrastructure Atlas for Senegal (www.infrastructureafrica.org/aicd/tools/maps).

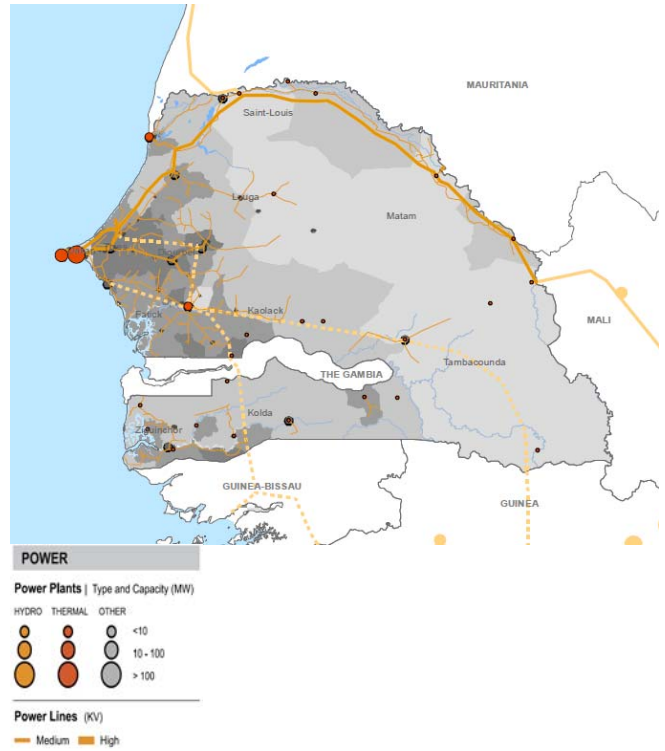
SENEGAL'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

Figure 4. Senegal's infrastructure

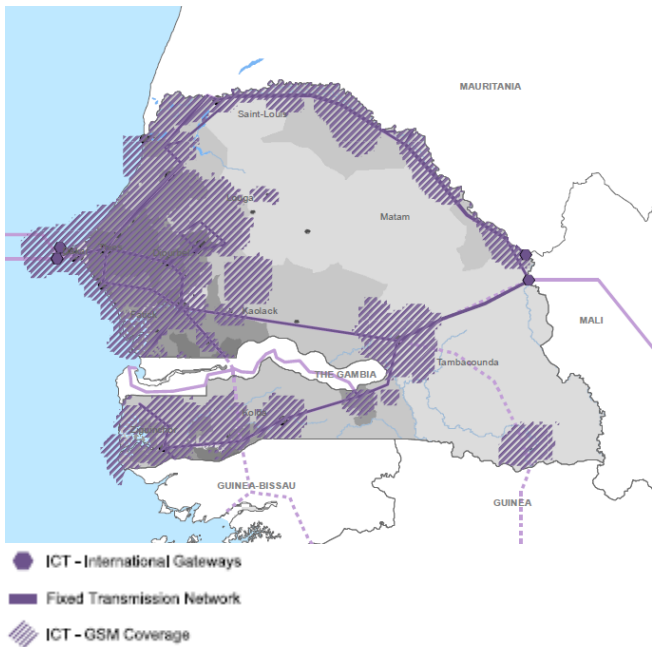
a. Roads



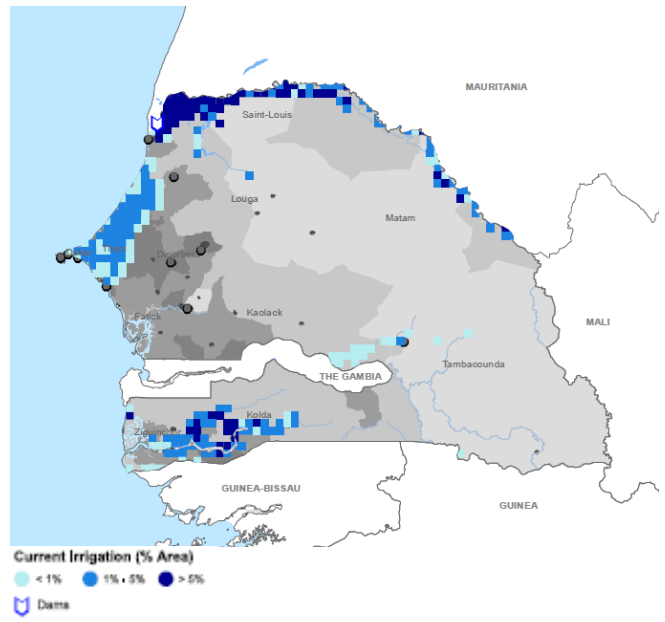
b. Power



c. ICT



d. Water



Source: AICD Interactive Infrastructure Atlas for Senegal (www.infrastructureafrica.org/aicd/tools/maps).

SENEGAL'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

Table 2. The achievements and challenges of Senegal's infrastructure sectors

	Achievements	Challenges
Roads	<p>Institutional strengthening with the creation of the second-generation road fund (FERA) and the road maintenance executing agency (Agence Autonome des Travaux Routiers, AATT).</p> <p>Adequate selection of road standards (at least until 2006).</p> <p>Good average perceived transport quality.</p> <p>First toll road concession granted for the Dakar-Diamniadio toll highway.</p> <p>Improvements in road safety.</p>	<p>Providing high maintenance resources for a highly deteriorated and deteriorating classified road network.</p> <p>Enforcing regulations pertaining overload on the Dakar-Bamako regional corridor.</p> <p>Improving quality of selection and prioritization of projects for use of public funds.</p> <p>Fostering increased private participation in the sector, which could be an alternative source of financing for transport infrastructure.</p> <p>Increasing rural accessibility, especially beyond centers close to the main trunk network and coastal lines.</p>
Railways	<p>Improvements in productivity under private concession compared to past performance as a state-owned enterprise.</p> <p>Freight tariffs are internationally competitive.</p>	<p>Rehabilitating tracks and modernizing rolling stocks are urgent to improve the service quality and unreliability.</p> <p>Revising the proposed emergency investment plan is urgent as it falls short of needs.</p> <p>Improving financial situation of SITARAIL.</p> <p>Increasing traffic level beyond break-even point (or about 600 millions of tonne-km/year). This is only possible, though, if tracks and rolling stocks are updated.</p>
Ports	<p>Traffic volumes at the Port of Dakar increased significantly, making corridors Bamako-Dakar and Ouagadougou-Dakar key corridors in West Africa, after the crisis in Côte d'Ivoire.</p> <p>A new 25-year concession contract granted after which a significant investment program has been set in place and financial position of the port has improved importantly.</p>	<p>Introducing a multimodal transport strategy to improve links between port, roads and railways.</p>
Air transport	<p>Emerging hub and a major player in air transport after Nigeria.</p> <p>Airport security at the airport certified by the ICAO and FAA/IASA was rated satisfactory. Only airport in West Africa with such certification.</p>	<p>Improving access to air transport within the country for passengers and freight could help reach remote areas.</p>
Water and sanitation	<p>On track to meet the MDGs in improved water.</p> <p>Rural-urban gap closing for access to improved water.</p> <p>SDE is an example of a best-practice PPP (affermage) among Sub-Saharan African countries.</p>	<p>Access to improved sanitation services has been slower.</p> <p>Rural-urban gap for access to improved sanitation has widened.</p> <p>Revising water tariff structure and levels.</p>
ICT	<p>Impressive growth of the mobile and Internet markets.</p>	<p>Achieving universal access to GSM.</p>
Power	<p>Relatively high access to electricity, particularly in urban areas.</p> <p>Introduction of private participation in electricity generation.</p> <p>Active participation in the regional power market through the OMVS.</p>	<p>Tackling the growing generation capacity deficit.</p> <p>Improving SENELEC's financial and operational position by promoting regular tariff adjustments, increasing predictability of budgetary transfers, enhancing operational performance and corporate governance issues.</p>

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

Note: FAA = U.S. Federal Aviation Administration; GSM = global system for mobile communications; IASA = International Aviation Safety Assessment; ICAO = International Civil Aviation Organization; MDGs = Millennium Development Goals; MW = megawatts; OMVS = Organisation pour la Mise en valeur du Fleuve Sénégal; PPP = public-private partnership.

Roads

Achievements

The existing network of 18,063 km of roads is adequate to provide basic regional, national, and international connectivity, linking Dakar to international border crossings and provincial capitals in the interior. This is generally true even if Senegal's road density indicators, both for classified and total network, are lower than African averages for low- and middle-income countries (table 3). This reflects an efficient network design that has given priority to connecting Dakar and other relatively large cities (with a population of 50,000 or more) to major ports as well as provincial capitals and cities (with populations of over 25,000).

Table 3. Senegal's road indicators

	Unit	Low-income countries	Senegal	Middle-income countries
Total road network density	km/1,000 km ² of arable land	132.1	93.8	318.4
Classified road network density	km/1,000 km ² of arable land	88.2	81.4	278.4
Rural Accessibility Index—HH survey	% of rural population within 2 km of all-season road	34.1	29.0	62.7
GIS rural accessibility	% of rural population within 2 km of all-season road	23.1	25.7	31.5
Paved road traffic	AADT	1,341.1	944.9	3,797.7
Unpaved road traffic	AADT	38.5	30.8	74.7
Paved network condition*	% in good or fair condition	86.2	61.0	82.0
Unpaved network condition*	% in good or fair condition	55.8	37	57.6
Perceived transport quality	% firms identifying roads as major business constraint	27.6	27.4	18.2
Overengineering	% of main road network paved relatively to low traffic	29.6	19.3	18.4
Underengineering	% of main road network paved relatively to high traffic	13.5	0	20

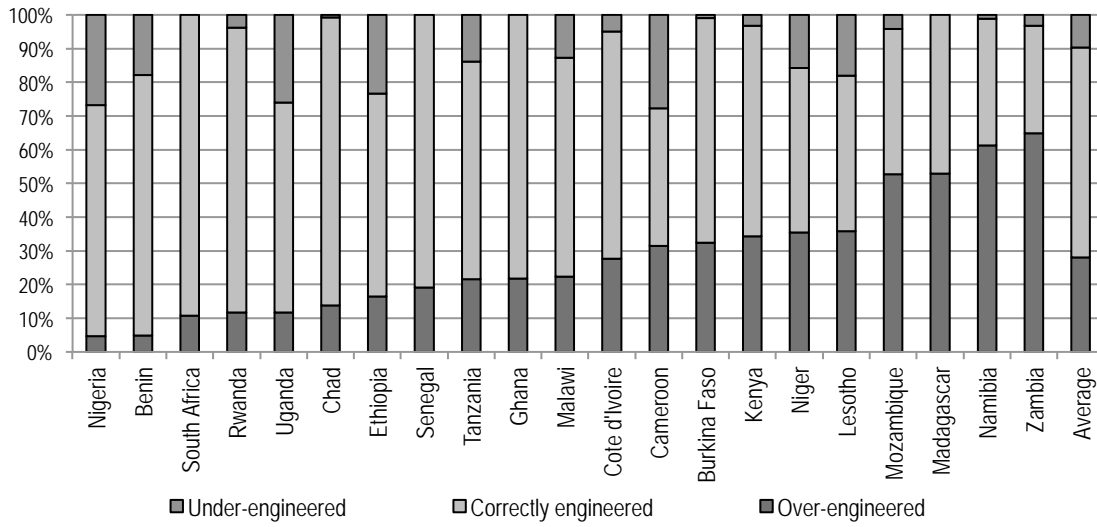
Source: Gwilliam and others 2008. Derived from the AICD national database (www.infrastructureafrica.org/aicd/tools/data).

Note: *2009 data (AL). GIS = geographic information system; AADT = average annual daily traffic.

Good connectivity has been matched by a good selection of road standards in Senegal. Decisions related to whether a road should be paved or not seem to be rooted in observed traffic patterns. In fact, contrary to most African countries, there is no indication of underengineering of roads in Senegal and not even 20 percent of the roads can be classified as overengineered (this is well below the road overengineering levels observed across African countries and cited as typical examples of fiscal mismanagement) (figure 5).¹

¹ Overengineered roads are paved although traffic levels are below 300 vehicles per day—the threshold level that justifies paving. Underengineered roads are not paved although traffic levels are higher than 300 vehicles per day.

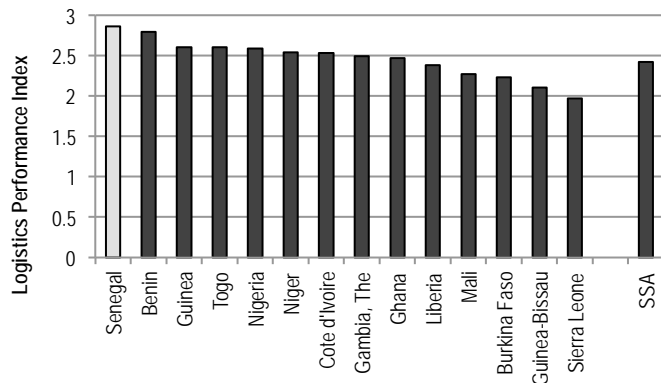
Figure 5. Road standards in Senegal (as of 2006)



Source: Gwilliam and others 2008. Derived from the AICD national database (www.infrastructureafrica.org/aicd/tools/data) using RONET.

The combination of good connectivity and adequate standard selection is well received by users. Therefore, despite the relatively poor conditions of the road network due to deferred maintenance, less than one-third of Senegal's firms identify transport services as a major constraint for doing business—a rating that is within the average observed among low-income countries. Moreover, according to a recent survey on trade logistics that captures indicators including the availability and quality of the roads, Senegal's Logistics Performance Index (LPI), at 2.86, is above the regional average of 2.46 (figure 6). The LPI 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. Such operators combine in-depth knowledge of the countries in which they operate with informed qualitative assessments of other countries with which they trade as well as the experience of a global logistics environment. By this ranking, Senegal's capacity to move goods and connect manufacturers and consumers with international markets is the highest in West Africa.

Figure 6. Senegal's Logistics Performance Index is the highest in West Africa



Source: World Bank 2010d
 Note: SSA = Sub-Saharan Africa.

But there is only so much a well-designed network can do, if it is not properly maintained over time. Road conditions are eroding due to the poor allocation of resources to maintenance and periodic rehabilitation (based on the roads' natural life cycles), and this hinders Senegal's connectivity. The

government of Senegal is fully aware of this issue and, as part of its strategy to modernize transport infrastructure and diversify financing sources for the road sector, has started to promote private participation in the road sector. In March 2009 a 30-year concession was granted for the Dakar-Diamniado toll highway, to build a 20.4 km (Pikine-Diamniadio) road and to manage and maintain the highway toll road from Patte d'Oie to Diamniadio (including a 4.2-km road between Patte d'Oie and Pikine).

There has also been a consistent effort to improve the institutional capacity to deal with road maintenance, a major issue in the sector. In 2008 Senegal established a sound system for funding road maintenance by adopting a second-generation road fund, FERA,² and creating the AATT³ (road maintenance executing agency). Given the evidence from other African countries, putting such institutions in place usually increases the likelihood that maintenance funding will be better protected and mobilized (table 4).

Table 4. Senegal is on the right track to secure road maintenance resources

Percentage of main road network in good or fair condition, by country grouping

Country category	Institutions		Geography		Financing		
Middle-income	81	Road fund and agency	82	Flat and arid	77	High fuel levy	79
Low-income, aid	75	Road fund only	70	Rolling and humid	70	Low fuel levy	70
Low-income, oil producer	70	Road agency only	62			No fuel levy	75

Source: Gwilliam and others 2008.

Finally, the country has made important progress in road safety. The number of accidents has declined from 4,074 in 2003 to 3,446 in 2005 (World Bank 2008), thanks to the stricter enforcement of licenses and registration and the inclusion of standards for signaling, marking, and lightening of roads in the road safety code.

Challenges

Once in relatively good shape, Senegal's road infrastructure has been deteriorating since the early 1990s. In 2007 the government, supported by donors, set in place the Program Sectoriel des Transports II (PTST2) to revamp the road network. After a couple of years of visible improvements, 40 percent of the paved network and 60–63 percent of the unpaved network still remains in poor condition (World Bank 2010c).

Part of the problem of deteriorating road conditions is that Senegal has not been able to fully procure and protect resources for road maintenance, despite the great strides toward institutional reform made by creating the FERA and AATT. Over the period 2005–09, Senegal's spending on network segments that could be maintained was short of estimated maintenance requirements by 78 percent, while spending on the whole network was about 11 percent short of estimated maintenance and rehabilitation requirements.

² Fonds d'Entretien Routier Autonome.

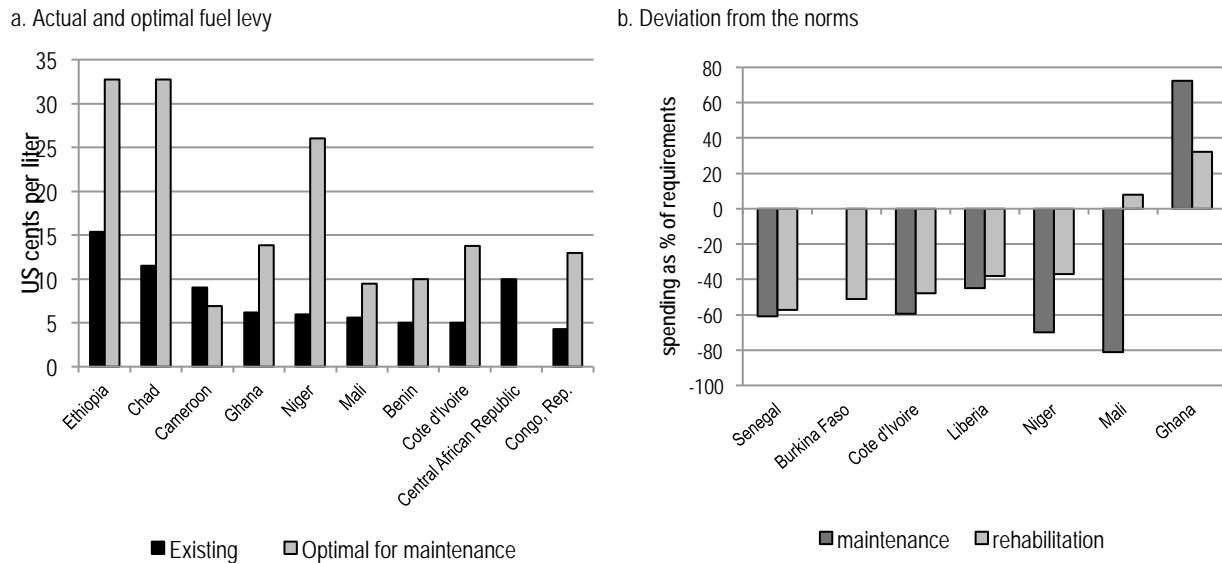
³ Agence Autonome des Travaux Routiers.

Moreover, studies conducted under the PST2 have identified a backlog in road rehabilitation needs of \$400 million.⁴

Assuming that the backlog for rehabilitation is financed overnight directly by the government with support from donors and that the network is in good or fair (that is, maintainable) condition, funding routine maintenance will require around \$100 million–\$10 million per year based on a 40-year life cycle for roads. These calculations lead to an optimal fuel levy of \$24.8 cents per liter—10 times higher than the actual fuel levy of \$2.6 cents per liter, as of 2009 (figure 7a).

The road fund has been funded primarily by transfers from the budget and by donor contributions to finance road maintenance. The level of the fuel levy has been a critical element of the sector's policy agenda. In fact, in 2011, the tax on gasoline was essentially doubled (decree 2011-336 of March 16, 2011). This measure is expected to substantially reduce the funding gap that must be covered by the government and donors. Yet results remain to be seen. According to the estimates described above, the fuel levy may still fall short of covering all maintenance needs. In 2009, taking into account internal and external contributions, the total amount spent on maintenance was equivalent to 0.44 percent of GDP (of which budget allocations were 0.33 percent of GDP) about 60 percent short of the needs (figure 7b).

Figure 7. Senegal's expenditure is not enough to catch up with its road rehabilitation backlog



Source: Gwilliam and others 2008.

Other efforts to diversify funding sources for maintenance and rehabilitation are noticeable, particularly those involving the private sector. Yet, there is an overdependence on public funds and an inadequate allocation of resources while financing transport infrastructure. Private sector financing of transport infrastructure is still quite limited, except for the recently approved Dakar-Diamniadio toll highway (World Bank 2010c). At the same time, there is no clear optimization of resource allocation to different projects in this sector. The need for greater selectivity and efficient prioritization of projects for

⁴ Some sector experts suggest that this is a conservative estimate and that rehabilitation needs are on the order of \$1.4 billion.

use of government funds is all the more important now in the context of the financial crisis and subsequent scarcity of public funds.

The binding unavailability of resources for road works has been made more conspicuous by the ongoing overloading of trucks, which has contributed significantly to road deterioration, especially along the regional transport corridor from Dakar to Bamako. This situation was exacerbated as international freight traffic increased when the political turmoil in Côte d'Ivoire forced transport operators to look for alternative routes. The lack of enforcement of weight controls along the road and the absence of formal agreements among the countries that utilize these corridors make it very difficult to distribute the costs of road rehabilitation and maintenance between national taxpayers and international truck operators. Achieving a consensus on how to distribute the costs and benefits of using this regional transport corridor is another critical element of the sector's policy agenda that has yet to be addressed.⁵

Finally, contrary to the good record of the road network in providing national and regional connectivity, Senegal has complex issues to tackle regarding the provision of rural road accessibility. Overall, about one-third of Senegal's population lives within 2 km of an all-weather road—the same level as for all low-income countries (or somewhat more, depending on the indicator used) and below the level found in middle-income countries (see table 3). But beyond the trunk network, accessibility falls off. The clustering of Senegal's population along the coast makes it comparatively difficult to achieve significant increases in rural accessibility by improving the quality of the existing rural network beyond this narrow band. Even though population density may be low in the remaining zones of the country, extending the rural road network remains a strong priority for the government because road density is one of the main determinants of cash income from agricultural sales in Senegal, along with agriculture yield, high-value crops, and direct selling to the market. Improving accessibility to roads in the more isolated rural regions is also important to strengthen their integration with the rest of the country.

Rail

Senegal has a binational railway line (between Dakar and Bamako), jointly owned with Mali, which is part of one of the main West African transport corridors. The Dakar-Bamako railway, which was the prime mode of transport during colonial times, could easily compete as a more economical means of transport than road. Senegal's rail transport, if successfully rehabilitated, could offer the best long-haul transport to and from Bamako.

Achievements

Efforts have been made to improve the functioning and capacity of Senegal's rail system and to bring fresh capital to an investment-starved system. In October 2003, through an international competitive process, a 25-year concession was granted to TRANSRAIL S.A., a privately owned company. Until then, the 1,228 km Dakar-Bamako railway was run by two parastatal companies: the Société Nationale des Chemins de Fer du Senegal (SNCS) operated the Senegalese part (644 km) and the Régie Nationale du Chemin de Fer du Mali (RCFM) operated the Malian part (584 km) (World Bank 2007b).

⁵ A reference framework adopted by the United Nations (Delphi Agreements) could be used as a starting point for these countries to reach an agreement.

Though TRANSRAIL productivity is on par or higher than most state-owned railways on the continent, it still has room for improvement as its performance is significantly below that of other African railway concessions such as SITARAIL and Camrail (table 5). With an average of 7 cents/tonne-km, however, TRANSRAIL's freight tariffs are regionally competitive. By comparison to its preconcession status, TRANSRAIL has improved both its operational and financial performance although it has yet to reach financial sustainability. Since its concessioning in 2003, TRANSRAIL's annual turnover has increased by 27 percent from \$29.7 million to \$37.8 million in 2009. But despite this improvement the company accumulated net losses between 2003 and 2009 of \$25 million, leaving it without any margin for major investments in rolling stock and/or infrastructure rehabilitation.

Challenges

The dilapidated tracks and outdated rolling stock together with the critical financing situation of TRANSRAIL are the two major problems that need to be urgently addressed in Senegal's railway sector.

TRANSRAIL's traffic volume for the years 2005 to 2009 is low—only half the volume of SITARAIL, the other West African railway concession with a very similar type of binational network—despite its having access to a greater hinterland demand. The main reason for this is a lack of financing, dilapidated tracks, and outdated rolling stock. The relatively high rate of derailments (0.45 derailments per million traffic units, TU) and the low locomotive reliability (15 mainline locomotive breakdowns per 100,000 km) are significant indicators of these problems. These numbers should not come as a surprise, however, as TRANSRAIL's assets are old—over 70 years for some portion of the track and more than 30 years on average for locomotives. The segment between Tambacounda and Dioubeba in Senegal (approximately 464 km), close to the border with Mali, is in poor condition and significantly hampers Mali's trade to the Port of Dakar.

Actions along key four axes are needed to improve the situation of the company and the delivery of services: (i) an increase in production beyond the break-even point (or about 600 million tonne-km/year), which means securing in excess of \$200 million in new investment in both tracks and rolling stock; (ii) the further reduction of the workforce and the training of new employees to counteract the depletion of personnel skills; (iii) more balanced intermodal competitive (road/rail) environment in host countries; and (iv) funding of a short- and medium-term cash deficit through an increase in working capital as part of a broad restructuring of both the concession agreement and current shareholder structure.

TRANSRAIL's short-term prospects are grim unless tracks and rolling stock are rehabilitated and its concession contract restructured. TRANSRAIL recently proposed an emergency investment plan that is deemed to be insufficient given its operational needs. The railway faces critical cash flow and insolvency issues; the company is almost bankrupt, with significant public service obligations and a build-up of arrears. The precarious operational situation is leading to unpredictable performance.

Senegal's rail transport, if successfully rehabilitated, could offer the best long-haul transport to and from Dakar. The role of the Dakar-Bamako railway, which was the prime mode of transport during colonial times, ought to be revitalized since it is a more economical means of transport than road. The management concession to a private operating company has shown that years of mismanagement and neglect can be offset; but to achieve long-lasting improvements, a major investment program, larger than the one already in place, would need to be funded and implemented.

Table 5. Railway indicators for Senegal and select other countries, 2005–09

	TRANSRAIL (Senegal–Mali)	SITARAIL (Côte d'Ivoire— Burkina Faso)	Camrail (Cameroon)	Madarail (Madagascar)
Concessions (1)/ state run (0)	1	1	1	1
Freight traffic volume (million tonne-km)	393	794	1,061	113
Passenger traffic volume (million passenger-km)	91	210	377	3
Total traffic volume (million TU)*	429	878	1,212	114
Efficiency				
Staff: 1,000 TU per staff	247	558	547	118
Derailments per million TU	0.45	0.01	0.15	2.31
Mainline locomotive breakdowns per 100,000 km	15	6	9	6
Tariffs				
Average unit tariff, freight, US cents/tonne-km	7.0	6.3	8.1	6.0

Source: Bullock 2009. Derived from the AICD rail operator database (www.infrastructureafrica.org/aicd/tools/data).

Note: *2.5 passenger-km equivalent to 1 TU, 1 tonne-km equivalent to 1 TU.

TU = traffic unit.

Ports

Achievements

The overall safety of maritime traffic improved significantly in the early 2000s, with the adoption of an updated maritime code and improvements in navigation and signaling equipment at the ports of Dakar, Kaolack, and Ziguinchor. The Port of Dakar is by far the most important port in Senegal and one of the most important ports in West Africa. Its traffic increased by over 300 percent between 1995 and 2005, going from 87,000 twenty-foot equivalent units (TEUs) in 1995 to over 363,000 TEUs in 2006.

The Dakar port has transit traffic arrangements with Mauritania; in fact 25 percent of that country's import volume is moved by road from Dakar, in large part because Mauritania's port at Nouakchott cannot meet the sizable demand of the country's potential container transshipment traffic. In recent years, traffic volumes at the Port of Dakar have increased as the unfortunate crisis in Côte d'Ivoire has forced Mali and Burkina Faso to shift trade traffic from Abidjan to Dakar, now emerging as a key alternative corridor in West Africa. To put things in perspective, until 2000 Abidjan captured about 80 percent of all transit traffic to and from Mali. By 2003 that figure had dropped to just 14 percent, as traffic was diverted to Dakar in Senegal, Lomé in Togo, and Tema in Ghana. Dakar soon became the most important port for Mali, capturing one-third of its traffic.

The Dakar port is predominately a hybrid port: its infrastructure and most of its operations—including some frontline operations—remain in public hands. The container port was given in concession to Bolloré; when this concession expired in 2008, a new 25-year concession contract was granted to Dubai Ports World. This concession includes the development and operation of the existing container terminal as well as the building and operation of a new container terminal at Port du Futur. The new operator has already started operations and has launched a significant investment program. The continuous involvement of the private sector in frontline activities is a step forward vis-à-vis the service ports model that predominates in Sub-Saharan Africa.

The involvement of the private sector has improved the financial viability of the Port of Dakar—handling costs have fallen substantially, particularly due to the reduction of dwell times in the port. Time to export and import is just one-third of the level of other Sub-Saharan African countries and about the level of the Organisation for Economic Co-operation and Development (OECD) countries. Costs of importing to Senegal are lower than the regional average, but 1.6 times the costs of importing to an OECD country, whereas costs of exporting from Senegal are now 25 percent lower than the Sub-Saharan African average and at the same level as those faced by OECD countries (table 6).

Table 6. Costs of exporting and importing

Indicator	Senegal	SSA	OECD
Cost to export (\$ per container)	1,098	1,942	1,090
Cost to import (\$ per container)	1,940	2,365	1,146
Time to export (days)	11	34	11
Time to import (days)	14	39	11
Documents to export (number)	6	8	4
Documents to import (number)	5	9	5

Source: World Bank 2011a.
Note: SSA= Sub-Saharan Africa; OECD = Organisation for Economic Co-operation and Development

The sector has also benefited from greater levels of traffic between the Port of Dakar and Port of Ziguinchor. Passenger and freight services increased from two times per week in 2000 to three times per week in 2008. Over the same period, the number of passengers increased from 500,000 to 504,000 and tonnes of freight from 100,000 to 300, 000.

Challenges

Transportation services within the Port of Dakar—from the ships to the warehouses—present a mixed performance record. On the one hand, the average container dwell time was 7 days as of 2006—the lowest among African competitors—and the average truck turnaround time, at 5 hours, was second only to Lomé, Togo. On the other hand, general-cargo performance indicators (vessel stay, preberth waiting time, and handling charges) rank very poorly when compared with neighboring ports (table 7).

Moreover, multimodal coordination remains an issue of concern, and the lack of a multimodal strategy for transportation in Senegal has seriously hindered the capacity of the port to realize its potential as a regional trade hub. The port has failed to fully capitalize on the consequences of the political crisis and instability in Côte d'Ivoire (whose vessels have needed alternate routes to deliver their freight in the region).

SENEGAL'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

Table 7. Port indicators for Senegal compared against those of select ports in Africa, 2006

Port	Dakar, Senegal	Cotonou, Benin	Abidjan, Côte d'Ivoire	Tema, Ghana	Apapa, Nigeria	Harcourt, Nigeria	Lome, Togo
Container dwell time—average (days)	7	12	12	25	42		13
Truck processing time for receipt and delivery of cargo (turnaround time)—average (hours)	5	6	2.5	8	6		4
General-cargo vessel preberth waiting time—average (hours)	24	48	2.9	9.6	36	38.4	
General-cargo vessel stay time (turnaround time)—average (hours)	60	48	2.2	48	40.8	45.6	
Container cargo—total handled (TEU, annual)	331,191	158,201	500,119	420,000	336,308	7,900	460,000
Container-cargo-handling charge (ship to gate)—average (\$ per TEU)	160	180	260	168	155		220
General-cargo-handling charge (ship to gate)—average (\$ per tonne)	15	8.5	13.5	10	8	8	9
Bulk dry-handling charge (ship to gate or rail)—average (\$ per tonne)	5	5	5	3			5

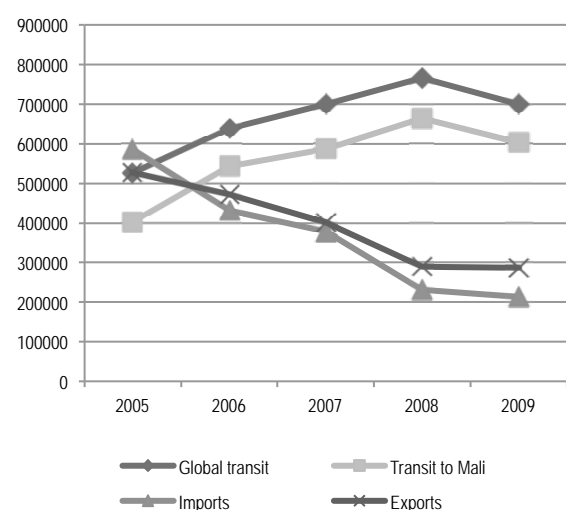
Source: Derived from the AICD port operator database (www.infrastructureafrica.org/aicd/tools/data).

Note: *Concession for building and operating container terminals, not the whole port.

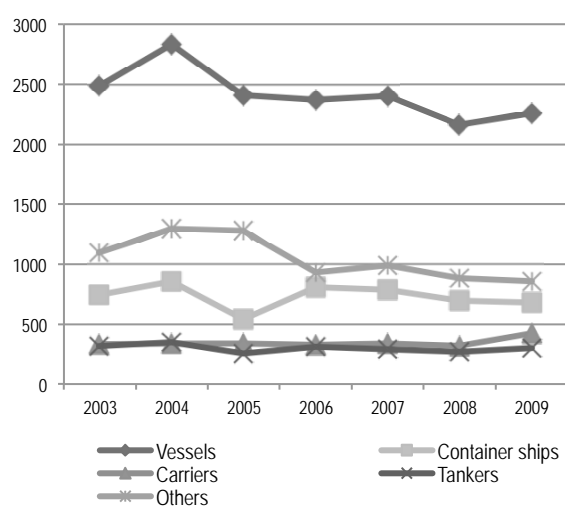
TEU = 20-foot equivalent unit.

Figure 8. Evolution of traffic and vessels moving through the Port of Dakar

a. Traffic, 2005–09



b. Vessels, 2003–09



Source: Port Autonome de Dakar 2010.

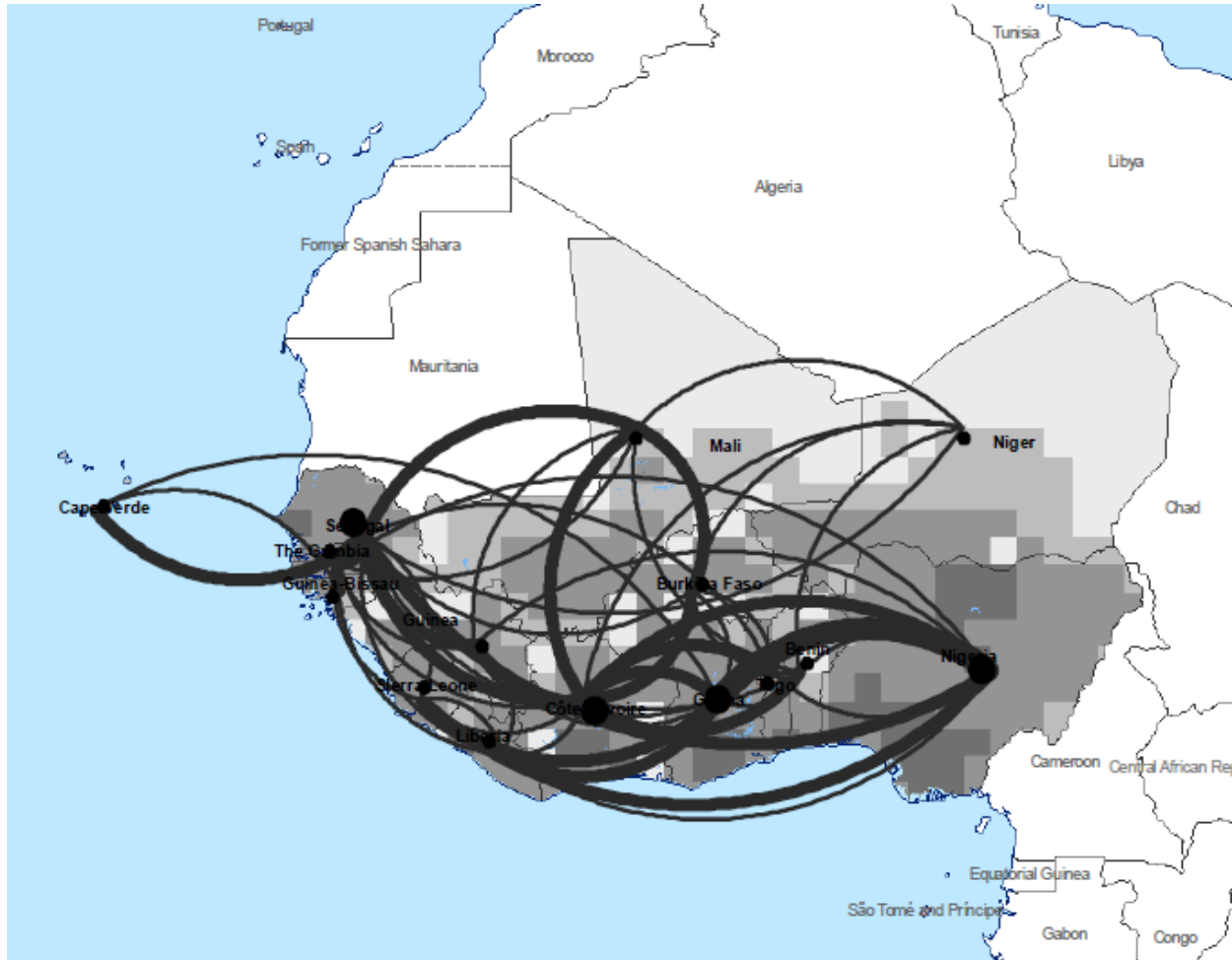
Air transport

Achievements

Senegal is an emerging hub and a major player in air transportation in West Africa (table 8, figure 9), ranking only second to Nigeria. Senegal's air transport sector accounts for more than 2.6 million seats per year across all traffic categories and has experienced rapid growth over the past few years. The Senegalese market grew more than 50 percent between 2001 and 2007, as the number of seats available

increased from 1.67 million to 2.6 million (figure 10a). The bulk of Senegal's air transport market is international (around 85 percent of total seats), excluding flights to Sub-Saharan and North Africa. Traffic in Dakar Airport increased from 1.1 million passengers in 2000 to 1.7 million in 2006 (World Bank 2008).

Figure 9. Senegal is an emerging hub for West Africa



Source: AICD 2010.

Senegal's position in the international air transport market has been strengthened recently as security at the airport was certified by the International Civil Aviation Organization (ICAO) and rated satisfactory by the U.S. Federal Aviation Administration/ International Aviation Safety Assessment (FAA/IASA). The FAA rating has led to additional traffic from the United States, since Dakar Airport is the only West African airport to have acquired such certification. Also, safety has improved following the modernization of the National Department of Meteorology, which provides weather updates for the entire transport sector. Foreign airlines (that is, South African Airlines, Brussels Airlines, and Delta Airlines) are now operating passenger and freight services from Léopold Sédar Senghor International Airport. Between 2000 and 2006, take-offs and landings increased by 17 percent and passenger traffic by 43 percent as tourism increased—and promises to continue doing so (World Bank 2008).

SENEGAL'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

Table 8. Benchmarking air transport indicators for Senegal and other select countries

Country	Senegal	Côte d'Ivoire	Ghana	Nigeria
Traffic (2007)				
Domestic seats (seats per year)	130,000	—	144,183	1,199,572
Seats for international travel within Africa (seats per year)	1,260,000	851,003	909,819	1,373,745
Seats for intercontinental travel (seats per year)	1,230,000	297,891	832,895	2,437,702
Seats available per capita	0.23	0.06	0.08	0.09
Herfindahl-Hirschmann Index—air transport market (%)	11.64	9.75	6.28	11.28
Quality				
Percent of seat-km in newer aircraft	98	90.9	96.8	71.42
Percent of seat-km in medium or smaller aircraft	39.3	52.3	15.7	29.6
Percent of carriers passing IATA/IOSA audit	50.0	0	0	28.6
FAA/IASA audit status	No audit	Fail	Fail	No audit

Source: Bofinger 2009. Derived from the AICD national database (www.infrastructureafrica.org/aicd/tools/data).

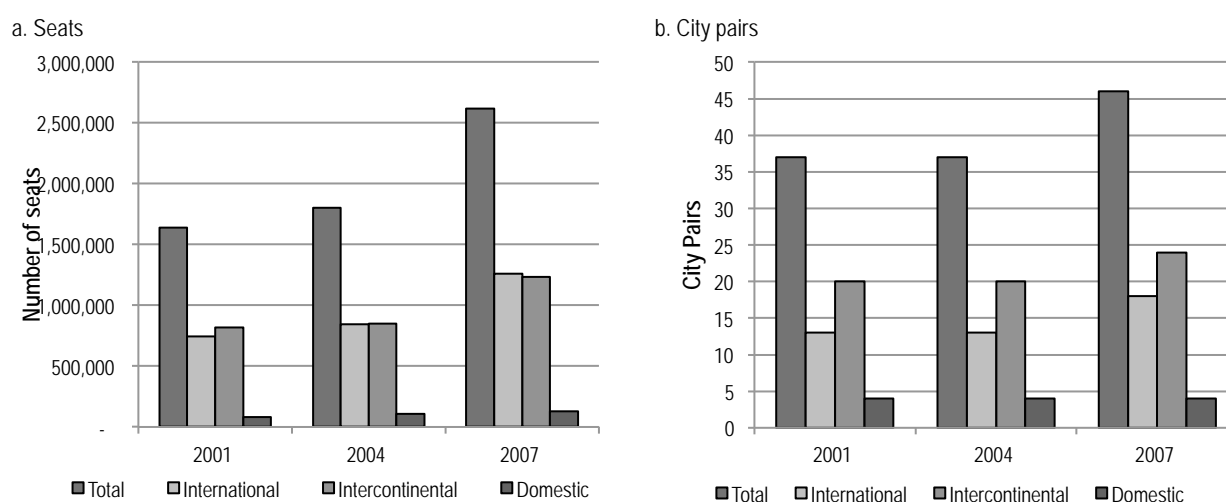
Note: Herfindahl-Hirschmann Index (HHI) is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. All data as of 2007 are based on estimations and computations of scheduled advertised seats, as published by the Seabury Aviation Data Group. This captures 98 percent of worldwide traffic, but a percentage of African traffic is not captured by these data.

FAA = U.S. Federal Aviation Administration; IASA = International Aviation Safety Assessment; IATA = International Air Transport Association; IOSA = IATA International Safety Audit.

— = Not available.

On par with this growth trend, Senegal's international connectivity has been progressively increasing, while domestic connectivity has remained constant. Intercontinental city pairs went up from 13 in 2004 to 18 in 2007, and international city pairs went from 20 to 24 during the same period (figure 10b). International services are competitive with a Herfindahl-Hirschmann Index of only 10 percent (table 8).

Figure 10. Evolution of seats and city pairs in Senegal, 2001–07



Source: Bofinger 2009. Derived from the AICD national database (www.infrastructureafrica.org/aicd/tools/data).

Note: As reported to international reservation systems.

The aircraft fleet serving Senegal was renewed in recent years, as the share of recently manufactured aircraft rose from 84 percent in 2001 to 98 percent in 2007 (table 8). Also, as of 2007, about 39.3 percent of aircraft serving Senegal were in the small- or medium-sized category, making its fleet among the smallest in the region. The renovation and scale-down of aircraft size promises to facilitate route consolidation toward a hub-and-spoke system.

Challenges

Senegal has a very thin domestic air transport market with only 127,244 domestic seats. While Senegal has strongly developed its international services for air transport, the domestic market is barely developed; as of 2007 there were only four domestic routes available that were being served by a single carrier (figure 10a). While the financial viability of this market segment may not equal that of international services, improving access to air transport within the country for passengers and freight could help reach remote areas such as Casamance or expand options for tourism to new locations. An assessment of the benefits of deepening the domestic air transport market would need to consider a multimodal transport strategy.

With respect to air transportation services, Senegal once had one of the most active airlines in Africa: SONATRA Air Senegal (SAS). In 2001 the government sold 51 percent of the shares of the state-owned SAS to Royal Air Maroc (RAM) and changed its name to Air Senegal International (ASI). Prior to its sale SAS had stopped operations for two years. RAM was given exclusive rights to all domestic flights for a period of 10 years through a concession contract and was allowed to operate flights to neighboring countries with the same rights as those enjoyed by Air Afrique and other companies. Furthermore, ASI was given unrestricted authority to determine its own company strategy. Between 2001 and 2005, ASI increased its traffic and labor force by fourfold, expanding its fleet from two to five airplanes and augmenting its revenues sevenfold. In February 2009 the airline suspended all its operations. Senegal Airlines replaced ASI and began operations in early 2010. As of January 2011 the airline was serving Burkina Faso, the Gambia, Côte d'Ivoire, Guinea, Guinea-Bissau, Mali, and Mauritania with two A-320s, but a full-fledged recovery of the market is still in progress. The region's air market still has a vacuum that needs to be filled, and if Senegal Airlines plays its cards correctly, it could thrive.

Finally, Senegal's safety oversight is at the level of the global average. Though this may compare favorably to surrounding African nations, by the ICAO's definition it is not good enough; today Senegal would not pass an FAA/IASA audit. There is still room for improvement.

Water supply and sanitation

Achievements

Since 1995 Senegal has undertaken important institutional reforms and significant steps to reach the MDGs. The existing public enterprise SONEES was replaced by SONES,⁶ an asset holder, and an *affermage* contract was granted to SDE,⁷ a private operator, for the provision of water services in Dakar as well as in secondary and tertiary cities, covering 35 percent of the country's population. Under this

⁶ Société nationale des Eaux du Senegal.

⁷ Senegalaise des Eaux

arrangement, SONES focuses on infrastructure development and financial management while SDE is in charge of the operations and maintenance and, to some extent, the rehabilitation and extension of the distribution network. On the sanitation side, the public company ONAS operates under an *affermage* contract with SONES.

The institutional reforms sent a robust signal to the markets. Between 1996 and 2006 close to \$420 million was invested in the urban water sector, with only 20 percent being passed on to SONES as grants or capital contributions. The remaining 80 percent was made available by external financiers.

Achievements during the past 10–15 years have been remarkable. Nowadays, Senegal has one of the highest levels of access to piped and stand-post water on the African continent. About 60 percent of the population has access to some form of utility water, which compares very favorably against even the 70 percent utility-water access found in middle-income countries. In urban areas, access to piped water is now almost universal—a marked improvement from the mid-1990s, when it was about 80 percent. This rate of success is due to a combination of reforms to the utility along with the implementation of social connection programs that have granted 70 percent of current SDE customers with low-cost water connections (customers pay a \$36 deposit rather than the full connection cost of \$150).

Senegal stands as one of the countries with the lowest levels of surface water usage, at 3.3 percent of the population—substantially below not only the level of other low-income countries but also of middle-income countries (table 9). Around 2 percent of the population has been gaining access to piped water every year—well above the Sub-Saharan African average (figure 11a). In urban areas an estimated 1.7 million people gained access to piped water between 1999 and 2005. Over time fewer people are using boreholes due to contamination and pollution problems and 1 percent of the population that once used boreholes has transitioned to other sources of water.

Equitable access programs have also been put in place in the sanitation sector, allowing customers to pay only 25 percent of the construction costs of on-site sanitation facilities. As a consequence, the population served by flush toilets more than tripled from 11 percent to 35 percent over the period 1995–2005; around 3.5 percent of the population gained access to flush toilets every year (figure 11b), a figure well above other African country levels. Similarly, the percentage of population practicing open defecation was cut by almost half, from 41 percent to 25 percent, and around 1 percent of the population is leaving open defecation as a mode of sanitation every year. Very interestingly, these impressive achievements came from improving the quality of sanitation services from improved and traditional latrines to flush toilets (septic tanks) (table 9).

SENEGAL'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

Table 9. Benchmarking water and sanitation indicators

	Unit	Low-income countries	Senegal		Middle-income countries
		Mid-2000s	Late 1990s	Mid-2000s	Mid-2000s
Access to piped water	% pop	10.5	30.1	40.9	52.1
Access to stand posts	% pop	16.2	18.3	19.7	18.9
Access to protected wells/boreholes	% pop	38.3	10.5	7.0	6.0
Access to nonprotected wells/boreholes	% pop		33.5	28.8	
Access to surface water	% pop	37.4	2.3	3.3	13.0
Access to flush toilets	% pop	4.9	11.2	34.7	40.8
Access to improved latrines	% pop	9.9	34.6	24.6	1.4
Access to traditional latrines	% pop	50.1	18.6	14.9	30.4
Open defecation	% pop	40.3	41.0	25.2	14.3
Urban water assets in need of rehabilitation	%	35.5	—	25.0	25.0
Domestic water consumption	Liter/capita/day	72.4	49.1	54.5(*)	165.9
Revenue collection	% sales	92.7	88.8	96.73	100.0
Distribution losses	% production	34.3	25.5	20.94	26.8
Cost recovery	% total costs	56.0	59	98	80.6
Operating cost recovery	% operating costs	65	95	144	145
Labor costs	Connections per employee	158.6	225.6	284.0(*)	368.7
Total hidden costs as % of revenue	%	109	94.27	13.08	167

Source: Demographic and Health Surveys (DHS) and AICD water and sanitation utilities database (www.infrastructureafrica.org/aicd/tools/data).

Note: DHS figures on access are as of 1997 and 2005 and utility numbers are as of 2000 and 2008, except when indicated. (*) Figures as of 2005.

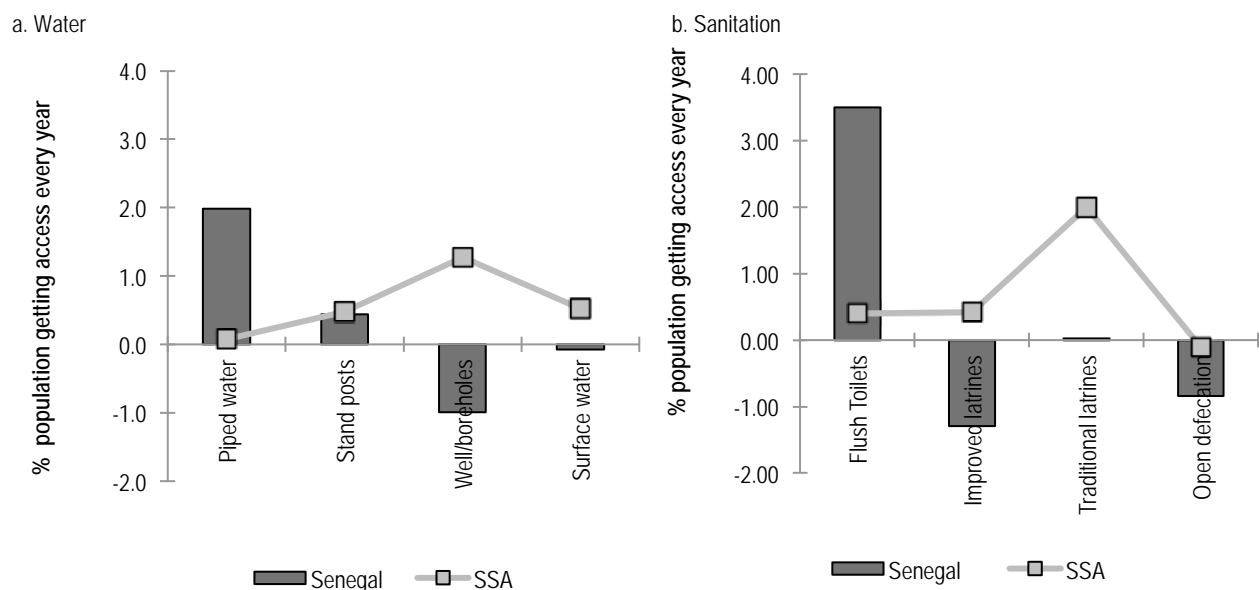
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Senegal's urban water utility, SDE, has set an example among Sub-Saharan African countries with its good bill-collection record and reduced water losses. Together SONES and SDE provide a model of a strong public-private partnership. Water has been made available 24/7 in large urban areas and several smaller towns. Distribution losses have been kept around 21 percent, compared with 34 percent in other African low-income countries, and even well below of what is observed in African middle-income countries (table 9). SDE captures 95 percent of the revenue stream that it needs to operate effectively, a comparatively good performance by regional standards. Also, the utility's collection ratio is 97 percent of its sales (table 10). Labor productivity doubled between 1996 and 2006, going from 5.8 employees per 1,000 connections to 2.8.

SDE's continuous improvements in most efficiency indicators translate into relatively small hidden costs associated with operational inefficiencies (box 1). In the early 2000s hidden costs represented the equivalent of 94 percent of the utility's revenues, but since then there has been a systematic improvement; as of 2008 hidden costs represented a mere 13 percent of revenues (figure 12).

SENEGAL'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

Figure 11. Rates of expansion of access to safe water and improved sanitation are above the African average



Source: World Health Organization (2010a and 2010b) from Demographic and Health Surveys for 1993, 1999, and 2005.

Note: SSA = Sub-Saharan Africa.

Table 10. Evolution of operational indicators associated with the urban water utility SDE

Year	Water delivered (million m ³ /year)	System losses (%)	Collection ratio (%)	Average cost (\$/m ³)	Average effective tariff (\$/m ³)	Total hidden costs (\$ million/year)	Total hidden costs (% revenues)
2000	78.86	26.10	97.00	1.05	0.57	46	94.27
2001	84.00	21.90	97.20	1.05	0.56	44	84.66
2002	87.86	21.60	97.71	1.04	0.59	42	75.32
2003	90.90	20.10	98.17	1.20	0.74	43	57.41
2004	95.09	19.90	98.30	1.25	0.82	42	50.28
2005	99.90	19.90	97.86	1.25	0.82	44	50.45
2006	103.63	19.80	98.20	1.25	0.86	42	43.70
2007	108.71	19.70	93.73	1.25	1.03	30	25.35
2008	109.17	20.94	96.73	1.25	1.14	17	13.08

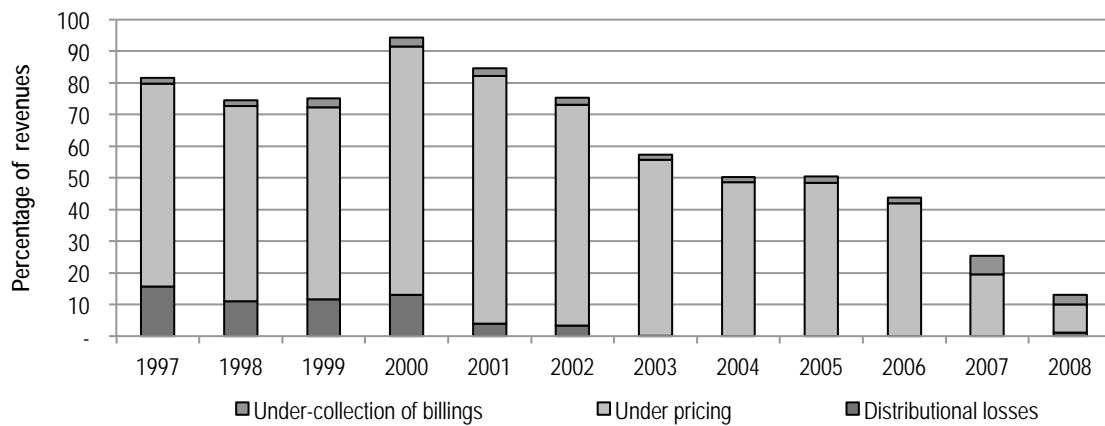
Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).

Box 1. The hidden costs of utilities

A monetary value can be attributed to observable operational inefficiencies—mispricing, unaccounted-for losses, and undercollection of bills, to mention three of the most conspicuous—by using the opportunity costs of these inefficiencies: tariffs for uncollected bills and production costs for mispricing and unaccounted-for losses. These costs are considered hidden since they are not explicitly captured by the financial flows of the operator. Hidden costs are calculated by comparing a specific inefficiency against the value of that operational parameter in a well-functioning utility (or the respective engineering norm) and multiplying the difference by the opportunity costs of the operational inefficiency.

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

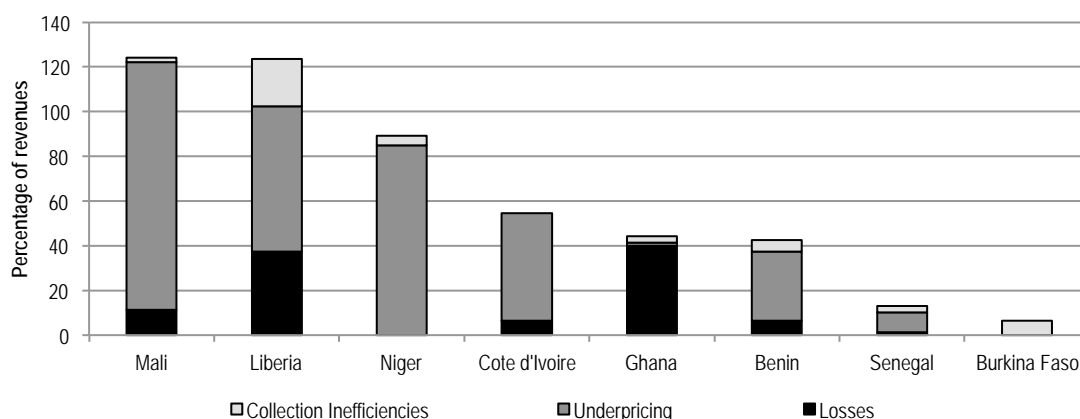
Figure 12. The hidden costs of the urban water utility SDE



Source: Derived from Banerjee and others (2008b).

The leading contributor to the hidden costs in Senegal’s water sector is the misalignment of tariffs and costs, which is commonly seen as the main source of inefficiency in other African utilities. Fortunately, SDE has been able to progressively align tariffs with costs; nowadays, tariffs recover not only operational costs but even the capital investment in its entirety! Costs due to losses or unaccounted-for water are minimal. Not surprisingly, Senegal’s SDE is among the most efficient of comparable utilities (figure 13).

Figure 13. Hidden costs of select water utilities, as a percentage of revenues



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

Challenges

In both rural and urban areas, access to improved water and sanitation has improved substantially since the early 1990s, but there are still important access gaps between rural and urban areas as well as between Dakar and other urban areas (table 11). As of 2005, 89 percent of the population living in cities had access to tap water, compared to only 41 percent in rural areas. Among urban areas, the Dakar area has almost universal coverage while in other urban centers up to two-thirds of the population has access to utility water. Among rural areas, too, there are wide disparities in access to piped-water systems ranging from 22.7 percent in the Kolda region to 73 percent in the Fatick region.

Table 11. Rural and urban access to improved water and sanitation in Senegal

		1986	1993	1997	2005	2009
Improved water	Rural	29.2	43.9	46.2	64	73.6
	Urban	55.1	90.6	89.9	92	97.0
Improved sanitation	Rural	25.9	24.9	24.0	26.2	28.9
	Urban	79.5	77.1	78.3	—	—

Source: WHO Joint Monitoring Program 2010a and 2010b, from the Demographic and Health Surveys for 1986, 1993, 1997, and 2005.

Note: Improved water defined as piped water, stand posts, and safe wells/boreholes; improved sanitation defined as flush toilets, septic tanks, and improved latrines, according to the JMP methodology.

— = Not available.

In terms of sanitation, 25 percent of the population still practices open defecation. This figure, while much better than that of other African low-income countries, is twice as high as what is seen in middle-income countries and a source of concern in itself.

In general, progress on the sanitation front has been much more modest than in the water sector, due to the enormous and widening gap in access to improved water supply between rural and urban areas. As of 2008 access to sanitation in urban areas was estimated at 63.6 percent; in rural areas it was as low as 28.3 percent.

Power

Achievements

In terms of access to electricity, Senegal is almost at the level of African middle-income countries and well above other low-income, nonfragile countries. About 47 percent of the population has access to electricity, and this figure reaches over 80 percent in urban areas (table 12). The relative success in expanding access is undoubtedly linked to well-planned reforms in the sector.

Table 12. Benchmarking Senegal's power indicators

	Unit	Low-income, nonfragile countries	Senegal			Middle-income countries
			Late 1990s	Early 2000s	Mid-2000s	
National access to electricity	% population	32.8	36.2	—	47.1	49.5
Urban access to electricity	% population	72.8	72.8	—	80.4	74.4
Rural access to electricity	% population	12.7	7.8	—	15.8	26.3
Population gaining access annually	% population/year	4.4		—	2.7	12.1
					Mid-2000s	Late 2000s
Installed power generation capacity	MW/million people	20			25	799
Power consumption (residential)	kWh/capita	107			179	4,479
Power outages	Day/year	124.5		—	141	70.6
Firms' reliance on own generator	% consumption	21		6.7	24.7	11
Firms' value lost due to power outages	% sales	6		4.3	5.0	2
Delay in obtaining an electrical connection	Days	41		9.4	—	12
Collection ratio	% billings	93	—	98.8	100	100
System losses	% production	24	—	21.5	22.5	20
Cost-recovery ratio	% total cost	89	—	58.3	74	85
Total hidden costs as % of revenue	%	68	—	90	52	6
Effective power tariffs ()						Other developing regions
		Senegal		Predominantly hydro generation	Predominantly thermal generation	
Residential at 100 kWh/month	US cents/kWh	23.8		10.7	15.7	
Commercial at 900 kWh/month	US cents/kWh	22.8		12.9	19.0	
Industrial at 100 kVA	US cents/kWh	15.8		9.3	13.0	5.0– 10.0
Average tariff	US cents/kWh	22.7		—	17.0	

Source: Eberhard and others 2008. Other sources include access data coming from the Demographic and Health Surveys 1996 and 2001; utility data from the AICD electricity database (www.infrastructureafrica.org/aicd/tools/data)

Note: kWh = kilowatt-hour; MW = megawatts; kVA = kilovolt ampere.

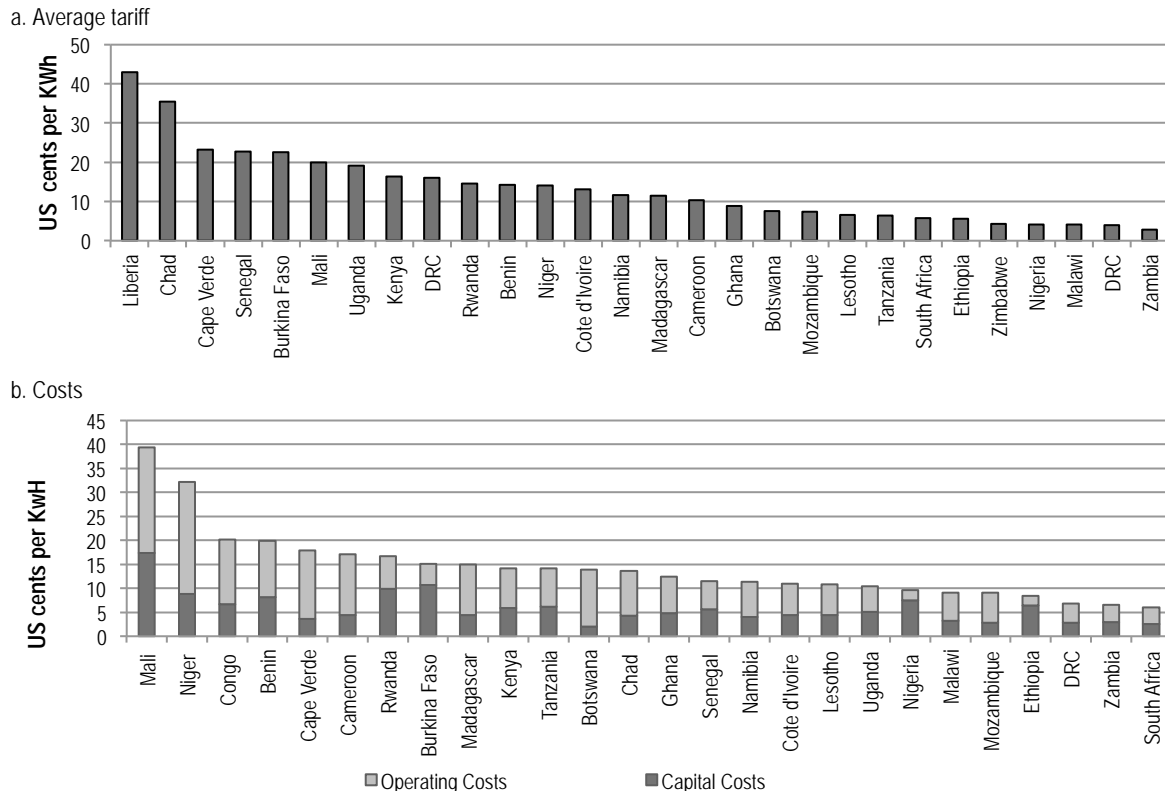
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Senegal has been moving from a unique vertical integrated provider (SENELEC)—which generates, transmits, and distributes electricity—to a model where generation, transmission, and retail distribution is liberalized and there is room for promising alliances with the private sector.

Senegal has had already a long history of private sector participation in the sector, under various kinds of contracts and with differing results. The first concession for SENELEC was granted in 1999 but

cancelled in 2000. More recently, in 2009, a 25-MW build-operate-run-transfer (BORT) was granted to ONE (Morocco) for the rural electrification of 550 villages along the Saint Louis–Dagana–Podor axis. Rights to serve rural communities are also being awarded to small-scale providers under concession arrangements with a public subsidy. For power generation, a build-operate-transfer (BOT) agreement was signed in 1997 for a 56-MW combined-cycle power plan, and one signed in 2005 for a 65.7-MW heavy-fuel diesel plan (for an independent power producer [IPP] at Kounoune). Under a different contractual arrangement, there was a rental agreement signed in 2005 for the 40-MW Aggreko Dakar Temporary Station to supply temporary power to SENELEC for two years.

Figure 14. Power prices and costs in Sub-Saharan Africa



Source: Power price: Briceño-Garmendia and Shkaratan 2010; Power costs: Eberhard and others 2008.
 Note: DRC = Democratic Republic of Congo.

Also Senegal has systematically increased its participation in regional initiatives. The country is active in the Senegal River Basin Organization,⁸ and it is also interconnected to the West African Power Pool (WAPP). Its increased participation in the regional electricity market is an important step toward addressing the lack of sufficient electricity supply to the economy, which may be helped by importing hydroelectricity, mainly from Guinée through the OMVG⁹, and also gas-fueled electricity from Côte d'Ivoire.

⁸ Organisation pour la Mise en valeur du Fleuve Sénégal (OMVS).

⁹ Gambia River Basin Development Organisation.

Challenges

Senegal's power supply is insufficient to meet the existing and rapidly growing demand. Between 2005 and 2009, generation capacity grew from 365 MW to 510 MW,¹⁰ but demand kept growing at a rate of 25–30 MW per year. An equilibrium between supply and demand has never been reached. As an example, in August–September 2009, an interruption of fuel supply linked to SENELEC's liquidity issues put about 10 units out of operation and caused major outages over several days. Frequent disruptions highlighted the structural problems and capacity shortages.

The country's installed generation capacity was only about 25 MW per million people (table 12), making it an unreliable system—a problem widespread throughout the African countries. The number of outages in a typical month in Senegal is almost 12, which is aligned with the averages found in other Sub-Saharan countries. By comparison, a typical power security standard in the United States is 1 day in 10 years. The percentage of firms relying on their own generator in Senegal is at 55.4 percent, above the Sub-Saharan African average of 43.1 percent. Not surprisingly, one-fourth of the electricity consumed in Senegal comes from private generation (table 13).

Table 13. Performance of the electricity sector in West African countries

	Burkina Faso (2009)	Cape Verde (2006)	Côte d'Ivoire (2009)	Ghana (2007)	Mali (2007)	Mauritania (2006)	Niger (2006)	Nigeria (2007)	Senegal (2007)	Simple average
Number of power outages in a typical month	10.8	12.5	4.5	9.7	4.4	3.7	20.7	26.8	11.8	14.4
Average duration of outages (hours)	3.3	5.3	4.6	12.6	3.9	2.9	0.5	8.2	6.2	6.6
Loss due to outages (% of sales)	5.8	8.9	5	6	1.8	1.6	2.5	8.9	5	6.4
% of firms owning/sharing generator	11.6	39.8	6.5	26.6	23.8	28.6	24.8	85.7	55.4	43.1
Electricity from own generator (%)	10.9	4.6	15.1	29.5	16	9.2	10.5	60.9	24.7	30.6

Source: World Bank 2011b.

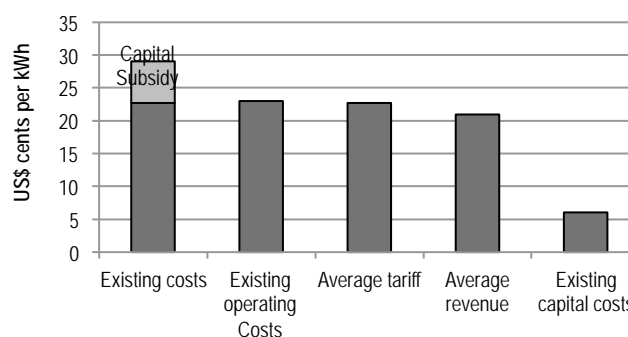
Note: Year of the survey in brackets.

SENELEC, Senegal's power utility, faces major financial problems. Power tariffs are admittedly relatively high when compared to other countries in the region, reflecting the fact that the cost of generation is high due to the percentage of thermal power (371 MW out of the 489 MW from SENELEC's plants are thermal, and the rest 66 MW are hydropower) (figure 9a). While tariffs somehow allow for recovering operational costs, they still are below the long-run marginal cost of the power sector, implying that a capital subsidy of close to 25 percent of total costs is tacitly in place (figure 15).

¹⁰ The installed capacity is 549.1 MW but, given the age of some of the equipment, the real generation capacity accounted for only 510 MW as of 2009. Sixty-five percent of this corresponds to SENELEC's production and the remaining 35 percent to private production.

The gap between tariffs and the current cost of electricity is one of the causes of SENELEC's financial problems and of the sector's as a whole. An increase in tariffs from 17.2 cents in June 2007 to 22.7 cents in 2009 (table 14) was insufficient to bridge this gap. In January 2009 tariffs dropped by 12 percent and in July 2009 they went up 8 percent. Moreover, although SENELEC's financial gap is expected to be met by the public sector, government transfers are insufficient and always late. As a result, the revenue gap for 2009 reached FCFA 8 billion as transfers fell short by FCFA 36 billion of the expected total of FCFA 43 billion for the year. The delays also created additional financial fees for the company, as electricity generation, transmission, and distribution facilities further deteriorated due to a lack of maintenance and renewal.

Figure 15. Prevailing tariffs in line with operational costs, but embedded is an important subsidy of capital costs



Source: Briceño-Garmendia and Shkaratan 2010.

Note: Light gray area represents capital subsidy.

Table 14. Evolution of hidden costs associated with SENELEC

	Electricity produced (GWh/year)	System losses (%)	Collection ratio (%)	Average total cost (\$/kWh)	Average effective tariff (\$/kWh)	Total hidden costs (\$ million/year)	Total hidden costs (% revenues)
2003	1,826	21.5	98.8	0.24	0.14	182.4	90.1
2004	1,952	21.1	99.6	0.24	0.15	176.4	74.9
2005	2,171	21.2	99.7	0.24	0.15	202.3	79.3
2006	2,192	20.6	100.0	0.29	0.17	273.4	88
2007	2,306	22.5	100.0	0.29	0.21	204.3	52

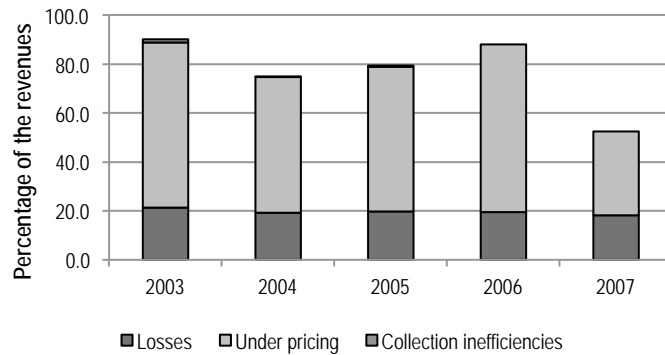
Source: Eberhard and others 2008; Briceño-Garmendia and Shkaratan 2010.

Note: GWh = gigawatt-hour; kWh = kilowatt-hour.

SENELEC's financial health is also severely impacted by persistent operational inefficiencies. Losses in transmission and distribution have amounted to about 20 percent of produced electricity during the past decade; the accepted engineering norm is 10 percent of electricity produced. When combined with the implicit cost-tariff deviation, the hidden costs of SENELEC amount to 60 percent of its revenues (box 1, figure 16).

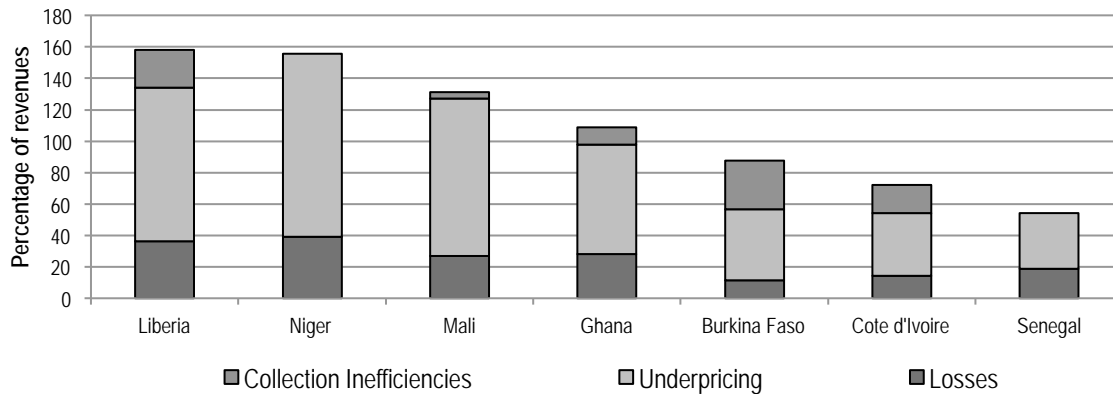
The hidden cost of SENELEC's inefficiencies, while moderate in comparison to other countries in the region, are significant and continue to penalize the financial performance of the operator (figure 17). Around three-fourth of the hidden costs are the result of underpricing, and transmission and distributional losses, at 21 percent of production, are responsible for the remaining one-fourth. In the case of SENELEC, these hidden costs underestimate the magnitude of the operator's financial problems, as they do not include the total cost of serving the debt but only the payment of interest and other fees (leaving aside the repayment of the principal).

Figure 16. The most significant inefficiency is underpricing



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

Figure 17. Hidden costs of power utilities in select West African countries, as percentage of revenues



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

Information and communication technologies

Achievements

Telecommunications has been a driving force behind Senegal's growth over the past decade, which is reflected in the strong contribution of this sector to the country's GDP—around 65 percent in 2007. The market reforms of the 2000s go a long way toward explaining this progress in the ICT sector. The reforms started with the partial divestiture of SONATEL¹¹ in 1997, with France Telecom as the strategic partner (later on Orange), followed by the granting of a 20-year mobile license to Milicom Senegal in 1998 and a

¹¹ Societ  Nationale des Telecommunications du S n gal.

unified license (fixed, mobile, and Internet) to Sudatel Senegal in 2007.¹² Consequently, as of 2007, there were three companies providing cellular telephone services: Orange, with two-thirds of the market; Tigol, which was rapidly gaining market share; and Sudatel. The Internet market was served by SONATEL and Sudatel. In addition, an independent regulatory agency for the sector—the Agency for Telecommunications and Postal Regulation (ARTP)—was created in early 2002.

Table 15. Benchmarking ICT indicators

	Unit	Low-income, nonfragile countries	Senegal		Middle-income countries
		2005	2005	(2007–08)	2005
GSM coverage	% of population under signal	48	82	85	97
International bandwidth	Mbps/capita	6	68.7	237.5	30
Internet	Subscribers/100 people	0	0.2	0.4	2
Landline	Subscribers/100 people	1	2.4	1.9	9
Mobile phone	Subscribers/100 people	15	15.3	44.1	87
		Senegal 2007	Countries without submarine cable	Countries with submarine cable	Other developing regions
Price of monthly mobile basket	US dollars	15.5	11.1	11.1	9.9
Price of monthly fixed-line basket	US dollars	21.6	13.6	13.6	n.a.
Price of 20-hour Internet package	US dollars	27.7	68.0	47.28	11.0
Price of a call to the United States per minute	US dollars	1.0	0.86	0.48	0.66
Price of an inter-Africa call per minute	US dollars	0.3	1.34	0.57	n.a.

Source: Senegal 2005 data together with benchmarks are taken from the AICD database.

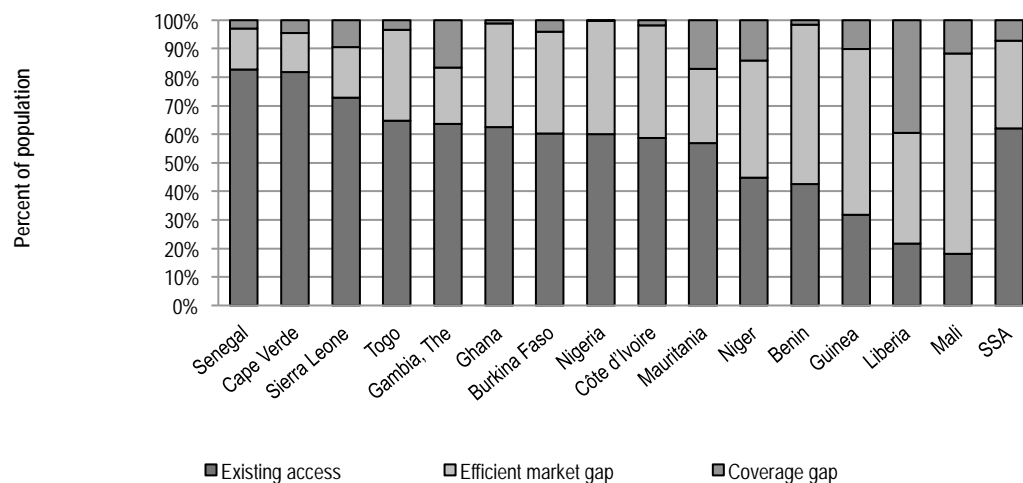
Note: Numbers reported in the table as of 2007. GSM = global system for mobile communications; Mbps = megabits per second. n.a. = Not applicable.

Growth in telecommunications has resulted in a countrywide expansion of these services. Currently, 82.7 percent of the population has access to a GSM signal, and it is estimated that up to 97 percent of the population could gain access to it on a commercial basis without the need for any government subsidy (figure 18).

In the mobile market, existing subscriptions went from 0.9 subscribers per 100 people in 2000 to 44.1 in 2007 (table 15). This translated into an average growth of 44 percent per year (table 16), a level comparable to its neighbors. In 2008 Senegal's mobile service penetration, excluding that of Nigeria, was the highest in West Africa; GSM coverage was almost double that of other low-income countries (table 15), though below the levels of middle-income countries.

¹² SONATEL began to be privatized in 2006, when Senegal's government sold a 51 percent stake to Maroc Telecom. As of 2009, the government was selling a further 20 percent of SONATEL's capital in a public offering and an additional 6 percent was expected to be sold to employees.

Figure 18. Efficient market gap for mobile telephone services 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. The coverage gap represents the percentage of the population for whom services are not viable without a subsidy. SSA = Sub-Saharan Africa.

Table 16. Senegal's skyrocketing mobile teledensity

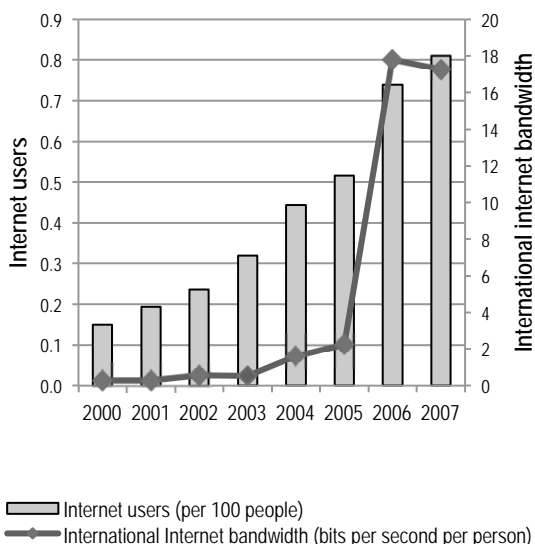
Subscribers/100 people	2005	2006	2007	2008	Average annual growth (%)
Benin	14.10	19.20	23.7	27.7	25.50
Burkina Faso	5.00	7.60	11.5	14.4	42.84
Ghana	12.10	19.30	29.4	34.6	43.17
Mali	6.70	12.90	21.1	35.4	74.63
Niger	2.70	4.40	6.7	8.5	47.37
Nigeria	14.40	24.40	34.7	44.2	46.35
Senegal	15.3	25.8	30.5	44.1	43.68
Togo	8.10	10.70	13.2	15.6	24.55

Source: Republique du Mali 2010.

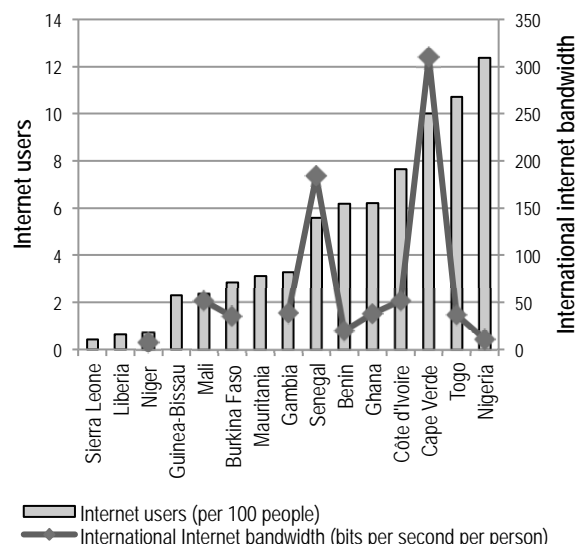
Internet penetration in Senegal has increased substantially. In 1999 the number of Internet users per 100 people was almost zero; this had increased to almost 9 per 100 people in 2008. This movement was accompanied by improvement in quality, expressed as bits per second per person (bps/person). In 1999 connections were very slow at 0.4 bps/person; as of 2008 the figure has reached 237 bps/person, following investments in access to the submarine cable SAT-3 (figure 19a). Senegal is ahead of other West African countries in terms of Internet users per 100 people and international Internet bandwidth (figure 19b).

Figure 19. Expansion of the Internet market in Senegal

a. Internet service trends, 2000–08



b. Internet service, ECOWAS, 2008



Source: World Bank, including the Information and Communications for Development database.

Note: ECOWAS = Economic Community of West African States.

Prices for telephony remain modest, particularly via the Internet; end-user prices are below those of countries both with and without access to the submarine cable (table 16). Such prices are a result of the advanced roaming arrangements for mobile services that exist in the Economic Community of West African States (ECOWAS) area. The West African region, by comparison with the rest of Africa, has made significant progress in promoting preferential intraoperator roaming arrangements. Subscribers who belong to one of these networks can use their mobile handsets in other countries, where they do not pay for incoming calls and are charged local rates for outgoing calls. Prepaid users can also recharge their phones in the country that they are roaming. Two factors explain the relatively advanced state of ECOWAS's regional integration with regard to mobile roaming arrangements. One is the existence of a proactive regional regulatory association for ICT—the West Africa Telecommunications Regulators Association (WATRA)—the other, the existence of many large mobile operators with a presence across multiple ECOWAS countries. Seven large mobile groups with a multicountry presence dominate the regional telecommunications market.¹³ These multicountry networks have provided the basis for the regional roaming arrangements that essentially collapse into three roaming areas: Orange Zone, Zain One, and One World (table 17). Within these areas, roaming charges are very modest.

¹³ Etisalat, France Telecom, Maroc Telecom, Millicom, MTC (Zain), MTN, and Comium.

Table 17. Intra-roaming networks in ECOWAS

Network	Countries
Orange Zone	Available for subscribers in Côte d'Ivoire, Guinea, Guinea-Bissau, Mali, Niger, and Senegal
Zain One	Available for subscribers in Burkina Faso, Ghana, Niger, Nigeria, and Sierra Leone
One World of MTN	Available for subscribers in Benin, Côte d'Ivoire, Ghana, Guinea, Guinea-Bissau, and Nigeria.

Source: Derived from Ampah and others (2009).

Table 18. International call charges

US\$	Call within region	Call to the United States	Internet dial-up	Internet ADSL
Without submarine cable	1.34	0.86	68	283
With submarine cable	0.57	0.48	47	111
Monopoly on international gateway	0.70	0.72	37	120
Competitive international gateway	0.48	0.23	37	98

Source: AICD

Note: ADSL = asymmetric digital subscriber line.

Access to submarine cables generally reduces costs, particularly if there is competition at the gateway (table 18). Therefore, the fiber-optic infrastructure that Senegal has put in place will serve it well in the long run.

Challenges

The main challenge in the telecommunications sector remains the need for more vigorous competition in the domestic markets. As modern ICT services develop, it is necessary for the regulator to ensure broadband access to independent service providers in addition to the three established carriers. Furthermore, Senegal has access to international gateways but only SONATEL/Orange has access to the existing submarine cables, even though Sudatel or Millicom could build their own cables. Prices of the international capacity/bandwidth sold by SONATEL have been relatively high compared to other SAT-3 members. New cables are unlikely to change the situation since neither Sudatel or Millicom would have access to these planned cables. Effective regulatory oversight is therefore needed to enforce open access to the submarine cable.

Financing Senegal's infrastructure

To meet its most pressing infrastructure needs and to catch up with developing countries in other parts of the world, Senegal needs to expand its infrastructure assets in key areas (table 19). The targets outlined in table 19 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, which can be modified or delayed as needed to achieve financial balance.

SENEGAL'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE

Table 19. Illustrative investment targets for infrastructure in Senegal

	Economic target	Social target
ICT	Strengthen connectivity with main economic partners in the region through the installation of fiber-optic links to neighboring capitals and submarine cables.	Provide universal access to the GSM signal and modern communication services with public broadband facilities.
Power	Increase electricity available to the economy—258 MW of new generation capacity and 487 MW interconnectors.	Expand electrification to 51 percent (100 percent urban and 10 percent rural).
Transport	Achieve regional (national) connectivity with good-quality 2-lane (1-lane) paved road.	Provide rural road access to 30 percent of the highest-value agricultural land, and urban road access within 500 meters.
WSS	n.a.	Achieve Millennium Development Goals and clear sector rehabilitation backlog.

Source: Mayer and others 2009; Rosnes and Vennemo 2009; Carruthers, Krishnamani, and Murray 2009; You and others 2009.

Note: WSS = water supply and sanitation; ICT = information and communication technology; GSM = global system for mobile communications. n.a. = Not applicable.

Meeting these illustrative infrastructure targets for Senegal would cost \$1.8 billion per year over a decade, with capital expenditure accounting for 57 percent of this requirement. The highest spending needs are associated with the power sector, which will require an estimated \$1.1 billion per year to install 258 MW of new generation capacity and expand electrification to meet the growing demand. The water and sanitation sector has the second-highest spending needs: almost \$0.3 billion will be needed each year to meet the MDGs, with capital expenditure accounting for 60 percent of the total. While less than the amounts needed for power and water and sanitation, requirements for the ICT and transport sectors are also high in absolute terms, amounting to \$0.25 billion and \$0.14 billion, respectively (table 20).

Table 20. Indicative infrastructure spending needs in Senegal, 2006–15

\$ million per year

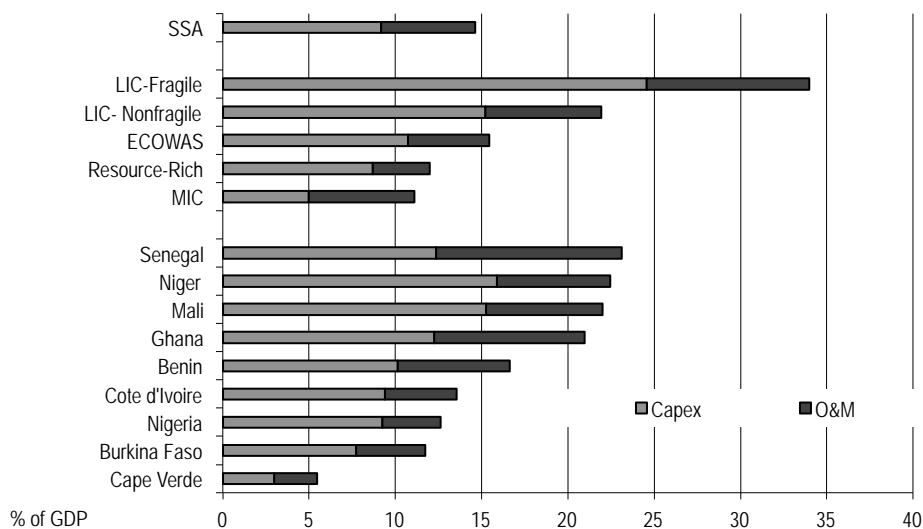
Sector	Capital expenditure	Operations and maintenance	Total needs
ICT	229	20	248
Power	507	555	1,062
Transport	87	54	141
WSS	204	138	342
Total	1,026	766	1,792

Source: Mayer and others 2009; Rosnes and Vennemo 2009; Carruthers, Krishnamani, and Murray 2009; You and others 2009. Derived from models that are available online at www.infrastructureafrica.org/aicd/tools/models.

Note: WSS = water supply and sanitation; ICT = information and communication technology.

Figure 20. Senegal's infrastructure spending needs are substantial relative to its GDP

As percentage of GDP



Source: Foster and Briceño-Garmendia 2009.

Note: LIC = low-income countries; MIC = middle-income countries; ECOWAS = Economic Community of West African States; SSA = Sub-Saharan Africa; GDP = gross domestic product; O&M = operations and maintenance; CAPEX = capital expenditure.

Senegal's infrastructure spending needs look particularly high relative to the country's GDP, since they would absorb 20 percent of its GDP. Investment alone would absorb around 12 percent of GDP, not far from the 15 percent China invested in infrastructure during the mid-2000s. These high numbers are on par with the average GDP share that other low-income, nonfragile African countries would need to spend, which amount to 22 percent of GDP (figure 20).

Senegal already spends a sizable amount (\$0.91 billion per year) to meet its infrastructure needs (table 21). About 70 percent of the total is allocated to capital expenditure and 30 percent to operating expenditures. Operating expenditure is entirely covered from budgetary resources and payments by infrastructure users. Public and private investment account for around 33 and 35 percent of capital funding respectively, followed by official development assistance (ODA) (16 percent). Non-OECD finance and household self-financing of the sanitation sector also play a smaller but nonetheless significant role, amounting to 8 percent of capital funding each.

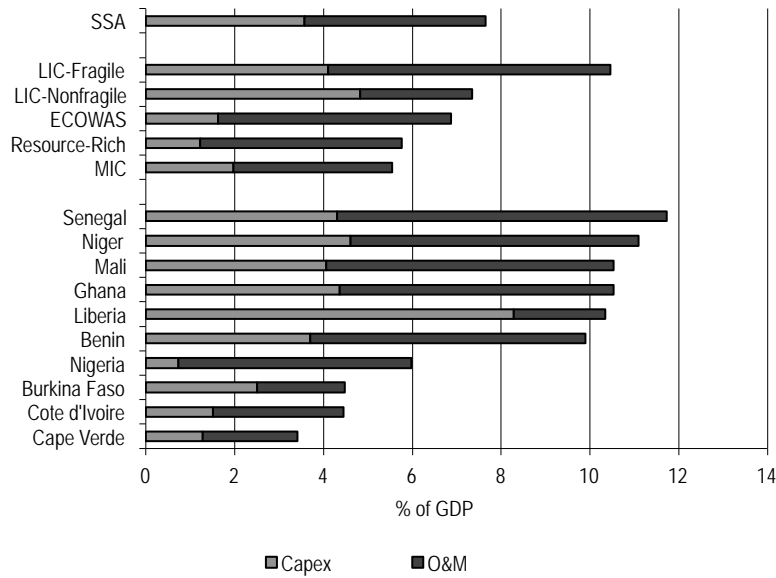
Table 21. Financial flows to Senegal's infrastructure, annual averages over the period 2001–06

\$ millions per year

	O&M		Capital expenditure					Total spending
	Public sector and users' tariffs	Public sector	ODA	Non-OECD financiers	PPI	HH self-financed	Total CAPEX	
ICT	1	1	2	3	205	0	211	212
Power	257	93	18	12	16	0	138	396
Transport	9	51	47	23	5	0	125	133
WSS	4	65	37	14	0	49	117	121
Total	270	210	103	53	225	49	640	911

Figure 21. Senegal's existing infrastructure spending is particularly high

As percentage of GDP



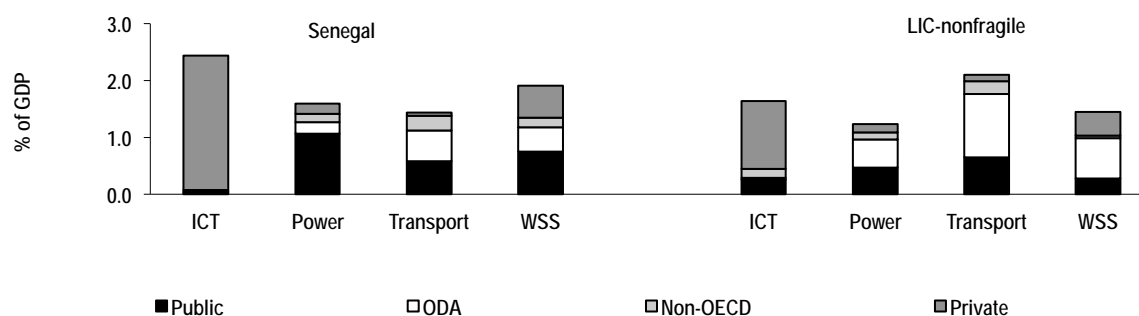
Source: Derived from Foster and Briceño-Garmendia (2009).

Note: LIC = low-income countries; MIC = middle-income countries; ECOWAS = Economic Community of West African States; SSA = Sub-Saharan Africa; GDP = gross domestic product; O&M= operations and maintenance; CAPEX = capital expenditure.

Senegal's existing spending amounts to 11 percent of its GDP (figure 21). This is close to the average for low-income, nonfragile states, even if it is substantially higher than some of its West African neighbors such as Côte d'Ivoire and Nigeria. Relative to its peer group, Senegal is relatively more reliant on the public budget for power and water investments, and relatively less reliant on ODA for transport, power, and water needs (figure 21). In the case of ICT, Senegal predominantly relies on the private sector for financing. The largest share of infrastructure spending goes to power (39 percent) followed by ICT (21 percent) and power (23 percent). The transport and water sectors receive 11 to 13 percent of total funding each (figure 22).

Figure 22. Senegal's pattern of capital investment in infrastructure, benchmarked against 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.

ODA = official development assistance; OECD = Organisation for Economic Co-operation and Development; ICT = information and communication technology; GDP = gross domestic product; WSS = water supply and sanitation; LIC = low-income countries.

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

Around \$312 million of additional resources could be recovered each year by improving efficiency (table 22). By far the largest area of inefficiency lies in the underrecovery of costs, which accounts for 66 percent of the total (\$206 million). Reducing distribution losses to a reasonable benchmark in the power and water sectors could save up to \$73 million each year. Potential efficiency gains of about \$17 million and \$14 million per year are possible from improving budget execution (that is, the share of budgeted funds actually spent) and optimizing staffing levels, respectively. Increasing collection rates do not seem to be an issue in Senegal, except in the water and sanitation sector. Looking across sectors, the power sector is by far the most problematic and presents the largest potential for efficiency dividends (\$206 million).

Table 22. Potential gains from greater operational efficiency

	ICT	Power	Transport	WSS	Total
Underrecovery of costs	—	133	n.a.	73	206
Overstaffing	n.a.	14	—	n.a.	14
Distribution losses	—	71	—	2	73
Undercollection	—	0	n.a.	2	2
Low budget execution	0	1	14	2	17
Total	0	219	14	78	312

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

Note: WSS = water supply and sanitation; ICT = information and communication technology.

— = Not available.

n.a. = Not applicable.

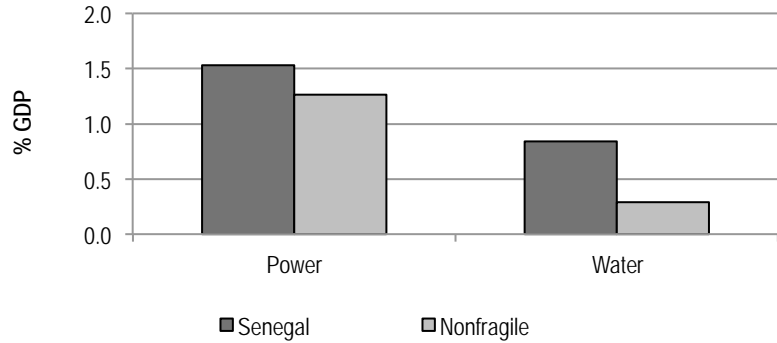
Undercharging for power services costs Senegal about \$133 million each year. In the power sector, the estimated average total cost of power was \$0.29 per kilowatt-hour (kWh) in 2007, while the average effective tariff was \$0.21/kWh, which hardly covered the operating and maintenance costs of \$0.23/kWh.

As a result, SENELEC covered only 72 percent of its costs, leaving capital investment largely unfunded. The associated financial burden was approximately 1.5 percent of GDP.

In the water sector, it is estimated that the average total cost of producing utility water is \$1.25 per cubic meters (m³), while the average effective tariff was only \$1.13 in 2008, which meant that the main utilities in the sector covered 91 percent of their cost through the tariff (actual numbers will depend on billing and collection rates). The associated financial burden was approximately 0.8 percent of GDP (figure 23).

Figure 23. Underpricing of water a more serious issue in Senegal than elsewhere

Financial burden of underpricing in 2007, as percentage of GDP



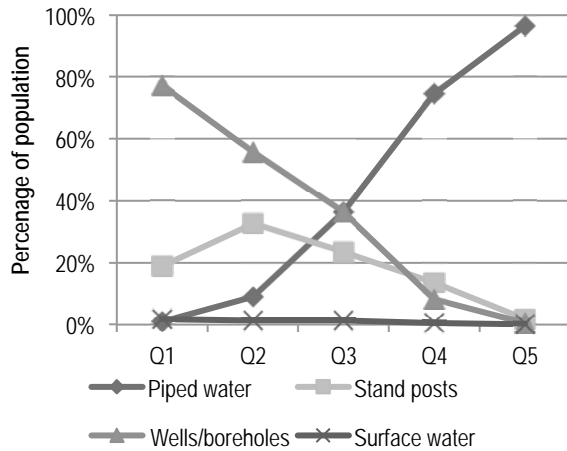
Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).

Note: GDP = gross domestic product; LIC = low-income countries

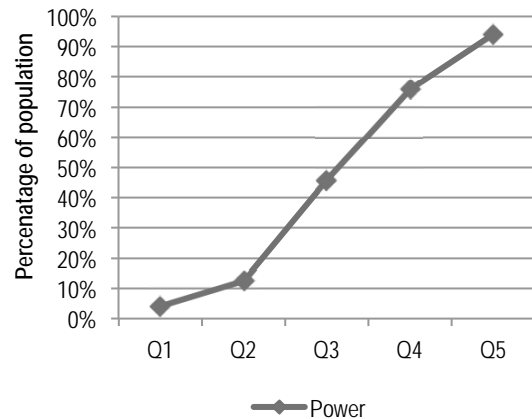
Access to utility services in Senegal is relatively high by African standards. Nevertheless, access patterns remain regressive, though in the case of power a significant minority of lower-income households do have access (figures 24).

Figure 24. Consumption of infrastructure services in Senegal varies by income quintile

a. Mode of water supply, by income quintile



b. Prevalence of connection to power grid among population, by income quintile



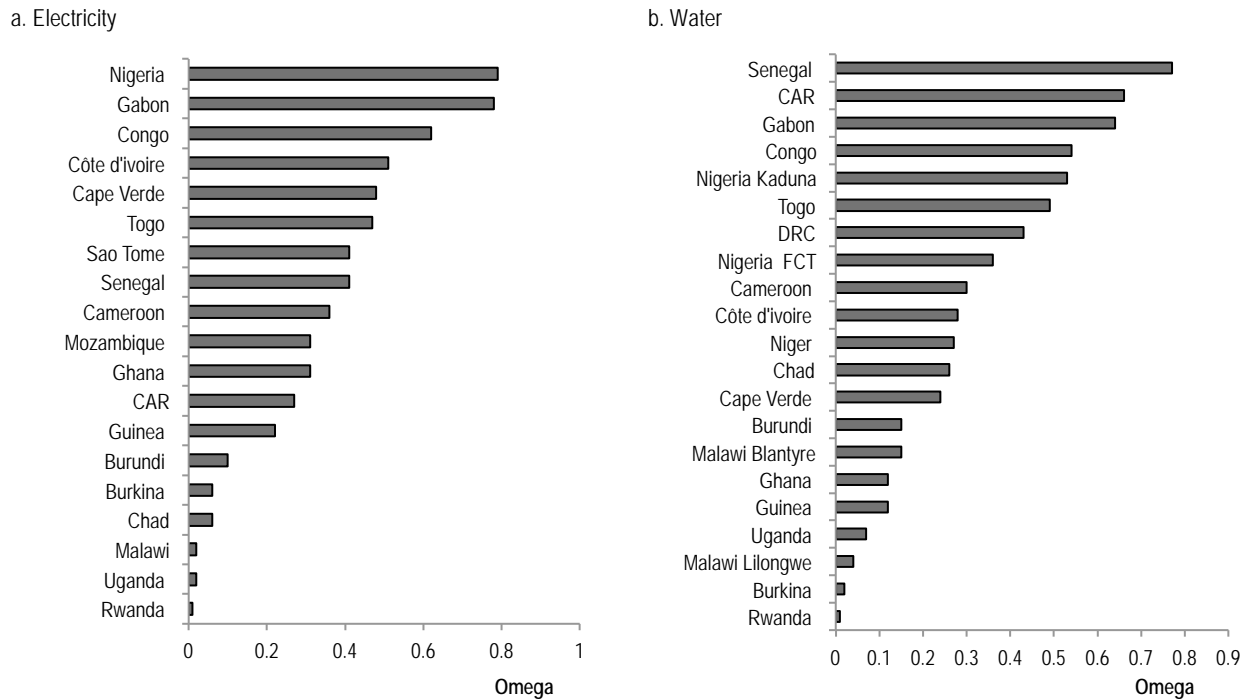
Source: Banerjee and others 2008b

Note: Q1—first budget quintile, Q2—second budget quintile, and so on.

Because of inequitable access to power services in Senegal, subsidized tariffs are necessarily quite regressive. This has been confirmed by recent empirical analysis showing that poor households capture far less than their fair share of power and water subsidies in Senegal. In the case of power, poor households capture less than half of the subsidy that should reach them based solely on their share of the overall population; in the case of water, however, poor households capture close to 80 percent of the

subsidy. While it is typical for utility subsidies to be regressive in African countries, the distributional performance of Senegal's subsidies is average in the case of power, and relatively good in the case of water (figure 25).

Figure 25. Electricity and water subsidies that reach the poor



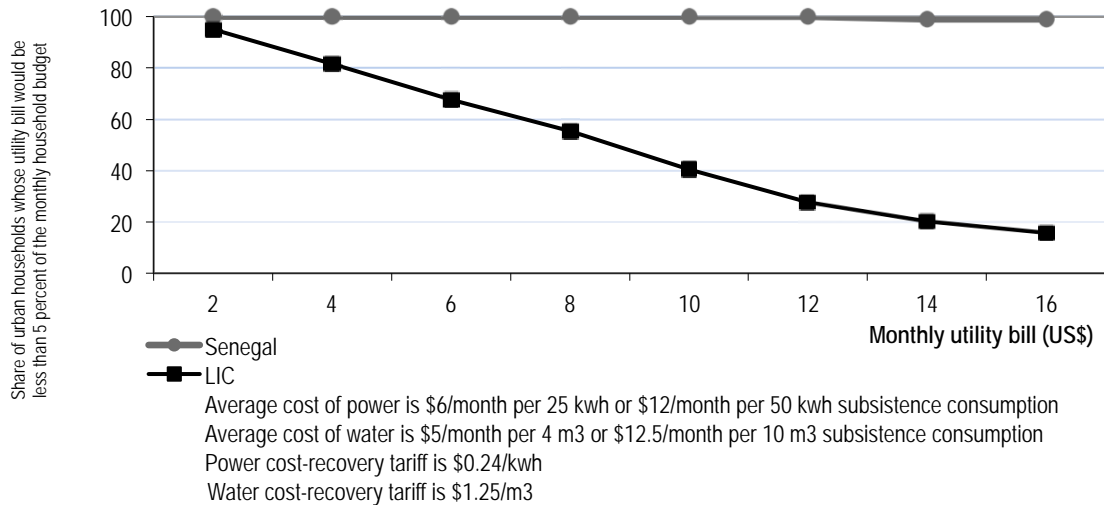
Source: Banerjee and others 2008b.

Note: Omega is a measure of distributional incidence that measures the share of subsidies received by the poor as a percentage of their share in the population. The higher the value of omega, the better the distributional performance of the subsidy. Values of omega below one denote a regressive subsidy; and values above one denote a progressive subsidy.

CAR = Central African Republic; DRC = Democratic Republic of the Congo.

How expensive would utility bills become if cost-reflective tariffs were applied? With a power cost-recovery tariff of \$0.29 per kWh and a monthly subsistence consumption of 50 kWh, the associated utility bill would come to \$14.5 per month. Based on the distribution of household budgets in Senegal, monthly utility bills at these levels would be affordable by close to 100 percent of the population (figure 26). Indeed, the share of the population that could afford the service is much higher than the share of the population that already has the service, suggesting that Senegal has scope to increase coverage before affordability could become a serious impediment. A more limited level of subsistence consumption of 25 kWh/month for power and 4 m³/month for water—which is capable of meeting the most basic needs—would cost \$7.3 and \$4.5 per month, respectively, and would be affordable to most of the population.

Figure 26. Affordability in Senegal is much better than in other low-income countries



Source: Banerjee and others 2008b

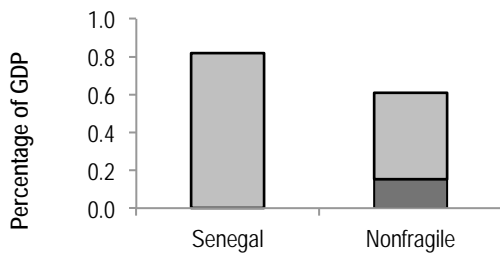
Note: LIC = low-income countries; kWh = kilowatt-hour; m³ = cubic meters.

Operational inefficiencies of power and water utilities cost Senegal a further \$89 million a year, close to 1 percent of GDP. The annual value of inefficiencies in the power sector (\$85 million) is substantially higher than for the water sector (\$4 million). The burden of utility inefficiencies in Senegal's water sector is lower than for the benchmark countries (figure 27), though distribution losses in power are higher than in comparator countries. Senegal had distribution losses of 22.2 percent in 2008 relative to a best-practice benchmark of around 10 percent, while in the water sector, SDE had distribution losses of 21 percent in 2009 relative to a best-practice benchmark of 20 percent.

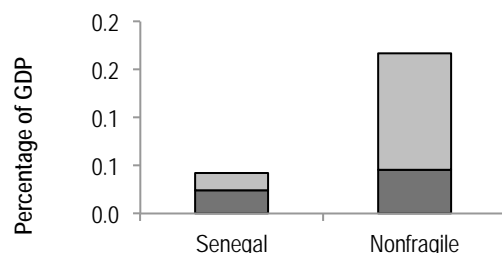
Figure 27. Senegal's utilities are comparatively efficient

Uncollected bills and unaccounted losses as percentage of GDP

a. Power sector



b. Water sector



■ Collection inefficiencies ■ Unaccounted losses

■ Collection inefficiencies ■ Unaccounted losses

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

Annual funding gap

Senegal's infrastructure funding gap amounts to \$578 million per year, or about 7 percent of GDP, once efficiencies are captured. The largest gap by far is in the power sector, with water and transport presenting much smaller annual funding gaps (table 23). Last, the funding gap in transport is insignificant compared to the other sectors, emphasizing the potential gains from improving efficiencies, due to the fact that investments in roads were large to start with and also because of the larger spending needs of road maintenance compared to that of other sectors.

Table 23. Funding gaps by sector

\$ millions					
	ICT	Power	Transport	WSS	Total
Spending needs	(248)	(1,062)	(141)	(342)	(1,792)
Existing spending*	212	396	95	170	873
Reallocation potential within sectors	0	0	38	0	38
Efficiency gains	0	219	15	78	313
Funding gap	(36)	(447)	No gap	(94)	(578)

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. WSS = water supply and sanitation; ICT = information and communication technology.

* traced to needs. — = Not available.

What else can be done?

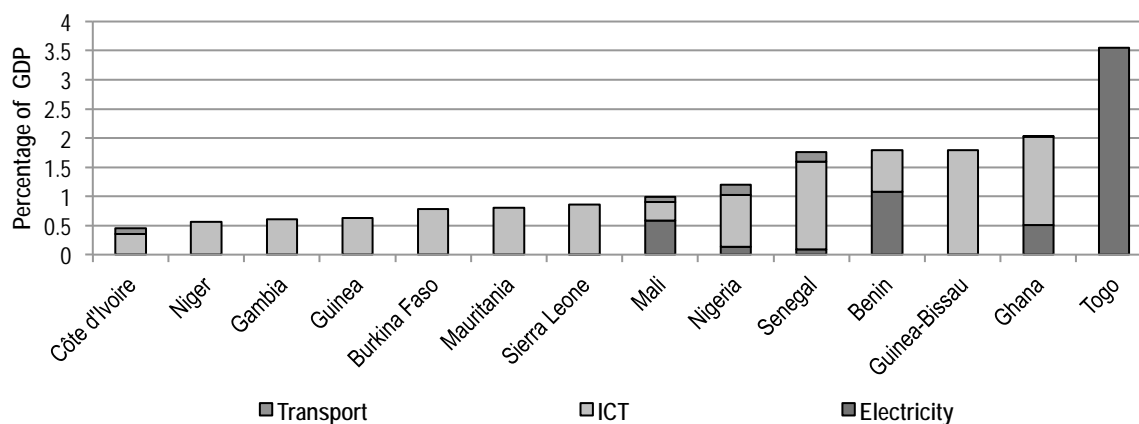
The funding gap can be addressed only by raising additional finance or, alternatively, using lower-cost technologies and/or adopting less ambitious targets for infrastructure development.

In the case of Senegal, the country could very likely increase the flow of resources and technical and managerial expertise by attracting private sector investment in the various infrastructure sectors, and by continuing to emphasize infrastructural projects with a regional dimension that facilitate access to larger, regional markets through Senegal's unique geographical location.

Senegal already has a long history of private participation in infrastructure (PPI), and among the West African countries, it has been one of the main destinations of private sector participation. One of the first projects was the concession of the Port of Dakar awarded to Bolloré in 1987, and since 1990, total investment commitment in private infrastructure projects has amounted to more than \$2.6 billion. Most of this, \$2 billion, was directed to telecommunications (figure 28).

Figure 28. Senegal has been a destination for private sector investment in West Africa

Average annual investment as a percentage of GDP, 2008



Source: World Bank 2010a.

Note: GDP = gross domestic product; ICT = information and communication technology.

Private participation has been implemented in all kinds of infrastructure services with relative success: energy, water, transport, and ICT. All types of contracts have been experimented with: lease, rental, concession, BOT, and divestiture (table 24). Over the years, 14 infrastructure projects with private participation have reached financial closure (this total includes the renewals). Eleven of them are still operational, including one electricity distribution project, three electricity generation projects, one railway project, one seaport project, one toll road project, one water supply project, and three telecommunications projects.

Table 24. Total investment commitments in infrastructure projects with private participation

Average between 2000 and 2009

Sector	Number of arrangements and value (US\$ millions) by type					
	Concession	BOT/BOO	Marchand	Location	Partial privatization	Affermage
Energy	2 (\$88)	2 (\$146)		1 (\$6)		
ICT			2 (\$408)		1 (\$1,536)	
Transport	4 (\$720 *)					
WSS						2 (\$20)

Source: World Bank 2010a.

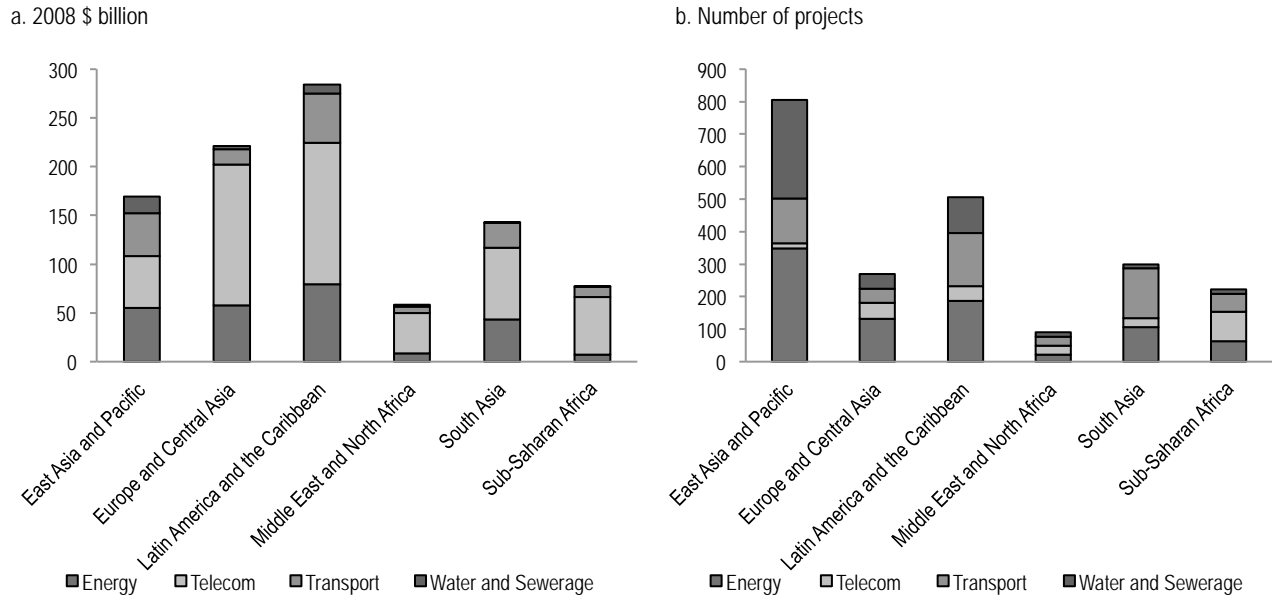
Note: (*) 2009 preliminary data reported.

BOT = build operate transfer; BOO = build operate own; ICT = information and communication technology; WSS = water supply and sanitation.

But while Senegal is among the countries in the region to have already attracted the private sector's investment in infrastructure, a comparative assessment of Sub-Saharan Africa shows that these private flows remain modest in comparison to countries in other regions (figure 29a, b). Increasing private sector participation in infrastructure, however, is not an easy task, especially in an environment where investment resources are scarce and private investors highly selective. In the case of Senegal, it will be important for the government, based on sector needs over the next 5 to 10 years, to carefully prioritize projects. The government could then identify a pipeline of projects in which the private sector could play a major role in either bringing in investment resources or, equally important, bringing in technical and

managerial expertise that would allow for the realization of the large potential efficiency gains that have been identified. Promoting competition within the markets, and developing a coherent framework for promoting private participation with standard bidding documents and clearly defined competitive bidding procedures will also be essential to ensure that the benefits of increased private participation will result in more cost-efficient services for a larger share of the population.

Figure 29. Africa attracts relatively less private sector investment in infrastructure compared with other regions



Source: World Bank 2010a.

The benefits of further pursuing regional integration are most evident in the power and transport sectors. First, the cost of meeting Senegal's power needs would be reduced if regional power trading developed further in the WAPP. These savings would reduce the annual infrastructure funding gap by as much as 12 percent a year. Second, continuing the emphasis placed on developing and maintaining regional transport corridors (road and railways) and integrating these corridors with gateways to worldwide markets (ports and airports), a multimodal vision of the transport sector could provide a major boost to Senegal's international competitiveness.

If Senegal were completely unable to raise additional finance or reduce infrastructure costs, the only way to meet the targets identified here would be to take a longer period of time than the decade contemplated at the outset of this exercise. If the country were to make efficiency gains overnight while holding spending at current levels, it could in fact meet the identified infrastructure targets within a 15-year period. Without tackling inefficiencies, those targets could take more than 80 years to achieve. These simulations underscore the importance of making progress on the efficiency agenda, which can put the country more than 60 years ahead in meeting its infrastructure targets.

Within the overall funding envelope, it will be very important to carefully prioritize infrastructure investments. Given the magnitude of the country's funding gap, it will not be feasible to resolve all pending infrastructure issues at once—thus the need to identify priorities. The foregoing analysis of

achievements and challenges suggests the importance of prioritizing key infrastructure interventions for the economy. These are notable in power, where acute shortages call for immediate measures to increase the capacity in the system; in the water and sanitation sector, to improve sanitation in general and in rural areas in particular; and in the transport sector, to address the pressing need for better maintenance and rehabilitation of both roads and railways.

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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 (AICD). All of these can be downloaded from the project Web site: www.infrastructureafrica.org. For papers go to the document page (www.infrastructureafrica.org/aicd/documents), for databases to the data page (www.infrastructureafrica.org/aicd/tools/data), for models go to the models page (www.infrastructureafrica.org/aicd/tools/models) and for maps to the map page (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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