



COUNTRY REPORT

Niger's Infrastructure: A Continental Perspective

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MAY 2011

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, which 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 net contribution of only 0.3 percentage points to the improved per capita growth performance of Niger, one of the lowest in Sub-Saharan Africa. Raising the country's infrastructure endowment to that of the region's middle-income countries (MICs) could boost annual growth by about 4.5 percentage points, mainly by improving the condition of the road network.

Niger has made significant progress in some areas of its infrastructure. Important reforms liberalizing the water supply and information and communication technology (ICT) sectors have boosted performance. In particular, reforms in urban water are among the most promising on the continent. Increased competition in the ICT market has contributed to the rapid expansion of mobile services. NIGELEC, the national power utility, has enhanced its performance. The Nigerien portions of regional corridors are in relatively good or fair condition. Air transport connectivity has improved.

Looking ahead, the country faces a number of important infrastructure challenges. Infrastructure services remain expensive and unreliable, hindering the competitiveness of the economy. Probably Niger's most pressing challenge lies in the water supply and sanitation sector. Niger has the highest reliance on open defecation in the continent, at 82 percent of the population. Ninety percent of the rural population relies on wells and boreholes, but only a fraction is protected. In the power sector, too, the country faces significant challenges: only 8 percent of the national population is electrified, one-fourth the level of comparable low-income countries (LICs). Power supply is inefficient and unreliable, constraining firms' ability to do business. In the transport sector, the country needs to improve the quality of its network and increase financing for rehabilitation and maintenance. Expanding the Internet and mobile markets and providing a high-speed fiber-optic network are the main challenges in the ICT sector. Niger heavily relies on its regional corridors for the efficient movement of goods and people, but neighboring countries are not prioritizing the maintenance of their portions of the regional corridors. To increase the efficiency of moving goods to and from Niger, the government needs to improve the overall condition of the road corridors and enhance the performance of the Port of Cotonou.

Addressing Niger's infrastructure challenges will require sustained expenditure of \$747 million per year over the next decade. Almost two-thirds of the required spending (\$529 million) is associated with capital investments, and the remaining third with operational and maintenance spending. More than one-third of the total spending needs are related to the water supply and sanitation sectors, followed by the power sector. Niger's effort, equivalent to 22.4 percent of its gross domestic product (GDP), is higher than the average for Sub-Saharan Africa (14.5 percent).

Niger already spends around \$225 million per year on infrastructure, equivalent to 7 percent of its GDP. Most of this goes toward capital expenditure (\$174 million); government spending accounts for around half of the total flows. Various players, many of them overseas development agencies, fund the remaining. The water and sanitation sector receives the highest level of spending, accounting for \$66 million per year.

The current spending envelope could be expanded if efficiency was improved. For example, \$62 million a year could be saved if Niger raised tariffs to cost-recovery levels, aligned operational

inefficiencies with reasonable developing-country benchmarks, and executed the full amount of its infrastructure budget.

After adding existing spending to required spending, and subtracting the potential savings from improved efficiency, a substantial funding gap of \$460 million per year remains. By far the largest portion of this is to be found in the water supply and sanitation sector.

Niger has the potential to close this funding gap by tapping alternate sources of financing or adopting lower-cost technologies. There is plenty of room for private sector participation in Niger's infrastructure sectors, in particular ICT. Meanwhile, the adoption of alternate lower-cost technologies in the water supply, power, and road sectors would reduce the financing gap by almost a half (\$219 million).

The continental perspective

The Africa Infrastructure Country Diagnostic (AICD) has gathered and analyzed extensive data on infrastructure in more than 40 Sub-Saharan countries, including Niger. The results have been presented in reports covering various areas of infrastructure—ICT, irrigation, 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 Niger, allowing the country's infrastructure situation to be benchmarked against that of its African peers. Given that Niger is a poor but stable country, two sets of African benchmarks will be used to evaluate Niger's situation: low-income countries (LICs) and middle-income countries (MICs). 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 data collection, a time lag is inevitable. The period covered by the AICD runs from 2001 to 2006. Most technical data presented are for 2006 (or the most recent year available), while financial data are typically averaged over the available period to smooth out the effect of short-term fluctuations. Second, to make comparisons across countries, indicators were standardized so that analyses were 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.

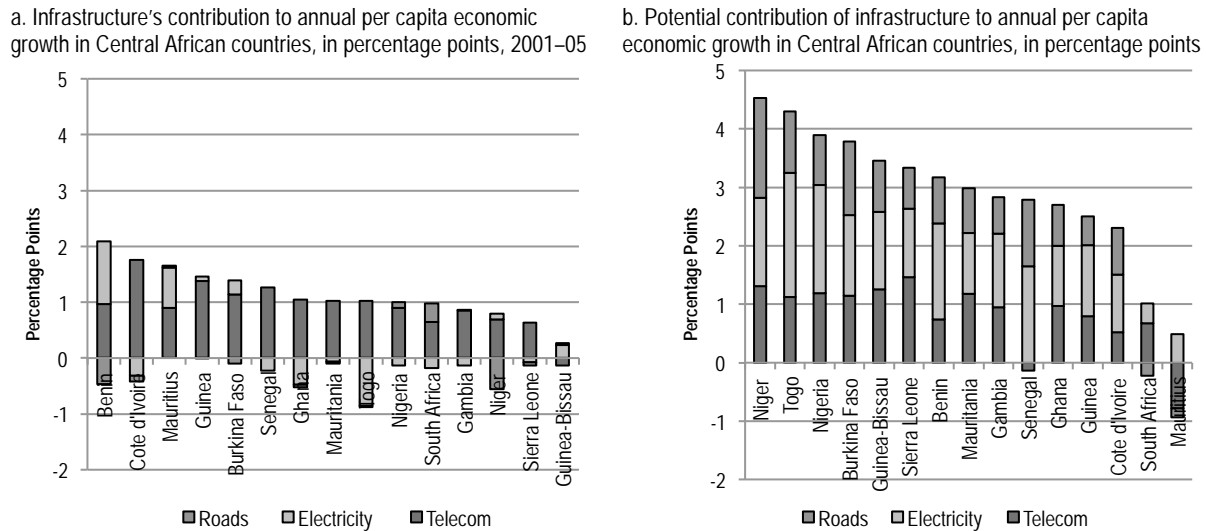
Why does infrastructure matter?

Niger's economic growth is below the desired level for reducing poverty. Between 2001 and 2009 Niger's grew at 4.8 percent per year, below the annual Sub Saharan growth at 6.2 percent. Niger's economic performance is below the 7 percent mark needed to make a significant impact on poverty reduction.

The poor condition of Niger's infrastructure hardly contributed to economic growth. The overall contribution of telecommunications, electricity, and roads infrastructure to Niger's per capita growth between 2000 and 2005 was only 0.3 percentage points, among the lowest on the continent. At this level, Niger—along with Chad—is one of the worst performers in infrastructure development in the region.

Unlike elsewhere, the ICT sector's contribution was relatively small—it added 0.69 percentage points to the per capita growth rate. The bad quality of the road network actually held per capita growth back, by -0.56 percentage points. Infrastructure contribution in Niger was also among the lowest in West Africa, only after Guinea-Bissau and Sierra Leone, in a region where the highest contribution of infrastructure took place in Benin (1.6 percentage points) (figure 1a).

Figure 1. Infrastructure's contribution to economic growth: Benchmarking Niger against other Sub-Saharan countries



Source: Calderón 2009.

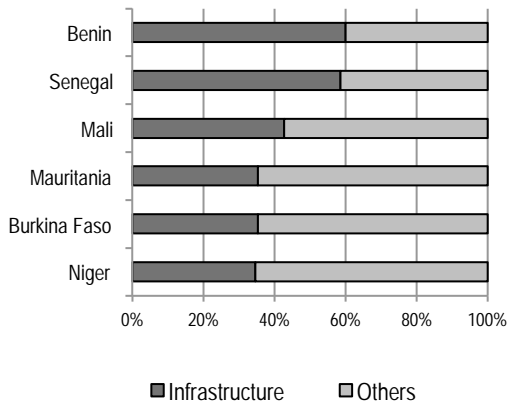
Poor infrastructure is a handicap for business in Niger. Evidence from enterprise surveys suggests that infrastructure constraints are responsible for about 35 percent of the productivity gap faced by Nigerien firms, the remainder being due to poor governance, red tape, and financing constraints (figure 2a). Firms' perception of infrastructure as a bottleneck to growth in Niger is the worst among countries in West Africa. Customs clearance is the infrastructure constraint that weighs most heavily on Niger firms, with power deficiencies in second place (figure 2b). Niger is ranked 172 out of 181 economies on its ease of doing business indicators.

Looking ahead, Niger could grow by as much as 4.5 percentage points per capita (to the level of Sub-Saharan African MICs) if it expands and improves its infrastructure, particularly in the road sector (figure 1b).¹ Improving the condition of paved and unpaved roads would facilitate and increase trade within the country, boosting economic growth by 1.71 percentage points. Power would contribute around 1.51 percentage points to per capita growth if generation capacity and national access rates—which as of today are among the lowest in the region—were increased. ICT would also make an important contribution to economic prospects (1.31 percentage points), provided the mobile and Internet markets continue expanding.

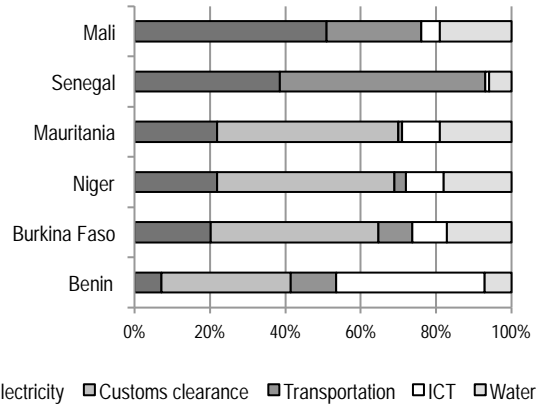
¹ The countries that are closest to Mauritius, whose infrastructure is the best in the region, will show the smallest infrastructure gap and will, therefore, have the smallest growth benefits.

Figure 2. Infrastructure deficits constrain firms' productivity

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



b. Degree to which infrastructure is perceived by firms as an obstacle to growth, by subsector (%)



Source: Escribano and others 2010.

The state of Niger's infrastructure

Niger's demographic characteristics and distribution patterns make infrastructure development difficult. Niger is a large country with an area of approximately 1,267,000 square kilometers (km²), but only one-third of the area in the southwest is arable. The country's population of 15.3 million is concentrated in this arable strip (figure 3a). Niger's high fertility rate (7 births per women) and rapid population growth (3.4 percent a year), among the highest in Sub-Saharan Africa, undermine the gains derived from its GDP growth and challenge infrastructure maintenance and expansion.

Niger has very limited water resources; the Niger River is the only source of permanent water for the country. Rain patterns are also highly volatile, and nearly 90 percent of the territory receives less than 350 millimeters (mm) of rain every year, which results in regular droughts (World Bank 2008a). This has a significant impact on the economy, since 45 percent of Niger's GDP comes from the agricultural sector, which is predominantly rain fed.

Niger remains one of the poorest countries of the world, though it has ample natural resources. The country ranked last among 182 countries in the Human Development Index (HDI).² With an annual per capita income of \$300—compared against the Sub-Saharan African average of \$500—in 2008, 60 percent of the Nigerien population lived below the poverty line of \$1 per day. Poverty incidence is highest in rural areas, where 85 percent of population lives. In the states of Tillaberi and Dosso, more than 70 percent of the population lives under the poverty line (figure 3b). The country's precious mineral resources

² The HDI provides a composite measure of three dimensions of human development: living a long and healthy life (measured by life expectancy), being educated (measured by adult literacy and gross enrollment in school), and having a decent standard of living, as measured by purchasing power parity (PPP) and income.

(uranium,³ gold, oil in the north, iron, and phosphates), if tapped, may provide an opportunity to improve livelihoods and alleviate poverty (figure 3c).

Poverty incidence is associated with Niger's low density of transport, power, and ICT infrastructure. Roads, power, water supply, sanitation, and ICT backbones are concentrated in urban areas, in particular around Niamey, with a noticeable lack of infrastructure in rural areas (figure 4a, 4b, and 4c). The highest levels of traffic are present around Niamey, as well as power transmission lines (figures 4a and 4b). Mobile signals are present in the south and some central areas where mining centers are located (figures 4c and 4d). The relatively high difficulty of getting electricity and water connections is a factor contributing to low network density. The average delay in obtaining a connection in Niger is higher than the average for Sub-Saharan Africa.

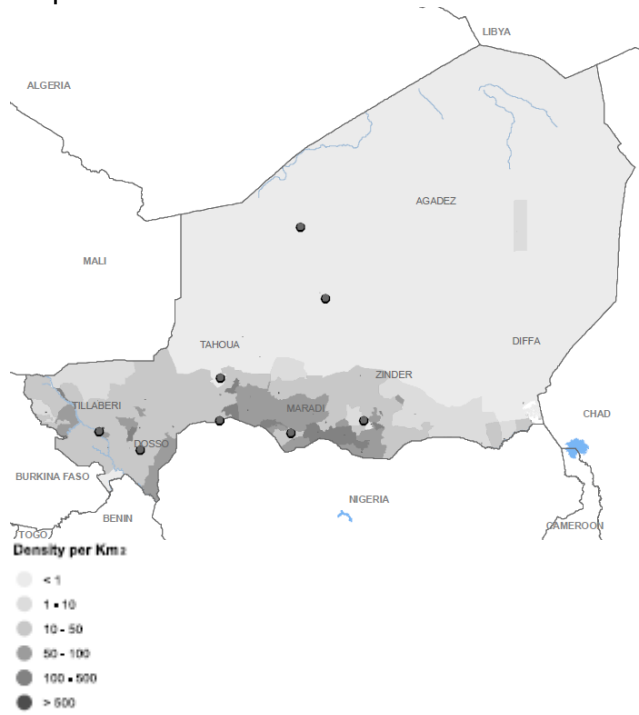
Niger depends highly on its transport infrastructure, particularly for its agricultural sector. Its transport infrastructure comprises a road network of 16,945 kilometers (km), 80 percent of which is classified. The classified network consists of about 6,055 km of main roads (interstate and national roads) and 7,500 km of rural roads. The country has an international airport in Niamey and a secondary airport in Agadez.

This regional transport infrastructure is essential for Niger's trade across borders, because of its landlocked condition. Four main corridors are used to reach ports (Enhanced Integrated Framework 2008): The Cotonou-Niamey corridor is used to import oil and a significant portion of general merchandise. This is the preferred route for Niger as it is the shortest in the western part of the country, has only one border crossing, and is located entirely in the CFA franc zone. The Lomé-Niamey corridor, which is 200 km longer than the Cotonou-Niamey corridor, has two border crossings instead of one. The Tema (Ghana) and Takoradi (Ghana) corridor has been used considerably following the crisis in Côte d'Ivoire. The Nigerian corridor, which starts in Lagos, leads to eastern Niger. Also, Niger has a portion of the interregional Nouakchott-Ndjamena corridor.

³ Niger is the third-largest producer of uranium in the world; nearly all of its production is exported to France and Japan (OECD 2007).

Figure 3. Niger's population, poorest areas, and mineral resources are concentrated in the south

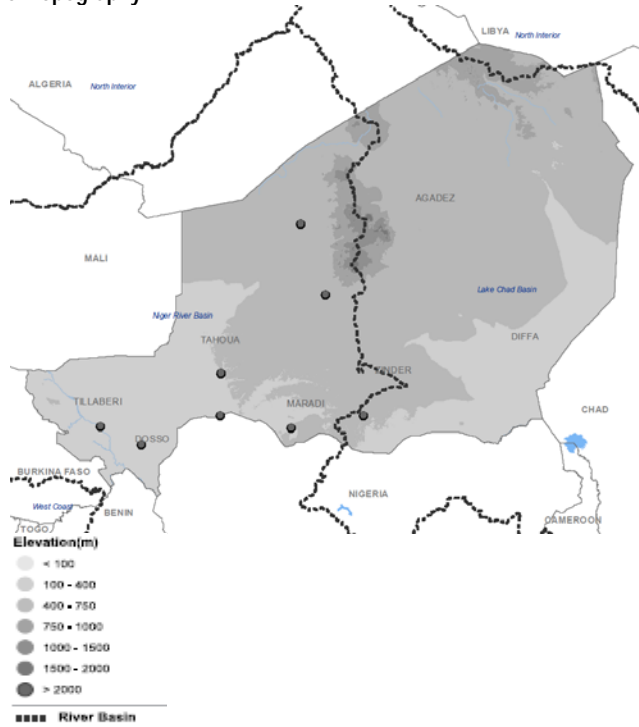
a. Population



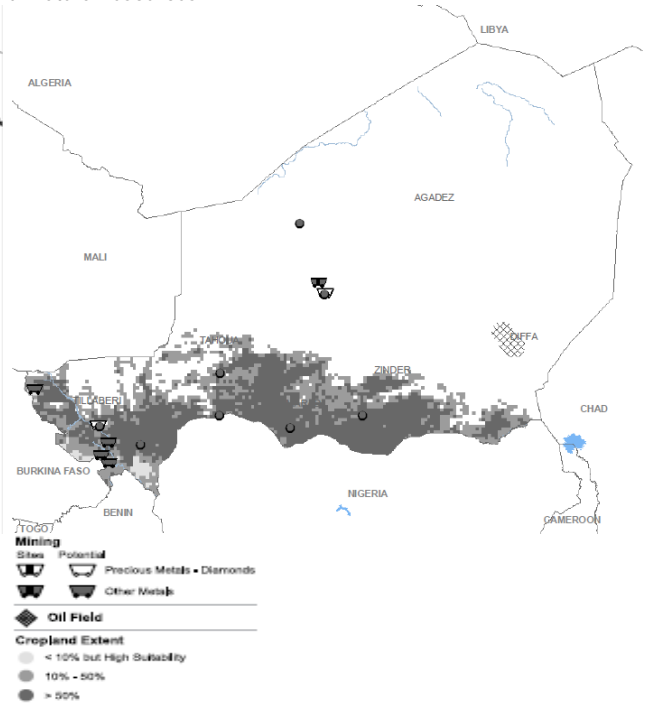
b. Poverty



c. Topography



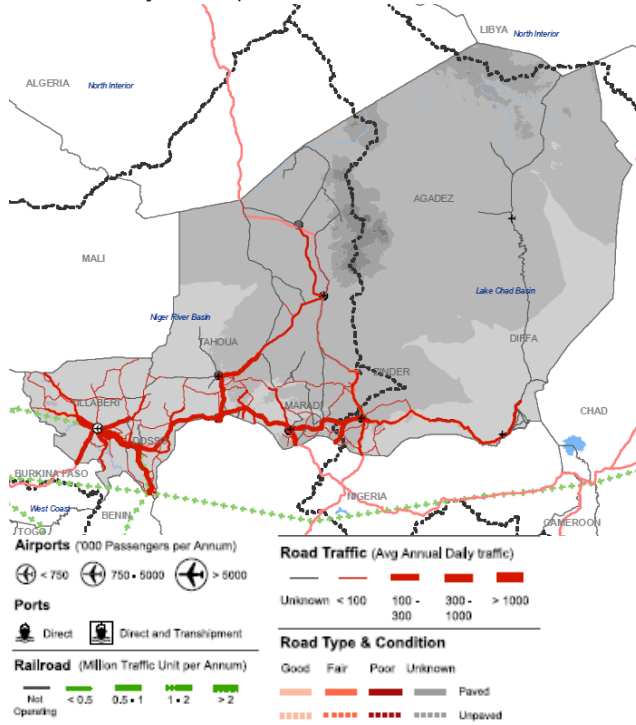
d. Natural resources



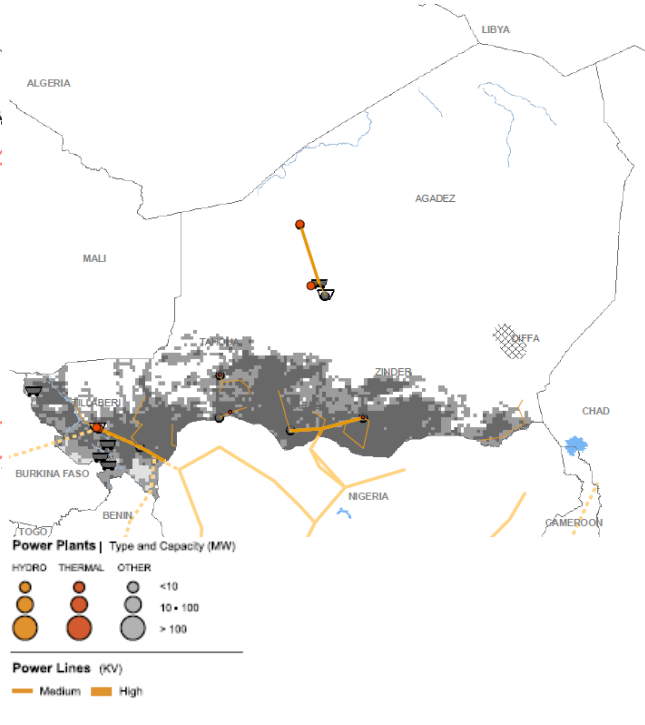
Source: AICD Interactive Infrastructure Atlas for Niger (www.infrastructureafrica.org).

Figure 4. Niger's infrastructure networks align with population density and natural resource concentrations

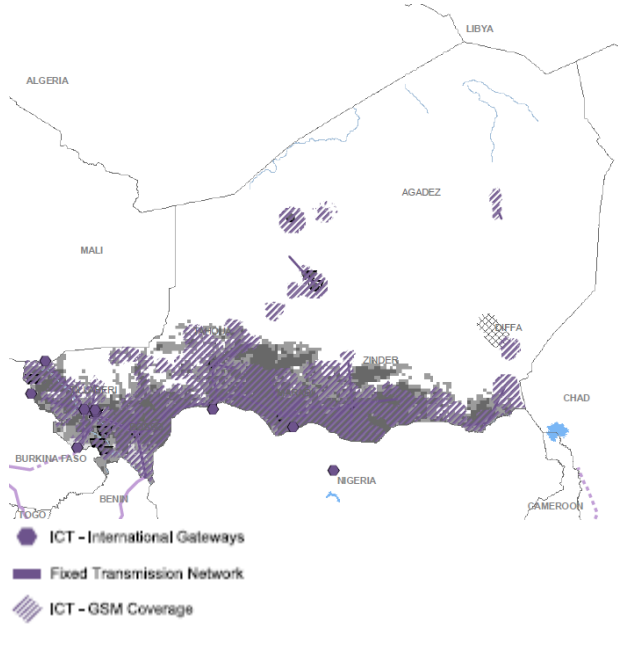
a. Roads, railways, and airports



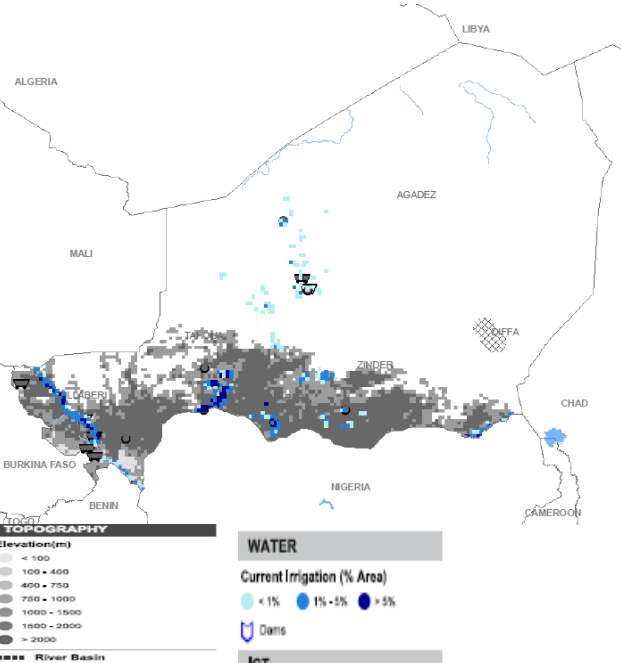
b. Power



c. ICT



d. Water resources



Source: AICD Interactive Infrastructure Atlas for Niger (www.infrastructureafrica.org).

This report begins by reviewing the main achievements and challenges observed in each of Niger's major infrastructure sectors, with the key findings summarized in table 1. Thereafter, attention will turn to the problem of financing Niger's outstanding infrastructure needs.

Table 1. The achievements and challenges of Niger's infrastructure sectors

	Achievements	Challenges
Transport	Ranked relatively high in the Logistics Performance Index (LPI), compared to landlocked countries in the region.	Reducing costs and time of trading across borders. Achieving regional integration to boost the quality of corridors in neighboring countries and the productivity of the Port of Cotonou.
Roads	Niger's portions of regional corridors are in good condition.	Improving condition of the road network (paved and unpaved). Financing maintenance of road networks with low density and traffic.
Railways		Boosting traffic and productivity.
Air transport	Connectivity and traffic have increased. The air fleet has been renovated.	Expanding the air transport market. Improving safety conditions.
Irrigation		Increasing irrigated area.
Water and sanitation	Reliance on surface water has been reduced. The operational and financial performance and service quality of the urban water sector have increased.	Extremely low access to sanitation and increasing reliance on open defecation. High reliance on unprotected wells and boreholes in rural areas.
Power	The operational and financial performance of NIGELEC has increased. User tariffs are at cost-recovery levels.	Expanding generation capacity. Increasing the volume, reliability, and quality of the electricity supply. High dependence on power imports from Nigeria.
Information and communication technology (ICT)	The sector has been liberalized and the mobile market rapidly expanded.	Expanding access to ICT services, in particular to the Internet.

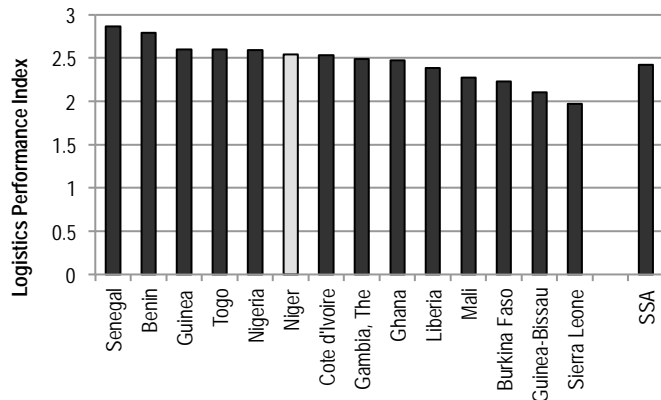
Source: Author's own elaboration based on findings of this report.

Transport

The transport sector plays a strategic role in Niger given its landlocked condition. While, according to the Logistic Performance Index (LPI), operators rank Niger higher than the average Sub-Saharan African country, trading to and from Niger is handicapped due to high costs and lengthy travel times. The efficiency of transporting goods to and from Niger also depends on the state of infrastructure in neighboring countries.

Niger’s capacity to efficiently move goods and connect manufacturers and consumers with international markets is above the regional average. When asked to give feedback on Niger’s logistics “friendliness,” operators (global freight forwarders and express carriers) gave it an LPI ranking of 2.54, above the West African average of 2.42 (figure 5). Senegal, Benin, Guinea, and Togo—all coastal countries—received a higher LPI. But Niger’s LPI is higher than Mali’s and Burkina’s, despite the fact that it is farther from the coast than these countries. Zooming in on the components of the LPI in Niger, operators gave the lowest scores to (i) the efficiency of the clearance process (that is, the speed, simplicity, and predictability of formalities) a border control agencies, and (ii) the quality of trade and transport-related infrastructure (for example, ports, railroads, roads, information technology).

Figure 5. Niger’s Logistics Performance Index ranking and that of other West African landlocked countries



Source: World Bank 2010d.

Note: The Logistics Performance Index is based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics “friendliness” of the countries in which they operate and those with which they trade. Such operators combine in-depth knowledge of the countries in which they operate with informed qualitative assessments of other countries with which they trade, and experience of a global logistics environment.

SSA = Sub-Saharan Africa.

Niger’s *costs* and *time* to trade across borders are among the highest in the region in spite of its relatively high efficiency in moving goods across borders. The cost of exporting from and importing to Niger is the highest among West African countries and more than 70 percent higher than the average of Sub-Saharan Africa (table 2). Around 40 percent of the firms identified transport in Niger as a major business constraint, a level higher than the average in LICs (32 percent) and MICs (18 percent).⁴ The time needed to comply with all procedures required to export goods from Niger is 59 days, versus 34 days in the average West African country. It takes 64 days to import goods to Niger, which is above the regional average of 39 days.

The *costs* of trading to and from Niger are driven up by inefficiencies in the Port of Cotonou. High costs in this port account for the bulk of the cost (55 percent) of importing goods using the Cotonou-Niamey corridor (the highest share among the various gateways in West Africa), and surface transport accounts for 35 percent of the cost. Surface transport and port costs each account for about 40 percent of the cost of moving imports to Niger using the Lomé-Niamey corridor (figure 6a). The handling charges in the Port of Cotonou and Lomé are among the highest in West Africa (table 3), where services cost twice as much as those in other global ports.

⁴ World Bank–International Finance Corporation (IFC) Enterprise Surveys on 32 Sub-Saharan African countries.

Table 2. Trading across borders in West African countries

Country	C/L	Documents to export (number)	Time to export (days)	Cost to export (\$ per container)	Documents to import (number)	Time to import (days)	Cost to import (\$ per container)
Burkina Faso	L	11	41	2,262	11	49	3,830
Mali	L	7	32	2,075	10	37	2,955
Niger	L	8	59	3,545	10	64	3,545
West Africa, landlocked		9	44	2,627	10	50	3,443
West Africa, coastal		7	24	1,263	8	28	1,514
Sub-Saharan Africa		8	34	1,942	9	39	2,365

Source: World Bank, Doing Business 2011.

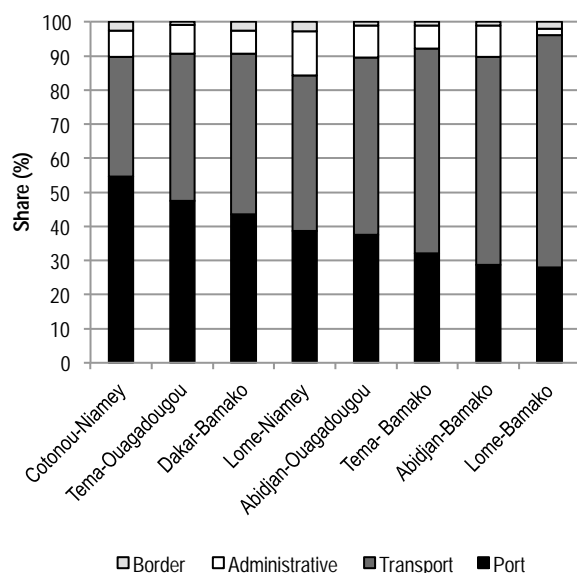
Note: C= coastal; L= landlocked. Documents to export (import): The total number of documents required per shipment to export (import) goods. Documents required for clearance by government ministries, customs authorities, port and container terminal authorities, health and technical control agencies, and banks are taken into account

Time to export (import): The time necessary to comply with all procedures required to export (import) goods. If a procedure can be accelerated for an additional cost, the fastest legal procedure is chosen.

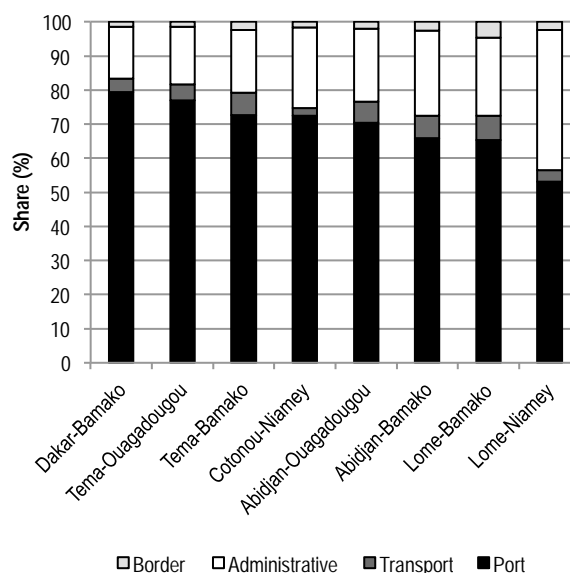
Cost to export (import): The cost associated with all procedures required to export (import) goods. Includes the costs for documents, administrative fees for customs clearance and technical control, customs broker fees, terminal-handling charges, and inland transport.

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

a. Cost



b. Time



Source: AICD ports database; Teravaninthorn and Raballand 2009.

Note: Ports data are based on indicators from 2006–07.

Similarly, the lengthy *travel times* to import and export from Niger are associated with ports’ inefficient operations. In the Cotonou-Niamey corridor, delays in the Port of Cotonou are responsible for more than 70 percent of the time required to import into Niamey, as the port operates over 200 percent of its capacity. It is estimated that the delays cost around \$180 per container; the average pre-berth waiting

time, at 48 hours, is the highest among West African ports. The global best practice for truck cycle time is one hour, and it is six hours in the Port of Cotonou (table 3). Delays in the Port of Lomé and administrative requirements are responsible for the bulk of the time consumed importing to Niger using the Lomé-Niamey corridor. This port is one of the busiest in West Africa, handling around 460,000 TEUs⁵ per year. Crane productivity in Lomé is 23 tonnes per hour, substantially better than elsewhere, although still short of the international benchmark. The international standard for the time containers spend in the terminal (dwell time) is 7 days or less, but in the Port of Lomé it is 13 days (table 3).

Time-consuming regulatory processes related to customs clearance and technical controls further augment the total time of trading across borders. In the Cotonou-Niamey corridor, administrative procedures account for about 23 percent of the total time required to move imports, and in the Lomé-Niamey corridor they consume around 35 percent (figure 6b). The administrative process in Niger is particularly cumbersome; unnecessary and often redundant formalities significantly prolong the time needed for customs clearance. This results in the costly immobilization of goods and means of transport (Enhanced Integrated Framework 2008).

Table 3. West African port indicators

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

Source: AICD ports database (www.infrastructureafrica.org/aicd/tools/data); data as of 2006.

Note: TEU = 20-foot equivalent unit.

— = Not available.

⁵ 20-foot equivalent units.

The inadequate implementation or simply the lack of enforcement of some of the rules and procedures agreed to by the various member states of the Economic Community of West African States (ECOWAS) and the West African Economic and Monetary Union (UEMOA)—rules and procedures that aim to promote efficiency and competition among transport carriers—augment the costs of trading to and from Niger. The abolishment of the queuing (*tour de role*) mechanism, a significant step toward trade facilitation, has not been effectively implemented by Niger. Trade flows are not balanced: import volumes total more than 20 times export volumes (table 4). Niger has to undertake urgent transport facilitation policies to phase out the many logistical and other barriers that impede the country's economic development (World Bank 2008c).

Table 4. Niger's international trade

Product	Value (CFAF billions)	Volume (in tonnes)
Imports	503.3	
Petroleum products	83.3	
Rice and related products	157	630,000
Consumption goods	99.9	138,750
Intermediate and capital goods	163.1	
Exports	263.5	
Uranium	78.5	3,400
Cattle	29.1	40,152
Cowpeas	11.4	23,940
Onions	33.8	83,248
Other exports	110.7	

Source: World Bank 2008c.

Roads

Achievements

The condition of Niger's portions of regional corridors is generally higher than these same corridors' overall condition. Niger's portion of the Lomé-Niamey corridor is entirely paved and almost 100 percent in good condition, while only 52 percent is in good or fair condition on the Togo side. Of the Cotonou-Niamey corridor, 100 percent of the Nigerien part is in good or fair condition, but only 40 percent of the Beninese part is. The country's portion of the Nouakchott-Ndjamena corridor is 70 percent in good or fair condition, and it is only 38 percent so in the Senegalese portion (table 5). Clearly, the incentives for the coastal country to maintain hinterland road corridors do not seem to be strong, since the coastal countries' economies are typically concentrated along the coast, making the up-country segments regional public goods, in effect. The relatively poor condition of the corridors in the coastal countries puts Niger at a disadvantage and calls for further regional coordination and collaboration.

Table 5. Road conditions along major transit ECOWAS corridors that run through Niger

Corridors	Percentage in condition			Percentage paved	Percentage in traffic band		
	Good	Fair	Poor		<300	300–1,000	>1,000
Gateways to the sea							
<i>Lomé-Niamey</i>	<i>50.2</i>	<i>30.1</i>	<i>19.8</i>	<i>100.0</i>	<i>0.0</i>	<i>82.6</i>	<i>17.4</i>
Togo	51.7	0.0	48.3	100.0	0.0	37.2	62.8
Burkina Faso	35.4	38.9	25.8	100.0	0.0	77.3	22.7
Niger	99.0	1.0	0.0	100.0	0.0	100.0	0.0
<i>Cotonou-Niamey</i>	<i>49.5</i>	<i>7.9</i>	<i>42.6</i>	<i>98.5</i>	<i>1.5</i>	<i>26.4</i>	<i>70.0</i>
Benin	38.1	2.2	59.7	97.8	2.2	15.8	81.5
Niger	77.7	22.3	0.0	100.0	0.0	52.8	41.4
Intraregional corridors							
<i>Nouakchott-Ndjamena</i>	<i>63.4</i>	<i>21.1</i>	<i>10.2</i>	<i>97.3</i>	<i>9.9</i>	<i>46.2</i>	<i>43.4</i>
Mauritania	50.6	23.8	25.6	100.0	0.0	21.5	78.5
Senegal	10.9	26.5	62.6	28.6	0.0	100.0	0.0
Mali	62.9	31.3	0.0	94.2	5.8	75.8	16.4
Burkina Faso	70.7	29.3	0.0	100.0	6.2	37.6	56.3
Niger	66.4	4.4	29.1	99.1	3.8	46.8	48.5
Nigeria	—	—	—	100.0	0.0	0.0	100.0
Cameroon	84.8	15.2	0.0	100.0	31.0	56.5	12.5

Source: AICD 2010.

Note: ECOWAS = Economic Community of West African States

— = Not available.

Challenges

Although only one-third of the Nigerien road network is in poor condition, most of the remainder is in fair rather than good condition. If no routine and periodic maintenance is performed, a large share of the main network could fall into poor condition within a short period of time. Even though 58 percent of the unpaved network – mostly rural - is in good or fair condition, above the average condition in LICs (table 6), the rural network is in fragile condition.

A major factor contributing to the poor or fair condition of the network is truck overloading. To compensate for the small number of trips per month (typically only one), truckers try to maximize their load. Some trucks exceed 70 tonnes, while the maximum allowed for six axles is only 51 tonnes (Enhanced Integrated Framework 2008); this contributes toward the deterioration of the road network and increases rehabilitation costs.

Coverage of the road network is an important challenge vis-à-vis the large size and relatively low population density of Niger. Total road density over arable land is around one-tenth the density of LICs (13 km compared to 132 km/1,000 km², table 6). There are only 1.2 km of roads per 1,000 people—one-third the average for Sub-Saharan Africa. The rural network density is even lower, at 0.6 km per 1,000 people, one of the lowest on the continent.

Table 6. Niger's road indicators

Indicator	Unit	Low-income countries	Niger	Middle-income countries
Total road network density [1]	km/1,000 km ² of land area	132	13	318
Classified road network density	km/1,000 km ² of land area	88	11	278
GIS rural accessibility	% of rural pop. within 2 km of all-season road	25	15	31
Household survey rural accessibility	% of rural pop. within 2 km of all-season road	34	37	63
Classified paved network condition	% in good or fair condition	72	67	86
Classified unpaved network condition	% in good or fair condition	53	58	65
Classified paved road traffic	AADT	1,131	387	2,451
Classified unpaved road traffic	AADT	57	31	107
Primary network overengineering	% of primary network paved with 300 AADT or less	30	53	18
Primary network underengineering	% of primary network unpaved with 300 AADT or more	13	23	20

Source: AICD Road Sector Database.

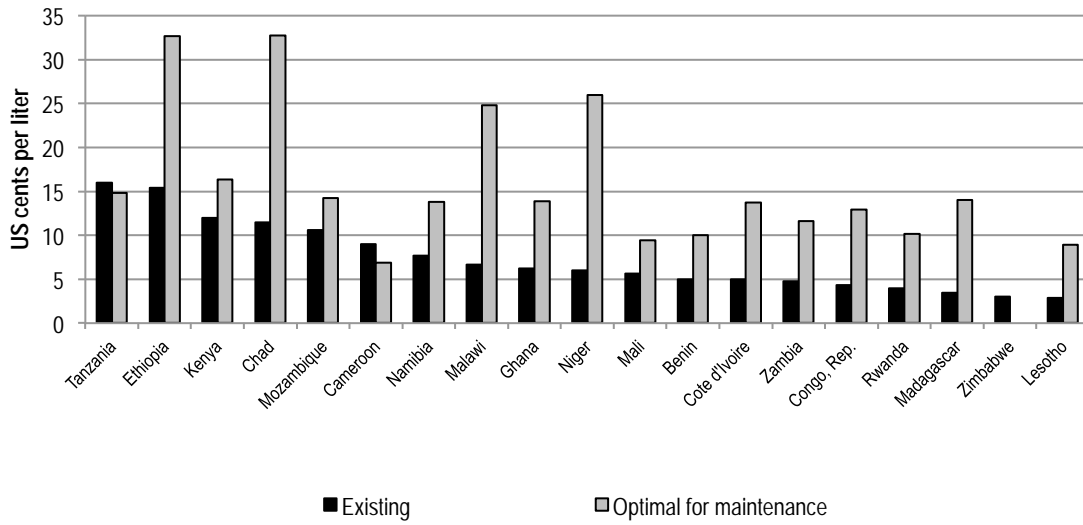
Note: [1] Includes the classified and unclassified network.

GIS = geographic information system; AADT = average annual daily traffic.

Traffic levels are extremely low, making it difficult to justify heavy road engineering. Traffic in the classified paved network, at 387 vehicles per day, is only one-third of the average 1,131 vehicles in LICs and one-eighth of the average 2,451 vehicles in MICs. The volume of traffic in Niger's unpaved network is also low—31 vehicles per day on average, versus 57 vehicles for comparable LICs. Niger has not been sensitive to this reality: around 53 percent of its primary network is over-engineered (that is, it is paved even though it has traffic levels of under 300 vehicles per day; table 6).

The spread of population over a wide geographical area, along with the requirement for international road connectivity, poses a challenge to road financing. At an estimated 6 cents per liter for diesel and super gasoline, the Niger fuel levy is in the middle of the Sub-Saharan Africa distribution. But the fuel levy is set well below the 26 cents per liter needed to cover the maintenance costs arising from wear and tear of the network by road users and is sufficient to finance only 34 percent of routine maintenance (figure 7). The estimated optimal fuel levy for maintenance in Niger is one of the highest on the continent after Ethiopia and Chad, reflecting the geographical characteristics of the country.

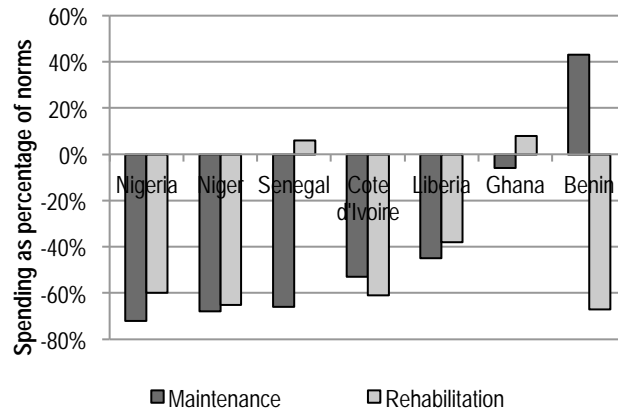
Figure 7. Optimal and existing fuel levy in select Sub-Saharan African countries



Source: Gwilliam and others, 2008.

In Niger current capital spending falls well below what is needed to clear the rehabilitation backlog and maintain the existing network. Taking into account the current distribution of network conditions and working toward a target of clearing the current rehabilitation backlog within a five-year period and maintaining the network, it is possible to produce detailed estimates of the rehabilitation and maintenance requirements for Niger's road network. The current levels of capital expenditure in Niger are not high enough to address the rehabilitation problem: they fall 65 percent below the rehabilitation norm, one of the biggest deviations among West African countries.

Figure 8. Spending on road maintenance and rehabilitation in Niger and other Sub-Saharan nations



Source: Gwilliam and others 2009.

Note: Analysis of adequacy of road maintenance spending can only be performed for the primary network under federal jurisdiction.

Spending on maintenance is around 70 percent below what is required to properly maintain Niger's road network (figure 8). Road maintenance funding paradoxically declined after the creation of CAFER⁶, the road fund created in November 1999; a lack of realism in maintenance programming has led to an overcommitment of CAFER's resources. A lack of resources and the accrual of substantial arrears in recent years have been two main obstacles to the proper maintenance of the road network and the development of a genuine private-public works subsector (World Bank 2008c). Additional funding will be needed despite implementation of road user charges, in particular for secondary and tertiary networks; 89

⁶ Caisse Autonome de Financement de l'Entretien Routier.

percent of the road fund's resources are dedicated to the primary network. The goal is to increase road user charges and gradually phase out direct treasury transfers or external funding. But it might be particularly difficult to implement full cost recovery, at 26 cents per liter, given the already high price of fuel.

Railways

Achievements

Efforts have been made to improve the functioning and capacity of OCBN's⁷ rail system, jointly owned by Benin and Niger, and to bring fresh capital to an investment-starved system. In February 2010, through a competitive process, a concession was granted to a privately owned company. But as OCBN is a joint Niger-Benin venture, Benin requires the agreement and involvement of Niger in any concession agreement—and so far Niger has not agreed to engage.

Table 7. Railway indicators for OCBN and select other railways

Latest available year

Indicator	Unit	OCBN	SITARAIL	GRC	TRANSRAIL	NRC
		Benin Niger	Burkina Faso Côte d'Ivoire	Ghana	Mali Senegal	Nigeria
Concessioned company	1-concessioned, 0-nonconcessioned	1	1	1	1	1
Network density	km/km ²	5.1	2.2	4	5.4	3.8
Network density	km/million population	66	39	40	77	23
Labor productivity	1,000 traffic units per employee	40	481	84	26	37
Carriage productivity	1,000 passenger-km (pkm) per carriage	900	862	416		737
Locomotive productivity	Million traffic units per locomotive	3	35	7	40	13
Wagon productivity	1,000 net tonne-km (ntkm) per wagon	74	1,020	458	804	59
Traffic unit—freight	Million ntkm	24	670	224	409	77
Traffic unit—passenger	Million pkm	18	25	64	113	174
Freight average yield	US cent/ntkm, average 2000–05	5.8	5.5	4.4	3.3	
Passenger average yield	US cent/pkm, average 2000–05	2	3.3	2.4	2.2	

Source: AICD railways database.

Challenges

The establishment of OCBN increased the cost of surface transportation in Niger. Benin and Niger jointly operate the Cotonou-to-Parakou railway line and coordinate complementary road transport between Parakou (in Benin) and Niamey (in Niger). In Cotonou, as a rule, shipments are sent by train, but if OCBN cannot accept the shipments within a reasonable period for lack of capacity, a special waiver is granted for trucks approved by OCBN. This situation often occurs because the train can only carry between 150,000 and 200,000 tonnes a year on its way from Cotonou, as the theoretical capacity of 600,000 tonnes per year is exceeded. The railroad goes as far as Parakou (see box 1), and then goods and containers are loaded on OCBN-approved trucks based on a rotation system.

⁷ Organisation Commune Bénin Niger.

By rule, two-thirds are distributed to trucks from Niger and one-third to those from Benin. The rate is set for the entire route (Cotonou to Niamey) but, in reality, Niger shippers often sell their “driving rights” to their Beninese counterparts and the rates are negotiable. The shippers then try to recover these costs and compensate for the low rates by overloading, which is a major problem for Niger’s road maintenance. Another alternative is for the importer to indicate Benin as the destination, and then obtain a reexport statement, or pay “unofficial” levies at the border (Enhanced Integrated Framework 2008).

Boosting freight and passenger traffic on OCBN’s tracks is an important challenge for Benin, where traffic levels are among the lowest in the region. On average, only 24 million net tonne-km and 18 million passenger-km were registered between 2001 and 2005—levels that put the Beninese railways behind other railways in West Africa (table 7). The situation further deteriorated, and passenger traffic stopped in 2007.

OCBN also needs to enhance its productivity, which lags most railways in West Africa. At 40,000 traffic units per employee, OCBN labor productivity is comparable with that of NRC but behind that of SITARAIL and GRC (481,000 and 84,000 traffic units per employee, respectively). On average, OCBN locomotives transported 3 million traffic units, the lowest figure compared to other concessions in the region. Similarly, wagon productivity, at 74,000 net tonne-km per wagon, was just a fraction of that of SITARAIL, GRC, and TRANSRAIL. Only carriage productivity, at 900,000 km per carriage, was comparatively high (table 7).

OCBN’s freight tariffs are the highest in the region—an average of 5.8 cents/tonne-km. Only SITARAIL has freight tariffs comparable with OCBN’s. But passenger tariffs, at 2 cents/passenger-km, are the lowest in the region (table 7).

Air transport

Achievements

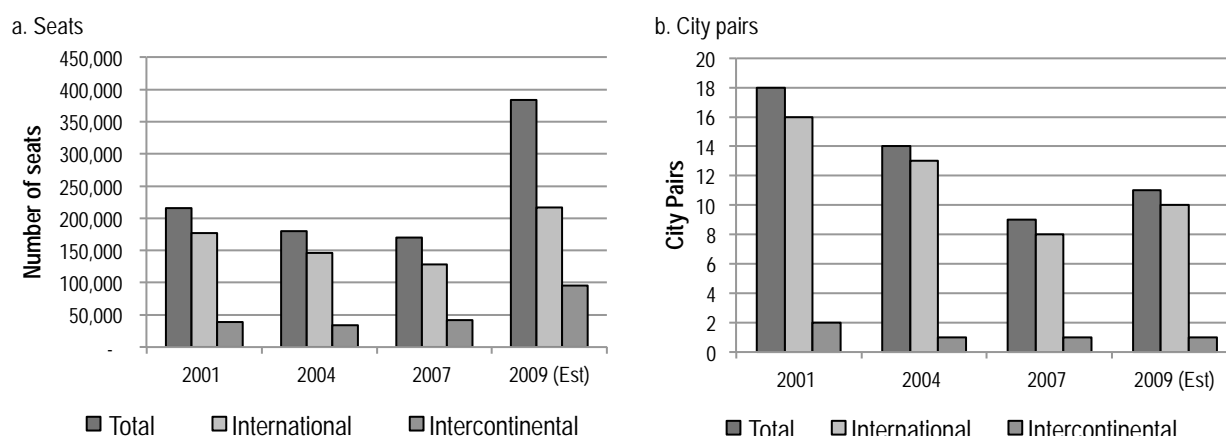
As with many of the neighboring countries, regional liberalization of the air transport market via the implementation of the Yamoussoukro Decision has made air traffic buck the trend of global recession. Preliminary figures for Niger show that capacity grew significantly between 2007 and 2009, recovering from the decline between 2001 and 2007. Total capacity increased by 215,703 seats in 2001 and reached an estimated 315,861 seats in 2009 (figure 9).

Box 1. Should the railway be extended to Niger?

OCBN’s intention has always been to extend the railway to Niamey. While there are inherent advantages in opting for road transport, it is difficult to properly manage the trucking sector and modernize it with cost-effective and reliable vehicles.

But can 1- or even 2-million-tonne traffic justify an investment such as the Parakou-Niamey railroad? Other railroads in Africa have a similar traffic pattern and have been fairly successfully leased out. For about 10 years, Africarail (Geftarail Engineering Group), a private group, has promoted an extension project and claims that it can mobilize interest from other continents. Based on various studies, it estimates the cost of the 645-km project infrastructure at about CFAF 65 billion, including a road/rail bridge over the Niger River. But others point out that new railroads have not been built in Africa in a long time, and that those that were concessioned out did not require the building of new lines.

Source: Enhanced Integrated Framework 2008.

Figure 9. Evolution of seats and city pairs in Niger


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

Note: As reported to international reservation systems.

The fleet servicing Niger has been renovated. Around 95 percent of the seat capacity is new, largely due to the international nature of the services. Four airlines—Air France, Royal Air Maroc, Afriqiyah Airways, and Air Senegal International—comprised over 80 percent of the regularly scheduled traffic in 2007. In 2009 Air Senegal International, with a market share of 14 percent, ceased operations.

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

Country	Niger	Mali	Chad	Nigeria	Burkina Faso	Central African Republic
<i>Traffic (2007)</i>						
Domestic seats (seats per year)	n.a.	n.a.	n.a.	9,304,568	20,245	n.a.
Seats for international travel within Africa (seats per year)	128,414	564,455	109,074	1,373,745	244,721	20,661
Seats for intercontinental travel (seats per year)	41,717	165,776	88,608	2,437,702	147,095	23,842
Seats available per capita	0.012	0.061	0.018	0.089	0.027	0.010
Herfindahl-Hirschmann Index—air transport market (%)	18.97	11.75	36.35	71.4	22.89	50.26
<i>Quality</i>						
Percent of seat-km in newer aircraft	94.3	95.6	99.5	71.4	93.4	100
Percent of seat-km in medium or smaller aircraft	44.9	51.8	93.6	27.6	46.7	23.5
Percent of carriers passing IATA/IOSA Audit	0	0	0	28.6	0	0
FAA/IASA Audit Status	No audit	No audit	No audit	No audit	No audit	No audit

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

n.a. = Not applicable.

Note: The 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. A HHI of 100 indicates the market is a monopoly; the lower the HHI, the more diluted the market power exerted by one company/agent.

All data as of 2007 are based on estimations and computations of scheduled advertised seats, as published by the Dusio SRS Analyzer. 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.

Challenges

The Nigerien air transport market is thin but has relatively developed infrastructure. The volumes of its international and intercontinental traffic are among the lowest in West Africa. The number of seats available per capita, at 0.12, is the second-lowest in the region, after the Central African Republic (table 8). The underdevelopment of the air transport sector is a reflection of the low level of national economic activity, the high cost of air transport compared to the population's purchasing power, and the cost of jet fuel. Niger has three international airports in Niamey, Agadez, and Zinder, and three national airports in Maradi, Tahoua, and Diffa. A B747 can land only at Niamey airport, but Agadez can receive an Airbus 320. The other airports are built according to B737/200 standards. There are also laterite landing strips that are used for light aviation. Each of the six airports has facilities for air traffic control, including a control tower. These infrastructures need to be rehabilitated to maintain a level of safety that complies with the category of the airfield, but there is a severe lack of funding (Enhanced Integrated Framework 2008).

The quality of Niger's safety oversight is below some of its neighbors and, except for the passing of the required civil aviation laws, the implementation of the International Civil Aviation Organization's (ICAO's) global standards and recommended practices is below global averages. In general, however, the passing of civil aviation laws is an indication of an ongoing effort within the country to raise overall safety standards and improve the oversight system.

Water resources

Niger is poorly endowed with water compared to countries occupying similar climatic zones, and is largely dependent on its neighbors. The Niger River, a transnational river that crosses the southwest of the country for about 550 km, is the only river that provides the country with permanent water, and its supply has declined over time. Niger belongs to two international basins: the Irbazer Lullemeden and the Chad. The renewable water resources per capita are estimated at about 2,710 cubic meters (m^3) per year (including the cross-border flows), far below the Sub-Saharan African average of 7,000 m^3 . Rainfall ranges between 100 and 800 mm per year (averaging 151 mm annually), with nearly 90 percent of the territory receiving less than 350 mm of rain.

There are several factors that put significant pressure on water resources. Agricultural production needs represent 95 percent of total demand for water. Demand for domestic purposes and the industrial sector—4 percent and 1 percent of total water use, respectively—has increased over time. The urban water demand is expected to grow by 30 percent over the next decade (World Bank 2009a).

Given the wide range of conflicting uses (agriculture, domestic consumption, and industry), it is essential to have a clearly defined basis for allocating water rights among sectors so as to maximize their development impact. Beyond investment in dams' maintenance, the further development of small-scale irrigation projects would do much to alleviate rural poverty and enhance the resilience of rural livelihoods to constant droughts.

Irrigation

The agricultural sector is central to Niger's economy. As of 2008, agriculture accounted for around 45 percent of Niger's GDP, and around 87 percent of the labor force is involved in agriculture (versus 59 percent in Sub-Saharan Africa). Niger's agricultural sector has grown 6 percent per year on average, twice the annual growth registered in Sub-Saharan Africa. But this was not enough to make it a net exporter. Niger imported around 50 percent of cereals from neighboring countries (Nigeria, Mali, Burkina Faso, Ghana, and Benin). Millet, the most drought-resistant cereal, accounts for almost two-thirds of total agricultural production. Despite its contribution to GDP, the agricultural value added per worker in Niger, at \$157 per year, was well below the Sub-Saharan African average of \$575. Low productivity is explained by the random nature of rainfall, the persistence of droughts and poor soil quality, and the small scale of production (85 percent of the total agricultural production is for self-consumption).

The arable land in Niger is estimated at 16.5 million hectares, equivalent to 13 percent of the country's land. This low percentage is explained by the fact that around two-thirds of the country in the north is a desert. As of 2004, 4.5 million hectares—or 27 percent of the arable land—were dedicated to agriculture (primarily rain fed) and mainly for sorghum, cowpea, and cassava crops.

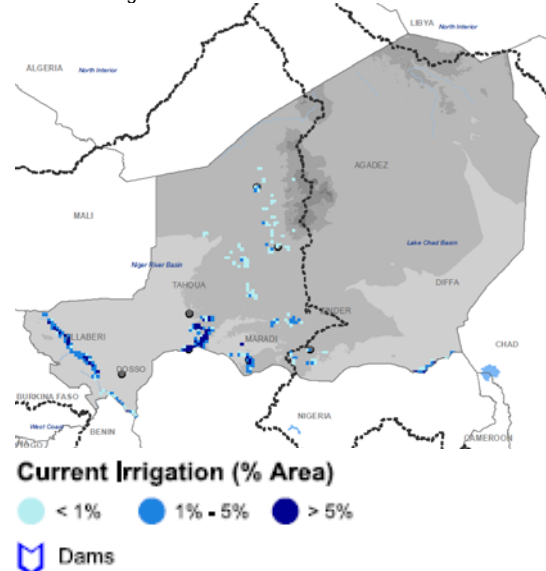
Irrigation systems might contribute to tapping this agricultural potential in Niger, which until now has been partially exploited under rain-fed agriculture. Niger's irrigation potential is largely underdeveloped. As of 2004, 73,663 hectares were equipped for irrigation and another 12,000 hectares were under some other form of water management. Public investment has been directed mainly toward small-scale irrigation systems. Both the irrigated area and the water management area were equivalent to 1.9 percent of the total cultivated area, a level below the average (3.5 percent) for Sub-Saharan African countries. Between 1973 and 2003 the irrigated area grew 4.8 percent annually, which was above the Sub-Saharan African growth rate of 2.3 percent. Even though irrigated land represents a negligible part of the total cultivated area, it contributes 30 percent to the total value of agriculture production. It is also estimated that irrigated agriculture, mainly rice, represents 14 percent of the agricultural GDP.

Niger's current irrigated area could be increased with good economic returns. Simulations suggest that with a threshold internal rate of return (IRR)⁸ of 6 percent, it would be economically viable to develop a further 192,151 hectares of land for irrigation, of which 35 percent could be developed through large-scale projects. If the threshold IRR is raised to 12 percent, the economically viable area for irrigation shrinks to 117,553 hectares for only small scale-projects, as large-scale projects would not have an IRR higher than 12 percent. The investment required to attain this expansion would be \$607 million (table 9). The area with the most irrigation potential is concentrated in the southwest part of the country, in the valley of the Niger River, close to the border with Burkina Faso (figure 10b).

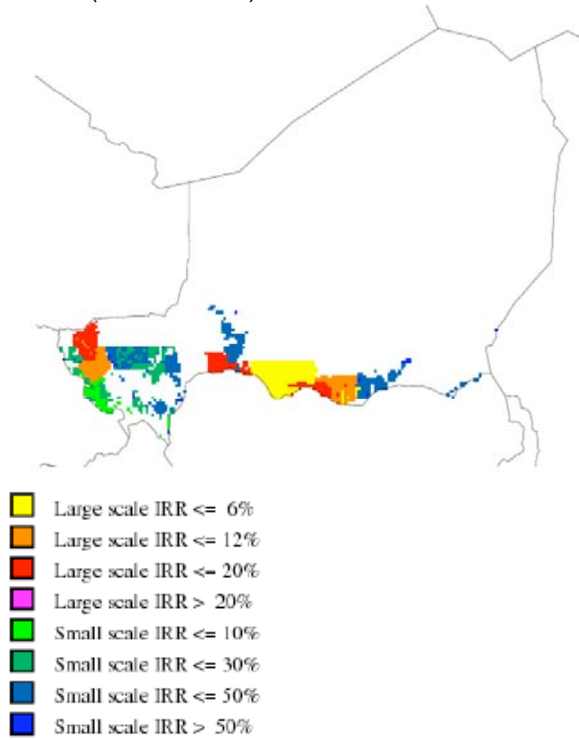
⁸ Internal rates of return (IRRs) for irrigation are calculated based on various values for water cost (for dam-based irrigation), three alternative levels of irrigation investment, and two-time trajectories for investment expenditures. For small-scale irrigation, profitable areas are identified by pixel; for large-scale irrigation, IRRs are calculated for each dam.

Figure 10. Niger's irrigation sector

a. Current irrigation area



b. Potential (baseline scenario)



Source: Map on current area: AICD Interactive Infrastructure Atlas for Niger (www.infrastructureafrica.org). Map on irrigation potential: You 2008.

Note: Baseline scenario was calculated assuming investment cost of \$3,000 per hectare, a canal maintenance and water-delivery cost of 1¢ per cubic meter, on-farm annual operation and maintenance costs of \$30 per hectare, and a discount rate of 12 percent. IRR = internal rate of return.

Table 9. Niger's irrigation potential

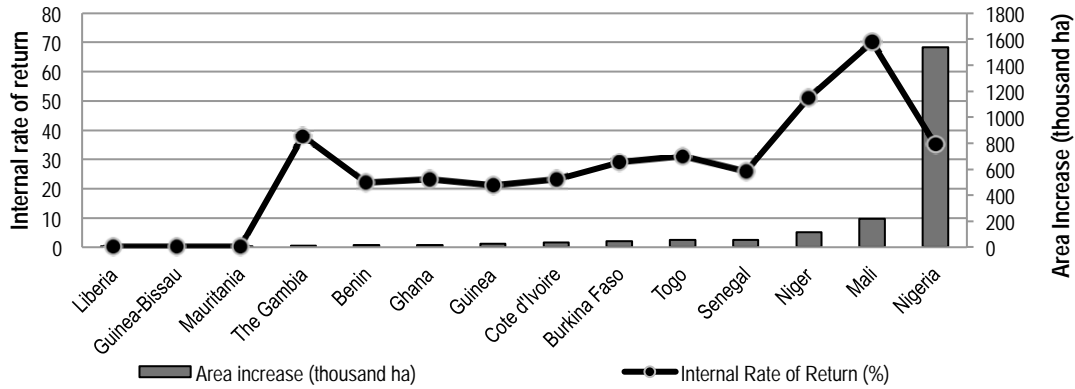
Cut-off (%)	Large scale			Small scale			Total		
	Investment	IRR	Area increase	Investment	IRR	Area increase	Investment	IRR	Area increase
	\$ million	%	hectare	\$ million	%	hectare	\$ million	%	hectare
0	130	9.3	66,569	658	40.0	127,357	788	29.5	193,926
6	130	9.3	66,569	649	45.0	125,582	779	32.6	192,151
12	0	0.0	0	607	51.0	117,553	607	51.0	117,553
24	0	0.0	0	530	65.0	102,660	530	65.0	102,660

Source: Derived from You and others (2009).

Note: Water for irrigation can be collected in two ways: through large, dam-based schemes or through small projects based on the collection of run-off from rainfall. The investment costs of large-scale irrigation development reflect only irrigation-specific infrastructure, such as distribution canals and on-farm system development. The potential for small-scale irrigation is assessed not only on the basis of agro-ecological conditions, but also in terms of market access, since irrigation is typically viable only if the increased yields can be readily marketed. The unit cost for large-scale projects is set at \$3000/ha and for small-scale projects at \$2000/ha. IRR = internal rate of return.

Compared with its regional peers, Niger has among the largest potential area for small-scale irrigation projects and an attractive rate of return (figure 11), using an IRR cutoff of 12 percent.

Figure 11. Irrigation potential, small-scale projects



Source: Derived from You and others (2009).

Note: Based on 12 percent cut-off estimates, at which the estimated area increase for southern African countries not included in the figure is zero. Water for irrigation can be collected in two ways: through large, dam-based schemes or through small projects based on collection of run-off from rainfall. The investment costs of large-scale irrigation development reflect only irrigation-specific infrastructure, such as distribution canals and on-farm system development. The potential for small-scale irrigation is assessed not only on the basis of agro-ecological conditions, but also in terms of market access, since irrigation is typically viable only if the increased yields can be readily marketed.

Water supply and sanitation

Achievements

In a context of high population growth, Niger has made important progress in reducing its reliance on surface water, in particular in urban areas. Reliance on surface water declined from 9.8 percent of the population in 1998 to 1.8 percent in 2006, a level well below the average for LICs and even MICs (table 10). In spite of high population growth (3.4 percent per year between 1998 and 2006), around 0.3 percent of the population has been moving away from surface water, and 1.1 percent of the urban population has been moving to some other form of water supply every year (figure 13).

Niger has managed to move its population up the water supply ladder by means of extending low-cost technologies, such as standposts and wells and boreholes. Access to standposts increased from 12.5 percent in 1998 to 16 percent in 2006 (table 10), which implies that at the national level 2.1 percent of the population was gaining access to this mode of water supply (figure 13). The number of wells and boreholes increased from 73 percent to 76.4 percent of the population between 1998 and 2006. Compared to other LICs, Niger's rate of access to wells and boreholes is twice as high. But only 20 percent of these wells can be considered safe.

Table 10. Benchmarking water and sanitation indicators

	Unit	Low-income countries	Niger		Middle-income countries	
		Mid-2000s	1998	2006	Mid-2000s	
Access to piped water	% pop	10.5	4.4	5.8	52.1	
Access to standposts	% pop	16.2	12.5	16.0	18.9	
Access to wells/boreholes	% pop	38.3	73.0	76.4	6.0	
Access to surface water	% pop	37.4	9.8	1.8	13.0	
Access to flush toilets	% pop	4.9	0.8	1.0	40.8	
Access to improved latrines	% pop	9.9	8.1	12.4	1.4	
Access to traditional latrines	% pop	50.1	8.1	5.1	30.4	
Open defecation	% pop	40.3	82.9	81.5	14.3	
			2001	2005	2007	
Domestic water consumption	liter/capita/day	50.7	37	41	44	154
Revenue collection	% sales	92.7	80	88	90	100.0
Distribution losses	% production	34.3	22	19	17	26.8
Cost recovery [1]	% total costs	56.0	41	57	67	80.6
Operating cost recovery	% operating costs	65	161	113	130	145
Labor costs	connections per employee	159	116	171	182	369
Total hidden costs as % of revenue	%	163	88	75	59	140
			Niger		Scarce water resources	Other developing regions
			2005	2006		
Residential tariff	US cents per cubic meter	34	34	60		
Nonresidential tariff	US cents per cubic meter	76	80	120		3–60

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

Note: Access figures from the Demographic and Health Surveys for 1998 and 2006. [1] Cost recovery is estimated based on the assumption of a capital cost of 40 cents/m³.

— = Not available.

In 1999 the government introduced an ambitious urban water sector reform aimed at improving the operational and financial performance of the sector by reducing operating costs, introducing private sector commercial management, achieving financial autonomy, and expanding access. The new institutional framework involved four main actors: the government, which was responsible for defining sector policy, managing water resources, and developing tariff policy; a multisector regulatory agency (Autorité de Régulation Multi-Sectorielle, ARM), responsible for developing a regulatory framework and monitoring urban water services and contractual arrangements among stakeholders; a public asset-holding company (Société de Patrimoine des Eaux du Niger, SPEN), responsible for investments; and a private operator selected by competitive bidding (Société d'Exploitation des Eaux du Niger, SEEN), in charge of delivering services. In March 2001 SPEN and the government granted SEEN a 10-year performance concession to operate the water supply systems of 51 urban centers—representing 72 percent of the population.

The urban water reform resulted in significant increases in access to piped water and standposts, and improvements in the sector's operational and financial performance and service quality. In 1998 the access to piped water and standposts in urban areas was 27 and 37 percent of the population, respectively. The national water utility (SNE) was overstaffed and its financial situation undermined by inadequate cost-recovery policies and the accumulation of arrears from public customers—by 2000 about \$12 million, equivalent to 125 percent of its revenue. The lack of investment resulted in a substantial backlog, leading to frequent water shortages. In 2006 piped water and standposts were expanded to 35 and 56 percent of the population, respectively. In the 10 years following the concession, systems losses declined progressively from 22 percent in 2001 to 16 percent in 2010, not only below the average of other LICs but even below the international benchmark of 20 percent of a well-performing utility. Collection ratios increased from 80 percent of all bills to 97 percent over those years, about the average collection ratio of other LICs (tables 6 and 7). Connections per employee rose from 116 to 184. Until 2006 regular tariff adjustments were made, helping compensate the increase in the unit total cost of production from 58 cents in 2001 to 82 cents in 2009 (table 11).⁹ The continuity of water supply was augmented from 18 hours to 24 hours between 2001 and 2009.

Table 11. Evolution of operational indicators associated with SPEN, Niger

Year	Water delivered (million m ³ /year)	System losses (%)	Collection ratio (%)	Average total cost (\$/m ³)	Average effective tariff (\$/m ³)	Total hidden costs (\$ million/year)	Total hidden costs (% revenues)
2001	32	22	80	0.58	0.27	8	88
2002	35	17	89	0.57	0.30	9	91
2003	36	17	94	0.80	0.36	14	121
2004	39	17	92	0.80	0.41	14	95
2005	42	19	88	0.82	0.47	14	75
2006	43	17	97	0.82	0.50	12	63
2007	47	17	90	0.82	0.55	13	59
2008	49	15	92	0.82	0.55	13	49
2009	52	16	97	0.82	0.55	13	50

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

Note: SPEN = Société de Patrimoine des Eaux du Niger.

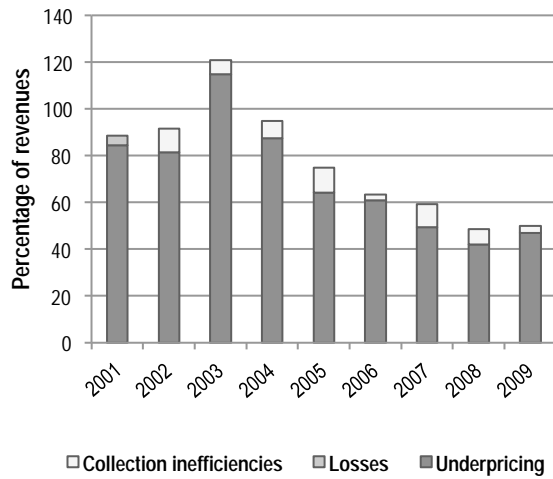
SPEN's improvements in operational and financial performance have led to decreasing hidden costs. Whereas in 2001 hidden costs represented 88 percent of SPEN's revenues, in 2009 they represented around 50 percent of the revenues, a level comparable to other utilities in the region (figure 12b). In 2003 hidden costs reached the highest point in the period 2001–09 due to an important increase in the average total costs compounded by a relatively low average effective tariff (table 11).

⁹ Since January 2006 the published water tariffs have not been adjusted (see effective residential water tariff at 10 m³ and nonresidential at 100 m³ in table 10). But due to changes in the composition of the total billings and total water consumption among residential and nonresidential customers, the average effective tariff per cubic meter indeed experienced an increase from 50 cents in 2006 to 55 cents in 2007 (see table 11).

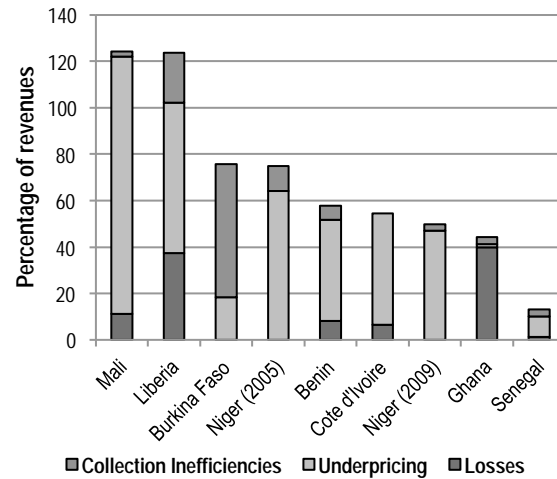
Figure 12. Hidden costs

Percentage of revenue

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



b. Hidden costs of select water utilities in West Africa



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

Challenges

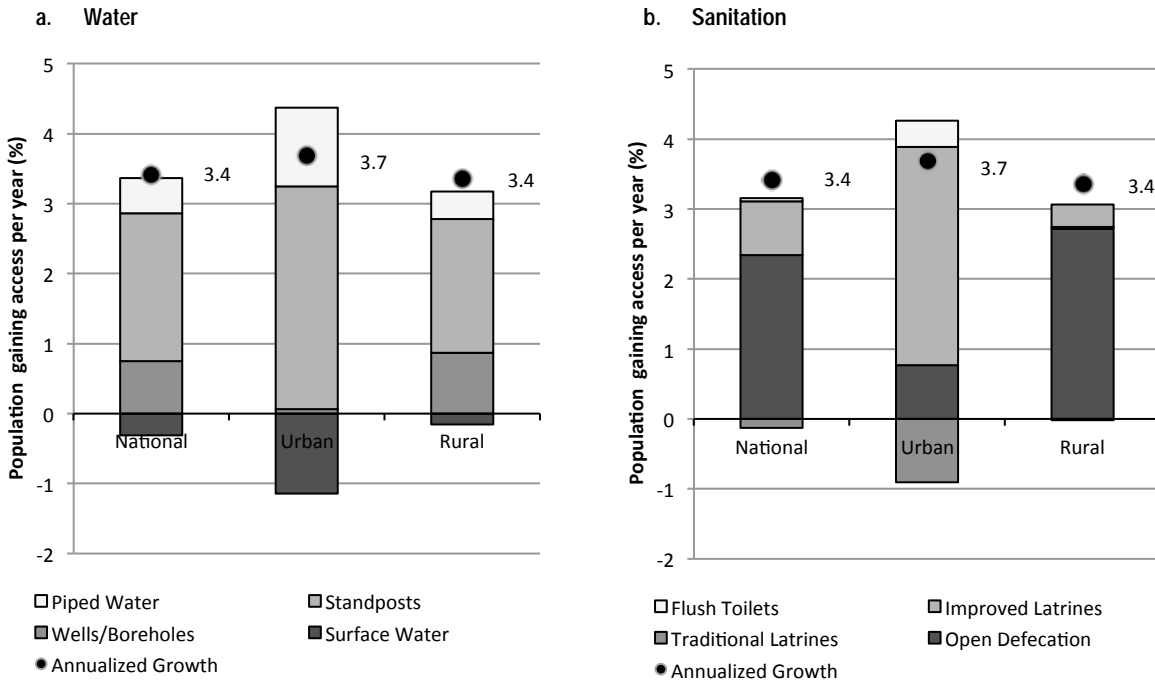
The frequency of open defecation in Niger is probably the worst in Sub-Saharan Africa and has increased over time. As of 2006, 82 percent of the population practiced open defecation in Niger, more than twice as high as the average for LICs (table 10). Furthermore, between 1998 and 2006 around 2.3 percent of the national population annually reverted to open defecation. The situation was even worse in rural areas, where around 2.7 percent of the population went back to open defecation. The slow progress in improving latrines has not been enough to counteract the country's population growth at 3.4 percent per year (figure 13b).

Progress in improving rural water supply is insufficient. While, as of 2006, 90 percent of the water in rural areas was supplied through wells and boreholes, only 22 percent of this was supplied by protected wells or boreholes. Given that around 30 percent of rural water facilities are not operating properly, mainly due to lack of rehabilitation and maintenance, effective access to safe water from wells and boreholes has been further reduced.

The financial equilibrium of the water supply sector is at stake if tariff adjustments do not take effect shortly and government arrears continue to grow. In January 2006 the government froze water tariffs as part of its poverty alleviation policy, and since then tariffs have remained at 34 cents/m³ for residential customers and 80 cents/m³ for non-residential customers (table 10). Even though SPEN has managed to cover its operational costs, the tariffs are not enough to cover its capital costs; as of 2007 revenues were covering only 67 percent of total costs (table 10). Until 2006 public customers were current on their payments, but since then arrears have grown, reaching more than \$2 million as of 2009.

Figure 13. Expansion of standposts and improved latrines in Niger

Population gaining access per year between 1998–2006



Source: WHO Joint Monitoring Program 2010, from the Demographic and Health Surveys for 1998 and 2006.

Power

Achievements

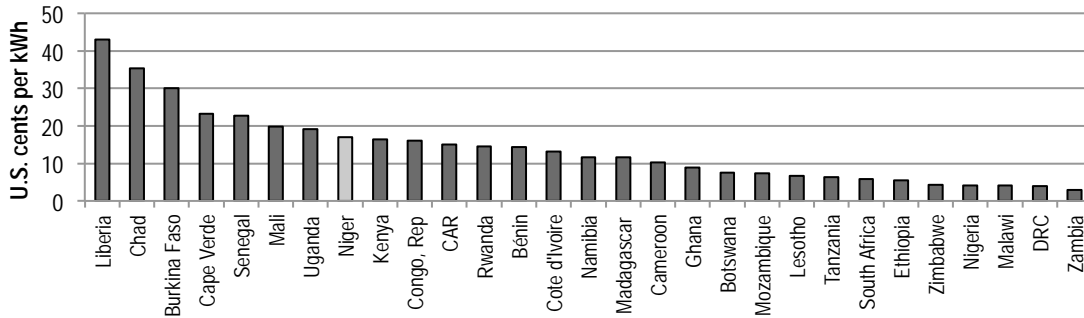
The performance of NIGELEC,¹⁰ Niger's power utility, improved significantly after the introduction of an internal restructuring program in 2006. System losses accounted for 27 percent of the power produced in 2005 and dropped to 17 percent in 2009, below what is observed in power utilities on average in Sub-Saharan African low- and middle-income countries. But system losses are still above the international best practice of 10 percent. At 96 percent of billings, NIGELEC's collection ratio exceeds that of other African MICs and LICs, and collections have increased as the government is paying its bills.

Recovery of costs accompanies NIGELEC's performance improvements. At \$0.17 per kilowatt-hour (kWh), Niger's consumers pay approximately \$0.07 more for power than the average African country that derives its power from thermal-based resources (figure 14). With this level of tariff, NIGELEC's revenues were enough to recover costs of production in 2009. Thus, at 100 percent cost recovery, NIGELEC performs better than utilities in other low- and middle-income countries (table 12).

¹⁰ Société Nigérienne d'Electricité (Niger Electricity Company).

Improvements in NIGELEC's performance resulted in lower hidden costs over time. The burden of hidden costs, as a percentage of revenues, dropped from 21 percent in 2007 to 10 percent in 2009 (figure 15a). Due to the increase in operating expenses, driven largely by the rising prices of oil, in 2008 NIGELEC was unable to recover costs and suffered losses of around 4 percent of its revenues. Relative to hidden costs in power utilities in West Africa, NIGELEC's are modest (figure 15b).

Figure 14. High tariffs in Niger relative to other countries with thermal-based generation



Source: Briceño-Garmendia and Shkaratan (2010); AICD estimates.

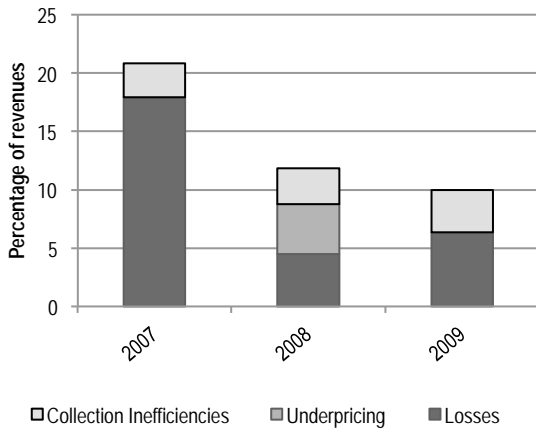
Note: Average effective tariff estimates are based on prices paid by domestic and nondomestic customers, weighted by their contributions to total consumption.

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

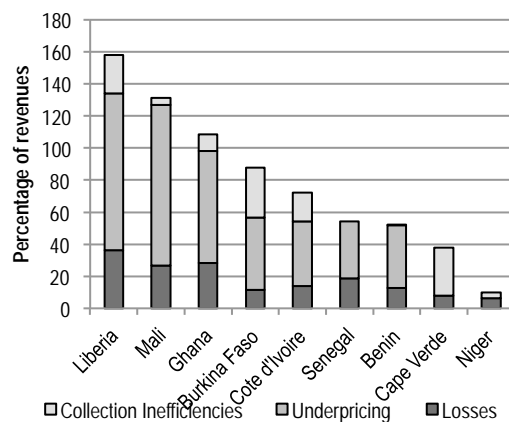
Figure 15 Hidden costs for NIGELEC have decreased over time

Percentage of revenues

a. NIGELEC's hidden costs



b. Hidden costs in West African utilities



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

Table 12. Power indicators, benchmarked against select country groups

		Niger	Low-income nonfragile countries	Middle-income countries
Access (national)	% of population	8	33	50
Access (urban)	% of population	41	86	101
Access (capital city)	% of population	53	81	81
Access (rural)	% of population	0	12	32
Installed generation capacity	MW per million people	105	651	36,971
Installed generation	MW per million people	8	20	799
Generation capacity, operational	MW	92	917	35,917
Firms that find power a constraint for business	% of firms	41	52	31
Firms with own generator	% of firms	20	41	18
Power outages	Days/year	5	10	6
Power outages	% of sales	5.6*	6	2
Collection rate	% of billing	96	92	91
System losses	% generation	17	24	20
Cost recovery	% of total costs	100	89	85
Revenue per unit	US cents per kWh	19	14	13
Total hidden costs	% revenue	10	69	0
US cents		Niger (2006)	Predominantly thermal	Other developing regions
Effective power tariff	Residential at 100 kWh	18.17	10.27	
Effective power tariff	Commercial at 100 kWh	15.75	11.73	5.0–10.0
Effective power tariff	Industrial at 50,000 kWh	18.17	11.39	

Source: Fragile and nonfragile countries' figures as of 2005, calculated using the AICD power database (www.infrastructureafrica.org/aicd/tools/data), which contains household data. For the CAR, national access is for 2008 (World Bank 2010a); power outages are for 2005 (Rosnes and Vennemo 2009); collection ratio is for 2010 (World Bank 2010b); cost-recovery ratio, system losses, and revenue per unit are for 2009 (NIGELEC 2009).

Note: kWh = kilowatt-hour; MW = megawatts.

Challenges

Despite the fact that its cost-recovery rates are high at present, NIGELEC's financial situation is threatened by the potential increases in Nigeria's power costs since Niger relies highly on Nigeria for power. Under an agreement made between Niger and Nigeria dating back to 1977, Nigeria's state electricity company supplies 90 percent of Niger's electricity needs to NIGELEC, with a preferential pricing of \$0.03 per kWh (World Bank 2007b); Nigeria offers Niger a \$0.05 subsidy for every unit of power imported. In 2009 Nigeria subsidized an estimated \$26.5 million (or around 3 percent of its revenues) for power imports. In the long run under a scenario where Nigeria increases the price of power to its recovery levels (\$0.08 per kWh), cost recovery for NIGELEC will be jeopardized as current tariffs would be unable to recover total costs. Hidden costs would then increase to 40 percent of Niger's revenue—four times what Niger encountered in 2009—as NIGELEC would be saddled with an additional \$26.5 million in losses a year due to underpricing.

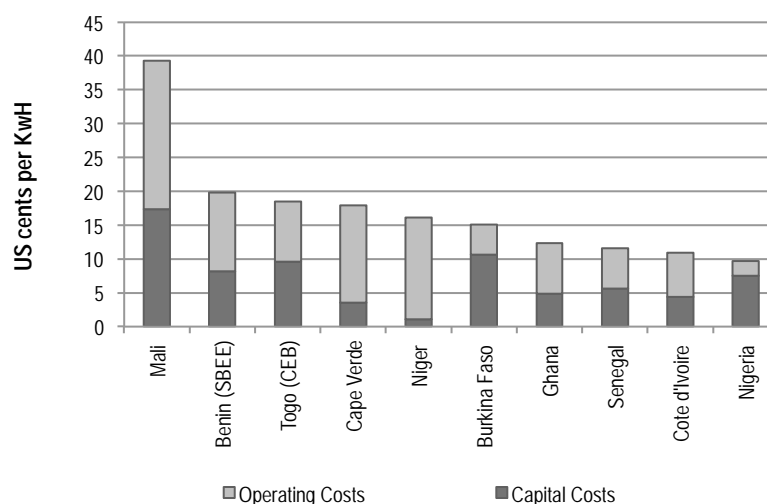
Given the current high costs of domestic thermal production, NIGELEC would not be able to counteract potential increases in Nigeria's power price. NIGELEC's cost of production per kilowatt-hour is among the highest in West Africa (figure 16)—on average, it costs \$0.16 to produce power in Niger, of which only \$0.06 is attributable to generation (NIGELEC 2009). The generation cost is composed

of the cost of power that is imported from Nigeria (around 87 percent of all power produced, at \$0.03 per kWh), power produced using diesel (around 8 percent of all power produced, at an astronomical \$0.30 per kWh), and power supplied domestically from SONICHAR (around 4.3 percent of all power produced, at \$0.12 per kWh). The other non-generation costs, at \$0.10, can be attributed to expenditures related to labor and new investments in transmission, among others.

The high costs of domestic thermal power are related to high diesel prices. As noted, domestically generated power is particularly expensive, at \$0.30 per kWh. Between 2004 and 2008, prices of diesel in Niger were high relative to some of its neighbors, ranging from \$0.94 to \$1.11 per liter (table 13). The lack of oil resources within Niger forced reliance on imported fuel that was transported to Niger via road. Transporting fuel to Niger is an expensive proposition, as is moving along West African corridors in general (costs are more than \$0.11 per tonne-km, among the highest in the world).

Niger's high reliance on Nigerian imports is due to its limited power infrastructure, in particular its generation capacity. Niger's installed capacity of 105 MW, primarily thermal, is only one-tenth of the capacity of comparable LICs. The installed capacity per million people is 8 MW, far below the 20 MW that is the average for LICs (table 12) and one of the smallest in the continent. Niger could look into developing its own domestic power sources, particularly hydropower. The Kandadji Dam—Niger's first hydroelectric project—about to

Figure 16. Mid-range cost of power production in Niger



Source: Briceño-Garmendia and Shkaratan (2010); AICD estimates.

Table 13. High fuel prices escalate domestic power production costs

Country	Power costs of production (\$/ kWh)	Diesel price (\$/liter)		
		2004	2006	2008
Burkina Faso	0.39	94	112	133
Mali	0.39	90	104	110
Niger	0.16	94	111	97
Nigeria	0.15	45	66	113
Ghana	0.12	43	84	90
Côte d'Ivoire	0.11	95	106	120

Source: GTZ 2009.
Note: kWh = kilowatt-hour.

be constructed—will boost power domestically and has the potential of supplying additional power to Niger's neighbors in West Africa.

Scarce power infrastructure translates into regular power shortages, constraining the ability of firms to do business. In 2009 Niger suffered 21 outages a month compared to 11 outages in an average Sub-Saharan African country, although the duration of power outages in Niger was lower than in other parts of the continent (2 hours each versus 6 hours in Sub-Saharan Africa). Over 41 percent of Niger's firms reported that power shortage was a large burden on business activity. Hotels were even more affected, with 70 percent of them reporting that power was a binding constraint (World Bank 2006; World Bank 2009e). Firms in Niger obtain 20 percent of their power from their own generators, compared to 25 percent in Sub-Saharan Africa. Around 6 percent of the firms' annual turnover was lost due to electricity shortages, no better than other LICs in Africa (World Bank 2006). It takes around 4 months¹¹ on average for firms in Niger to obtain a permanent electricity connection, and costs to obtain a power connection are on average 43 times the income per capita (World Bank 2010a).

In particular, the future growth of mining is exposed to the scarcity of power infrastructure. The mining industry is responsible for over half of Niger's export earnings, and its future is critically linked to the availability of adequate power supply for its activities. In recent years there has been rapid growth in the demand for uranium in the world market, in particular by China, to support its burgeoning electricity generation (EIU 2010). Since 1981 SONICHAR¹² has mined coal for the production and supply of electricity to the towns of Arlit and Akouta, and the SOMAIR and COMINAK uranium mines. At the end of 2006, the estimated remaining reserves of SONICHAR (4,933,043 tonnes) were not enough for power generation to support the mining industry, which was growing steadily in the region (World Bank 2010b). Other coal reserves that could serve as sources of electricity have recently been found. The growth of the mining industry depends on expanded generation of power to support extractive industries activity.

As power infrastructure is scarce, access rates to electricity are low in Niger, particularly in rural areas. In 2005 national access to electricity was only 8 percent of the population, one-fourth the level in comparable peer countries. Around 41 percent of the urban population is electrified in Niger, and 86 percent in LICs. Practically no one in Niger's rural areas is electrified, while 12 percent of rural dwellers are in peer countries (table 12). Since no significant new investments were made in the sector during the period 2000–05, NIGELEC's investment needs remain substantial (World Bank 2007b).

Low access to electricity negatively impacts Niger's environmental sustainability. Increasing population growth, at 3.4 percent a year, compounded with low levels of access to power has furthered reliance on traditional sources of energy for domestic consumption. Reliance on traditional fuels has placed undue stress on fuel wood and, consequently, forestry resources, leading to overexploitation of the natural forest cover. Only 5,000 hectares are replanted versus 100,000 hectares of forest cleared every year (African Development Bank 2005). Households' combustion of biomass for domestic uses also increases carbon emissions.

¹¹ Getting Electricity Database 2010. The number of days to obtain a permanent electricity connection captures the median duration that the electricity utility and experts indicate is necessary, in practice (rather than required by law), to complete a procedure.

¹² Société Nigérienne de Charbon.

Information and communication technologies

Achievements

Niger implemented a number of reforms to boost competition in the ICT sector. The liberalization of the mobile market allowed the licensing of a second operator in 2001, a third in 2004, and a fourth in 2008. The landline incumbent, SONITEL,¹³ was privatized in 2001. The government also awarded a global service license to France Telecom in 2007, allowing it to provide any ICT service (for example, fixed line, mobile, and Internet). ARM, one of the few multisector regulatory agencies in Africa,¹⁴ was established to supervise the telecommunications sector.

The country has benefited from a huge expansion in the coverage of and access to mobile communications. Whereas the global system for mobile communications (GSM) signal was almost nonexistent in 2000, around 50 percent of the population was covered by the GSM signal in 2008 (but this is still below the average, 63 percent, for comparable peer countries). Mobile penetration increased from less than 1 per 100 inhabitants in 2000 to 12.8 per 100 in 2008—half the average for LICs and one-tenth the average for MICs. Growing mobile penetration is starting to have an impact on the economic and social development of the country and helping to reduce poverty (Aker 2008). One study on the Nigerien grain sector found that the introduction of mobile phones has reduced price asymmetries, lowered search costs, enhanced grain transport efficiency, and contributed to poverty reduction.

Table 14. Benchmarking ICT indicators

Indicator	Unit	Low-income countries		Niger		Middle-income countries
		2008	2000	2005	2008	2008
GSM coverage	% of population under signal	63	—*	22	46	96
Mobile phone	Subscribers/100 people	24	0.02*	2.4	12.8	95
International bandwidth	Bits/capita	24.8	0.04	2.4	7	209.3
Internet	Users/100 people	3.5	0.04	0.3	0.7	7.0
Landline	Subscribers/100 people	0.8	0.2	0.2	0.4	9.2
Price of mobile basket	\$ per month	11.0	17.0	16.8	12.8	9.2
Price of fixed-line basket	\$ per month	10.4	10.8	12.4	11.8	11.4
Price of fixed broadband	\$ per month	287	—	131	52	57
Price of a call to [[the United States?]]	\$ per minute	0.7	0.6	0.7	0.5	0.6
Price of an inter-Africa call	\$ per minute	0.9	—	0.4	0.7	1.1

Source: Adapted from ARM, Zain, and Orange reports, and World Bank ICT At-a-Glance.

Note: Converted to \$ using annual average exchange rates (2010 figures using 2009 exchange rate). Penetration figures derived from population data of the National Statistical Institute. GSM = global system for mobile communications.

* The first digital GSM network launched in 2001. Prior to that, there was an analog mobile network.

— = Not available.

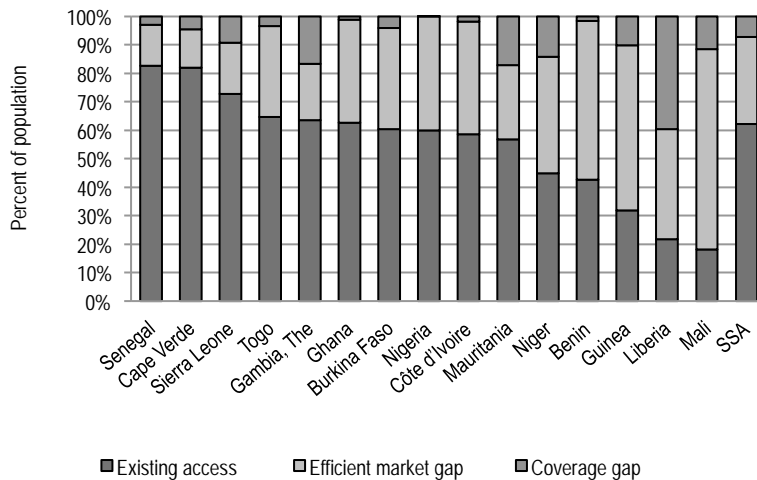
¹³ Société Nigérienne des Télécommunications. SONITEL's privatization took place in December 2001, with 51 percent of shares being awarded to a Libyan-Chinese consortium; the government of Niger maintained 49 percent ownership.

¹⁴ ARM is also responsible for transport, energy, and water supply.

Challenges

Niger still faces tremendous challenges in extending access to ICT. Barriers include low incomes, relatively high prices, lack of electricity,¹⁵ and a large, landlocked landmass. Niger, however, has a good platform to grow the sector with a partly private incumbent operator, a second national operator, and a competitive mobile market.

Figure 17. The efficient market gap in Niger—highest in the region



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

Note: Existing access represents the percentage of the population covered by voice infrastructure as of the third quarter of 2006.

Efficient market gap represents the percentage of the population for whom voice telecommunications services are commercially viable given efficient and competitive markets.

Coverage gap represents the coverage gap—the percentage of the population for whom services are not viable without a subsidy.

the universal service fund will efficiently fill coverage gaps in rural areas that are not likely to be met by commercial services.

In the regional context, Niger has the lowest mobile penetration among the ECOWAS countries, even though Guinea-Bissau, Liberia, and Sierra Leone all have lower per capita incomes (table 15).

Internet penetration is low, at just over 1 percent of the population. Nevertheless there are signs that the market is beginning to develop, including recent sharp increases in international connectivity (figure 18a) and wireless broadband service offerings, and a reduction in retail Internet prices. Meanwhile, Niger's Internet penetration and connectivity still lags most of its ECOWAS peers (figure 18b). The price of a fixed ADSL¹⁷ subscription has fallen by more than one half (in local currency) since 2008. The incumbent offers a CDMA¹⁸-based wireless service with an option of unlimited monthly Internet access at

With a per capita income of \$300 in 2008, Niger is the sixth-poorest country in the world.¹⁶ Although the mobile market is competitive, prices have not dropped as sharply as expected, and around half of rural communities are still without access to telecommunications services (Adamou 2009). Prices for fixed, mobile, and Internet services are all above the regional average (table 1). Estimations suggest that to achieve universal mobile coverage, around 14 percent of the population would need to be subsidized (figure 17).

Improving the administration of

¹⁵ Only around 10 percent of households with electricity.

¹⁶ Based on gross national income (GNI) per capita using the Atlas method. Data from the World Bank's World Development Indicators (<http://data.worldbank.org/indicator/NY.GNP.PCAP.CD>).

¹⁷ Asymmetric digital subscriber line.

¹⁸ Code division multiple access.

around \$30 per month. France Telecom also offers WiMAX¹⁹ Internet access through its Orange subsidiary.

Table 15. Mobile penetration in West African countries

Subscribers per 100 people

Country	2005	2006	2007	2008	2009	Annual average growth (%)
Benin	8.4	12.8	23.1	44.7	46.7	54
Burkina Faso	5.3	6.9	11.7	17.9	25.3	48
Côte d'Ivoire	12.3	20.2	36.6	45.4	54.4	45
Cape Verde	17.2	22.5	31.0	55.6	68.1	41
Ghana	11.5	22.6	32.4	51.4	63.0	53
Gambia, The	15.4	25.9	33.4	51.3	59.6	40
Guinea-Bissau	6.3	9.0	19.2	23.9	29.5	47
Liberia	3.2	11.9	15.0	19.0	26.3	70
Mali	7.6	12.6	20.5	27.0	32.3	43
Mauritania	22.9	34.8	48.3	62.7	75.0	35
Niger	2.4	4.1	6.7	11.6	18.4	67
Nigeria	12.7	23.1	27.8	42.6	48.1	40
Senegal	16.3	27.3	36.8	43.1	53.8	35
Sierra Leone	4.6	5.0	13.2	16.2	20.0	44
Togo	8.6	13.7	22.4	27.7		48
Simple average	10.3	16.8	25.2	36.0	44.3	44

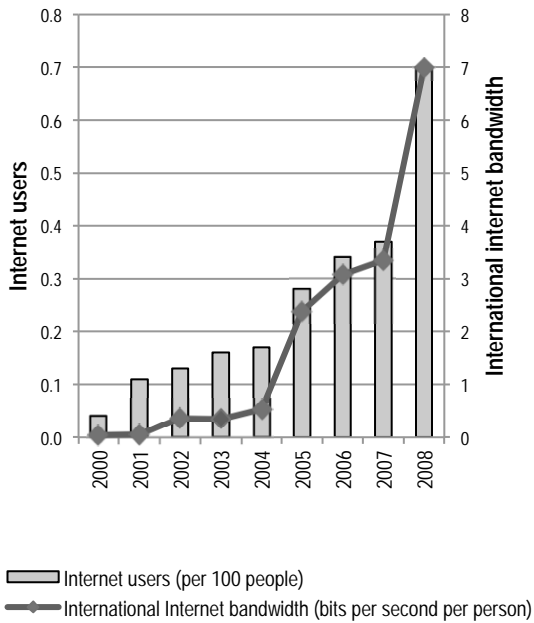
Source: AICD.

Providing a high-speed fiber-optic backbone for the country remains a challenge. Domestic backbone connectivity in the western part of the country is partly served by fiber-optic cable, but most of Niger is linked by microwave or domestic satellite connections. Despite its landlocked situation, Niger has access to an international submarine cable via Benin and Burkina Faso. Currently connections are to the South Atlantic 3 (SAT-3) cable, but this will expand as additional cables are laid along the west coast of Africa over the coming years. One potential bottleneck is of the incumbent SONITEL controlling the fiber backbone. It is important to achieve open access by either ensuring that wholesale access pricing is competitive or by encouraging other operators to construct their own fiber networks. The regulator needs to ensure that wholesale access to fiber-optic connectivity is priced competitively.

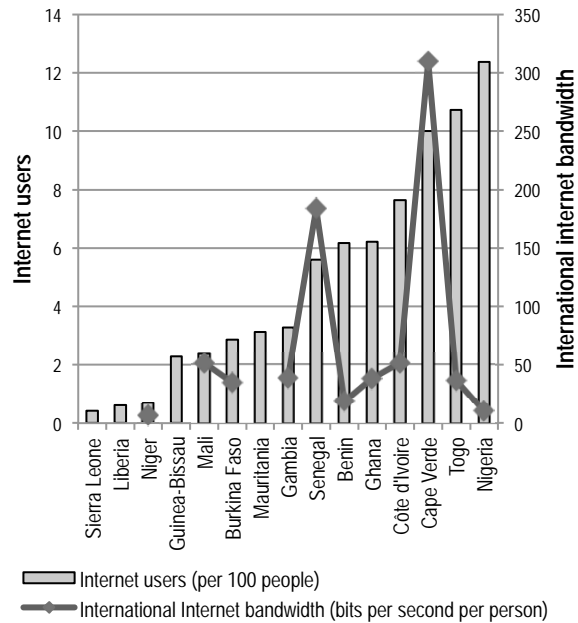
¹⁹ Worldwide interoperability for microwave access.

Figure 18. Niger's Internet market compares poorly with other ECOWAS countries

a. Internet service trends, Niger



b. Internet service, ECOWAS, 2008



Source: World Bank, including AICD analysis.
 Note: ECOWAS = Economic Community of West African States.

Financing Niger's infrastructure

To meet its most pressing infrastructure needs and catch up with developing countries in other parts of the world, Niger needs to expand its infrastructure assets in key areas (table 16). The targets outlined in table 16 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 that can be modified or delayed as needed to achieve financial balance.

Table 16. Illustrative investment targets for infrastructure in Niger

	Economic target	Social target
ICT	Install fiber-optic links to neighboring capitals and submarine cable.	Provide universal access to GSM signal and public broadband facilities.
Irrigation	Develop additional 117,553 hectares of economically viable small-scale irrigation.	n.a.
Power	Develop 206 MW interconnectors (no-trade scenario).	Increase electrification to 20 percent (100 percent urban and 1 percent rural).
Transport	Achieve regional (national) connectivity with good-quality 2-lane (1-lane) paved road.	Provide rural road access to 37 percent of the highest-value agricultural land, and urban road access within 500 meters.
WSS	n.a.	Achieve Millennium Development Goals (MDGs), 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 Niger would cost \$747 million per year over a decade. Capital expenditure would account for 71 percent of this requirement. Water supply and sanitation is the sector with the highest spending needs and will require an estimated \$266 million per year. Power is the area with the second-highest spending needs: about \$184 million will be needed each year to meet the Millennium Development Goals (MDGs). Transport will require around \$139 million per year. Last but not the least, \$92 million and \$66 million will be needed annually to meet demand and quality standards in the ICT and irrigation sectors, respectively (table 17).

Table 17. Indicative infrastructure spending needs in Niger, 2006–15

\$ million per year			
Sector	Capital expenditure	Operations and maintenance	Total needs
ICT	53	40	92
Irrigation	64	2	66
Power (nontrade)	126	58	184
Transport	74	66	139
WSS	213	52	266
Total	529	218	747

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

Derived from models that are available online at www.infrastructureafrica.org/aicd/tools/models.

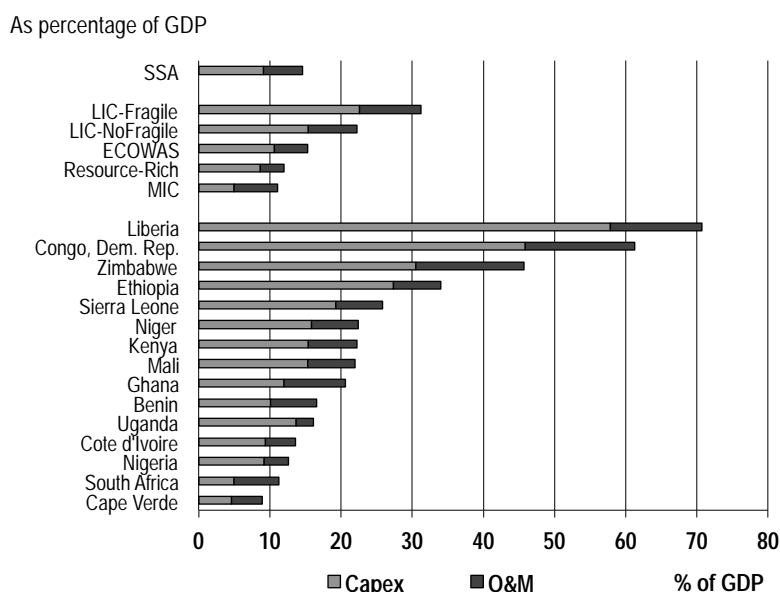
Note: WSS = water supply and sanitation; ICT = information and communication technology

Niger's infrastructure spending needs are in the middle of the distribution of its African peers. Niger's burden of needs, at 22.4 percent of GDP, is lower than that of Sierra Leone, Ethiopia, Zimbabwe, Congo, and Liberia (figure 19). Investment would absorb around 16 percent of its GDP, similar to what China invested in its infrastructure during the mid-2000s.

Niger already spends a sizable amount (\$225 million per year) to meet its infrastructure needs (table 18). About 77 percent of the total is allocated to capital expenditure and 23 percent to operating expenditures. The largest share of infrastructure spending in Niger goes to water and sanitation (30 percent), followed by the transport (28 percent), power (25 percent), ICT (14 percent), and irrigation (5 percent) sectors.

Niger's existing spending amounts to around 6.7 percent of its GDP (figure 20). This is less than the average for nonfragile, low-income comparator states. Relative to this peer group of low-income, nonfragile states, Niger spends less on power and ICT.

Figure 19. Niger's infrastructure spending needs in the regional context



Source: Foster and Briceño-Garmendia 2009.

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

Table 18. Financial flows to Niger's infrastructure

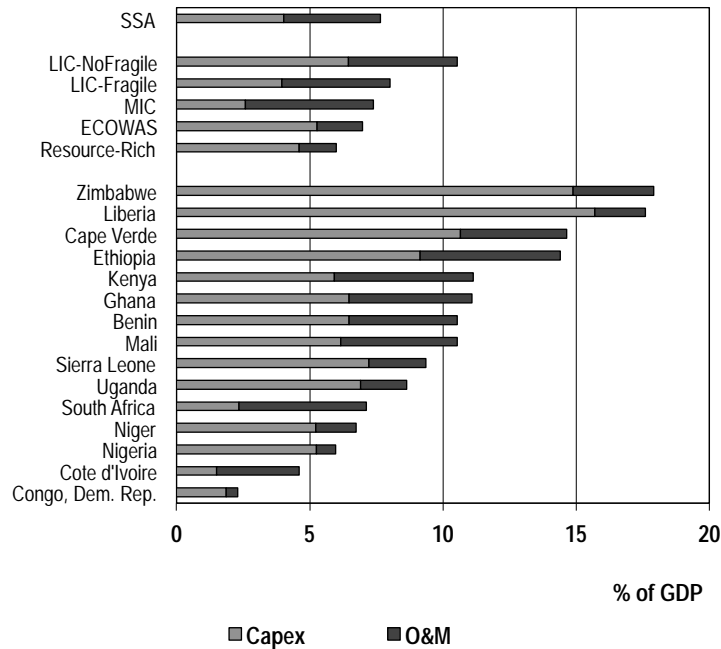
	\$ millions per year						Total spending
	O&M		Capital expenditure				
	Public sector	Public sector	ODA	Non-OECD financiers	PPI	Total CAPEX	
ICT	0	0	0	3	27	31	31
Irrigation	2	8	0	0	0	8	10
Power	30	11	0	14	0	25	56
Transport	8	16	30	9	0	54	62
WSS	11	28	23	1	4	56	66
Total	51	63	53	27	31	174	225

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

Note: O&M = operations and maintenance; ODA = official development assistance; PPI = private participation in infrastructure; CAPEX = capital expenditure; OECD = Organisation for Economic Co-operation and Development; WSS = water supply and sanitation; ICT = information and communication technology.

Figure 20. Niger's existing infrastructure spending is relatively low

As percentage of GDP



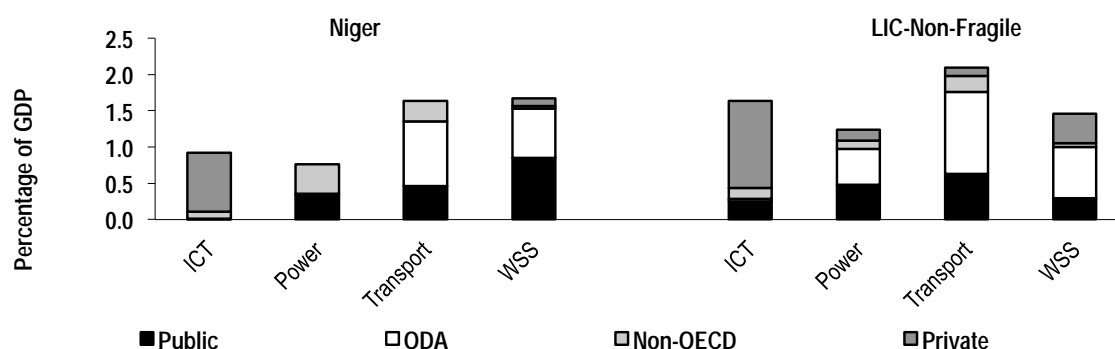
Source: Derived from Foster and Briceño-Garmendia (2009).

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

Whereas operating expenditures are entirely covered from budgetary resources and payments by infrastructure users, capital expenditures are financed by diverse sources (figure 18). About 36 percent of capital expenditure funding comes from the federal and state governments, as well as state-owned enterprises (SOEs). Niger relies heavily on official development assistance (ODA), which accounts for another 30 percent of total capital spending. Private financing plays a substantial and important role in financing capital infrastructure investments in Niger, accounting for about 18 percent of total capital spending. Non-OECD financiers account for around 16 percent of capital spending. ODA in Niger benefits mainly the transport and water sectors, but not the power sector (figure 21).

Figure 21. Patterns 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. Non-OECD financiers include China, India, and Arab countries. 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 country.

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

Around \$62 million of additional resources could be recovered each year by improving Niger's utilities' efficiency and raising rates of budget execution (table 19).

The largest potential source of efficiency gains for the roads and water sectors would be tapped by improving the cost-recovery rates of road fuel levies and water tariffs (\$32 million). Ensuring that all bills are duly collected for the services rendered by power and water utilities, as well as by the road agency, could bring additional \$12 million annually. Optimization of the staffing levels of power and water utilities could save \$8 million per year. Around \$6 million every year is wasted due to high distributional losses of power, which could be saved. More efficient execution of the capital budget could save another \$4 million for transport and irrigation needs. Looking across sectors, roads can save the most—up to \$28 million per year—by tackling inefficiencies in the sector. Potential savings in the water and power sectors are also significant—\$17 and \$16 million, respectively.

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

\$ million						
	ICT	Irrigation	Power	Transport	WSS	Total
Underpricing	n.a.	—	0	20	12	32
Overstaffing	—	n.a.	6	n.a.	1	8
Losses	n.a.	n.a.	6	n.a.	0	6
Undercollection	n.a.	—	3	6	3	12
Low budget execution	0	1	0	2	0	4
Total	0	1	16	28	17	62

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

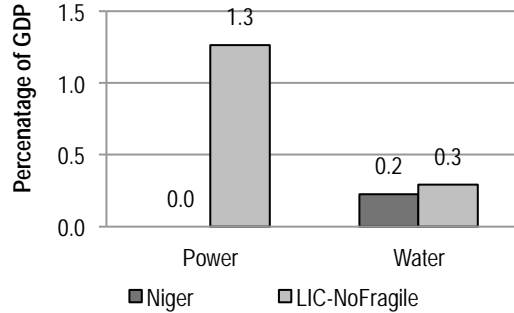
Note: WSS = water supply and sanitation; ICT = information and communication technology.

— = Not available; n.a. = Not applicable.

In the water sector, the average tariff charged by SPEN, Niger's water utility, stood at \$0.55 per m³ as of 2009, versus the estimated \$0.82 per m³ average cost-recovery rate. The consequent macroeconomic burden of undercharging for water services, at 0.23 percent of GDP, is slightly lower than in other nonfragile LICs. As the tariffs currently charged by NIGELEC are enough to cover production costs, which are highly subsidized by Nigeria, at present there does not appear to be a cost-recovery problem in the Nigerien power sector (figure 22).

Figure 22. Underpricing of water in Niger is comparatively less burdensome

Financial burden of underpricing, as percentage of GDP

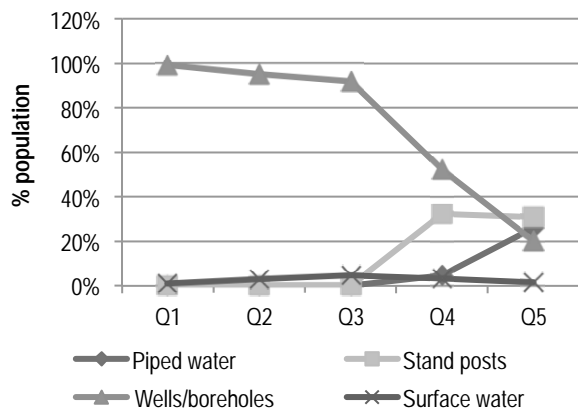


Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).
 Note: GDP = gross domestic product; LIC = low-income country.

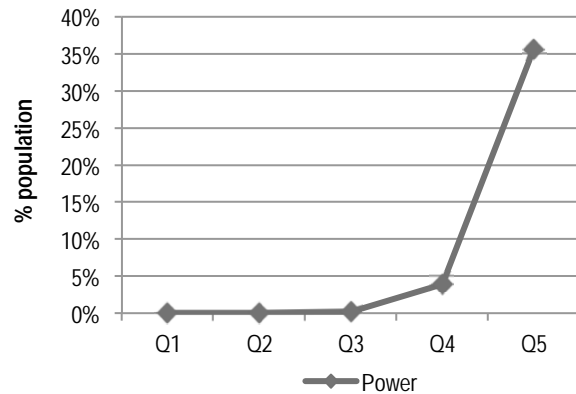
Because of inequitable access to power and water services in Niger, subsidized tariffs are highly regressive. Close to 100 percent of those that have electricity or piped water connections belong to the top 20 percent of the expenditure distribution; such connections are nonexistent for poorer households (figure 23). Only the richest quintile has access to piped water; most of the poorest quintiles still rely on wells and boreholes for water supply.

Figure 23. Consumption of infrastructure services in Niger 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 2009.

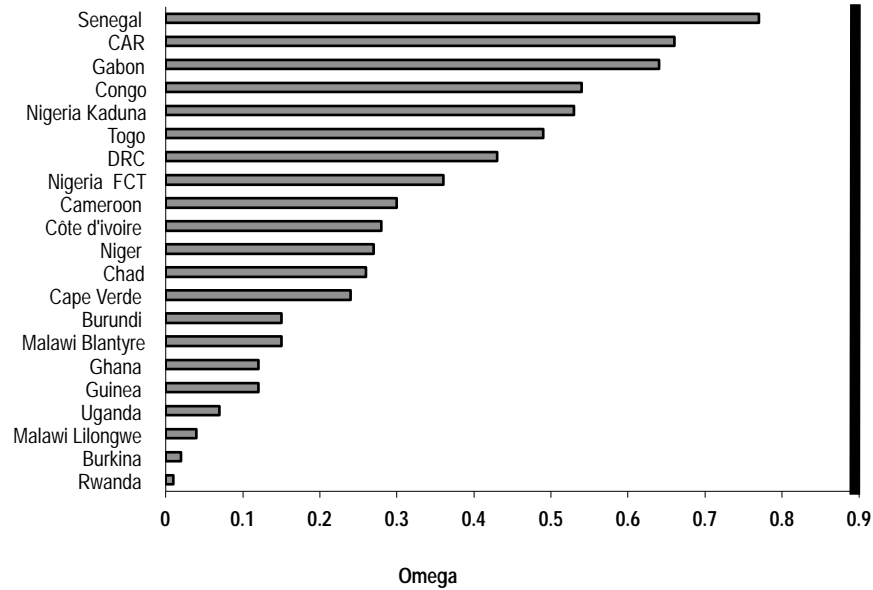
Note: Q1—first budget quintile, Q2—second budget quintile, and so on.

The inequitable distribution of water supply and electricity connections virtually guarantees that any subsidy to these services will be extremely regressive (figure 24). With a measure of distributional incidence of 0.27, Niger has one of the most regressive systems in Sub-Saharan Africa.

How expensive would utility bills become if cost-reflective tariffs were applied? With a cost-recovery tariff of \$0.16 per kWh and a monthly subsistence consumption of 50 kWh for power and 10 m³ per

month for water, the associated utility bill would come to \$8 and \$8.2 per month, respectively, or \$16.2 for both services. Based on the distribution of household budgets in Niger, monthly utility bills for power and water at these levels would be affordable for less than 20 percent of the population (figure 25). A more limited level of subsistence consumption, at 25 kWh per month for power and 4 m³ per month for water—which is capable of meeting the most basic needs—would cost \$4.0 and \$3.3 per month, respectively, and would be affordable for half of the population.

Figure 24. Water subsidies that reach the poor

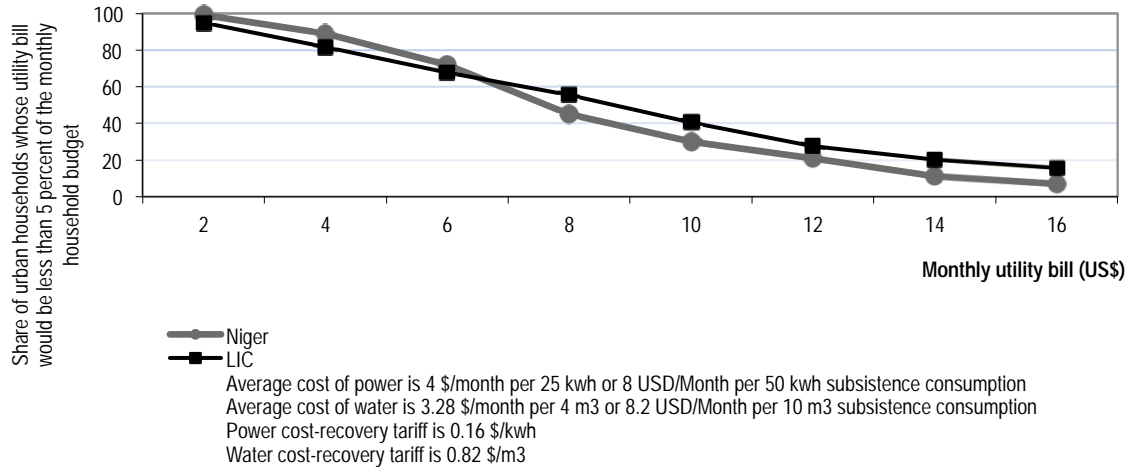


Source: Banerjee and others 2008a.

Note: Omega is a measure of distributional incidence, or 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 1 denote a regressive subsidy and values above 1 denote a progressive subsidy. CAR = Central African Republic; DRC = Democratic Republic of Congo

Operational inefficiencies of the power and water utilities cost Niger \$20 million a year, equivalent to 0.64 percent of GDP. The annual value of collection inefficiencies and losses in the power sector (at \$16 million) is substantially higher than for the water sector (at \$4 million). The burden of utility inefficiencies in Niger is considerably lower than for the benchmark countries in both the power and water sectors (figure 26).

Figure 25. Affordability in Niger in comparison to other low-income countries



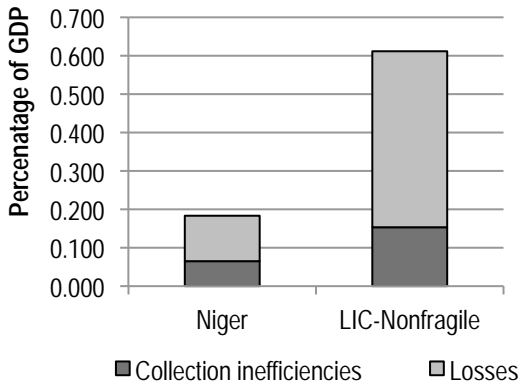
Source: Banerjee and others 2009.

Note: LIC = low-income country; kWh = kilowatt-hour.

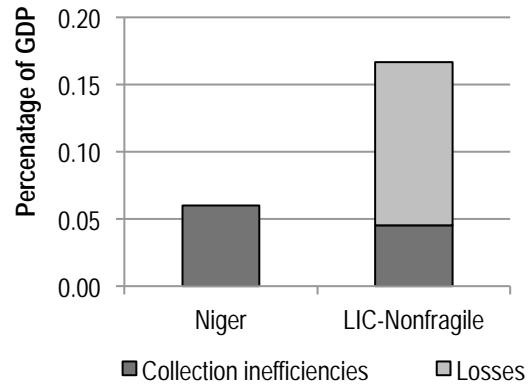
Figure 26. Niger's power and water utilities burden of inefficiency

Uncollected bills and unaccounted losses as percentage of GDP

a. Power sector



b. Water sector



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

Annual funding gap

Niger's infrastructure funding gap amounts to \$460 million per year, or about 14 percent of its GDP, once efficiencies are captured. This overall gap is predominantly in water and power, but also in the ICT, irrigation, and transport sectors (table 20).

Table 20. Funding gaps by sector

\$ millions

	ICT	Irrigation	Power	Transport	WSS	Total
Spending needs	(92)	(66)	(184)	(139)	(266)	(747)
Existing spending	31	10	56	62	66	225
Efficiency gains	0	1	16	28	17	62
Funding gap	(62)	(54)	(112)	(50)	(183)	(460)

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. Total assumes complete fungibility across sectors.

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

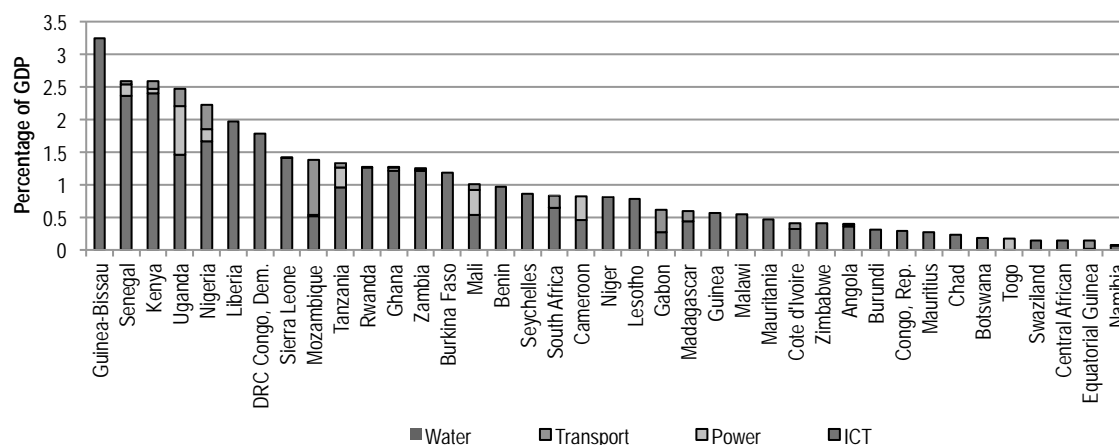
What else can be done?

The funding gap can be addressed by raising additional finance, adopting lower-cost technologies, or extending the time horizon.

In the case of Niger, there may be realistic prospects for *increasing the flow of resources* from alternative sources, such as private players. When compared to other African peers, Niger has failed to attract a significant amount of private finance for infrastructure (figure 27). Over the early 2000s, Niger captured private investment commitments worth only 0.8 percent of its GDP, predominantly in the ICT sector. Countries such as the Democratic Republic of Congo, Liberia, Nigeria, Uganda, Kenya, and Senegal have all captured between 1.8 and 2.5 percent of their GDP. For instance, as the ICT market is still growing, there is plenty of room for private sector companies to invest in Niger. On the other hand, attracting private sector investment into Niger’s infrastructure sectors might be constrained by low purchasing power.

Figure 27. Niger has captured relatively low private sector participation

Average per year between 2002 and 2007



Source: AICD calculations.

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

Adopting lower-cost technologies could substantially reduce the cost of meeting the posited infrastructure targets, and reduce the funding gap. If Niger could strategically expand its capacity by installing hydropower plants, this would reduce the resource deficit of the power sector, lowering power needs from \$184 million to \$76 million per year. As discussed in the power section, Niger could potentially reduce its dependence on Nigeria's power imports by means of expanding its own hydroelectric capacity in the Kandadji, Dyondyonga, and Gambou I hydroplants. Meeting the MDGs for water supply and sanitation with lower-cost technologies—such as standposts, boreholes, and improved latrines—could reduce the associated price tag from \$266 million to \$203 million each year. Similarly, meeting transport connectivity standards using lower-cost road-surfacing technologies—such as single-surface treatments—could reduce the associated price tag from \$139 million to \$91 million. The overall savings from these measures would amount to \$219 million dollars, which would reduce the existing total funding gap by almost a half, underscoring the importance of technology choices (table 21).

Finally, if all else fails, it may be necessary to *extend the time horizon* for meeting the infrastructure targets beyond the illustrative 10-year period considered here. Simulations suggest that even if Niger is unable to raise additional finance, if at least inefficiencies can be addressed, the identified infrastructure targets could be achieved within a 27-year horizon. But without stemming inefficiencies, the existing resource envelope would not suffice to meet infrastructure targets in the medium term.

Table 21. Savings from innovation

\$ millions

	Before innovation	After innovation	Savings	Savings as % of sector funding gap	Savings as % of total funding gap
Power expansion of generation capacity	184	76	108	96	23
WSS low-cost technology	266	203	63	34	14
Roads low-surface treatment	139	91	49	98	11
Total	589	370	219	48	48

Source: Author's own calculations.

Note: WSS = water supply and sanitation.

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

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