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The Central African Republic's Infrastructure

A Continental Perspective

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Abstract

Between 2000 and 2005, infrastructure contributed less than 1 percentage point to the Central African Republic's annual per capita GDP growth, despite substantial spending in the road sector. Raising the country's infrastructure endowment to that of the region's middle-income countries could boost annual growth by about 3.5 percentage points.

The CAR has made significant progress in the transport, water, power, and information and communications technology (ICT) sectors. But the high cost of fuel, which raises transportation and energy costs, has been a vexing issue across all infrastructure sectors.

The CAR's most pressing infrastructural challenge lies in the transport sector, which relies heavily on neighboring countries and could benefit from improved road conditions and enhanced performance at the port of Douala in Cameroon. In the power sector, the country suffers from a deteriorating infrastructure stock that it can no longer afford to maintain, and an inefficient and unreliable power supply. Additional challenges include a need for improved infrastructure in the water and sanitation and ICT sectors.

Addressing the CAR's infrastructure challenges will require sustained expenditure of $346 million per year over the next decade. The nation already spends around $134 million per year on infrastructure, with $37 million a year lost to inefficiencies of various kinds. If those inefficiencies were fully eliminated, the country's annual infrastructure funding gap would be $183 million per year.

Improvements in funding, coupled with the prospect of an economic rebound and prudent policies, could lift the country from its fragile state back to and beyond the prosperity standards it once enjoyed.

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Produced by the Research Support Team

The Central African Republic's Infrastructure: A Continental Perspective

Carolina Domínguez-Torres and Vivien Foster

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Synopsis

Between 2000 and 2005 infrastructure made a modest net contribution of less than 1 percentage point to the improved per capita growth performance of the Central African Republic, despite high expenses in the road sector. Raising the country's infrastructure endowment to that of the region's middle-income countries could boost annual growth by about 3.5 percentage points.

The CAR has made significant progress in some areas of its infrastructure. The country's road network is in relatively good or fair condition and is adequate for traffic levels. Air transport connectivity has improved. Also, important reforms providing for the liberalization of the water, power, and information and communications technology (ICT) sectors have boosted performance. In particular, increased competition in the ICT market has contributed to the rapid expansion of mobile and Internet services.

Unfortunately, there is one vexing issue across all these sectors: the high cost of fuel. Among Central African countries, diesel prices are the highest in the CAR. This is due to the high cost—in both money and time—incurred by importing oil from Cameroon (via the Doula-Bangui corridor) and the Democratic Republic of Congo (via the Oubangui River). Higher oil prices raise transportation costs and impact the cost of thermal power production. Scarcity of fuel is also responsible for constant power outages as thermal production is curtailed, which in turn affects water treatment.

Looking ahead, the country faces a number of important infrastructure challenges. Probably the CAR's most pressing challenge lies in the transport sector, which depends heavily on the neighboring countries. To increase the efficiency of moving goods from and to the CAR, the overall condition of the road corridors needs to be improved and the performance of the Port of Doula enhanced. The CAR, in conjunction with its neighbors, needs to invest in river transportation. Reducing transportation costs would likely impact the price of diesel, with positive effects on the power and water and sanitation sectors.

In the power sector the country is both economically and financially exposed to a deteriorating infrastructure stock that the country can no longer afford to maintain, and inefficient and unreliable power supply. In the water and sanitation sector, the country needs to improve the quality of its infrastructure to expand access to improved water supply and sanitation services, increase consumption per capita, and reduce distributional losses, as well as strengthen the operation and financial performance of the Central African Water Distribution Corporation (SODECA). Expanding the Internet market, connecting to the submarine cable landing in Cameroon, and liberalizing the fixed-line market are the main challenges in the ICT sector.

Addressing the CAR's infrastructure challenges will require sustained expenditure of $346 million per year over the next decade, with heavy emphasis on capital expenditure; almost half of the total relates to the transport sector. At 17 percent of the CAR's 2009 gross domestic product (GDP), this effort is almost at the level of other Sub-Saharan African countries.

The CAR already spends around $134 million per year on infrastructure, equivalent to about 7 percent of its GDP. Almost $37 million a year is lost to inefficiencies of various kinds, associated mainly with underpricing in the power, water, and road sectors; poor financial management of utilities; and inefficient allocation of resources across sectors. If the CAR could raise the tariffs to cost-recovery levels, and manage aligning operational inefficiencies with reasonable developing-country benchmarks, it would increase existing flows to the infrastructure sectors.

Assuming that the inefficiencies are fully captured, comparing spending needs against existing spending and potential efficiency gains leaves an annual funding gap of $183 million per year. By far the largest gap exists in transport. The CAR has the potential to close this gap by raising additional public funding for infrastructure from increased fiscal receipts of various kinds. Furthermore, the CAR has not captured as much private finance for infrastructure (measured as a percentage of GDP) as many of its neighbors. This scope for improvement, coupled with the prospect of an economic rebound and prudent policies, could lift the country from it fragile state back to and beyond the prosperity standards it once enjoyed.

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 the Central African Republic. The results have been presented in reports covering different areas of infrastructure—ICT, irrigation, power, transport, water and sanitation—and different policy areas, including investment needs, fiscal costs, and sector performance.

This report presents the key AICD findings for the CAR, allowing the country's infrastructure situation to be benchmarked against that of its African peers. Given that the CAR is a fragile state trying to catch up with other low-income countries (LICs) in the region, both fragile-state and LIC African benchmarks will be used to evaluate the CAR's situation. Detailed comparisons will also be made with immediate regional neighbors in Central 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 2009. Most technical data presented are for 2008 (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 infrastructure matters

Between 2002 and 2009 the CAR's GDP grew at a rate of 2.2 percent per year. The effect of the global economic crisis was notable: the economy grew 3.7 percent in 2007, 2.2 percent in 2008, and 1.7

percent in 2009. Meanwhile, the CAR's economic performance is less than the 7 percent mark needed to make a significant impact on poverty reduction, and below the annual Sub-Saharan African growth of 6.2 percent. Going forward, average annual real GDP growth for 2009–29 is projected to be 4.4 percent provided that there is sustained security and political stability, improvement in the country's institutional and administrative capacity, and appropriate macroeconomic policies (World Bank 2009c).

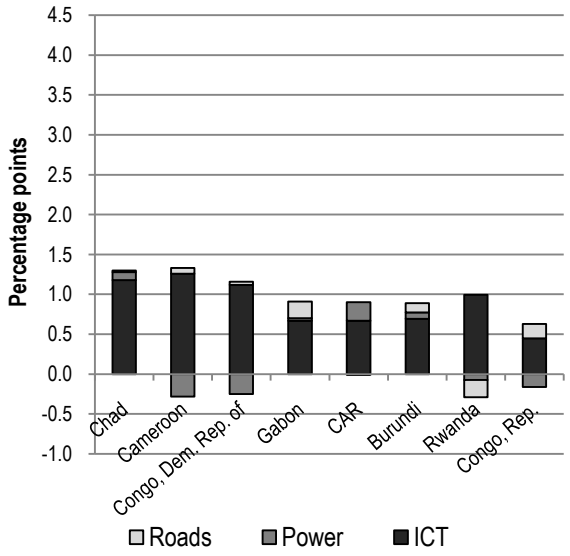
The overall contribution of telecommunications, electricity, and road infrastructure to the CAR's per capita growth between 2000 and 2005 was 0.9 percentage points, most of this attributed to a faster accumulation of infrastructure assets than to an improvement in infrastructure quality. While this contribution seems relatively low, it should be borne in mind that the period analyzed coincides with years of conflict. Similar to elsewhere in Africa, the ICT sector was responsible for most of this contribution, adding 0.67 percentage points to the per capita growth rate, while the road sector actually held back per capita growth by -0.01 percentage points (figure 1a).

Infrastructure's contribution in the CAR was lower than in other Central African countries—1.3 percent for Chad, 1.05 percent for Cameroon, and 0.91 percent for the Democratic Republic of Congo and Gabon (figure 1a). In the Sub-Saharan African context, infrastructure development led to faster growth per capita in Sudan (1.76 percent), Botswana (1.66 percent), Mauritius (1.67 percent), Benin (1.63 percent), and Uganda (1.54 percent).

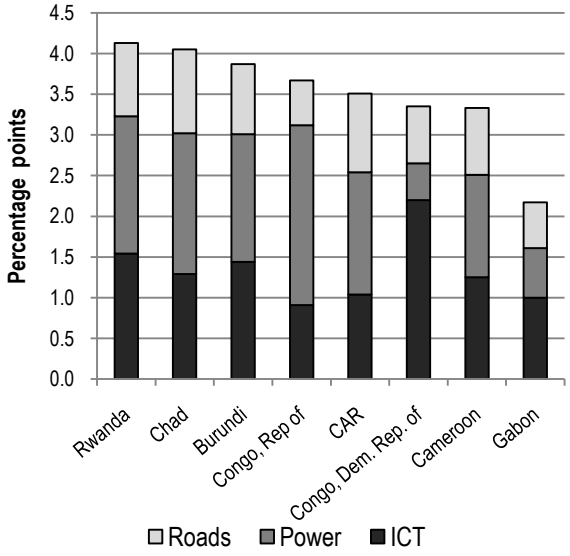
Looking ahead, if the CAR improves its infrastructure to the level of middle-income countries in Sub-Saharan Africa, growth performance could be enhanced by as much as 3.5 percentage points per capita (figure 1b). Most of the potential growth would come from the power sector (1.5 percentage points), in particular by increasing generation capacity and national access rates, which as of today are among the lowest in the region. ICT would continue making an important contribution to economic prospects (1.05 percentage points) as long as the expansion of mobile and Internet markets continues. Improving the condition of road corridors would facilitate and increase trade with neighbors, boosting economic growth.

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

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



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



Source: Calderón 2009.

The state of the CAR's infrastructure

The CAR's 4.5 million people sparsely populate its 623,000 square kilometers (km²) (figure 2a). Civil conflict resulted in significant displacement, including rapid and hazardous urbanization centered on Bangui, where economic activity is concentrated and 20 percent of the CAR's population lives. Secondary cities remain relatively small, with fewer than 120,000 inhabitants. At around 7.1 inhabitants per km², the CAR's low population density imposes a big challenge to financing the development of infrastructure assets. One solution in the ICT sector is to adapt low-cost technologies, such as WiMax;[1] meanwhile, water supply services can be expanded via standposts and protected wells.

Poverty incidence in the CAR is one of the highest in the continent: more than two-thirds of the population live below the poverty line. Poverty is higher in rural areas and in regions affected by the civil conflict (figure 2b). In the southwest of the country, poverty occurrence is lower, in particular in Bangui, where most of the economic activity and infrastructure is concentrated. In 2007 the Participatory Poverty Analysis identified poor governance, insecurity, and lack of economic opportunities connected to recent conflicts as the three main causes of poverty in the CAR.

The CAR's economy is dominated by the primary sector, which accounted for 52 percent of the GDP in 2008. In the primary sector, subsistence agriculture represents 28 percent of the GDP, and livestock about 13 percent. The country's main sources of export revenues are timber, cotton, coffee, and extractive industries. Timber has accounted for about 16 percent of export earnings, which are small overall.

[1] Worldwide Interoperability for Microwave Access.

The CAR's extractive industry potential could be expanded to constitute a solid basis for growth and economic diversification. The main potential mining centers—gold, diamonds, uranium, iron, and copper— are located in the southwest and central parts of the country (figure 2d). On average, diamonds have accounted for about 40 percent of exports.

The country's transport infrastructure is very limited, particularly in terms of connecting the country internationally (figure 3a). The CAR has only one international airport, located in Bangui but its runaways are deteriorated. The country does not have rail infrastructure. In the south west region most of the roads are in good condition vis-à-vis the South East and North East regions where the quality is fair or poor (figure 3a).

The CAR has two primary corridors but in practice relies only on one of them. The first is the Doula-Bangui corridor, through Cameroon, often impassable in the rainy season owing to the poor condition of Cameroonian roads. This corridor extends 1,700 km and connects the CAR with the port of Douala in Cameroon, the closest port. The other is the Pointe Noire-Brazzaville-Bangui, involving transit down the Oubangui River, which is unnavigable in the dry season.

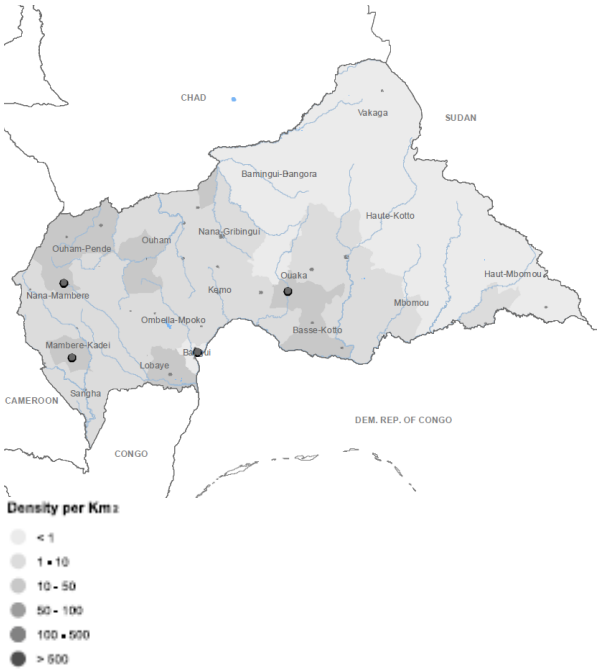
In the power sector, there are only two transmission lines, connecting Ombella-Mpoko and Bangui, and two power plants, Boali 1 and Boali 2 (figure 3b). The CAR's total installed capacity of 39 megawatts (MW) needs to be refurbished to either prolong the life of the outdated plant by restoring it to full operational status, or to repair generation assets seriously damaged during the civil war. Over 50 percent of the distribution lines are more than 30 years old.

Access rates to safe water and sanitation services are among the lowest in Sub-Saharan Africa. In particular, the CAR relies on low-cost technologies (boreholes and traditional latrines) that frequently fail to provide improved water and sanitation. At present there is no sewerage network; and poor drainage poses critical health risks, including diarrhea and malaria. Solid waste collection was discontinued during the war and needs to be reestablished.

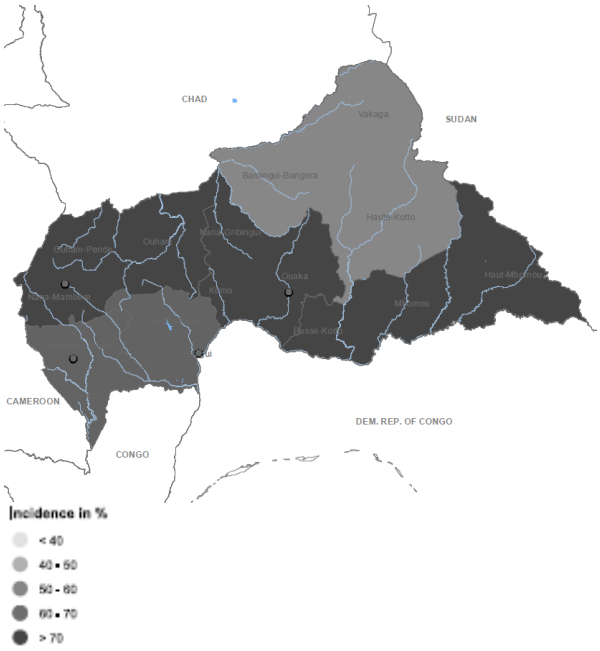
Reflecting the country's economic activity and population trends, roads, power, and ICT backbones are concentrated in urban areas—Bangui in particular. There is a noticeable lack of infrastructure in rural areas. Only Bangui enjoys global system for mobile communications (GSM) coverage (figure 3c), and only 8 percent of the population living in urban areas have access to electricity. Meanwhile, urban infrastructure requires significant investment as the urban population grows by1.7 percent per year. The absence of infrastructure, such as electricity, in rural areas (home to 60 percent of the population) poses a particular challenge.

Figure 2. The Central African Republic is sparsely populated and has a high incidence of poverty

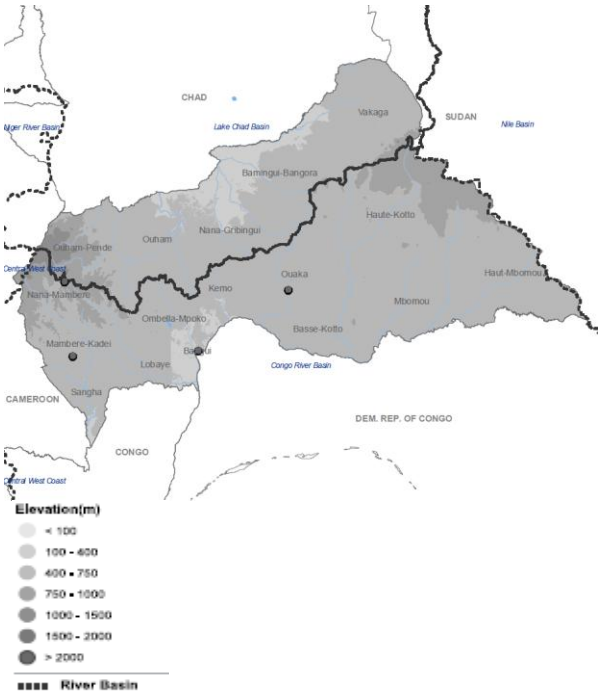
a. Population



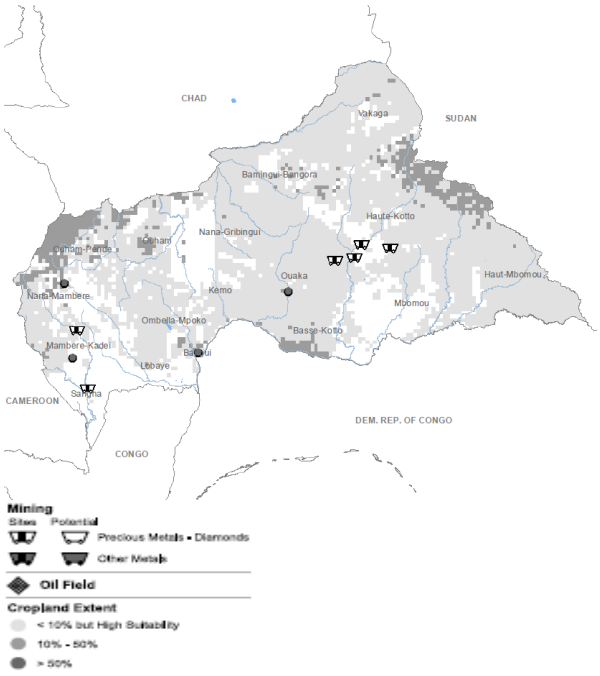
b. Poverty



c. Topography



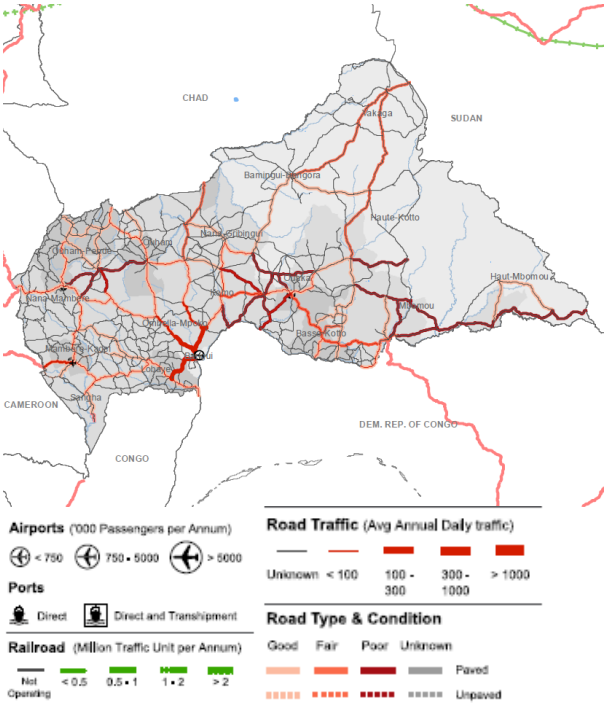
d. Natural resources



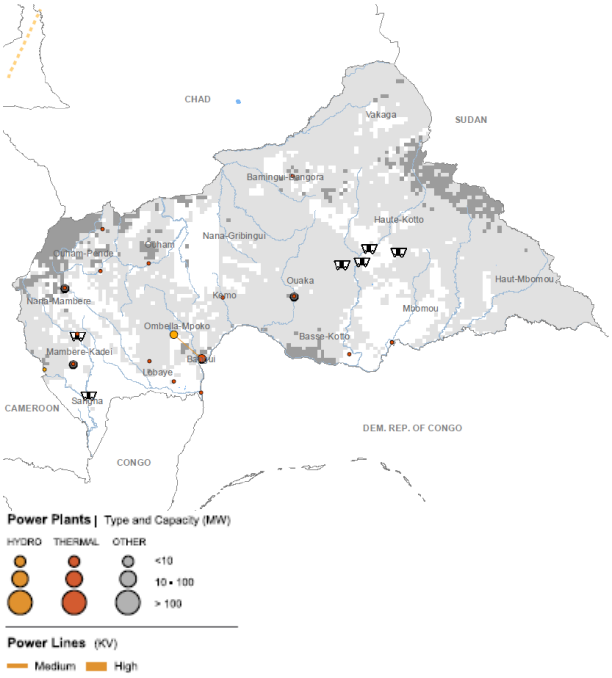
Source: AICD Interactive Infrastructure Atlas for the CAR (http://www.infrastructureafrica.org/aicd/system/files/gha_new_ALL.pdf).

Figure 3. Infrastructure networks follow population density and natural resources

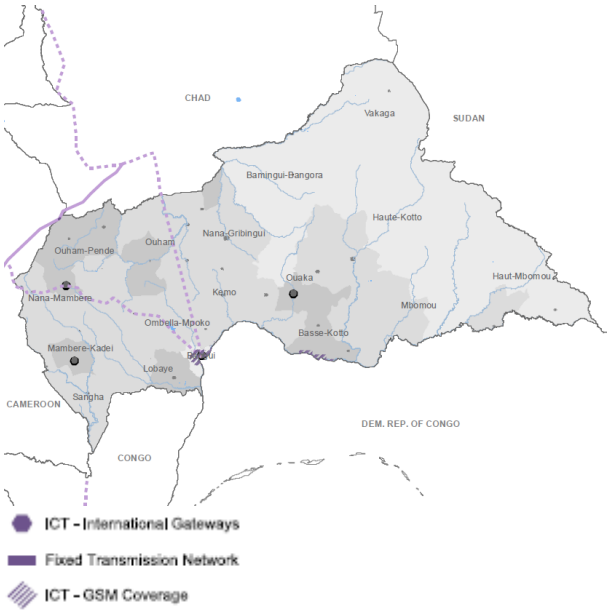
a. Roads, railways, and airports



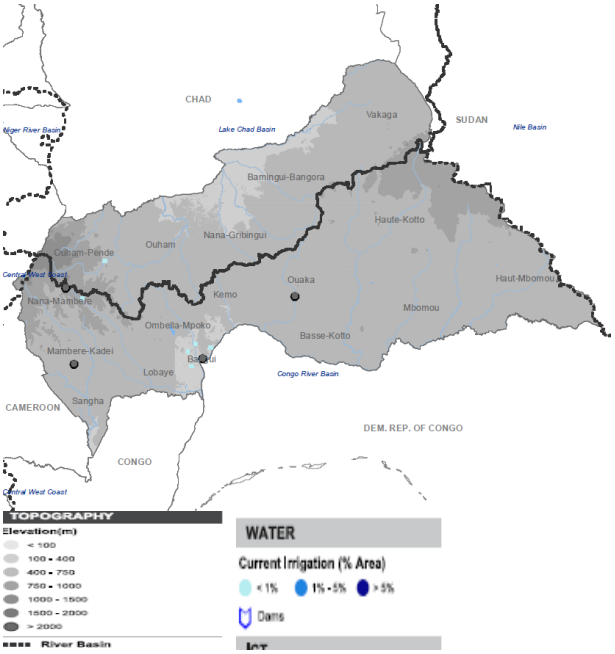
b. Power



c. ICT



d. Water resources

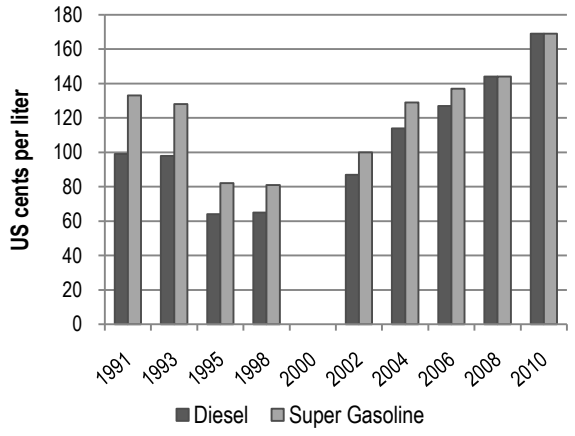


Source: AICD Interactive Infrastructure Atlas for the CAR (http://www.infrastructureafrica.org/aicd/system/files/gha_new_ALL.pdf).

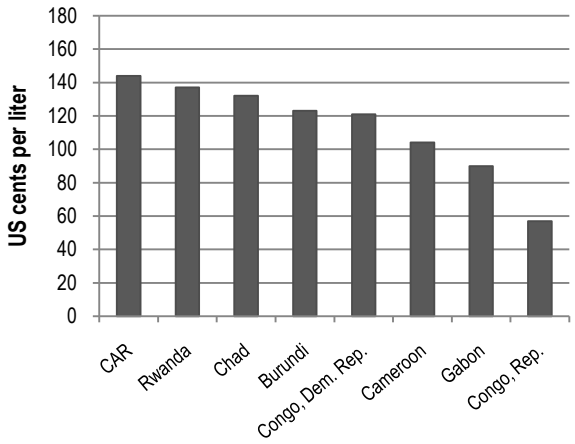
The state of the CAR's infrastructure and the price of fuel are highly correlated. After a notable decline in the retail price of diesel and super gasoline during the mid-1990s, these prices have been steadily increasing. In 1998 the price of diesel, at 64 cents per liter, reached its lowest point between 1991 and 2010. The retail price in 2010 was 169 cents per liter—an increase of about 260 percent (figure 4a). Meanwhile, diesel prices in the CAR are the highest in Central Africa (figure 4b). This is due to the high cost—in both money and time—incurred by importing oil from Cameroon (via the Doula-Bangui corridor) and the Democratic Republic of Congo (via the Oubangui River). Higher oil prices raise transportation costs and impact the cost of thermal power production. High power generation costs in turn scale up the price of energy, which can only be afforded by the highest quintiles of the population. Scarcity of fuel is also responsible for constant power outages as thermal production is curtailed, which in turn affects water treatment.

Figure 4. Diesel and super gasoline retail prices

a. The CAR's diesel and super gasoline retail prices



b. Central African countries diesel retail prices



Source: GTZ 2008.
Note: Diesel retail prices for Central African countries as of mid-November 2008.

The CAR's infrastructure network would benefit from closer interconnection and collaboration with neighboring countries. The Central African Backbone has the potential to connect the CAR to the submarine cable landing in Cameroon, reducing the cost of telecommunications in the CAR. Upgrading the Cameroonian portion of the Bangui-Douala corridor is critical, as it could decrease the time and cost of transport goods from the CAR to the port of Douala. As far as the energy sector is concern, estimates suggest that as long as the CAR is in a position to develop its own significant domestic hydropower, the country will not necessarily benefit from regional trade.

The main achievements and challenges in each of the CAR's major infrastructure sectors are summarized in table 1. The table outlines the need for upgrading infrastructure in all subsectors, the obstacles to enhancing the coverage and quality of infrastructure services, and the ambitious reform efforts in this area. In particular, there is a need to improve the operational and financial performance of state-owned enterprises (SODECA, ENERCA, and SOCATEL). The following section discusses these achievements and challenges in more detail, by sector.

Table 1. Achievements and challenges in various infrastructure sectors

	Achievements	Challenges
Surface transport	Relatively good or fair condition of road network and selection of surface treatment appropiate to traffic levels	Improving the condition of road corridors Diversifying access to sea ports by facilitating river transportation Reducing transportation costs to further reduce price of diesel
Air transport	Increased connectivity (that is, number of city pairs and traffic) Renovation of air fleet	Opening and expanding the market Rehabilitating runways
Water and sanitation	Sectoral reform, including of national water agency	Improving the quality of water supply and sanitation infrastructure to expand access to improved water supply and sanitation services, increase consumption per capita, and reduce distributional losses Strengthening the operation and financial performance of SODECA
Irrigation		Expanding irrigation areas through small-scale projects
Power	Sectoral reform, providing for market liberalization	Improving the quality of energy infrastructure to expand access to power and reduce power outages and transmission and distribution losses Strengthening the operation and financial performance of ENERCA
ICT	Sectoral reform, providing for market liberalization Rapid expansion of the mobile market via entry of private operators	Expanding the Internet market and connecting to the submarine cable landing in Cameroon Liberalizing the fixed-line market

Source: Authors' elaboration based on findings of this report.
Note: ICT = information and communications technology.

Transport

Transporting goods from and to the CAR is extremely costly and slow. The reduced quality of its transport infrastructure and that of its neighbors, compounded with the CAR's landlocked position, imposes higher costs of transporting goods than found in comparable countries with better infrastructure or easier access to the coast. The cost associated with exporting or importing a container, at about $5,500 per container, is the second-highest in Central Africa after Chad. The CAR's costs of trading across borders are above the average of Central African countries, which in fact are higher than in other regions in Sub-Saharan Africa. The average time to export and import is 54 and 62 days, respectively (table 2). The result is that basic goods are considerably more expensive in the CAR than in the nonlandlocked neighboring countries.

Table 2. Trading across borders in Central African countries

Country	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)
Burundi	9	47	2,747	10	71	4,285
Cameroon	11	23	1,379	12	26	1,978
Central African Republic	**9**	**54**	**5,491**	**17**	**62**	**5,554**
Chad	6	75	5,902	10	101	8,150
Congo, Dem. Rep. of	8	44	3,505	9	63	3,735
Congo, Rep. of	11	50	3,818	10	62	7,709
Equatorial Guinea	7	29	1,411	7	48	1,411
Gabon	7	20	1,945	8	22	1,955
Rwanda	8	35	3,275	8	34	4,990
São Tomé and Principe	8	27	690	8	29	577
Central Africa	8	40	3,016	10	52	4,034
Sub-Saharan Africa	8	32	1,962	9	38	2,492

Source: World Bank 2010g.
Note: 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.

Expensive surface transport costs along the Bangui-Douala corridor account for the bulk of the cost of importing to the CAR (figure 5a). Inland transport costs, at about $3,500 to $4,500 per container, account for more than 65 percent of the total cost of importing (see table 2). Moving a tonne of freight along intraregional corridors in the Central African region[2] costs twice as much (between $230 and $650) as in southern Africa region[3] (between $120 and $270), where distances are significantly longer (World Bank 2010a).

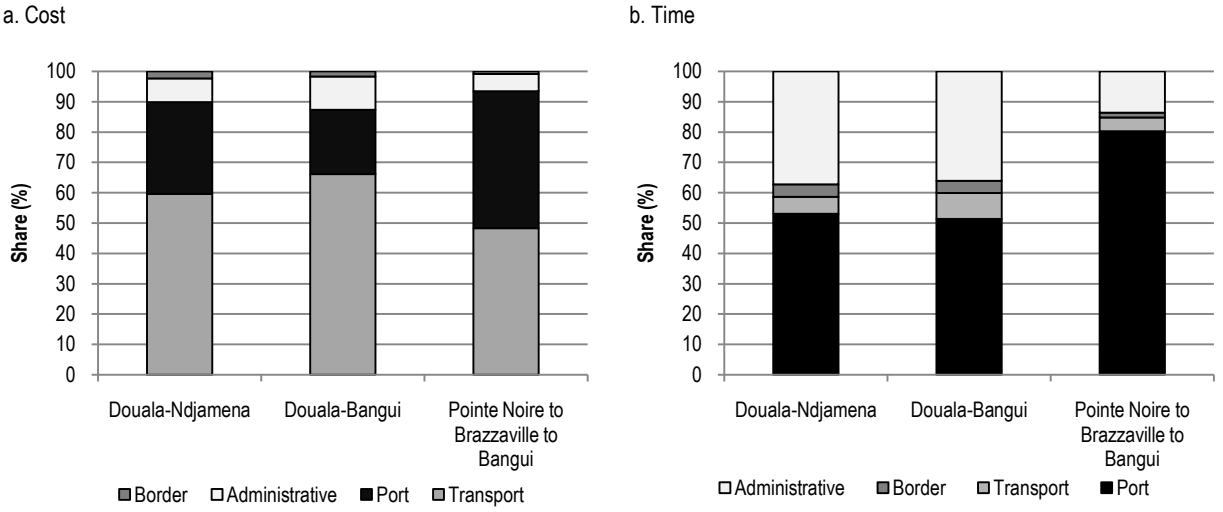
Surface transport costs are highly impacted by the strong presence of freight bureaus and transport associations, which prevent truck operators from contracting with customers directly and result in high profit margins for the trucking industry. The regulatory framework, based on market sharing and centralized allocation of freight, limits vehicle mileage (to around 2,000 km per month versus 12,000 in the developed world) and weakens incentives to invest in service quality upgrades. As a result, the truck fleet is largely composed of poorly maintained secondhand trucks that are typically overloaded to obtain maximum revenue from their restricted usage. This is a rather serious problem in the region and promotes excess supply, with too many vehicles chasing modest freight volumes.

[2] Comprising Cameroon, the Central African Republic, Chad, Congo, Equatorial Guinea, and Gabon.

[3] Comprising Angola, Botswana, the Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe.

Lengthy travel times in the Douala-Bangui corridor are mainly associated with inefficient operations in the Port of Douala, which is responsible for half of the time required to import to the CAR. Productivity measures record poor performance. For example, truck-processing time for the receipt and delivery of cargo in the Port of Douala is 14 days versus 7 days for an average port in Sub-Saharan Africa. Vessel berth productivity, at 12 tonnes per hour in the Port of Douala, is nearly half the Sub-Saharan African average. Further privatization of the customs clearance system and expansion of the port might help improve the performance of the Port of Doula. Time-consuming regulatory processes related to customs clearance and technical controls further augment the total time, accounting for about one-third of the total time (figure 5b).

Figure 5. Shares of different components involved in the time and cost of importing through alternative gateways



Source: World Bank 2010a; Teravaninthorn and Raballand 2009.

Roads

Challenges

Road network coverage poses a critical challenge, considering the large size of the CAR and its relatively low population. Total road density over arable land is around one-third of the density of low-income, fragile countries (41 km compared to 145 km/1,000 km^2). There are only 6 km of roads per 1,000 people. The rural network density is even lower, at 25 km/1,000 km^2 (table 3).

The CAR's network appears to be in relatively poor condition except for its strategic corridors. The condition of the classified paved road network is below the level of comparable peer countries: 62 percent is in good or fair condition in the CAR versus 80 percent in fragile states. Meanwhile, it is estimated that only 2 percent of the unpaved network is in good or fair condition (table 3). This divergence in the quality of paved and unpaved roads can be partially explained by the fact that 75 percent of the resources of the Road Fund—most for routine maintenance—are directed to the primary network, which is almost totally paved (table 3).

Table 3. Road indicators, benchmarked against Sub-Saharan African fragile and low-income countries

Indicator	Unit	Fragile states	CAR	Low-income countries
Road network density [1]	km/1000 km^2 of land area	145	41	132
GIS rural accessibility	% of rural pop within 2 km from all-season road	30	58	23
Classified paved road network condition [2]	% in good or fair condition	80	62	86
Classified unpaved road network condition	% in good or fair condition	72	2	56
Classified paved road traffic	AADT	843	200	1,288
Classified unpaved road traffic	AADT	31	14	39
Primary network overengineering	% of primary network asphalted with 300 AADT or less	47	61	30

Source: AICD Road Sector Database.

[1] Total network includes the primary, secondary, and tertiary networks.

[2] Classified roads are those that have been included in the roads legislation as public roads.

GIS = geographic information system; AADT = average annual daily traffic; the CAR = Central African Republic.

The CAR relies heavily on its regional corridors for the efficient movement of goods and people, but its neighbors are not prioritizing the maintenance of their portions of the corridors. The Douala-Bangui and Point Noire–Brazzaville–Bangui corridors are still not completely paved. Some sections of the Douala-Bangui corridor (about 250 km in Cameroon and 210 km in the CAR) are being upgraded as part of the Economic and Monetary Community of Central Africa (CEMAC) Transport Transit program. Meanwhile, all of Cameroon's segment of the Point Noire–Brazzaville–Bangui corridor (308 km) is unpaved, as is 1,000 km on the Congolese side. This means that the CAR does not have a single all-weather road corridor to its coastal port gateways (table 4).

Furthermore, only 48 and 21 percent of the Douala-Bangui and Point Noire–Brazzaville–Bangui corridors, respectively, are in good condition. In both cases the problem seems to lie in the coastal gateway country's neglect of road quality. Only 30 percent of the Cameroonian section in the Douala-Bangui corridor is in good condition, versus 100 percent of the Central African section. Similarly, only 56 percent of Cameroon's segment of the Point Noire–Brazzaville–Bangui corridor—and none on the Republic of Congo side—is in good condition, whereas 100 percent of the the CAR segment is in good condition (table 4). It is worth noting, however, that a good portion of the the CAR segments consist of surface treatment pavements that do not have the same properties and durability as asphalt. Around 80 percent and 35 percent of the CAR's share of the Point Noire–Brazzaville–Bangui and Douala-Bangui corridors, respectively, are surface treated. Clearly, the incentives for a coastal country to maintain hinterland road corridors do not seem to be very strong, since coastal countries' economies are typically concentrated along the coast, making the up-country segments regional public goods.

Table 4. Condition and type of road corridors

		Type (%)		Condition (%)			Average annual daily traffic (%)		
Corridor	Total kilometers	Paved	Unpaved	Good	Fair	Poor	<300	300–1,000	>1,000
Douala to Bangui	*1,704*	*69*	*31*	*48*	*25*	*25*	*65*	*20*	*15*
Cameroon	1,118	52	48	30	36	35	53	24	23
Central African Republic [1]	587	100	0	100	0	0	86	14	0
Pointe Noire to Brazzaville to Bangui	*2,419*	*40*	*54*	*21*	*21*	*49*	*27*	*11*	*0*
Cameroon	311	0	100	56	39	0	70	24	0
Central African Republic [1]	535	99	1	100	0	0	79	19	0
Congo, Rep. of	1,573	28	63	0	21	69	0	6	0

Source: AICD calculations.

Note: The summation of the good, fair, and poor conditions does not necessarily add up to 100 since there might be some links of the network for which the condition is unknown.

The summation of the paved and unpaved type does not necessarily add up to 100 since there might be some links of the network for which the type is unknown.

[1] Asphalt and surface treatment pavements are considered paved roads.

The relatively poor condition of the corridors in the coastal countries calls for further regional coordination and collaboration. The adoption of the Trade and Transport Facilitation Program by the CEMAC (Economic Community of Central African States) member states points in this direction. The program comprises the implementation of a regional institutional framework, harmonization of national regulations, regional interconnectivity of customs information technology systems, and implementation of a pilot trade and transport facilitation project on the Bangui-Douala (about 1,450 km) and N'Djamena-Douala (about 1,850 km) surface transport corridors.

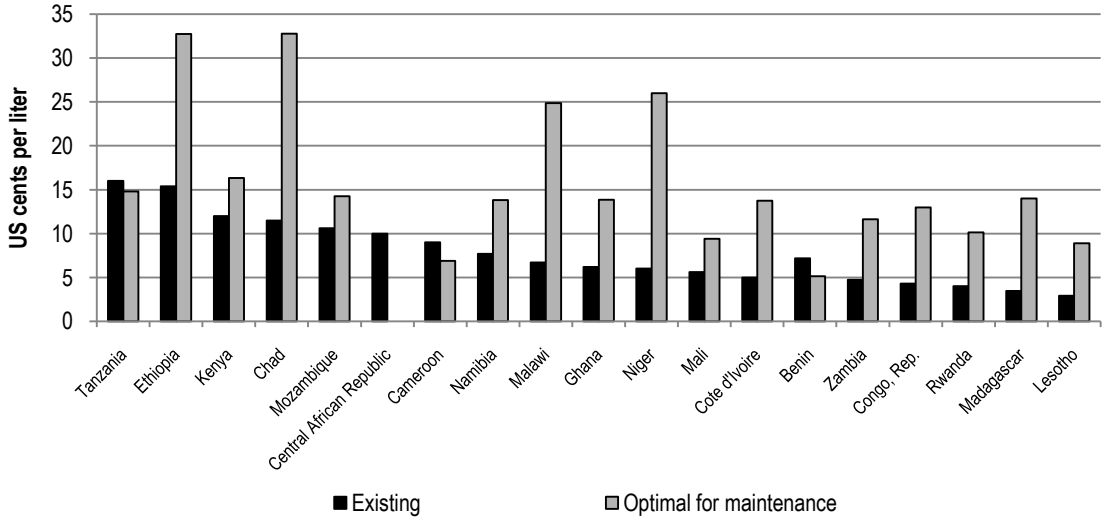
Road financing in the CAR is a major challenge. At 10 cents per liter (figure 6), the CAR fuel levy is among the highest in Sub-Saharan Africa covering routine maintenance needs and 25 percent of the total maintenance requirements. Existing fuel levy represents around 7 percent of the retail diesel and super gasoline prices. AICD estimations suggest that CAR is spending on maintenance and rehabilitation around 55 percent and 10 percent less than required, respectively.

Despite the implementation of road user charges, public funding to finance the road sector is still likely to be needed. The challenge is large due to the poor budgetary situation of the government and the high volatility of transfers in recent years. In 2001 central transfers accounted for 56 percent of the Road Fund's total revenue; in 2003 this was 71 percent, and in 2006 only 26 percent.

But estimates suggest that low execution ratios are an important source of inefficiency in the road sector. In fact, the road sector received $54 million on average per year from the public sector, out of which $9 million was lost due to low budget execution. This means that budgeted capital spending is typically 16 percent higher than what the CAR actually succeeds in spending. If rehabilitation requirements are compared to an estimate of budgeted (versus actual) capital spending, then the funding situation looks somewhat more positive. Thus, improving capital budget execution is an important first step toward clearing rehabilitation backlogs. In Sub-Saharan Africa the evidence shows that the main causes of low budget execution are weaknesses and delays in the public procurement process that prevent

contracts from being awarded and completed within a 12-month budget cycle (Gwilliam and others 2009).

Figure 6. Optimal and existing fuel levy in select Sub-Saharan African countries



Source: Gwillliam and others 2009.

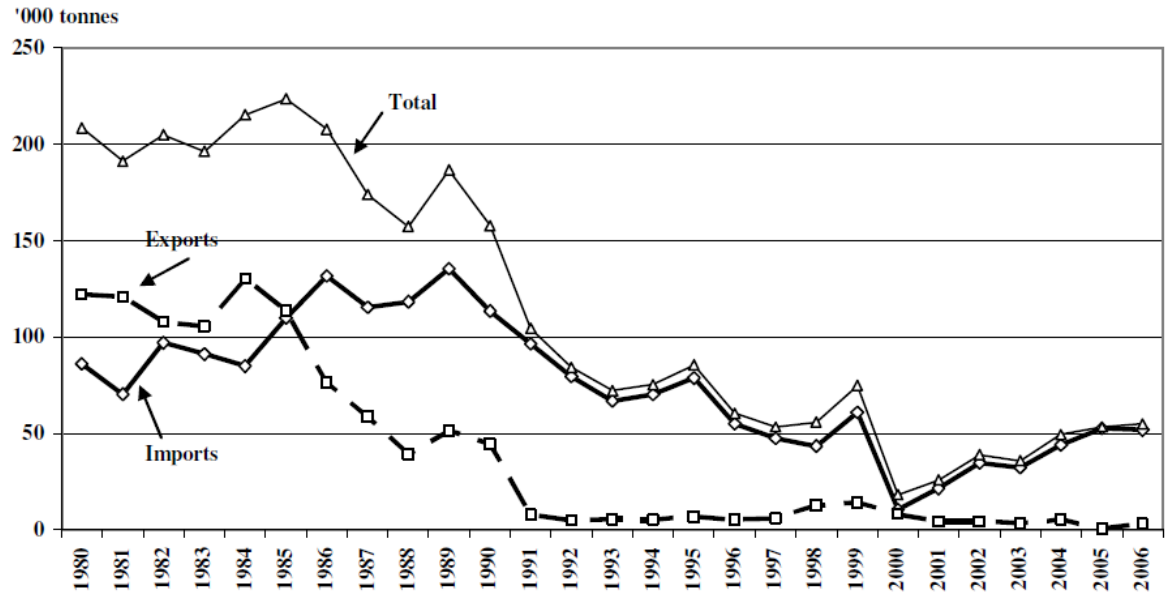
Traffic levels are extremely low, making it difficult to justify heavy road engineering. Traffic, mainly concentrated in the Bangui-Douala and Point Noire–Brazzaville–Bangui corridors, consists of 200 vehicles per day on the paved segments. This is only 25 percent of the average—843 vehicles per day—in the fragile countries and 15 percent of the average—1,288 vehicles per day—in low-income countries. The volume of traffic in the CAR's unpaved network is also low, with only 14 vehicles per day versus 31 vehicles per day on average for comparable fragile states (table 4). Around 86 percent of the traffic in the the CAR section of the Douala-Bangui corridor consists of fewer than 300 vehicles per day, the estimated minimum economic threshold for paving. In the case of the Point Noire–Brazzaville–Bangui corridor, about 80 percent of the traffic in the CAR's section consists of fewer than 300 vehicles per day. With 61 percent of the primary network under asphalt and an average annual daily traffic of below 300 vehicles, the CAR's level of overengineering is 47 percent higher than in comparable fragile states (table 3). Nevertheless, due to recent conflict it may be that traffic volumes are artificially depressed due to security concerns.

Primary and secondary networks have been sensitive to this reality by adopting lower-cost surfacing. The CAR's total road network, consisting of 25,235 km, is largely surface treated, both pavement (63 percent) and gravel (34 percent). The primary or national network (about 5,000 km) consists of mainly surface treatment pavement (4,322 km) and asphalt (654 km), and represents about 20 percent of the total network. The secondary or regional network primarily consists of surface treatment pavement (4,364 km) and gravel roads (589 km). The tertiary or rural network (about 15,000 km) consists of 100 percent gravel roads. Adopting more appropriate standards would reduce the costs of network maintenance and ease the financial pressure on road maintenance.

River transport

The river transport subsector remains an important and indispensable mode of transport and promises to open up the Central African Republic. However, navigability is limited throughout the 5,000 km waterway network—only 2,067 km are navigable for four months a year, mainly on the Bangui-Brazzaville corridor (1,195 km). The Congo and Ubangi rivers are the traditional routes for the export of products, and once provided a cost-effective transport artery for timber from the CAR. Because of civil conflict in the CAR and the Republic of Congo in the past decade, however, routes through Cameroon became preferred by importers and exporters. Traffic decreased sharply, especially timber exports, although the river is still used to import petroleum products during the navigable season (figure 7).

Figure 7. River traffic, 1980–2006



Source: World Trade Organization 2007.

Still, river transportation remains a highly competitive mode of transport: costs average $0.05 per tonne-km. And since the peace process got under way in the Democratic Republic of the Congo, the river has once again become an option for the lower-cost shipping of imports and exports to and from the CAR. For imports, the river route takes longer (12–15 days from Brazzaville or Kinshasa), but the cost of transport is 20 to 60 percent less (World Trade Organization 2007). The river's unreliable navigability, however, reduces the benefits of its low costs (Briceño-Garmendia and Pushak 2010).

In this context, investments in the regular dredging of sand from the Congo and Ubangi rivers could make them accessible all year round to the Pointe Noire–Brazzaville–Bangui corridor. According to the Republic of Congo National Transport Plan estimates, the investment required to dredge the Sangha and Ubangui tributaries of the Congo River is roughly $30 million (Briceño-Garmendia and Pushak 2010). The rehabilitation of the Salo and Amont ports is also fundamental to boosting river transit. In the long term, building a dam at Palambo to regulate the upstream flow of the Oubangui Bangui (at Zawara,

Palambo, or Longo) will make it navigable from 11 to 12 months a year (Ministère de l'Economie, du Plan et de la Coopération international 2007). More intensive use of the river for transporting goods and passengers means replacing the SOCRATAF's[4] equipment, which is ongoing following its recent privatization.

Restoring the navigability of the Congo and Ubangi rivers would make the port of Pointe Noire an alternative to the Port of Douala for the CAR trade, through a combination of river and rail transport using the CFCO[5] line from Brazzaville to Point Noire. In fact, Point Noire is one of the best-performing ports in Sub-Saharan Africa, and the Republic of Congo is one of the few countries in Africa that has developed a national port master plan (see box 1).[6]

For the CAR to benefit from the potential offered by the port of Pointe Noire and river transport (Ministère de l'Economie, du Plan et de la Coopération international 2007), measures to improve the entire corridor (including improvements in navigability of the Congolese river stretches, rehabilitation of the CFCO railways, improvements in the port of Point Noire, and rehabilitation of the Cameroonian and Congolese road sections of the Pointe Noire–Brazzaville–Bangui corridor) would need to be closely coordinated with the Republic of Congo and Cameroon.

Box 1. The CAR could benefit from the development of transport corridors in the Republic of Congo

Tapping the potential for developing transport infrastructure in the Republic of Congo would mean taking advantage of multimodal transport corridors that already exist. Once the road and rail corridor to Brazzaville are operating normally, the port of Pointe Noire should be able to capture the Republic of Congo's imports and exports, particularly timber, now diverted to other ports in West Africa, such as the Port of Doula in Cameroon and the Port of Matadi in the Democratic Republic of the Congo.

If the Republic of Congo were successful in reestablishing a transit role, traffic and associated transport revenues at Pointe Noire could double. In an optimistic scenario, the Republic of Congo would essentially double the existing imports and the export of timber going through Pointe Noire—from around 1 million tonnes of imports and exports each to around 2 million tonnes. The overall value of traded goods would also double, from $3.3 to $6.6 billion per year, as would the associated transportation revenues, from $135 to $278 million per year.

Source: World Bank 2010b.

Air transport

Achievements

After years of decline, the CAR's air transport traffic and connectivity are recovering. Between 2001 and 2007 the number of total seats declined from144,991 to 44,503 due, in part, to the collapse of Air Afrique and Cameroon Airlines, the latter serving the market since 2004. The greatest downturn took place in the number of international seats, which fell from 118,122 in 2001 to 20,661 in 2007. Estimated

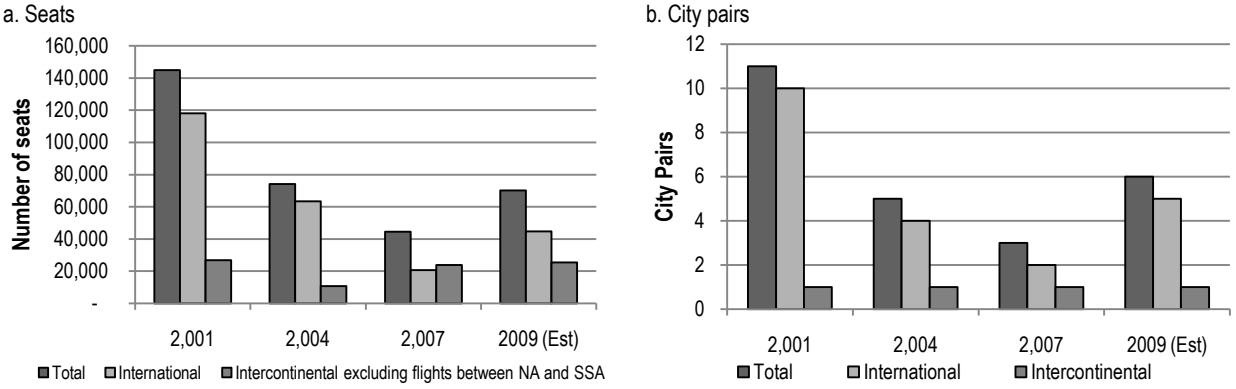
[4] Société Centrafricaine des Transports Fluviaux.

[5] Chemin de Fer Congo Ocean.

[6] The Port Authority of the Republic of Congo has developed a national port master plan and secured commitments of $798 million in private investment to double the current 17-hectare container facility and double the existing annual throughput capacity of 300,000 20-foot equivalent units (TEUs) within 8 years. The port investment program also includes deepening the port to accommodate vessels of up to 6,000 TEU, rehabilitating wharfs and warehouses, constructing drainage and electricity supply networks, and creating a timber yard (World Bank 2010b).

figures for 2009 show that the total number of seats grew by about 50 percent compared to 2007 levels. In particular, the international seats more than doubled between 2007 and 2009 (figure 8a). Connectivity is recovering, evident in the increase in city pairs being served within Africa. Between 2001 and 2007, the city pairs served dropped from 11 to 3. Preliminary numbers show that in 2009 city pairs went up to 6 (figure 8b).

Figure 8. Evolution of seats and city pairs in the Central African Republic



Source: Bofinger 2009. Derived from the AICD national database (http://www.infrastructureafrica.org/aicd/tools/data).
Note: As reported to international reservation systems

Carriers in the CAR are using modernized air fleets. Air France and Libya's Air Afriquia, the only air carriers in the CAR, have modernized 100 percent of their fleets, and as of today, the CAR is served by the newest fleet in the region (table 5).

Table 5. Air transport indicators, benchmarked against select other countries

Country	Central African Republic	Chad	Congo, Dem. Rep. of	Cameroon	Niger	Congo, Rep. of
Domestic seats (seats per year)	—	—	327,988	105,742	—	443,634
Seats for international travel within Africa (seats per year)	20,661	109,074	468,217	472,089	128,414	351,882
Seats for intercontinental travel (seats per year)	23,842	88,608	193,414	398,034	41,717	117,962
Seats available per capita	0.010	0.018	0.016	0.051	0.012	0.24
Herfindahl-Hirschmann Index—air transport market (%)	50.26	36.35	22.65	10.18	18.97	30.79
Percent of seat-km in newer aircraft	100	99.5	74.7	91.8	94.3	73.3
Percent of seat-km in medium or smaller aircraft	23.5	93.6	39.3	31.9	44.9	50.5
Percent of carriers passing IATA/IOSA audit	0	0	0	0	0	0
FAA/IASA audit status	No audit	No audit	Failed	No audit	No audit	No audit

Source: Bofinger 2009. All data as of 2007 based on estimations and computations of scheduled advertised seats, as published by the Diio SRS Analyzer. This captures 98 percent of worldwide traffic, but a higher percentage of African traffic is not captured by the data.
Note: The Herfindhal-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.
FAA = U.S. Federal Aviation Administration; IASA = International Aviation Safety Assessment; IATA = International Air Transport Association; IOSA = IATA International Safety Audit.
— = Data not available.

Challenges

Despite the recent turnaround, capacity and connectivity remain low in relative terms due to poor infrastructure and small market size. Of the 42 airport platforms, only four runaways are paved (Bangui, Berberati, and Bobangui Avakaba). The Bangui-M'Poko airport requires major investments: its paved runaway has not been reinforced since 1987. Also, the expansion and redevelopment of the terminal and the provision of equipment safety and security (such as fencing around the airport) are urgent necessities (Ministère de l'Economie, du Plan et de la Coopération international 2007).

Compared to other Central African peers, the CAR reported the lowest numbers of seats for international travel within Africa and for intercontinental travel, and its seat capacity per capita is among the lowest in the region (table 1). The type and condition of air transport infrastructure constrain the expansion of the market. The infrastructure includes basic, rudimentary airstrips in remote towns, such as Birao in the north, Obo near the eastern border, and the main airport in Bangui. These factors are compounded by high poverty prevalence, which makes harder for users to afford air fares, and low population density, which imposes greater cost for infrastructure expansion.

The number of city pairs served in the CAR is very low, which manifests itself in the frequency of flights. In 2009 the average number of international flights from North Africa landing in Bangui was two per week; the sole intercontinental connection, via Air France, saw one flight per week. Including the 1.4 flights per week from other Sub-Saharan countries, on average there were fewer than 5 flights per week connecting the CAR to the rest of the world as of 2009. The entrance of new airlines to the market—such as Ethiopian Airlines, Kenya Airlines, Inter Air, Royal Air Maroc, and TAAG—most likely has augmented the number of flights per week over the past two years.

Water resources

The CAR has important sources of water. There are two river basins: the Ubangi and Chari. Two-thirds of the country lies in the basin of the Ubangi River, which flows south into the Congo River, while the remaining third lies in the basin of the Chari River, which flows north into Lake Chad. The water potential, however, is worrisome, as the volume of water in these basins has declined steadily from year to year. The quality of surface water is also deteriorating, especially that from the rivers, springs, ponds, and traditional wells that provide drinking water to around 70 percent of the population.

The renewable water resources per capita are estimated at about 36,912 cubic meters per year (m^3/year) (including cross-border flows), which is above the Sub-Saharan African average of 7,000 m^3/year. Rainfall averages 1,343 millimeter per year (mm/year), but levels vary considerably across regions and over the course of the year.

There are several factors that put significant pressure on water resources. Agricultural production needs—representing 77 percent of the total water use—add to the stress, in particular for cotton production. Domestic demand—representing 18 percent of total water use—has increased over time, but access to clean water remains a major challenge for the population. The millennium goal of reducing the proportion of people without access to drinking water or safe sanitation by half will not be achieved for either the urban or the rural areas. The industrial sector—accounting for 5 percent of total water use—is also growing as the economy improves.

Irrigation

The irrigation potential in the CAR is substantial. Only 135 of a potential 1.9 million hectares are irrigated (see figure 3d) (FAO 2004). The irrigated area could be increased substantially with good economic returns. Simulations suggest that with a threshold internal rate of return (IRR) of 6 percent it would be economically viable to develop 6,048 hectares of land for irrigation through small-scale projects. If the threshold IRR is raised to 12 percent, the economically viable area for irrigation shrinks to 1,824 hectares. The required investment for attaining this expansion is $9 million (table 6). Large-scale projects do not appear to be economically viable in the CAR at any rate of return.

Table 6. Irrigation potential for small-scale projects

Cutoff	Investment	Internal rate of return	Area increase
(%)	$million	%	**hectares**
0	68	4.0	13,065
6	31	10.0	6,048
12	9	0.0	1,824
24	0	0.0	0

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 runoffs 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 agroecological 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 $3,000/hectare and for small-scale projects at $2,000/hectares.

Water supply and sanitation

Achievements

Since the end of the conflict, the CAR has made important efforts to improve the institutional and legal framework of the water supply and sanitation sectors. In 2006 the Water Code was promulgated and the Government's Policy and Strategy Paper on the National Water and Sanitation Program (NESP) was approved, and in 2007 the National Agency for Water and Sanitation was established. But a clear definition of responsibilities among the different actors in the water supply and sanitation sectors is pending.

The CAR has managed to reach people with some form of water supply and sanitation, as shown by the relatively low reliance on surface water and open defecation. According to the results of the 2006 Multiple Indicator Survey (box 2), the CAR's reliance on surface water is only one-third of the average for fragile states, which in fact do better than other low-income countries. In particular, due to the rapid expansion of utility connections in urban centers since the end of the conflict, it is expected that the use of surface water has decreased further in recent years. Reliance on open defecation in the CAR is at the level of other fragile countries.

Box 2. How different are estimates from households surveys compared to government data?

The Africa Infrastructure Country Diagnostic (AICD) uses the Joint Monitoring Data (JMP) coverage statistics as the main source of access data on water supply and sanitation and processes these using a standardized methodology to allow cross-country comparisons by technology rather than by improved or unimproved water supply or sanitation. These data might differ from those reported by governments. Whereas the JMP data are based on household surveys and therefore reported by users of the services, the government data are based on other methodologies. The CAR's Directorate General of Water (DGH) calculates access by technology, multiplying the number of existing water or sanitation assets (functional or not functional) by a norm of how many people are served by each point. In the CAR the DGH data do not take into account population projections. The DGH estimated that by the end of 2009 there were 3,200 water points in the CAR. In 2010 the Water and Sanitation Public Expenditure Review estimated that for 2008 the access rate to safe water was 20 percent in rural areas, assuming 300 users per water point, 25 percent nonfunctioning water points, and 2.5 percent annual population growth.

Other factors underlying these potential differences include the definition of which technologies constitute improved access to water supply and sanitation, and the JMP's use of several household surveys vis-à-vis the use of a single data point by several governments. Therefore, measures of progress toward the Millennium Development Goals (MDGs) and of the spending needed to achieve them might differ according to the data source used.

Source: AICD and World Bank 2010b.

Challenges

The vast majority of the population is barely on the first rung of the water and sanitation ladder with major concerns about quality of service.

Around 70 percent of the population relies on wells and boreholes as the main source of water (table 7), above the average reliance seen in comparable fragile states. The condition of the CAR's wells and boreholes in many cases does not guarantee the provision of safe water. As of 2004 only 10 percent of the wells were disinfected on a regular basis, and the water was safe in only 47 percent of the cases, according to the Ministry of Heath. Furthermore, 92.3 percent of urban households and 98.4 percent of rural households reported not using any form of water treatment (ICASEES 2009). The challenge of improving the quality of water is more pressing when one considers that around one-fourth of the boreholes are out of service and that on average they provide water to 1,500 to 2,000 people—many more than the government's norm of 300 people.

There is a wide disparity in access to safe water between rural and urban populations. At 52 percent of the population, urban access to standposts is 10 times higher than rural access, and at 43 percent, urban reliance on wells and boreholes is half of the level in rural areas (figure 9a). In rural areas, 95 percent of the water comes from boreholes with hand pumps (World Bank, 2010g). If one considers that only 10 percent of the water coming from wells and boreholes is safe, only 14 percent of the rural population has access to safe water versus 61 percent in urban areas. In addition, 43 percent of rural households spend between 30 minutes and 1 hour walking to fetch water versus 25 percent of their urban peers (and water is carried by women 74 percent of the time) (World Bank, 2010g).

Table 7. Benchmarking water and sanitation indicators

	Unit	Fragile states	Central African Republic			Low-income countries
		Mid-2000s	1994	2000	2006	Mid-2000s
Access to piped water	% pop	17.9	2	3	2	9.3
Access to standposts	% pop	9.4	15	19	23	17.1
Access to wells/boreholes	% pop	54.5	73	68	70	39.3
Access to surface water	% pop	18.1	10	9	5	34.2
Access to septic tanks	% pop	11.2	1	1	2	4.7
Access to improved latrines	% pop	29.0	24	24	76	18.3
Access to traditional latrines	% pop	36.8	42	51		38.5
Open defecation	% pop	23.1	33	24	23	38.3
			2000	**2005**	**2009**	
Domestic water consumption	liter/capita/day	29.6	—	6.3	6.5	50.9
Revenue collection	% sales	94.6	61	61	86	94.1
Distribution losses	% production	31.5	39	53	51	34.8
Cost recovery	% total costs	57.2	—	46	—	89.5
Operating cost recovery	% operating costs	80.1	—	64	—	125.2
Labor costs	connections per employee	168.8	63	49	62	175.9
Total hidden costs as % of revenue	%	169	185	187	148	67
		2004	**2009**	Non-scarce water resources		Other developing regions
Average effective tariff	U.S. cents per m^3	57	57	80		3.0–60.0

Source: AICD water supply and sanitation database (http://www.infrastructureafrica.org/aicd/tools/data).

Access figures calculated by the AICD using data from Demographic and Health Survey (1994) and Multiple Indicators Cluster Surveys (2000 and 2006), as published by the WHO/Joint Monitoring Program (JMP) in March 2010.

Note: Domestic water consumption is calculated as a weighted average of the consumption in Bangui and seven other centers served by SODECA. A country is considered to have non-scarce water resources if the renewable internal freshwater resources per capita are greater than 3,000 millimeters.

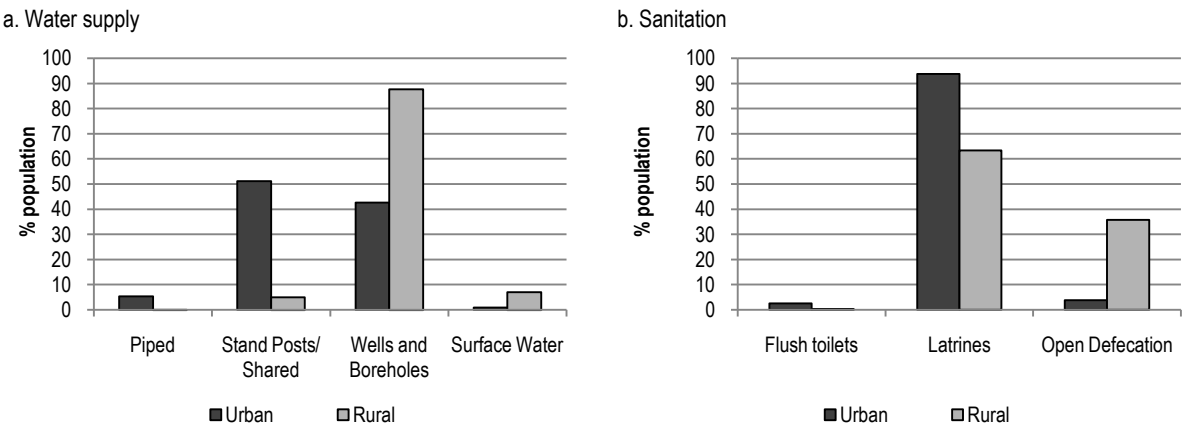
m^3 = cubic meters.

= Data not available.

More than three-fourths of the population relied on latrines as of 2006, but due to data constraints and the difficulty of tracking investments made by nongovernmental organizations (NGOs), it is not possible to make a clear separation between improved and traditional latrines. In rural areas, it is mainly VIP latrines or septic sanplat or double-vented types that are installed by NGOs. Devices for handwashing have been installed in community centers by the Department of Health and NGOs working in the sector (World Bank, 2010g). After 2006 a substantial number of households had access to shared latrines constructed by humanitarian agencies.[7]

[7] Shared latrines have expanded dramatically in recent years: 27 new shared latrines were built in 2007, 5,352 in 2008, and 1,527 in 2009 (World Bank 2010g).

Figure 9. Urban versus rural access to water supply and sanitation, 2006



Source: AICD water supply and sanitation utilities database (http://www.infrastructureafrica.org/aicd/tools/data).
Access figures calculated by the AICD using data from the 2006 Multiple Indicators Cluster Surveys published by the JMP in March 2010.
ß

Availability of utility water in urban areas is extremely low relative to subsistence benchmarks, partly due to deficiencies in water treatment infrastructure. Domestic water consumption is on average 6.5 liters per capita per day, an insufficient amount to satisfy absolute subsistence at 25 liters per capita per day and only one-fifth of the average consumption of other fragile, rich countries (table 7). Whereas in Bangui the consumption is around 10 liters per day, in the other seven urban centers served by SODECA the daily consumption is limited to 5 liters. It is estimated that only 21 percent and 4 percent of the population living in Bangui and the other seven urban centers, respectively, consume the levels required to satisfy basic needs (World Bank 2010g). In view of the insufficient supply of water, there is an urgent need to secure access to chemicals and power for treatment (factors that have contributed to water shortages in the past), as well as to expand the existing treatment capacity, which is inadequate. During the conflict, prices of chemicals for water treatment went up following scarcity. In December 2004 Bangui suffered a total cut of its supply for several days following the delay of an order for chemicals needed to treat raw water. Water supply in the capital depends heavily on expensive electricity produced by ENERCA—itself in a difficult situation—so an energy blackout could stop the supply of drinking water in Bangui in six hours (COWI 2007). A majority of the urban centers served by SODECA have experienced pipe breaks in the water network, lasting a few weeks to several months (World Bank 2010g).

The CAR's provision of utility water is critically affected by SODECA's inefficiencies. It is particularly striking that the utility is losing half the treated water in the network when there is such a shortage of treated water to distribute. Distributional losses are not only more than twice as high as those of a well-performing utility, but also among the highest in Sub-Saharan Africa. Despite an important improvement in collection ratios, SODECA has recovered only 86 percent of the total billing in 2009, which does not compare favorably with utilities in fragile states. At 62 connections per employee, labor productivity is less than half the average productivity of a utility in fragile states and below the benchmark of 200 connections per employee calculated for a well-run utility in Africa. With an average cost-recovery ratio of 43, revenues are not enough to cover total costs. The relatively low average

effective tariff (at 57 cents/m^3)—below the average total cost (at 119 cents/m^3)—calls for the introduction of mechanisms to get consumers to contribute more to the utilities' financial sustainability.

Table 8. Evolution of operational indicators associated with SODECA, Central African Republic

Year	Water delivered	System losses	Collection ratio	Average total cost	Average effective tariff	Total hidden costs	Total hidden costs
	(million m^3/year)	(%)	(%)	($/$m^3$)	($/$m^3$)	($ million/year)	(% revenues)
2000	8.2	39	61	0.87	0.44	4	185
2001	8.3	40	61	0.88	0.42	4	199
2002	9.0	45	61	0.85	0.45	4	185
2003	8.9	44	61	0.91	0.45	5	203
2004	9.3	53	61	1.09	0.64	5	214
2005	9.3	53	61	1.09	0.57	5	187
2006	10.0	48	61	1.01	0.57	5	177
2007	9.9	52	67	1.11	0.57	6	164
2008	9.9	51	83	1.11	0.57	5	166
2009	9.3	51	86	1.11	0.57	5	148

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

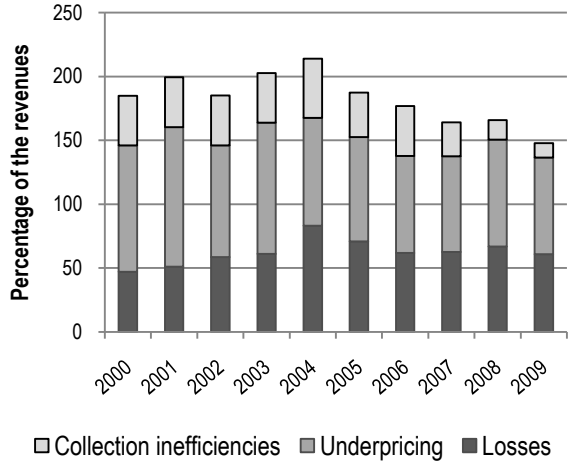
Cost recovery may be complicated by the dominance of flat-rate tariff. Water from kiosks is priced at 207 CFA francs/m^3 (or 44 cents) and has not been adjusted since 1998. Moreover, revenue collection from private taps represents less than a tenth of the customer base. Also, the government represents around 35 percent of the total consumption but is unlikely to pay for months or years. On average, between 2002 and 2008 the arrears accounted for about $7 million, more than twice the utility's revenue for 2008.

Despite recent improvements, hidden costs remain very high relative to benchmarks. Comparing the key performance indicators available for the CAR against those of a well-performing utility provides a quantified, monetary value of the major inefficiencies affecting the sector. Here three types of hidden costs are considered: first, losses on the water distributional network above the norm of 20 percent of production (losses); second, an inability to collect 100 percent of bills (collection inefficiencies); and, third, an average effective tariff that is not high enough to cover the cost of producing a cubic meter of water (underpricing).

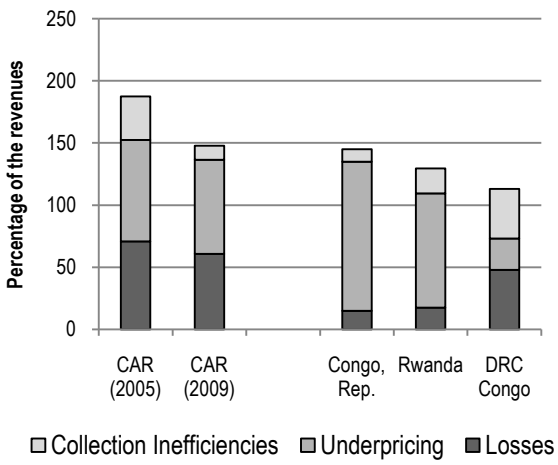
The AICD calculations estimated SODECA's hidden costs at 185 percent of its revenues in 2000, with underpricing accounting for half of the total. Hidden costs reached a maximum of 214 percent of the revenues in 2004, when distributional losses were the highest in the decade, at 53 percent of the production (figure 10a). Since 2005, estimated hidden costs decreased due to improvements in the collection ratio and a decrease in nonrevenue water. But as the average effective tariffs have remained at 57 cents/m^3, the hidden costs have been driven by underpricing (table 8). Whereas in 2005, SODECA's hidden costs were above the average level for utilities in the Central African region (below 150 percent of revenues), as of 2009 SODECA's hidden costs were at the same level of other utilities in Central Africa (figure 10b).

Figure 10. The hidden costs of water supply, as a percentage of revenue

a. Evolution of hidden costs in SODECA



b. Hidden costs of select water utilities



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

Power

Achievements

Important reforms in the CAR's energy sector have been implemented, including market liberalization allowing participation of the private sector. But as of today there is only one operator in the power sector (ENERCA), which produces, distributes, and markets electricity throughout the country. A newly appointed electricity regulator (ARSE) was created, but its capacity is still limited.

Challenges

Years of sociopolitical crisis in the CAR have left the power infrastructure in an embryonic state. Total installed capacity in the CAR is 39 MW, one of the lowest in Sub-Saharan Africa. But the limited infrastructure available is decaying due to scarce maintenance and needs to be completed refurbished. Half of the assets are more than 30 years old. The installed capacity, at 10 MW per million people, is half the average of low-income countries in Sub-Saharan Africa (table 9). The limited generation capacity consists of Boali 1 and Boali 2—the two main hydropower plants—with a capacity of 14.9 MW each, a diesel plant in Bangui with a capacity of 6 MW, an interconnected grid between Boali and Bangui that carries 34 MW of generated power, and a small distribution network. In 2007 the government started construction of Boali 3, an additional 10 MW hydropower plant that is not yet operational.

Further limitations derive from aging infrastructure stock and the pilfering of power equipment. There are frequent breakdowns at power plants, which reduce the supply of already-scarce energy resources—as happened in 2008, when the country faced a power crisis. Boali 2 has been plagued by breakdowns of its power turbines and lost half its generation capacity due to technical failures. Theft of grounding equipment for light has made the transmission network more vulnerable to forces of nature and severely limited transmission capacity.

Table 9. Power indicators, benchmarked against select groups of countries

		CAR	Fragile states	Low-income countries	Middle-income
Access (national)	% of population	**1**	15	33	50
Access (urban)	% of population	**10***	58	86	101
Access (rural)	% of population	**0**	4	4	32
Installed generation capacity	MW per million people	**10**	46	20	799
Electricity consumption	kWh/capita	**27**	165	107	4,479
Power outages	Days/year	**40**	11	10	6
Collection rate	% of billing	**69**	34	92	91
Cost-recovery ratio	% of total costs	**75**	100	89	85
Revenue per unit	U.S. cents per kWh	**13**	3	14	13
System losses	% generation	**48**	40	24	20
Total hidden costs	% revenue	**167**	443	69	0.1
U.S. cents		CAR	Predominantly hydro	Other developing regions	
Effective power tariff	Residential at 100 kWh	15	10.27	5.0–10.0	
Effective power tariff	Commercial at 100 kWh		11.73		
Effective power tariff	Industrial at 50,000 kWh		11.39		

Sources: Fragile and nonfragile countries' figures as of 2005, calculated using the AICD power database (http://www.infrastructureafrica.org/aicd/tools/data), which contains household data. For the CAR, national access is for 2009 (World Bank 2009g), electricity consumption is for 2007 (CIA World Fact Book 2010**)**; power outages are for 2005 (Rosnes and Vennemo 2009); collection ratio is for 2010 (World Bank 2010c); cost-recovery ratio is for 2009 (World Bank 2009f); system losses are for 2009 (ENERCA 2010); effective tariff is for 2008 (World Bank 2009f).

Note: Urban access for the CAR represents access to electricity in Bangui.

kWh = kilowatt-hour; MW = megawatts.

Thermal generation is curtailed by the expensive price of diesel in the CAR. The routes used to transport fuel are expensive,[8] increasing the price of oil in the CAR. At 144 cents per liter of diesel, in 2008 the CAR paid 40 cents more for fuel than Cameroon and 23 cents more than the Democratic Republic of Congo (GTZ 2008). This situation has affected secondary centers that rely on thermal sources for power. Further, Bangui's diesel plant is often strapped for funds and finds itself unable to pay for fuel, limiting power availability.

The limited availability of power translates into poor access to electricity. As of 2009 only 1 percent of the CAR's population had access to electricity compared to 33 percent in low-income countries (table 9). Urban access, at 10 percent and mainly concentrated in Bangui, is just one-ninth of the average access in urban areas found in other low-income countries. No one in rural areas benefits from electrification. Households in the CAR rely on firewood or fuel oil as the main source of energy for domestic

[8] There are two main routes used to transport fuel. The first is a more costly and poor-quality overland route from Cameroon. The second is from Kinshasa. One-fifth of CAR's oil is supplied from the Democratic Republic of Congo via the Oubangui River. River transit was also affected by tensions along the border that disrupted the supply of oil (EIU 2007).

consumption (EIU 2007). Very low population densities in the CAR impose a substantial challenge to expanding access to power.

Consumption of electricity in the CAR is a fraction of its African peers. The available electricity is erratic and unreliable; leading to an estimated 11 gigawatt-hour (GWh) suppressed demand (that is, the difference between so-called notional demand and availability at the going price). Outages in 2006 lasted as much as 950 hours during the year, with an average duration of 5.2 hours (Rosnes and Vennamo 2009). Load shedding cut off power as much as 8 hours a day in 2008 and has reportedly increased to 13.5 hours a day on average (World Bank 2010c). Secondary centers in rural areas are powered by expensive diesel generation (Bernard Kief Consultants 2006).

Limited power availability has wider repercussions throughout the economy. Connecting to the grid is expensive, and firms—most of which are small and informal—wait around 7 months to get a connection to electricity (World Bank 2011b). Obtaining a power connection costs around 52 times the average yearly income per capita in the CAR.[9] Firms' efficiency is handicapped by chronic power shortages and frequent outages, and they have to rely on their own expensive generators. During the power crisis of 2008, power shortages badly impacted SODECA, the CAR's water utility, as it was unable to pump water in some neighborhoods. Hospitals were also impacted by the lack of power. Bangui is said to have come close to facing a serious humanitarian crisis. Meanwhile, the creditworthiness of both the government and sector has deterred investments in the sector. Inadequate resources to reestablish reliable power supply around Bangui—coupled with faulty generation equipment that frequently breaks down, and ENERCA's inability to cover its costs—have led the government to appeal to the international community for resources to rehabilitate the power infrastructure.

The CAR will need to develop 143 MW of additional capacity to fully meet growing demand over the next 10 years.[10] But after the development of Boali 3, the next available plant at Palambo is a full 300 MW site that would require huge investment ($450 million) to develop and would likely support excess capacity for some time. Initial estimates suggest that it might not be possible to export this power, although this possibility would need to be further explored. Another option would be to link the development of the power plant to the expansion of the mining activities in the country.

The CAR's power sector is critically affected by ENERCA's poor performance, a public enterprise characterized by enormous system losses (both technical and nontechnical in nature), an inability to recover operational and capital costs, and low revenue collection rates.

On average a staggering 50 percent of the generated power in the system has been lost every year since 2006. Around 35 percent of the power is lost due to nontechnical factors such as theft. Illegal users

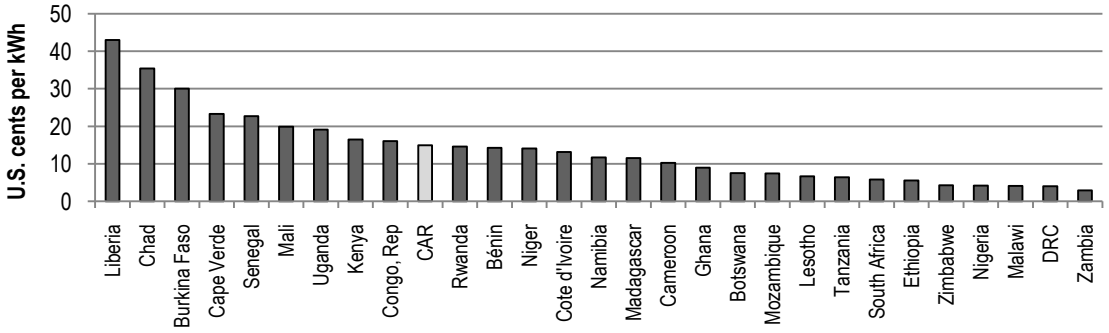
[9] *Doing Business 2011* (World Bank 2011, http://www.doingbusiness.org/data/exploretopics/getting-electricity). The cost to obtain a connection is recorded as a percentage of average income per capita. Costs are recorded exclusive of value added tax. All the fees and costs associated with completing the procedures to connect a warehouse to electricity are recorded, including those related to obtaining clearances from government agencies, applying for the connection, receiving inspections of both the site and the internal wiring, purchasing material, getting the actual connection works, and paying a security deposit. Information from local experts and specific regulations and fee schedules are used as sources for costs. If several local partners provide different estimates, the median reported value is used. In all cases the cost excludes bribes.

[10] These represent investments in the Palambo and Boali 3 plants.

make temporary connections of power at night to avoid detection during the day. The remaining 15 percent of the system losses are due to technical issues. Distribution cables in Bangui are over 40 years old and are made of bare copper. The copper is a rather attractive commodity for looters, and aging cables have been an easy target for illegal connections.

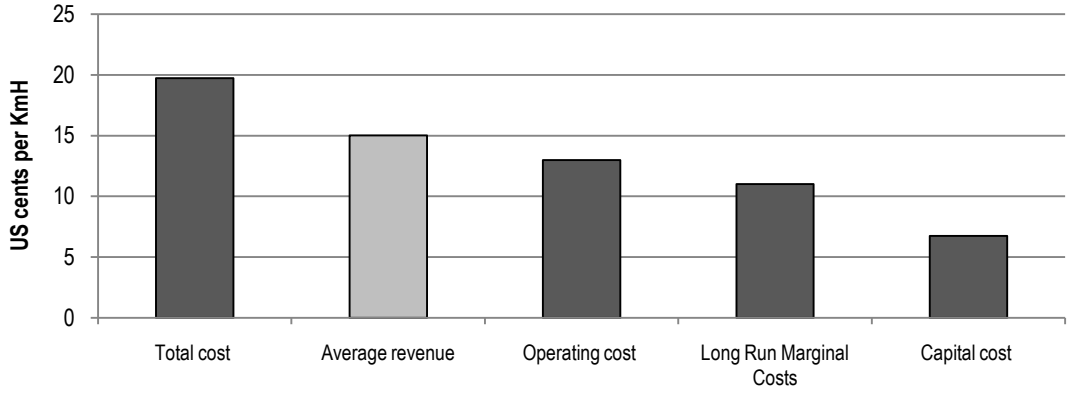
Despite relatively high tariffs, ENERCA has not been able to recover its total cost of production. At 15 cents per kilowatt-hour (kWh), the CAR's consumers pay higher prices than consumers in other African countries that generate power from hydro resources (figure 11). High prices are driven up further by the high costs often associated with the small scale of production, escalation of fuel prices, and regular breaks of the power infrastructure. Historically, ENERCA has only recovered 75 percent of its total cost of around 20 cents/kWh (table 9, figure 12). Underpricing has hindered ENERCA's ability to undertake new investment and refurbish its dilapidated infrastructure. But in the medium term, as the structural problems facing the sector are addressed and new generation capacity comes on stream, long-run marginal costs would likely be on the order of 11 cents/kWh, or within range of existing tariffs (figure 12).

Figure 11. Power prices, benchmarked against other Sub-Saharan African countries



Source: World Bank 2009f; AICD estimates.
Note: Average effective tariff estimates are based on prices paid by domestic and nondomestic customers, weighted by their contributions to total consumption.

Figure 12. ENERCA's average revenue and total costs, 2002–09



Source: Based on Briceño-Garmendia, Smits, and Foster (2009).
Note: Historical cost (both total and operational) is a simple average of ENERCA's cost between 2002 and 2009.

ENERCA's revenue collection ratio has worsened over time, decreasing from 88 percent to 62 percent between 2006 and 2010. A striking 50 percent of the unpaid bills were for public sector entities and administrations related to state and local governments (including the town hall/mayor's office) (ENERCA 2011). The municipality of Bangui accumulated arrears of almost CFAF 7 billion ($7 million) to ENERCA. As of 2009, the government needed to repay its arrears and assume the domestic commercial bank debts of ENERCA. These payments were valued at CFAF 1.7 billion or almost $4 million (IMF 2009). Paying off this balance will allow ENERCA to strengthen its finances.

The large system leakages—compounded by ENERCA's inability to recover power production costs and its undercollection of revenues—have led to vast hidden costs,[11] which have worsened over time both in absolute and relative terms (table 10). The increase in operating costs from 2008 to 2009 was largely circumstantial due to the breakdown of the Boali power plant.

Table 10. Large inefficiencies drain significant potential revenues from ENERCA

Year	Power delivered	System losses	Collection ratio	Average total costs	Average effective tariff	Total hidden costs	Total hidden costs
	(GWh/year)	(% of production)	(% of billings)	($/kWh)	($/kWh)	($ million/year)	(% revenues)
2004	64	50	88	0.14	0.14	5	48
2005	77	57	88	0.16	0.14	8	84
2006	65	55	88	0.15	0.14	7	90
2007	66	53	83	0.12	0.15	6	63
2008	64	57	74	0.15	0.15	7	76
2009	72	48	64	0.20	0.15	14	117

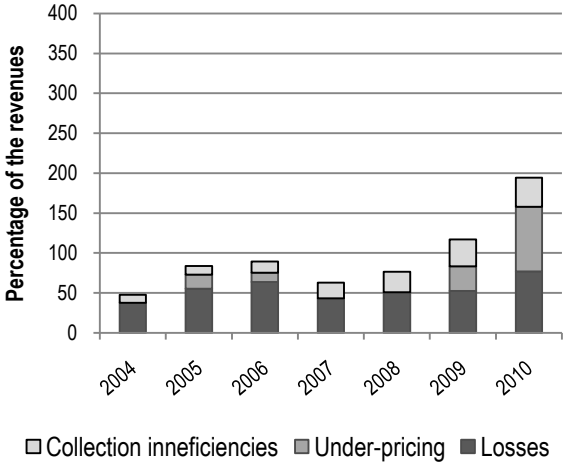
Source: ENERCA 2005, 2006, 2007a, 2007b, 2008, 2011; World Bank 2009f.
Notes: Collection ratios for 2004–05 were not available, so the 2006 ratio was used.

[11] Hidden costs were defined in the WSS section.

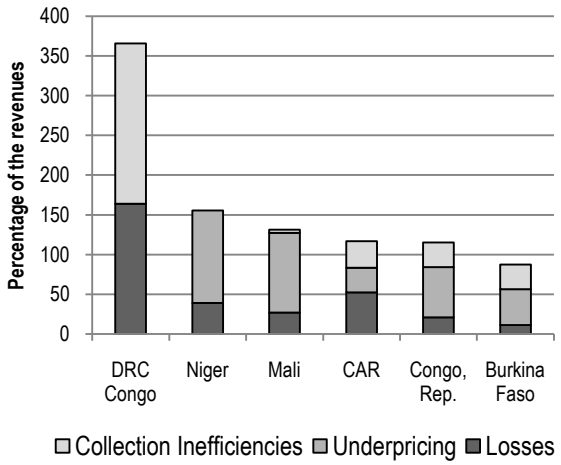
Unaccounted losses (mostly nontechnical) constitute the most obvious challenge, followed by collection inefficiencies. Inadequate bill collection has been an increasing burden for ENERCA in recent years (figure 13a). Relative to other low-income countries in Central and West Africa, however, ENERCA's hidden costs in 2009 were better than several other countries (figure 13b).

Figure 13. Hidden costs, as percentage of revenues

a. ENERCA has massive hidden costs largely due to unaccounted losses



b. Hidden costs are large compared to several countries in Central and West Africa



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

Information and communications technologies

Achievements

The CAR pressed ahead in its commitment to liberalization and private participation with the creation of a legal and institutional environment for the ICT sector. In 1996 the country enacted a telecommunication law that provides for the liberalization of the sector; a new sector regulator started functioning in 2004. This took place in parallel with and in spite of the ongoing conflict, making it an even more remarkable achievement. The country has achieved a genuinely competitive market with no real dominant player, except in the landline market.

Table 11. ICT indicators, benchmarked against Sub-Saharan African fragile and low- income countries

		Fragile states	CAR		Low-income countries
Indicator	Unit	2008	2000	2008/2009	2008
GSM coverage	% population under signal	68	19	50	63
Mobile phone	subscribers/100 people	20.0	0.3	15.2	24.4
International bandwidth	bits/capita	47.2	0.06	3.5[1]	24.8
Internet	users/100 people	2.7	0.06	1.4	3.5
Landline	subscribers/100 people	0.7	0.3	0.2	0.8
		Fragile states	CAR		Low-income countries
US dollars		2008	2002	2009	2008
Price of monthly mobile basket		12.0	—	12.4	11.0
Price of monthly fixed-line basket		16.0	—	13.9	10.4
Price of monthly fixed broadband		72	—	671[2]	287
Price of a call to the United States per minute		0.62	4.53	0.62	0.69
Price of an inter-Africa call per minute		0.74	—	0.62	0.94

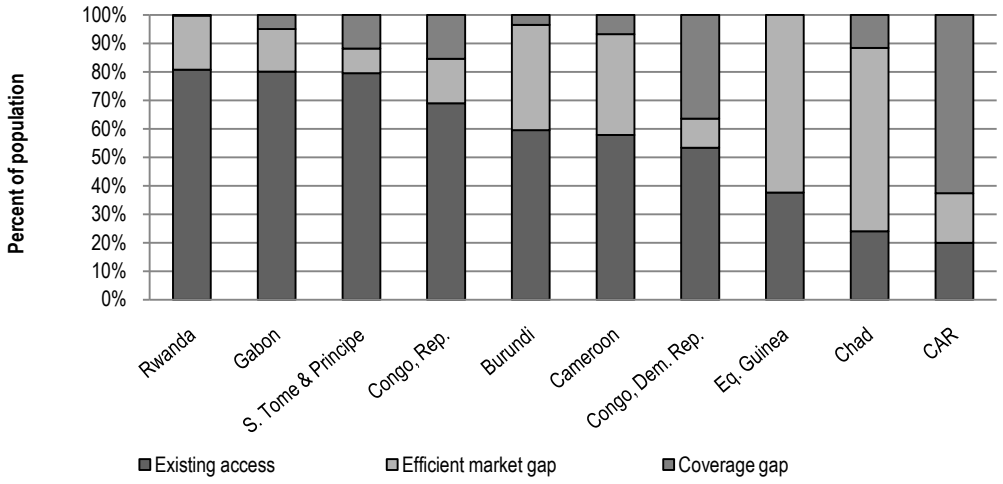
Source: Adapted from AICD, OTH, ART, SOCATEL, Orange, and World Bank ICT At-a-Glance.
[1] = 2007.
[2] = 2010, WiMAX.
— = Data not available.

The country has benefited from a huge expansion in the coverage and access of mobile communications. Mobile penetration rose from 0.3 subscriptions per 100 people in 2000 to 15.2 in 2009, but is still below the rates of fragile states. Nonetheless, with only around half the population covered by a mobile signal,[12] penetration remains behind the levels of comparable Sub-Saharan peers (table 11). The intensification of competition since 2004 and the actions of strategic investors from the Middle East and Europe in mobile operations[13] should help to boost access. But this may be difficult without universal service support, since it is estimated that only around half the population can afford to pay for service (figure 14) (Mayer and others 2009).

[12] Figure refers to the largest mobile operator by subscriptions (Orascom Telecom 2010).

[13] Bintel (a Dubai-registered company) purchased Nationlink, an existing mobile operator in 2007. Likewise, Orascom Telecom of Egypt purchased Telecel, another existing mobile operator, in 2008. France Telecom entered as the fourth mobile operator in 2007 through its Orange subsidiary.

Figure 14. Efficient market gap, benchmarked against Central African countries



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

Note: Existing access represents the percentage of the population currently 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 percentage of the population for whom services are not viable without subsidy.

The presence of multiple operators in the mobile market (table 12) has contributed to the rapid expansion of connections and the impressive drop in prices. Between 2004 and 2009 the number of connections (prepaid and postpaid) increased eightfold, from 60,000 connections to more than 500,000. The price of an international call dropped 50 percent, from $1.20 in 2004 to $0.60 in 2009. The connection charge to a prepaid mobile dropped 76 percent, from $25.60 to $6.30.

Table 12. Players in the ICT sector

Market	Mobile	Internet	Fixed line
Operators	Telecel Centrafrique (1995) Nationlink Telecom (2004) Moov (2005) Orange Centrafrique (2007)	Telecel Centrafrique Nationlink Telecom Moov Orange Centrafrique SOCATEL (ADSL)	SOCATEL

Source: AICD and Agency for Telecommunications Regulation (http://www.art-rca.org).
Note: SOCATEL = Société Centrafricaine des Télécommunications; ADSL = asymmetric digital subscriber line; ICT = information and communications technology.

In 2008 the telecommunications sector contributed 5 percent of the overall GDP and was growing at a rate of about 40 percent per year. The ICT sector is the most significant fiscal contributor in the country and attracted more than $80 million FDI from mobile operators in 2008 and 2009 (World Bank 2009d).

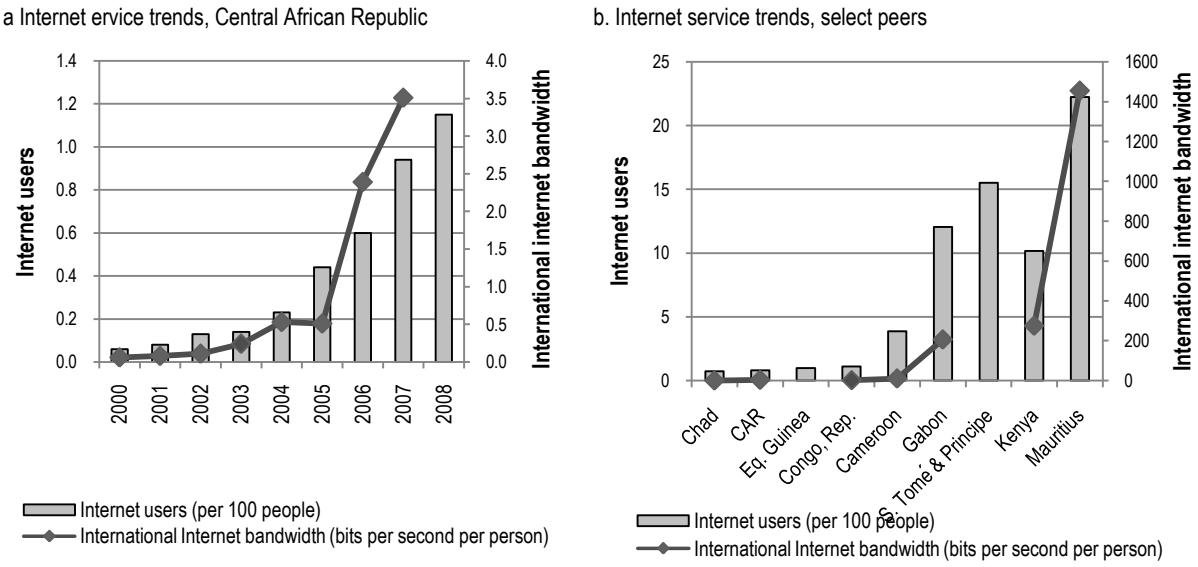
Challenges

A number of factors external to the ICT sector have hindered the CAR's access to and use of modern electronic communications, resulting in relatively high Internet prices and low access (table 11, figure 15). Among other factors, the CAR's poor electricity infrastructure and fiber-optic links are major barriers to the expansion of the ICT sector.

The low level of access to electricity is a major factor constraining telecommunications in the CAR. Only 1 percent of households had an electrical connection in 2009 (10 percent in Bangui) and less than 1 percent of the population owned a computer (Institut Centrafricain des Statistiques, et des Etudes Economiques et Sociale 2009).

Internet costs remain high, pending completion of fiber-optic links to submarine cables. Being landlocked, the CAR is reliant on costly satellite VSAT[14] connectivity for international Internet access. While there has been significant growth in the Internet market, international Internet connectivity, and the number of Internet users (around 3.5 bits per person,[15] or 1.4 users per 100 people; see figure 15a), the CAR's Internet market is one of the least developed in the CEMAC region (figure 15b). The poor condition of SOCATEL's network makes the launch of DSL[16] Internet services unlikely.

Figure 15. Internet market, 2008



Source: World Bank, including AICD analysis.

[14] Very Small Aperture Terminal.

[15] International bandwidth was estimated at between 14 to 16 megabits per second (Mbps) in 2007 (World Bank 2009e).

[16] Digital subscriber line.

Table 13. Submarine cables and competition, ICT prices, 2008

$	Price per minute during peak time		Monthly Internet ADSL[1]
	Region	United States	
Without submarine cable	0.97	0.96	266
With submarine cable	1.07	0.63	89
• Monopoly on international gateway	1.65	1.11	109
• Competitive international gateway	0.45	0.28	65

Source: AICD analysis

Note: [1] 256 kilobyte per second (kbps) connection.

ADSL = asymmetric digital subscriber line; ICT = information and communication technology.

Efforts are under way to establish fiber-optic links to undersea cables landing in neighboring Cameroon,[17] which would help lower prices provided that there is competition in the international gateway (table 13). The creation of a Central African Backbone (CAB) across the CAR, Cameroon, and Chad could provide much of the needed capacity. Estimations suggest that the opportunity cost of providing bandwidth that relies on satellite connection as opposed to the CAB network is estimated at $117 million until 2021.[18] In addition, the economic impact on Cameroon, the CAR, and Chad is estimated at $94 million, out of which $76 million is consumer surplus and $18 million is producer surplus. Despite these potential gains, there are problems surrounding the institutional arrangements and governance of international cable access, which, for instance, impede Chad from using its existing fiber-optic links laid along the Chad-Cameroon oil pipeline. Another identified risk for the CAB is low private sector interest in financing, installing, managing, and maintaining the regional network infrastructure (World Bank 2011a).

Incomplete liberalization and poor infrastructure led to the stagnation of the landline market under state monopoly control. SOCATEL, once partly owned by France Telecom, is now fully state owned[19] and the only player in the fixed-line market. SOCATEL suffers chronic operating losses given its low market share in a competitive sector (about 1 percent of the overall subscribers for the telecommunications fixed and mobile segments) (World Bank 2009d). Fixed-line subscriptions have been stagnant for several years, at about 0.2 subscribers per 100 people (table 11), and 97 percent of the 9,000 existing lines are in Bangui. On average, only 20 new lines per month are connected to the network. Given the shortage of traditional fixed lines, higher levels of ICT access will come through wireless technologies. Recently, Orange launched a wireless broadband service using WiMAX technology, but prices are still high at $671 per month for a 256 kilobyte per second (kbps) connection.

[17] The Central African Republic is one of the first three countries selected for the World Bank's Central African Backbone project which will "support the countries of the Central African region in developing their high-speed telecommunications backbone infrastructure to increase the availability of high-speed Internet and reduce end-user prices" (see http://go.worldbank.org/D1V9Y4SYS0).

[18] Using a discount rate of 13 percent and average annual decrease of satellite connection of 8 percent.

[19] SOCATEL is allegedly facing serious difficulties due to unpaid government bills and disputes over the international gateway (Balancing Act 2010).

Financing an upgrade of the CAR's infrastructure

This section develops a financial framework in which the cost of meeting infrastructure development targets is compared against the existing spending levels and patterns to quantify sector-specific funding gaps and possible financing sources. After estimating the price tag of achieving preestablished sector-specific targets, the section examines infrastructure spending in the period 2002–07, identifying main sources of financing (public sector, private sector, official development assistance (ODA) from the member states of the Organisation for Economic Co-operation and Development, and assistance from non-OECD states), uses of funds for capital, operations and maintenance (O&M), and the relative importance of each sector against the existing budget envelope. Particular focus is given to public spending patterns, as well as to the identification and quantifying of inefficiencies in both on-budget and off-budget public spending. The section then evaluates—sector by sector—the funding gaps and discusses how these gaps might be covered by existing budgetary resources or the extension of the time horizon.

Estimating sectoral spending needs

The cost of achieving the CAR's infrastructure targets, discussed in this section, was estimated using sector-specific models developed within the AICD framework. The infrastructure deficit for each country was calculated using microeconomic models that take into account both growth-related and social demands for infrastructure, and incorporate costs of maintenance, rehabilitation, and expansion. The physical infrastructure targets are the grounds for the set of spending estimates. Starting at 2005, for most sectors a 10-year horizon was used as a timeline for attaining a number of key social targets for broader infrastructure access. Methodologies for estimating spending needs vary according to the characteristics of each sector, as follows:

• *Transport.* The spending needs model for transport is based on a spatial analysis that assesses the costs of linking economic and demographic nodes through transport infrastructures with the objective of achieving regional, national, urban, and rural connectivity. The model identified key geographic and demographic features of each country, using geographic information system (GIS) data to measure the necessary distances. Costs are based on condition, type and standard of investment, and maintenance needs.

• *Irrigation.* The spending needs model for small-scale irrigation combines spatial information on current rain-fed crop production, irrigation potential, and exploitable runoff. The results provide unit revenue increases to be expected with the implementation of small-scale irrigation.

• *Water and sanitation.* This model builds on the standards methodology developed by the Joint Monitoring Program of the United Nations to estimate the cost of meeting the Millennium Development Goals (MDGs) for water and sanitation. Estimates were based on minimum acceptable asset standards. It was assumed that relative prevalence of water and sanitation modalities remain broadly the same between 2006 and 2015, and services are upgraded for only a small segment of customers.

• *Power.* A dynamic model that combined economic growth and electrification targets was used to estimate power spending needs. The model simulated optimal (least-cost) strategies for generating, transmitting, and distributing electricity in response to demand increases. It also estimated the cost of

meeting power demand under a range of alternate scenarios that considered access targets, fuel prices, unit costs of investment, and the feasibility of cross-border trade. The spending needs estimation started by identifying potential generation projects and their rank according to cost effectiveness. Investments included refurbishment of existing capacity for electricity generation and construction of new capacity for cross-border electricity transmission. Spending needs also accounted for the O&M requirements of existing, refurbished, and new assets.

• *ICT.* Spatial models were used to simulate the commercial viability of further expanding coverage of voice and broadband signals into uncovered, mostly rural areas, using GSM and WiMAX technologies. The models considered the cost of network rollout based on topographical factors and local availability of power. They also estimated local revenue potential based on demographic densities, per capita incomes, and estimated subscriber rates. Based on the commercial viability, the models calculated the amount of investment and recurrent spending required to achieve universal population coverage, meet market-driven demand through 2015, and improve cross-border connectivity.

Infrastructure targets for the CAR and their costs

To meet its most pressing infrastructure needs and catch up with developing countries in other parts of the world, the CAR needs to expand its infrastructure assets in key areas. The targets outlined below are purely illustrative, but they represent a level of aspiration that is not unreasonable. They were defined based on the current diagnostics of the quantity and quality of the existing infrastructure of each sector, as discussed in previous sections. Developed in a standardized way across African countries, they allow for a cross-country comparison of the affordability of meeting the targets, which can be modified or delayed as needed to achieve financial balance (table 14).

The CAR needs to achieve transport connectivity with good-quality, one-lane paved roads in fair condition. The country needs to meet the MDGs for water supply and sanitation; that is, to halve the number of people without sustainable access to safe drinking water and basic sanitation by 2015. Infrastructure development targets specific to the CAR in the energy sector include installing 143 MW of new capacity for hydropower generation[20] to increase electrification from 1 percent to 34 percent of the population, which implies increasing the number of connections by a factor of 50—from 6,000 to more than 300,000. Finally, the country needs to establish a fiber-optic link to Chad to later connect to the submarine cable landing in Cameroon.

Meeting the illustrative infrastructure targets for the CAR would cost $349 million per year over a decade.[21] Capital expenditure would account for about 60 percent of this requirement. Transport is the sector with the highest spending needs, requiring $160 million per year. ICT is the sector with the second-highest needs, requiring $86 million per year for the next decade to meet various connectivity targets. Around $55 million per year is needed to meet demand in the power sector. About $47 million will be needed each year to meet the MDGs in the water supply and sanitation sectors. While smaller than what is

[20] As discussed in the power section, for the CAR to achieve this capacity the country would need to build the Boali 3 (10 MW) and Palambo (300MW), and the country would then produce an excess capacity of around 157 MW.

[21] These estimates do not include the river transport subsector.

needed for other sectors, requirements for small-scale irrigation projects are also important, amounting to around $1 million a year (table 15).

Table 14. Illustrative investment targets for infrastructure

	Economic target	Social target
Transport	To connect Bangui, cities with more than 250,000 inhabitants, and border crossings with one-lane paved roads in fair condition [1]	Providing rural road access to the highest-value agricultural land, and urban road access within 500 meters
Irrigation	Develop additional 1,824 hectares of economically viable small-scale irrigation projects [2]	—
WSS	—	Achieving Millennium Development Goals of halving the population without access to improved water and improved sanitation by 2015
Power	Develop 143 MW of new generation capacity to meet national access rate of 34 percent	Increasing national electrification to 34 percent (84 percent urban and 1 percent rural)
ICT	Install fiber-optic links from Bangui (the CAR) to N'Djamena (the CAR) to allow for connectivity to the submarine cable landing in Cameroon.	Providing universal access to GSM signal and public broadband facilities

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

Note:

[1] Regional connectivity is defined as the road network that links national capitals to each other, to all other cities with a population greater than 250,000, to international land borders, and to deep-water ports.

[2] Assuming an internal rate of return of 12 percent.

WSS = water supply and sanitation; ICT = information and communication technology; GSM = global system for mobile communications.
— = Not available.

Table 15. Indicative infrastructure spending needs for 2006–15

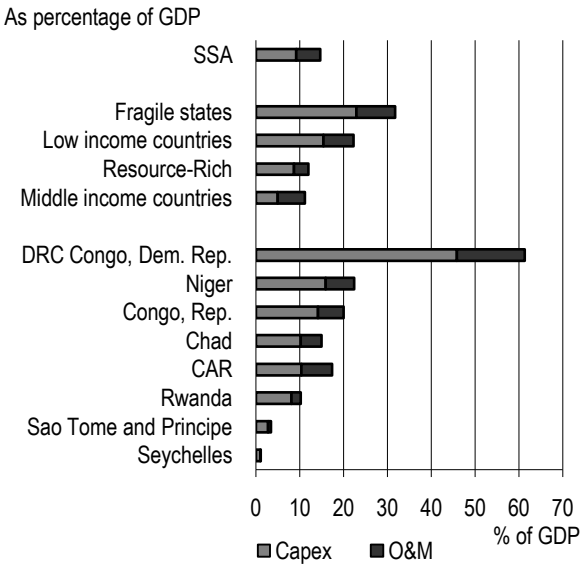
$ million per year

Sector	Capital expenditure	Operations and maintenance	Total needs
Transport	91	69	160
ICT	30	56	86
Power	50	5	55
WSS	37	10	47
Irrigation	1	——	1
Total	208	141	349

Sources: Mayer and others 2009; Rosnes and Vennemo 2009; Carruthers, Krishnamani, and Murray 2009; You and others 2009. Derived from models that are available at http://www.infrastructureafrica.org/aicd/tools/models.
Note: ICT = information and communications technology; WSS = water supply and sanitation.

The CAR's infrastructure spending needs, at 17.5 percent of GDP (using 2009 GDP), are among the average level for Central African countries and lower than comparable fragile states. Capital investment would absorb around 10 percent of GDP, somewhat less than what China invested in its infrastructure during the mid-2000s. Spending needs for O&M account for around 7 percent of the CAR's GDP (figure 16).

Figure 16. Infrastructure spending needs in the regional context



Source: Foster and Briceño-Garmendia 2009.

Note: O&M= operations and maintenance; CAPEX = capital expenditure; GDP = gross domestic product; SSA = Sub-Saharan Africa; the CAR = Central African Republic.

Spending needs in the transport sector are mainly driven by needs in the road sector, in particular in capital expenditure. Whereas road needs account for $158.2 million per year, needs for the air transport sector are only $1.5 million per year (table 16). To ensure regional connectivity, the CAR must have access to the Port of Douala. National connectivity is provided by a transport network that links each country's provincial capitals and cities with a population of at least 25,000. High capital expenditure on transport is justified by substantial upgrades of the road sector ($81.2 million per year). O&M needs are calculated assuming that all transport infrastructure is maintained in fair condition.

Table 16. Transport needs

$ millions per year

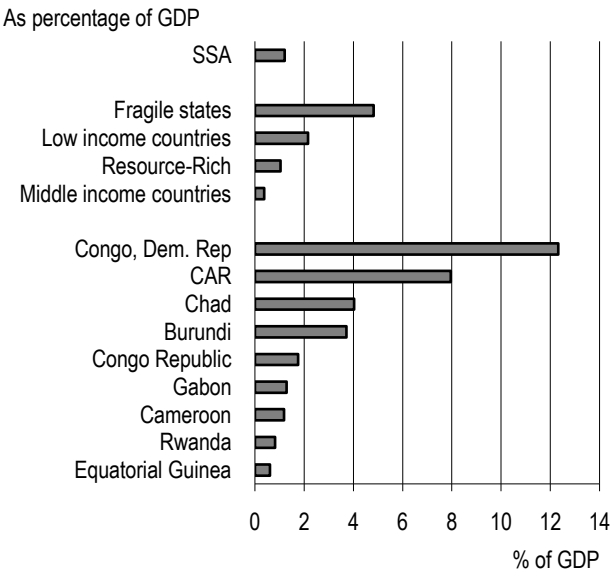
	Improve condition	Upgrade category	Expand capacity	Capital	Operations and maintenance	Total
Roads	8.2	81.2	0.2	89.6	68.6	158.2
Regional	1.4	42.5	0	43.9	17.9	61.8
National	0.3	35.4	0.2	35.9	14.3	50.2
RAI	0.3	3.3	0	3.6	32	35.6
UAI	6.2	0	0	6.2	4.4	10.6
Airports	0	1	0	1	0.4	1.5
Total	8.2	82.2	0.2	90.6	69.1	159.7

Source: Carruthers, Krishnamani, and Murray 2009.

Note: RAI= Rural accessibility index; UAI= Urban accessibility index

Spending requirements in the transport sector would absorb 8 percent of the GDP, above the average requirement for low-income countries (4.8 percent assuming a similar scenario).[22] Compared to the needs of Central African peers, the CAR's transport needs are the highest after the Democratic Republic of Congo (figure 17).

Figure 17. Transport spending needs compared to Central African peers



Source: Carruthers, Krishnamani, and Murray 2009.
Note: O&M= operations and maintenance; CAPEX = capital expenditure; GDP = gross domestic product; SSA = Sub-Saharan Africa; CAR = Central African Republic.

Spending needs in the CAR's ICT sector, at $86 million per year, are the second largest. Most are associated with voice services ($54 million), in particular O&M of the existing network. Spending needs related to broadband provision account for around $ 29 million per year. Extending the ICT backbone would cost around $3 million per year (table 17).

The CAR's power spending needs amount to $55 million per year, or 2.7 percent of GDP. The overall cost of developing the power system appears high, but not unattainable. Raising electrification levels to meet national electrification targets (34 percent of the population) would entail a commitment of $50 million per year, mainly for expanding the existing generation capacity by 143 MW (table 18); 18 MW needs to be refurbished.

Table 17. ICT spending needs

$ millions per year

	New investment	Rehabilitation	Capital	Operations and maintenance	Total
Voice	14	1.5	15.5	39	54
Broadband	10	1.5	11.5	18	29
Backbone	2	1	3	1	1
Total	26	4	30	56	86

Source: Carruthers, Krishnamani, and Murray 2009.

[22] Taking into account the burden of transport spending needs, a pragmatic scenario rather than a basic scenario is assumed. For more details on the differences among scenarios (Carruthers, Krishnamani, and Murray 2009).

Table 18. Power spending needs

$ millions per year

	Expansion	Rehabilitation	Capital	Operations and maintenance	Total
Generation	28	1	29	3	32
Hydro	28	1	29		
Transmission and distribution	20	1	21	2	23
Distribution grid	1				
Urban connection	19				
Total	48	2	50	5	55

Source: Rosnes and Vennemo 2009.

The CAR needs to spend about $47 million per year (or 2.4 percent of the GDP) to meet the MDG of halving the percentage of people without access to improved water and improved sanitation. These estimates assume that the new customers will be provided with middle-range water supply and sanitation modalities. In particular, in urban areas, new customers will be using standposts and ventilated-improved-pit (VIP) latrines; in rural areas, new customers will rely on wells, boreholes, and traditional latrines. As a result, no expansion of upper-end modalities such as piped water supply or sewer connections is envisaged. As the current provision of improved services is low, the CAR needs to make an effort to expand and rehabilitate water supply and sanitation assets, at an estimated cost of $36.6 million per year. The O&M of existing service would require spending about $10.5 million per year (table 19).

Table 19. Water supply and sanitation spending needs

$ millions per year

	Expansion	Rehabilitation	Capital	Operations and maintenance	Total
Water supply	14.4	10.2	24.6	8.0	32.7
Sanitation	5.6	6.3	12.0	2.5	14.4
Total	20.1	16.5	36.6	10.5	47.1

Source: AICD water supply and sanitation spending needs model, 2010.

To expand the irrigated land by 1,824 hectares through small-scale projects, the CAR would need to spend about $1 million per year. The total spending needs for the irrigation sector were calculated assuming an IRR cutoff of 12 percent and the investment required for additional land, plus requirements for the rehabilitation and maintenance of existing irrigation infrastructure (recall table 6 in the irrigation section).

Spending allocated to address infrastructure needs

When all traceable financing sources—public sector, private sector, ODA, and non-ODA—are put together, existing spending in infrastructure amounts to $134 million per year (table 18). The public sector has the lion's share of infrastructure spending, at about two-thirds of total funds ($87 million). The remaining third is sourced externally, mainly by ODA ($43 million), and to a smaller extent, by the private sector ($4.5 million). There are no data on spending by non-OECD financiers in the CAR.

Table 20. Financial flows to infrastructure

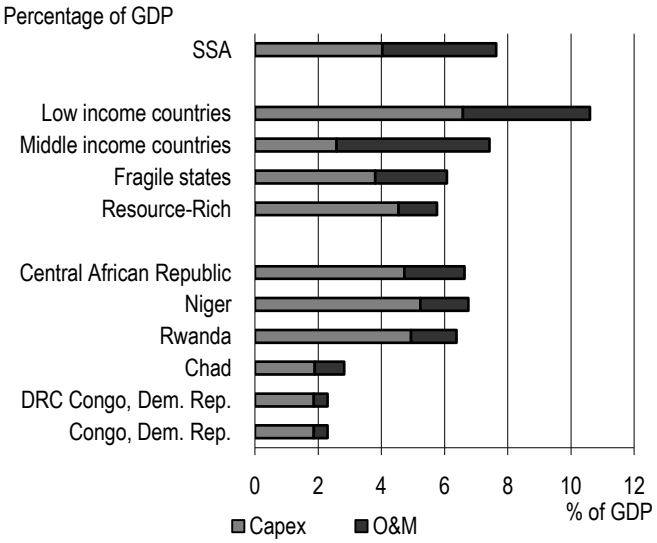
$ millions per year

	Operation and maintenance	Capital expenditure					Total spending
	Public sector	Public sector	ODA	Non-OECD financiers	PPI	Total capital expenditure	
ICT	2.5	0.1	2.7	0.0	4.5	7.3	9.8
Irrigation	—	—	0.0	0.0	0.0	0.0	0.0
Power	10.1	11.3	4.0	0.0	0.0	15.3	25.5
Transport	23.1	35.3	29.2	0.0	0.0	64.6	87.6
WSS	3.2	0.9	6.7	0.0	0.0	7.6	10.8
Total	38.9	47.7	42.6	0.0	4.5	94.8	133.7

Source: Derived from Foster and Briceño-Garmendia (2009).
Note: Public sector spending includes central government spending (on-budget) and state-owned enterprise (SOE) spending. Non-OECD financiers include China, India, and the Arab countries.
Financial flows for on-budget government spending are the average of budgeted amounts for 2008–09; various periods are covered in each case to maximize data availability for SOEs; 2008–09 average of disbursement is taken in the case of external financiers (ODA, non-OECD, and PPI).
ODA = official development assistance; PPI = private participation in infrastructure; OECD = Organisation for Economic Co-operation and Development; Capex = capital expenditure; ICT = information and communications technology.
— = Not available.

In terms of GDP share, the CAR's existing infrastructure spending is already quite substantial. It devotes around 7 percent of GDP to spending on economic infrastructure. While this is the most among countries in Central Africa and higher than the average for fragile states (figure 18), it is only half of the 14 percent of GDP that China has systematically invested in infrastructure over the past two decades. That said, the CAR's spending level represents an important effort relative to the size of its economy and a still-precarious revenue base as the country emerges from conflict.

Figure 18. Existing infrastructure spending in a regional context



Source: Foster and Briceño-Garmendia 2009.
Note: O&M= operations and maintenance; Capex = capital expenditure; GDP = gross domestic product; SSA = Sub-Saharan Africa; the CAR = Central African Republic.

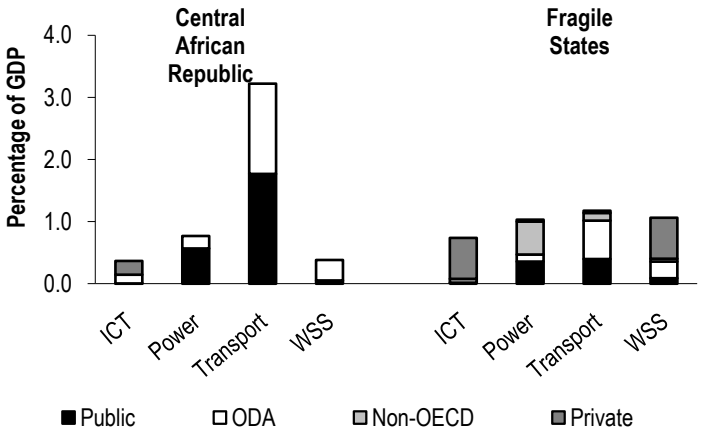
Infrastructure spending is skewed toward capital investment (figure 19). Expenditure on the rehabilitation and expansion of the existing network absorbs about three-fourths (or $95 million) of the total financial flows to infrastructure in the CAR. Operating expenditures account for the remaining one-fourth (or $39 million) (table 20).

Operating expenditure in the CAR is entirely covered by budgetary resources and payments from users recovered by the stated-owned enterprises (table 20). The transport sector receives around half of the total O&M financing flows, mainly channeled to the road subsector.

Financing of capital expenditure is mainly from the public sector. Close to 50 percent of capital expenditure funding comes from the public sector, from central and state governments, and public enterprises. ODA accounts for 44 percent of total capital flows to infrastructure. Private sector flows account for just 5 percent of total capital investment, suggesting that the PPI potential, even in the ICT sector, is hardly tapped in the CAR. It is worth noticing that these figures do not capture the amounts invested by NGOs, which might be particularly important in some sectors, such as sanitation. Relative to comparable peer states, the CAR is more reliant on public investment in the power and transport sectors (figure 19). Most of the capital flows to the ICT sector in the CAR come from the private sector, followed by ODA.

Figure 19. Patterns of capital investment in infrastructure benchmarked against comparator countries

Investment in infrastructure sectors as percentage of GDP, by source

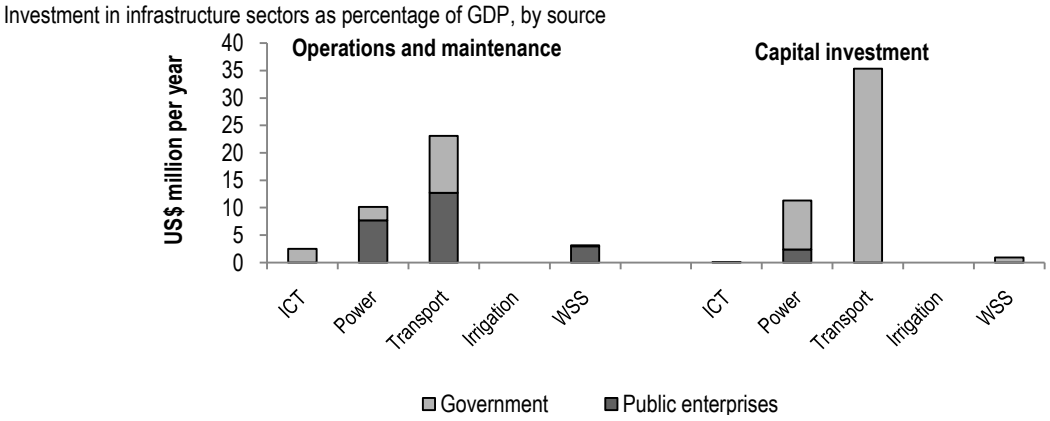


Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).

Note: Private investment includes self-financing by households. Non-OECD financiers include China, India, and the 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.

Public spending is mostly channeled through the central government, in particular capital investment. It is particularly striking that the transport and water supply and sanitation sectors do not report any significant capital investments financed from own sources. Operating expenditure, on the other hand, is largely channeled through public enterprises. SODECA finances around 85 percent of the total O&M spending in the water supply and sanitation sectors. Spending by ENERCA represents 75 percent of the O&M funds allocated by the public sector in power. The road fund finances around 50 percent of the total O&M made by the public sector in transport (figure 20).

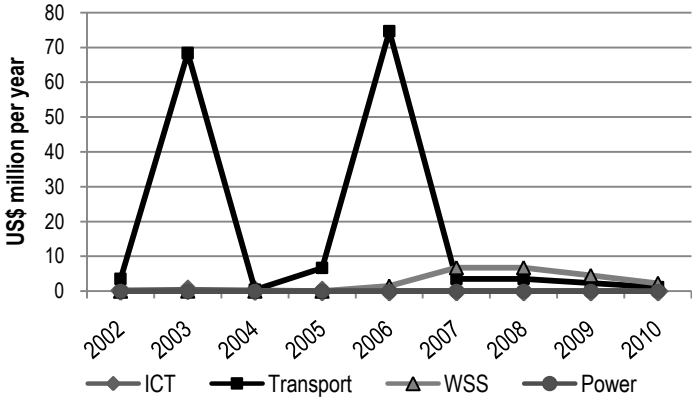
Figure 20. Patterns of public spending on infrastructure



Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).
Note: GDP = gross domestic product; ICT = information and communications technology; WSS = water supply and sanitation.

ODA flows to the CAR averaged $42.6 million per year and were mainly channeled to the transport sector. But while ODA to the transport sector has been volatile over time, the other sectors have experienced different trends. The power sector received some development assistance in 2006 but it was minimal. ODA flows to the ICT sector have been rather constant, at about $0.1 million per year. Notably, the water supply and sanitation sector has attracted an important flow of ODA resources since the end of the conflict, reaching a peak of $6.8 million in 2007 and 2008, and declining since (figure 21).

Figure 21. ODA commitments by sector

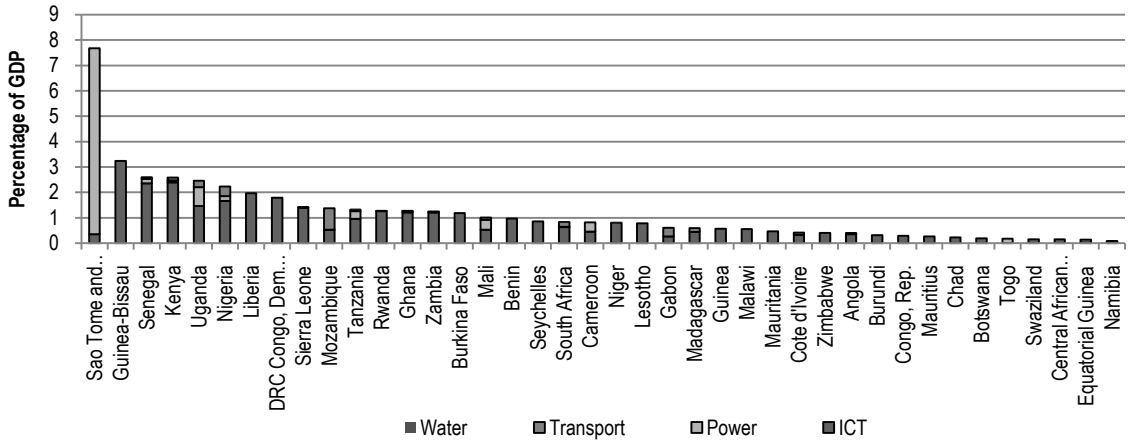


Source: AICD Fiscal Matrix 2011.
Note: ODA = official development assistance; ICT = information and communications technology; WSS = water supply and sanitation.

The CAR has attracted very little private finance into infrastructure investment compared with its African peers. In fact, before 2007 the country did not attract any private investment. In 2007, $12 million went to the ICT sector, primarily for the mobile sector. Between 2008 and 2009 the CAR received just $4.5 million per year on average (table 20). Many African countries have done significantly better in this area (figure 22). Notable is the absence of private investments in the power and transport sectors. Countries such as the Democratic Republic of Congo, Liberia, Nigeria, Uganda, Kenya, and Senegal have captured between 1.8 and 2.5 percent of GDP. But in 2008 and 2009 the ICT sector attracted more than $80 million in foreign direct investment (FDI), most of it from mobile operators (World Bank 2009d).

Figure 22. Private investment in the Central African Republic and select African countries

Average per year between 2002 and 2007



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

The transport sector accounts for the largest of total annual financial flows to infrastructure in the CAR (60 percent, table 20). Spending on maintenance and rehabilitation in the transport sector is only one-fourth of total financial flows to the sector. Evidence suggests that countries that spend too little on maintenance will end up with larger rehabilitation liabilities, often resulting in the need for emergency works to restore the functionality of critical infrastructure. On the other hand, countries with large investment programs may have fewer resources left over to address road maintenance needs. This is a worrisome finding because if high capital spending comes at the expense of lower maintenance expenditure, then the condition of the network will only deteriorate over time (Gwilliam and others 2009). The transport sector is significantly reliant on ODA funds, which are mostly allocated to this sector (figure 19, table 20). On average around 45 percent of financial flows to transport come from ODA. The high volatility of ODA flows has contributed to the volatility of public investment in the sector. ODA commitments were reduced during the conflict and reached their peak in 2006, when the peace agreements were signed. After 2006 ODA commitments to the sector were severely reduced and have been stagnant since (figure 21).

Spending in the power sector ($26 million) is evenly distributed between capital investment and the O&M of existing assets. Most of the spending in ICT ($13 million) has been devoted to capital investments as the greatest expansion of ICT services has taken place since the end of the conflict (table 20).

Resources in the water and sanitation sectors have been mainly channeled to financing capital investment. Total financial flows to the water supply and sanitation sectors averaged $10.8 million, of which about $7.6 million was dedicated to capital investment (table 7).

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

Around $34 million of additional resources could be recovered each year by improving efficiency (table 21). Capital budgets' low ratios of execution point the way to an easy and budget-neutral increase in public investment—if only execution ratios can be raised. The CAR could expand its resource envelope by $14 million per year if it raises its budget execution ratios.

Reducing inefficiencies in infrastructure operations is also a practical and realistic way of making more resources available for infrastructure in the CAR. While the CAR needs to devote considerable effort to improving infrastructure, it is also severely constrained in what it can spend. The CAR has trouble raising domestic revenue and reallocating revenue from other uses that might require structural reforms. By contrast, efficiency improvements (that is, the reduction of distributional losses and the undercollection of bills) could enlarge the CAR's availability of funds by $12 million per year, or around 11 percent of the current spending flows to infrastructure (table 21). Distributional losses in power cost $6 million per year, and another $2 million in the water sector. Undercollection of bills for electricity services could save another $4 million.

Increasing tariffs to cost-recovery levels could save further $6 million per year: $4 million in power and $2 million in the water sector.

Looking across sectors, power offers the greatest savings—up to $22 million per year—by tackling the inefficiencies of ENERCA and reallocating resources within the sector.

Table 21. Potential gains from greater operational efficiency

$ million per year

	ICT	Irrigation	Power	Transport	WSS	Total
Low budget execution	0	—	3	10	—	14
Distribution losses	n.a.	n.a.	6	n.a.	2	8
Undercollection	n.a.	—	4	—	0	4
Underrecovery of costs	n.a.	—	4	—	2	6
Reallocation potential within sector	0	0	5	0	0	5
Total	0	0	22	10	5	37

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

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

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

Raising capital budget execution

Budget underexecution is a significant issue in the transport sector, leading to the underspending of about $14 million in available funds annually. In particular, in the transport sector underexecution of the budget leads to an average loss of $10 million per year.

Reducing distributional losses and utilities' undercollection of bills

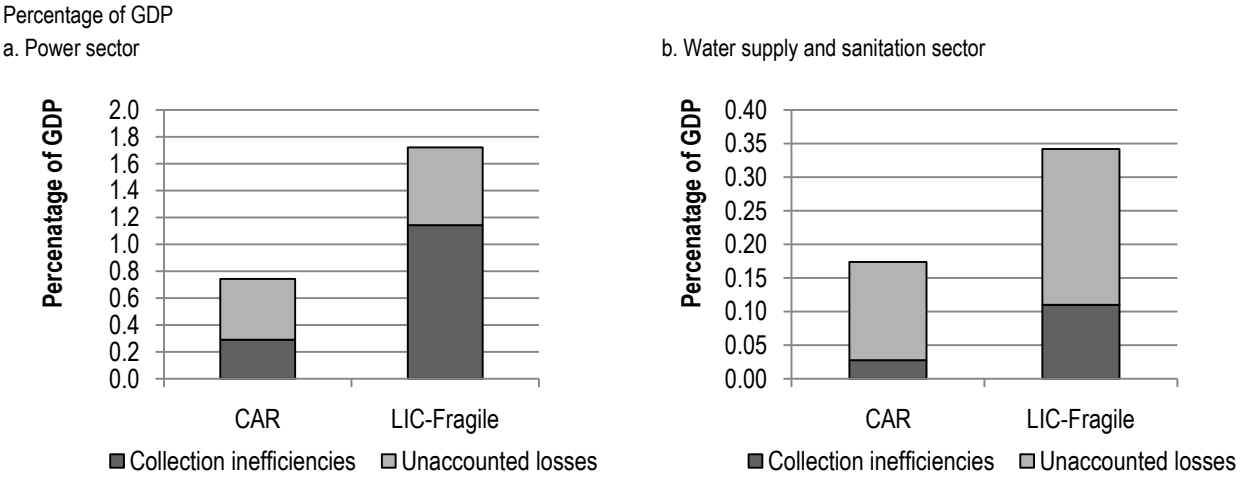
ENERCA suffers from high power losses and low bill-collection efficiency. In 2009 ENERCA's distributional losses, at 48.3 percent of production, were almost five times the best-practice 10 percent benchmark. If transmission and distributional losses were tackled, it could result in $6 million savings

(0.19 percent of GDP). Another $4 million (or 0.3 percent of GDP) per year could be saved by raising bill-collection efficiency from 64 to 100 percent.

Operational inefficiencies are also present in the water supply sector and cost the CAR about $2 million a year, equivalent to 0.12 percent of GDP, with distributional losses responsible for about 85 percent of the hidden costs and collection inefficiencies for about 15 percent. The CAR could avoid this cost by reducing nonrevenue water from 51 percent to the 20 percent benchmark of a well-functioning utility.

If the CAR tackles the operational inefficiencies in the power and sanitation sector it could expand the budget envelope by 0.62 percent of GDP, which is equivalent to almost 70 percent of the contribution of infrastructure to the CAR's economies during the earlier 2000s. The burden of operational utility inefficiencies in the CAR is lower than for the benchmark countries (figure 23).

Figure 23. Uncollected bills and unaccounted losses in power and water utilities, 2009



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

Improving cost recovery from user charges

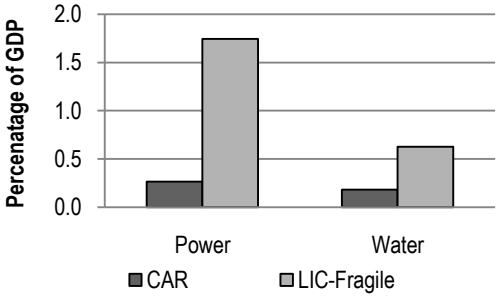
Underpricing of power costs the CAR about $4 million each year, or around 0.3 percent of the country's GDP. If compared with the rest of Africa, where underpricing of power is commonplace, the CAR's power utility ENERCA is doing better than other fragile, low-income countries. It is estimated that the average total cost of producing electricity has been $0.20 per kWh in the CAR, while the average effective tariff stood at $0.15, as of 2009 (figure 24).

In the water sector, average tariffs charged by SODECA, the CAR's water utility serving Bangui and seven urban centers, stand at $0.57/m^3 versus an estimated $1.1/m^3 average cost-recovery tariff. The consequent macroeconomic burden of undercharging for water services—at 0.12 percent of GDP—is somewhat lower than that for power (0.18 percent of GDP) and is comparatively lower than in other fragile states. Furthermore, underpricing is the major inefficiency driving up SODECA's hidden costs.

Because of inequitable access to power and water services in the CAR, subsidized tariffs are highly regressive. Close to 100 percent of people with electricity or piped water connections belong to the top 20 percent of the expenditure distribution; such connections are nonexistent for poorer households (figure 25). Only the richest quintile has access to piped water. Most of the poorest quintiles still rely on surface water. This inequitable distribution of connections virtually guarantees that any price subsidy to these services will be extremely regressive.

Figure 24. Underpricing of power and water in the Central African Republic and comparator countries

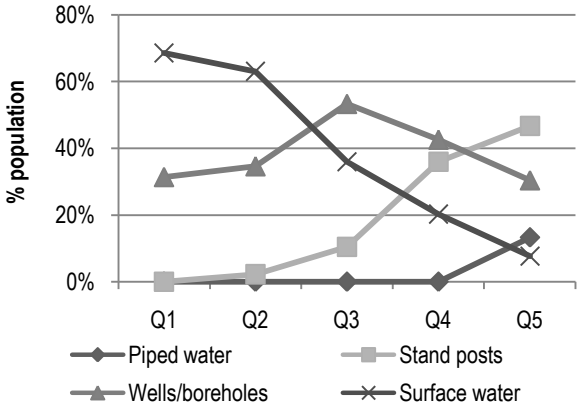
Financial burden of underpricing, as percentage of GDP



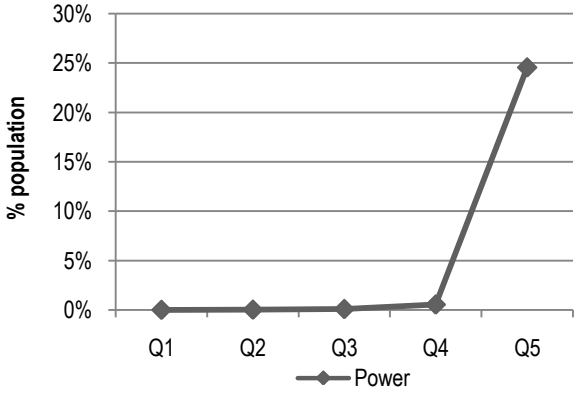
Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).

Figure 25. Consumption of infrastructure services is highly differentiated by budget, 2006

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.

Reallocating existing spending within sectors

About $5 million more than the estimated O&M requirements in the power sector is spent each each year. This could be better allocated toward the expansion and rehabilitation of the existing network. According to estimates, the CAR needs to spend around $5 million per year on power O&M (see table 15) but in fact is spending about $10 million (recall table 20).

Annual funding gap

The CAR's infrastructure funding gap amounts to $183 million per year, or about 9 percent of GDP, once efficiencies are captured. While much of this gap is found in the transport and ICT sectors, accounting for about 75 percent, the water supply and sanitation sectors account for 17 percent of the funding gap and the power sector for the remaining 7 percent (table 22).

Table 22. Funding gaps by sector

$ million per year

	ICT	Irrigation	Power	Transport	WSS	Total
Spending needs	(86)	(1)	(55)	(160)	(47)	(349)
Existing spending*	10	0	20	88	11	129
Efficiency gains	0	0	22	10	5	37
Funding gap	(76)	(1)	(13)	(62)	(31)	(183)
Reallocation potential across sectors	0	—	0	0	0	0

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 will be applied toward other infrastructure sectors.

— = Not available.

*traced to needs.

**Assuming complete fungibility across sectors.

As can be seen in table 22, the size of the efficiency gains are equivalent to only about 17 percent of the total funding gap, suggesting that to meet infrastructure targets the country needs to scale up the size of its infrastructure to boost economic growth and provide basic services to its population. This finding concurs with the earlier discussion of the potential contributions of infrastructure to annual per capita growth, where it was established that most of the growth gains would be due to faster accumulation of infrastructure assets.This point also coincides with one of the pillars of the CAR's poverty reduction strategy, which places the emphasis on building new assets.

The infrastructure funding gap is almost equally divided between capital investment and O&M (table 23). The water supply and sanitation sectors, and—to a lesser extent—the ICT and transport sector have important gaps in funding capital expenditure. The largest funding gap for O&M is found in the ICT sector ($50 million), followed by the transport sector ($39 million).

Table 23. The size and the composition of the funding gap by sector, O&M and capital

$ million per year

	Capital expenditure gap	Operation and maintenance gap	Total funding gap
ICT	23	50	73
Irrigation	—	—	0
Power	18	0	18
Transport	22	39	62
WSS	25	6	31
Total	88	96	183

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

Note: WSS = water supply and sanitation; ICT = information and communication technology; O&M = operations and maintenance.

What else can be done?

Extending the time horizon, prioritizing spending, and tapping resources outside the budget are alternatives to the poor budgetary situation of the government.

More time

Extending the time horizon for meeting the infrastructure targets beyond the illustrative 10-year period is considered here. Simulations suggest that in a scenario in which a country is unable to raise additional finance, the identified infrastructure targets could be achieved within a 40-year horizon

provided that operation and financial inefficiencies are tackled. But without stemming inefficiencies, the existing resource envelope would not suffice to meet power infrastructure targets in the foreseeable future.

Prioritizing infrastructure spending

Given the size of the funding gap, the CAR will need to be strategic in its prioritization of infrastructure investments. The sector analysis points to several such priorities:

- Ensure existing assets are maintained.
- Refurbish existing power and water infrastructure to functioning order.
- Take measures to reduce international transport costs and, in particular, the price of diesel, in collaboration with the Republic of Congo and Cameroon.
- Try to link power sector development to mines.
- Reduce telecommunications prices by prioritizing the ICT backbone.
- Change how expansions of sanitation services are financed, with the goal of reducing the burden on government (for example, through community-led total-sanitation programs).

Exploring other sources of financing

The size of the funding gap calls for tapping sources outside of the budget. Under realistic assumptions of the scope for spending efficiency gains, there is still a considerable financing gap for infrastructure development in the CAR. Finding additional resources from outside the budget would bring additional benefits beyond tapping additional financing sources.

To this end, creative cross-border financing mechanisms (such as for power generation and transmission investments) as well as joint transport projects (such as the Bangui-Doula and Bangui-Brazzaville corridors) are desirable. Attracting private sector investment in the CAR's infrastructure sectors would bring critical technical and managerial know-how on infrastructure development and service delivery. But involving the private sector more would require reforms to the legal and regulatory framework.

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

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AICD
AFRICA INFRASTRUCTURE COUNTRY DIAGNOSTIC

About AICD and its country reports

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

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

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

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

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

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

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

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

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

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