AICD

AFRICA INFRASTRUCTURE COUNTRY DIAGNOSTIC

COUNTRY REPORT

Zimbabwe's Infrastructure: A Continental Perspective

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Africa's Infrastructure | A Time for Transformation

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About AICD and its country reports

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

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

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

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

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

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

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

Financing for the AICD is provided by a multidonor trust fund to which the main contributors are the United Kingdom's Department for International Development (DFID), the Public-Private Infrastructure Advisory Facility (PPIAF), Agence Française de Développement (AFD), the European Commission, and Germany's Entwicklungsbank (KfW). A group of distinguished peer reviewers from policy-making and academic circles in Africa and beyond reviewed all of the major outputs of the study to ensure the

technical quality of the work. The Sub-Saharan Africa Transport Policy Program and the Water and Sanitation Program provided technical support on data collection and analysis pertaining to their respective sectors.

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

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

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Acknowledgments

This paper draws up contributions from sector specialists from the Africa Infrastructure Country Diagnostic team: notably, Heinrich Bofinger on air transport, Alberto Nogales on roads, Rupa Ranganathan on power, Michael Minges on information and communication technologies, Nataliya Pushak on public expenditure, and Alvaro Federico Barra on spatial analysis.

The paper is based on data collected by local consultants and from feedback provided by colleagues in the Senegal country team: notably, Moctar Thiam; Alain D'hoore; Mamadou Ndione; Jean Philippe Tre and Manievel Sene (irrigation); Stephan Garnier and Philippe Durand (energy); Pierre Pozzo di Borgo, Lucien Andre Aegerter, Ibou Diouf, and Christian Diou (transport); and Matar Fall and Pierre Boulanger (water).

Synopsis

Despite general economic decline and power supply deficiencies, infrastructure made a modest net contribution of less than half a percentage point to Zimbabwe's improved per capita growth performance in recent years. Raising the country's infrastructure endowment to that of the region's middle-income countries could boost annual growth by about 2.4 percentage points.

Zimbabwe made significant progress in infrastructure in its early period as an independent state. The country managed to put in place a national electricity network and establish regional interconnection in the power sector; to build an extensive network of roads for countrywide accessibility and integration into the regional transport corridors; to lay the water and sewerage system; and to make progress on building dams and tapping the significant irrigation potential. Unfortunately, at present the cross-cutting issue across all these sectors is Zimbabwe's inability to maintain and rehabilitate the existing infrastructure since the country became immersed in economic and political turmoil in the late 1990s. Neglect of all sectors due to the crisis has resulted in a generalized lack of new investment (in the power and water sectors in particular), and the accumulation of a huge rehabilitation agenda. Quality of service has declined across the board. The power system has become unjustifiably costly, inefficient, and unreliable. The condition of roads has deteriorated to the point that Zimbabwe became a bottleneck on the North–South transport corridor. Rural connectivity hardly exists. Failure to treat potable water, along with the deterioration of the water, sanitation, and garbage disposal systems, was responsible for the spread of cholera in 2008. By 2010 cholera affected most areas of the country and posed a health threat to neighboring countries.

Looking ahead, Zimbabwe faces a number of important infrastructure challenges. Zimbabwe's most pressing challenges lie in the power and water sectors. Inefficient and unreliable power supply poses major risks to the economy, while the maintenance and upgrading of existing power infrastructure no longer looks to be affordable. At the same time, overhauling the water and sewerage system is imperative for curbing the public health crisis.

With respect to regional integration, Zimbabwe must improve the condition of the international road corridors that pass through its territory, along with reducing transit costs and transit time, to gain the most from its strategic location in the heart of the southern Africa region and its proximity to the region's largest economy and trading partner: South Africa.

Addressing Zimbabwe's infrastructure challenges will require sustained expenditure of almost $2 billion per year over the next decade, with heavy emphasis on rehabilitation; more than half is needed for the power sector. This overall level of spending would represent 46 percent of gross domestic product (GDP),[1] one of the largest infrastructure burdens for any African country. Investment alone would absorb 31 percent of GDP, roughly twice the unprecedented infrastructure investment effort made by China during the 2000s. Even if measured in terms of average precrisis GDP, the overall infrastructure spending needs would absorb some 30 percent of GDP.

[1] Estimated 2009 GDP of $4.397 billion (www.imf.org/external/np/sec/pn/2010/pn1062.htm).

Given the magnitude of the burden, some less ambitious infrastructure spending scenarios were also considered. An intermediate scenario considers a somewhat less ambitious set of infrastructure targets and greater reliance on lower-cost technologies and brings the overall spending needs down to $1.7 billion annually, which would still represent about 39 percent of the 2009 GDP. A minimalist scenario considers only rehabilitation and maintenance expenditure for existing assets with no new investment. This would bring costs down to $1.2 billion annually, still absorbing 28 percent of the 2009 GDP. These scenarios illustrate that the bulk of the spending needs have to do with addressing the neglect of recent years, and that even this apparently modest objective hardly looks affordable when viewed against the contraction of GDP that has taken place over the intervening period. As of today, the country seems to find itself in the difficult position of having more infrastructure assets than it can afford to sustain.

Zimbabwe already spends around $0.8 billion per year on infrastructure between government budget, parastatal companies, donor spending, and foreign direct investment (FDI). This is already equivalent to about 18 percent of the 2010 GDP and indicates that the country strives to improve the state of its infrastructure. This spending takes place against a broader macroeconomic backdrop of sharply declining gross domestic investment, which fell from 19 percent of GDP in 2000 to 3 percent in 2006.

What is particularly striking is that $0.7 billion a year is being lost to inefficiencies of various kinds, which is almost as much as total current spending and amounts to almost 16 percent of GDP. The main sources of inefficiency are underpricing in the power, water, and roads sectors and poor financial management of utilities. If Zimbabwe could raise tariffs to cost-recovery levels and align operational inefficiencies with reasonable developing country benchmarks, these measures alone would almost double the existing flow of resources to the infrastructure sectors.

Assuming that the inefficiencies could be fully captured, an annual funding gap of $0.6 billion per year would remain for the full set of infrastructure spending needs. The funding gap would drop to $0.4 billion per year for the intermediate investment scenario, and further fall to $0.1 billion under a minimalist spending scenario. By far the largest gaps exist in the power and water sectors. Zimbabwe has the potential to close this gap by raising additional public funding for infrastructure from increased fiscal receipts of various kinds, particularly when the international sanctions are lifted. Furthermore, Zimbabwe has not captured as much private financing for infrastructure — as a percentage of GDP — as many of its neighbors have succeeded in capturing so far. This scope for improvement, coupled with the prospect of economic rebound and prudent policies, should help the country to regain its historic advantages in infrastructure.

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 Zimbabwe. The results have been presented in reports covering different areas of infrastructure—information and communication technology (ICT), irrigation, power, transport, water and sanitation—as well as various policy areas, including investment needs, fiscal costs, and sector performance.

This report presents the key AICD findings for Zimbabwe, allowing the country's infrastructure situation to be benchmarked against that of its African peers. Given that Zimbabwe is at present a distressed low-income country, but has approached middle-income status in the past, two sets of African benchmarks will be used to evaluate Zimbabwe's situation: that of low-income countries and that of middle-income countries. Detailed comparisons will also be made with Zimbabwe's immediate regional neighbors in the Southern African Development Community (SADC).

Several methodological issues should be borne in mind. First, because of the cross-country nature of data collection, a time lag is inevitable. In the particular case of Zimbabwe, it is hardly possible to make sense of the financial data for the period 2005–08 due to the spiraling currency crisis: hyperinflation soared to an official figure of over 230 million percentlow-income countrieby February 2008. Therefore the report will focus on the Zimbabwe's 2004 pre-currency-crisis and 2009 post-currency-crisis data points. Most technical data presented are for 2006 (or the most recent year available), while financial data for comparator countries are typically averaged over 2001–06 to smooth out the effect of short-term fluctuations.

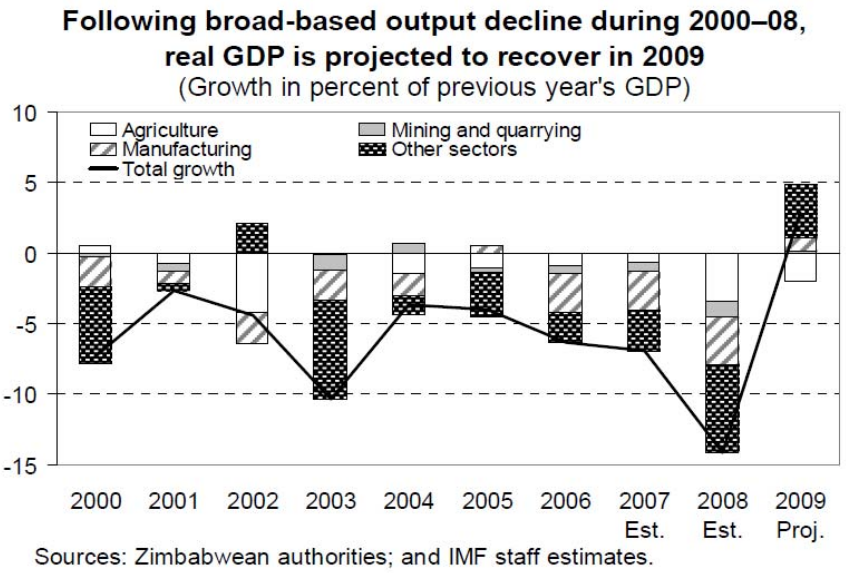
Second, to make comparisons across countries, indicators are standardized to allow for a consistent cross-country analysis. This means that some of the indicators presented here may be slightly different from those that are routinely reported and discussed at the country level.

Why infrastructure matters

In common with the rest of the continent, southern Africa's[2] growth performance improved markedly in the 2000s vis-à-vis the 1990s. The overall improvement in per capita growth rates has been estimated at 2.1 percentage points, of which 1.1 points are attributable to better structural policies and 1.0 point to improved infrastructure. Zimbabwe stands out markedly as a sad exception. Zimbabwe's broad-based output declined dramatically during 2000–08. Its GDP contracted by roughly 50 percent —possibly the largest peacetime contraction ever recorded[3]—reaching a low point in 2008. The recent introduction of effective policy measures, including the dollarization of the economy, is likely to lead to a nascent economic rebound (figure 1).

[2] Southern Africa (or those countries in the SADC) includes Angola, Botswana, Madagascar, Mauritius, Malawi, South Africa, Zambia, and Zimbabwe.
[3] 2010 Investment Climate Statement—Zimbabwe (www.state.gov/e/eeb/rls/othr/ics/2010/138171.htm).

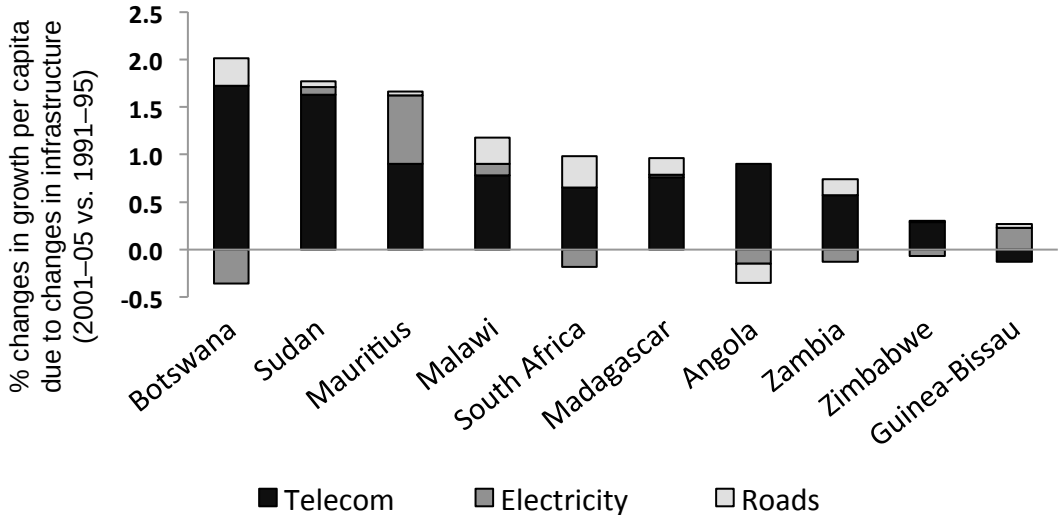
Figure 1. Zimbabwe's economy is set for recovery



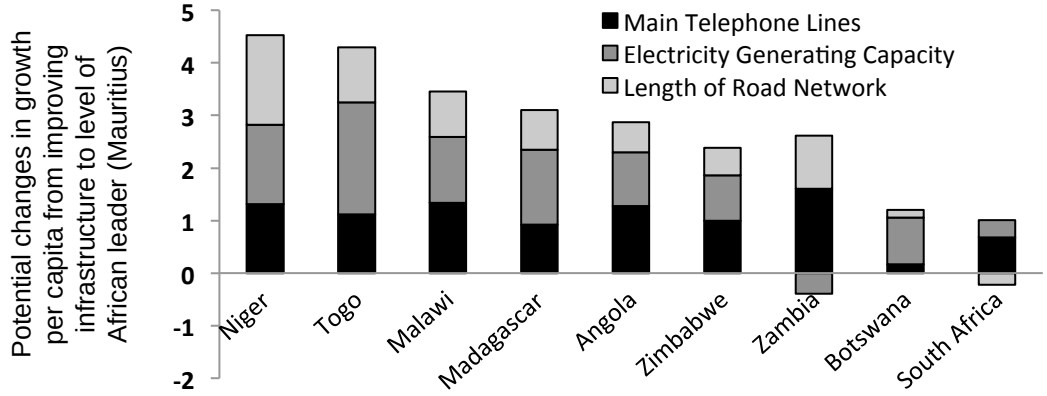
Despite the overall decline, improvements in infrastructure did add around 0.3 percentage points to the per capita growth rate for 2003–07 (figure 2a), offsetting some of the overall GDP decline. In the context of Zimbabwe's deteriorating economic environment, this overall impact was much less pronounced than in other neighboring southern African countries such as South Africa, Angola, Zambia, and Malawi, where infrastructure contributed twice as much to the per capita growth rate as it did in Zimbabwe. As in these neighboring countries, Zimbabwe's boost came predominately from the ICT revolution, while power sector deficiencies held growth back by around 0.07 percentage points.

Figure 2. Infrastructure's contribution to growth comparatively low, with power holding back the economy, but considerable potential present

a. Infrastructure's contribution to annual per capita economic growth in selected countries, 2003–07, in percentage points



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



Source: Calderón 2009.

Looking ahead, simulations suggest that if Zimbabwe's infrastructure could be improved to the level of the African leader—Mauritius—annual per capita growth rates would be 2.4 percentage points higher than they are at present. This impact would come from improvements not only in ICT, but also from an increase in power-generating capacity and better road infrastructure (figure 2b).

The state of Zimbabwe's infrastructure

Zimbabwe's population of around 11.3 million is relatively evenly distributed across the country, though more densely populated urban areas surround the capital Harare and other major cities, and there are more scarcely populated areas in the western and southern parts of the country (figure 3a). Geographically, Zimbabwe is located on a plateau that forms a watershed between the Zambezi and Limpopo river systems. Consequently, it has significant agriculture, forestry, and tourism potential. But agriculture, which used to be the backbone of the economy, has declined as a result of the near collapse of commercial farming during the past decade, and has been further aggravated by apparent neglect of rural roads in high-value agricultural areas.

Zimbabwe is endowed with more than 40 minerals[4]—including gold, diamonds, ferrochrome, copper, and coal—clustered along the mining belt running across the country from north to south (figure 3c). Gold used to be the country's key foreign currency source, but its production has declined in recent years.

By African standards, Zimbabwe has impressive backbone infrastructure, including power, roads, ICT, and water. The country is historically well integrated with its neighbors when it comes to power and transport networks, allowing Zimbabwe to participate in regional trade and act as a critical transit country for landlocked neighbors Zambia and Botswana and a key link in the north-south surface corridors (figures 3d–h). But the deteriorating quality of this infrastructure is currently jeopardizing the functionality of the regional and national links.

[4] www.state.gov/r/pa/ei/bgn/5479.htm.

This report begins by reviewing the main achievements and challenges in each of Zimbabwe's major infrastructure sectors, with the key findings summarized below (table 1). Thereafter, attention will turn to the problem of how to finance Zimbabwe's outstanding infrastructure needs.

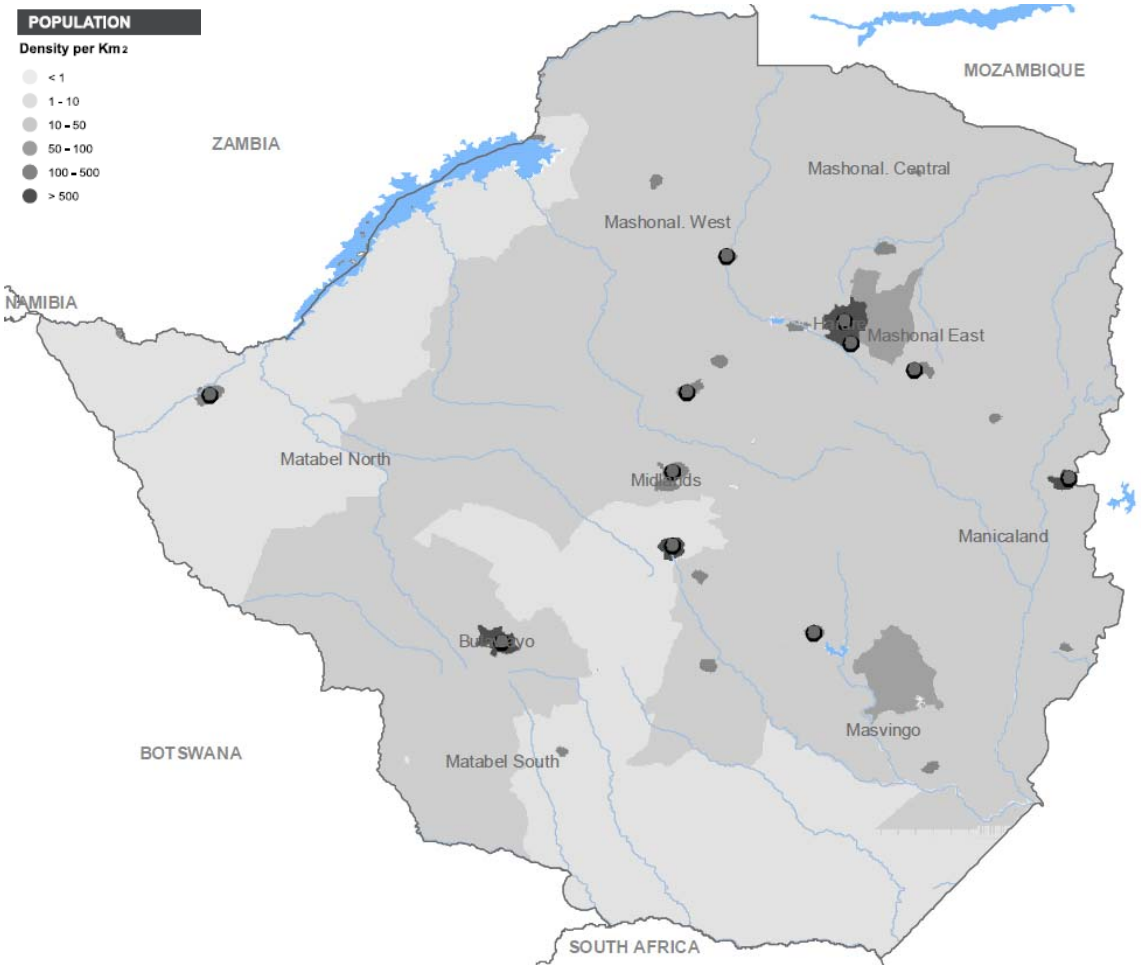
Table 1. Achievements and challenges in Zimbabwe's infrastructure sectors

	Achievements	Challenges
Air transport	Growth in air-transport capacity due to tourism. Relatively safe service.	Increasing competition and improving financial health.
Information and communication technology	High fixed telephone line penetration. Mobile telephony market more than doubled in 2009. Competitive fixed telephone line and mobile retail pricing. Substantial private investment.	Boosting competition sector wide to reduce costs. Increasing international connectivity.
Irrigation	Relatively developed irrigation sector, though still small in absolute terms.	Capturing significant unexploited potential particularly for large-scale irrigation schemes.
Power	National grid with regional interconnections. Comparatively high installed capacity and access.	Financing huge investment and rehabilitation needs. Strengthening sector finances by raising tariffs and enforcing revenue collection.
Railways	Functional railway network with regional interconnections and relatively high traffic density.	Removing tariff distortions that prevent railways from functioning effectively as part of the regional corridor.
Roads	Relatively dense national road network with good regional interconnections. Modern road sector institutions established.	Securing adequate financing to support much-needed road maintenance and rehabilitation. Addressing serious border delays that prevent effective functioning of regional road corridor. Improving rural accessibility for productive agricultural land.
Water resources	Relatively well endowed with water storage.	Providing improved water security for agriculture.
Water and sanitation	Relatively high coverage of piped water and flush toilets.	Improving performance of utilities and rehabilitating decrepit infrastructure with a view to restoring water quality. Reversing decline in access to sanitation.

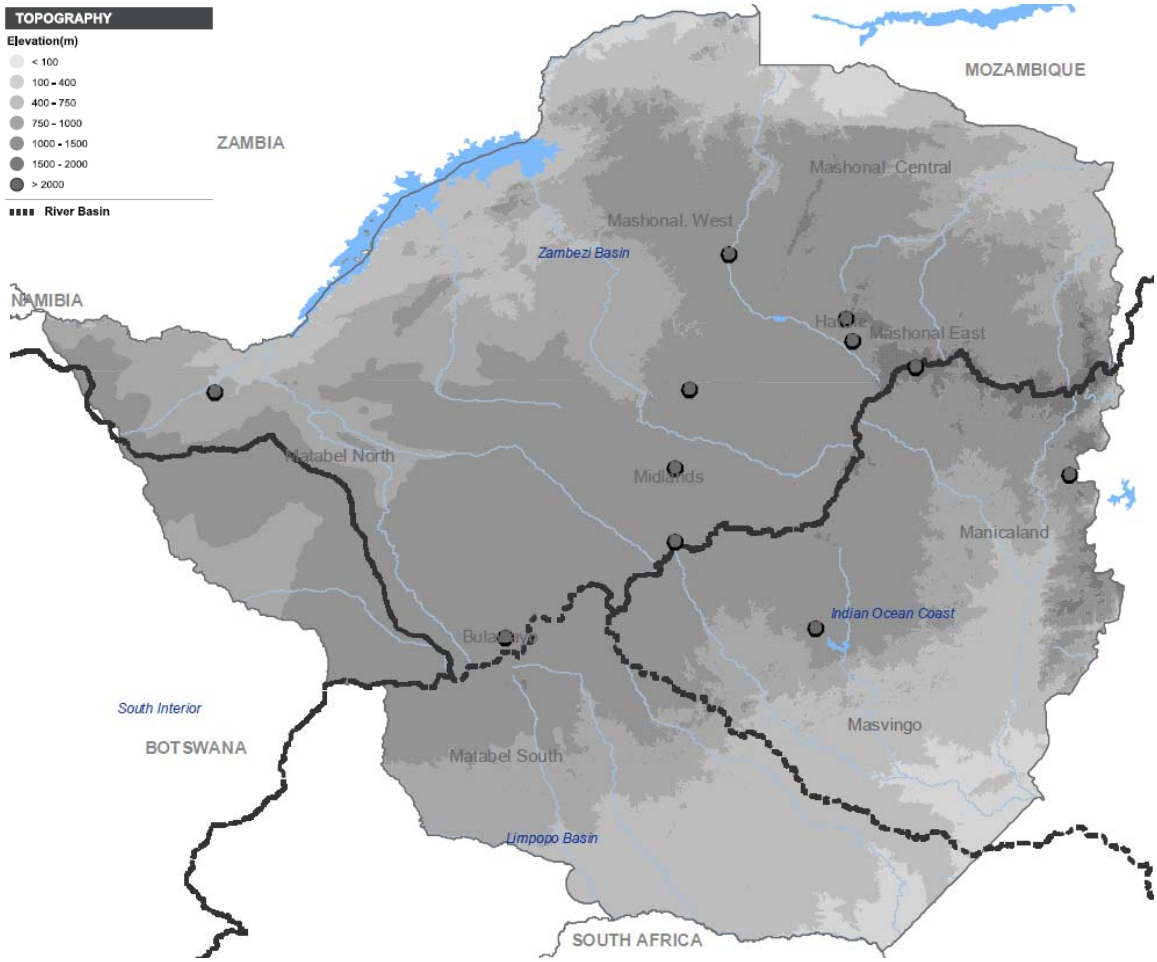
Source: Authors' own elaboration based on findings of this report.

Figure 3. Zimbabwe's infrastructure aligns with the geographical distribution of its mineral resources and population

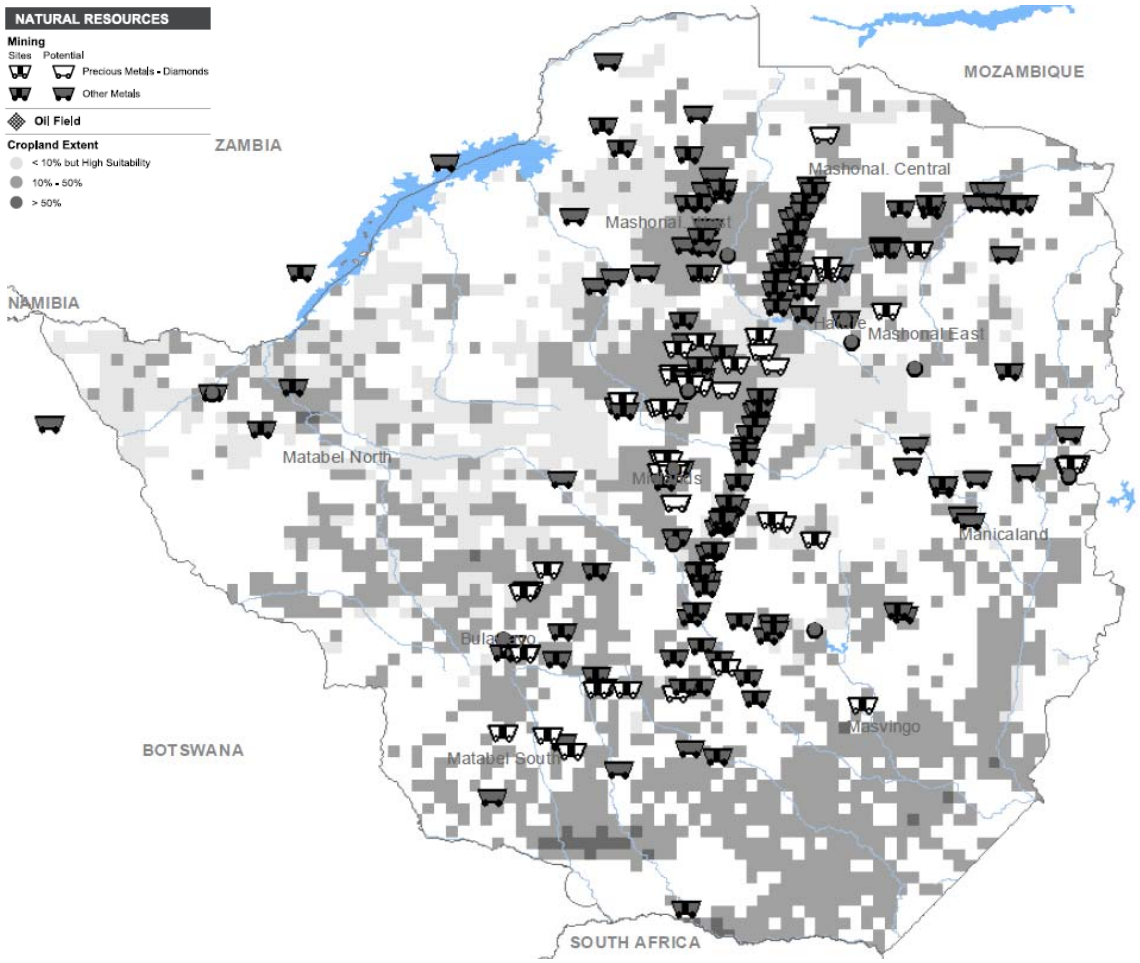
a. Population



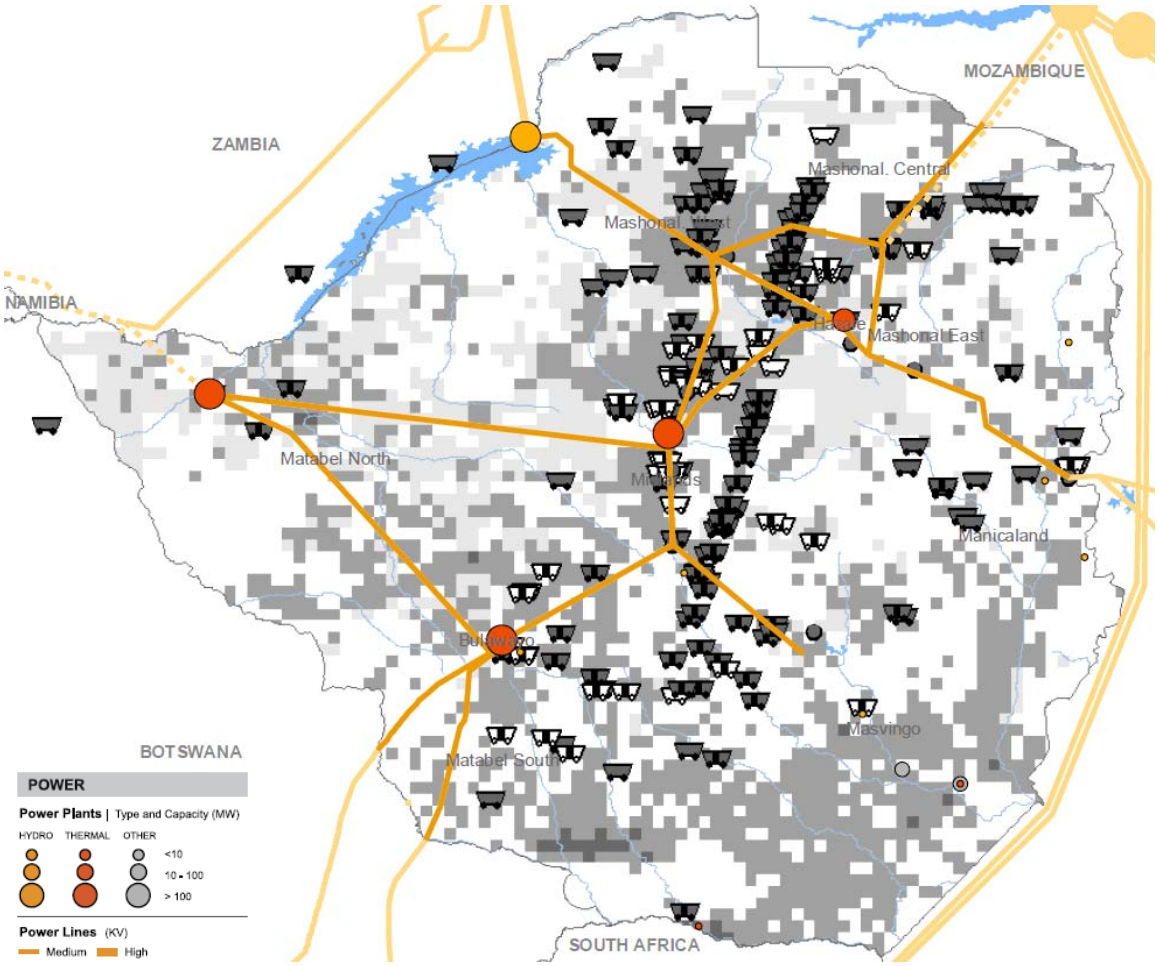
b. Topography



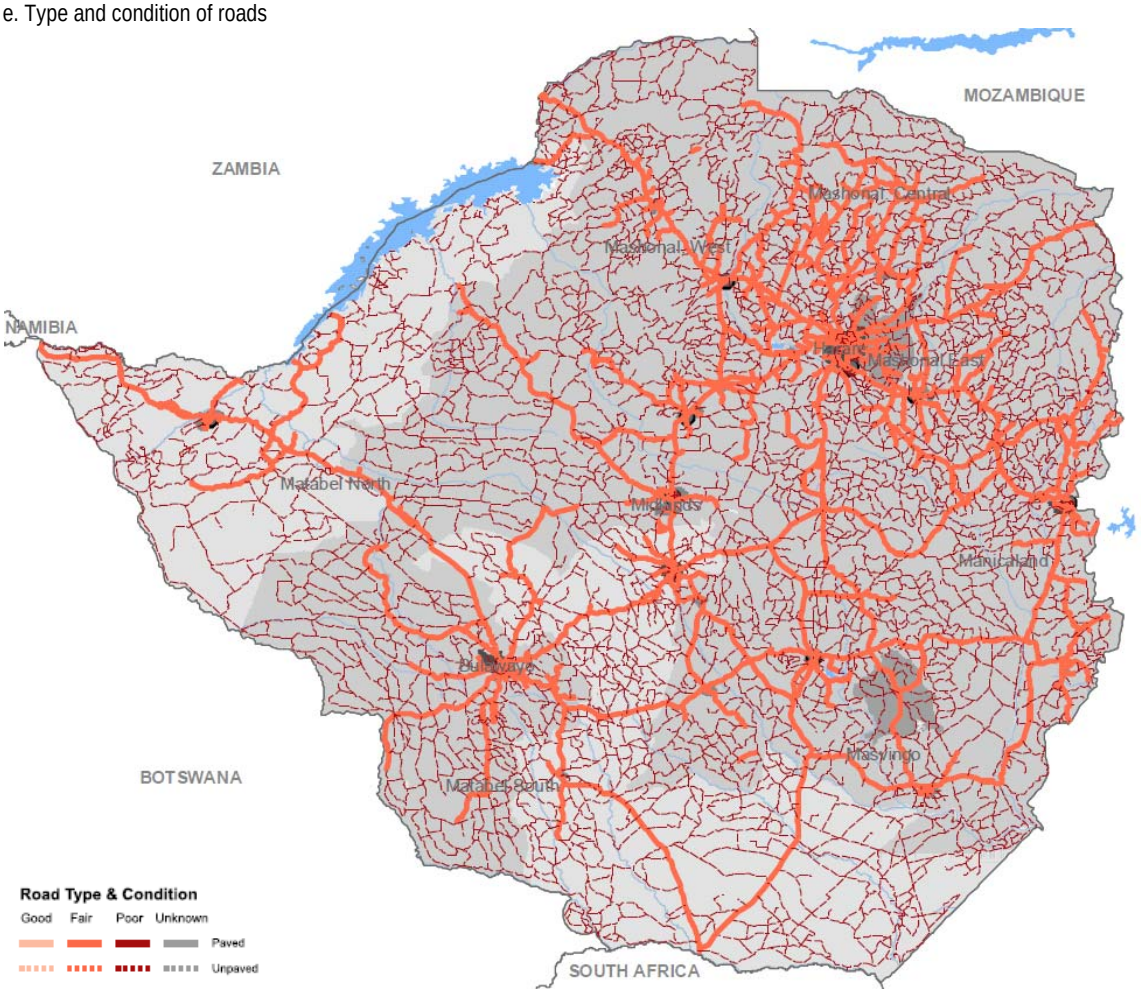
c. Natural resources



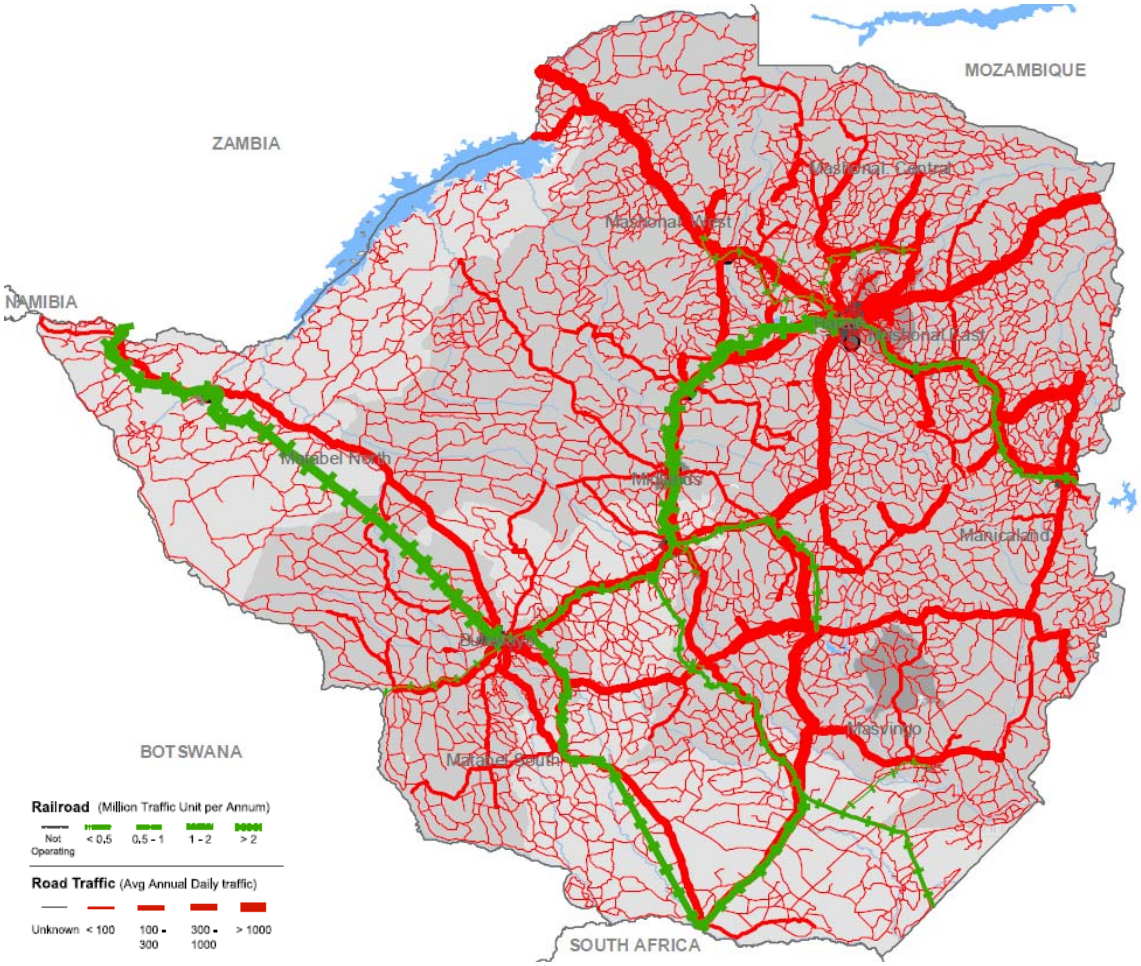
d. Power


MOZAMBIQUE
ZAMBIA
Mashonal. Central
Mashonal. East
NAMIBIA
Matabel North
Manicaland
Masvingo
Matabel South
BOTSWANA
SOUTH AFRICA
POWER
Power Plants | Type and Capacity (MW)
HYDRO THERMAL OTHER
<10
10 - 100
> 100
Power Lines (KV)
Medium High

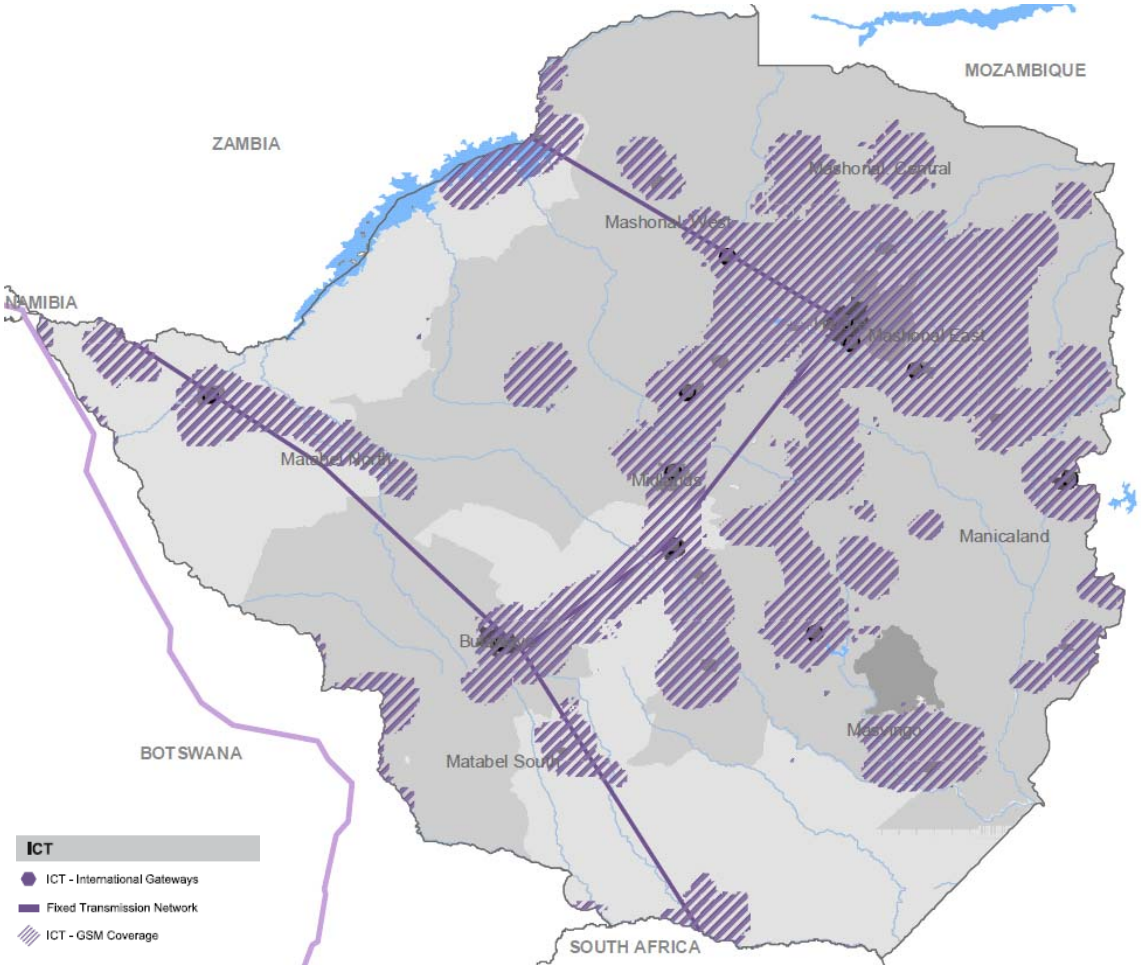
e. Type and condition of roads



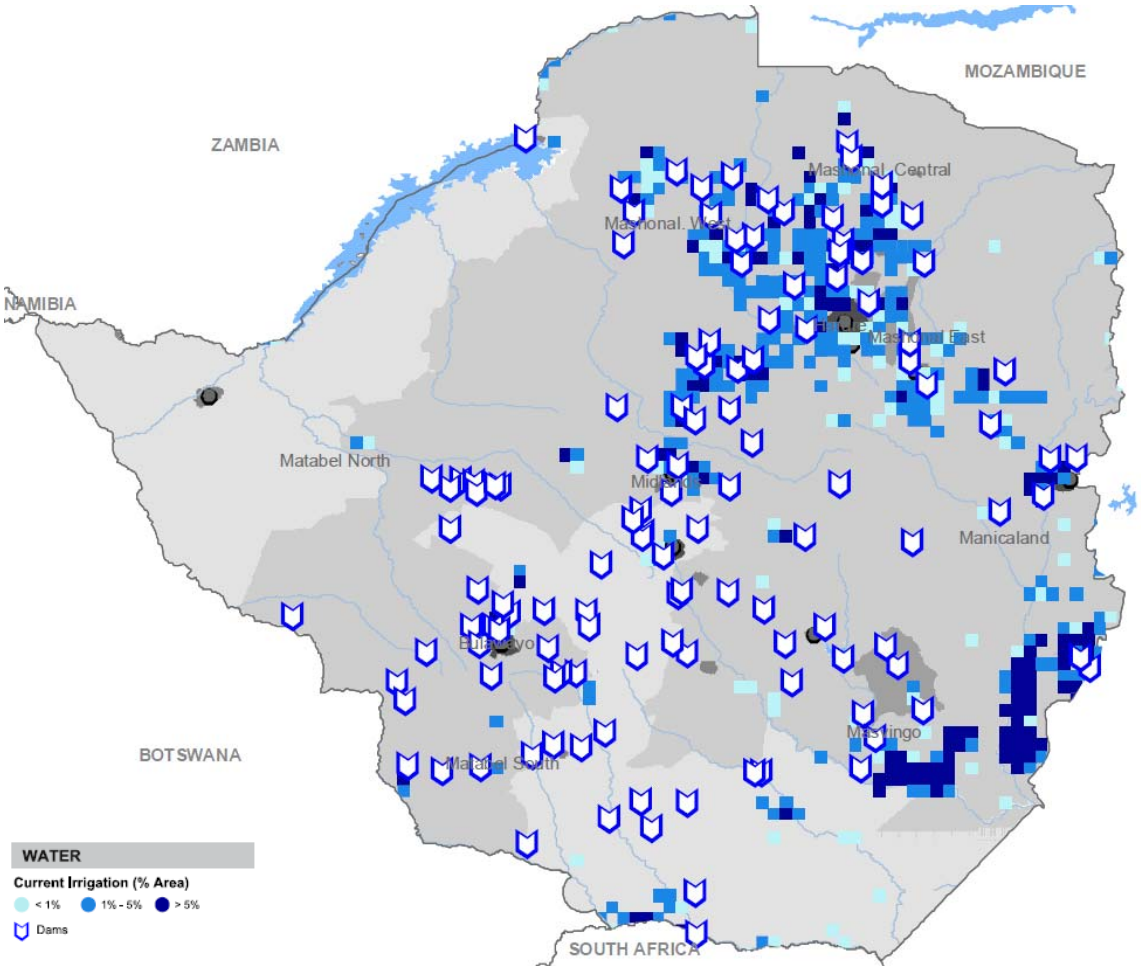
f. Road and rail traffic



g. ICT


MOZAMBIQUE
ZAMBIA
Mashonal Central
Mashonal West
NAMIBIA
Mashonal East
Matabel North
Midlands
Manicaland
Masvingo
BOTSWANA
Matabel South
SOUTH AFRICA
ICT
ICT - International Gateways
Fixed Transmission Network
ICT - GSM Coverage

h. Water



Source: AICD Interactive Infrastructure Atlas for Zimbabwelow-income countrie).

Power

Achievements

Zimbabwe's installed capacity and access to electricity compare favorably to countries of similar income in Africa. Total installed capacity at 1,960 megawatts (MW) and per capita capacity at 146 MW are three and seven times higher, respectively, than what the nation's African low-income peers have in place. Zimbabwe's overall access rates and rural access rates are also better than the average for African low-income countries (table 2). Estimates from 2009 indicate that these access levels had improved to 40 percent of Zimbabwe's population from 30 percent in the early 2000s. Almost 80 percent of the urban population had access to electricity and almost 20 percent of the rural population had access to electricity. Most of this performance is the result of systematic investment carried out in and around the late 1980s, when Zimbabwe established a relatively good power infrastructure backbone with decent installed capacity and a recognizable national grid, and attained good access levels. Thus, unlike many other parts of Sub-Saharan Africa, Zimbabwe has developed the semblance of a national grid (figure 3d).

Table 2. Benchmarking Zimbabwe's power infrastructure

Indicators	Units	Zimbabwe (before 2006)	Zimbabwe (after 2006)	Low-income (nonfragile) countries	Middle-income countries
Access to electricity (national)	% of population	33.9	41.5	33	50
Access to electricity (urban)	% of population		79	86	73
Access to electricity (rural)	% of population		19	12.7	26.3
Installed capacity per million population	MW per million population	151	146	20	799
Power outages	days/year	14.6		10.4	5.9
Collection rate	% billing	49	62	92	91
Revenue per unit	U.S. cents/ kWh	1	5	14	13
System losses	% of generation	13	11	24	20
Cost recovery	% total cost	19	65	89	85
Hidden costs	% of revenue	560	108		
Effective power tariff				Predominantly thermal	Other developing regions
residential at 100 kWh	U.S. cents	2	6	14.5	5.0–10.0
commercial at 100 kWh	U.S. cents		7	18.8	
industrial at 50,000 kWh	U.S. cents		7	14.2	

Source: All sources are AICD unless indicated otherwise. Access to electricity (national, urban and rural) from World Energy Outlook (International Energy Association, 2010); installed power capacity data for 2009 based on presentation from Zimbabwe investor conference (2009); collection rate data based on World Bank staff information based on 2004 and 2009; revenue per unit derived from data based on AICD calculations for 2004 and 2009; system losses are for 2003 and 2009 and are based on World Bank (2008a) and World Bank staff estimates; cost recovery calculated based on World Bank (2010) and are for 2004 and 2009; hidden costs based on data from 2004 and 2009 and derived from AICD calculations; and tariff information is for 2004 and 2009 and derived based on World Bank (2010).

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

Challenges

Zimbabwe's power infrastructure is starved of new investments, however. Zimbabwe has not seen any investments to expand its generation infrastructure since 1988, when Hwange Power Station added 440 MW. Only around 60 percent of the 1,960 MW of installed capacity is operational. Installed capacity in per capita terms is following a clear downward trend (table 2). Power transmission and distribution networks have been further corroded due to damage and theft. This vandalism produced losses of about $400,000 a month during 2009, of which only 40 percent was recovered later (World Bank 2010).

ZESA,Zimbabwe Electricity Supply Authority,the integrated power utility, faces an unsustainable financial situation that leaves no room for new investments. Sixty-eight percent of Zimbabwe's installed capacity is thermal as of 2008, and ZESA uses 2.4 million tonnes of coal per year for thermal power generation. Between over half of its coal comes from the state-owned Hwange Colliery Company, which has continuously subsidized the coal ZESA buys. Other inputs such as water (for hydropower generation) and transportation services are also provided at below-market costs (World Bank 2008b). Yet, despite the highly subsidized prices, ZESA was unable to pay Hwange for its coal supply. The inability of ZESA to pay for coal has in turn weakened the financial capacity of its supplier.

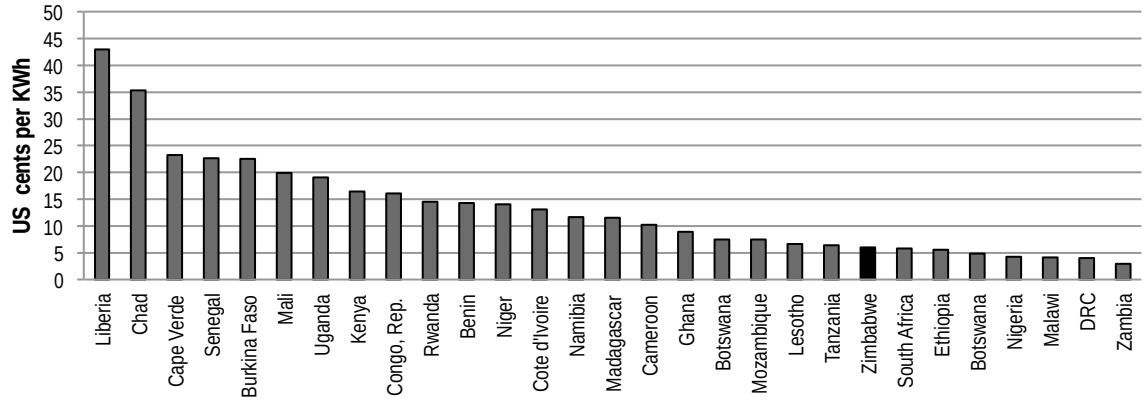
But Hwange is working at only 35 percent capacity, leaving Zimbabwe increasingly dependent on its neighbors for coal and electricity imports to satisfy power demand—the nation imports 20–35 percent of its power from South Africa, the Democratic Republic of Congo, Mozambique, and Zambia. A recent study found that ZESA would need 11,000 tonnes of coal per month if the thermal plants were to run at full capacity. At present, ZESA consumes only 6,000 tonnes of coal per month. The price of domestic coal is about half the international coal price, in part because of its lower quality (World Bank 2010), but primarily due to the subsidy applied. ZESA finds itself in a bind, since it is expensive to replace domestic coal with imported coal.

But the supply of imported electricity is in jeopardy as ZESA's weak financial position has resulted in nonpayment for power imports from neighboring countries. Power imports declined in the late 2000s by as much as 44 percent due to ZESA's inability to make timely payments. The amount payable totaled $41.8 million, of which $23.8 million (57 percent) was at least 90 days delinquent (World Bank 2009b). Imports from Zambia, Mozambique, and the Democratic Republic of Congo were cut off due to these payment problems. ESKOM—South Africa's power utility—converted the debt into a loan for Zimbabwe (Kaseke 2009). ZESA's inability to repay the loans required government support, and by February 2009, the government-guaranteed external debt owed by ZESA was almost $400 million, all of which has become due and payable.[5]

Recent efforts to level tariffs with costs have not been enough to allow ZESA to reach cost-recovery status. The average true cost of power is about $0.10 per kilowatt-hour (kWh) in Zimbabwe, which is already relatively low by African standards (figure 4). Nonetheless, due to subsidies of various kinds, at present tariffs amount to only $0.06 per kWh, among the lowest in Africa.

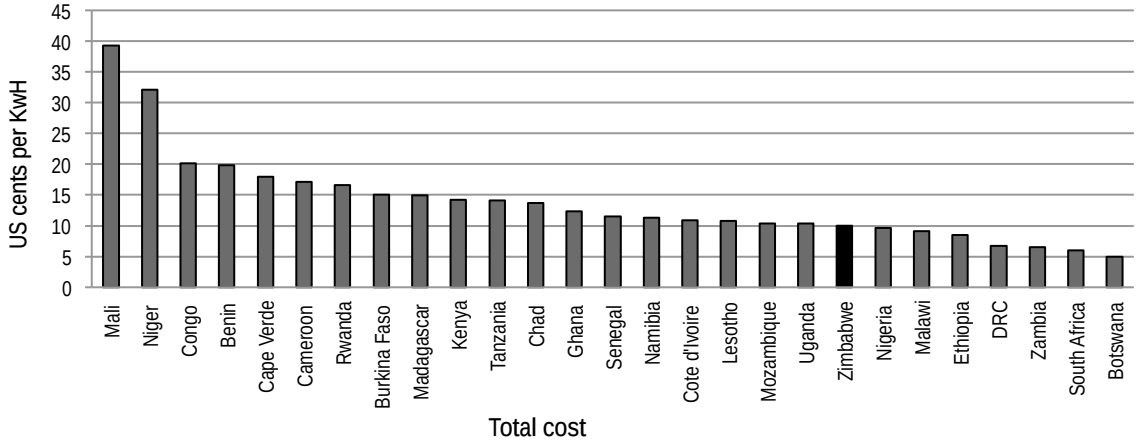
Figure 4. Moderate tariffs for power in Zimbabwe do not recover costs

a. Power prices



[5] The analysis covers the ZPC and ZETDC **[[expand acronyms?]]**operations, including management fees which they pay to the holding company and does not include other ZESA affiliates.

b. Power costs



Source: Power price: Briceño-Garmendia and Shkaratan 2010; Zimbabwe average tariff derived based on World Bank (2010); power costs: Eberhard and others 2008
Note: DRC = Democratic Republic of Congo.

ZESA also faces difficulties with revenue collection, which deprives the utility of millions of dollars each year. Only 60 percent of ZESA's bills are collected, a very poor performance when compared to other low-income countries in Africa (table 2), but nonetheless a slight improvement from the collection rate in the early 2000s, when less than 50 percent of the bills were collected. At present, around 83 percent of the arrears are from the private sector, though nonpayment from other parastastals and the government is a significant issue and creates a perverse tax on utilities.

Fortunately in Zimbabwe network losses are a relatively minor concern as the backbone transmission and distribution network, despite the lack of investment, remains in good condition. Another interesting element is the low system losses, which are in part due to low levels of nontechnical losses. A valid explanation for these small losses could be that the cheap power prices deter power theft.

In 2009 the cumulative effect of these inefficiencies amounted to $485 million, or the equivalent of 100 percent of ZESA's revenues (table 3). Over 50 percent of the costs are due to collection inefficiencies while essentially the rest is traceable to tariff subsidies (table 3).

ZESA's hidden costs remain high in absolute terms, but they have been coming down in recent years. In 2009 tariffs were increased about $0.01 to current levels of $0.065 per kWh, which led to a substantial reduction in hidden costs. The circumstantial reduction in the volume of power sold also helped to contain hidden costs, though it does not represent any kind of improvement in efficiency. Yet, compared to other southern African countries, hidden costs in 2009 are still high at around 400 percent of sector revenues, second only to those found in the Democratic Republic of Congo (figure 5).

While not included in the estimates of hidden costs in figure 5, labor-related inefficiencies further curtailed ZESA's financial security, draining as much as 16 percent from revenues in 2009. As of 2007, ZESA employed around 6,455 staff and was plagued by low staff utilization that reduced the scale of operations. The number of workers per gigawatt-hour of power produced was 0.86, four times larger than the figure for several other countries.

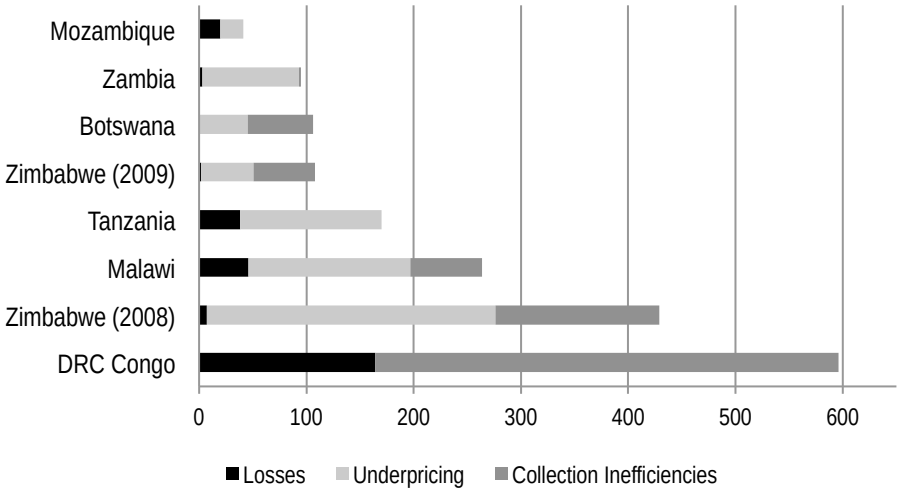
Table 3. Massive inefficiencies are related mainly to underpricing and undercollection of bills

	Power billings	System losses	Implicit collection ratio	Cost-recovery benchmark	Average effective tariff	Total hidden costs
	(GWh/year)	(%)	(%)	($/kWh)	($/kWh)	($ millions/year)
2001	10,152	16.2	49	0.10	0.05	855
2002	11,327	13.6	49	0.10	0.07	771
2003	10,411	13.1	49	0.10	0.02	953
2004	10,405	11.5	49	0.10	0.01	964
2005	10,755	10.8	62	0.10	0.05	772
2006	10,451	10.5	62	0.10	0.06	643
2007	9,239	11.0	65	0.10	0.01	874
2008	8,756	11.0	62	0.10	0.01	560
2009	8,912	11.0	62	0.10	0.065	485

Source: Calculations based on the Southern African Power Pool (SAPP) annual reports 2005–09, World Bank 2011, World Bank 2009b , World Bank 2008alow-income countrieand World Bank staff estimates.

Note: The cost-recovery benchmark in Zimbabwe takes into account the unit cost of power generation within Zimbabwe, the cost of buying power from neighboring country utilities at $0.02–$0.03 per kilowatt, and the cost of transmission and distribution of power.
GWh = gigawatt-hour; kWh = kilowatt-hour.

Figure 5. Benchmarking Zimbabwe's hidden costs against southern African peers, 2008–09



Source: AICD calculations.

Note: DRC = Democratic Republic of Congo.

The reliability of Zimbabwe's power supply is much worse than that of its peers, with serious effects on the productivity of businesses. Zimbabwe has faced greater power outages than what low- or middle-income countries in Africa typically encounter. Households with electricity connections lack power for 15 days a year due to power outages (table 2). Erratic power supply has resulted in loss of productivity across various sectors. For example, a sample of 50 wheat-producing farmers indicated that problems of load shedding resulted in low agricultural yields. Load shedding ranged on average from 8 to 12 hours a day, halving expected yields (from 6 to 8 metric tonnes to 3 tonnes per hectare). Around 70 percent of farmers indicated that frequent load shedding damaged their farm equipment. The economic loss due to

erratic power supply for the surveyed farmers was approximately $2 million (Kaseke 2009). Another study found that inadequate electricity impeded the efficiency of the mining sector (box 1).

Box 1. Costs of inadequate electricity to the mining sector in Zimbabwe

Zimbabwe is richly endowed with over 40 different minerals that have a high demand in international markets, and mining activities in Zimbabwe contribute around 13 percent to gross domestic product (GDP) and are the second-greatest contributors to foreign-currency earnings after agriculture. The minerals extracted include gold, coal, nickel, platinum, and diamonds. Extraction of these minerals in Zimbabwe has been plagued by persistent power cuts, which has been cited as the main obstacle to the productivity of Zimbabwe's mining industry. Almost 90 percent of the mines surveyed indicated that electricity was a major obstacle to mining operations. Firms indicated that frequent outages that were as much as over 12 hours plagued efficiency of mineral extraction.

Erratic power supply at mines resulted in loss of output, idle labor costs, and costs associated with restarting the mining operations when the power returned. Disaggregating the costs of irregular power supply indicates that 85 percent of the costs were due to loss in output. Mining companies had to spend large amounts on backup generation as well as stock up on additional fuel, oil, and grease required to run the backup equipment. Backup equipment was run on average 4 hours a day for at least five to six times per week. Smaller mines were far more impacted by unreliable power supply than the larger mines. The smaller mines were often unable to finance the large amounts of backup generation required and were unable to mitigate the costs of inadequate power. During power outages, a majority of the laborers were idle, waiting for the power to resume. This idle time led to significant costs for the mines as these laborers were paid even for their idle time. Overall, the outage cost per kilowatt-hour ranged from $1.20 to $13. In absolute terms, inadequate power supply led to massive loss in productivity for mining companies.

Source: Kaseke 2010.

Obtaining power connections in Zimbabwe is a lengthy and costly process. The situation during 1999 to 2006 indicates that the rate of connection of new customers declined by 50 percent while the waiting list for connections increased fourfold. The waiting time for new connectionslow-income countriewas reported to have increased from less than a month in 2000–01 to between 9 and 16 months in 2005–06 (World Bank 2008a), while 2010 estimates indicate that the wait time for firms is about 4 months (World Bank 2011). Moreover, the cost of making the connection once the opportunity arises is high; firms pay the equivalent of 650 times the country's per capita income to obtain such a connection, although this is not dissimilar to trends observed elsewhere in Africa (World Bank 2010).

Looking ahead, Zimbabwe has a key role to play as a transit country in regional power trade with the Southern African Power Pool (SAPP). The geographic proximity of Zimbabwe and the Democratic Republic of Congo—the country with southern Africa's greatest hydropower resources—makes Zimbabwe a key player in regional trade (figure 6).[6]

[6] Future power demand can either be met through expanding national production or expanding cross-border power trade within the Southern African Power Pool (SAPP). Two alternative scenarios will be considered in this report. The *trade-stagnation* scenario assumes that no additional cross-border interconnectors will be built, so that trade is constrained at the levels observed today, and countries are thus obliged to meet incremental power demands solely through the development of their own domestic power sectors. For many SAPP countries that lack significant energy resources of their own, this entails increased reliance on thermal generation fueled by oil imports. Alternatively, under the *trade-expansion* scenario, future regional power demand is met by the most cost-effective energy resources available to the region as a whole, and additional cross-border transmission capacity is added wherever required to allow power to flow from production to consumption locations. Essentially, this scenario takes regional power trade to its fullest economic potential, assuming that there are no restrictions to cross-border exchange and that the necessary infrastructure can be built wherever it is required. Reality is likely to lie somewhere in between the trade-stagnation and trade-expansion scenarios, and in this sense the two scenarios serve to frame the range of possible outcomes.

There is the potential for Zimbabwe to benefit significantly from wheeling Congolese power southwards toward markets in neighboring countries, notably South Africa. Assuming trade expansion, Zimbabwe could transmit up to 20 terawatt-hours (TWh) of power from the Democratic Republic of Congo to Mozambique, Botswana, and South Africa. But to participate in trade, Zimbabwe would need to develop 3,100 MW of interconnector capacity, with a price tag of $370 million over the next 10 years. Wheeling of power at $1.40 per kilowatt to $28 per kilowatt[7] would allow Zimbabwe to benefit from a return of anywhere between 1 and 23 percent annually on its investment.

Table 4. Zimbabwe's possible hydropower expansion

Project	Planned capacity (MW)	Lead time	Cost estimate ($ millions)
Kariba South Extension	300	3	200
Mutapha Gorge*	300	7	454
Batoka*	800	10	1,250
Additional capacity	15	—	—

Source: Derived from Rosnes and Vennemo (2009).
Note: * Borders Zambia (capacity and cost split between countries).

Irrespective of the evolution of trade in southern Africa, Zimbabwe will always remain a modest net importer of power, continuing to rely primarily on its own coal-based and hydropower plants for generation. Future hydropower sites that could be developed include Batoka, Kariba Soth, and Mutapha Gorge (table 4). To meet domestic demand, Zimbabwe is expected to import no more than 4 TWh of power from its neighbors for domestic consumption going forward.

To meet its own power demand and expand access to 70 percent of the population, Zimbabwe will need to spend $1.2 billion annually over a decade. Of this total, $375 million will be needed for new investment in generation, $97 million for rehabilitation of existing generation capacity, and $233 million for generator maintenance.

Table 5. Zimbabwe's annualized costs of capacity expansion (over 10 years)

$ millions

Generation	Investment cost	375.5
	Thermal	165.2
	Hydro	201.2
	Other	9.2
	Rehabilitation cost	97.4
	Thermal	57.1
	Hydro	40.4
	Other	0.0
	Variable cost (fuel, O&M)	223.0
	New capacity	106.1
	Installed capacity	116.9
Transmission and distribution	Investment cost	201
	Cross-border	0
	Distribution grid	75
	Urban connection	20
	Rural connection	106
	Rehabilitation cost	160
	Variable cost (existing capacity)	185
Subtotals	Capital cost	834
	Investment cost	577
	Rehabilitation cost	257
	Variable cost	408
Total		1,242

Source: Derived from Rosnes and Vennemo (2009).
Note: O&M = operations and maintenance; T&D = transmission and distribution.

[7] These charges are used for illustrative purposes and drawn from The Potential of Regional Power Sector Integration: South African Power Pool (SAPP) Transmission and Trading Case Study (2009).

Another $201 million of new investments is needed for transmission and distribution networks, $160 million for network rehabilitation, and $185 million for network maintenance. Notably, more than half of required new investments into transmission and distribution are for rural electrification (table 5).

Water resources

Zimbabwe has a relatively limited endowment of water resources compared to countries occupying similar climatic zones. The major river systems are the Save, Runde, Mzingwane, Gwayi, Zanyati, Manyame, and Mazowe, all of which (except the Save and Runde) drain into either the Zambezi or the Limpopo. The renewable water resource per capita is estimated at about 1,547 cubic meters (m^3) per year (including the cross-border flows), well below the Sub-Saharan African average of 7,000 m^3. Rainfall averages 657 millimeters (mm) per year, but levels vary considerably across regions and during the course of the year. As of 2004 only 37 percent of the country received adequate rainfall for agriculture. For the remaining part of the country full-time irrigation systems are indispensable to balance out the erratic and unreliable rainfall patterns.

There are several factors that put significant pressure on water resources. The need for agricultural production—representing 17 percent of Zimbabwe's GDP, 40 percent of total export earnings, and 79 percent of the total water use—adds to the stress, in particular for wheat, cotton, and sugarcane productions. Residential demand—representing 14 percent of total water use—has increased over time, leaving water production in urban areas at 30 percent below requirements. The industrial sector—accounting for 7 percent of total water use—is also growing.

In the mid-1990s the government constructed a number of large and medium-sized dams to tackle increasing pressure on water resources, but the dams have been poorly maintained. As of 2004, total capacity was 103 cubic kilometers (km^3), including Lake Kariba on the Zambezi River, shared between Zambia and Zimbabwe and accounting for 94 km^3. Excluding the shared dam, the total capacity is about 9 km^3 (figure 1a). But current utilization is only about 22 percent of mean annual runoff due to high-level siltation, poor drainage from irrigation schemes, leakage in urban areas, and loss of capacity of ground-water recharge due to soil compaction. Absence of adequate dam maintenance also creates a high public-safety risk from breaches and losses of large water volumes.

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

Irrigation

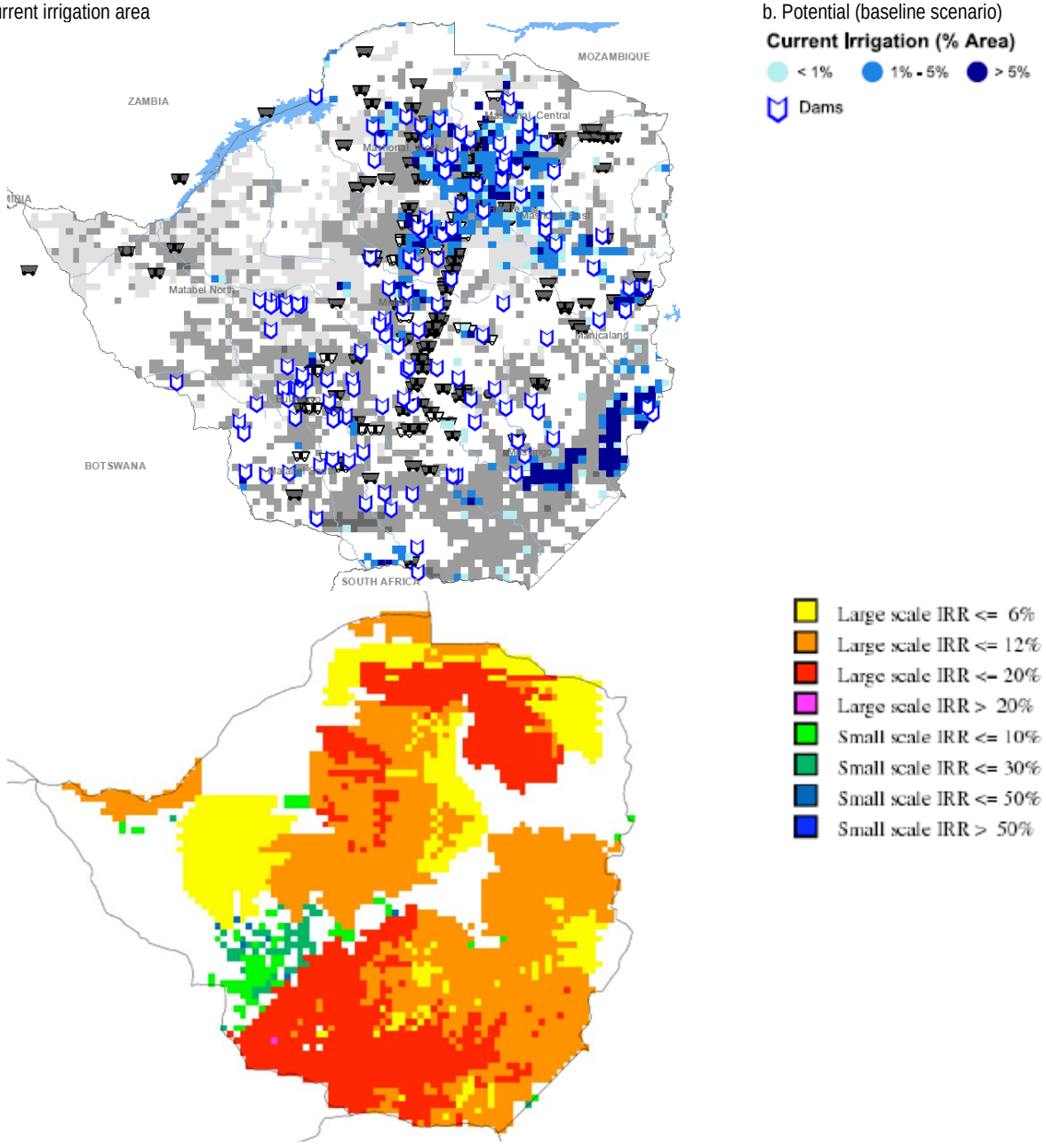
Irrigation in Zimbabwe falls well short of its potential. As of 2004 only 173,513 hectares were equipped for irrigation, plus a further 20,000 hectares that are water managed, yielding a total of 193,513 hectares. This is equivalent to 5.8 percentlow-income countrieof the country's cultivated area, well above the regional average of around 3.5 percent. Between 1973 and 2003 the irrigated area grew 3.6 percent annually, above the average growth registered in Sub-Saharan Africa of 2.3 percent per year. It is

estimated that around 60 percent of the labor force is involved in agriculture, a level comparable to the Sub-Saharan average. The agricultural value added per worker, $205, was below the Sub-Saharan average of $575 (figure 6).

Figure 6. Zimbabwe's irrigation sector

a. Current irrigation area

b. Potential (baseline scenario)



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

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

The country's current 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 already be economically viable to develop a further 374,335 hectares of land for irrigation, of which 99 percent would be developed through large-scale projects. If the threshold of the IRR is raised to 12 percent the economically viable area for irrigation shrinks to 143,588 hectares, mainly for large-scale projects. The required investment for attaining this expansion is $286 million (table 6). This area is concentrated in the southeast and central parts of the country (figure 6b), which has the highest agricultural potential given the significant clay content of the soils.

Table 6. Zimbabwe's irrigation potential

	Large-scale			Small-scale			Total		
	Investment	IRR	Area increase	Investment	IRR	Area increase	Investment	IRR	Area increase
Cutoff (%)	$ million	%	ha	$ million	%	ha	$ million	%	ha
0	1,132	8.2	579,876	40	3.0	7,692	1,171	8.1	587,568
6	723	10.8	370,481	20	0.0	3,854	743	10.7	374,335
12	277	14.7	141,846	9	0.0	1,742	286	14.6	143,588
24	0	0.0	0	3	0.0	561	3	0.0	561

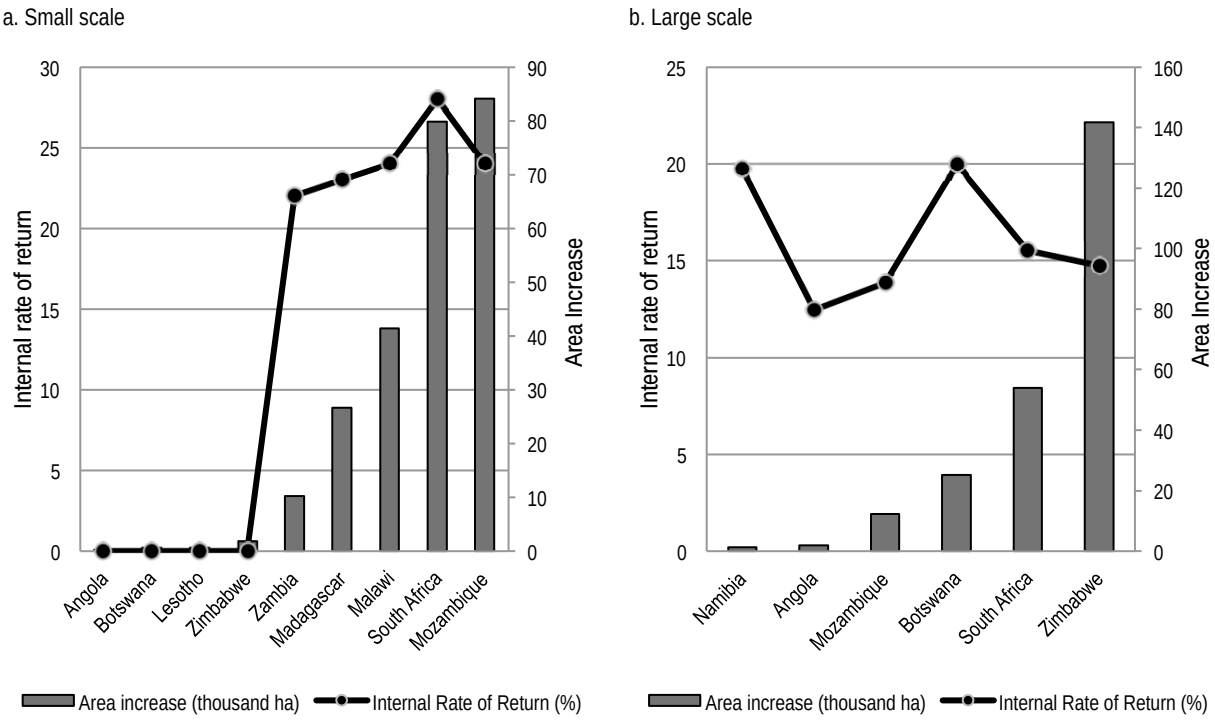
Source: Derived from You and others (2009).

Note: Water for irrigation can be collected in two ways: through large, dam-based schemes, or through small projects based on the collection of runoff 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 per hectare and for small-scale projects at $2,000 per hectare.
IRR = internal rate of return.

Whereas Zimbabwe's irrigation potential for small-scale projects is one of the lowest among southern African countries (figure 7a), the nation stands as the country with the highest potential area increase for large-scale projects when the cutoff for the IRR is set at 12 percent (figure 7b).

Water for irrigation can be collected in two ways: through large, dam-based schemes, or through small projects based on the collection of run-off from rainfall. The investment costs of large-scale irrigation development reflect only irrigation-specific infrastructure, such as distribution canals and on-farm system development. The potential for small-scale irrigation is assessed not only on the basis of agroecological conditions, but also in terms of market access, since irrigation is typically viable only if the increased yields can be readily marketed.

Figure 7. Irrigation potential



Source: Derived from You and others (2009). Based on 12 percent cutoff estimates, at which the estimated area increase for southern African countries not included in the figures is zero.

Water supply and sanitation

Achievements

Zimbabwe's access to water-utility services is, nominally, among the highest in African low-income countries. Access to piped water is more than three times the rate found in other low-income countries, and Zimbabwe's reliance on surface water, at only 7 percent of the population, is correspondingly one of the lowest in Sub-Saharan Africa, below the average for middle-income countries and only one-fifth of comparable low-income countries (table 7).

Table 7. Benchmarking water and sanitation indicators

		Low-income, nonfragile countries	Zimbabwe		Middle-income countries
	Unit	Mid-2000s	1999	2005	Mid-2000s
Access to piped water	% pop	9.3	34	37	61.1
Access to standposts	% pop	17.1	10	5	22.1
Access to wells/boreholes	% pop	39.3	49	50	4.8
Access to surface water	% pop	34.2	6	7	10.9
Access to flush toilets	% pop	4.7	33	36	47.7
Access to improved latrines	% pop	18.3	25	14	33.7
Access to traditional latrines	% pop	38.5	16	20	6.9
Open defecation	% pop	38.3	27	29	11.0
				2006	
Domestic water consumption	liter/capita/day	50.9		202	196.4
Continuity of supply	hours/day	18		20	24
Revenue collection	% sales	94.1		—	99.3
Distribution losses	% production	34.8		46	28.8
Cost recovery	% total costs	89.5			86.3
Operating cost recovery	% operating costs	125.2		—	120.8
Labor costs	connections per employee	175.9		89	203.4

		Zimbabwe		Countries with scarce water resources	Other developing regions
		2005	2008	Mid-2000s	Mid-2000s
Residential tariff	US cents / m^3	24	23	60	3–60
Nonresidential tariff	US cents / m^3	39	82	121	

Source: Demographic and Health Surveys and AICD water and sanitation utilities database (www.infrastructureafrica.org/aicd/tools/data).
Note: Access figures from the 1999 and 2005 Demographic and Health Surveys; — = Not available.

Challenges

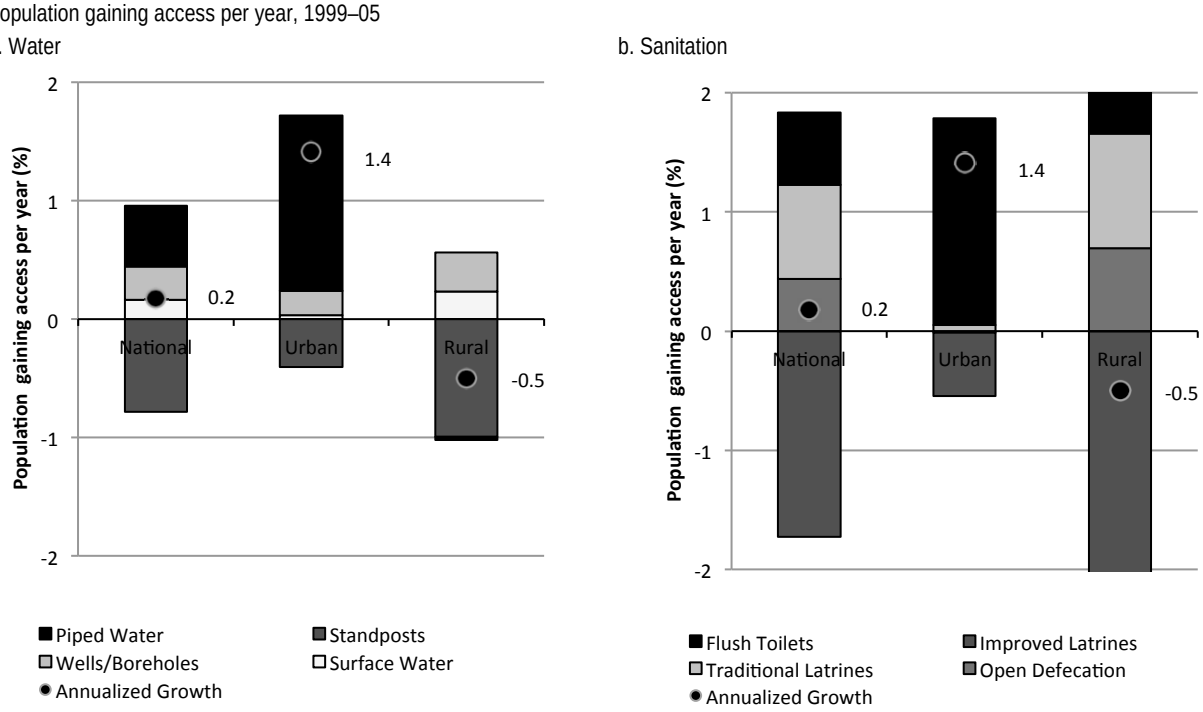
Due to lack of proper maintenance, Zimbabwe's water and sanitation network is in dismal condition, constituting a threat to public health. The cholera outbreaks in 2008 and 2009 were a red flag to the poor state. The disease had killed more than 3,000 people and infected around 60,000 by February 6, 2009, according to the World Health Organization (WHO), and spread over most of the country and across the borders into neighboring countries. A significant contributor to the outbreak was the inability of urban water utilities to treat supplied water.

A sign of the network quality deterioration can be seen in the extremely high distribution losses, which amount to almost half of the water produced. In fact between the early 2000s and mid-2000s, unaccounted for water increased by around 15 percent.

Along with technical water supply problems, the quality of service has greatly deteriorated in recent years. Access to wells and boreholes is the prevalent form of water supply covering about 50 percent of the population, significantly higher than for the peer group. But in 2004 around 75 percent of hand pumps were not functioning, and the situation has become worse since. The increase in acess to piped water,

from 34 percent in 1999 to 37 percent in 2005, conceals a major contraction in the use of stand posts, from 10 to 5 percent over the same period. In fact, 0.8 percent of the population per year lost access to standposts and around 0.3 percent of the population each year has been gaining access to wells and boreholes, a lower-quality form of water supply (figure 8a).

Figure 8. While access to improved water supply has kept pace with population growth, sanitation levels lag (annualized growth)



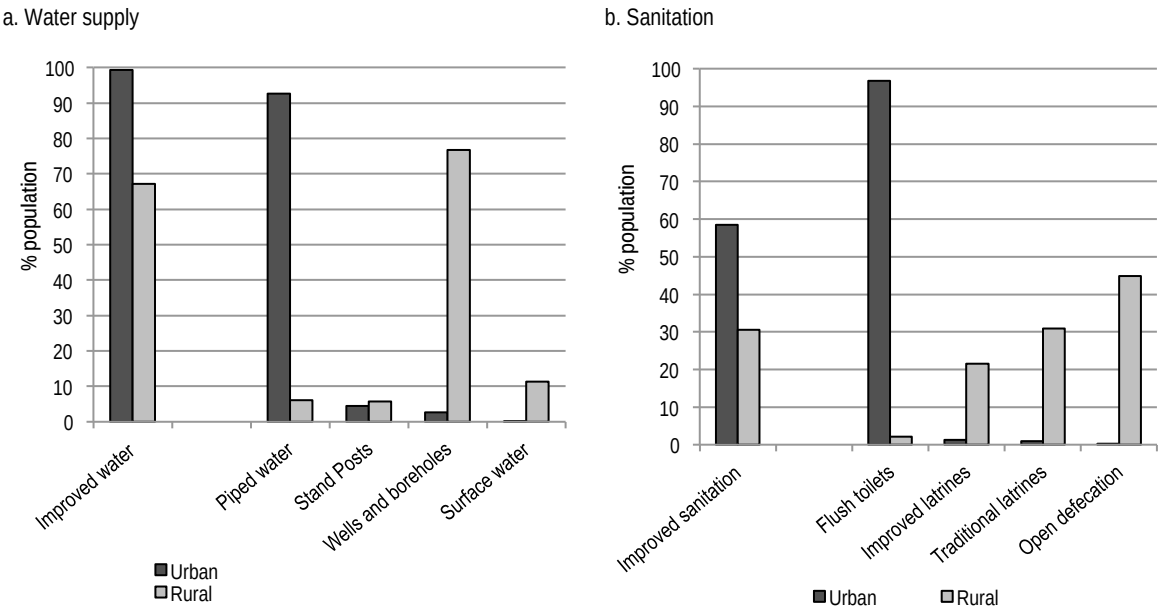
Source: WHO 2010, from the 1999 and 2005 Demographic and Health Surveys.

Access to improved water is highly inequitable, with the poorest quintiles of the population not connected to piped water. Access to improved water in urban areas—where most of the better-off population lives—is 99 percent versus 67 percent in poorer rural areas (figure 9a), according to the 2005 Demographic and Health Survey (DHS). The main driver of the inequity is that piped-water service is more affordable in the more densely populated urban areas than it is in rural areas. The limited reach of piped water into rural areas makes the population largely reliant on springs and wells. Matters are made worse by the fact that more than two-thirds of these groundwater sources are unprotected, raising water-quality risks.

Zimbabwe's sanitation sector has deteriorated over time, causing an increase in reliance on open defecation and a sharp decline in access to improved latrines. Reliance on open defecation increased from 27 to 29 percent between 1999 and 2005 (table 7), implying that, on average, 0.5 percent of the population was losing access to other forms of sanitation each year. Strikingly, access to flush toilets remained relatively steady, while access to improved latrines dropped from 25 to 14 percent between 1999 and 2005, exposing more people to unsafe sanitation options.

The state of sanitation is particularly dire in the rural areas, where only 31 percent of individuals have access to improved sanitation (figure 9b). The difference is largely due to the ubiquity of flush toilets in urban areas (figure 9b). In rural areas, on the other hand, there has been a shift away from improved latrines and back toward inferior traditional latrines—and even open defecation in some cases. Indeed, up to 5 percent of rural Zimbabweans lost access to improved latrines between 1999 and 2008. This is due to the fact that the construction of the improved latrines was becoming obsolete, at a time when cement had become too scarce and expensive to allow for the necessary repairs and reconstruction of the latrine structures to take place. Despite the progress in traditional latrines and, to a much lower extent, flush toilets, the combined expansion of improved sanitation facilities fell short of rural population growth, which stood at 1.4 percent per year.

Figure 9. Access to water sources is highly inequitable between urban and rural communities



Source: AICD water supply and sanitation database (www.infrastructureafrica.org/aicd/tools/data).
Note: Access figures calculated by the AICD using data from the 2005 Demographic and Health Survey.

Water utility performance is plagued by inefficiencies and lack of investment. In the late 1990s, legislation established the Zimbabwe National Water Authority (ZINWA) to take responsibility for water supply and sanitation nationwide. But water supply and sanitation systems significantly deteriorated under the ZINWA, affecting utility performance and service quality. The lack of investment in the sector for almost a decade has led the ZINWA to have distributional losses as high as 45 percent of production (see table 7), more than double the level of a well-performing utility and one of the highest among southern African utilities (figure 10a). Water production is estimated to be 30 percent below requirements (World Bank 2008a), while bill collection is very low at around 20 percent as of April 2009. Since dollarization in 2009, collections ratios started to pick up, but are still at very low levels.

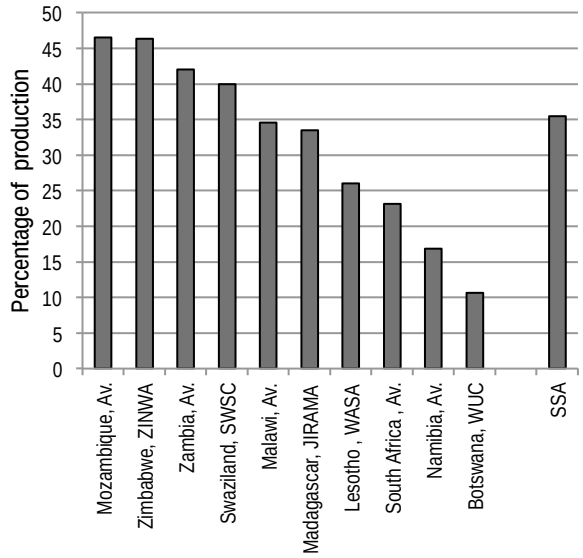
With less than 90 connections per employee, the ZINWA's labor productivity is one of the lowest in southern Africa (figure 10b). The recent transfer of responsibility for ensuring provision of water and

wastewater services from the ZINWA to local governments, and the capital city water services to Harare Water, is an important step to restore coverage and service quality to pre-ZINWA levels.

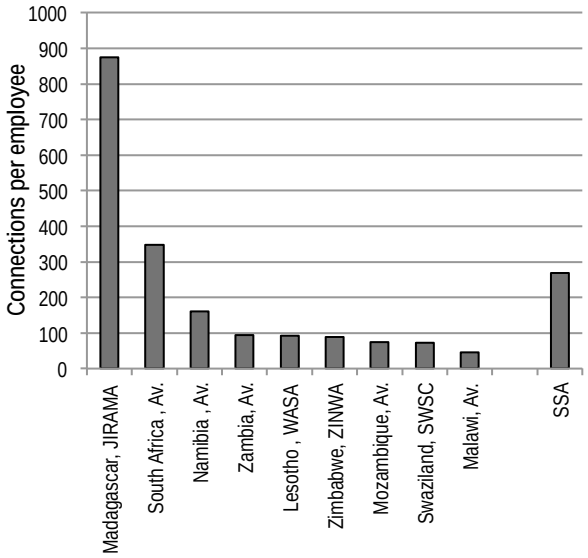
Figure 10. Distribution losses and labor productivity among southern African utilities

Latest available year

a. Distributional losses (percentage of production)



b. Labor productivity (connections per employee)



Source: AICD water and sanitation utilities database (www.infrastructureafrica.org/aicd/tools/data).
Note: Per water connection. Zimbabwe data is for 2008; SSA = Sub-Saharan Africa.

Another problem is that water tariffs do not cover costs. At an estimated \$0.23 and \$0.82 per m^3 for residential and nonresidential tariffs, respectively, the ZINWA's tariffs are below the tariffs reported in other water-scarce countries in Africa and other developing regions in the world (see table 7).

About 60 percent of total water and sanitation sector spending needs comes from urban areas. This is due to the relatively rapid population growth in urban as opposed to rural areas (1.4 percentage points per annum versus 0.2 percentage points) and due to the prevalence of more costly higher-end water and sanitation solutions in urban areas (such as piped water and flush toilets). Water accounts for 87 percent of total needs, while sanitation accounts for the rest. Around 70 percent of sanitation needs are in the rural areas (table 8).

Table 8. Water and sanitation needs

$ millions/year

	Urban	Rural	Total
Water and sanitation			
Total spending	260.0	167.4	427.5
Capital spending	164.1	121.5	285.6
Expansion	67.3	47.4	114.7
Rehabilitation	96.8	74.1	170.9
Operation and maintenance	95.9	45.9	141.8
Water			
Total spending	242.9	128.3	371.2
Capital spending	151.4	88.4	239.8
Expansion	57.5	23.0	80.5
Rehabilitation	93.8	65.4	159.2
Operation and maintenance	91.5	39.9	131.4
Sanitation			
Total spending	17.2	39.1	56.3
Capital spending	12.8	33.1	45.9
Expansion	9.8	24.4	34.2
Rehabilitation	3.0	8.7	11.7
Operation and maintenance	4.4	6.1	10.5

Source: Banerjee and others 2009.

Transport

Roads

Achievements

Zimbabwe has a relatively dense national road network. Total road density is 100 km/1,000 square kilometers (km^2)—double the figure for neighboring Zambia and almost triple that of Mozambique—and the network spanned almost 44,000 km in 2008.[8] The classified network—roads under state jurisdiction—totaled 18,253 km in 2010, according to the recent Zimbabwe Road Condition Survey, while there are an additional 5,000 km of urban roads, and around 39,000 km of unclassified roads. The rural-accessibility index in Zimbabwe, at 46 percent, is more than double the regional averages (table 9).

Zimbabwe has strong road connections with the SADC. Zimbabwe is linked to its neighbor South Africa—the largest regional economy and home to the busiest port in Africa—and other countries such as Mozambique, Botswana, Zambia, the Democratic Republic of Congo, Malawi, and Tanzania through the North–South Corridor, the most extensive corridor system in the region. In addition, the North–South

[8] Alternative sources, including several World Bank project documents, mention a total of more than 88,000 km, doubling AICD's estimates.

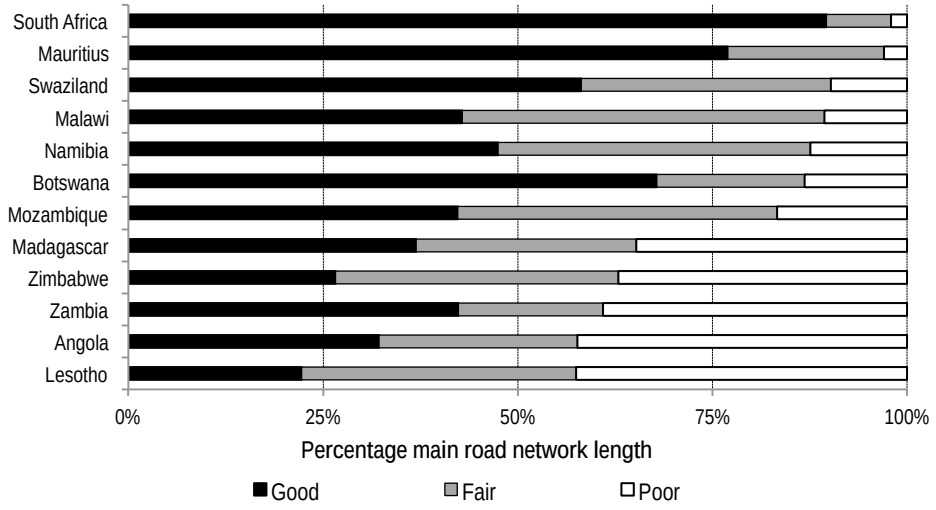
Corridor serves as a link to other important corridors that branch off from it, such as the Trans-Kalahari, Beira, Lobito, Dar es Salaam, and Nacala corridors (Curtis 2009). Along the corridor, the core road artery runs 7,500 km from Dar es Salaam in Tanzania to Durban in South Africa, via Lusaka, Zambia, through the Chirundu border crossing and on to Harare, Zimbabwe, and then into South Africa at Beitbridge. But as a result of recent political unrest in Zimbabwe, an alternative route has opened up, bypassing Zimbabwe and going through Botswana instead.

The road sector went through important institutional reforms in 2000–01. Before the reforms most of the financing for roads came from government appropriations out of the national budget. But in the early 2000s dedicated road-user charges were created and assigned to the road fund, to be managed by the Zimbabwe National Road Administration (ZINARA). But maintenance and rehabilitation is constrained by insufficient funding, aggravating the extent of undermaintenance.

Challenges

While Zimbabwe boasts one of the most extensive road networks in the region, its condition has deteriorated rapidly over the past two decades. As of 2008 Zimbabwe has one of the lowest percentages of roads in good condition the region (figure 11). The roads in poor condition include key regional arteries, such as the corridor leading to the port of Beira in northern Mozambique, hindering the competitiveness of the port even though it is significantly closer to Zimbabwe than the port of Durban. The 2010 Zimbabwe Road Condition Survey paints an even more dismal picture of the current quality of classified roads (table 10). Only 34 percent of total classified roads are in fair or good condition and only 14 percent in good condition. The quality of paved/sealed roads is somewhat better than that of gravel and earth roads; nevertheless, a daunting 50 percent of classified paved roads are in poor condition and require costly rehabilitation. Based on the results of this survey, the government estimates that $2.9 billion would be needed to rehabilitate Zimbabwe's entire classified network.

Figure 11. Benchmarking road conditions against regional peers 2006–08



Source: AICD road sector database on southern sub-saharan african countries (2008).

Table 9. Zimbabwe's road indicators benchmarked against Africa's low- and middle-income countries, as of 2008

Indicator	Unit	Low-income, fragile countries	Resource-rich countries	Zimbabwe	Middle-income countries
Classified road network density	km/1,000 km^2 of land area	96	98	51	278
Total road network density [a]	km/1000 km^2 of land area	145	128	100	318
GIS rural accessibility	% of rural population within 2 km of all-season road	32	20	46	31
Main road network condition [b]	% in good or fair condition	55	68	63	86
Rural road network condition [c]	% in good or fair condition	56	61	54	65
Classified paved road traffic	AADT	843	1,408	861	2,451
Classified unpaved road traffic	AADT	55	54	19	107
Primary network overengineering	% of primary network paved with 300 AADT or less	47	15	16	18
Perceived transport quality [d]	% firms identifying transport as major business constraint	32	27	n.a.	18

Source: AICD Road Sector Database on 40 Sub-Saharan African countries.

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

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

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

d. *Source:* World Bank—IFC Enterprise Surveys on 32 Sub-Saharan African countries.

AADT = average annual daily traffic; GIS = geographic information system.
n.a. = Not applicable.

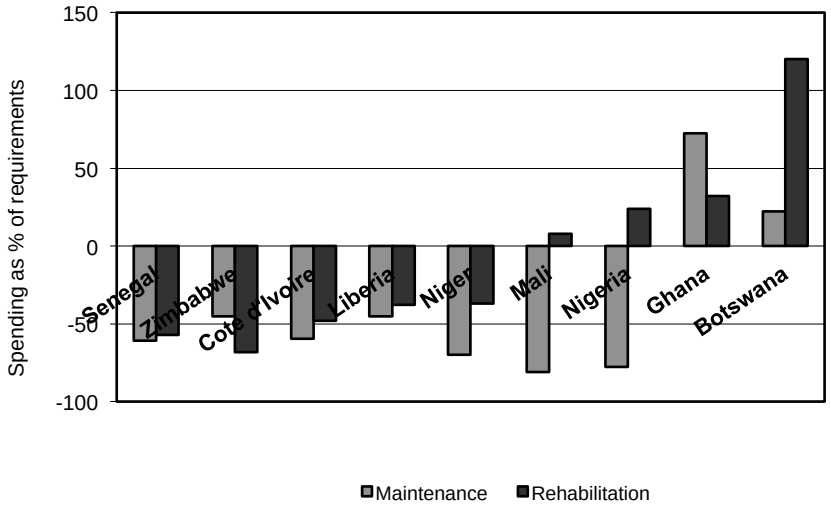
Table 10. Quality of classified roads in Zimbabwe, 2010

	Paved/sealed		Gravel		Earth		Total	
	km	%	km	%	km	%	km	%
Very good	705	7	39	0	6	1	750	4
Good	1,512	15	298	4	90	12	1,900	10
Fair	2,720	28	706	9	56	7	3,482	19
Poor	4,857	50	6,670	86	612	80	12,141	66
Total	9,793	100	7,713	100	764	100	18,273	100

Source: 2010 Zimbabwe Road Condition Survey.

Based on the physical configuration and condition of Zimbabwe's infrastructure network, it is possible to estimate the resources that would be needed to clear the current rehabilitation backlog and maintain the network in good condition. Comparing recent spending against these norms indicates that Zimbabwe has not succeeded in securing adequate resources for road-network preservation and maintenance (figure 12). There is a shortfall of about 50 percent between recent spending on road maintenance and rehabilitation and the requisite amounts. As the benchmarking shows, this situation is quite commonplace in Sub-Saharan Africa.

Figure 6. Zimbabwe's spending is not sufficient to cover maintenance and rehabilitation needs



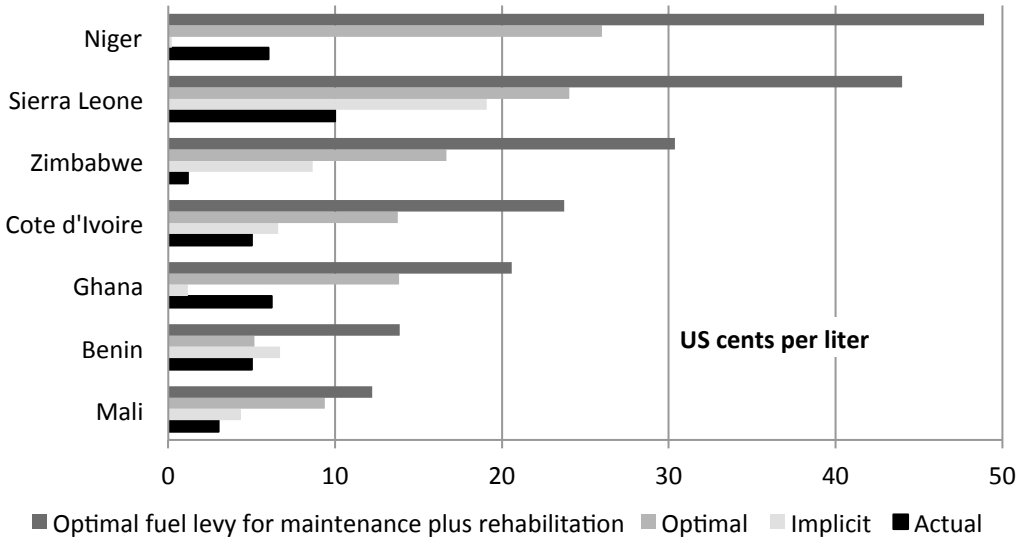
Source: Gwilliam and others 2008

One reason Zimbabwe does not have adequate road maintenance funds is that its fuel levy is too low. Fuel levies stand at $0.011 per liter of diesel and $0.0124 per liter of gasoline, well below more typical levels of $0.05–$0.10 per liter found elsewhere in Africa. The ZINARA plans to increase the gasoline fuel levy to 4 cents per liter to boost cost recovery, but so far its implementation has not been feasible. In addition, toll gates have been added to allow for the application of additional road-user charges. Nevertheless, the ZINARA has been unable to raise sufficient road-user revenues to cover road-maintenance requirements, in part because it lacks control over the revenue collection, transfer, and allocation mechanisms. Further efforts are therefore needed to provide a secure and adequate source of funding for road maintenance.

Zimbabwe needs to function more effectively as a regional transit country to allow smoother passage of trade flows from neighboring countries and to benefit from the business opportunities that these represent. Although Zimbabwe is on the crossroads of Africa, occupying a strategic position on the North–South corridor, it nonetheless faces one of the highest export and import costs in the region (figure 14). The administrative costs and delays associated with moving freight across its borders are significant and include lengthy documentation time and high customs clearance fees and terminal-handling charges. A Mozambican company entering Zimbabwe must pay a number of charges including an entry visa fee costing approximately $30 for a month, and a customs guarantee costing $120 per year (USITC 2009). These administrative charges add greatly to the costs of trade. As a result, Zimbabwe was ranked 168 among 183 countries in 2010 and 2011 with regard to facilitation of cross-border trade. [9]

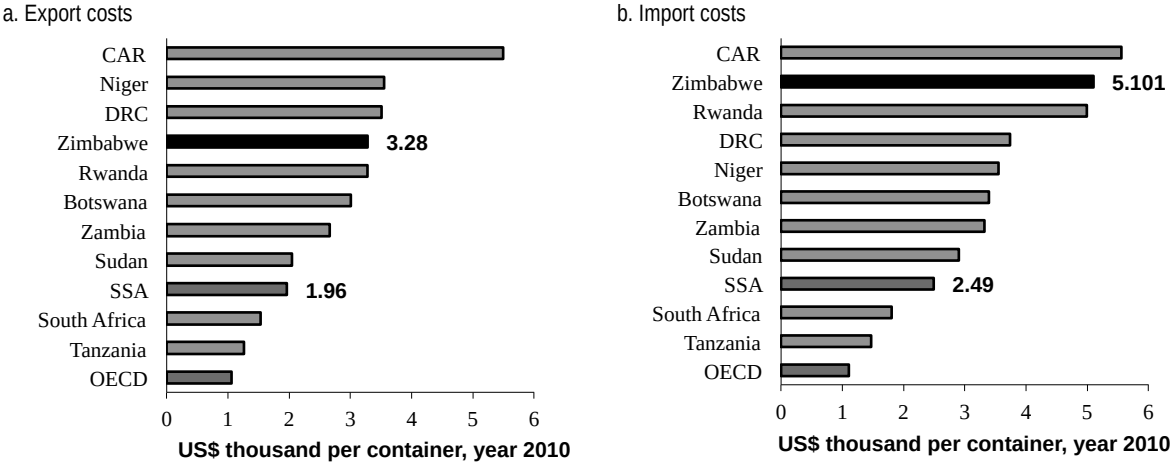
[9] www.doingbusiness.org/data/exploreeconomies/zimbabwe.

Figure 13. Zimbabwe's fuel levy and public contribution fall short of the road network's maintenance and rehabilitation needs



Source: Gwilliam and others 2008.

Figure 14. Trading across borders is expensive in Zimbabwe



Source: World Bank's "Doing Business" Database 2010.

Note: CAR = Central African Republic; DRC = Democratic Republic of Congo; OECD = Organisation for Economic Co-operation and Development; SSA = Sub-Saharan Africa.

By far the most problematic road border crossings in southern Africa are those at Beitbridge (Zimbabwe to South Africa) and Chirundu (Zambia into Zimbabwe). The combined four-day delay at this pair of crossings is much higher than at any other major crossings in Africa, meaning as much as 50 percent of transport time between Durban and Lusaka is lost at the Zimbabwean border. There is therefore an urgent need to create one-stop border crossings at these locations, and to rehabilitate existing border-post infrastructure. The overall investment cost of improving the performance of border posts along the corridor is relatively modest, lying between $20 million and $30 million. But challenging

administrative and regulatory reforms are also needed. Reducing delays would significantly help improve utilization of Zimbabwe's trucking fleet and lower transport prices.

Rail

Achievements

Zimbabwe has a functional railway network. The state-controlled National Railways of Zimbabwe (NRZ) rail network has a single-track route length of 3,077 km, of which 2,759 km are operational. The Bulawayo Beitbridge Railway (BBR), a build-operate-transfer (BOT) project, consists of around 317 km and runs from Beitbridge on the border with South Africa to Heany Junction near Bulawayo.

Zimbabwe has the highest rail-traffic density in the region aside from South Africa. As the table below shows, the NRZ has very high freight density at around 902,000 tonne-km/km (table 11), while most other southern African railways are serving substantially less. Passenger density is also comparatively high.

Table 11. Railway indicators for Zimbabwe and selected other countries, 2000–05

	NRZ (Zimbabwe)	CFM (Angola)	BR (Botswana)	CEAR (Malawi)	Nacala Railroad (Mozambique)	Beira Railroad (Mozambique)	Ressano Garcia Line (Mozambique)	Transnamib (Namibia)	Spoornet (South Africa)	RSZ (Zambia)
Concessioned (1)/ state run (0)	0	0	0	0	1	1	0	0	0	1
Freight density (1,000 tonne-km/km)	902	469	827	90	270	663	364	475	2,427	406
Passenger density (1,000 passenger-km/km)	166	—	—	38	103	44	44	33	60	92
Labor productivity (1,000 traffic units per employee)	390	580	722	131	710	281	—	484	3,308	502
Locomotive productivity (million traffic units per locomotive)	8	30	41	3	25	13	—	25	33	25
Carriage productivity (1,000 passenger-km per carriage)	—	4,046	2,391	1,176	3,333	750	—	—	—	3,286
Wagon productivity (1,000 net tonne-km per wagon)	195	950	987	82	260	476	—	805	913	377
Freight yield (US cents/tonne-km)	—	—	—	6	5	3	3	—	—	4
Passenger yield (US cents/passenger-km)	—	—	—	1	0.9	0.5	1	—	—	1

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

Note: * With 2.5 passenger-km equivalent to 1 traffic unit, 1 tonne-km equivalent to 1 traffic unit.
— = Not available.

Zimbabwe's railways are interconnected with other national networks along the North–South Corridor, allowing for through traffic across Zambia, Zimbabwe, Tanzania, and South Africa. But while the rails are physically connected and of compatible gauge, there is a lack of reciprocal access rights between operators that would allow through train service due to the lack of arrangements for servicing other operators' locomotives that may experience technical difficulties. This means that locomotives need

to be exchanged at national borders, often leading to extensive delays due to shortages in traction capacity.

Challenges

The NRZ is not functioning effectively as part of the regional corridor. It has very poor operational performance, one of the worst in southern Africa. For example, as table 11 shows, labor productivity and wagon productivity are comparatively low. Over the past decade, the NRZ's technical, operational, and financial performance have been adversely affected by instabilities in the Zimbabwean economy, which, along with the NRZ's obligation as a public entity to provide certain uncompensated public-service obligations, has led to poor financial performance. Moreover, as a quasi-government organization, the NRZ cannot always respond to market dynamics. This has culminated in loss of network capacity leading to reduced traffic, reduced revenues, and reduced availability of funds for infrastructure maintenance and renewal. The dilapidated state of the infrastructure has resulted in some major accidents and derailments (World Bank 2008a).

In neighboring Zambia, the operator RSZ practices discriminatory pricing for rail freight, which is distorting rail traffic flows along the entire North–South Corridor, including those experienced by the NRZ. Across much of Sub-Saharan Africa rail tariffs are close to $0.05 per tonne-km, on a par with or slightly below that of roads. But the unregulated rail-freight tariffs charged by the Zambian operator RSZ can stand at more than $2.00 per tonne-km, or 40 times the region's average. These tariffs reflect an abuse of monopoly power, motivated in part by vertical integration, with the same concessionaire operating the Zambian**low-income countrie**rail network and the Beitbridge border crossing from Zimbabwe into South Africa. The high level of these tariffs is having a distortionary effect on traffic flows and investment decisions along the entire corridor. For example, copper exports from the Democratic Republic of Congo are currently going by road to avoid these charges, whereas they would be more naturally suited to rail transportation via the NRZ network. Resolving this situation is far from straightforward, and would probably require a major renegotiation of the Zambian rail concession contract, combined with careful tariff regulation thereafter.

Air transport

Achievements

Zimbabwe has experienced steady growth in air transport capacity since 2004. About half of the seats are provided by the national carrier Air Zimbabwe, and a further 30 percent by two leading South African carriers.

Zimbabwe's record on air transport safety is relatively strong. Air Zimbabwe, the national flag carrier out of Harare, is in the International Air Transport Association (IATA) International Safety Audit (IOSA) registry, meaning it has passed IATA's operational-safety audit. In addition, the 2004 International Civil Aviation Organization (ICAO) Safety Oversight Audit found Zimbabwe overall to be slightly above global averages for the implementation of safety regulation and practices; in a follow-up, the country had an implementation rating of around 86 percent, compared to the global average of no more than 68 percent for the year. None of Zimbabwe's carriers appear on the European Union's (EU's) blacklist, and

Air Zimbabwe maintains regular service between Harare and London. Carriers based in Zimbabwe are not currently allowed to fly aircraft into the United States, however.

Table 12. Benchmarking air transport indicators for Zimbabwe and select other countries

Country	Zimbabwe	Botswana	Zambia	Mozambique	Namibia	South Africa
Traffic (2007)						
Domestic seats (seats per year)	237,835	241,696	437,658	1,144,644	84,162	31,767,537
Seats for international travel within Africa (seats per year)	1,109,986	435,708	1,459,766	582,836	877,812	6,314,557
Seats for intercontinental travel (seats per year)	182,585	n.a.	113,217	91,637	242,736	7,707,063
Seats available per capita	0.118	0.357	0.168	0.087	0.574	0.954
Herfindahl-Hirschmann Index—air transport market (%)	30.20	60.25	17.53	31.54	39.39	16.66
Quality						
Percent of seat-km in newer aircraft	71.4	100.0	63.8	57.0	79.0	83.8
Percent of seat-km in medium or smaller aircraft	42.7	0.0	50.6	42.5	28.3	32.8
Percent of carriers passing IATA/IOSA audit	33.3	0	0	100.0	100	33.3
FAA/IASA audit status	Failed	No audit	No audit	No audit	No audit	Passed

Source: Bofinger 2009Derived from AICD national database (www.infrastructureafrica.org/aicd/tools/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.
n.a. = Not applicable.

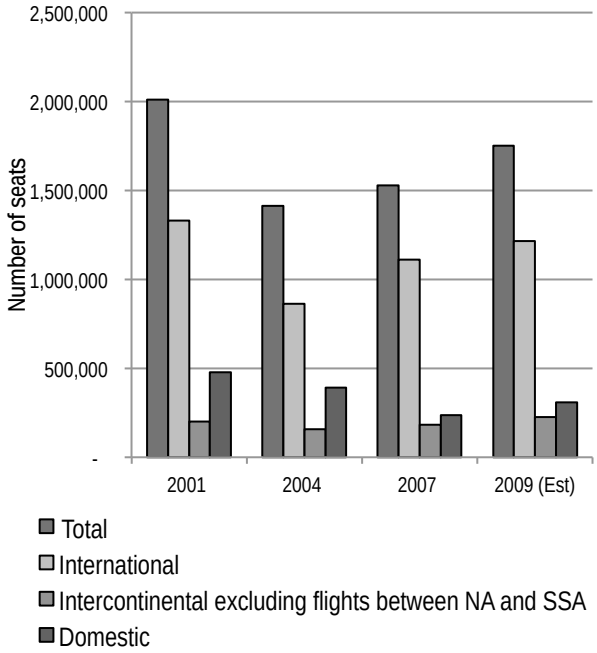
Challenges

The air transport sector is not immune from Zimbabwe's political and economic challenges. Air Zimbabwe is struggling financially, and anecdotal evidence of poor schedule reliability and service quality show an airline with many operational challenges. The economic difficulties faced by the airline are potentially affecting its ability to import spare parts for maintenance.

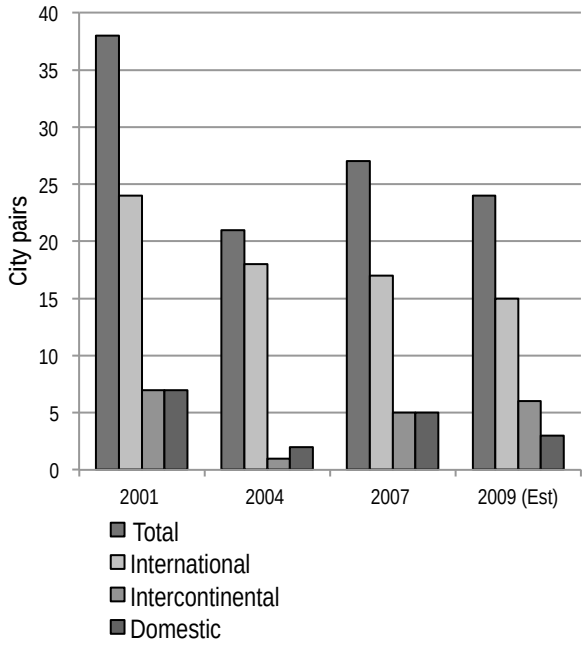
Zimbabwe's overall spending needs for the transport sector are estimated at $218 million annually for a decade, which would restore the road network to good condition and make improvements to other transport modes. By far the largest component of transport spending needs is rehabilitation of the road network, which accounts for 87 percent of total transport needs (table 13). Moreover, as much as 70 percent of total road sector spending needs are traceable to restoring the condition of the extensive rural network.

Figure 15. Evolution of seats and city pairs in Zimbabwe

a. Seats



b. City pairs



Source: Bofinger 2009Derived from AICD national database (www.infrastructureafrica.org/aicd/tools/data).
Note: As reported to international reservation systems.
NA = North Africa; SSA = Sub-Saharan Africa.

Table 13. Zimbabwe's transport needs

US$ million per year

		Improve condition	Upgrade category	Expand capacity	Maintenance	Total
Roads	Total	107.6	16.8	0.0	65.6	190.0
	Regional	8.4	0.0	0.0	6.3	14.7
	National	4.9	4.9	0.0	5.3	15.2
	Rural	90.7	0.0	0.0	43.1	133.8
	Urban	3.6	11.9	0.0	10.9	26.4
Railways		0.0	13.8	0.0	8.1	21.9
Airports		0.3	0.0	0.6	5.0	5.9
Total		107.9	30.7	0.6	78.7	217.9

Source: Carruthers, Krishnamani, and Murray 2009.

Information and communication technologies

Achievements

Despite Zimbabwe's political and economic situation, it has maintained parity with Sub-Saharan African averages for many ICT indicators. Fixed telephone line penetration exceeded the Sub-Saharan average in 2008 and Internet access penetration was about the same. Mobile penetration has lagged due to chronic network underinvestment as a result of the country's economic situation. But the market more than doubled in 2009, lifting mobile subscriptions per 100 inhabitants to 24, reducing the gap between Zimbabwe and the rest of Sub-Saharan Africa (table 14).

Table 14. Benchmarking ICT indicators

		Zimbabwe		Zimbabwe	Lower-income group	Sub-Saharan African region
	Unit	2000	2005	2008	2008	2008
GSM coverage	% population under signal	48	56	59	56	56
International bandwidth	Bits/person	1	4	10	24	34
Internet	Users/100 people	0.4	3.9	4.5	4.6	5.1
Landline	Subscribers/100 people	2.2	2.8	2.7	4.6	1.5
Mobile phone	Subscribers/100 people	2.7	5.9	9.6	28.5	33.3

		Low-income group	Sub-Saharan Africa	Zimbabwe
		2008	2008	2009
Price of monthly mobile basket	US dollars	10.0	11.8	10.8
Price of monthly fixed-line basket	US dollars	9.8	11.6	9.8
Price of monthly fixed broadband	US dollars	102	100	200
Price of a call to the United States per minute	US dollars	—	0.8	*Regional: 0.19 International Group 1: 0.27 Group 2: 0.47 Group 3: 1.10
Price of an inter-Africa call per minute	US dollars	—	1.0	

Source: Adapted from Econet, POTRAZ, Tel-One, AICD, and World Bank ICT At-a-Glance.
Note: * Country breakdown not available.
— = Not available.

Challenges

Zimbabwe has made some institutional reforms such as the creation of the Postal and Telecommunications Regulatory Authority of Zimbabwe (POTRAZ). The country has introduced competition in the mobile sector with three operators: Econet, Telecel, and Net-One. It is also moving toward a streamlined licensing system. Despite the reforms, the level of competition remains low. There is only one fixed-line operator and four Internet service providers (ISPs), and Econet dominates the mobile market. Fixed operator Tel-One and its mobile subsidiary Net-One are state owned.[10] Foreign investment is limited to Telecel, which is 60 percent owned by Orascom of Egypt.

[10] The government is reportedly searching for a strategic partner. See: www.tmtfinance.com/reports/newreports/newreports8.aspx.

A major issue has been the country's rampant inflation causing frequent tariff changes to ICT pricing (POTRAZ 2009). The dollarization of the economy in 2009 brought this to an end by introducing stability to tariffs, which are now expressed in U.S. dollars. Zimbabwe's fixed-line and mobile retail pricing is similar to peer averages. Fixed broadband is expensive, almost twice as much as the Sub-Saharan average, which is already high by international standards.

Internet-access penetration in Zimbabwe is average for the southern African region (figure 17). There are no comprehensive official data on the number of Internet users in Zimbabwe, though the Zimbabwe All Media and Products and Services Survey found that 22 percent of urban dwellers aged 15 years and older used the Internet in mid-2010 (Ndlela 2010). This amounts to some 645,000 people or 5.1 of the total population.[11]

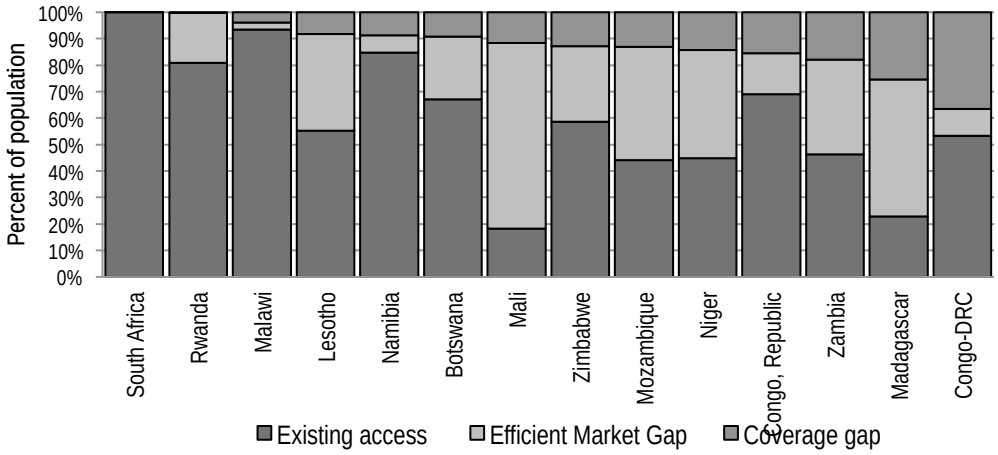
International connectivity is a challenge for Zimbabwe due to its landlocked situation. Much of Zimbabwe's international connectivity has been through satellite. Activities are under way to build out national fiber networks to obtain cross-border connectivity to undersea fiber cable. For example, Powertel, a subsidiary of the Zimbabwe Electricity Supply Authority, inked an agreement with the Botswana Telecommunications Corporation (BTC) for supply of international bandwidth via its links to undersea cables (Smarts 2010). Tel-One is building a fiber-optic cable to Mutare on Zimbabwe's eastern border where it will connect to a submarine cable in Mozambique (*Technology Zimbabwe*, June 24, 2010). Econet is also busy laying a nationwide fiber-optic cable backbone with spurs planned for connection to undersea fiber systems in Mozambique and South Africa (Econet Wireless Zimbabwe 2010). If these initiatives achieve fruition, they would create competing sources of international bandwidth, driving down bandwidth costs and retail broadband prices. Wireless broadband will also create greater competition with Econet having launched 3G and WiMAX[12] networks while Powertel and Tel-One have deployed CMDA[13] 2000-based high-speed wireless networks.

[11] As in most low-income countries, Internet access is estimated to be negligible in rural areas in Zimbabwe. The 2010 estimate for Internet users is derived from applying the ZAMPS**[[expand acronym?]]** survey data to the urban population 15 years and older using statistics for Zimbabwe from the United Nations. See: unstats.un.org/unsd/demographic/products/socind/.

[12] Worldwide interoperability for microwave access.

[13] Code division multiple access.

Figure 16. Around 13 percent of Zimbabwe's population can be reached by GSM signal under a subsidy scheme



Source: Mayer and others 2009.

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

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

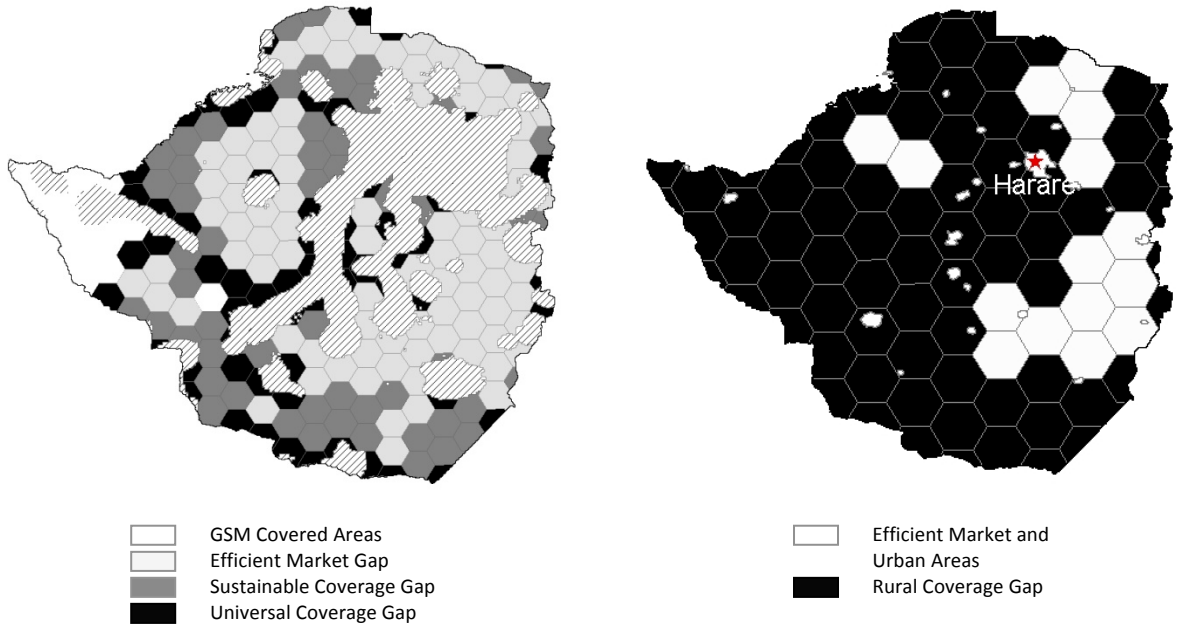
Coverage gap represents the coverage gap—the percentage of the population for whom services are not viable without a subsidy.

GSM = global system for mobile communications; DRC = Democratic Republic of Congo.

Figure 17. Telecom coverage in Zimbabwe

a. Voice infrastructure

b. Broadband

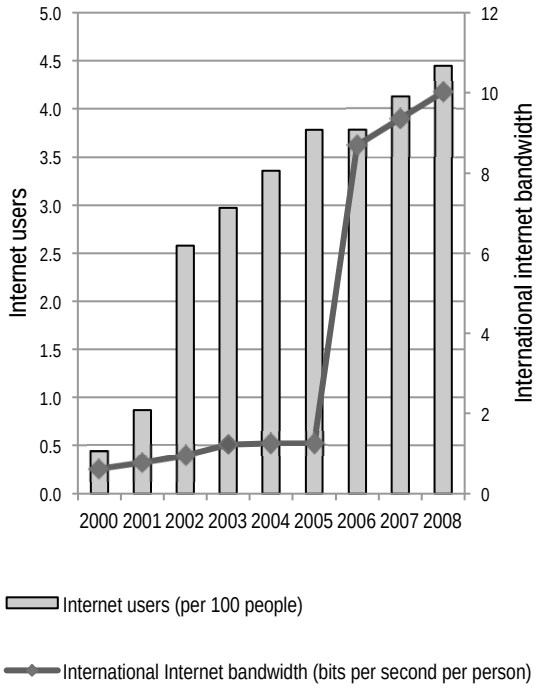


Source: Mayer and others 2009.

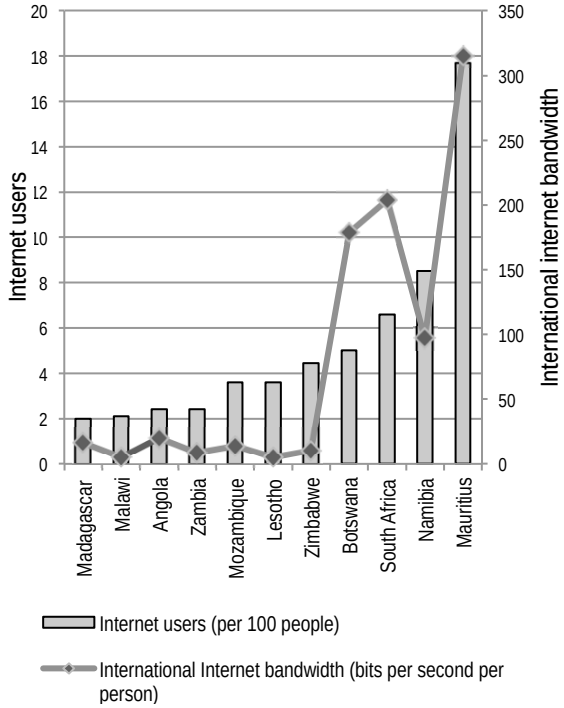
Note: GSM = global system for mobile communications.

Figure 18. Zimbabwe's Internet market and southern African peers

a. Internet service trends, Zimbabwe, 2000–08



b. Internet service trends, southern Africa



Source: AICD.

Mobile is the best hope for extending connectivity to most Zimbabweans. Telecel reports its network has population coverage of 68 percent (Orascom Telecom 2009), while Econet states "all urban areas and most rural areas have been covered (Econet Wireless Zimbabwe 2010)" The country is thus close to reaching its coverage gap, which has been calculated to be 13 percent (figures 16, 17) (AICD 2009). The coverage gap represents the proportion of the population living in areas that may not be commercially viable and require some level of public investment or subsidy. There is a universal service fund to which operators contribute 2 percent of their revenues, and which could be used to complete mobile coverage of the population. Consistent with that potential, annual private flows to the sector increased in 2008 and 2009, from average commitments of $17 million in 1998–2007 to average commitments of $162 million in 2008–09.[14]

Financing Zimbabwe's infrastructure

To meet its most pressing infrastructure needs and catch up with developing countries in other parts of the world, Zimbabwe needs to expand its infrastructure assets in key areas (table 15). The targets outlined in table 15 are purely illustrative, but they represent a level of aspiration that is not unreasonable. Developed in a standardized way across African countries, they allow for cross-country comparisons of the

[14] http://ppi.worldbank.org.

affordability of meeting the targets, which can be modified or delayed as needed to achieve financial balance. In the power sector, the targets assume that Zimbabwe will reach demand-supply balance based on its own domestic energy sources and meet national electrification targets of 52 percent. In terms of water, the targets assume that Millennium Development Goals (MDGs) will be met using the same mix of high- and low-end service types as is prevalent today. In transport, the target is to reach full connectivity of the capital city with international borders and secondary towns, as well as into agriculturally productive areas.

Table 15. Illustrative "ideal" investment targets for infrastructure in Zimbabwe

	Economic target	Social target
ICT	Install fiber-optic links to neighboring capitals and submarine cable.	Provide universal access to GSM signal and public broadband facilities.
Irrigation	Develop additional 141,846 hectares of large-scale and 1,742 hectares of economically viable small-scale irrigation.	n.a.
Power	Develop 2,251 MW of new generation capacity and 3,072 MW of interconnector capacity (no-trade scenario).	Rise electrification to 51.8 percent (98.8 percent urban and 13.7 percent rural).
Transport	Achieve regional (national) connectivity with good-quality 2-lane (1-lane) paved road.	Provide rural road access to 78.6 percent of the highest-value agricultural land, and urban road access within 500 meters.
WSS	n.a.	Achieve Millennium Development Goals, clear sector rehabilitation backlog.

Source: Mayer and others 2009; Rosnes and Vennemo 2009; Carruthers, Krishnamani, and Murray 2009; You and others 2009.
Note: WSS = water supply and sanitation; ICT = information and communication technology; GSM = global system for mobile communications. n.a. = Not applicable.

Meeting these illustrative "ideal" infrastructure targets for Zimbabwe would cost a staggering $2 billion per year over a decade. Capital expenditure would account for 60 percent of this requirement. Meeting the growing demand for power—the sector with by far the highest spending needs—will require an estimated $1.4 billion per year to install almost 2,251 MW of new generation capacity; 3,072 MW of interconnector capacity, and around $0.3 billion to rehabilitate the power network. Capital expenditure accounts for up to 67 percent of the total power needs. The water and sanitation sector is the area with the second highest spending needs: about $0.4 billion will be needed each year to meet the MDGs, with the capital investments absorbing close to 70 percent of the needs. As in the power sector, a significant amount is required for rehabilitation—around $0.2 billion per year. Another $0.2 billion per year will be required by the transport sector. While less than the amounts needed for other infrastructures sectors, requirements for ICT and irrigation are also high in absolute terms, amounting to around $0.08 billion and $0.05 billion a year respectively.

Zimbabwe's infrastructure spending needs are comparatively high in absolute terms, and even more so in GDP terms—Zimbabwe's burden of needs at 45.7 percent of GDP[15] is among the highest in the region (figure 19). Investment would absorb around 40 percent of GDP, more than twice what China invested in its infrastructure during the mid-2000s.

But given the volatility of Zimbabwe's GDP and, in the recent past, exchange rate, the estimate of the burden of needs relative to GDP is extremely sensitive to the year for which GDP is considered. For example, if expressed as percentage of average 1995–2000 GDP, the burden of needs would amount to

[15] Estimated 2009 GDP of $4.397 billion (IMF).

about 39 percent. Looking ahead, the relative burden is expected to decrease from the 2009 level to about 30 percent in 2010, as the projected nominal 2010 GDP is expected to continue rebounding. Even then, the burden is comparatively very high.

Thus, Zimbabwe's "ideal" investment scenario may lie out of reach for the time being. Therefore, two alternative scenarios were developed in this case (table 16).

Table 16. AICD annual spending needs estimates over a 10-year period

	Scenarios		
$ million per year	Ideal	Intermediate	Minimalist
Total	2,009	1,729	1,219
Power	1,242	1,156	665
WSS	427	342	313
Transport	218	110	187
ICT	75	75	36
Irrigation	47	47	18
New investment			
Power	577	491	0
WSS	115	48	0
Transport	31	16	0
ICT	39	39	0
Irrigation	29	29	0
Rehabilitation			
Power	257	257	257
WSS	171	171	171
Transport	108	24	108
ICT	0	0	0
Irrigation	17	17	17
Maintenance			0
Power	408	408	408
WSS	142	123	142
Transport	79	69	79
ICT	36	36	36
Irrigation	1	1	1

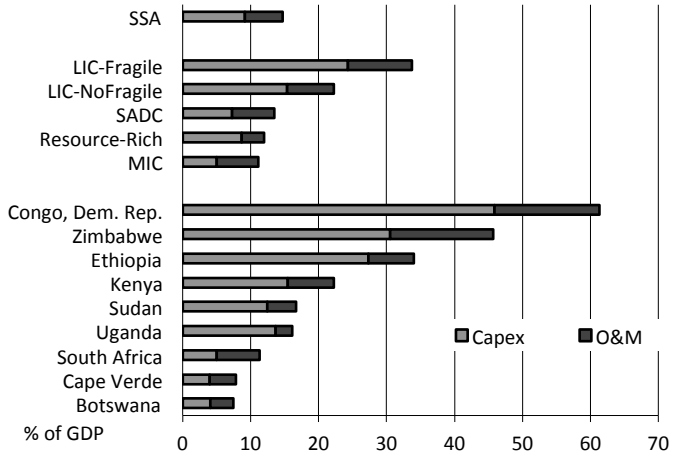
Source: Mayer and others 2009; Rosnes and Vennemo 2009; Carruthers, Krishnamani, and Murray 2009; You and others, AICD 2009. Derived from models that are available online at www.infrastructureafrica.org/aicd/tools/models.
Note: WSS = water supply and sanitation; ICT = information and communication technology.

The "minimalist" scenario assumes that only maintenance and rehabilitation needs should be met, thus reducing the total annual needs by 40 percent from $2.009 billion to $1.219 billion. But not making any new investments would have a negative impact on Zimbabwe's growth and economic sustainability and may slow down the overall recovery. Therefore, an "intermediate" scenario is also considered, which, in addition to maintenance and rehabilitation needs, allows for a modest level of new investment, including greater adoption of appropriate technologies for the transport and water sectors. For example,

meeting the MDGs for water supply and sanitation with lower-cost technologies than previously used, such as stand posts, boreholes, and improved latrines, could reduce the associated price tag by $85 million annually. Similarly, meeting transport-connectivity standards using lower-cost road-surfacing technologies—such as the single-surface treatment—could reduce the associated price tag by $108 million. Under this "moderate" scenario, the total infrastructure spending needs are reduced by 14 percent from $2.009 billion to $1.729 billion per year.

Figure 19. Zimbabwe's infrastructure spending needs are among highest in the region relative to GDP

Estimated infrastructure spending needed to meet targets, as percentage of GDP



Source: Foster and Briceño-Garmendia 2009.

Note: LIC = low-income countries; MIC = middle-income countries; SADC = Southern African Development Community; SSA = Sub-Saharan Africa; GDP = gross domestic product; O&M = operations and maintenance; CAPEX = capital expenditure.

Zimbabwe already spends a sizable amount ($0.8 billion per year) to meet its infrastructure needs (table 17). Characteristically, for Zimbabwe, as much as 83 percent of the total is allocated to operations and maintenance (O&M) and only 17 percent to capital expenditures. The emphasis onlow-income countrieO&M spending underscores the fact that maintaining already-existing infrastructure stock is both a challenge and a priority for Zimbabwe. Operating expenditure is entirely covered from budgetary and state-owned enterprise (SOE) resources and payments by infrastructure users. Around 25 percent of capital-expenditure funding comes from public sources. Overall, the central government directly accounts for slightly more than 2 percent of the public spending, with the rest being channeled via parastastal entities. Non–Organisation for Economic Co-operation and Development (Non-OECD) financiers account for an impressive 63 percent of total capital spending. The private sector accounts for another 10 percent, and official development assistance (ODA) flows at around 1 percent also play a smaller, but nonetheless significant, role.

Zimbabwe's existing infrastructure spending amounts to a staggering 23 percent of GDP (figure 20). This represents a very high level of effort, even when compared to the average for low-income states. Relative to its peer group, Zimbabwe, due to international sanctions, is much less reliant on ODA. Instead, its power sector capital investments are heavily reliant on non-OECD funding. Public investments on the other hand, are scarce in the power sector, but are more pronounced in the road and water sectors. The ICT sector, similar to the comparator group, is predominately financed by private

players. Zimbabwe's spending effort on power is substantially higher than the respective average for other low-income countries (figure 21). The largest share of infrastructure spending goes to power (48 percent), followed by ICT (24 percent), transport (17 percent), and water and sanitation (11 percent) (table 17).

Table 17. Financial flows to Zimbabwe's infrastructure, 2009*

$ millions per year

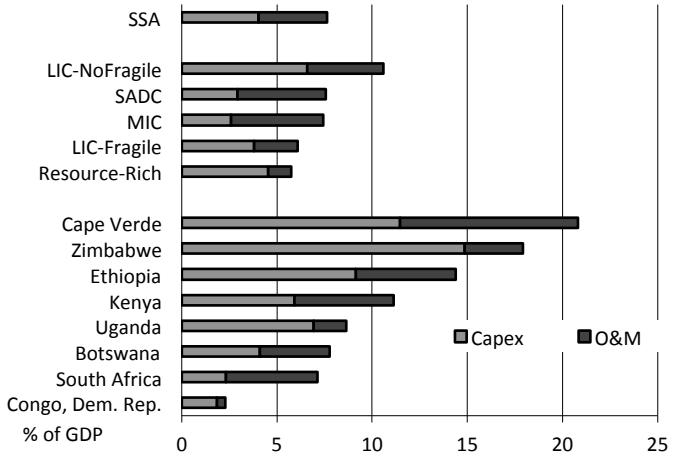
	O&M	Capital expenditure					
	Public sector	Public sector	ODA	Non-OECD financiers	PPI	Total CAPEX	Total spending
Information and communication technology	175	0	1	0	14	15	190
Irrigation	1	1	0	0	0	1	2
Power	294	1	0	83	0	84	378
Transport	110	23	0	1	0	24	134
Water supply and sanitation	75	9	1	0	0	10	85
Total	654	34	2	84	14	134	788

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

Note: O&M = operations and maintenance; ODA = official development assistance; PPI = private participation in infrastructure; CAPEX = capital expenditure; OECD = Organisation for Economic Co-operation and Development.

* in few singular cases, where 2009 numbers were not available, 2004 spending was used instead.

Figure 20. Zimbabwe's existing infrastructure spending is one of the highest in the region

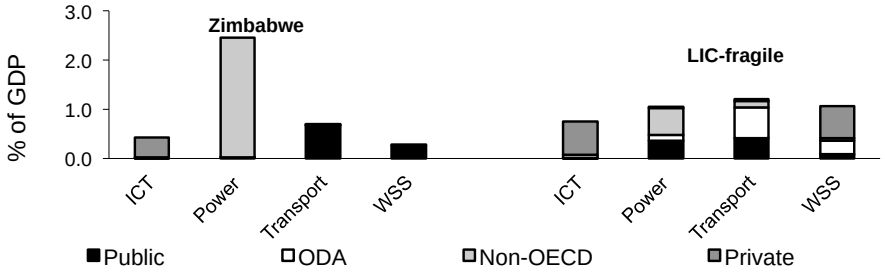


Source: Foster and Briceño-Garmendia 2009.

Note: LIC = low-income countries; MIC = middle-income countries; SADC = Southern African Development Community; SSA = Sub-Saharan Africa; GDP = gross domestic product; O&M = operations and maintenance; CAPEX = capital expenditure.

Figure 21. Zimbabwe's pattern of capital investment in infrastructure differs from that of comparator countries

Investment in infrastructure sectors as percentage of GDP, by source



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

Note: Private investment includes self-financing by households. ODA = official development assistance; OECD = Organisation for Economic Co-operation and Development; ICT = information and communication technology; GDP = gross domestic product; WSS = water supply and sanitation; LIC = low-income countries.

How much more can be done with existing resources?

As much as $752 million of additional resources could be recovered each year by improving efficiency (table 18). The most vexing problem is the underrecovery of costs in power, roads, and water. Every year up to $321 million is lost due to undercharging in these three infrastructure sectors. Raising power tariffs to cost-recovery levels could save $220 million annually, a better-balanced road fuel levy could bring in an additional $71 million, and more economically reasonable water tariffs could recover additional $48 million per year. Collection of bills also needs to be improved—as a result of poor collection discipline, Zimbabwe is losing $255 million per year in the power sector and $18 million per year in the water sector. Overstaffing in power and water parastastals is also quite significant. Cutting staff levels to economically viable benchmarks could save $71 million and $8 million in the power and water sectors, respectively; reducing distributional losses could save another $27 million and $10 million in the water and power sectors, respectively. Looking across sectors, the power and water sectors can benefit the most from tackling identified inefficiencies, followed by the roads sector.

Table 18. Zimbabwe's potential gains from greater operational efficiency (annualized)

	ICT	Irrigation	Power	Transport	WSS	Total
Underrecovery of costs	—	n.a.	220	71	48	339
Overstaffing	n.a.	—	91	—	10	101
Distribution losses	—	—	10	—	27	37
Undercollection	—	n.a.	255	n.a.	18	273
Low budget execution	0	0	0	1	1	2
Total	0	0	576	72	104	752

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

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

— = Not applicable.

n.a. = Not available.

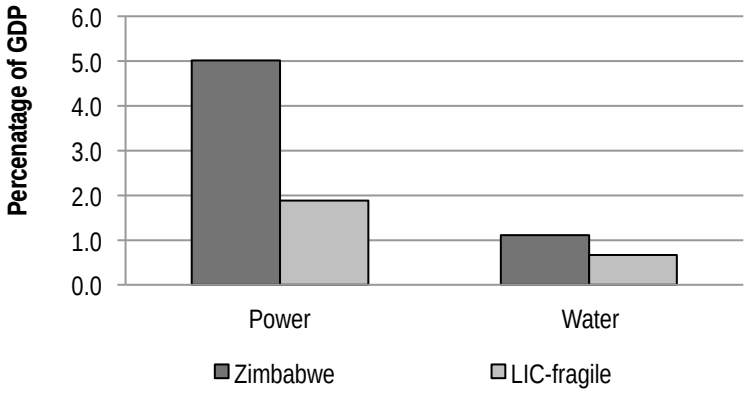
Undercharging for power alone costs Zimbabwe about $220 million each year. Even compared with the rest of Africa, where underpricing of power is commonplace, Zimbabwe's power company ZESA stands out as a relatively poor performer. It is estimated that the average total cost of producing electricity

has been $0.10 per kilowatt-hour (kWh) historically in Zimbabwe, while the average effective tariff stood at only $0.0753 as of 2009. The discrepancy produced an associated financial burden of about 5.0 percent of GDP (figure 22).

In the water sector, as of 2009 the ZINWA's average tariffs stand at $0.30 per m^3, falling substantially short of the estimated cost-recovery tariff of $0.74 per m^3. The economic burden caused by this discrepancy, 1.1 percent of GDP, is lower than that for power, but nevertheless is huge. In comparison to the average for low-income, fragile countries, Zimbabwe performs considerably worse when it comes to cost recovery of water and power tariffs.

Figure 22. Underpricing of power and water in Zimbabwe is burdensome

Financial burden of underpricing as percentage of GDP



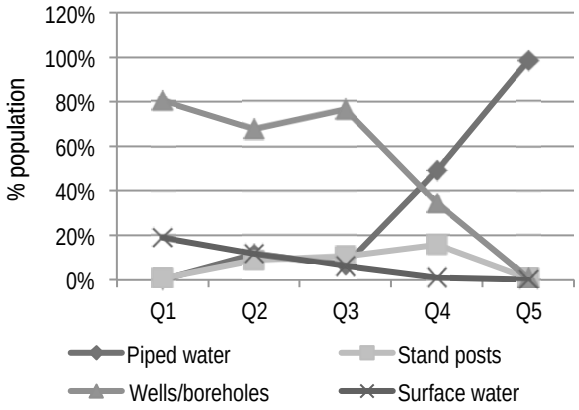
Source: Derived from Briceño-Garmendia, Smits, and Foster (2009).
Note: GDP = gross domestic product; LIC = low-income countries.

Moreover, because of inequitable access to power and water services in Zimbabwe, subsidized tariffs are regressive. More than 90 percent of those that have electricity or piped-water connections belong to the top 40 percent of the expenditure distribution; such connections are nonexistent for poorer households (figure 23). Only the richest quintile has access to piped water, while most of those in 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.

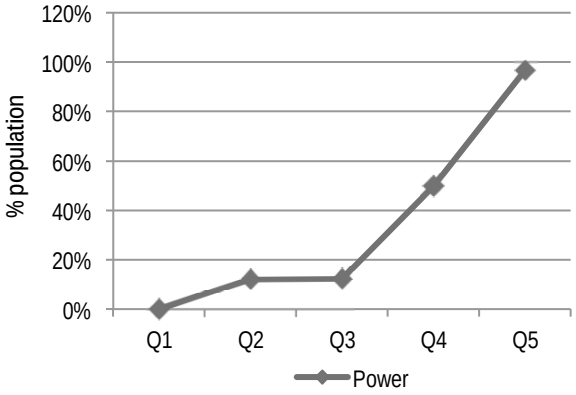
Both the power utility ZESA and water utility ZINWA are comparatively inefficient in terms of bill collection. While ratios may fluctuate from year to year, the most recent data available suggest that ZESA manages to collect only 62 percent of its power bills, while the ZINWA collects only 45.7 percent. As a result, the power utility undercollects $225 million per year, and the water utility undercollects $18 million per year.

Figure 23. Consumption of infrastructure services in Zimbabwe is highly differentiated by budget

a. Mode of water supply, by income quintile



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



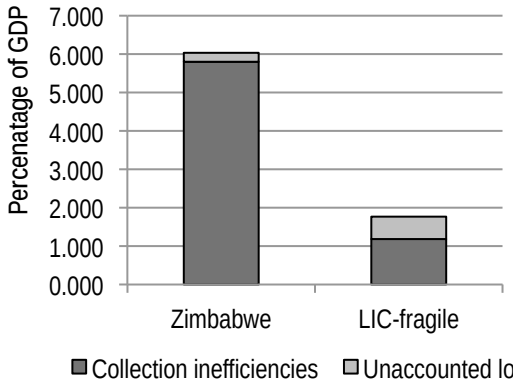
Source: Banerjee and others 2009.

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

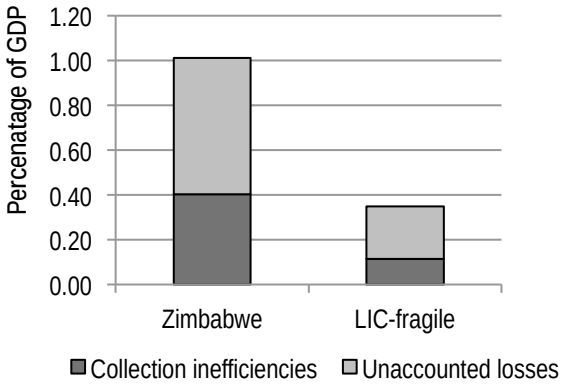
ZESA's distributional losses of 11 percent are not that far from the best-practice 10 percent benchmark for power, but they still result in $10 million in losses. Losses are more pronounced in the water sector, where nonrevenue water accounts for as much as 46.3 percent of total water production. This costs Zimbabwe about $27 million a year, equivalent to 0.61 percent of GDP. Zimbabwe could avoid this cost by increasing the bill collection efficiency and reducing losses for water and power services. Across both the power and water sectors, the burden of utility inefficiencies in Zimbabwe is considerably higher than for the benchmark countries (figure 24).

Figure 24. Zimbabwe's power and water utilities: The burden of inefficiency

a. Uncollected bills and unaccounted losses in the power sector, as a percentage of GDP



b. Uncollected bills and unaccounted losses in the water sector, as a percentage of GDP



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

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

Annual funding gap

Zimbabwe's infrastructure funding gap amounts to $584 million per year in the case of the idealistic scenario, or about 13 percent of GDP once efficiencies are captured. Every infrastructure sector except ICT is facing a funding gap (table 19). By far the biggest funding gap, even after accounting for significant efficiency potential, is found in the power sector, followed by water and sanitation. The funding gap could be fully funded from the available resources, assuming that huge efficiency gains are captured, under the minimalistic scenario set out above or the recent Governmental Action Program for Infrastructure. According to the action program, Zimbabwe would require $962 million of public and $460 million of private funds annually to meet most pressing infrastructure needs, including rehabilitation of existing stock and upgrades.

Adopting lower-cost technologies could substantially reduce the cost of meeting the posited infrastructure targets, and eliminate the funding gap. The overall savings from these measures would amount to $226 million or 38 percent of the country's total infrastructure funding gap, underscoring the importance of technology choices.

Table 19. Funding gaps by sector

US$ millions

	ICT	Irrigation	Power	Transport	WSS	Total
Spending needs idealistic scenario	(75)	(47)	(1,242)	(218)	(427)	(2,009)
Spending needs intermediate scenario	(75)	(47)	(1,156)	(110)	(342)	(1,729)
Spending needs minimalist scenario	(36)	(18)	(665)	(187)	(313)	(1,219)
Existing spending*	51	2	378	103	85	618
Reallocation potential within sectors	24	0	0	31	0	55
Efficiency gains	0	0	576	72	104	752
Funding gap idealistic scenario	—	(44)	(288)	(13)	(239)	(584)
Funding gap intermediate scenario	—	(45)	(202)	—	(153)	(304)
Funding gap minimalistic scenario	—	(16)	—	—	(124)	-

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

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

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

* traced to needs.

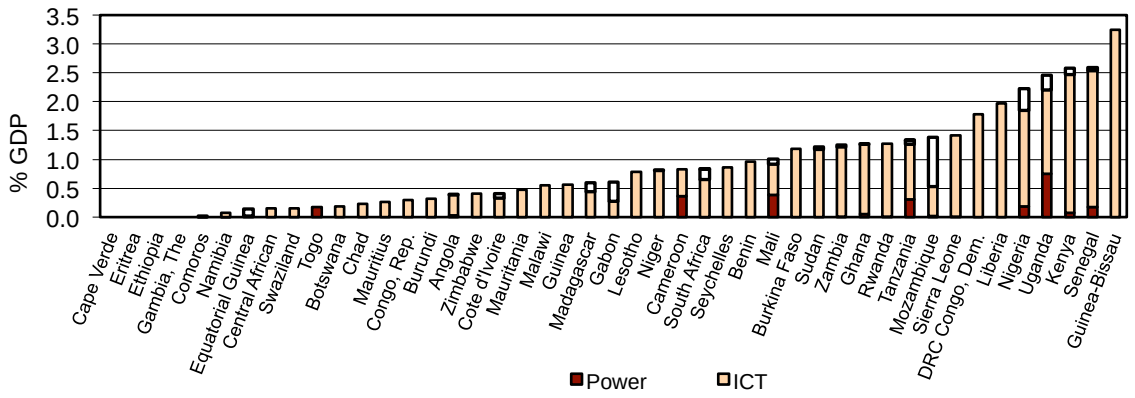
— = Not available.

What else can be done?

The funding gap can be addressed only by raising additional financing or, alternatively, by adopting lower-cost technologies or less-ambitious development targets. Zimbabwe may have realistic prospects for increasing the flow of resources to infrastructure, and to power and water in particular, both from the public and private sectors, and from ODA. But due to its economic and political turmoil, Zimbabwe has not attracted as much private finance into infrastructure as other African peers. Over the early 2000s, Zimbabwe has captured private investment commitments worth only around 0.4 percent of GDP, predominantly in the ICT sector. Most of Zimbabwe's peers have done significantly better in this area.

Notable are the absence of private investments in the power sector (figure 25). Countries such as the Democratic Republic of Congo, Liberia, Nigeria, Uganda, Kenya, and Senegal have all captured between 1.8 and 2.5 percent of GDP, while the most successful country in this regard, Guinea-Bissau, has captured in excess of 3.0 percent of GDP.

Figure 25. Zimbabwe needs to attract more private investment



Source: World Bank's Private Participation in Infrastructure Database, 2010.
Note: GDP = gross domestic product; ICT = information and communications technology.

Attracting required private sector funding is a challenge. The uncertain and difficult investment climate in Zimbabwe, where private property itself seems frequently jeopardized, makes it difficult to attract investors. Furthermore, most of the infrastructure providers are parastastals that require restructuring before any private participation can take place; poor parastastal performance currently poses too high a risk for private investors, and the regulatory framework needs to be revised and properly implemented. However, the potential scope of private participation in infrastructure (PPI) in Zimbabwe is highly promising, and therefore the country must take all possible means to tap this potential.

Given the size of the funding gap, clear principles for prioritization and sequencing of infrastructure investment decisions are essential. Since infrastructure is only a means to an end, it is important to define infrastructure development plans in close coordination with the national growth vision. Zimbabwe is currently envisaging a growth strategy based around key development corridors that anchor economic activities in a number of key sectors including agriculture, forestry, and mining. Scoping out the infrastructure packages needed to support development along these corridors would be a helpful way of prioritizing the overall national requirements identified in this report.

In any case, it will likely be necessary for Zimbabwe to consider a period longer than a decade to reach the illustrative infrastructure targets here outlined. Under business-as-usual assumptions on spending and efficiency, it would take a very long time for Zimbabwe to reach these goals. But with a combination of increased finance, improved efficiency, and cost-reducing innovations, it should be possible to catch up in a much shorter period. Simulations suggest that even if Zimbabwe is unable to raise additional finance, if at least inefficiencies can be addressed, the identified infrastructure targets could be achieved within a 14-year horizon. But without stemming inefficiencies, the existing resource envelope would not suffice to meet infrastructure targets in the medium term.

Bibliography

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 Web site: www.infrastructureafrica.org. For papers go to the document page (www.infrastructureafrica.org/aicd/documents), for databases to the data page (www.infrastructureafrica.org/aicd/tools/data), for models go to the models page (www.infrastructureafrica.org/aicd/tools/models), and for maps to the map page (www.infrastructureafrica.org/aicd/tools/maps). The references for the papers that were used to compile this country report are provided in the table below.

General

AICD (Africa Infrastructure Country Diagnostic). Africa's Infrastructure: A Time for Transformation (AICD Web site). www.infrastructureafrica.org.

Foster, Vivien, and Cecilia Briceño-Garmendia, eds. 2009. *Africa's Infrastructure: A Time for Transformation.* Paris and Washington, DC: Agence Française de Développement and World Bank.

Financing

Briceño-Garmendia, Cecilia, Karlis Smits, and Vivien Foster. 2009. "Financing Public Infrastructure in Sub-Saharan Africa: Patterns and Emerging Issues." AICD Background Paper 15, Africa Region, World Bank, Washington, DC.

Growth

Calderón, César. 2009. "Infrastructure and Growth in Africa." Policy Research Working Paper 4914, World Bank, Washington, DC.

Escribano, Alvaro, J. Luis Guasch, and Jorge Pena. 2010. "Assessing the Impact of Infrastructure Quality on Firm Productivity in Africa." Policy Research Working Paper 5191, World Bank, Washington, DC.

Yepes, Tito, Justin Pierce, and Vivien Foster. 2009. "Making Sense of Africa's Infrastructure Endowment: A Benchmarking Approach." Policy Research Working Paper 4912, World Bank, Washington, DC.

Information and communication technologies

AICD (Africa Infrastructure Country Diagnostic). 2009. "Connecting the Continent: Costing the Needs for Spending on ICT Infrastructure in Africa." Background Paper 3 (Phase II), Washington, DC.

Ampah, Mavis, Daniel Camos, Cecilia Briceño-Garmendia, Michael Minges, Maria Shkratan, and Mark Williams. 2009. "Information and Communications Technology in Sub-Saharan Africa: A Sector Review." AICD Background Paper 10, Africa Region, World Bank, Washington, DC.

Econet Wireless Zimbabwe. "Limited Final Results For the Financial Year Ended 28 February 2010." www.b2i.us/profiles/investor/fullpage.asp?f=1&BzID=1685&to=cp&Nav=0&LangID=1&s=0&ID=9346.

Mayer, Rebecca, Ken Figueredo, Mike Jensen, Tim Kelly, Richard Green, and Alvaro Federico Barra. 2009. "Connecting the Continent: Costing the Needs for Spending on ICT Infrastructure in Africa." AICD Background Paper 3, Africa Region, World Bank, Washington, DC.

Ndlela, Dumisani. 2010. "Zim Newspaper Readership Slumps, TV Viewership Grows." BizCommunity.com, July 21. www.bizcommunity.com/Article/238/23/50215.html.

Orascom Telecom. "Annual Report 2009." www.otelecom.com/Investor_Relations/AnnualReports.aspx.

POTRAZ. 2009. "Zimbabwe Country Report." Presented at the 12th CRASA Annual General Meeting, April 2. www.crasa.org/countryreport09.htm.

Smarts, Nchidzi. 2010. "BTC Signs Bandwidth Deal with Zim's Powertel." The Botswana Gazette, February 3. www.gazettebw.com/index.php?option=com_content&view=article&id=5321:btc-signs-bandwidth-deal-with-zims-powertel&catid=13:business&Itemid=2.

Technology Zimbabwe. 2010. "TelOne has 15 km of Fibre to Mutare and is 'Progressing Well'." June 24. www.techzim.co.zw/2010/06/telone-has-15km-of-fibre-to-mutare-and-is-"progressing-well"/.

Irrigation

Svendsen, Mark, Mandy Ewing, and Siwa Msangi. 2008. "Watermarks: Indicators of Irrigation Sector Performance in Africa." AICD Background Paper 4, Africa Region, World Bank, Washington, DC.

You, L., C. Ringler, G. Nelson, U. Wood-Sichra, R. Robertson, S. Wood, G. Zhe, T. Zhu, and Y. Sun. 2009. "Torrents and Trickles: Irrigation Spending Needs in Africa." AICD Background Paper 9, Africa Region, World Bank, Washington, DC.

Power

Briceño-Garmendia and Shkaratan. 2011. "Power Tariffs: Caught Between Cost Recovery and Affordability" Policy Research Working Paper forthcoming, World Bank, Washington DC

Eberhard, Anton, Vivien Foster, Cecilia Briceño-Garmendia, Fatimata Ouedraogo, Daniel Camos, and Maria Shkaratan. 2008. "Underpowered: The State of the Power Sector in Sub-Saharan Africa." AICD Background Paper 6, Africa Region, World Bank, Washington, DC.

Foster, Vivien, and Jevgenijs Steinbuks. 2009. "Paying the Price for Unreliable Power Supplies: In-House Generation of Electricity by Firms in Africa." Policy Research Working Paper 4913, World Bank, Washington, DC.

Rosnes, Orvika, and Haakon Vennemo. 2009. "Powering Up: Costing Power Infrastructure Spending Needs in Sub-Saharan Africa." AICD Background Paper 5, Africa Region, World Bank, Washington, DC.

Transport

Bofinger, Heinrich C. 2009. "An Unsteady Course: Growth and Challenges in Africa's Air Transport Industry." AICD Background Paper 16, Africa Region, World Bank, Washington, DC.

Bullock, Richard. 2009. "Off Track: Sub-Saharan African Railways." AICD Background Paper 17, Africa Region, World Bank, Washington, DC.

Carruthers, Robin, Ranga Rajan Krishnamani, and Siobhan Murray. 2009. "Improving Connectivity: Investing in Transport Infrastructure in Sub-Saharan Africa." AICD Background Paper 7, Africa Region, World Bank, Washington, DC.

Curtis, Barney. 2009. "The Chirundu Border Post: Detailed Monitoring of Transit Times." SSATP Discussion Paper No. 10, Regional Integration and Transport—RIT Series, Africa Region, World Bank, Washington, DC.

Gwilliam, Ken, Vivien Foster, Rodrigo Archondo-Callao, Cecilia Briceño-Garmendia, Alberto Nogales, and Kavita Sethi. 2008. "The Burden of Maintenance: Roads in Sub-Saharan Africa." AICD Background Paper 14, Africa Region, World Bank, Washington, DC.

Kumar, Ajay, and Fanny Barrett. 2008. "Stuck in Traffic: Urban Transport in Africa." AICD Background Paper 1, Africa Region, World Bank, Washington, DC.

Ocean Shipping Consultants, Inc. 2009. "Beyond the Bottlenecks: Ports in Africa." AICD Background Paper 8, Africa Region, World Bank, Washington, DC.

USITC (United States International Trade Commission) 2009. "Sub-Saharan Africa: Effects of infrastructure conditions on Export Competitiveness. Third Annual Report.", USITC Publication 4071, Washington DC.low-income countrie

Water resources

Irrigation

FAO (Food and Agriculture Organization). 2004. "Aquastata: Zimbabwe Country Profile." www.fao.org/nr/water/aquastat/main/index.stm.

Svendsen, Mark, Mandy Ewing, and Siwa Msangi. 2008. "Watermarks: Indicators of Irrigation Sector Performance in Africa." AICD Background Paper 4, Africa Region, World Bank, Washington, DC.

You, L. 2008. "Irrigation Investment Needs in Sub-Saharan Africa." Appendix 2 Country Results, World Bank, Washington, DC.

You, L., C. Ringler, G. Nelson, U. Wood-Sichra, R. Robertson, S. Wood, G. Zhe, T. Zhu, and Y. Sun. 2009. "Torrents and Trickles: Irrigation Spending Needs in Africa." AICD Background Paper 9, Africa Region, World Bank, Washington, DC.

Water supply and sanitation

AMCOW (African Ministerial Council on Water) 2010. *Country Status Overviews on Water Supply and Sanitation 2010*. Regional Synthesis Report, August.

Banerjee, Sudeshna, Vivien Foster, Yvonne Ying, Heather Skilling, and Quentin Wodon. 2008."Cost Recovery, Equity, and Efficiency in Water Tariffs: Evidence from African Utilities." AICD Working Paper 7, World Bank, Washington, DC.

Banerjee, Sudeshna, Heather Skilling, Vivien Foster, Cecilia Briceño-Garmendia, Elvira Morella, and Tarik Chfadi. 2009. "Ebbing Water, Surging Deficits: Urban Water Supply in Sub-Saharan Africa." AICD Background Paper 12, Africa Region, World Bank, Washington, DC.

IBNET (The International Benchmarking Network for Water and Sanitation Utilities). 2009. www.ib-net.org/.

Keener, Sarah, Manuel Luengo, and Sudeshna Banerjee. 2009. "Provision of Water to the Poor in Africa: Experience with Water Standposts and the Informal Water Sector." AICD Working Paper 13, World Bank, Washington, DC.

Morella, Elvira, Vivien Foster, and Sudeshna Ghosh Banerjee. 2008. "Climbing the Ladder: The State of Sanitation in Sub-Saharan Africa." AICD Background Paper 13, Africa Region, World Bank, Washington, DC.

WHO (World Health Organization) Joint Monitoring Program (JMP). 2010. "Zimbabwe Estimates for the Use of Improved Drinking-Water Sources." www.wssinfo.org/resources/documents.html.

———. 2010. "Zimbabwe Estimates for the Use of Improved Sanitation Facilities." www.wssinfo.org/resources/documents.html.

World Bank. 2009a. *Zimbabwe WSS Sector Budget Review*. Draft October 30, 2009.

Other

IMF (International Monetary Fund). 2009. Zimbabwe: 2009 Article IV Consultation—Staff Report; Public Information Notice on the Executive Board Discussion; and Statement by the Executive Director for Zimbabwe. Report No. 09/139, May 2009.

International Energy Association. 2010. "World Energy Outlook: The Electricity Access Database." www.worldenergyoutlook.org/database_electricity10/electricity_database_web_2010.htm.

———. 2011. "Electricity/Heat Data for Zimbabwe." www.iea.org/stats/electricitydata.asp?COUNTRY_CODE=ZW.

Kaseke, Nyasha. 2010. "The Cost of Power Outages in Zimbabwe's Mining Sector." African Executive, Issue 277, Nairobi, Kenya.

Mudzuri Eng. 2009. "Energy and Power Sector as Key Enablers of Investment in Zimbabwe." Presentation made by the Ministry of Energy and Power Development, Zimbabwe Investor Conference , July 9–10. www.zimtreasury.org/downloads/280.pdf.

World Bank. 2008a. "Zimbabwe Infrastructure Dialogue in Roads, Railways, Water, Energy, and Telecommunication Sub-Sectors." Report No. 43855-ZW, Africa Transport Sector (AFTTR), Africa Region, Washington, DC.

———. 2008b. "Zimbabwe: A Preliminary Review of Parastatals." Draft version as of February 2008, Washington, DC.

———. 2009b. "Back to the Office Report." The World Bank Economic Mission, Washington, DC, March 23–29, 2009.

———. 2010. "Financial and Regulatory Challenges in Infrastructure Parastatals and Sectors." Draft Report, Poverty Reduction and Economic Management Unit, Africa Region, Washington, DC.

———. 2011. Getting Electricity—Database. Washington, DC: World Bank.