Tanzania's Infrastructure

A Continental Perspective

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Abstract

Infrastructure contributed 1.3 percentage points to Tanzania's annual per capital GDP growth during the 2000s. If the country's infrastructure endowment were improved to the level of the African leader, Mauritius, annual per capita growth rates could increase by 3.4 percent.

Tanzania has made great progress in reforming its trunk roads, improving the quality of the road network. The country has also seen significant gains in ICT networks, and has one of the most competitive domestic air transport sectors in Africa.

The power sector poses Tanzania's most serious infrastructure challenge. Despite significant improvements in pricing and operational performance in recent years, inefficiency still absorbs about 1.4 percent of GDP. Moreover, due to heavy reliance on hydro-power the sector remains vulnerable to climate variability. The port of Dar es Salaam also suffers from performance

problems as rapid traffic growth has increasingly exposed deficiencies in storage and access to the port. Poor access to safe water is another challenge, exacerbated by poor budget execution in the sector.

Tanzania would need to invest \$2.4 billion annually for 10 years to meet its infrastructure targets. Spending at that level would absorb just over 20 percent of the country's GDP. Existing spending stands at \$1.2 billion a year.

Tanzania loses \$0.5 billion each year to inefficiencies such as underpricing, undercollection of revenue, overstaffing, and lack of budget prioritization. But even if inefficiencies could be fully captured, an annual funding gap of \$0.7 billion would remain. That gap could be shrunk to \$0.4 billion if lower-cost technologies were adopted and if regional power trade could be further developed.

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Tanzania's Infrastructure: A Continental Perspective

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Infrastructure (chiefly telecommunications) contributed approximately 1.3 percent of Tanzania's annual growth in per capita gross domestic product (GDP) during the 2000s. If the country's infrastructure platform were improved to the level of the African leader, Mauritius, annual per capita growth rates could increase by 3.4 percent, of which 1.6 percent would come from improvements in the power sector.

Tanzania has made great progress in road sector reform and network quality. Reforms implemented in recent years have provided the country with a modern second-generation road fund and road agency structure and established a fuel levy that is commensurate with maintenance needs. As a result, Tanzania is one of the few African countries that appear to be allocating adequate resources to maintenance of its road network. Its main and rural networks are in good condition compared with those of many of its neighbors. The chief setback to date has been widespread evasion of the fuel levy, which prevents the road fund from functioning as intended. Tanzania is also one of the few African countries with a competitive domestic air transport market.

Tanzania's power sector has long been a major concern. Power consumption in Tanzania is low, electrification is limited, and supply is unreliable, even by the standards of other low-income countries in Africa. The country's strong reliance on hydro-power leaves it vulnerable to climate variability. The severe droughts of the mid-2000s, for example, led to outages whose economic cost has been estimated as high as 4 percent of GDP. The recent resurgence of frequent dry spells illustrates the need to expand and diversify generation capacity. The national power utility – TANESCO – generates substantial economic losses due to under-pricing and weak operational performance. The situation has improved significantly in recent years, but under-pricing remains an issue, representing more than 1 percent of GDP.

The port of Dar es Salaam has regional significance for eastern and southern Africa. In recent years, its productivity has improved significantly, so that the port now compares more favorably with other regional ports. The award of a concession for private operation of the container terminal and the installation of modern container gantries has contributed to service improvements. Despite these gains, the port has yet to realize its potential as a regional hub owing to serious capacity constraints caused by rapid growth in traffic and poor linkages with inland transport networks.

In the water supply sector, despite reforms and increased financing performance has remained poor. In fact, access to clean and safe water in Tanzania has fallen significantly since 2000 in both urban and rural areas, and inefficiencies continue to plague the sector. Despite efforts to improve the commercial performance of utilities, most continue to record low revenue collection, low cost recovery, and high distribution losses. At the central government level, poor budget execution has prevented increased funding from having its desired impact.

Tanzania has made substantial progress in modernizing its institutional framework for information and communication technology (ICT). There are seven wireless operators and it has achieved one of the most competitive mobile markets in Africa. However, at 28 percent, mobile tax rates are among the highest in Africa. The country also is lagging behind its neighbors in extending mobile coverage to rural areas. Only around 75 percent of the population lives within range of a GSM signal; compared with more than 90 percent in neighboring Kenya and Uganda.

Tanzania would need to invest \$2.4 billion in infrastructure annually for a decade to catch up with the rest of the developing world. More than one-third of that total relates to the power sector where 2,046 megawatts of new generation capacity are needed to keep pace with demand. Transport and water and sanitation each account for a quarter of the total spending requirement. Spending at this level would absorb just over 20 percent of the country's GDP, three-quarters of which would go for investment. The economic burden would thus be substantial, but comparable to the exceptionally high levels sustained by China in the mid 2000s.

Existing spending stands at \$1.2 billion a year—almost 9 percent of 2006 GDP. The public sector, the largest source of finance for infrastructure in Tanzania, accounts for 56 percent of total spending. Official development assistance and the private sector are also important financiers; they respectively fund 25 and 18 percent of total expenditures. At present, the transport and power sectors each receive nearly one-third of total spending, while the ICT and water sectors each receive a further 18 percent. Per capita infrastructure spending is \$30 annually, on par with Uganda and Ethiopia but just one-fifth of what is spent by Kenya and only one-twelfth of what is spent by South Africa.

Tanzania incurs losses to inefficiency of \$500 million a year. By far the largest source of inefficiency is the national power utility, which wastes \$350 million a year through underpricing of power and losses in distribution. The second largest source of inefficiency is undercollection of the fuel levy for road maintenance, which represents a loss on the order of \$100 million a year.

Even if inefficiencies could be fully captured, a funding gap of \$0.7 billion a year (or 5 percent of 2006 GDP) would remain. The largest component of the annual funding gap is the \$380 million shortfall for meeting the Millennium Development Targets in water and sanitation. Smaller, but nonetheless substantial, funding gaps also exist for power (\$200 million a year) and transport (\$100 million a year).

The overall funding gap could be reduced to \$370 million if lower-cost technologies were adopted in the transport sector and if cross-border finance could be mobilized to support the development of the infrastructure needed to support power exports. If Tanzania could capture the resources currently lost to inefficiency, the country would be able to meet these infrastructure targets over a period of 19 years (as opposed to 36) without mobilizing additional resources. Without increased spending or efficiency gains, it may take 36 years to reach the goals articulated in this report.

The continental perspective

The Africa Infrastructure Country Diagnostic (AICD) has conducted extensive data collection and analysis of the infrastructure situation in 24 Sub-Saharan countries, including Tanzania, during the period 2001 to 2009. The results have been presented in a variety of continental reports covering different areas of infrastructure—ICT, irrigation, power, transport, water, and sanitation—and different policy areas, including investment needs, fiscal costs, and sector performance.

This report presents the key AICD findings for Tanzania for the period up to 2006, thus allowing the country's infrastructure situation to be benchmarked against that of its African peers—particularly other low-income, nonfragile countries.

A number of methodological issues must be considered. First, due to the cross country nature of the data collection, there is inevitably a time lag involved. The period covered by the AICD runs from 2001 to 2006. Most technical data presented is for 2006 (or the most recent year available), while financial data is typically averaged over the available period to smooth out the effect of short term fluctuations. Second, to make comparisons across countries, it was necessary to standardize the indicators and analysis to allow everything to be calculated on a consistent basis. This means that some of the indicators may be slightly different from those that are routinely reported and discussed at the country level.

Why infrastructure matters

From 2003 to 2007, Tanzania's economic growth averaged 7.0 percent, compared with 3.7 percent from 1990 to 2002. Infrastructure contributed 1.4 percentage points to annual per capita economic growth over that period. This was primarily due to Tanzania's ICT revolution, although the power sector also had a positive impact. Simulations suggest that if Tanzania's portfolio of infrastructure assets could be improved to the level of the African leader, Mauritius, annual per capita growth rates could increase by 3.4 percentage points. The largest share of this impact would come from improvements in the power sector, but telecommunications and roads would have substantial impact as well (figure 1).

Evidence from enterprise surveys suggests that infrastructure constraints are responsible for about 34 percent of the productivity handicap faced by Tanzanian firms over the period 2002-2006, with the remainder being due to governance, red tape, and financing constraints (figure 2). Transportation is reportedly the infrastructure constraint that weighs most heavily on Tanzanian firms, with water a close second.

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

a. Infrastructure's contribution to annual per capita economic growth, 2003-07

b. Potential contributions of infrastructure to annual per capita economic growth

Source: Calderón 2009.

Figure 2. Infrastructure's contribution to the productivity handicap of firms, 2002-2006

a. Overall contribution of infrastructure

b. Contribution of infrastructure by sector

Source: Escribano and others 2009.

The state of Tanzania's infrastructure

Tanzania's population and agricultural activity is concentrated along its main transport and development corridors going: from Dar es Salaam west to Dodoma and northwest to Mwanza on Lake Victoria in the northern part of the country, connecting to Uganda and Kenya; from Dar es Salaam west and southwest to Mbeya and on to Zambia; from Dar es Salaam north to the mountainous area around Kilimanjaro in the northeast of the country; and from Mwanza to Kigoma on Lake Tanganyika. The development of Tanzania's infrastructure backbone has broadly followed this pattern of spatial activity, with the country's principal road artery and its major power transmission and fiber optic backbones following these routes (figure 3). By contrast, the rest of the country is sparsely populated and has only fragmentary infrastructure coverage. While there are some transport links with Kenya, Uganda, Democratic Republic of Congo, Zambia, Rwanda, and Burundi, road connections were of low quality as of 2006, although they have been improving subsequently. As of 2006, power and ICT backbones were not yet fully integrated across borders in the region.

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

Table 1. Overview of achievements and challenges in Tanzania's infrastructure sectors

	Achievements	Challenges
Air transport	Fourth-largest domestic market in Sub-Saharan Africa Advanced institutional reforms, competition on domestic routes.	Create more favorable conditions for direct intercontinental flights linked to tourism Address problems with national carrier. Improve safety by making greater use of radar
ICT	First-tier institutional reforms accomplished: Regulatory agency established. Strong competition in mobile	Consider appropriateness of fiscal regime for mobile sector Reduce cost of domestic backbone services Improve performance of TTCL
Ports	Dar es Salaam is a major container hub for East Africa	Undertake investment to increase capacity and improve hinterland links Boost efficiency with institutional reforms
Power	Recent tariff increases and reduction in distribution losses	Raise access, consumption, and quality of service Complete adjustment to cost-reflective tariffs Improve reliability through new (and diversified) sources of generation
Railways		Improve performance through investment and institutional reform
Roads	Good institutional framework, adequate road levy, and good quality roads.	Raise revenue collection effort for fuel levy resources. Improve rural connectivity
Water and sanitation	Advanced institutional reforms in urban and rural areas. Open defecation low	Address growing reliance on surface water Address underpricing and operational inefficiency of water utilities

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

Figure 3. Tanzania's infrastructure follow a number of key development corridors, 2006

a. Roads

b. Power

c. ICT

d. Water

Source: AICD Interactive Infrastructure Atlas for Malawi, http://www.infrastructureafrica.org/aicd/system/files/tza_new_ALL.pdf.

Power

Achievements

Tanzania has also made significant progress in turning around its power sector since the crisis years of the mid-2000s. Tanzania's national power utility – TANESCO – is a vertically integrated parastatal organization fully owned by the government of Tanzania and regulated by the Ministry of Energy and Minerals. While TANESCO's revenue collection efficiency is relatively good at 94 percent, system losses at 26 percent in 2005 were about double best practice levels. Recent operational reforms have helped to bring down distribution losses substantially to just over 15 percent by 2010. Under-pricing has also been a major issue, with power tariffs in 2005 towards the lower end of the range observed in the region and covering less than half the historical cost of power development in the sector (figure 5). Some progress has been made in recent years, with the average effective tariff rising from US\$0.06 per kilowatt-hour in 2006 to US\$0.08 per kilowatt-hour in 2010. As a result, of both of these reforms, the hidden costs of TANESCO fell from 175 percent of revenues (or a staggering 2.4 percent of GDP) in 2006 to 87 percent of revenues (or 1.4 percent of GDP) in 2010. From a macro-economic perspective, these savings are significant amounting to a whole percentage point of GDP; and are comparable in magnitude to the savings achieved by Kenya's power sector reform in the early 2000s (box 1).

Challenges

Nevertheless, TANESCO's average effective tariff of US\$0.08 per kilowatt-hour in 2010 remains low relative to estimated historic costs of US\$0.14 per kilowatt-hour, and even long run marginal costs that have been estimated at US\$0.10 per kilowatt-hour (figure 6). The associated hidden costs of 1.4 percent of GDP remain a significant macro-economic savings amounting to more than US\$300 million annually. Hence the importance of continuing tariff reforms to close this remaining financial shortfall in the sector.

Tanzania's power supply sector remains vulnerable to hydrological conditions, and the pressing need to expand and diversify generation capacity. A major drought in the mid-2000s caused Tanzania to face a major supply crisis. The crisis was precipitated by drought that drastically reduced the country's capacity to generate hydro-power – its main source of electric energy. This forced businesses to rely on own generation, increasing the costs of production, complicating the survival of businesses (especially small ones), and generally making the economy less competitive. The crisis led to high levels of power outages resulting in economic losses that have been valued as high as 4 percent of GDP, one of the highest reported in Africa (figure 4). Power outages increased the demand for expensive emergency diesel power generation, which cost the country almost 1 percent of GDP per year. With the end of the drought, reliability of power supply improved. According to occasional enterprise surveys, the number of annual days of power outages reported by firms fell from 63 days in 2005 to 47 days in 2008. Per capita power consumption also increased substantially over this period from 48 to 81 kilowatt-hours per capita per year (table 2). Unfortunately, the drought situation of 2006 was repeated in 2011, with similar consequences.

Furthermore, power supply and electricity access in Tanzania remain extremely low in absolute terms. Both installed generation capacity and power consumption in Tanzania are comparable if not slightly worse than the benchmark for low income countries (table 2). National power consumption at less

than 100 kilowatt-hours per capita per year is less than 1 percent of levels in OECD countries, and barely enough to power one light bulb per person for three hours per day. Electricity access remains low at just over 10 percent of the population; even in urban areas only 40 percent of the population has access to power, while in rural areas that number lies below 2 percent. As of the mid 2000s, Tanzania was electrifying less than one percent of the population annually. Unless this pace is accelerated universal electrification could take another 100 years to achieve.

Looking ahead, Tanzania has the potential to play a significant role in regional power trade within the framework of the East African Power Pool, as well as the Southern Africa Power Pool. A simulation exercise exploring Tanzania's potential contribution to a fully integrated East African Power Pool finds that if the region pursued power trade to its fullest economic potential, Tanzania could emerge as a power exporter with exports rising to 2.4 TWh over a decade, equivalent to over 20 percent of future domestic consumption (Rosnes and Vennemo, 2009). Tanzania's long-term marginal cost of power generation – was estimated at \$0.065 per kilowatt hour. Trade expansion would require Tanzania to build an additional 1,200 megawatts of power generation capacity over the next decade beyond that required to meet domestic demand, as well as 266 megawatts of new cross-border transmission. This would require investment of \$150 million per year, over and above what is needed to meet domestic power needs. Nevertheless, the relative positions of East African countries with respect to energy resources is evolving rapidly with the discovery of new geothermal and wind resources, which may affect the conclusions of the 2009 study.

Figure 4. The cost of power outages in Tanzania is higher than in other East African countries, 2006

Source: Eberhard and others 2009.

Table 2. Benchmarking power indicators, 2005-2010

	Unit	Low-income countries, 2006	Tanzania 2005/06	Tanzania 2008/09	Middle-income countries 2006
Installed power generation capacity	MW/mil. people	24.4	22.3	22.5	796.2
Power consumption	kWH/capita	99.5	47.6	80.8	4,473
Power outages	Day/year	40.6	63.1	47.3	5.6
Firms' reliance on own generator	% consumption	17.7	12.3	36.8	0.5
Firms' value lost due to power outages	% sales	6.1	—	9.6	0.8
Access to electricity	% population	15.4	10.6	14.0	59.9
Urban access to electricity	% population	71	38.9	52.0	83.7
Rural access to electricity	% population	12.0	1.8	2.0	33.4
Growth access to electricity	% population/year	1.4	0.8	—	1.8
Revenue collection	% billings	88.2	94.0	94.0	99.9
Distribution losses	% production	22.1	26.0	15.4	15.7
Cost recovery	% total cost	90.0	41.9	57.1	125.7
Total hidden costs as % of revenue	%	121.2	175.3	86.6	3.5
	Tanzania 2005	Tanzania 2010	Predominantly hydro generation	Other developing regions	
US cents					
Power tariff (residential at 75 kWh)	5.5	7.3	10.27	5.0 – 10.0	
Power tariff (commercial at 900 kWh)	10.1	9.4	11.73		
Power tariff (industrial at 50,000 kWh)	9.1	6.2	11.39		

Source: Eberhard and others 2009.

Derived from AICD electricity database, <http://www.infrastructureafrica.org/aicd/tools/data> and more recent data provided by World Bank staff. For Tanzania, data for 2005 and 2010 are reported to show progress over time. Benchmark data, however, relates to 2006.

— = Data not available.

Figure 5. Tanzania's power tariffs among the lowest in Africa, 2005

Source: Eberhard and others 2009.

Figure 6. Power costs and tariffs in Tanzania, 2005

Source: Derived from Eberhard and others 2009; Rosnes and Vennemo 2009.

Table 4. Detailed evolution of TANESCO's hidden costs, 2006-2010

	Power billed	System losses	Collection ratio	Average total cost	Average effective tariff	Total hidden costs		
	(GWh/year)	(%)	(%)	(US\$/kWh)	(US\$/kWh)	(US\$m/year)	(% revenue)	(% GDP)
TANESCO								
2006	2,628	26	94	0.16	0.06	344	175	2.37
2008	3,377	26	94	0.14	0.07	332	132	2.11
2010	3,923	15	94	0.14	0.08	305	87	1.36

Notes: System losses for 2008 was not available and was estimated as the average of losses for 2006 and 2010;

Source: TANESCO annual reports and World Bank staff estimates

Figure 7. Evolution of Tanesco's hidden costs, 2002–08

Source: Briceño-Garmendia and others 2009 updated with information from World Bank country staff.

Box 1. Kenya's success with reducing hidden costs of power utility

In the early 2000s, KPLC had substantial hidden costs in underpricing, collection losses, and distribution losses; these absorbed 1.4 percent of GDP. In the run up to a management contract, revenue collection improved from 81 percent in 2004 to 100 percent in 2006. Distribution losses also began to fall, though more gradually, a reflection of the greater difficulty in resolving them. Power pricing reforms allowed tariffs to rise in line with escalating costs, from \$0.07 in 2000 to \$0.15 in 2006 and \$0.20 in 2008. As a result of those measures, the hidden costs of the power sector fell to 0.4 percent of GDP in 2006 and were eliminated by 2008 (see figure). This outcome put the sector on a firmer financial footing and has saved the economy more than 1 percent of GDP.

Source: Interviews with World Bank staff from the Africa Energy Department 2008.

Ports**Achievements**

Dar es Salaam is a major regional port, handling nearly 5 million tons of cargo in 2009. Alongside Mombasa, it is one of the key transshipment centers for the East Africa region (table 4).

Table 4. Benchmarking port indicators: Dar Es Salaam as compared with largest and neighboring ports, 2006

	Mombasa (Kenya)	Maputo (Mozambique)	Sudan (Sudan)	Dar es Salaam (Tanzania)	Cape Town (South Africa)	Durban (South Africa)	Apapa (Nigeria)
EFFICIENCY:							
Average container dwell time in terminal (days)	5	22	28	7	6	4	42
Average truck processing time for receipt and delivery of cargo (hours)	4.5	4	24	5	4.8	5	6
Average container crane productivity (containers loaded-unloaded per crane hour)	10	11	8	20	18	15	12
Average general cargo crane productivity (tons loaded-unloaded per crane working hour)	20.82	11	8	20	15	25	9
TARIFFS							
Average general cargo handling charge, ship to gate (USD/ton)	6.5	6.0	10	13.5	1.48	17.4	8
Average dry bulk handling charge, ship to gate or rail (USD/ton)	5	2.0	3	4.5	6.5	1.48	n.a.
Average liquid bulk handling charge (USD/ton)	n.a.	0.5	1	3.5	2.68	n.a.	1

Source: Mundy and Penfold 2009.

Derived from AICD ports database, <http://www.infrastructureafrica.org/aicd/tools/data>.

n.a. = Not available

Dar es Salaam's performance indicators compare well to those of other eastern and southern Africa ports. It has a low container dwell time of seven days, low truck processing time of 5 hours, and high crane productivity of 20 containers or tons per crane hour. This strong performance can be explained by Dar es Salaam's sizable terminal operations, specialized container handling equipment, and adoption of a container terminal concession to incorporate private management of operations. As a result, the port leads Sub-Saharan Africa in container handling productivity and ranks among the top in general cargo handling.

Challenges

Despite its achievements in productivity, Dar es Salaam suffers from significant capacity constraints and congestion following double digit growth in the container sector during the 2000s. Its demand to capacity ratio is 140 percent in the container sector (demand of 350,000 TEU/year and capacity of 250,000 TEU/year) and 93 percent in the general cargo sector (demand of 3.8 million tons/year and capacity of 4.1 million tons/year). These are the highest ratios in Africa after Mombasa. In fact, Dar es Salaam took responsibility for transshipments that Mombasa could not handle due to severe capacity constraints and operational inefficiencies. As a point of reference, once a port's capacity ratio surpasses the 80 percent mark, congestion becomes a serious issue that reduces the effectiveness of the port, and Dar es Salaam is already well past this level. New capacity needs to be introduced to solve this problem,

not only in the port itself, but also in upstream linkages to ensure that cargo can be efficiently moved on to road and rail infrastructure.

Roads

Achievements

Tanzania is one of the better performers on road sector institutional reform in Africa. The country is among the few whose road funds meet the Sub-Saharan Africa Transport Policy Program's seven criteria for road design: a clear legal foundation, separation of functions, application of road user charges, direct transfer of funds, representation of road users on the board, clear revenue allocation rules, and independent auditing of accounts. As of 2006, Tanzania's fuel levy was approximately \$0.16 per liter, which is set at close to optimal fuel levy for maintenance of \$0.15 per liter (figure 8). In contrast to many countries, this was broadly sufficient to fully fund the country's road maintenance requirements and some of its rehabilitation needs (figure 9).

However, during the period 2007/10 a growing gap has opened-up between Road Fund revenues and the cost of road network maintenance. This can be attributed in part to the depreciation of the national currency, as well as to the growing costs of road works. According to the Road Fund Board, by the year 2009/10 Road Fund revenues were barely sufficient to cover 58 percent of total maintenance needs. This experience underscores the need to review the level of the fuel levy over time in order to sustain the financial equilibrium of the sector.

The length of Tanzania's trunk network is adequate. Although the country's road density indicators are low compared to African low- and middle-income countries, the trunk network provides basic regional and national connectivity, linking the capital to the coast. International border crossings, and the internal provincial capitals. Both paved and unpaved roads in Tanzania are in good condition compared to the benchmark groups. In Tanzania as of 2006, about 95 percent of the paved network and 69 percent of the unpaved network are in good condition, compared to 80 percent and 58 percent in low-income countries and 79 percent and 58 percent in middle-income countries (table 5).

Table 5. Benchmarking road indicators, 2006

	Unit	Low-income countries	Tanzania	Middle-income countries
Paved road density	km/1000 km ² of arable land	86.6	47.1	507.4
Unpaved road density	km/1000 km ² of arable land	504.7	482.6	1,038.3
GIS rural accessibility	% of rural pop within 2 km from all-season road	21.7	24.0	59.9
Paved road traffic	Average Annual Daily Traffic	1,049.6	1,797	2,786.0
Unpaved road traffic	Average Annual Daily Traffic	62.6	99.8	12.0
Paved network condition	% in good or fair condition	80.0	94.7	79.0
Unpaved network condition	% in good or fair condition	57.6	69.1	58.3
Perceived transport quality	% firms identifying as major business constraint	23.0	14.1	10.7
Overengineered network	% of total network	26.0	22.0	20.0

Source: Gwilliam and others 2009.

Derived from AICD database, <http://www.infrastructureafrica.org/aicd/tools/data>.

Figure 8. Benchmarking the fuel levy, 2006

Source: Gwilliam and others 2009.

Figure 9. Provision for maintenance and rehabilitation, 2006

Source: Gwilliam and others 2009.

Challenges

As of 2006, fuel levy collection was a major issue for Tanzania's Road Fund, which was collecting only 39 percent of the required amount; one of the worst collection rates among the countries in Sub-Saharan Africa that had adopted road funds at that time. Despite this, and due to the addition of resources from the public budget, spending at that time remained adequate to meet maintenance and rehabilitation needs (figure 9). Over the period 2007/10, this issue has been addressed and the Road Fund reports a steep increase in the collection of fuel levy resources.

Although the trunk network provides basic regional and national connectivity, rural accessibility is another important issue for the country. Only 24 percent of Tanzania's rural population lives within two kilometers of an all weather road. This is somewhat above the low-income country benchmark but less than half the level found in middle-income countries. Reaching 100 percent rural accessibility would entail doubling the classified network, which would be a major challenge. If instead the network were expanded to provide connectivity to those areas responsible for 80 percent of the country's agricultural production value, the required expansion would be only 50 percent of the existing network—a significant but manageable challenge.

Rail

Achievements

Tanzania's rail corridors are key conduits for bulk freight in the region. They ease the pressure on roads, in particular on the north-east corridor connecting Sudan-Ethiopia-Kenya-Tanzania-Uganda; the east-south corridor connecting Tanzania-Rwanda-Democratic Republic of Congo-Uganda and as Dar Es Salaam-Kigoma-Burundi; and the east-south corridor connecting Tanzania-Zambia-Zimbabwe-

Mozambique-South Africa. Although freight traffic density in Tanzania was substantially lower than in South Africa, as of 2006 it was on a par with neighboring Kenya, Uganda, and Zambia (table 6).

Table 6. Benchmarking railway indicators, 2006

	Kenya (KRC)	South Africa (SPOORNET)	Malawi (CEAR)	Tanzania (TRC)	Tanzania-Zambia (TAZARA)	Uganda (URC)	Zambia (RSZ)
Concessioned (1)/ State run (0)	0	0	1	0	0	0	1
Traffic density, freight, 1000 ton-km/km	690	5,319	112	510	460	815	379
EFFICIENCY							
Staff: 1,000 UT per Staff	185	3,037	204	228	300	181	452
Coaches: 1,000 passenger-km per coach	1,015	596	1,285	3,157	3,120	n.a.	2,772
Cars: 1,000 ton-km per wagon	200	925	212	692	502	166	180
Locomotive availability in %	44.8	—	89.9	74.2	25.2	69.5	31.2
TARIFFS							
Average unit tariff, freight, US cents/ton-km	3.8	—	5.8	4.0	3.0	15.2	3.9
Average unit tariff, passenger, US cents/passenger-km	0.6	—	1.0	1.6	1.1	2.3	0.8

Source: Bullock 2009.

Derived from AICD rail operators database, <http://www.infrastructureafrica.org/aicd/tools/data>.

— = Data not available.

n.a. = Not applicable.

Challenges

Tanzania's rail concession has run into difficulties. The Tanzania Railways Corporation (TRC) concession was awarded to India's RITES in September 2007 for a period of 25 years, giving the concessionaire a 51 percent stake in the company. The contract has since experienced labor conflicts and financial distress, due to lower than anticipated traffic flows. By the end of the first year of the concession TRC's operational and financial performance indicators had fallen below pre-concession levels. Both the concessionaire and the government have made several proposals to renegotiate the contract, but in the end the contract was terminated.

Air Transport

Achievements

Tanzania has the fourth-largest air transport domestic market in Sub-Saharan Africa, in part due to its immense tourism attraction. The main airport in Dar es Salaam had actual passenger figures of 1.2 million in 2008 with much additional traffic related to the international airport on Zanzibar.

Tanzania stands out in the region for allowing competition in its domestic air transport market. Each of the country's 17 domestic routes has more than one provider. As of 2007, only one other country in Sub-Saharan Africa, South Africa, permitted competition in its domestic air transport sector. Tanzania has also made significant progress with institutional reforms in the sector by establishing an independent

regulatory body, and allowing private sector competition with its nationally owned flag carrier, Air Tanzania..

Challenges

Dar es Salaam airport is currently operating at the margins its design capacity. There are currently constraints in terminal capacity and air side infrastructure, such as taxiways and aprons. In 2007, passenger traffic at the airport was estimated to be 1.2 million passengers, compared with a terminal capacity of 1.5 million passengers. Runways, aprons, and taxiways have been completely revamped and are up to global standards, however, the main terminal will soon become a constraint. The government is evaluating options for increasing air traffic handling capacity at the airport.

Tanzania's biggest challenges are typical for Sub-Saharan Africa in that they in the sector lie in (a) the overall safety oversight system, and (b) the role of the nationally owned flag carrier, Air Tanzania. Tanzania has gone through important institutional reforms with regards to its CAA and airports authority, but still lacks the overall technical capabilities for full oversight, as do many of its neighbors. The East African Civil Aviation Authority, which is a new authority founded in part with support of the FAA's Safe Skies for Africa program, may in time help by pooling high-priced technical resources and sharing them amongst all members of the EAC.

Air Tanzania is not financially sustainable and may be the host of serious governance problems. There is a risk that domestic economic regulation on air routes may in fact distort the market in Air Tanzania's favor, out of fear that the successful private operator, Precision Air, is turning into a monopoly. The correct policy would be to continue building an environment where additional private carriers may compete with Precision, rather than having an unsustainable government-owned carrier provide attempt to balance the market.

Water supply and sanitation

Achievements

Tanzania has been actively promoting water sector reform and increasing allocation of funds to the sector. The government has adopted a road map for sector transformation that includes the move to a sector wide approach to planning (SWAP) and an accompanying National Water Sector Development Strategy (2006) and Water Sector Development Program (2006) to improve water resource governance and increase services delivery. The newly created Sector Working Group facilitates collaboration among government sector agencies, development partners, and civil society. Despite efforts to direct more fiscal resources to the sector, progress has been slow, cross sectoral integration and realignment have been inadequate, lessons from the early pilots have yet to be mainstreamed.

Tanzania has relatively low reliance on surface water and open defecation compared to its peers. Reliance on unsafe surface water is at 24 percent, compared to 34 percent in the peer group. Open defecation is practiced by 14 percent, compared to 37 percent in the peer group. Tanzania has achieved these outcomes largely by focusing on intermediate options such as wells and boreholes and traditional latrines that are the dominant forms of service provision in the country.

Table 7a. Benchmarking water and sanitation indicators for Tanzania against Sub-Saharan Africa, 2006

	Unit	Low-income countries	Tanzania	Middle-income countries
Access to piped water	% pop	10.1	7.4	56.4
Access to stand posts	% pop	16.1	25.2	20.4
Access to wells/boreholes	% pop	38.3	41.0	6.3
Access to surface water	% pop	33.8	24.4	13.9
Access to septic tanks	% pop	5.3	2.8	44.0
Access to improved latrines	% pop	9.3	3.7	0.9
Access to traditional latrines	% pop	47.9	79.2	33.0
Open defecation	% pop	37.1	14.3	15.8
Domestic water consumption	liter/capita/day	72.4	62.0	Na
Urban water assets in need of rehabilitation	%	35.5	42.0	25.0
Revenue collection	% sales	96.0	121.0	99.2
Distribution losses	% production	33.0	45.0	23.1
Cost recovery	% total costs	56.0	36.0	80.6
Labor productivity	connections per employee	176	109	203
Total hidden costs as % of revenue	%	130.0	144.8	84.9
US cents per m ³		Tanzania	Scarce water resources	Other developing regions
Residential tariff		39.8	60.26	3.0 – 60.0
Nonresidential tariff		117.0	120.74	

Source: Banerjee and others 2009.

Data on access to services are derived from the 2004 DHS Survey to be consistent with benchmarks.

Data on utility performance are from 2007 and are a weighted average of performance indicators from the seven largest utilities in the country namely Arusha, Dawasco, Dodoma, Mbeya, Morogoro, Moshi, and Mwanza

Derived from AICD water utilities database, <http://www.infrastructureafrica.org/aicd/tools/data>.

Table 7b. Benchmarking water and sanitation indicators across Tanzanian utilities, 2007

Utility	Water connections ('000s)	Water delivered (mns m3/year)	System losses (%)	Collection ratio (%)	Average total cost (US\$/m3)	Average effective tariff (US\$/m3)	Total hidden costs (US\$m/year)	Total hidden costs (% revenues)
Arusha	23.8	16	33	95	0.68	0.28	6	193
Dodoma	16.1	7	34	113	0.93	0.45	3	127
Mbeya	19.8	9	44	85	0.69	0.31	3	245
Morogoro	18.0	9	34	100	0.81	0.32	4	195
Moshi	15.2	8	34	115	0.78	0.27	4	206
Mwanza	21.6	12	34	99	0.57	0.34	3	99
Dawasco	127.1	101	52	139	0.90	0.29	47	237
Tanzania	241.7	162	45	121	0.84	0.30	69	209

Data on utility performance are from 2007 and are a weighted average of performance indicators from the seven largest utilities in the country namely Arusha, Dawasco, Dodoma, Mbeya, Morogoro, Moshi, and Mwanza and were provided by World Bank country staff.

Challenges

Access to safe water has been declining during the 2000s. According to household survey evidence, access to safe water decreased from 90 percent in 2000 to 80 percent in 2007 in urban areas and from 46

percent in 2000 to 40 percent in 2007 in rural parts of the country (figure 10). Similarly, urban access to safe water within 30 minutes from home decreased from 81 percent in 2000 to 75 percent in 2007.

Figure 10. Access to safe water is declining, 2000-2007

Source: Monitoring Progress in Water and Sanitation, WaterAid, Tanzania, March 2009 (HBS 2007).

In addition, Tanzania's utilities are highly inefficient (table 6a). Distribution losses are typically around 45 percent, compared with 33 percent among peers. At around \$0.40 per cubic meter, Tanzania's water tariffs are substantially lower than those found in other African countries, covering only two thirds of the cost of service provision. The hidden costs of these inefficiencies are very substantial amounting to 145 percent of sector revenues.

There is significant performance variation across Tanzania's utilities (table 6b). System losses range from 33 to 52 percent. Collection ratios range from 85 to over 100 percent. Cost recovery ratios range from 32 to 60 percent. Only the better performers (Dodoma, Mwanza) have hidden costs around the level of the low income country benchmark for Africa, while the worst performers (Dawasco, Mbeya, Moshi) have hidden costs in excess of 200 percent of revenues. In absolute terms, the hidden costs associated with Dawasco dwarf those of the other utilities amounting to US\$47 million annually.

Irrigation

Achievements

The 2002 National Water Policy (NAWAPO - 2002) stipulates an integrated approach to water resource management and development. Within this framework, Tanzania's government has successfully implemented institutional reform in the irrigation sector. As a result, the country now has four out of five good practice features for sector institutional development: a specialized agency for basin level management, infrastructure development separated from agronomic management, empowerment of the WUAs, and irrigation strategy. The government published a National Irrigation Policy in 2009 to support implementation of its Agriculture Sector Development Program.

Like many African countries, Tanzania has realized very little of its irrigation potential. According to analysis by IFPRI, currently, 184,330 hectares are irrigated—only 3.6 percent of the total cultivated area

and only 9 percent of its physical irrigation potential. However, due to the productivity effect of irrigation, this 3.6 percent of the cultivated area produces a full 10 percent of the country's agricultural value. The irrigated area in Tanzania has been expanding more rapidly than elsewhere in Africa, at a rate of 4.6 percent annually during 1973–2003.

Challenges

Even if an area is physically suitable for irrigation, it may not be economically viable. Economic viability depends on proximity to markets and the value of crops under cultivation. A spatial simulation exercise undertaken to explore economic viability concluded that rates of return on large scale irrigation schemes in Tanzania appear to be relatively low—no more than about 3 percent on average (figure 11). On the other hand, there is substantial potential to develop close to 300,000 hectares of small scale irrigation, which would more than double the area irrigated today. These areas are concentrated in the northwest and southeast of the country. The associated investment cost would be around \$1 billion with an average rate of return of as high as 27 percent.

Figure 11. Tanzania has significant potential for irrigation development, 2006

Source: You and others 2009.

ICT

Achievements

Tanzania has introduced key institutional reforms. In 2003, the country established the Tanzania Communications Regulatory Authority (TCRA), which merged the Tanzania Communications Commission and the Tanzania Broadcasting Commission. The licensing framework has been streamlined and Tanzania has intensified competition in the mobile sector. From four active operators in 2001, Tanzania had seven mobile operators by 2010 making its wireless sector one of the most competitive in the region. Penetration reached half the population by 2010. In common with other countries in eastern and southern Africa that have lacked access to fiber optic submarine cable, Tanzania had high costs of internet service. Two undersea fiber optic cables now land in Tanzania (SEACOM in 2009 and EASSy in 2010). This has led to a huge increase in international bandwidth and a 50% fall in fixed broadband retail prices between 2008 and 2010. Nonetheless fixed broadband prices remain high relative to Tanzanian incomes.

Table 8. Benchmarking ICT indicators, 2008

	Unit	Tanzania 2008	Low-income countries 2008	Sub-Saharan Africa 2008	Tanzania 2010
GSM coverage	% population	67	63	72	75.8
International bandwidth	bits/capita	7.6	25	39	83.7
Internet	users/100 people	2.3	3.6	5.5	3.9
Landline	subscriptions/100 people	0.3	0.8	1.4	0.4
Mobile phone	subscriptions/100 people	32.7	24.4	33.1	50.6

	Tanzania 2008	Low-income countries 2008	Sub-Saharan Africa 2008	Tanzania 2010
Price of monthly mobile basket	13.7	11.0	12.1	11.3
Price of monthly fixed line basket	11.7	10.4	12.4	9.1
Price of 20-hour fixed broadband Internet package	66	287	209	32
Price of a 1 minute call to US	0.25	0.70	0.7	0.28
Price of inter-Africa tel. calls, mean	0.34	0.94	1.0	0.39

Source: TCRA, TTCL, Vodacom and AICD database.

Note: Low-income countries refer to those in Sub-Saharan Africa.

Challenges

As of 2010, just over three quarters of Tanzania's population lived within range of a GSM signal (table 8), falling somewhat short of the performance of east African neighbors such as Kenya and Uganda, where more than 90 percent of their population is covered by mobile networks. Detailed spatial analysis of potential costs and revenues for GSM service across the country suggest that around 95 percent of Tanzania's population could be served on a commercially viable basis. There is thus a market

efficiency gap amounting to 20 percent of the population that could be served if suitable regulatory and institutional reforms allow for greater competition in rural areas. One key issue affecting the mobile sector in Tanzania is the relatively high tax of 28% (18% VAT and 10% special excise tax on mobile airtime), which significantly affect the viability of more marginal rural services. Another issue is the availability of wireless spectrum with demand by operators higher than what has been made available. More efficient spectrum management and allocation can make operator investment in rural areas more viable.

Tanzania has had difficulty privatizing its fixed line telecom incumbent. In 2001, the Government sold part of Tanzania Telecom Co. Ltd. (TTCL) to private investors. The company was later divided into a mobile and fixed line operator in 2007. The fixed line operator was renationalized and a management contract awarded to a Canadian operator was later cancelled. Analysis suggests that the fixed line operator has high levels of employment relative to its size, and that these additional hidden costs amount to as much as 0.3 percent of GDP. Efficiency in TTCL operations is particularly critical given that it has been mandated to manage the national fiber optic backbone, which is priced relatively high by regional standards.

Financing Tanzania's infrastructure

To reach its national developmental goals, Tanzania needs to implement an ambitious infrastructure investment agenda (table 9). The targets outlined below are purely illustrative in nature, but they represent a reasonable level of aspiration. They have been developed in a way that is standardized across African countries and thus allows for cross country comparisons of the affordability of meeting the targets. This section of the report estimates the level of funding required to achieve these goals.

Table 9. Infrastructure targets for the next ten years, 2006-15

	Economic target	Social target
ICT	Fiber optic links to neighboring capitals and submarine cable	Universal access to GSM signal and public broadband facilities
Power	Develop 2,046 MW of new generation capacity and 266 MW of interconnectors	Raise electrification to 30 percent (63 percent urban and 2 percent rural)
Transport	Achieve regional connectivity with good quality two lane paved road Achieve national connectivity with good quality one lane paved road	Provide rural road access to 100 percent of high value agricultural land Urban population within 500m paved road
WSS	n.a.	Achieve MDG for water and sanitation

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

n.a. = not applicable.

Meeting Tanzania's infrastructure needs would cost \$2.4 billion per year for ten years. Capital investment accounts for two thirds of this requirement. Close to 40 percent of the total relates to the power sector alone, which needs 2,046 megawatts of new generation capacity and 266 megawatts in interconnectors to keep pace with demand and participate in regional trade. Achieving regional, national, rural, and urban connectivity in the transport sector accounts for one-quarter of total spending needs, and meeting the Millennium Development Goals for water absorbs a further quarter of the total. ICT spending

needs are relatively modest and equal only nine percent of the total. The need for capital investment is highest in the power sector at \$631 million. Operations and maintenance spending needs are of the order of \$200 million in each of the power, transport and water sectors (table 10).

Table 10. Indicative annual infrastructure spending needs in Tanzania, 2006-15

Sector	US\$ million per year		
	Capital expenditure	Operation and maintenance	Total spending
ICT	181	75	257
Power	631	280	910
Transport	352	267	619
WSS	449	177	626
Total	1,613	799	2,412

Sources: Mayer and others 2008; Rosnes and Vennemo 2009; Carruthers and others 2009; You and others 2009.

Derived from models at <http://www.infrastructureafrica.org/aicd/tools/models>.

Note: O&M = operations and maintenance; CAPEX = capital expenditure.

At 17 percent of the country's GDP, Tanzania's infrastructure spending needs relative to the size of its economy is noticeably higher than the average for Sub-Saharan Africa average and close to the average for nonfragile low-income countries (figure 12).

Figure 12. The burden of infrastructure needs by country typology, 2006

Source: Foster and Briceño-Garmendia 2009.

Tanzania currently devotes \$1.2 billion per year to meeting its infrastructure needs. The public sector is the largest source of finance for infrastructure in Tanzania and accounts for 56 percent of total expenditure (table 11). ODA and the private sector are also important sources of financing and account for 25 percent and 18 percent of total expenditure, respectively. Transport and power each capture one-third of total funding, and ICT and the water sector each capture 18 percent.

Table 11. Existing financing flows to Tanzania, average annual 2001-05

US\$ million per year

Sector	O&M		Capital expenditure				Capital expenditure total	TOTAL
	Public sector	Public sector	ODA	Non-OECD financiers	PPI			
ICT	75	3	2	0	135		140	215
Power	260	16	40	0	44		99	358
Transport	194	82	117	7	9		214	408
WSS	15	33	143	4	29		209	224
Total	544	134	302	11	217		662	1,205

Source: Derived from Foster and Briceño-Garmendia 2009.

Note: PPI = private participation in infrastructure; O&M = operations and maintenance; CAPEX = capital expenditure.

Tanzania's existing infrastructure spending is quite substantial relative to GDP. Tanzania currently devotes 8.6 percent of GDP to infrastructure spending, which is typical of nonfragile low-income countries and similar to its East African neighbors (figure 13). This translates to \$30 per person per year in infrastructure spending, which is on par with Uganda and Ethiopia but only a fifth of what is spent by Kenya and a twelfth of what is spent by South Africa.

Figure 13. Existing financing flows by country typology, average annual 2001-06

Source: Foster and Briceño-Garmendia 2009.

Investment in power and ICT is lower in Tanzania than in other nonfragile low-income countries. There is considerable specialization in sources of investment finance across sectors: the private sector is the predominant source of investment finance for ICT; the private sector and ODA are equally important for the power sector; and ODA is the primary source of funding for the transport and WSS sectors (figure 14). This pattern is typical of the peer group, although Tanzania has less non-OECD funding than many of its peers and the power sector is more reliant on private investment than in other low-income countries.

Figure 14. Existing capital expenditure for infrastructure investment, annual average 2001-06

Source: Foster and Briceño-Garmendia 2009.

Tanzania faced an efficiency gap of \$0.5 billion per year in 2006, representing resources that could be recaptured by suitable policy and institutional reforms. There is substantial evidence that more could be achieved by making more efficient use of Tanzania's existing resource envelope. The largest areas of inefficiency identified were underpricing of electricity, power distribution losses, under-collection of the fuel levy, and over-employment in the telecom incumbent (table 12). Since 2006 – the base year for the analysis – Tanzania has captured some US\$40 million of this efficiency gap thanks to tariff adjustments and efficiency improvement in the power sector.

As of 2006, the inefficiencies of Tanzania's water and power utilities create annual losses of \$90 million, the bulk of them associated with the power sector. At that time, system losses were the primary source of inefficiency in the power sector, while non-revenue water was the main source of inefficiency in the water sector, suggesting in both cases the distribution networks are over-stretched and poorly maintained. In macroeconomic terms, the operational inefficiencies of TANESCO amount to 0.5 percent of GDP, a significant amount yet somewhat lower than in other low income countries. Since 2006, TANESCO has achieved important reductions in distribution losses bringing the cost of operational inefficiencies down to 0.2 percent of GDP, which is substantially better than the peer group. In the case of the water sector, the value of the operational inefficiencies is miniscule in GDP terms and substantially better than in the low-income peer group (figure 15).

Figure 15. Hidden costs in the power and water sector due to inefficiency, 2006

a. Power

b. Water

Source: Foster and Briceño-Garmendia 2009.

As of 2006, underpricing of water and power services was costing Tanzania about \$260 million per year. In the power sector, the average historical cost of producing electricity in Tanzania has been \$0.14 per kilowatt-hour over the last decade. By comparison, the average effective power tariff in 2006 was \$0.06 per kilowatt-hour. Overall, losses due to underpricing of power were very substantial 1.8 percent of GDP, more than twice as high as those in the peer group (figure 16). However, due to recent tariff increases, this has subsequently dropped to 1.1 percent of GDP; a substantial improvement but still well above the average for the benchmark group. In the water sector, the total production cost of \$0.68 per cubic meter is similarly somewhat higher than the average effective tariff is only \$0.50. However, the associated burden of approximately 0.02 percent of GDP is not significant in macroeconomic terms.

Figure 16. Underpricing in the power and water sectors, 2006

Source: Derived from Briceño-Garmendia and others 2009.

These shortfalls in power and water tariffs are ultimately met by state subsidy. However, due to highly inequitable access to these services, the distributional incidence of these subsidies has tended to be highly regressive. Of households with access to piped water in the year 2000, 69.4 percent belonged to the top quintile of the income distribution. Similarly, 87.6 percent of households with access to power in the year 2000 belonged to the richest quintile (figure 17).

Figure 17. Infrastructure and income, 2000

a. Power

b. Water

Source: Banerjee and others 2009.

Assuming that households can afford to spend 5 percent of their budget on power and 5 percent on water, subsistence consumption bundles of water and power at cost recovery prices would be affordable for the vast majority of Tanzanian households (figure 19). For power, with a cost recovery tariff of \$0.16 per kilowatt hour for power and a subsistence consumption of 25 kilowatt hours per month (enough to power two 100 watt light bulbs for four hours per day), the monthly power bill would be \$4. For water, with a cost recovery tariff of \$0.68 and a subsistence consumption of 4 cubic meters per month (25 liters per person per day for a family of five), the monthly water bill would be \$4. Based on analysis of household income distribution, monthly utility bills of \$4 would be affordable to all but the poorest 20 percent of Tanzania's population. Given that access to these services is currently confined to the more affluent 10 percent of the population, affordability is unlikely to become a real issue for some time to come until service access is much more widely available than at present.

Even if all inefficiencies could have been eliminated, an infrastructure funding gap of \$0.7 billion per year (5 percent of GDP) remained as of 2006 (table 12). Looking across sectors, the overall funding gap was mainly associated with water (55 percent of total) and to a lesser extent power (30 percent of total).

Tanzania could further reduce the infrastructure funding gap by adopting lower cost technologies and seeking cross-border finance for regional investments. Adoption of more appropriate technologies for the paving of roads could save \$220 million annually. In the power sector, where \$150 million per year of spending needs relate to power export projects, cross-border finance could be sought from neighboring countries that could benefit from importing lower cost power from Tanzania. Overall, if these measures were adopted, the infrastructure funding gap could be reduced by \$0.3 billion per year, lowering it to only \$0.4 billion per year.

Alternatively, Tanzania could spread the requisite spending over a longer time period, although this would entail delaying the achievement of the targets. If Tanzania were unable to increase current levels of infrastructure spending, address the associated inefficiencies, or take any of the other proposed cost

saving measures, meeting the infrastructure targets outlined here would take 36 years (figure 18a-b). If, on the other hand, Tanzania were unable to increase infrastructure spending but were able to eliminate inefficiencies, this would take only 19 years. These simulations help to underscore the value of reducing inefficiencies, which hemorrhage resources from the sector. Eliminating them could bring Tanzania 17 years closer to meeting its infrastructure targets.

Table 12. If all inefficiencies were eliminated, the funding gap would be much smaller

US\$ million	ICT	Power	Transport	WSS	Total
Needs	(257)	(910)	(619)	(626)	(2,412)
Spending	215	358	408	224	1,205
Potential efficiency gains:	41	348	108	19	516
Including:					
Capital execution	1.1	1.4	27	13	42.5
Operational inefficiencies	40.0	87.0	81	4.1	212.1
Including:					
Labor inefficiencies	40.0	11.9	—	-	51.9
Losses	—	74.9	—	2.1	77.0
Undercollection	—	-	48.2	2.0	50.2
Undermaintenance	-	-	33.3	-	33.3
Cost recovery	—	260	-	2.3	262.3
(GAP) or surplus	(0)	(204)	(103)	(383)	(691)
Reallocation potential	32	0	0	0	32

Source: Derived from Foster and Briceño-Garmendia, AICD Flagship Report, 2009.

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

— = Data not available.

Figure 18. Spreading investment over time

a. Existing resource envelope

b. Resource envelope assuming efficiency gains

Source: Derived from Foster and Briceño-Garmendia, AICD Flagship Report, 2009.

Note: The threshold is the index value of 100.

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

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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 as possible of the additional African countries.

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

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

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

The data underlying 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.