

# Malawi's Infrastructure

## A Continental Perspective

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## Abstract

Infrastructure contributed 1.2 percentage points to Malawi's annual per capital GDP growth over the past decade. Raising the country's infrastructure endowment to that of the region's middle-income countries could increase that contribution by 3.5 percentage points. Malawi's successes in infrastructure development include reaching the Millennium Development Goals for water and making GSM telephone signals widely available without public subsidy.

Challenges include improving the reliability and sustainability of the power sector, raising funding for road maintenance, preventing overengineering of roads, enhancing market access in agricultural areas, and lowering the cost of information and communications services. The latter goal may be achievable by securing competitive access to the new submarine infrastructure on the East African coast.

Addressing Malawi's infrastructure deficit would require sustained expenditures of almost \$600 million per year over the decade 2006–15. During the mid-2000s, the country spent close to \$200 million per year, about half of which went to the transport sector. Because of widespread inefficiencies—underpricing of power, improperly maintained roads, and utility distribution losses—about \$200 million is wasted each year.

But even if those inefficiencies were eliminated, Malawi would still face an annual infrastructure funding gap of almost \$300 million. That gap could be cut to \$100 million by engaging in regional trade of electricity, using lower-cost technologies in water and sanitation, and adopting less-ambitious road-building technologies. If inefficiencies were eliminated and recent spending levels sustained, Malawi could reach its infrastructure targets within 16 years.

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# Malawi's Infrastructure: A Continental Perspective

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Infrastructure contributed 1.2 percentage points to the annual per capita growth of Malawi's gross domestic product (GDP) over the past decade, thanks mainly to the revolution in information and communication technology (ICT). Raising the country's infrastructure endowment to that of the region's middle-income countries could further boost annual growth by 3.5 percentage points per capita. Today, Malawi's basic infrastructure indicators look relatively good when compared with other low-income countries in Africa, although the performance of that infrastructure could be significantly improved.

Malawi is one of the few African countries to have already reached the Millennium Development Goals (MDGs) for water—almost a decade ahead of the target. The private sector has made GSM telephone signals widely available without public subsidy. A substantial road investment program has raised the average condition of the country's road network, and a foundation for institutional reform has been laid in the ICT, power, and road transport sectors.

Despite this success, many challenges remain. Perhaps the most pressing is improving the reliability and sustainability of the power sector, which is taking a significant toll on the economy through underpricing and operational inefficiencies. In the road sector, adequate funding for road maintenance will be needed to preserve the value of recent investments in the sector. Future investments plans must avoid overengineering of the network and put greater emphasis on enhancing rural connectivity in high-value agricultural areas. In ICT, the main issue is to bring down the cost of services to make them more affordable for the population. Securing access to the new submarine infrastructure along the East African coast holds the key to achieving that goal, as long as competition prevails.

Addressing Malawi's infrastructure deficit would require sustained expenditures of almost \$600 million per year (20 percent of GDP) over the decade 2006–15, about 80 percent of which would be for capital expenditure. The power, water supply, and sanitation sectors each account for about a third of total spending needs.

During the mid-2000s, Malawi's infrastructure spending was close to \$200 million per year (6 percent of GDP). About half of that spending was in the transport sector. Because of widespread inefficiencies in several infrastructure sectors, an additional \$200 million is wasted. Key areas of inefficiency include underpricing of power (worth \$72 million a year), undermaintenance of roads (\$32 million), and utility distribution losses (\$21 million).

Even if those inefficiencies could be eliminated, Malawi would still face an infrastructure funding gap of almost \$300 million a year. This could be lessened to \$100 million by engaging in regional trade of electricity, using lower-cost supply modalities in water supply and sanitation, and adopting appropriate technologies for road sector development. As long as efficiency gains are captured and spending sustained at the levels of the recent past, the country's infrastructure targets could be reached within 16 years.

## **The continental perspective**

The Africa Infrastructure Country Diagnostic (AICD) has gathered and analyzed extensive data on infrastructure across almost all African countries, including Malawi. The results have been presented in

reports covering different areas of infrastructure—ICT, irrigation, power, transport, WSS—and different policy areas including investment needs, fiscal costs, and sector performance.

This report presents the key AICD findings for Malawi, allowing the country's infrastructure situation to be benchmarked against that of its African peers. Malawi is benchmarked against both low- and middle-income African peers that, respectively, provide close comparators and a more aspirational point of reference. Detailed comparisons will also be made with immediate regional neighbors in the Southern African Development Community (SADC).

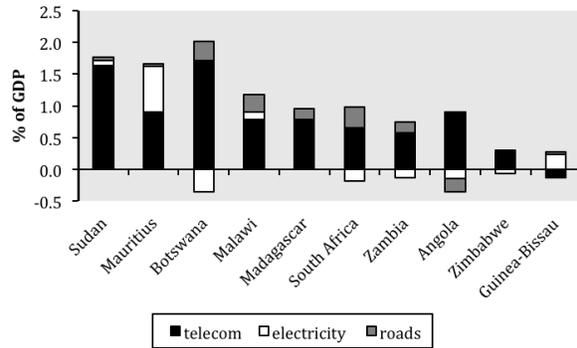
Several methodological issues should be borne in mind. First, because of the cross-country nature of data collection, a time lag is inevitable. The period covered by the AICD runs from 2001 to 2006. Most technical data presented are for 2006 (or the most recent year available), while financial data are typically averaged over the available period to smooth out the effect of short-term fluctuations. Second, in order to make comparisons across countries, the indicators and analysis had to be standardized so that everything was done on a consistent basis. This means that some of the indicators presented here may be slightly different from those that are routinely reported and discussed at the country level.

## **Why infrastructure matters**

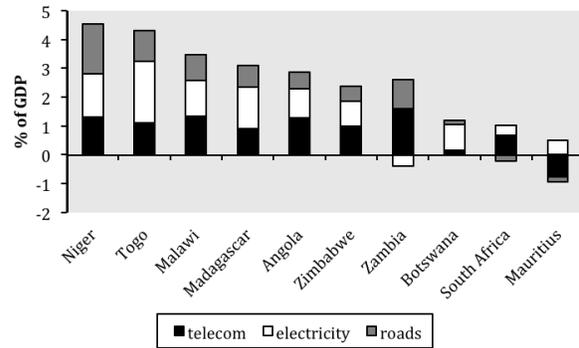
Over the decade 1997–2007, Malawi's economy grew at an average annual rate of only 2.9 percent, placing it among the slower-growing nations on the continent. This performance falls well short of the sustained 7 percent per year needed to meet the MDGs. About 0.8 percentage points of southern Africa's improved per capita growth performance during the 2000s can be credited to improved structural and stabilization policies (Calderón 2008), while 1 percent is related to improvements in the countries' infrastructure platforms. In the case of Malawi, most of the boost was due to the ICT revolution, while power and roads contributed very little. Simulations suggest that if Malawi's infrastructure could be improved across the board to the level of the African leader—Mauritius—annual per capita growth rates would be 3.5 percent higher than they are at present. All three of the infrastructure sectors considered could make substantial contributions to economic growth (figure 1).

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

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



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

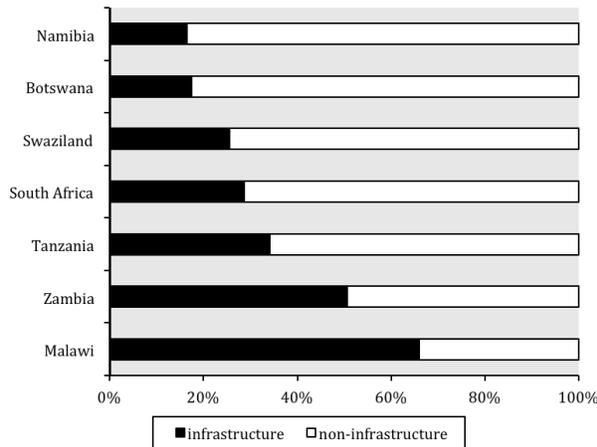


Source: Calderón 2009.

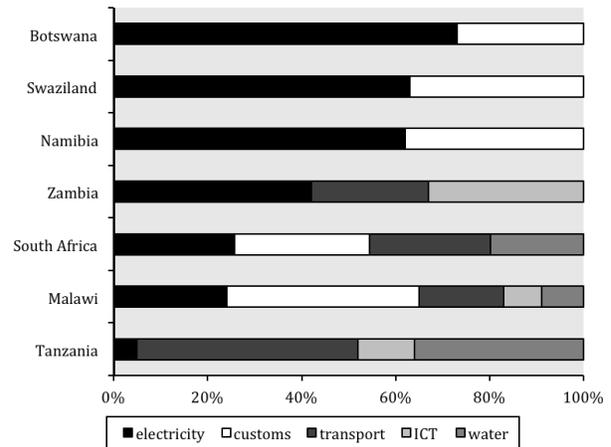
Evidence from enterprise surveys suggests that infrastructure constraints are responsible for about two-thirds of the productivity handicap faced by Malawi's firms (figure 2), with the remainder due to poor governance, bureaucratic red tape, and financing constraints. No single sector bears the entire responsibility for this: power, customs, transport, and water all having a material impact on the productivity deficit.

**Figure 2. Infrastructure deficits hold back firms' productivity**

Weight of infrastructure deficits among all factors that sap business productivity (%)



Weight of various sectors in productivity deficit attributable to infrastructure (%)



Source: Escibano and others 2009.

## The state of Malawi's infrastructure

By African standards, Malawi is a relatively small and densely populated country that suffers widespread poverty. Malawi's economy is predominantly agricultural, with the concentration of agricultural activity and mineral resources in the center and south of the country. Generally speaking,

Malawi's infrastructure backbones follow the north-south axis running parallel to Lake Malawi. Power and ICT backbones are entirely national in nature, with no regional integration at present, although a number of cross-border connections have been proposed. Regional transport connectivity is also quite limited. While the practice of irrigation is extended across the national territory, the intensity is extremely low—at less than 1 percent of cultivated land, with a slightly higher level of concentration in the far south.

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

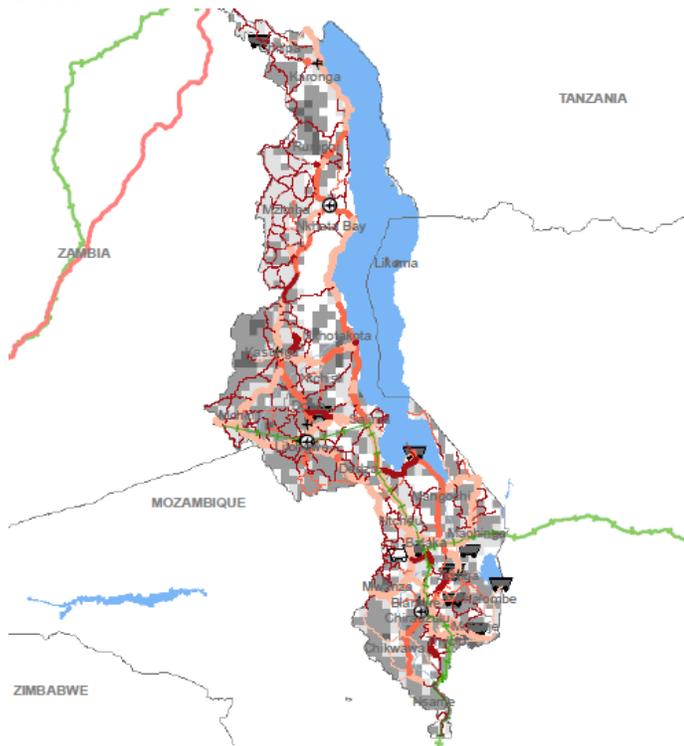
**Table 1. Achievements and challenges in Malawi's infrastructure sectors**

	<b>Achievements</b>	<b>Challenges</b>
Air transport		Addressing lack of sustainability of Air Malawi Strengthening safety oversight
ICT	Advanced sector reform GSM signal almost universal	Acquiring competitive access to submarine cable to reduce costs of international connectivity Expanding penetration of GSM services by improving affordability
Irrigation	Adoption of national strategy and empowerment of water user associations	Completing institutional framework Developing potential high-return small-scale irrigation schemes
Power	Adoption of modern legal framework and regulatory agency	Improving reliability of power supply Addressing underpricing and operational inefficiencies
Railways	Awarded concession for the Central East African Railways (CEAR) leading to some improvements in performance	Improving competitiveness of rail network in terms of both cost and quality
Roads	Adoption of modern road fund Large investment program leads to high-quality roads	Providing adequate funds for road maintenance Safeguarding against overengineering of road network Improving accessibility to high-value agricultural land
WSS	Early attainment of MDG targets Low reliance on surface water and open defecation	Addressing underpricing and operational inefficiencies Moving ahead with rural water reforms Designing policies to promote upgrading of latrines

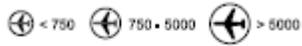
Source: Author's own elaboration based on findings of this report.

Figure 3. Malawi's infrastructure networks follow natural resources

a. Roads



**Airports** ('000 Passengers per Annum)



**Ports**



**Railroad** (Million Traffic Unit per Annum)



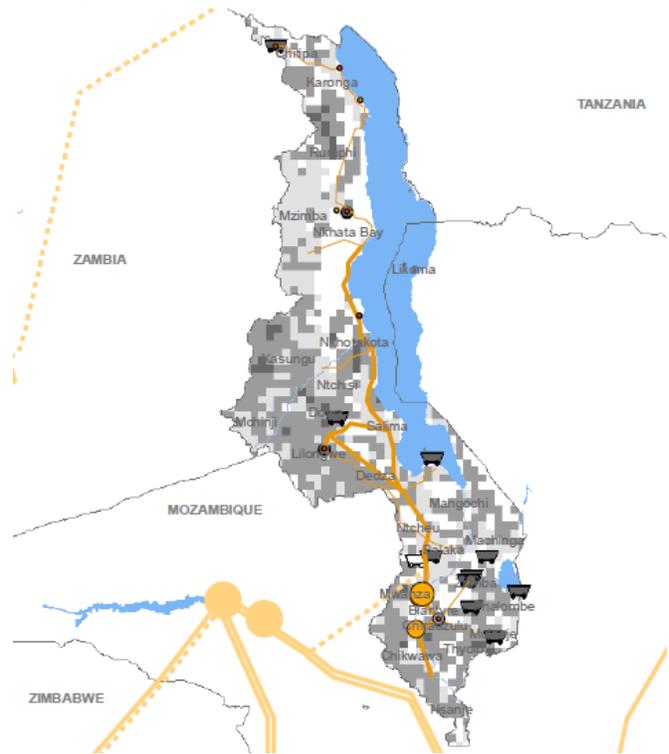
**Road Traffic** (Avg Annual Daily traffic)



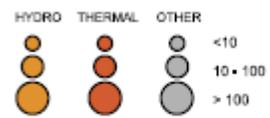
**Road Type & Condition**



b. Power



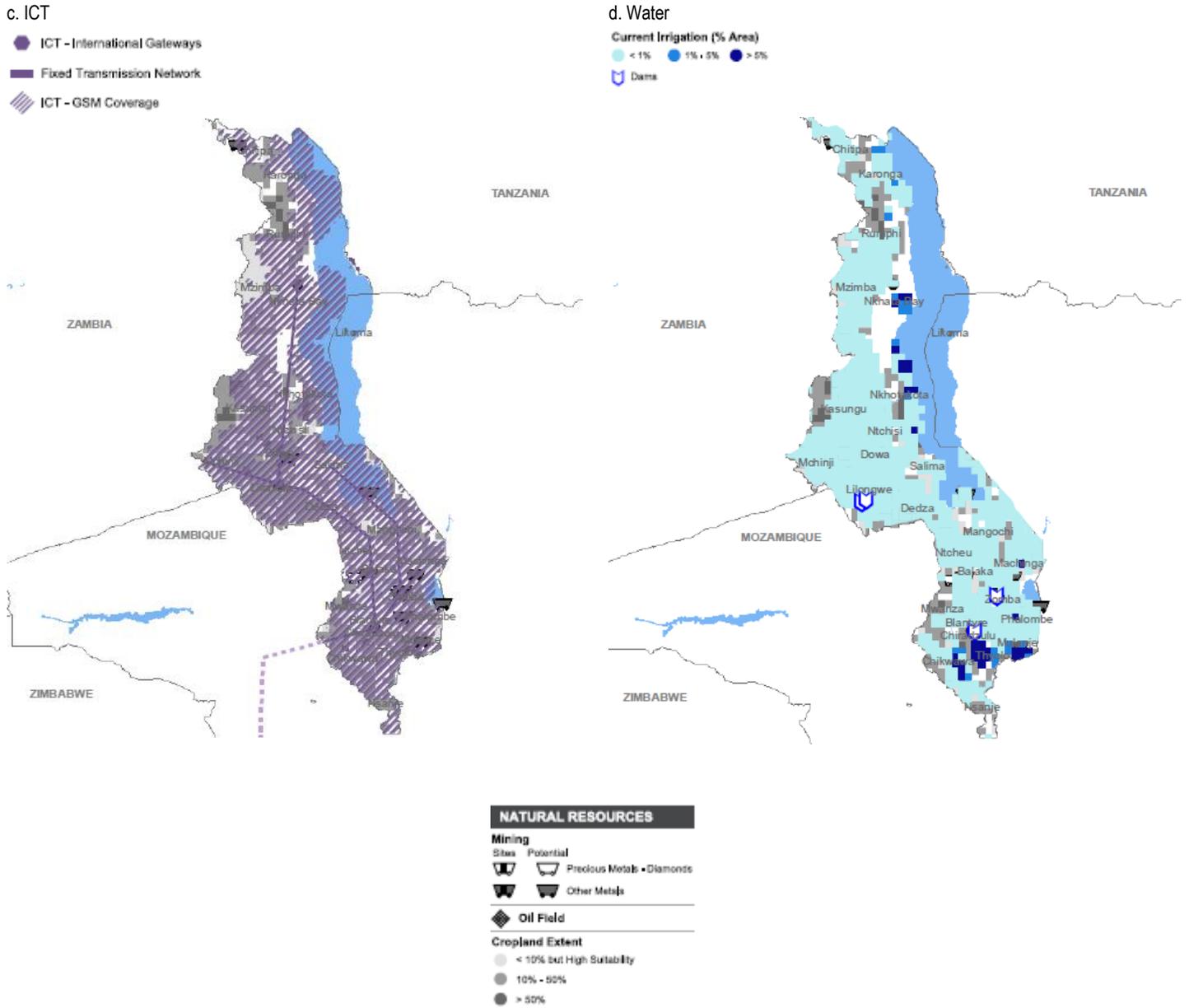
**Power Plants** | Type and Capacity (MW)



**Power Lines** (KV)



# MALAWI'S INFRASTRUCTURE: A CONTINENTAL PERSPECTIVE



Source: AICD Interactive Infrastructure Atlas for Malawi, [http://www.infrastructureafrica.org/aicd/system/files/ken\\_new\\_ALL.pdf](http://www.infrastructureafrica.org/aicd/system/files/ken_new_ALL.pdf).

## Roads

### Achievements

Malawi has been spending heavily on its road network in recent years, and as a result has achieved better levels of road quality. During the early 2000s, Malawi was devoting nearly 4 percent of its GDP to road sector spending, one of the highest ratios in southern Africa. The results are evident when Malawi's road sector is benchmarked against that of its peers. Paved road density is comparatively high. Paved road quality is somewhat better, while unpaved road quality is substantially better with nearly 90 percent of the network in good or fair condition, compared with less than 60 percent elsewhere (table 2). Malawi has also made significant progress on the institutional reform agenda for roads. Malawi has introduced a road fund that meets most of the best-practice institutional design features.

**Table 2. Malawi's road indicators benchmarked against Africa's low- and middle-income countries**

	Unit	Low-income countries	Malawi	Middle-income countries
Paved road density	km/1,000 km <sup>2</sup> of arable land	86.6	<b>141.2</b>	507.4
Unpaved road density	km/1,000 km <sup>2</sup> of arable land	504.7	<b>164.7</b>	1,038.3
GIS rural accessibility	% of rural population within 2 km of all-season road	21.7	<b>26.2</b>	59.9
Paved road traffic	Average annual daily traffic	1,049.6	<b>600.6</b>	2,786.0
Unpaved road traffic	Average annual daily traffic	62.6	<b>44.5</b>	12.0
Paved network condition	% in good or fair condition	80.0	<b>85.5</b>	79.0
Unpaved network condition	% in good or fair condition	57.6	<b>89.4</b>	58.3
Perceived transport quality	% firms identifying roads as major business constraint	23.0	<b>16.4</b>	10.7

Source: Gwilliam and others 2009.

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

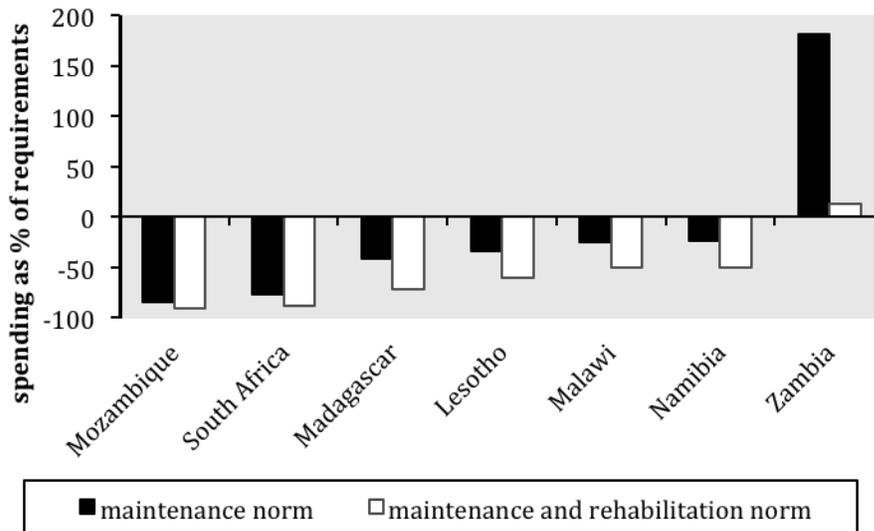
Note: GIS = geographic information system.

### Challenges

Road preservation expenditure still falls significantly short of what is needed to preserve the network in good condition. Based on the Road Network Evaluation Tool (RONET) analysis, Malawi's recent spending on road maintenance falls about 24 percent short of what is needed to sustain the infrastructure (figure 4). One of the issues is that the fuel levy of around \$0.07 per liter, while fairly typical of southern Africa, falls substantially short of the \$0.25 per liter needed to fully finance optimal maintenance requirements. This benchmark level is probably higher than what could in practice be applied, and certainly well above the highest level observed in the region (in Tanzania, at around \$0.16 per liter). Government transfers to the road fund currently make up for part (although by no means all) of this difference, reaching an implicit spending level of almost \$0.19 per liter.

There is some evidence that Malawi's road network is overengineered in places. About 20 percent of the main road network was found to be overengineered, meaning that paving has been applied to roads with traffic volumes below the typical 300-vehicle-per-day threshold. This is also consistent with the finding that Malawi's paved road density is far above that of its low-income peers, while average annual daily traffic (at 600 vehicles per day) is substantially below such peers (over 1,000 vehicles per day). The combination of relatively high road sector spending, apparent overpaving, and underfunding of maintenance suggest that there may be a case for shifting resources away from investment toward asset maintenance.

Figure 4. Malawi is not spending enough on road maintenance and rehabilitation



Source: Gwilliam and others 2009.

Beyond the trunk network, accessibility falls off. About 26 percent of Malawi's population lives within 2 kilometers (km) of an all-weather road. While this is significantly better than the benchmark for low-income countries, the number is low in absolute terms and remains a concern for a country so heavily reliant on agriculture. Placing the entire rural population of Malawi within 2 km of an all-season road would be extremely costly and challenging, since it would require a quadrupling of the classified road network. A more strategic approach would be to prioritize improvements in rural accessibility toward areas of high current or potential agricultural production.

## Rail

### Achievements

In 1999 a concession was awarded for Malawi's rail operator, with notable performance improvements. Following the concession, there were improvements in labor productivity (as the workforce was substantially reduced) and some recovery in domestic rail traffic as well as some growth in international traffic. But traffic and productivity indices suffered dramatically following the 2003 cyclone, which washed away the critical Rivirivi Bridge and thus impacted the concession.

**Table 3. Railway indicators for Malawi and select countries, 2000–05**

	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, 1,000 tonne-km/km	690	5,319	112	510	460	815	379
<b>Efficiency</b>							
Staff: 1,000 unit tariff (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 tonne-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
<b>Tariffs</b>							
Average UT, freight, U.S. cents/tonne-km	3.8	—	5.8	4.0	3.0	15.2	3.9
Average UT, passenger, U.S. cents/passenger-km	0.6	—	1.0	1.6	1.1	2.3	0.8

Source: Bullock 2009.

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

Note: — = data not available; n.a. not applicable.

## Challenges

Notwithstanding some improvements made under the concession, the performance of the CEAR still does not compare favorably with networks in neighboring countries (table 3). Relatively high freight tariffs and slow transit times continue to limit the competitiveness of rail vis-à-vis road transport. Moreover, the line is very lightly used—even relative to others in southern Africa—further challenging financial sustainability.

Malawi's rail links with the rest of the continent are not functioning very effectively. There is interest in improving the performance of the Nacala corridor, which is Malawi's shortest route to the sea through northern Mozambique, and which is currently beset with performance problems. Another proposal exists to extend the rail network northwards to connect with the Tanzania and Zambia Railway Authority (TAZARA) network; however, the associated costs are high (\$200 million) and the economic case is not clear.

## Air transport

### Challenges

In common with other small countries in Africa, Malawi has a relatively small air transport market. The domestic market amounts to no more than 167,000 seats, while the international market comes to 435,000 seats. The intercontinental market is negligible. Nevertheless, relative to the population of the country the number of seats per capita—at just over 23—is an order of magnitude higher than would be found in larger countries.

While Malawi has experienced declining air transport connectivity in recent years, it is well connected with Zambia and the regional hub in South Africa. Whereas in 2004, there were 28 city pairs reachable out of Malawi, this number fell by almost one-half to 15 pairs by 2007. This is a standard trend across Africa's smaller countries and reflects the concentration of air traffic around a number of regional hubs. With this new pattern, what is most critical is to ensure that the country has regular service to the relevant hubs. As of 2007, Malawi had, on average, 10 flights a week to Johannesburg and 13 to Lusaka, which is not unreasonable.

Air Malawi remains financially unsustainable, and multiple privatization attempts have failed. The main domestic route between Blantyre and Lilongwe is being outsourced to smaller carriers. The air transport market would benefit from allowing new private operators to enter and provide services, as has taken place in Tanzania.

Malawi does not have an autonomous civil aviation authority (CAA), and the International Civil Aviation Organization (ICAO) has raised significant concerns about its air safety. Airports are not equipped with radar equipment. Malawi could potentially benefit from a unified air space for the SADC, which would allow regional air traffic control (ATC) to be centralized at one location with representation from member states, and which would provide a stronger financial basis for ensuring the provision of key satellite-based air surveillance equipment and radio communications.

## **Water supply and sanitation**

### **Achievements**

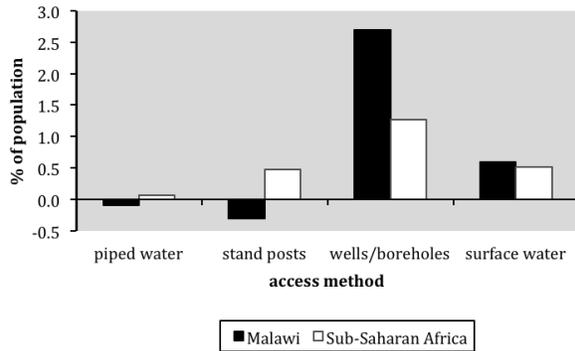
According to the World Health Organization/United Nations Children's Fund (WHO/UNICEF) Joint Monitoring Program, Malawi was one of only five Sub-Saharan African countries to already have reached the MDG for water as of 2006, almost a full decade ahead of the target date. This is a considerable achievement, particularly given that most of the other countries in that successful group—notably, Ghana, Namibia, and South Africa—have much higher incomes than Malawi and started out from a higher baseline level of coverage in 1990.

This achievement is reflected in the fact that—relative to other low-income countries in Africa—Malawi has much lower levels of reliance on surface water and sanitation. Reliance on surface water in Malawi is less than 12 percent, compared with 37 percent in the relevant peer group (table 4). Practice of open defecation in Malawi is less than 15 percent, compared with 40 percent for the comparator countries (table 4). This has been achieved through the widespread prevalence of intermediate solutions such as boreholes and traditional latrines. Both of these intermediate modalities have been reaching an additional 3 percent of Malawi's population each year (figures 5 and 6), a rate of expansion that is substantially higher than what is observed elsewhere in Africa. But it is worrisome that the percentage of the population relying on surface water has been increasing in recent years, albeit from a relatively low base (figure 5).

By the same token, access to higher-end WSS solutions—such as piped water and flush toilets—are substantially lower in Malawi than in other low-income countries in Africa (table 4). Access to piped water is 6.5 percent in Malawi compared to 11.7 percent in the peer group, while access to flush toilets is 3.6 percent in Malawi compared to 5.3 percent in the peer group. This is not necessarily a bad thing, if it

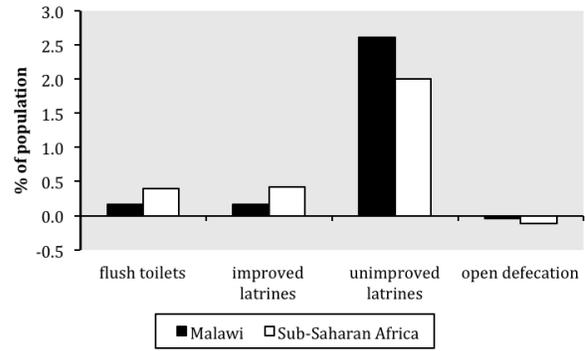
means that Malawi has been able to reach the MDG more rapidly than other low-income countries by focusing on lower-cost service modalities. But it is noteworthy that the percentage of the population relying on utility water—whether through private taps or standposts—has been declining somewhat in recent years (figure 5).

**Figure 5. Exceptionally rapid expansion of wells and boreholes**



Source: Banerjee and others 2009.

**Figure 6. Rapid expansion of traditional latrines**

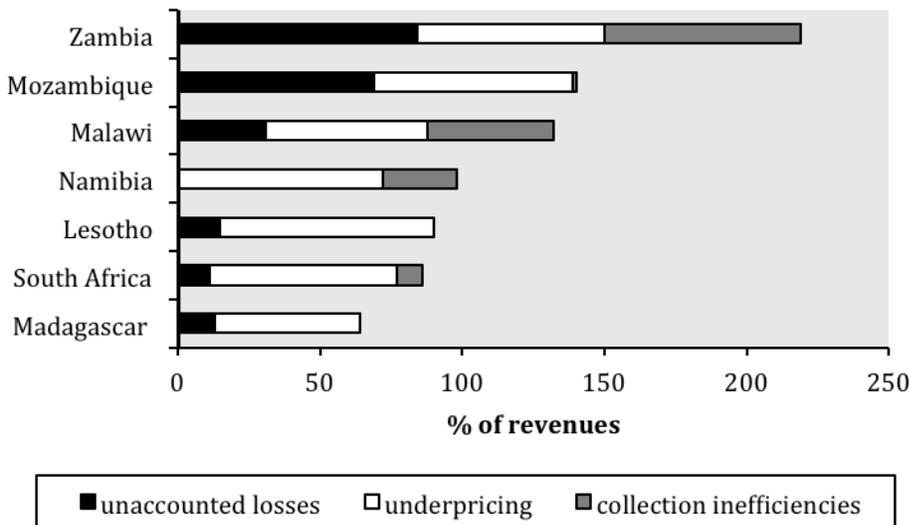


Source: Morella and others 2009.

**Challenges**

Malawi’s urban water utilities face major hidden costs that amount to 130 percent of sector revenues. This makes them among the more inefficient utilities in southern Africa (figure 7). The hidden costs come from a number of sources that contribute in almost equal measure to the overall problem. First, tariffs—at \$0.36 per cubic meter (m<sup>3</sup>)—cover only about two-thirds of production costs. Second, revenue collection is particularly low, estimated at only 50 percent of total billings. Third, distribution losses—at close to 35 percent—are well above best-practice levels of around 20 percent, even if they are quite typical for the peer group as a whole.

**Figure 7. Hidden costs of water utilities**



Source: Banerjee and others 2009.

Malawi has not made much progress in rural water sector reform thus far. Malawi has adopted a rural water policy and created a dedicated budget line, but does not yet have a rural water agency, a cost-recovery policy, or a map of rural water points. This lack of attention to rural water can be seen in the growing reliance on surface water that has been observed in rural areas in recent years.

**Table 4. Benchmarking water and sanitation indicators**

	Unit	Low-income countries	Malawi	Middle-income countries
Access to piped water	% pop	10.1	<b>6.5</b>	56.4
Access to standposts	% pop	16.1	<b>12.7</b>	20.4
Access to wells/boreholes	% pop	38.3	<b>69.0</b>	6.3
Access to surface water	% pop	33.8	<b>11.7</b>	13.9
Access to septic tanks	% pop	5.3	<b>3.6</b>	44.0
Access to improved latrines	% pop	9.3	<b>1.2</b>	0.9
Access to traditional latrines	% pop	47.9	<b>80.7</b>	33.0
Open defecation	% pop	37.1	<b>14.5</b>	15.8
Domestic water consumption	liter/capita/day	72.4	<b>109.4</b>	Na
Urban water assets in need of rehabilitation	%	35.5	<b>42.0</b>	25.0
Revenue collection	% sales	96.0	<b>50 (est.)</b>	99.2
Distribution losses	% production	33.0	<b>34.6</b>	23.1
Cost-recovery	% total costs	56.0	<b>67.7</b>	80.6
Total hidden costs as % of revenue	%	130.0	<b>153.7</b>	84.9
U.S. cents per m <sup>3</sup>	<b>Malawi</b>	Scarce water resources		Other developing regions
Residential tariff	<b>35.7</b>		60.26	
Nonresidential tariff	<b>54.0</b>		120.74	3.0–60.0

Source: Banerjee and others 2009; Morella and others 2009.

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

In sanitation, the main policy challenge is how to upgrade traditional latrines to improved standards. While more than 80 percent of Malawi's population has access to a traditional latrine, little more than 1 percent has access to an improved latrine. While this imbalance is typical across Africa, it is particularly marked in the case of Malawi. This suggests that the main sanitation challenge for the country is how to make it easier for households to improve their latrines. Given that a widespread subsidy policy is likely unaffordable, the right place to begin would be on the supply side, investigating the barriers that prevent the construction of improved latrines, such as lack of technical know-how or the nonavailability of key parts in the local market. There are a few countries in the region that have had some success in expanding traditional latrines—most notably Burkina Faso, Madagascar, and Rwanda—and their experience could be relevant to Malawi.

## Power

### Achievements

Malawi has been moving ahead with institutional reform in the power sector. In 2004 a new legal framework for the sector was passed, comprising the Energy Regulation Act, Electricity Act, and Rural Electricity Act. In 2007 the first Commissioners of Malawi's new independent regulator—the Malawi Energy Regulatory Authority (MERA)—were appointed. Overall, Malawi has implemented about 60 percent of best-practice institutional reforms for the power sector, which puts it ahead of the average score for Sub-Saharan Africa.

### Challenges

Malawi has suffered considerably from unreliable power supplies. Although installed generation capacity and power consumption per capita are typical for the region, outages in Malawi have been about three times the average levels observed in the peer group. As a result, almost half of formal sector enterprises surveyed in the Malawi report have backup generators, which is twice the share found in other African low-income countries. Moreover, the percentage of business turnover lost to power outages, at over 22 percent, is more than three times as high as the benchmark. Based on a lost load of \$0.50 per kilowatt-hour (kWh), power outages are estimated to be costing the economy around 2 percent of GDP.

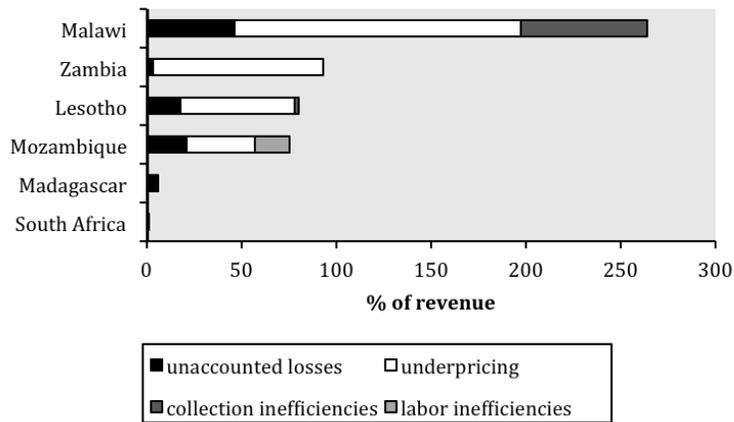
The hidden costs of Malawi's power utility are by far the largest found in southern Africa. Malawi's utility suffers from a variety of inefficiencies whose total value adds up to 250 percent of the company's turnover. In other words, the utility loses far more revenue than it makes. The size of this hemorrhage is more than double the next-worst case, the Zambian Electricity Supply Company Ltd. (ZESCO), with hidden costs equivalent to 100 percent of utility turnover.

Although a number of factors are responsible for this situation, by far the largest is underpricing. Existing power tariffs in Malawi—averaging little more than \$0.05 per kWh for residential consumers—are among the lowest in Africa and are relatively low even by global standards. These tariffs cover no more than one-half of the total costs of power production. The Government of Malawi is aware of this issue and has increased tariffs by around 50 percent, with further increases planned. In the longer term, as new (more-efficient) investments in power generation capacity are made, the incremental cost of power in Malawi could be expected to fall toward the \$0.05–\$0.06 per kWh range allowing tariffs to come down in the longer run.

In addition, the power utility suffers from substantial operational inefficiencies. Only 60 percent of bill payments due are actually collected. As a result, the average revenue of the utility—\$0.03 per kWh—is well below the effective tariff, and even further from the cost-recovery benchmark. At 23 percent, system losses are about double best-practice levels, even if they are typical among low-income countries in Africa.

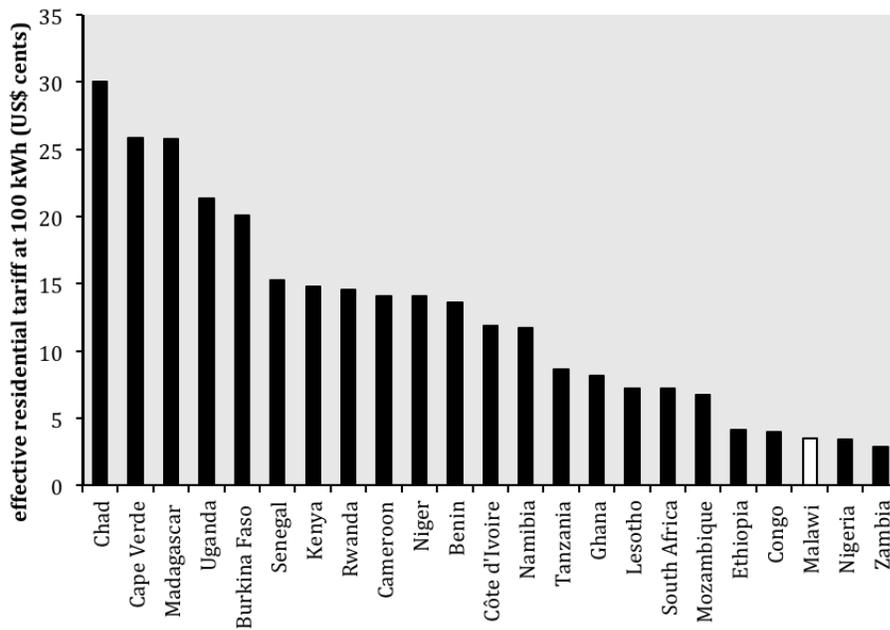
**Figure 8. Malawi's power sector has much higher hidden costs than many of its neighbors**

Hidden costs of power utilities in select countries

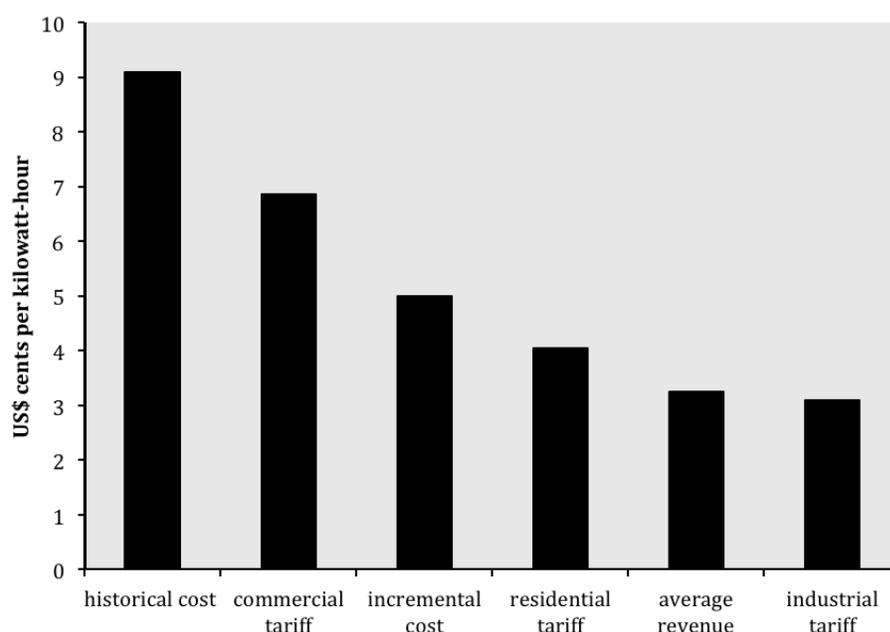


Source: Eberhard and others 2009.

**Figure 9. Comparison of electricity tariffs across Africa**



Source: Derived from Eberhard and others 2009.

**Figure 10. Comparison of Malawi's power tariffs against various cost benchmarks**

Source: Derived from Eberhard and others 2009.

**Table 5. Benchmarking power indicators**

	Unit	Low-income countries	Malawi	Middle-income countries
Installed power-generation capacity	MW/mil. people	24.4	<b>21.5</b>	796.2
Power consumption	kWh/capita	99.5	<b>103.4</b>	4,473
Power outages	Day/year	40.6	<b>77.0</b>	5.6
Firms' reliance on own generator	% consumption	17.7	<b>49.1</b>	0.5
Firms' value lost due to power outages	% sales	6.1	<b>22.6</b>	0.8
Access to electricity	% population	15.4	<b>11.0</b>	59.9
Urban access to electricity	% population	71	<b>34.0</b>	83.7
Rural access to electricity	% population	12	<b>2.5</b>	33.4
Growth access to electricity	% population/year	1.4	<b>0.6</b>	1.8
Revenue collection	% billings	88.2	<b>59.8</b>	99.9
Distribution losses	% production	22.1	<b>23.0</b>	15.7
Cost-recovery	% total cost	90.0	<b>44.8</b>	125.7
Total hidden costs as % of revenue	%	121.2	<b>264.0</b>	3.5
U.S. cents	<b>Malawi</b>	Predominantly hydrogeneration	Other developing regions	
Power tariff (residential at 75 kWh)	<b>5.4</b>	10.27	5.0–10.0	
Power tariff (commercial at 900 kWh)	<b>10.6</b>	11.73		
Power tariff (industrial at 50,000 kWh)	<b>7.5</b>	11.39		

Source: Eberhard and others 2009. Derived from AICD electricity database, <http://www.infrastructureafrica.org/aicd/tools/data>.

At present, Malawi does not participate in regional power trade in the Southern African Power Pool (SAPP), although the construction of an interconnector with Mozambique is being considered. In the longer term, as regional power trade develops, Malawi would have the opportunity to interconnect with Zambia as well. When the major Inga hydropower scheme is developed in the Democratic Republic of Congo (DRC), Malawi would become a transit country for Congolese power that would flow in through Zambia and onward to Mozambique. About 1.6 terawatt-hours (TWh) of this power could potentially remain in Malawi, contributing to the satisfaction of domestic power demands. There is no particular economic advantage to Malawi from importing Congolese power, since the long-run marginal cost of domestic power *generation* (only) at just over \$0.03 per kWh is comparable to the long-run marginal cost of power imports. But there could be a sizeable financial advantage to the country, since by importing Congolese power Malawi would be able to postpone the major investments needed to develop its own domestic hydropower resources, by delaying projects such as Songwe, Kholombizo, Fufu, and Kaphichira Phase II.

## **Water resources**

### **Achievements**

Malawi has made some progress in recent years with the development of irrigation. A national irrigation strategy has been adopted, as have measures to empower water user associations throughout the country. But there is no concrete irrigation action plan in place. Institutionally, the development of irrigation infrastructure remains the responsibility of broader agricultural management bodies. Further, there are no specialized river basin organizations for water resource management at the catchment level.

### **Challenges**

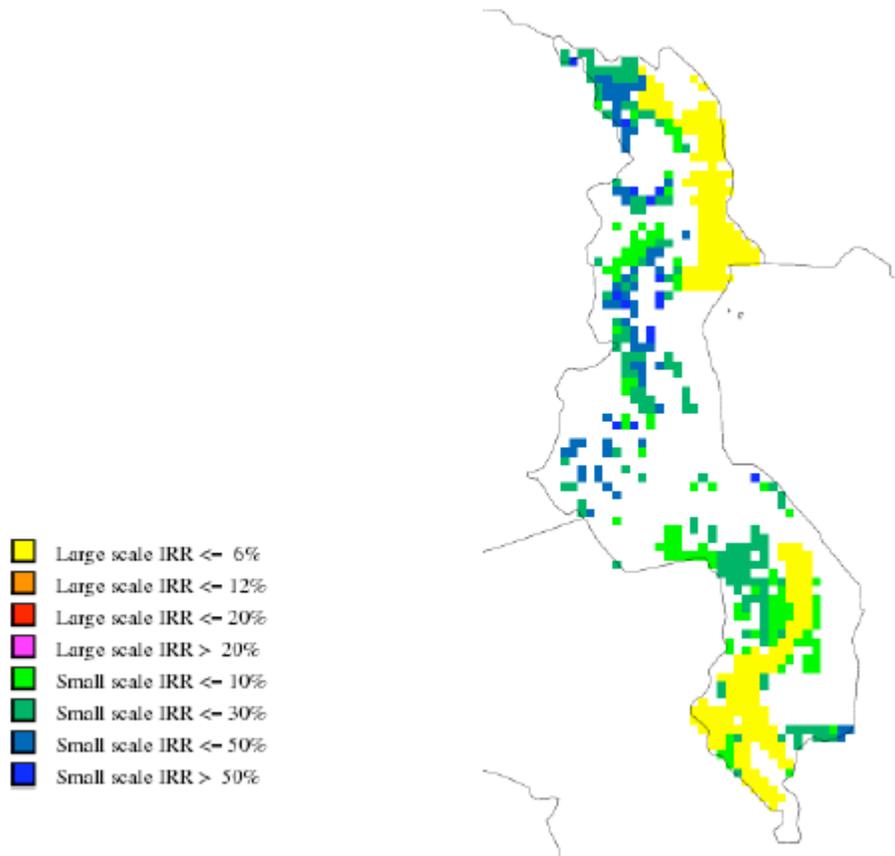
At present, Malawi irrigates only 56,000 hectares or just over 1 percent of its agricultural land. In contrast to other countries, this 1 percent is scattered throughout the national territory in the form of low-intensity, small-scale schemes (recall figure 3d).

In the period 1973–2003, irrigated area in Malawi expanded relatively rapidly, at 6 percent annually (albeit from a base lower than many of its neighbors). Since 2003 the growth rate has slowed considerably, to 0.6 percent.

Recent simulations serve to identify the areas with greatest potential for irrigation development (figure 11). While there are significant areas with potential for large-scale dam-based irrigation in the extreme northeast and southwest of the country, the associated economic returns are relatively low, under 6 percent. A larger area shows potential for small-scale irrigation schemes, with the highest return areas clustered in the northwest quadrant of the country. A total of 162,000 hectares is found to be economically viable for small-scale irrigation, with an average rate of return of 9 percent.

**Figure 11. Irrigation schemes could be viable in many new locations**

Areas viable for irrigation



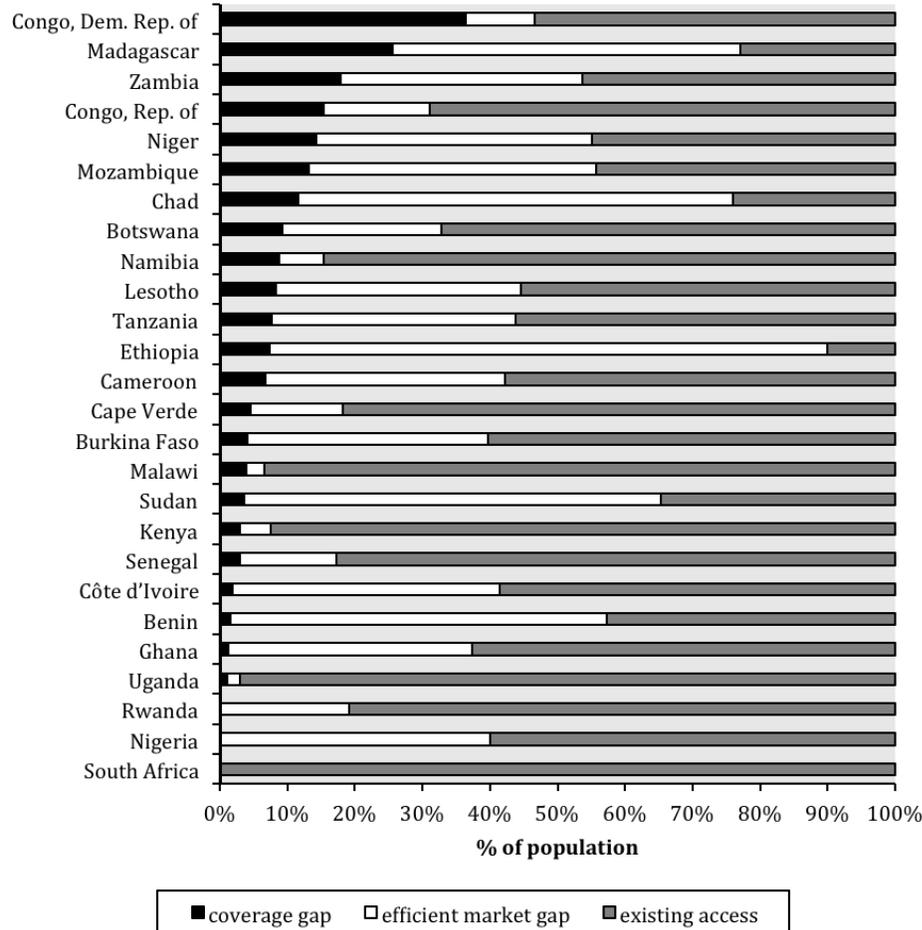
Source: You and others 2009.

## Information and communication technologies

### Achievements

Malawi has made great progress in ICT sector reform, emerging as one of the regional leaders in this area. The country has completed all of the major steps in the reform process, including the privatization of the fixed-line incumbent, the establishment of an independent regulatory agency, and the establishment of a competitive market for mobile services. As a result, the country scores close to 60 percent on an index of institutional best practices for the ICT sector, well above the average level for Sub-Saharan Africa.

Malawi's GSM signal coverage, which reaches 93 percent of the population, is one of the highest in Africa and even exceeds the average of 85 percent across middle-income countries in the region (table 6). As a result, Malawi has one of the lowest market-efficiency gaps in the region. The dismantling of regulatory barriers has allowed the private sector to expand GSM service throughout the national territory, almost reaching the limits of commercial viability (figure 12).

**Figure 12. Malawi has made tremendous progress in expanding GSM coverage**

Source: Mayer and others 2008.

### Challenges

With the exception of mobile phones, prices for ICT services remain relatively high in Malawi (table 6). Much of this has to do with Malawi's landlocked position and the absence of a submarine cable along the East African coast. This is now changing, with three new submarine cables competing to be the first to start service. There are also plans to extend the fiber-optic backbone from Malawi to the coast. As a result, prices of Internet and international calls could fall substantially, as long as competition is retained on the international gateway to the submarine cables. Experience elsewhere in Africa highlights the importance of such competition in ensuring that the full benefits of submarine infrastructure are passed on to the consumer (table 7).

Despite the broad reach of the GSM signal across Malawi's territory, mobile penetration, at only 5 subscribers per 100 people, is about a third of the average across other low-income countries in Africa. Although mobile prices are no higher than in the peer group, the relatively low incomes of Malawi's households may make the service unaffordable to the vast majority of the population. One contributing factor to the cost of mobile services is a relatively high value added tax of 18 percent.

**Table 6. Benchmarking ICT indicators**

	Unit	Low-income countries	Malawi	Middle-income countries
GSM coverage	% population	48.2	<b>93.3</b>	97.2
International bandwidth	Mbps/capita	5.8	<b>0.19</b>	30.2
Internet	subscribers/100 people	0.1	<b>0.15</b>	2.0
Landline	subscribers/100 people	0.8	<b>1.3</b>	9.4
Mobile phone	subscribers/100 people	15.1	<b>5.2</b>	86.7
			Countries without access to submarine cables	Other developing regions
		<b>Malawi</b>		
Price of monthly mobile basket		<b>11.0</b>	11.12	9.9
Price of monthly fixed-line basket		<b>16.5</b>	13.58	—
Price of 20-hour Internet package		<b>46.6</b>	67.95	11.0
Price of call to the United States		<b>1.33</b>	2.59	2.0
Price of intra-African calls, mean		<b>1.10</b>	0.72	n.a.

Source: Minges and others 2009.

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

Note: Mbps = megabit per second; — = data not available; n.a. = not applicable.

**Table 7. High international call charges driven by both technology and market power**

\$	Percent of cases	Call within region	Call to the United States	Internet dial-up	Internet ADSL
Without submarine cable	67	1.34	0.86	68	283
With submarine cable	33	0.57	0.48	47	111
• Monopoly on international gateway	16	0.70	0.72	37	120
• Competitive international gateway	16	0.48	0.23	37	98

Source: Minges and others 2009.

## Financing Malawi's infrastructure

To meet its most pressing infrastructure needs and to catch up with developing countries in other parts of the world, Malawi needs to expand its infrastructure assets in key areas (table 8). The targets outlined in table 8 are purely illustrative, but they represent a level of aspiration that is not unreasonable. Developed in a standardized way across African countries, they allow for cross-country comparisons of the affordability of meeting the targets, which can be modified or delayed as needed to achieve financial balance.

**Table 8. Illustrative investment targets for infrastructure in Malawi**

	<b>Economic target</b>	<b>Social target</b>
ICT	Fiber-optic links to neighboring capitals and submarine cable	Universal access to GSM signal and public broadband facilities
Irrigation	Develop 162,000 hectares of small-scale irrigation	n.a.
Power	700 MW new generation	Electricity coverage of 17.1% (75.9% urban and 1.1% rural)
Transport	Regional connectivity by good quality 2-lane paved road National connectivity by good quality 1-lane paved road	Rural network gives access to 80% agricultural production Urban population within 500-meter paved road
WSS	n.a.	Sustain MDG target for water Achieve MDG target for sanitation Clear sector rehabilitation backlog

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

n.a. = not applicable.

Meeting these illustrative infrastructure targets for Malawi would cost \$0.6 billion per year through 2015. Capital expenditure would account for 80 percent of this requirement. The two highest price tags are associated with the power and water sectors, each requiring about \$190 million annually, which is about as much as the other three sectors put together. The power sector need is associated with providing 700 megawatts (MW) of new generation capacity to meet demands over the next decade, as well as boosting electrification to 17 percent overall. The water-spending needs relate to sustaining the MDG target level for water as population expands, attaining the MDG target for sanitation and clearing the sector's rehabilitation backlog (table 9).

**Table 9. Indicative infrastructure spending needs in Malawi, 2006–15**

Sector	CAPEX	O&M	Total needs
ICT	29	12	41
Irrigation	59	1	61
Power	176	14	190
Transport	45	39	84
WSS	144	44	188
Total	471	113	564

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

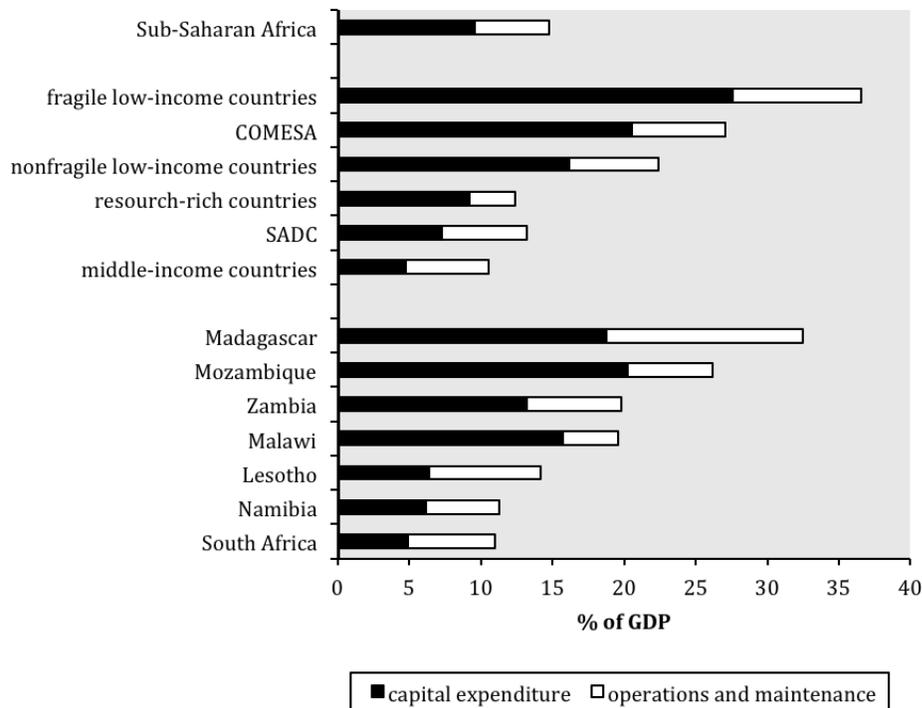
Derived from models at <http://www.infrastructureafrica.org/aicd/tools/models>.

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

Malawi's infrastructure spending needs look particularly high relative to the country's GDP, since they would absorb 20 percent of GDP for a decade. Infrastructure investment alone would absorb 15 percent of GDP, comparable to what China invested in infrastructure during the mid-2000s. Although these numbers are very high, they are still below the average 22 percent of GDP that other low-income, nonfragile African countries would need to spend.

**Figure 13. Malawi's infrastructure spending needs are substantial relative to GDP**

Estimated infrastructure spending needed to meet targets, as percentage of GDP  
 Capex = gray segment; O&M = black segment



Source: Foster and Briceño-Garmendia 2009.

Note: COMESA = Common Market for Eastern and Southern Africa.

At present, Malawi only spends \$175 million on meeting its infrastructure needs (table 10). About 60 percent of the total is allocated to capital expenditure and 40 percent to operating expenditures. Operating expenditures are entirely covered from budgetary resources and payments by infrastructure users. The two largest sources of funding for infrastructure investment are the public sector and donors, each providing about \$40 million per year on average. The private sector has been investing at about half of this level. About half of existing spending is allocated to the transport sector, more than twice what is spent on either power or water.

This level of spending absorbs about 6 percent of Malawi's GDP—less than in other low-income, nonfragile African states that have been spending around 10 percent of GDP on infrastructure in recent years (figure 13). The sources of infrastructure investment finance in Malawi differ somewhat from the peer group. Striking is the limited role of official development assistance (ODA) in the power sector, and the absence of private investment in transport. In addition, Malawi has not received investment from countries outside the Organisation for Economic Co-operation and Development (OECD).

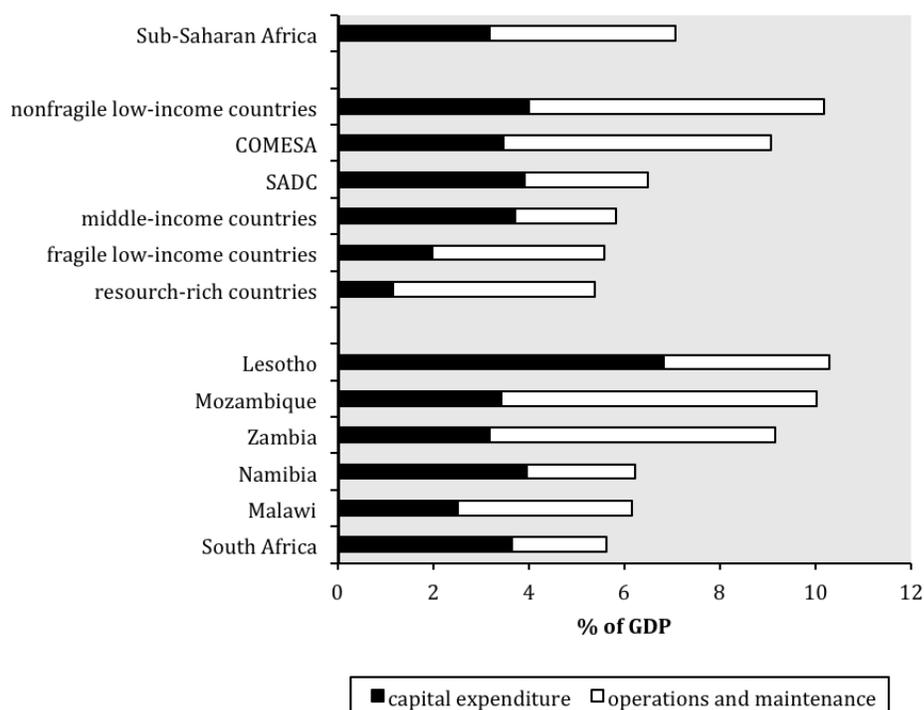
**Table 10. Financial flows to Malawi's infrastructure, average, 2001–06**

\$ millions per year

	O&M		CAPEX				Total spending
	Public sector	Public sector	ODA	Non-OECD financiers	PPI	Total CAPEX	
ICTs	2	0	1	0	16	17	19
Irrigation	1	1	0	0	0	1	2
Power	14	15	1	0	0	16	30
Transport	39	22	21	2	0	45	84
WSS	15	3	16	0	6	25	40
Total	72	42	38	2	22	104	175

Source: Derived from Foster and Briceño-Garmendia 2009.

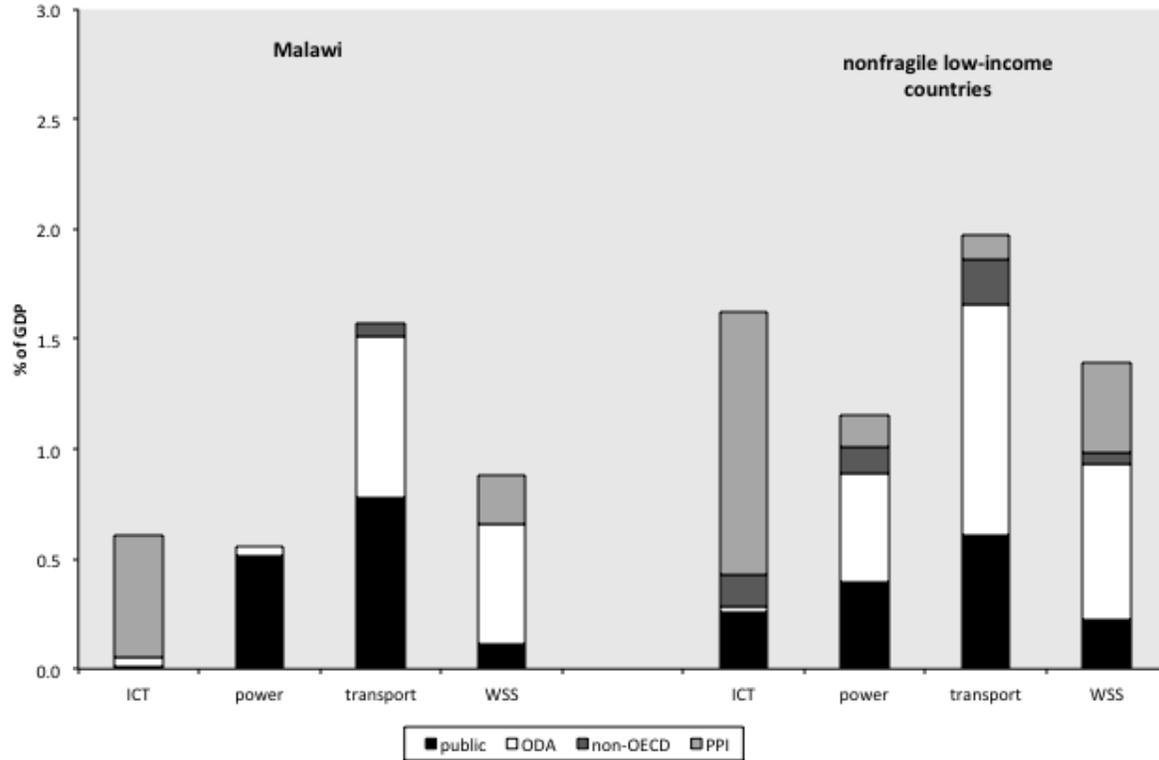
Note: PPI = private participation in infrastructure; O&amp;M = operations and maintenance; CAPEX = capital expenditure.

**Figure 14. Malawi's existing infrastructure spending is not particularly high**

Source: Foster and Briceño-Garmendia 2009.

**Figure 15. Malawi'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 and others 2009.

Note: Private investment includes self-financing by households.

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

About \$182 million of additional resources could be utilized each year by improving efficiency (table 11), in particular by better recovering costs. Other areas where significant inefficiencies exist are road maintenance, distribution losses, and capital-budget execution (that is, the share of budgeted funds that is actually spent). The two sectors that present the largest potential efficiency dividends are power and transport.

**Table 11. Potential gains from greater operational efficiency**

	ICT	Irrigation	Power	Transport	WSS	Total
Underrecovery of costs	—	n.a.	72	22	10	105
Overstaffing	n.a.	—	n.a.	—	4	4
Distribution losses	—	—	16	—	6	21
Undercollection	—	n.a.	3	0	8	11
Undermaintenance	—	n.a.	n.a.	32	n.a.	32
Low budget execution	0	n.a.	0	9	0	9
Total	0	n.a.	91	63	28	182

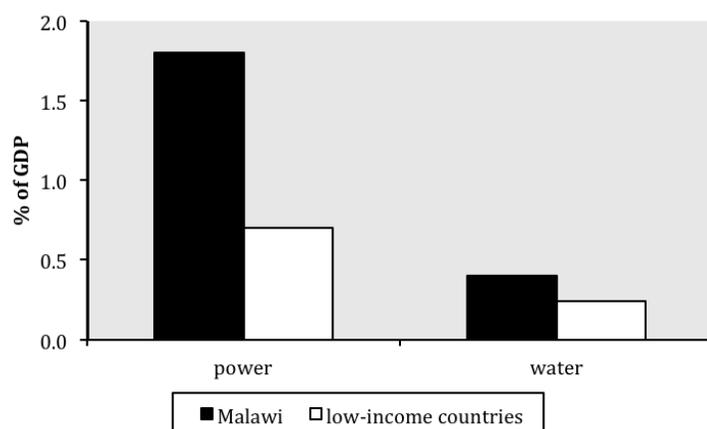
Source: Derived from Foster and Briceño-Garmendia 2009.

Note: — = data not available; n.a. = not applicable.

Undercharging for power and water services is costing Malawi about \$82 million each year. In the power sector, it is estimated that the average total cost of producing electricity has been \$0.10 per kWh historically, while the average effective residential tariff is only \$0.05, which barely covers operations and maintenance (O&M) costs. Overall, the power utility covers only 60 percent of costs, leaving capital investment unfunded. The associated financial burden is a staggering 1.8 percent of GDP, more than twice as high as that of comparator countries (figure 15). In the water sector, tariffs stand at \$0.37 per m<sup>3</sup>, covering only about two-thirds of operating costs. The macroeconomic burden, at 0.4 percent of GDP, is much smaller than that for power, even if it is still significantly larger than in the comparator countries.

**Figure 16. Underpricing of power and water in Malawi is relatively burdensome**

Financial burden of underpricing in 2006, as percentage of GDP

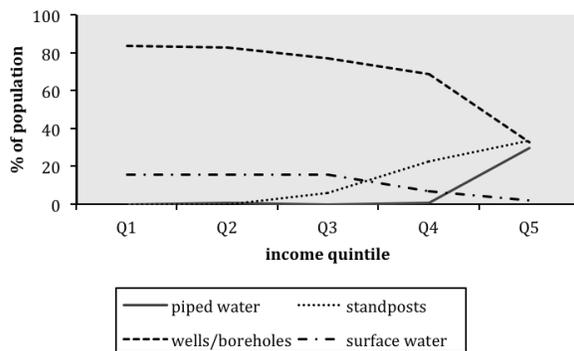


Source: Derived from Briceño-Garmendia and others 2009.

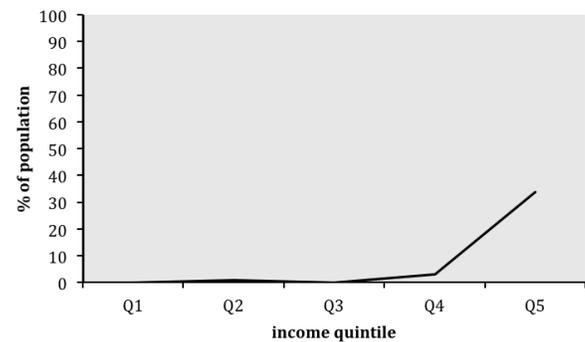
Because of inequitable access to power and water services in Malawi, subsidized tariffs are highly regressive. About 90 percent of those that have electricity or piped-water connections belong to the top 20 percent of the expenditure distribution; such connections are virtually nonexistent for poorer households (figure 17). This highly inequitable distribution of connections virtually guarantees that any price subsidy to these services will be regressive.

**Figure 17. Consumption of infrastructure services in Malawi is unequal**

(a) Mode of water supply, by income quintile



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

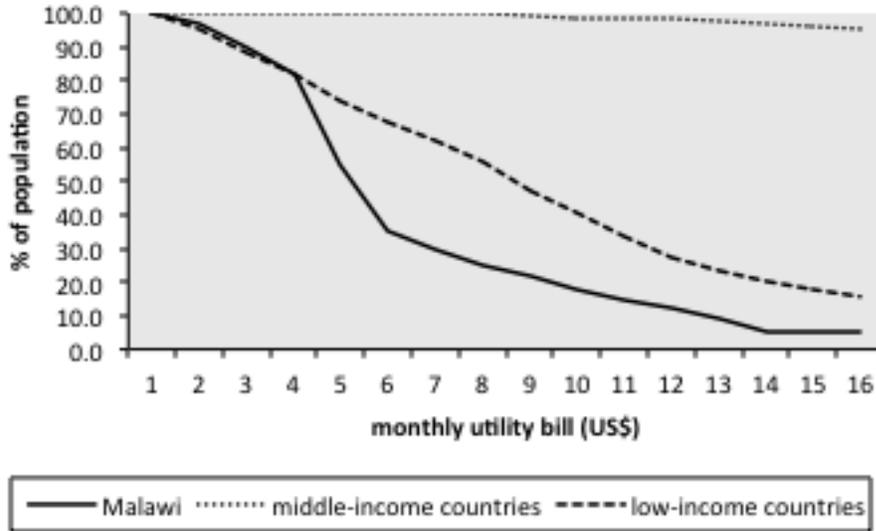


Source: Banerjee and others 2009.

The affordability of cost-recovery infrastructure tariffs can be assessed by looking at the distribution of household budgets in Malawi and comparing these against standard infrastructure affordability thresholds, such as 5 percent of the household budget. Relative to other low-income countries in Africa, the purchasing power of Malawi's households is quite low (figure 18). Nevertheless, monthly bills of up to \$4 are affordable for the vast majority of households.

The monthly bill that would affordably recover costs can be estimated using the cost-recovery benchmark tariff and applying it to a subsistence level of household consumption. A cost-recovery tariff of \$0.10 per kWh for power and a subsistence consumption of 25 kWh per month—which is enough to power two 100-watt light bulbs for four hours per day—amounts to a monthly power bill of \$2.50, which would be affordable for 85 percent of Malawi's population (figure 18). Taking a cost-recovery tariff of around \$1 for water and a subsistence consumption of 4 m<sup>3</sup> per month—which amounts to an absolutely minimal consumption of 25 liters per capita per day for a family of five—the monthly water bill would be \$4. This would be affordable for 70 percent of Malawi's population. Given the very low levels of access to these services prevalent today, and the extremely regressive distribution of this access, it is safe to say that cost-recovery tariffs for services would be affordable to households that currently have services. Indeed, affordability of services would only become a serious issue in Malawi when services have expanded to reach well over half of the population, which still lies some way ahead.

Figure 18. Affordability of utility bills

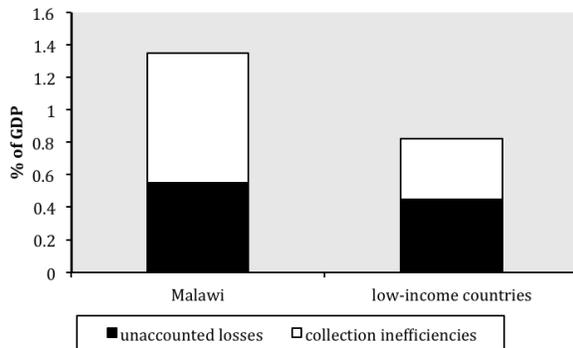


Source: Banerjee and others, 2008

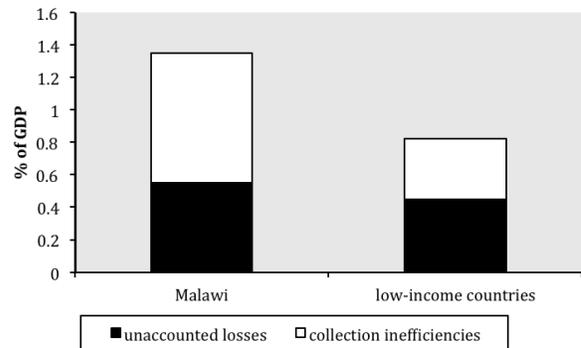
Operational inefficiencies of power and water utilities are costing Malawi \$32 million each year, which amounts to 1.8 percent of GDP overall (figure 19). Malawi’s power utility faces distribution losses of 23 percent (around twice that of best-practice levels) and collects only 59 percent of its revenue (compared to 90 percent for the peer group as a whole). As a result, Malawi’s power utility generates hidden costs for the economy that are substantially larger than those observed in the low-income peer group. The story in the water sector is a similar one. Distribution losses are almost 35 percent, while revenue collection is estimated as low as 50 percent. Due to the smaller financial turnover of the water sector, these hidden costs weigh less heavily on GDP; however, they remain more than twice as high as those in the low-income peer group. It is striking that across both power and water, undercollection seems to be the largest source of hidden costs.

Figure 19. Malawi’s power and water utilities impose a greater burden of inefficiency than peers

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 and others 2009.

## Annual funding gap

Malawi's infrastructure funding gap amounts to \$0.3 billion per year, or about 10 percent of GDP. Almost half of the country's entire funding gap is found in the WSS sector, where the annual shortfall in meeting the MDGs is \$141 million (table 12). Another significant part of the gap is found in the power sector, where an additional \$69 million is needed to meet the country's development goals.

**Table 12. Funding gaps by sector**

\$ millions	ICT	Irrigation	Power	Transport	WSS	Total
Spending needs	(41)	(61)	(190)	(84)	(188)	(585)
Existing spending	19	2	30	84	40	175
Efficiency gains	0	0	91	63	28	182
Funding gap	<b>(22)</b>	<b>(59)</b>	<b>(69)</b>	<b>63</b>	<b>(120)</b>	<b>(270)*</b>

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.

## What else can be done?

The most obvious way to address the funding gap is by raising additional finance. While prospects for doing so may be limited, it is worth noting that (relative to its GDP) Malawi is capturing less external finance for infrastructure than other African low-income countries, whether through ODA, private investment, or non-OECD finance.

But even if additional finance is hard to secure, there is still much that Malawi can do to reduce the infrastructure funding gap through its own policy choices, and in particular the technology choices it makes to meet its infrastructure targets. The single-largest measure that Malawi could take to reduce its infrastructure spending needs would be to integrate itself more closely with the SAPP. As a result, the country would become a net importer of power—importing up to 1.5 TWh of electricity by 2015 from neighboring countries—and as a result would save \$134 million of annual investment requirements. Another \$30 million a year could be saved by adopting lower-cost technologies to meet the MDGs; for example, by placing greater emphasis on standposts, boreholes, and improved latrines. Finally, \$15 million a year could be saved by adopting appropriate technologies for the surfacing of paved roads. If all these policy measures were adopted, Malawi could save \$179 million a year, cutting its infrastructure funding gap by two-thirds and bringing it down to \$91 million a year.

Finally, if all else fails, it may be necessary to extend the time horizon for meeting the infrastructure targets beyond the illustrative 10-year period considered here. Simulations suggest that if Malawi were unable to raise additional finance but addressed inefficiencies, the identified infrastructure targets could be achieved within a 16-year horizon. Without stemming inefficiencies, however, 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 website: [www.infrastructureafrica.org](http://www.infrastructureafrica.org). For papers go to the document page (<http://www.infrastructureafrica.org/aicd/documents>), for databases to the data page (<http://www.infrastructureafrica.org/aicd/tools/data>), for models 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](http://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.

