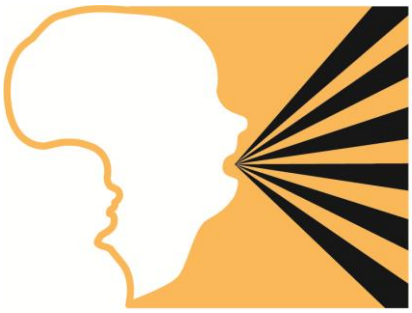


african monitor

African voices for Africa's development

Unlocking the African Moment –

Rural infrastructure in Africa

DSM Paper Series

Development Support Monitor 2012

Contents

A. Introduction

Inadequate and unreliable infrastructure services are common in the majority of rural communities in Africa. Rural households do not have access to safe drinking water, electricity, reliable transportation or modern communication services. Only 34 percent of rural Africans live within two kilometres of an all-season road, compared to 65 percent in other developing regions (Torero and Chowdhury, 2005). These services support quality of life and form the basis of a healthy and robust economy. Moreover, the lack of connectivity in rural roads seriously constrains agricultural production - in the absence of rural feeder roads, the cost of moving produce can be as high as U$ 2.00 per ton-kilometre. As a result, some 85 percent of crop production takes place within six hours' travel time from the largest cities (AFDB, 2010). It is imperative to note that properly planned rural road links to the formal road network can create new markets and opportunities for isolated communities. (PGDP, 2009).

The agricultural sector is the mainstay for more than 415 million people in Sub-Saharan Africa (SSA) which is 55 percent of the population. The majority of farmers are engaged in subsistence and smallholder farming. The sector is characterised by low productivity and has stagnated for the last three decades. This can be largely attributed to the lack of rural infrastructure, agricultural inputs and technology, as shown in the international fund for agricultural development (IFAD's) *Rural Poverty report 2011*.

Whilst the case for improving rural infrastructure has been made by African governments in NEPAD's Comprehensive African Agricultural Development Programme (CAADP) and their development partners via other platforms, very limited progress has been made in auctioning it. The CAADP notes that "adequate and well-functioning infrastructure is essential for agriculture to be competitive", as it improves productivity by reducing the costs of delivering inputs and transport to markets (NEPAD, 2003). The programme estimates that US$ 92 billion would need to be invested for the period 2003-2015, of which US$ 62 billion would be allocated to building rural roads whilst US$ 2.8 billion would be needed for increasing trade-related capacities. In addition, the protection of infrastructure investments would require additional allocations for continued operation and maintenance, totalling some US$ 37billion over the period.

Progress in improving the region's urban infrastructure has been limited largely as a result of the inability of its poorest countries to mobilize the necessary resources to successfully implement urban infrastructure projects. Furthermore, private investors have had little incentive to invest in infrastructure. Donors have shown very little inclination to bridge the infrastructure financing gap.

Investment in rural infrastructure is fundamental to unlocking the African Moment and has been well documented in theoretical and empirical studies. Growth in

smallholder agriculture cannot be generated without augmenting productivity. Effective infrastructure must be built and established to facilitate growth in productivity. The infrastructure needs for rural farming communities include transport and communication services, energy, water and irrigational facilities and extension services. The OECD (2007: 20) notes that the provision of infrastructure should not been seen as an end in itself, but as a means to contribute to the delivery of goods and services that promote prosperity and growth, contribute to quality of life, including social well-being, health and safety, and the quality of the environment.

The development of rural infrastructure not only reduces the cost of inputs and transport to markets as mentioned above; it also reduces increases farmers' access to enlarged markets, facilitates trade flows, and spurs value addition and crowds-in investment. Pinstrup-Andersen and Shimokawa (2010) corroborate this by pointing out that growth in agricultural productivity depends largely on an effective rural infrastructure, functioning domestic markets, appropriate institutions and access to appropriate technology. An inefficient transport system can constrain agriculture by raising the costs and effectiveness of inputs in the production process and by delaying the sale of harvested crops (Fan, 2004). This has been proven in some regions in Africa, where increases in agricultural output have been accomplished by increasing the provision of transportation. Furthermore, investment in infrastructure is essential to increase farmers' access to input and output markets, to stimulate the rural non-farm economy and vitalize rural towns, facilitate the integration of less-favoured rural areas into national and international economies (Pinstrup-Anderson and Shimokawa, 2010).

Rural development, spurred by reforms introduced in the 1970s, has been the main reason for China's agricultural-led growth, particularly smallholder growth. As a result, poverty has been drastically reduced in the last three decades[1]. This "firing from the bottom approach" is based on decentralising agricultural production systems and is coupled with providing good rural infrastructure, agricultural research capacities and extension services. Fan and Chan-Kang (2005)[2] use their country's provincial-level data for 1982–99 to show that development of rural roads, an increase in agricultural research and development irrigation, education, electricity, and telecommunications, have combined to make significant contributions to agricultural development and poverty reduction. Lessons drawn from the Chinese experience demonstrate that Africa also needs to introduce policies designed to incentivise smallholder farmers so as to increase their productivity and production, supported by extensive investments in rural infrastructure, such as rural roads and

[1]The share of people living below US$ 1.25 a day in China decreased impressively from 84 percent of the population in 1981 to 16 percent in 2005.

[2]An analytical framework was developed that extends to earlier work by Fan *et al.* (2002) by distinguishing roads of different quality, andby disaggregating the measured effects of road investments inrural and urban areas.

irrigation. Similarly, investments in agricultural research should also be increased and tailored to the continent's unique conditions, such as having a predominantly rain-fed weather pattern (Fan, Nestorova and Olofinbiyi, 2010).

B. Country Experience and Grassroots Priorities

From 2008 to 2010, African Monitor and its partners conducted *poverty hearings* in which grassroots communities were invited to identify what they regarded as the most important issues for urgent government action. These hearings were conducted in South Africa, Kenya, Liberia, Senegal and Mozambique. These people also identified the lack of rural infrastructure as a major stumbling block to socio-economic improvement, and pointed out that it also hampers their governments' poverty alleviation efforts. In the *Kenya Poverty hearings* for instance, it was found that national government efforts to assist the poor were generally failing due to inadequate attention to the informal sector and the provision of rural infrastructure. A strong and recurring message from the hearings was that government should improve rural infrastructure and access to markets.

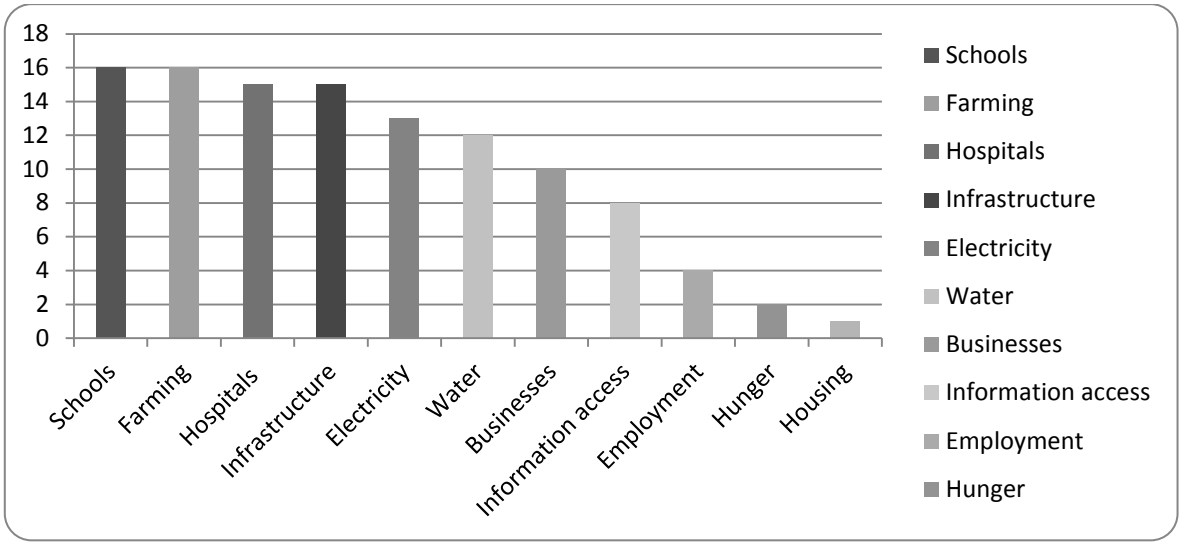
If rural infrastructure remains as is, producers of perishable goods will suffer and sales of produce and goods will remain limited. The following particularly apt quote, shown in the text box below, illustrates the real challenge that poor infrastructure presents to informal traders who are attempting to rid themselves of the shackles of poverty through self-employment.

> *"...I worked very hard to make ends meet after failing to have the best education. Before my dairy business collapsed, I used to make many losses since the road to the dairy plant was inaccessible used to take a lot of time on the way and the milk used to go bad. At times even the electricity could be off at the plant..."*

In the *Mozambique Poverty hearings*, the grassroots communities also lamented the lack of adequate infrastructure. Bad roads were identified as having a negative effect on business and the community's ability to access important facilities such as schools. However, these particular hearings also showed that the Mozambican government has begun construction on roads in some areas of the country.

During the pre-hearings survey, informants were asked to rate positive improvements in services that contribute to better conditions in their communities by answering the question, '*What do you think are successes (improvements) achieved so far in your community with regards to social and economic well-being?* 'Nearly all of them indicated infrastructure provision as the fourth most important priority alongside schools, farming, and hospitals. (See graphic below.)

Figure 1: Most important services to communities



Source: Mozambique Pre-Poverty Hearings Survey 2010

An informant in the Malulu District in Niasa (Mozambique) commented that "*In our town the access roads are being improved.*" Informants indicated that they saw the improvement of roads in their areas as an important factor that would help their businesses to grow and be sustainable.

In the *Liberian Poverty hearings* communities in rural areas mourned the lack of adequate infrastructure especially the proximity of health facilities. They often have to walk long distances to access basic primary health care facilities and pointed out that they do not have access to information on health services.

> "*Sometimes when a family member is sick, we don't have the means to take them to hospital. I just go and collect some tablets (pills) from around and give to them. The hospitals are also very far from where we stay.*"

In the *South African Poverty hearings* held in 2008, the lack of road networks, telecommunication and access to health facilities were also mentioned as one of the major stumbling blocks communities face in rural areas in Limpopo, and the Northern and Eastern Cape. Communities in these regions reflected that they often had to travel long distances to access basic facilities.

The provision of infrastructure has also been identified as fundamental in providing an enabling environment in which grassroots communities can realize their potential, through African Monitor's Grassroots Focus Index process[3]. When asked to rank their

[3] The GFI measures the extent to which the grassroots are prioritised in the formulation and implementation of development policies, programmes and activities. The GFI is organised around three main dimensions which are:

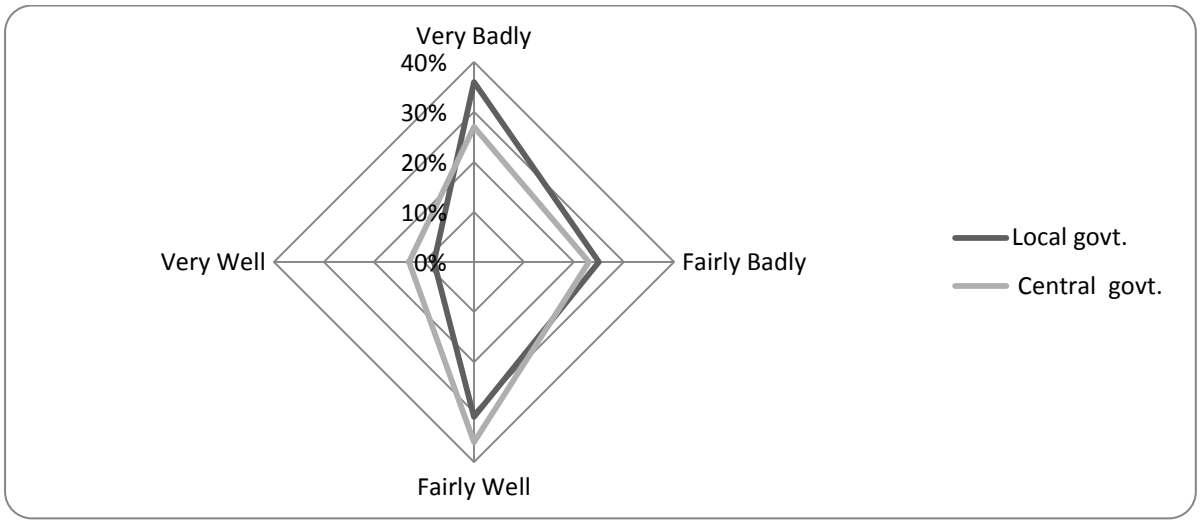
- Governments'/donors' responsibilities;
- Resource mobilisation, management and utilisation; and
- Grassroots influence.

ideas in terms of order of importance, the communities surveyed ranked the provision of roads as most important, followed by employment, health care facilities, electricity and potable water. They pointed out that the inadequate modernization of the agricultural sector, its inadequate infrastructure and corrupt government officials are significant impediments to progress. These factors limit their ability to fully enjoy the benefits of government and donor development programmes, and generate the perception that grassroots communities are 'cut-off' from development.

In all three countries (South Africa, Nigeria and Cameroon) surveyed the grassroots communities expressed a strong need to be empowered so that they could engage in business and thereby improve their living standards. The grassroots pointed to the need to be enabled at the local level through infrastructure provision (electricity, roads, health, and education) as well as in the provision of water and irrigation facilities agricultural production. They also strongly called on governments (through their councillors) to implement promises and resolutions made at community meetings and consultations.

Grass roots communities find government performance in provision of infrastructure services to unsatisfactory. These views are supported by the Afrobarometer data set (2008) for 20 countries, in which respondents rated their governments' (central and local) performance in managing and maintaining roads. Fifty percent of respondents rated their central governments' performance in maintaining roads as 'very bad' and 'fairly bad', and more than 60 percent rated their local governments' provision and maintenance of road similarly. In Namibia, 35 percent of respondents rated their local government's performance as 'non-satisfactory' ('very bad' and 'fairly bad') and in Zimbabwe, 78 percent of respondents responded similarly.

Figure 2: African governments' performance in the provision and maintenance of infrastructure



Source: Afrobarometer, 2008

More than 70 percent of respondents from Kenya, Lesotho, Senegal, Zambia and Zimbabwe rated the performance of their local government as 'not satisfactory.' This high level of dissatisfaction is of huge concern given the priority and weight citizens attach to the provision of rural infrastructure in Africa.

C. Rural infrastructure Initiatives

African continental infrastructure initiatives have failed to prioritise rural infrastructure, which is also often over-shadowed by other mega-projects. Africa's infrastructure challenges are outlined in the Programme for Infrastructure Development in Africa (PIDA). PIDA is designed as a successor to the NEPAD Medium to Long Term Strategic Framework (MLTSF). It aims to establish an adequate, cost effective and sustainable regional infrastructure base to promote Africa's socio-economic development and integration into the global economy (AfDB, 2012). In 2010, at the AU Summit, African Heads of State identified, endorsed and prioritized seven infrastructure projects. These include: the development of the Kinshasa Brazzaville Road-Rail Bridge Project (Republic of Congo); the development of a gas pipeline linking Nigeria to Algeria; the development of broadband ICT and links to fiber-optic networks in neighboring states (Rwanda) and the development of the north-south corridor rail and road project (South Africa)(AU, 2011).

The PIDA does not expressly articulate a policy on rural infrastructure despite the Africa Infrastructure Country Diagnostic's (AICD) study recommends further rural investment. Whilst the PIDA looks at the infrastructure challenges on a macro-level, it does not adequately take into account the daily struggles faced by grassroots communities in their communities and localities that are caused by infrastructure

deficits. It is therefore necessary to integrate rural infrastructure into the wider PIDA program.

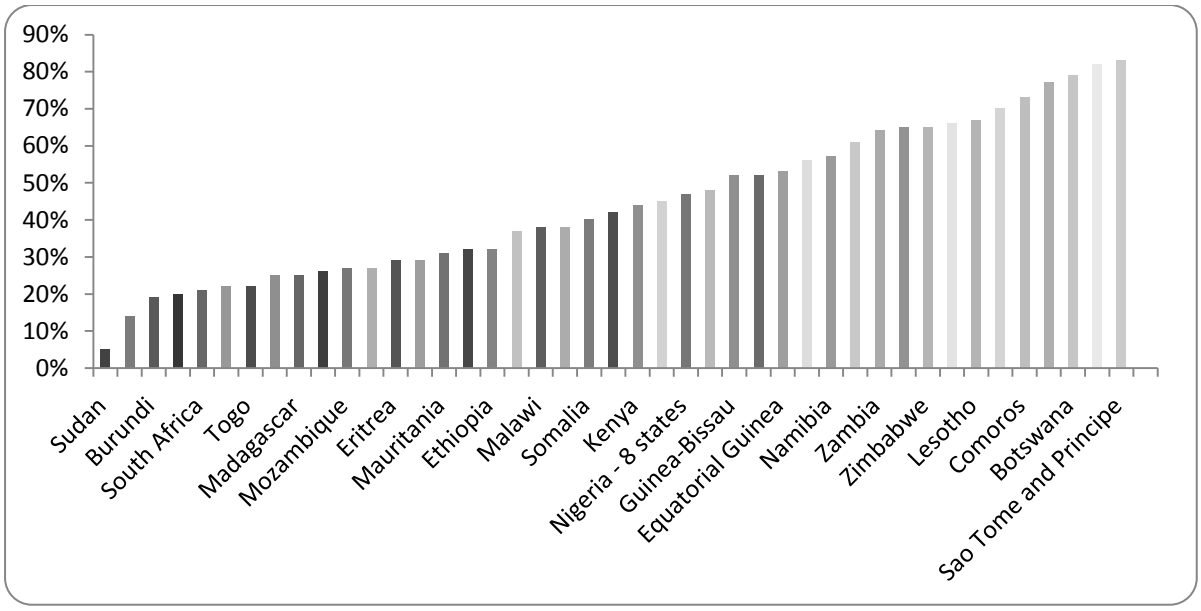
D. **The state of rural infrastructure in Africa**

Rural infrastructure comprises roads, irrigation, energy, Information and Communication Technology (ICT), water and sanitation. The following section provides a brief overview of the state of rural infrastructure in Africa, with a particular focus on accessibility, quality and affordability.

Rural roads

Rural roads link markets and the centres of production for many economic sectors such as agriculture. Africa currently has about a million kilometres of rural roads[4]. Their density (tertiary and unclassified) ranges from 0.1 km per 1,000 people in the Democratic Republic of Congo to 21.6 in Namibia, with a mean of 2.6 km and a median of 1.2 km. Burkina Faso, Namibia and South Africa stand out as having the most extensive rural networks relative to their populations (G William, 2011).Rural networks typically carry very low levels of traffic amounting to no more than 10 percent of the overall figure on the classified network. There are a handful of countries where the rural network plays a more prominent role, capturing more than 20 percent of traffic, namely Ethiopia, Malawi, and Nigeria.

Figure 3: Rural Accessibility Index, 2007



Source: World Bank, 2007

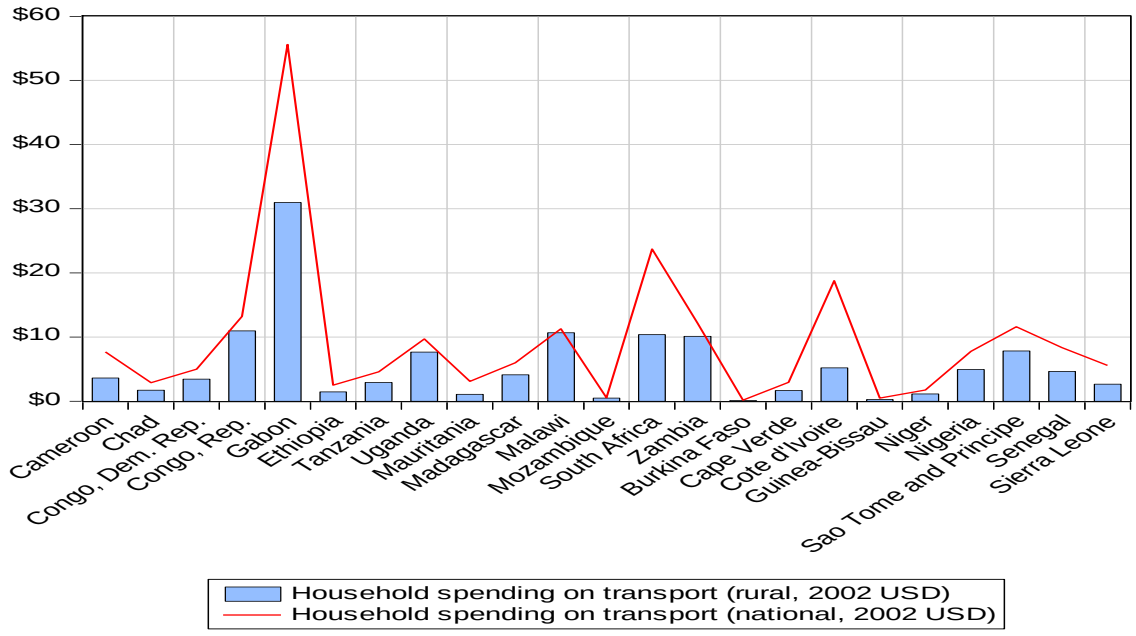
[4]Either tertiary or unclassified

According to the *Rural Accessibility Index,* only 34 percent of the African rural population lives within two kilometres of rural roads, compared to East Asia and the Pacific countries, where 90 percent of their rural populations have access to rural roads. (59 percent of rural populations in Latin America have this type of access as well.) In Africa, the rural infrastructure index ranges from five percent access in the Sudan to over 80 percent access in Botswana. Seventeen countries (using data from43 countries) have access to rural roads, which is less than 32 percent.

As most of the population in SSA are farmers, most isolated rural areas are able to realise only a small percentage of their full potential. Studies show that the exploitation of the potential for agriculture in rural areas for the majority of countries is the highest in zones that are between two to five hours travel time from the nearest large town and that beyond this time zone/frame, the ratio of actual production to potential drops very sharply(Murray ,2008)

The cost of rural transport in Africa is prohibitively high. The cost Road freight in African is three times that of other developing regions[5] . Burkina Faso has the lowest cost of rural road transport in Africa and is only topped by Gabon, which comes in at US$ 30.98. High transport costs reduce profits on agricultural products thereby discouraging production.

Figure 4: Affordability of rural transport (US$ per month)



Source: World Bank, 2012

[5] Cost road freight is 0.04–0.14 (US$ per ton-kilometre) in Africa compared to 0.01–0.04 (US$ per ton-kilometre) in other developing regions

Even where feeder roads exist, the rural environment presents particular institutional challenges for road maintenance. Only half of the existing rural road network is in good or in fair condition, which is much lower than the 80 percent found for the inter-urban network. Explanations for the poor rural road quality range from a lack of local resources to fund road maintenance and severe neglect. (Gwilliams, 2011).According to the AICD (2010) dataset, on average, only 33 percent of tertiary roads in the continent are in good condition, with 23 percent in a fair condition while 40 percent are in poor condition[6]. Rwanda (100 percent), Madagascar (85 percent) and the Congo Republic (65 percent) have rural roads in poor condition. Mauritius, Burkina Faso and Ghana have respectively, three, nine and 13 percent of their roads in a poor condition. One of the explanations given for the poor rural road quality is the lack of local resources to fund road maintenance. Moreover, the road sector has not always been managed or seen as part of the market economy but is regarded as a social service. This means that funding for road maintenance usually comes from general revenues and are thus the first to be cut during difficult periods (Addo-Abedi, 2007).

According to Foster and Briceño-Garmendia (2010) the large variation in road quality throughout the various SSA countries reflects several interacting factors. It firstly relates to affordability where the GDP per capita is most strongly correlated with the percentage of the main road network in good condition, signifying that richer countries tend to spend more on maintenance. They note that no such clear relationship exists for rural roads. The second factor relates to topographic and climatic influences where mountainous and wet countries normally have poorer road conditions, in both main and rural networks, associated with climate influences rather than traffic. They also found that countries with road funds and road agencies have considerably better road conditions than those that have neither. Furthermore, both the road fund design and the level of the fuel levy appear to significantly affect the quality of the main road network, although the effect on rural road quality is much less pronounced.

A number of African countries have embarked on reforms in the last few decades supported by four 'building blocks.' These are: ownership, financing, responsibility and management (Addo-Abedi, 2007). These reforms are designed to address the large backlogs of deferred maintenance, an acute shortage of funds and ineffective institutional arrangements for the management of the sector. Furthermore, the main drive has been aimed at managing roads as a business and bringing them into the market place by charging for road use on a fee-for service basis. The most significant outcomes of the reforms have been the establishment of independent "second generation" road funds and autonomous or semi-autonomous road agencies.

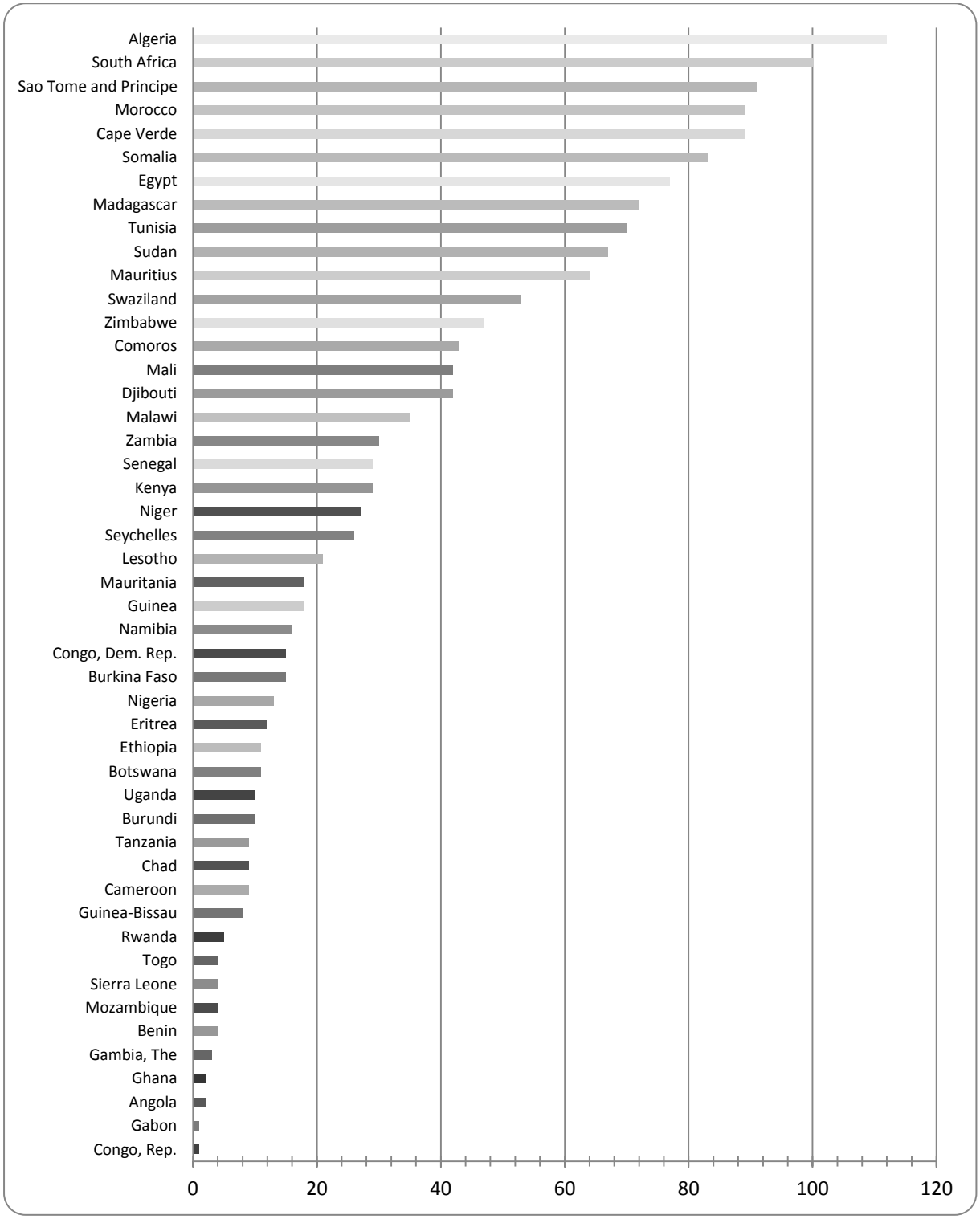
[6] See annex table 1 -AICD and Gwilliam data set

Irrigation

Irrigation is noted as one of CAADP's 'pillars'. Improving agriculture can only be attained with sustainable land management and reliable water control systems. Irrigation has the potential to contribute immensely towards rural communities' ability to generate income and reduce poverty. Its *direct impacts* can include higher incomes through higher yields, cropping intensity and diversification towards higher value crops; higher rural employment and lower food prices. Its *indirect impacts* can comprise: higher production, consumption and labour demands in the surrounding upstream and downstream non-farm economy (Musa and Sonou *et al.* 2010: 4). Despite its potential, it has not played a key role in African agriculture thus far.

In outlining Africa's irrigation potential, the *Africa Infrastructure Country Diagnostic* (AICD) estimates that an estimated 39 million hectares of agricultural land in Africa is physically suitable for irrigation purposes. In addition, the CAADP notes that "in Africa, the percentage of arable land that is irrigated is seven percent (barely 3, 7 percent in SSA), with percentages for South America, the East and South-East Asia and South Asia being 10 percent, 29 percent and 41 percent respectively" (pp, 23). Across SSA, irrigated agricultural output accounts for 25 percent of the value of agricultural output, which illustrates that irrigation increases land productivity, although not nearly as much as it should.

Figure 5: Irrigated area (percent of irrigation potential) - Period 2001-2008

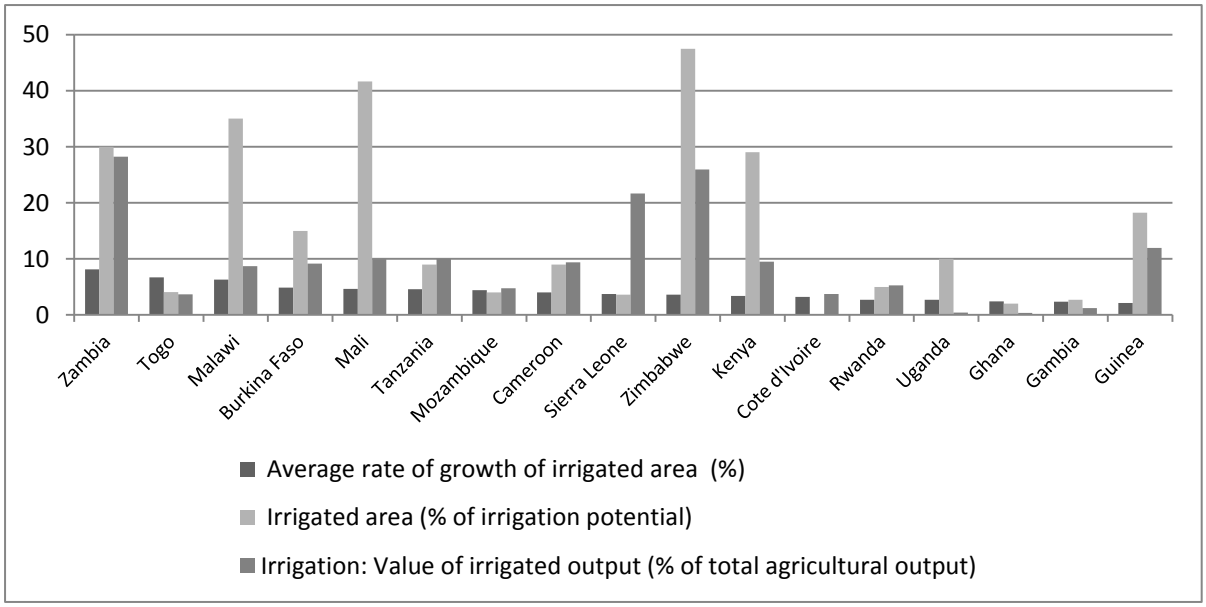


Source: World Bank (2012)

In SSA on average 25 percent[7] of irrigation potential is irrigated. The median irrigation rate is 14, meaning that half of these countries have irrigated less than 14 percent of their agricultural land. However, there are exceptions - South Africa has managed to irrigate 100 percent of its potential followed by Mauritius at about 64 percent. The North African region is relatively higher on irrigated agriculture: Libya has an irrigated area of 1,175 percent of its potential, followed by Algeria, Morocco, Egypt and Tunisia. In comparison irrigation in SSA is considerably lower; valuable irrigation is concentrated in a few countries such as South Africa, Sudan, and Madagascar. More than 60 percent of the total irrigated area is concentrated in these three countries with each having over a million hectares that are irrigated.

In some countries such as Zambia and Zimbabwe, irrigated lands account for over a quarter of their agricultural output. This is due to a significant rate of growth in irrigated areas (of about 8 and 4 percent respectively) (see figure below). Zambia has the highest rate of growth in irrigated areas (8.1 percent), owing to the government's commitment and developmental interventions by NGOs (Daka, 2006). It is the most water and resource-rich country in SAA (FFSSA, 2004), and has benefitted from policies such as the 2005 National Irrigation Plan[8], and The Fifth National Development Plan (FNDP), which has set a target of doubling the acreage under irrigation to 200 000 ha by 2010 (Zambia, 2006). If governments are committed and become pro-active (forging public-private partnerships) it is possible to improve irrigation coverage.

Figure 6: Irrigation infrastructure indicators for selected African countries - 2001-2008



Source: AICD, 2012

[7] Un-weighted

[8]Under this policy during the first 2-3 years of the NIP, duty and VAT on basic irrigation equipment was reduced, as well as customs and excise duty for irrigation equipment.

Apart from large-scale irrigation initiatives such as these, there is great potential for small-scale irrigation projects. Much of SSA comprises large, existing rain-fed areas which could be profitably converted to small-scale irrigation. Moreover, financial commitments for the development of large-scale irrigation schemes have been on the decline in some regions partly because of the varied success of these projects and their environmental weaknesses. According to Grimm and Richter (2008) it has become possible to reach a large number of farms due to the development and refinement of a great variety of small-scale irrigation technologies. Some of these allow the utilization of resources (land and water) that have not been considered for irrigation before.

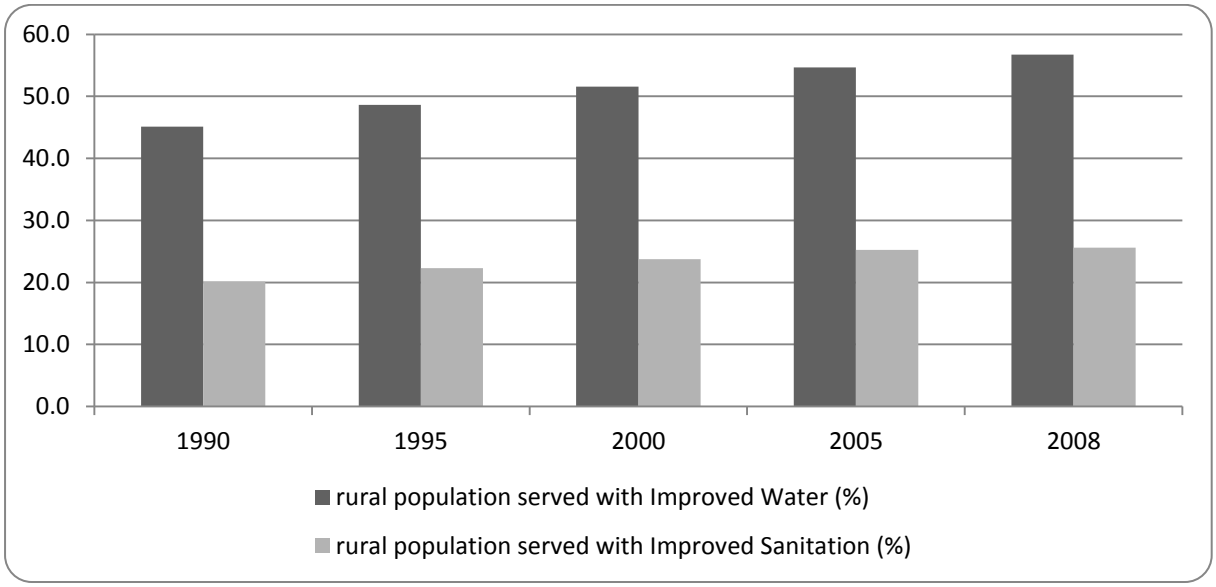
To fully irrigate Africa's rural areas, development will need to be balanced between large- and small-scale irrigation schemes. Costs would only be slightly lower for the latter because on-farm water storage systems would need to be built in addition to water distribution infrastructure. Foster and Briceño-Garmendia (2010) note that an annual increase in irrigation investment by African countries of 3, 6 percent would triple the irrigated harvested area to 22 million hectares by2050. The scaling-up of irrigation would furthermore reduce the continent's reliance on food imports. They note that Africa currently imports more than 23,000 tons of cereals annually and that the food trade deficit is projected to grow dramatically to more than 98,000 tons in 2050, reflecting a substantial rise in food demand from growing and increasingly urban populations combined with a relatively slow expansion of output. Therefore, scaling-up and expanding homegrown food production and irrigation investments could reduce food imports to only 11,000 tons by 2050.

The problems facing irrigation development and management in the recent past have mostly related to: 1. *Environmental factors*: water scarcity and poor water quality especially with regard to sediment concentration; land degradation as a result of poor operation and maintenance(O&M) activities due to inefficient water management practices. These result in water wastage and water logging including land-use regulation. 2. *Capacities of farmers*: where there has been a lack of know-how in, and access to, the opportunities of irrigation technology; the weak economic base of most farmers and the relatively high development costs involved in developing irrigation schemes. 3. *Government policy; institutional and legal support*: in general there has been limited or no priority given to irrigation development in national and local planning and budgeting; there are poor management structures in place to support farmers and promote irrigation development; and the current land tenure system does not encourage farmers to invest in permanent improvements on their plots and make improvements to obtain credits for further development; and unclear water rights and their enforcement (Tafesse, 2003; FAO, 2007 in Musa and Sonou *et al.,* 2010).

Water and sanitation

In Africa, only 55 percent of the rural population has access to improved water and 25 percent has access to sanitation facilities**.** A UNICEF report notes that around six percent of the global burden of disease is water-related, and diarrhoea and related diseases are responsible for the death of two million people a year, with most of these children under five. These diseases are the leading cause of infant mortality and malnutrition as noted by Banerjee and Morella (2011). It has been argued that if the Millenium Development Goals (MDGs) are met, access to safe water will produce an economic benefit of US$3.1 billion (in 2000 terms) in Africa, a gain realised by a combination of time savings and health benefits (Hutton and Haller, 2004 in Banerjee and Morella, 2011). Additionally, extending basic sanitation services could reduce the risk of a broad range of diseases which include respiratory ailments, malaria, and diarrhoea and also reduce the prevalence of malnutrition.

Figure 7: Rural access to water and sanitation (percentage) - 2008



Source: WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation, 2012

In most rural areas on the continent the access to improved water has increased from 45 percent 1990 to 56 percent in 2008. Most people in rural areas of the continent rely on surface water. Boreholes are the main source of improved water, and a further 40 percent of the population rely on them. Access to piped water and stand posts is very low, having barely increased over the last 15 years. Indeed, in many countries, less than one percent of the rural population receives piped water.

Energy

Access to modern forms of energy is important for the rural poor as it enables them to enhance their production and improve their standard of living. There is a significant amount of evidence that suggests that rural electrification has considerable positive impacts on households' income, expenditure and educational outcomes (Khandker, Barnes and Samad, 2009). Africa has both low electricity generation capacity and limited interconnections. The continent's entire electric generation capacity is estimated to be only 68 gigawatts (GW). When normalized per million people, the installed capacity of SSA, excluding South Africa, is only a little more than a third of South Asia's. This capacity has largely remained stagnant during the last three decades, registering growth rates of barely half those found in other developing regions (Eberhard, *et al.,* 2008).

The low level of power generation is furthermore accompanied by correspondingly low rates of electrification. In SSA, the electrification rate amounts to only 30 percent, and nearly 585 million people do not have access to electricity. Only 14 percent of the rural population has access to electricity. This is very low compared to East Asia, which boasts rural electrification levels of 86 percent and Latin America 73 percent(see table below).

Table 1: Rural electrification, 2010

	Population without electricity millions	Electrification rate %	Urban electrification rate %	Rural electrification rate %
Africa	587	41.8	68.8	25.0
North Africa	*2*	*99.0*	*99.6*	*98.4*
SSA	*585*	*30.5*	*59.9*	*14.2*
Developing Asia	675	81.0	94.0	73.2
China & East Asia	*182*	*90.8*	*96.4*	*86.4*
South Asia	*493*	*68.5*	*89.5*	*59.9*
Latin America	31	93.2	98.8	73.6
Developing countries	1,314	74.7	90.6	63.2

Source: World Energy Outlook, 2011

This deficiency in energy generation has significantly affected the overall performance of the region's social and economic indicators. It has largely hampered the modernisation of smallholder agriculture in terms of irrigation as well as value addition to agricultural produce. Davidson *et al.* (2006 in Schelling, 2007) state that the region's relatively poor health and education indicators could be significantly enhanced by the provision of improved modern energy services. They cite amongst others, the low population density in the rural areas, the seclusion of the small villages in the rural areas from the grid, and high costs of production, transmission and distribution of electricity as key factors (Davidson et al, 2006). Others include the low energy demand due to minimal levels of industrialization

including small amounts of money allocated to the energy sector due to the strong reliance on external financing (Davidson et al, 2006 in Schelling, 2007).

Where energy is available its quality has been a major cause for concern. Measured in the number of outages per year, Madagascar experienced 1872 in 2005, Malawi 239 in 2006, Mozambique 156 in 2007, and South Africa had 103 power breaks in 2007[9].These power breaks negatively affect production which relies heavily on the supply of electricity. They have also discouraged farmers' motivation to upgrade farming equipment and techniques to modern ways. Foster and Dominguez (2010), note how the poor performance of the power sector has reduced the per capita growth of Zambia's gross domestic product (GDP) by 0.1 percentage point over a decade. At such a pace, feeding two billion people by 2050 will remain a pipe dream for the continent if not adequately addressed.

Information and Communications Technology

The provision of adequate ICT infrastructure could enable grassroots communities to be connected to socio-economic projects in their localities and economies. Africa is making positive progress in ICT. In 2000, the continent had 11 million mobile cellular subscriptions and three million internet users. By the end of 2008, there were 32 million Internet users, and 246 million mobile cellular subscriptions. The annual growth between 2003 and 2008 in both services in Africa has been twice that of the world (ITU, 2009). It is expected that by 2015 that the mobile network will break the electricity barrier in more than four major regions. Sub-Saharan Africa will have more people with access to mobile networks than to electricity (ITU, 2009).

The table below, which is based on ITU statistics, indicates that although mobile cellular subscriptions were almost non-existent in the 1990s and only very small in the early 2000s, in 2010 the number increased to 44, 7 percent. The percentage of Internet users also showed moderate increase ranging from 0, 5 percent in 2000 to 10,6 percent to 2010. Both the number of cellular subscriptions and Internet users are comparatively lower than other regions. Moreover, SSA is well behind other regions with regards to percentage of the amount of fixed telephone lines per 100 people as the region only showed a miniscule increase between1990 and2010. The fixed line sector remains very limited and is stagnating, which also limits fixed broadband deployment through ADSL, the world's most widely deployed fixed broadband technology. In addition, there are practically no cable networks as several countries have a shortage of international Internet bandwidth. However other countries such as Gabon partnered with Microsoft in 2010 to develop a digital economy and will be connected to the ACE submarine cable linking South Africa to Europe, resulting in access of 1.5 terabits (The Africa Report, March 2012.) Fixed broadband access on the continent is lower compared to other regions and most broadband prices are

[9] Based on African infrastructure knowledge programme data set

beyond the reach for the majority of people. The Gabon investment will reduce communication costs substantially.

Table 2: Access to information and communication technology

	Fixed telephone lines per 100 population			Mobile cellular subscriptions per 100 population			Internet users per 100 population		
	1990	2000	2010	1990	2000	2010	1990	2000	2010
Developing Regions	2.3	7.9	11.9	0	5.4	70	0	2.1	21.1
Northern Africa	2.8	7.2	11.4	0	2.8	95.2	0	0.7	28.1
SSA	1	1.4	1.4	0	1.7	44.7	0	0.5	10.6
LAC	6.3	14.7	18.2	0	12.3	98.2	0	3.9	34
Latin America	6.2	14.9	18.7	0	12.6	101.1	0	4	34.6
Caribbean	7	11.3	10.7	0.1	7.5	58.5	0	2.9	25.4
Eastern Asia (EA)	2.4	13.7	23.9	0	9.9	66	0	3.7	36.1
Southern Asia (SA)	0.7	3.2	4.2	0	0.4	60.5	0	0.5	8.3
Developed Regions	37	49.4	41.6	0.9	40	114.3	0.2	24.9	68.8
LDCs	0.3	0.5	1	0	0.3	33.7	0	0.1	4.6

Source: ITU World Communication, 2011

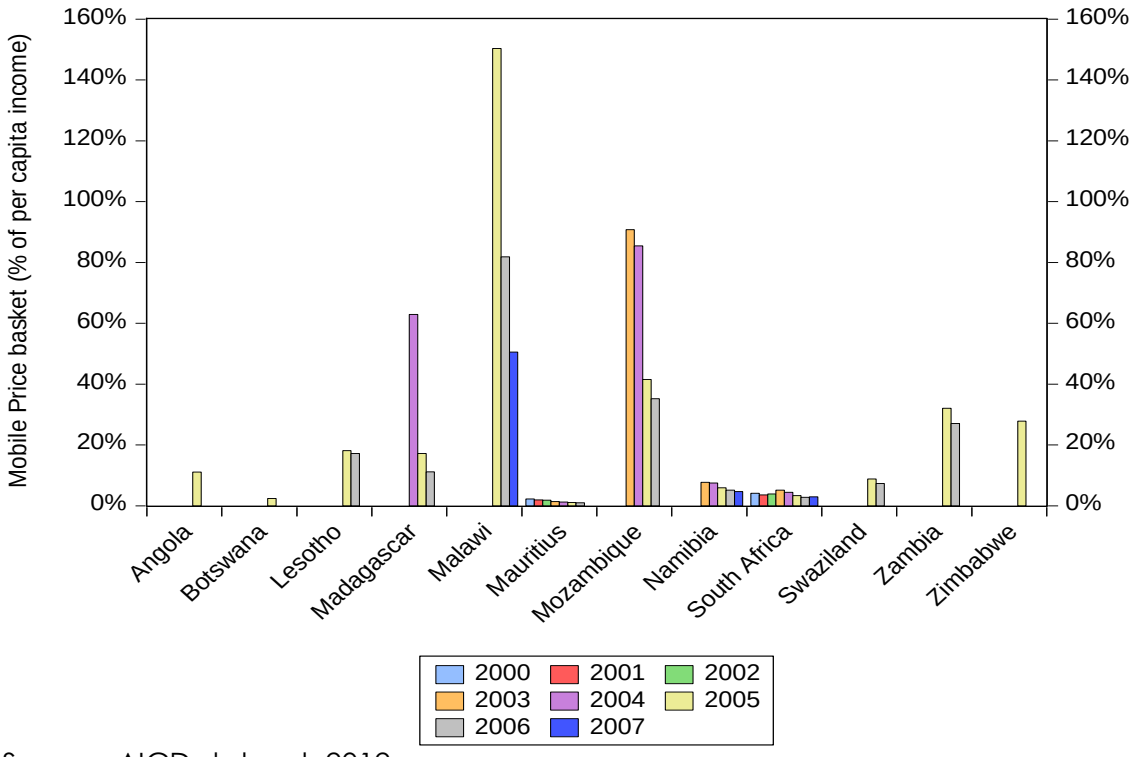
It should be noted that much of these services and gains made in the region are experienced in more urban than rural areas. The ITU has cautioned that many African countries have yet to achieve the widespread access to ICT required to stimulate progress towards meeting the World Summit on the Information Society (WSIS) connectivity and UN Millennium Development Goals by 2015. Official data shows that there are around 400 000 localities in SSA of which 99 percent are villages (ITU, 2007).

Of the key challenges in Africa, regarding ICT infrastructure has been to extend infrastructure services beyond *access* only. An example of this is, although coverage in Africa has increased in rural areas, only 7 percent of rural households had subscription to mobile services. It demonstrates that increasing mobile telecommunication penetration by simply providing increased access is not sufficient. It needs to be complemented with other services as well. Goetz (2009) argues that it is imperative that the mobile technology and service offering in Africa, especially in rural areas, be appropriated to the market sector in order to ensure adoption. Thus, it needs to go beyond extending access. Furthermore to note is, that there is a strong correlation between mobile telecommunication penetration and affordability. Most of rural households do not have the means to afford much of the services they have access to. In fact, domestic use has, until recently, been largely confined to the small proportion of the population that can actually afford their own telephone (Goetz, 2009).

Moreover, it was estimated that less than three percent of villages had fixed line services, whilst under 0.5 percent of them had access to public Internet facilities. Access to mobile services will overshadow the challenges with fixed line services especially given the arrival of 3G technology. It is estimated that in most cases the largest towns in most regions accounted for up to 77 percent of the total national main telephone lines in 2004. The high cost of connecting rural areas with fixed telecommunications, coupled with the lack of electricity and low incomes, has also severely restricted the availability of fixed lines (ITU, 2007). Improved access is only possible when the government is committed to provide such infrastructure as is necessary. For example, Gabon's government created the National Agency of Frequencies and Digital Infrastructure (ANINF) in January 2011 and tasked it with the responsibility of creating and managing telecommunications, broadcasting and information technology infrastructure and national resources.

Data on the quality of Africa's ICT is only available for fixed line services in the number of main line faults per hundred main lines per year and the waiting list for main lines (number of customers). Based on the former, Swaziland has managed to improve the quality significantly by about 82 percent (from189 down to 34) between 1995 and 2007 (shown in annexure table 3). The majority of the SSA countries have seen a steady decrease in mobile prices. Malawi had the highest for the period 1995-2007, with Mauritius displaying a very low and affordable rate.

Figure 8: Affordability of ICT



Source: AICD dataset, 2012

According to the ITU (2007), most of the ICT discrepancy between urban and rural areas is due to policy and regulatory reforms. Challenges include the different and sometimes inadequate policies with respect to rural and remote areas; high costs of interconnectivity; lack of access to electricity and phone-charging facilities; limited affordability, reducing demand for services; high risks for investment projects, in particular in rural and remote areas; high operational and maintenance costs (significantly exceeding possible revenues); lack of self-sustainability of access; network infrastructure projects/poor infrastructure including challenges of the physical terrain; lack of competition in access networks; low literacy levels; and limited technical and management competence in some areas. Furthermore, whilst the liberalization of the telecommunication sector has paved the way for private sector investment in the development of ICT and has led to rapid growth in mobile communication services in urban areas, the same connectivity is not as widely available in rural and remote areas, where an estimated two-thirds of all Africans live.

E. The financing of African rural infrastructure

Infrastructure in Africa is largely financed domestically. Annual infrastructure spending is estimated to be US$45 billion a year when budget and off-budget spending (including state-owned enterprises and extra budgetary funds) and external financiers are taken into account. As much as two thirds of this overall spending is domestically sourced: US $29.8 billion of annual spending is financed by the African taxpayer and infrastructure user, and a further US$ 15 billion is from private and external sources. Brixiova *et al.* (2011) also makes the point that in many low income countries, infrastructure development has been confined to public finance sources only, which has left infrastructure needs largely unaddressed. To diversify sources of financing for infrastructure development would provide space for public finances to prioritise rural infrastructure development

Table 3: Financing of African infrastructure- US$ billions

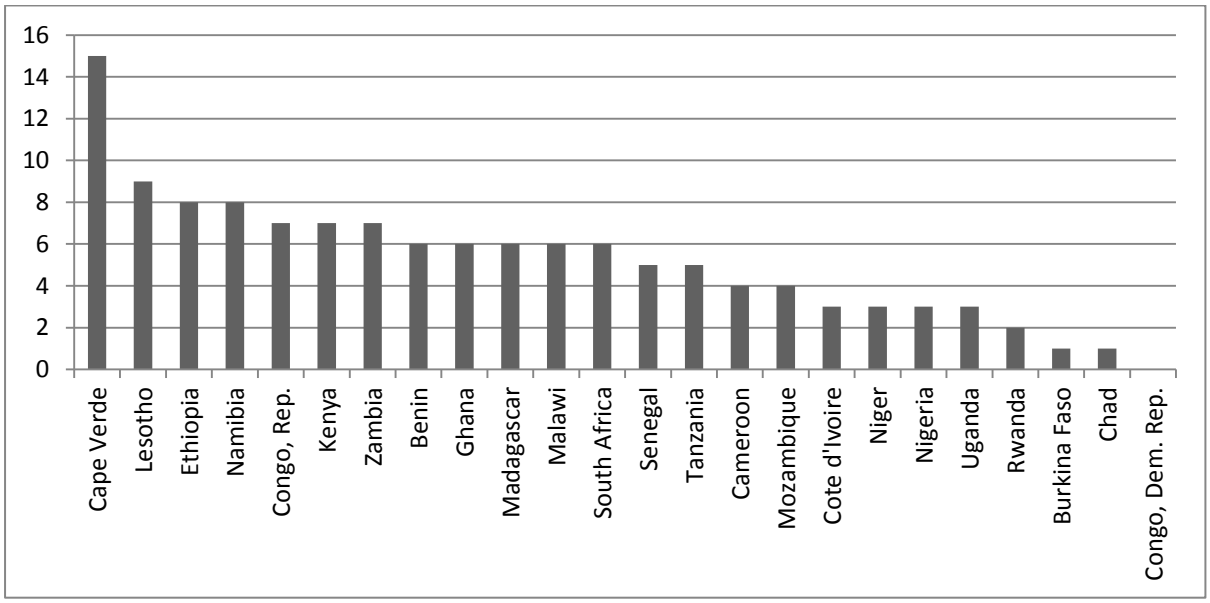
	operation and maintenance	Capital expenditure					
	Public sector	Public sector	ODA	Non-OECD	Private sector	Total	Total spending
ICT	2	1.3	0	0	5.7	7	9
Power	7	2.4	0.7	1.1	0.5	4.6	11.6
Transport	7.8	4.5	1.8	1.1	1.1	8.4	16.2
WSS	3.1	1.1	1.2	0.2	2.1	4.6	7.6
Irrigation	0.6	0.3	—	—	—	0.3	0.9
Total	20.4	9.4	3.6	2.5	9.4	24.9	45.3

Source: Briceño-Garmendia, Smits and Foster, 2008

As of 2008, public spending on this sector by African governments was estimated to be US$ 29.8 billion annually. Of this amount, US$ 20.4 billion went to operation and maintenance with the remainder (US$ 9.4 billion) being spent on capital expenditures (Briceño-Garmendia, Smits and Foster, 2008). As shown in the in the above table, almost above 45 percent of infrastructure spending was allocated to operations and maintenance, whilst 55 percent went to capital expenditure. The private sector has been an important source of investment in Africa and accounts for more than a third of capital expenditure in African infrastructure. However, it must be noted that this expenditure is focused mainly in the ICT and transport sectors.

African governments through the NEPAD and AU Assembly have made various commitments which focuses on infrastructure development in Africa. Amongst these include, the NEPAD's Short Term Action Plan (STAP) which was established in 2002 to address specific infrastructure development problems including facilitation, capacity building, physical and capital projects, and studies required to prepare future projects. At the 18th Assembly meeting, the AU has endorsed the AU has endorsed the Programme of Infrastructure Development in Africa (PIDA) and it has resolved to; Increase public financing on infrastructure and promote public-private partnerships to speed up infrastructure development; Promote innovative financing mechanisms reflecting a real commitment by Africa to speed up infrastructure development on the continent.

Figure9: Infrastructure: Total spending - public sector (percent of GDP) - Latest Year Available, period 2001-2008



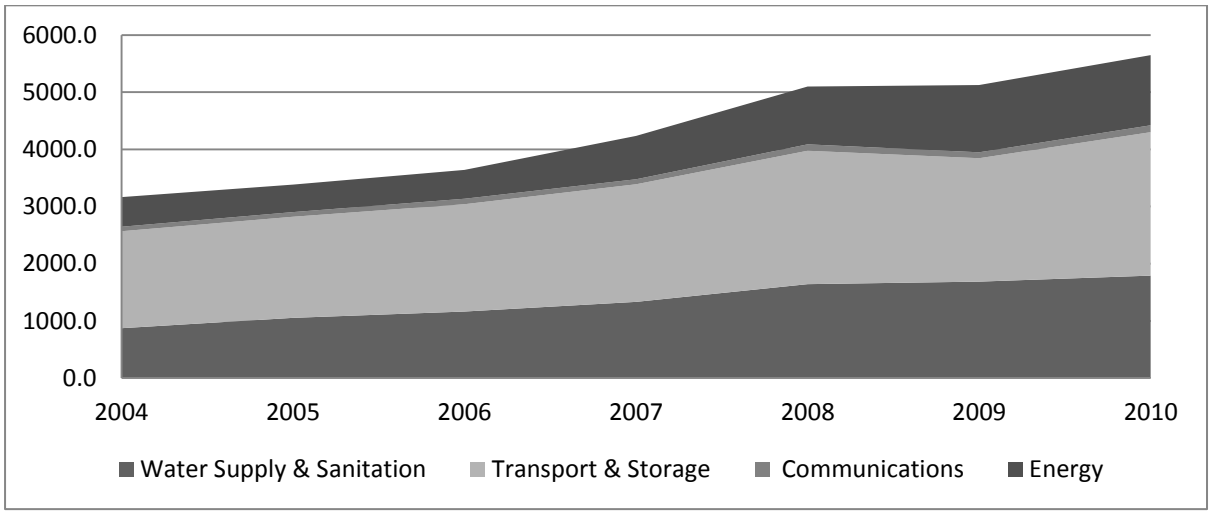
Source: World Bank/AICD, 2012

Sub-Saharan Africa, on average has been spending 5 percent on infrastructure development. Low income African (fragile) countries were spending 3 percent of GDP on infrastructure while middle income countries were spending 6 percent of GDP infrastructure. Cape Verde (15 percent), Lesotho (9 percent) and Ethiopia (8 percent) and Namibia (8 percent) have spent on their infrastructure development.

Apart from the above initiatives, of the key commitments from African governments to rural infrastructure has been through the support of CAADP. Governments have committed to spend 10 percent of public spending on agricultural development. According to the RESAKSS study (2012) only 6 African countries have thus far met the Maputo commitment to allocate 10 percent of their public spending on the agriculture sector.

Development partners' support to Africa's infrastructure development reached US$ 5.6 billion in 2010, a steady increase since 2005.In 2010, 44 percent of the aid went to transport infrastructure and 31 percent was allocated to water and sanitation. The energy sector received 21 percent of the ODA while the communication sector received only two percent of the ODA.

Figure10: ODA disbursement from DAC countries to SSA Economic infrastructure (US$ millions- 2010 constant prices)



Source: OECD-DAC, 2012

The Infrastructure consortium for Africa(ICA) (2010) reports that total commitments for infrastructure in Africa in 2010, from all sources, amounted to US$ 55.9 billion, up by 44 percent from US$ 38.9 billion in 2008. ICA members contributed to over half the amount - US$ 29.1 billion. The private sector contributed US$ 13.8 billion and China committed US$9 billion. Other contributors include Arab funds and India which contributed US$ 4 billion. North African countries received 30 percent of the ICA funding commitment and South Africa received 25 percent. The report further notes

that the average disbursement rate of bilateral members amounted to 27 percent and 42 percent from multilateral donors.

China has been an important financer for African infrastructure development. The China's Foreign Aid white paper (2011)states that one of the basic features of the country's foreign aid policy is to help build up self-development capacity in other countries. This has benefitted Africa, with China's aid focussing on creating and strengthening domestic capacity and infrastructure development. According to the white paper, 61 percent of China's concessional loans go to infrastructure development. Schiere and Rugamba (2011) point out that China's commitments to African infrastructure were US$ 9billion in 2010. The investment in African infrastructure has also remained stable at around US$ 5 billion per year from 2005 to 2009. For 2010, the ICA estimates that there has been a significant step-up of 80 percent (amounting to US$ 9 billion) of Chinese investments in African infrastructure. Furthermore, China's own experience of developing rural infrastructure needs to be looked at in the context of South-South triangular co-operation.

The financing requirement

The Africa infrastructure country diagnostic (AICD) estimates that US$ 93 billion per year is required to develop African infrastructure. Major investments in building, maintenance and the operation of infrastructure assets are required to reverse the current infrastructure backlog. Africa's current spending is US$45 billion; there is thus a financing gap of US$ 48 billion. The financing requirement for low income countries is generally high, especially for fragile low income countries which need to spend 42 percent of their GDPs to address their infrastructure development backlog. The investment requirement for middle income and oil exporting countries is relatively lower.

Table 4:Sub-Saharan Africa's infrastructure needs, 2006–15, by sector

	US$ billion a year	GDP share (%)	Water supply and sanitation	Energy	ICT	Transport
	Year		Shares			
Middle income	17.92	6.62	4.89	80.93	0.95	13.23
Oil exporting	18.73	8.97	16.84	41.97	3.14	38.05
LIC-nonfragile	24.15	21.4	16.87	48.42	3.54	31.17
LIC-fragile	16.38	42.92	10.96	56.99	2.34	29.71
Africa	74.9	11.69	13.39	56.9	2.57	27.14

Source: Briceño-Garmendia, Smits and Foster, 2008

The biggest share of investment needed is in the energy sector. Middle income countries such as Nigeria and South Africa need 80 percent of infrastructure investments in their energy sectors while the average SSA country requires 56 percent. The transport sector accounts for 27 percent of the total investment requirement. According to the report produced for CAADP, US$ 36 billion is needed for irrigation, US$ 62 billion for building rural roads, US$ 37 billion for operation and maintenance, and US$ 2.8 billion for trade-related capacities over the period 2003-2015. This excludes rural electrification and ICT investment requirements.

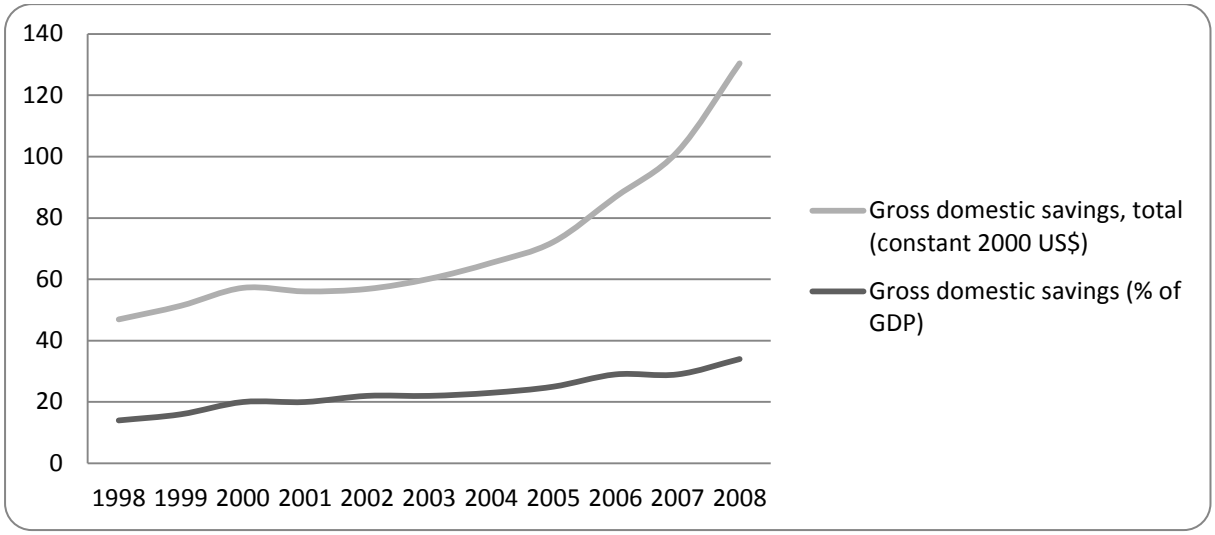
F. Africa's options to finance rural infrastructure investment

The primary source of infrastructure financing in these countries remains domestic**.** It should be noted that Africa's robust economic performance in the last 10 years, fuelled in part by the commodity boom, has positively affected the potential for domestic resource mobilization in private domestic savings and public revenue generation. It has broadened the tax base in most African countries. Unfortunately, many African countries have been unable to harness this potential due to their under-developed financial sectors and under-capacitated tax administration systems. The current state of the financial sector on the continent reveals that less than 10 percent of economically plausible citizens are able to bank. It is imperative to develop Africa's capacity to mobilize its domestic resources for its development so that it can reduce its dependency on external flows and create greater policy space, including providing positive signs to donors and potential investors.

Domestic investment

Rural infrastructure investment needs to bank on the growth of gross domestic savings. Sub-Saharan African countries' gross domestic savings have shown a dramatic increase in magnitude as well as as a percentage of GDP. By 2008, gross domestic savings has reached US$ 130 billion, a 132 percent increase from 2001 levels. The gross domestic savings rate increased from 20 percent in 2001 to 34 percent in 2008. This phenomenon bodes well for the continent and will fundamentally affect the course of its economic development. Despite increases in the levels of domestic savings in Africa which according to studies currently stands at 34 percent, these remain lower than developing Asia's47 percent.

Figure 11: Gross domestic saving in SSA (developing)



Source: African Development Indicators, 2010, World Bank

Africa's domestic financial intermediaries must be adequately equipped to channel savings such as these into infrastructure investment. An underdeveloped financial sector will present a challenge in mobilising more domestic savings and in channelling these resources to infrastructure investment programmes. Africa needs a functioning financial system that can mobilise resources effectively and allocate them to the most productive investment opportunities; the demand for financial intermediation from households and firms is high despite low income levels. However, the African financial system has failed to meet the demand for financial intermediation mainly because it is fragmented and segmented. Most of the financial sector in Africa is dominated by banks and even where non-banking financial institutions exist, their influence generally remains largely marginal compared (Aryeetey, 2004).

Local currency bonds have emerged in Kenya and South Africa as an option to leverage domestic resources for infrastructure development. The Kenyan government has issued infrastructure bonds (long term) to finance infrastructure projects. The bonds can be used as collateral for bank loans and corporate bond tax incentives. Between 2009 and 2011, the country raised US$ 1 billion in this manner. In South Africa, the Standard Bank Group has issued commodity-linked bonds which are denominated in the local currency. These initiatives can be used as options for other African countries to explore (Brixiova, *et al.* 2012).

Pension funds

Pension funds are potential sources of finance for infrastructure investment. They can provide sizable domestic long-term finance and can be used to acquire funds either directly, by means of investments in specific projects, or indirectly, via investment in special infrastructure funds to finance infrastructure projects. There is a need to design infrastructure financial instruments that are attractive to pension funds (i.e. which are more liquid, less risky and volatile) (Vives, 2000).

The experience of the Pan-African Infrastructure Development Fund (PAIDF) would be vital in doing so and could also show SSA countries how to broaden participation of private and civil-service pension funds in African infrastructure development. The PAIDF is attempting to attract African pension funds by offering them a 25-year infrastructure equity fund. It has targeted a commitment of at least US$ 1 billion from African pension funds for the end of the fiscal year (2006/2007). It also aims to raise US$ 3 billion (Manuel, 2006) by attracting international pension funds. The potential of the pension fund industry is extensive. Loxton and Bonorchis (2005) have quoted past SA President Mbeki as saying that nine civil-service pension funds on the continent collectively held more than US$ 120 billion. It is thus clear that the potential of pension funds to provide long-term capital for infrastructure investments is immense.

Leveraging public revenue

Whilst private financing is emerging as an important source of infrastructure finance, especially in the ICT and transport sectors, public revenue has traditionally been the main source of finance for infrastructure projects with high social but low financial returns (Brixiov, 2011). It is thus less likely for the private sector to invest in rural infrastructure. Therefore, the onus falls largely on the public sector to prioritise this largely public need. It must be both direct financer and act as a catalyst for private finance.

A study by the AFDB/OECD reports that Africa's average tax revenue as a share of GDP has increased since the early 1990s from 22 percent of GDP in 1990 to 27 percent in 2007. This growth in tax revenues has been driven by increasing resource revenues in resource rich countries. However, other countries find it difficult to increase their tax revenues despite introducing reforms (North-South Institute, IMF, 2010). According to the AFDB/OECD study on the tax effort index in 47 African countries, 18 countries have the potential to raise additional tax revenues if appropriate reforms are introduced.

The challenges faced by African countries in raising tax revenues are mainly due to the pervasiveness of the 'hard to tax' sectors (such as the informal economy), limited capacity of revenue administrations, widespread tax evasion and fraud, misuse of transfer pricing techniques, difficulty in taxing extractive industries, overuse of tax preferences, and trade liberalization (OECD/AFDB, IMF, and North-South Institute). The tax reforms needed include the removal of tax preferences, proper handling of transfer pricing abuses by multinational enterprises and taxing the extractive industries fairly and transparently. Strategies that target the 'hard to tax' sectors enhance fiscal legitimacy and to seek international cooperation must also be developed. The G20, EU and G8 have committed to support African countries in domestic resource mobilization. This can be used to leverage and build the capacity of revenue authorities.

Despite the fact that the bulk of infrastructure spending is financed via public funds, the transparency of national budgets especially with regards to the allocation of

infrastructural expenditure between rural and urban areas is not clear at best. There is a clear case for independent budget analysis and advocacy initiatives that can improve budget transparency and the poverty focus of government expenditure priorities. While the structure of the budget process makes substantial changes in expenditure priorities difficult to achieve, budget groups directly contribute to positive impacts on budget allocations and improved implementation, thereby increasing the accountability of decision-makers (Robinson, 2006).

Stopping the illicit financial outflows

Plugging illicit financial outflows could also make capital available for infrastructure. A recent estimate by the Global Financial Integrity (2011) report on illicit outflows states that in 2009 around US$ 56 billion has left the continent. This is lower than 2007 and 2008, when outflows peaked. In 2009, they declined by 7.5 percent from 2008 levels. The estimate cites Nigeria and South Africa and a number of small oil producing countries as having been most adversely affected by the illicit outflows. Halting these and creating an attractive investment environment could help to make capital available for rural infrastructure investment.

Leveraging the Diaspora remittances

There has been an increased recognition of the value of remittances as a source of development finance in Africa. The Diaspora savings for SSA are estimated by Ratha and Mohapatra (2011) to be 30.4 billion, and nearly US$ 53 billion for the entire African continent including North Africa. This is a sizable amount which can be leveraged by adopting foreign current accounts at African banks, and issuing Diaspora bonds. Ethiopia has issued Millennium Corporate Bonds, targeted at Ethiopians residing at home and abroad, to finance infrastructure projects. This Diaspora bond is expected to raise finance capital for the state owned Ethiopian Elective Power Corporation. Ratha *et al.* (2009) have estimated that SSA can raise up to US$ 5-10 billion per year via this mechanism.

Innovative Financing for Development (IFD)

Policy makers must explore the possibility of leveraging Innovative sources of finance for rural infrastructure development**.** This is already occurring to counter the limitations of existing forms of public finance in addressing financing gaps, climate change and other natural disasters. The interest in innovative finance for development can be traced to the Monterrey consensus for development finance which notes that it is important to"… recognize the value of exploring innovative sources of finance …. to study where possible other source of finance for development." Recently, the G8 summit stressed "the need to go beyond aid and mobilize other resources as stated in the Monterrey consensus, including domestic resources, innovative financing, migrant remittances, market instruments used by development banks and private sector flows."

The leading group on innovative financing for development [10] has attempted to identify alternative sources of finance to complement official development assistance. This has been fuelled by the shortcomings of official development assistance which include its unpredictability and volatility. The most popular innovative financing position thus far has been the Financial Transactions Tax (FTT) and Currency Transactions Tax (CTL) and is gaining some political support. These instruments should be leveraged for rural infrastructure development.

The High Level Panel on Infrastructure appointed by the G20 in Seoul (2010) has identified three key issues in exploring innovative financing for infrastructure investment. These are (1) ensuring a strong and sustainable supply of bankable projects, (2) creating an enabling environment for infrastructure investment and (3) making funding available under appropriate terms. The report notes that it is important to explore innovative financing approaches to further leverage public resources as well as development finance institutions' capital to support infrastructure investments. An increased level of private sector funding will enable and ensure that a higher portion of resources is available to the much needed traditional public investments in infrastructure.

G. Challenges

The rural infrastructure challenge differs across countries in terms of access and quality. Briceño- *et al.* (2008) attribute this to Africa's widely varying quality of existing infrastructure and circumstances, which affect people's access to institutional and technical resources. For instance in North Africa, countries have highly developed irrigation systems, and certain African countries have above average access to rural roads. There are also differing challenges in middle-income countries (Cape Verde and South Africa), resource rich countries with economies that are heavily reliant on petroleum or mineral revenues (Nigeria and Zambia), fragile states emerging from conflict (Côte d'Ivoire and the Democratic Republic of Congo), and low-income countries that are neither fragile nor resource rich (Senegal and Uganda) .

There is a huge rural infrastructure backlog resulting from decades of under investment, lack of maintenance, and destruction and dilapidation due to conflict. Access to infrastructure is very limited as only 30 percent of the rural population has access to rural roads, whilst only 25 percent of the irrigation potential of the continent is being utilised. Only seven percent of rural households are estimated to subscribe to mobile services. The quality of infrastructure is generally poor and infrastructure service costs are relatively high. This lack of access to infrastructure services constrains the region's agricultural growth and limits its market access.

Prioritisation of urban and large scale infrastructure projects at the expense of rural and small scale infrastructure means that the latter is very often in a very poor state. This is true of current programmes that are purported to be inclusive. Rural infrastructure is usually seen as part of the agricultural sector development plan as reflected in the CAADP and will thus only be allocated a share of the agricultural budget, rather than being catered for from the proceeds of a separate infrastructure development budget.

To reverse this infrastructure backlog will require major investments in building, maintenance, resources and operation. The AICD estimates that US$ 93 billion per year is required to develop African infrastructure. As current spending is US$45 billion, there is a financing gap of US$ 48 billion. The CAADP estimates that US$36 billion is needed for irrigation, US$ 62 billion for building rural roads, US$ 37 billion for operation and maintenance thereof, and US$ 2.8 billion is for trade-related capacities in rural areas over the period 2003-2015. The cost of rural infrastructure investment is inflated due to the low population density in rural areas. It is estimated that over 20 percent of the population lives in dispersed settlements where typical population densities are less than 15 people per square kilometre; hence, the costs of providing infrastructure for them are comparatively high. This has investment and operational implications for African countries to build, maintain and operate rural infrastructure.

It is an enormous challenge for African countries to meet the financing gap so as to build and improve rural infrastructure. Most of them, especially fragile states and low income countries, lack financial resources and the requisite technical and institutional capacity. The resources needed to develop rural infrastructure are often beyond what available to these countries, and the problem is further compounded by the fact that rural infrastructure is less likely to attract private investment. This is significant because more than a quarter of investment on infrastructure comes from this sector. Rural infrastructure will have to depend on public investments and official development assistance.

Lack of appropriate technical and institutional capacity to develop and maintain rural infrastructure is also a challenge. Suitable institutional arrangements and infrastructure delivery systems are needed to reduce the cost of rural infrastructure investment and to ensure smooth operation and maintenance. In most countries, rural infrastructure services are provided by the public sector which at times is unresponsive, inefficient, and lacking in financial autonomy, accountability and transparency. Strengthening public institutions that provide public goods and services can also significantly reduce costs while improving the quality of services provided (Fan, 2004). In making rural infrastructure more inclusive and productive, it is critical to see the benefits that can be derived from the decentralisation of infrastructure services. The added benefits of decentralization are the participation of users themselves. Community participation in rural infrastructure construction and maintenance is crucial for financial incentives to work efficiently and to institute a legal framework for such activities.

H. Conclusion

There is sufficient evidence and experience to demonstrate that rural infrastructure is fundamental to unlocking the African Moment. In a continent where the majority of people depend on smallholder farming for their livelihoods, investment in rural infrastructure to support productivity and reduce input costs, and improving market access can have a multiplier effect in reducing poverty. The Chinese and Asian experiences demonstrate that a green revolution is possible. These countries have reduced poverty over three decades by investing in agriculture, including rural infrastructure.

African grassroots communities have been calling for the prioritisation of rural infrastructure development for a long time. In our interaction with them through the Poverty hearings, Citizen Consultations and the Pilot study of the Grassroots Focus Index these appeals have been consistent. Rural infrastructure is their top priority.

Despite this overwhelming evidence in support of rural infrastructure as a key lever for African development, investment in this sector rarely becomes part of the African development agenda. Whilst it is recognised as one of the pillars of the CAADP, African countries and their international partners' failure to allocate resources to this programme reflects their lack of genuine commitment.

Africa lacks sufficient and adequate rural infrastructure to support smallholder famers. A mere 34 percent of the continent's rural population have adequate access to rural roads, while only 14 percent have access to electricity, and seven percent to telecommunication. Where available, the service quality is usually poor due to the lack of proper operation and maintenance. In addition, road networks are usually in a poor state due to years of neglect and under-maintenance. Furthermore, the infrastructure services are often unaffordable for grassroots communities. African countries need to prioritise rural infrastructure by allocating adequate resources to existent programmes such as the CAADP and PIDA. It is imperative that African governments provide leadership and commitment and not mere resources to catalyse the agricultural revolution that will reduce poverty and increase food security on the continent.

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Annexure tables:

Annex table 1 Quality of rural roads (Tertiary roads)

Country	Fair	Poor	Good
Angola	20	20	60
Benin	23	43	34
Botswana	31	34	35
Burkina Faso	63	28	9
Burundi	40	20	40
Cameroon	32	26	41
Central African Republic	40	20	40
Chad	39	20	40
Congo,Dem.Rep.	30	21	49
Congo,Rep.	24	12	65
Côted'Ivoire	29	30	41
Eritrea	40	20	40
Ethiopia	32	25	43
Gabon	40	20	40
Gambia,The	20	25	55
Ghana	51	36	13
Guinea	40	20	40
Kenya	49	11	40
Lesotho	31	24	45
Liberia	40	20	40
Madagascar	10	5	85
Malawi	44	42	14
Mali	39	22	39
Mauritania	40	19	41
Mauritius	77	20	3
Mozambique	21	35	44
Namibia	33	25	43
Niger	31	24	45
Nigeria	31	33	36
Rwanda	0	0	100
Senegal	21	18	61
Sierra Leone	34	18	48
SouthAfrica	31	24	45
Sudan	20	22	58
Swaziland	40	20	40
Tanzania	31	24	45
Togo	40	20	40
Uganda	40	20	40
Zambia	16	30	54
Zimbabwe	25	29	47
Average	33	23	43
Median	32	21	41

Source: Calculations by Alberto Nogales based on AICD RONET Summary Outputs, June 2010

Annex table 2: Quality of the water and sanitation infrastructure (WSS: Continuity of water service (hours/day)

	2005
Congo, Dem. Rep.	11.00
Ethiopia	24.00
Kenya	6.64
Tanzania	23.41
Uganda	23.00
Madagascar	8.00
Malawi	19.83
Mozambique	13.87
Zambia	17.90
Benin	24.00
Burkina Faso	23.00
Cote d'Ivoire	24.00
Ghana	11.33

Source: African infrastructure knowledge programme, 2012

Annex Table 3: quality of the ITC infrastructure (ICT: Number of main line faults (per 100 main lines per year))

	2001	2002	2003	2004	2005	2006	2007
Chad	60.75	..	..	..	..	..	..
Gabon	57.00	54.00	50.00	..	..	..	..
Comoros	51.11	55.82	..	..	..	..	..
Eritrea	62.54	53.34	..	..	..	..	..
Kenya	..	149.00	149.10	130.40	145.40	..	..
Sudan	..	..	..	17.00	95.50	..	..
Tanzania	20.40	24.00	..	..	..	..	..
Mauritania	..	..	128.00	..	..	..	..
Angola	..	..	..	..	..	..	..
Lesotho	69.17	72.84	..	..	..	..	..
Madagascar	77.50	42.50	..	..	..	..	..
Mauritius	56.84	41.47	..	..	..	..	..
Mozambique	80.00	70.00	65.00	66.00	52.00	..	..
Namibia	51.50	42.20	40.40	32.60	35.10	34.80	..
South Africa	52.80	48.20	47.60	43.30	47.00	48.50	..
Swaziland	85.00	100.00	..	..	..	..	34.00
Zambia	90.82	90.80	..	..	..	..	..
Benin	6.00	..	..	..	..	..	..
Burkina Faso	51.08	19.66	..	..	..	..	..
Cape Verde	46.00	44.40	44.40	39.60	..	..	..

Cote d'Ivoire	99.00	81.00	..	..	..	..	..
Ghana	67.42	48.00	..	..	..	..	..
Guinea	..	1.57	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..
Mali	..	..	..	..	..	..	..
Niger	104.55	..	..	..	..	..	..
Senegal	17.28	..	..	..	..	..	..
Togo	4.62	6.19	..	..	..	..	..

Source: African infrastructure knowledge programme, 2012