



# CHALLENGES OF ENERGY POVERTY IN SUB SAHARAN AFRICA

## PREAMBLE

Africa's long term economic growth and competitiveness fundamentally depend on reliable access to energy. However, despite reforms and other measures to scale up electricity access, sub-Saharan Africa (SSA) in particular has not succeeded in expanding access to electricity. In the past decade, SSA has lagged behind globally not only in terms of Gross Domestic Product (GDP), but also in terms of electricity consumption. Africa's total primary energy production is about 7.6 percent of the world's total output yet the inhabitants of the continent consume the least amount of energy per capita, accounting for 3.1 percent of world commercial primary energy consumption (EIA). The population of Sub-Saharan African countries have the least access to electricity compared to developing countries from other regions. The OECD, as well as transition economies, enjoys an electrification rate of over 99 percent, while the average rates in the Middle East, North Africa, East Asia/China and Latin America are all above 90 percent. South Asia and sub-Saharan Africa rank lowest, with rates of 60.2 percent and 28.5 percent respectively. Even though Africa is well endowed with energy resources such as fossil fuels and renewable resources, they are not adequately distributed and their full potential remains largely unexploited, which is one contributing factor in making the continent the lowest consumer of energy worldwide. Generally,

energy demand and energy investment are chronically mismatched in the SSA region. Consequently Africa's energy sector is characterized by deficiencies such as low access and insufficient capacity, poor reliability as well as extremely high costs (World Bank, 2009). These and other shortcomings in the power sector threaten Africa's long term economic growth and competitiveness.

Energy poverty is a quite complex problem. Since the electricity sector is the most capital intensive of all major industrial sectors (IEA, 2003), it could easily be concluded that energy poverty is merely a question of insufficient investment and/or limited ability to afford electricity. However, energy poverty is probably due to a multitude of factors, considering the difference in performance among developing countries. As of 2008, 1.46 billion people roughly 25 percent of the world population - have no access to electricity (EIA), more than 80% of which are located in South Asia and sub-Saharan Africa, among the poorest regions in the world. Therefore it is not surprising that there is a strong correlation between the lack of electricity and the number of people living below

**Table 1 Electricity Access in 2008 – Regional Aggregates**

	Electrification Rate (%)	Population without Electricity (million)	Rural Electrification Rate (%)	Urban Electrification Rate (%)
<b>World</b>	<b>78.2</b>	<b>1456</b>	<b>63.2</b>	<b>93.4</b>
<b>Developing Countries</b>	<b>72</b>	<b>1453</b>	<b>58.4</b>	<b>90</b>
Africa	40	589	22.7	66.8
Sub-Saharan Africa	28.5	587	11.9	57.5
Developing Asia	77.2	809	67.2	93.5
Latin America	92.7	34	70.2	98.7
Middle East	89.1	21	70.6	98.5
<b>Transition economies &amp; OECD*</b>	<b>99.8</b>	<b>3</b>	<b>99.5</b>	<b>100</b>

Source: IEA, 2009b.

\* OECD figures aggregate some important regional variations. The electrification rate for Turkey and Mexico is about 95%. All other Member countries have 100% electrification.

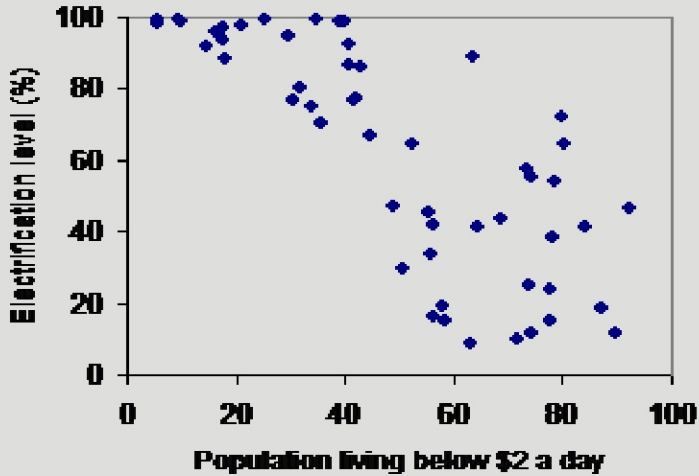
**Table 2 Electricity Access and per capita Consumption Rates of Selected SSA Countries**

Country	Access to Electricity (percentage), 2008	Per capita electric power consumption (kWh per capita), 2005
Benin	24.8	69
Botswana	45.4	1406
Cote d'Ivoire	47.3	170
Gabon	36.7	999
Ghana	54.0	266
Kenya	15.0	138
Mozambique	11.7	450
Nigeria	46.8	127
Senegal	42.0	151
South Africa	75.0	4847
Tanzania	11.5	61
Zimbabwe	41.5	953

Source: IEA, 2009b and World Bank 2008a.

\$2 per day (IEA, 2002) (See Figure 1). Income, however, is not the only determinant of electricity access. As of 2000, China, for instance, with 56 percent of its people still poor, had managed to supply electricity to more than 98 percent of its population (IEA, 2002). China's success in developing its power infrastructure is characterized by structural reforms opening up new sources for capital and, maybe even more importantly, high domestic savings (IEA, 2002). What, however, are the factors characterising sub-Saharan Africa's particularly poor performance in terms of electricity provision to its population?

**Figure 1 Access to Electricity and Poverty**



**Source: IEA, 2009b and World Bank 2008a.**

The objective of this paper is to empirically analyze the problem of energy poverty in developing countries in general and in SSA countries in particular. In doing so, we identify major variables, and analyze their potential contribution in shaping the level of EP. We undertake this analysis within a South-South framework, which enables us to compare the determinants of EP particular in SSA and other developing regions. With its main focus on SSA countries, this analysis deserves a considerable amount of attention for various reasons. First, energy poverty seems to be somewhat under researched in Africa in the sense that it is difficult to come across an empirical study on energy poverty that focuses particularly on African countries. This is quite surprising, since energy supply is crucial to the region's much needed economic development. According to the Economic Report on Africa [ERA] 2008, currently only a few, and mainly northern African, countries are well on track to meeting an important number of Millennium Development Goals [MDGs]. In this respect the report singles out 'the poor state of infrastructure in Africa' as one of the major impediments to 'domestic market and regional integration, to equitable access to social services, and therefore to growth'. In the case of energy, clean and available (modern) services in this sector are indispensable to the escape from poverty (IEA, 2002). In fact, "modern energy can directly reduce poverty by raising a poor country's productivity and extending the quality and range of its

products thereby putting more wages in the pockets of the deprived" (IEA, 2002, p 366).

Second, positive developments in the energy sector can affect the impact of climate change, whose mitigation plays a major role in making progress towards the MDGs. Taking a closer look at the 8 Goals and 18 Targets from the Millennium Declaration, it quickly becomes obvious that energy is indispensable to meeting virtually all of them, from the eradication of extreme poverty and hunger and the promotion of gender equality and empowerment of women to environmental sustainability.

Third, drastic cutbacks in energy investment as a result of the global economic and financial downturn will impede access to electricity and other forms of modern energy by poor households (IEA, 2009a). At the same time financial problems limit the ability of utilities to connect new customers. A better understanding of the underlying factors will help policy makers in the energy sector respond better to the effects of the financial crisis on the electricity sector in developing countries.

Given the importance of the infrastructural facility 'energy' to the socio-economic well-being of a country, we seek to expand our understanding of the factors underlying countries' performance in the energy/electricity sector. This study is important because although relatively plenty of research has been done on energy and economic performance etc., it is difficult to find an analysis of the factors characterizing energy poor countries in a systematic way.

### **METHODOLOGY ADOPTED**

Factors that determine the different levels of electricity access based on the analysis of the factors underlying electricity poverty in developing countries were identified. The dependent variable is the percentage of population with access to electricity. The choice of independent variables was constrained by data availability. For instance, data on important factors such as domestic investment or indicators for reforms in the electricity sector are not readily available for most developing countries, especially for countries in SSA. The impact of important factors, such as the finance gap and structures of the electricity sector on access to electricity could not be tested. Furthermore, the often poor availability of data, particularly in many SSA countries, severely constrains the number of observations in the regressions.

### **CONCLUSION AND POLICY RECOMMENDATIONS**

This study analyzed the determinants of electricity access in developing countries and, particularly, examined why sub-



Saharan Africa has been relatively unsuccessful in providing electricity to its population, despite reforms in the electricity sector. The results indicate that the factors underlying electricity access in developing countries have a different impact in sub-Saharan Africa. Specifically, the marginal benefit from increased gross domestic savings is less in SSA suggesting that a higher savings rate will lead to higher levels of electrification in non-SSA than SSA countries. It is equally found that the percentage of rural population in a country is another important factor underlying electricity access in developing countries, though our results suggest that it plays a more important role in SSA countries than in non-SSA developing countries. This entails that a SSA country will, on average, have a lower level of electrification, than a non-SSA counterpart with the same percentage of rural population, whose remote location makes it difficult to provide access to the national grid. Finally, it is identified that the percentage of the population living below \$2 a day as another important factor determining the level of electricity access, since, electricity access is generally a function of income. However, this factor appears less significant in SSA countries.

The results strongly point towards the importance of the institutional quality, in the sense that:

- (1) government has the power to channel an adequate portion of savings in the electricity sector;
- (2) government has the power to guide reforms towards targeting marginalised customers the rural, mainly poor, population.

As far as policy implications are concerned, the results inspire a few suggestions.

First, the importance of renewable energy technologies cannot be overemphasized. Energy from solar, wind and micro-hydropower technologies is an attractive option, particularly in SSA countries, which are richly endowed with the necessary resources. Most attempts to expand the existing grid networks are inappropriate for the vast majority of people in SSA, in particular for those living in rural areas. Therefore, decentralised electricity generation using clean, renewable energy systems is perceived to be one of the most suitable solutions to meet Africa's rural electrification needs. Nevertheless, many of these technologies that are theoretically best suited for the provision of energy services to those areas have high initial capital costs as well as maintenance and replacement costs. In addition, the diffusion of information on renewable energy sources is a necessary condition for the success of their installation, since populations without electricity are scattered in very remote areas where information on such systems are not available. For these reasons, governments are advised to introduce policy reforms to make capital resources more readily

available for small-scale rural energy investments so that the barriers of lack of information as well as high initial capital costs for such systems could be more easily overcome. This would help make renewable energy affordable to small rural consumers.

Second, it is thus essential to encourage the mobilization of the necessary capital to make available adequate finance, which is one of the main challenges developing countries are facing in meeting their current and future energy demand. Apart from governments, current sources of energy finance in developing countries include multilateral institutions, ODA as well as private investors (Postnote, 2002). The public sector alone will hardly be able to meet up with the finance requirements to satisfy growing energy demands, consequently the responsibility to ensure adequate energy supplies lies to a large extent with the private sector. However, clearly, it has proven difficult to secure the amount of investment needed, which can be attributed not only to various barriers faced by private as well as foreign investors in many developing countries but also to the common association of relatively low rates of return with energy investments. African countries in particular are perceived to be overly risky, which is one of the greatest hindrances to investment in African countries. Thus, governments should encourage domestic resource mobilization as well as improve negative perceptions about their countries by highlighting positive aspects.

Finally, we wish to stress, once again, the importance of effective reforms. Prior to reforms, the electricity sector in developing countries was typically owned, operated and regulated by the government. In recent years, however, this model has been challenged in most countries and has been most commonly replaced by a market-led model, involving measures from the unbundling of utilities (separating their different functions) to complete private ownership. This was to enable countries to keep up with the financial pressure of the new generating capacity resulting from economic growth and the ensuing increased energy demand (GNESD, 2004). However, this privatisation of the power sector has had detrimental consequences to the poor due to the government's lack of commitment to improving the mostly poor, rural population's access to electricity. Studies have shown that the one thing those countries, that have been successful in improving electrification levels for their marginalized citizens have in common is their focus on rural electrification (GNESD, 2004). Therefore countries whose reforms have not yet developed to an advanced stage are advised to make provision for increased rural electrification before embarking on large scale privatisation.

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*AIAE Policy Brief Series contains short, soft read summaries of research findings and policy recommendations. The objective is to promote evidence based dialogue. The views expressed in this Brief are those of the authors and not necessarily representative of the African Institute for Applied Economics or the agencies which sponsored or supported the research. September 2012*

