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Brief

Energy Poverty Alleviation and its Consequences on Climate Change Mitigation and African Economic Development

Isabella Alloisio, Jacopo Bonan, Carlo Carraro, Marinella Davide, Manfred Hafner, Simone Tagliapietra, Massimo Tavoni.
Fondazione Eni Enrico Mattei

Abstract

FEEM Policy Brief

Energy access in Africa is a key policy priority, given the strict inter-relation between energy, economic growth and sustainability.
The current and projected trends on Africa access to energy and electricity indicate that unless new policies are implemented, energy access in the continent will remain low, hindering Africa's ability to transition economically. The challenges in overcoming energy poverty and in mobilizing the investment needs for a reliable and sustainable energy infrastructure are significant, but can be attained using the right energy mix. Providing energy access will not significantly exacerbate other global challenges such as climate change mitigation. Innovative financing mechanisms and policy tools can help achieve a sustainable energy transition, and the EU can play a vital role in filling the investment gaps.

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01 Introduction: current situation and trends in access to energy in Africa

Energy poverty is defined as lack, scarcity or difficulty in accessing modern energy services by households, in particular it refers to the access to electricity and to modern and clean cooking facilities. The International Energy Agency estimates that **currently 1.18 billion people** (16% of the worldwide population) lack access to electricity and 2.74 billion (40% of the global population) rely on traditional cooking methods based on the use of biomass (IEA 2016).

The geographical distribution of such phenomena is uneven across the world. People without electricity are mostly in Africa (53%) and developing Asia (43%); similarly, those still relying on traditional cookstoves and fuels are concentrated in developing Asia (68%) and Africa (29%).

Within countries, the lack of access to modern energy services is **concentrated in rural areas where 80% of energy poor people live**. Despite its considerable wealth of resources, **Sub-Saharan Africa remains the region with energy consumption per capita among the lowest in the world and the greatest concentration of energy poverty**, with 65% of the population, 633 million people, lacking access to electricity and about 80%, 792 million people, without access to clean cooking.

The World Health Organization estimates that the use of traditional methods of cooking, through wood and biomass combustion, has severe consequences on the health of households, due to indoor air pollution. The recent Global Burden Disease study estimates that **almost four million people die every year from indoor air pollution due to the use of traditional cooking fuels and stoves** (Lim et al. 2013, Martin et al. 2011). Moreover, the extensive use of wood as main energy fuel impacts the local environment, due to deforestation, soil degradation and erosion. At global level, inefficient biomass combustion is a major determinant of black carbon, a **contributor to global climate change**. Emissions from cooking stoves continue to be a major component of global anthropogenic particulate matter (UNEP/WMO, 2011) particularly in developing countries, for example in Africa and South Asia where emissions from cooking stoves are well over 50% of anthropogenic sources (Bond et al., 2013).

According to the IEA's scenarios, the situation regarding access to electricity is expected to evolve significantly by 2040, but not for Sub-Saharan Africa. In particular, while most countries are expected to reach the target of universal access (47 million energy poor people are expected to be in developing Asia), Sub-Saharan Africa will lag behind.

It has been **projected that more than 90% of people without electricity will be in Sub-Saharan Africa in 2040** (about 489 million people). Progress in access will allow to reduce the numbers of energy poor people, also in the light of demographic growth, compared to the current situation. However, this will be concentrated in urban areas through centralized grid connections, while the 95% of the population without electricity will be concentrated in rural population.

Projections for access to clean cooking facilities show less progress than in the case of electrification, as about 1.85 billion people are expected to rely on traditional fuel and cookstoves by 2040, 38% of which (about 700 million people) living in Sub-Sahara Africa. Once again, the highest incidence will be experienced in rural areas, where the establishment of clean fuel supply networks will be most difficult. Rural population is expected to rely on solid biomass and improvement in access will be reached through the adoption of more efficient and clean biomass cookstoves.

02 The relation between energy poverty, energy demand and economic development

Access to adequate and affordable energy is strongly and mutually intertwined with economic development and poverty eradication. The **lack of modern and clean energy services negatively affects time availability, agricultural and economic productivity, and other opportunities for income generation**. It is therefore usually associated with low-income levels, malnourishment, poor and unhealthy living conditions, as well as limited opportunities in terms of education and employment. All these elements in turn make the possibility to escape from poverty even harder, leading to a “vicious cycle” that keeps people with no access to modern energy trapped into a situation of economic and social deprivation. Breaking this cycle will allow the African continent to unlock access to improved economic opportunities, improved healthcare, universal education, and, consequently, longer and better life for its population (GEA, 2012). Providing poor in rural areas with clean and modern energy reduces the time currently spent, especially by women and children, in gathering traditional fuels used for cooking and make it available to income-earning activities or education (van de Walle et al. 2013, Bonan et al. 2016). Moreover, energy - either fuels or electricity - is crucial to increase technology and mechanical power in production process and agricultural practices, currently dominated by human or animal energy, thus contributing to economic development and food security. Overall, **increased access to modern energy supports the transition from agriculture-based to industry-based economies**, where cleaner energy options play a strategic role in the production of commodities and provision of increasing service demand. In this case, also the quality, affordability and efficiency of the energy are important for the final outcome. An analysis covering 26 African countries, finds, for example, that **poor-quality electricity supply infrastructures have strong negative effect on firm’s productivity**, especially in lower income African countries such as Eritrea, Ethiopia, Mali, Senegal, Uganda and Zambia (Escribano et al. 2009).

Energy development differs widely within the huge African continent. Of the total Africa's primary energy demand, which in 2014 was 772 million tonnes of oil equivalent (Mtoe), 22.5% arises in North Africa, where less than 1% of the population are without electricity (IEA, 2017). Although the rapid economic growth and energy use increasing by 45% since 2000, SSA's energy demand is still very low – at 580 (Mtoe) and the electrification remains at the lowest levels in the world. South Africa is the exception in the region as it is responsible for more than 40% of the power generation capacity - but only a quarter of the population – (IEA, 2014).

Future prospects are expected to change as a consequence of different factors, such as increasing population and urbanization, expansion and modernization of industrialized sectors and a booming middle class. Different estimates are available. The magnitude of **energy deployment depends, however, on the assumptions about future socioeconomic development**. As Figure 2.1 shows, different development patterns are possible depending on the rate of economic growth, which particularly uncertain in the region, as well as other policy, global and contextual factors (O'Neill et al. 2017).

Most projections, **estimate an average growth rate in generating capacity in the range of 6–8% per year**, in line with different GDP forecasts (Bazilian et al. 2011, PIDA, 2011.) **Less optimistic are the projections of the IEA** (2014) baseline scenario for the Sub-Saharan region, which is estimated to increase its economy fourfold by 2040, with a primary energy demand 80% higher than current level. In this case, average energy demand growth is expected to be around 2% per year in the period 2012 – 2040, reflecting changes to the mix of fuels and the increased efficiency.

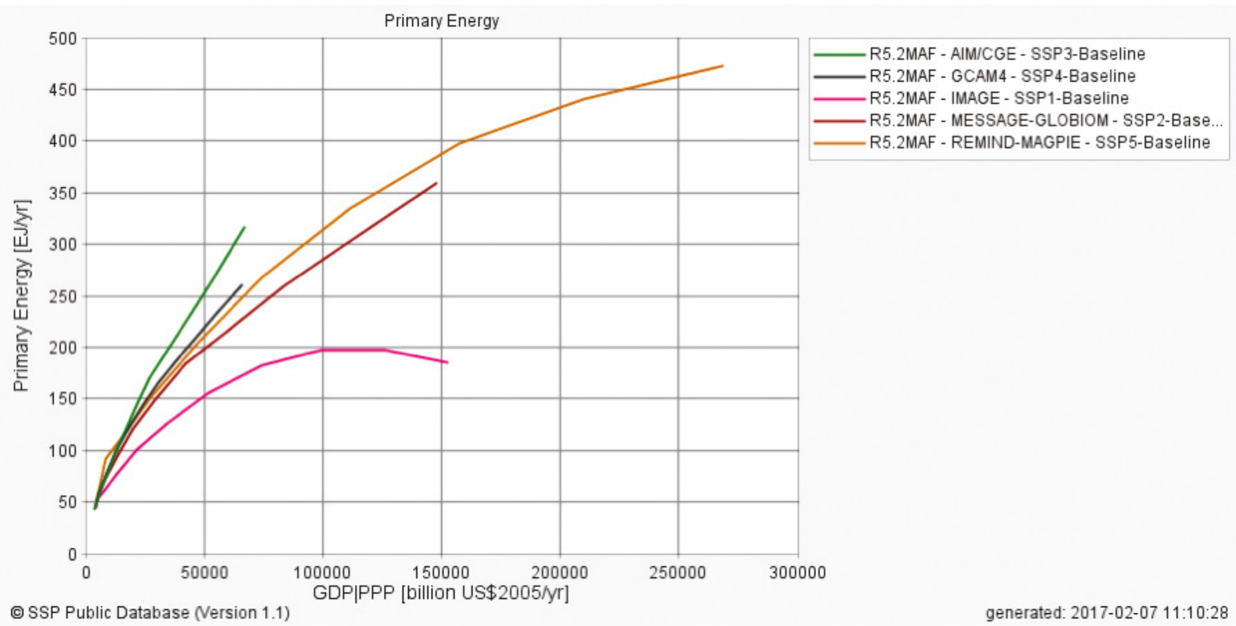

Figure 2.1 *Relation between GDP and primary energy from 2010 to 2100 for Middle East and Africa under 5 different scenarios of socio economic development (source: SSP database)*

The major energy source in SSA in the next decades is expected to remain bioenergy despite higher incomes and expansion of other fuels. However, the shift towards modern types of bioenergy (from current biomass to biogas and pellets) could lead the share in the energy mix to decrease from more than 60% in 2012 to about 50% in 2040 (Calvin et al. 2016, IEA, 2014). This is particular relevant for a development perspective as the extremely inefficient traditional biomass use is proved to have adverse implications for human health and welfare (Pachauri et al. 2013). **Consistent reduction in the share of primary biomass in the energy mix (i.e. below a third) would require per capita income to grow approximately above $10/day** (Calvin et al. 2016).

The share of coal in the energy demand mix is expected to decline, including in South Africa - where it currently accounts for more than 60% - as **demand for natural gas and oil grows in relative terms** mainly led by increasing power generation as well as industrial and transport development (PIDA, 2011 and IEA, 2014).

Also renewable sources (excluding biomass) are expected to constantly and rapidly grow, especially solar and wind in the long term (Calvin et al. 2016). At regional level, Nigeria will increase the use of both oil and gas, followed by the rest of West Africa. Southern Africa, led by South Africa, Mozambique and Tanzania, will follow as the second-largest energy demand growth of any sub-region (IEA, 2014). Although the direction of causality between energy availability and **economic growth is still matter of debate, advancement in modern and more efficient energy** use in the Sub-Saharan region is accompanied by the creation of value from productive sectors. In the IEA (2014) baseline scenario, the **economic growth of energy intensive industries and services will represent respectively 70% and 25% of total productive energy**. Agriculture, although benefitting from mechanization and enhanced productivity, will decline its role in the local economy.

The projected changes in the Sub-Saharan energy landscape are expected to spread their effects also outside the continent, through its **energy trade balance with the rest of the world**. In particular, by 2040 the region will experience a decline in crude oil export. This will be mainly due to the oil boom in the United States, who have already reduced their demand by two-thirds since 2008, as well as to the increased volumes of African refining to meet the needs of a regional oil consumption expected to more than double by 2040. In the same period, apart from Nigeria and Angola that will continue to lead the exporting market, the other countries will see their exports **dropping considerably** (as in the case of Chad, Congo, Equatorial Guinea) or even becoming net importers to satisfy the increasing internal energy demand (Cameroon and Sudan). Although Europe continues to play an important role in both oil and gas markets, a larger segment of exports in all commodities will be redirected towards the Asian market, to feed increasing demand in India, China and South Asia (IEA, 2014).

Notwithstanding these improvements, in 2040 SSA remains poorer than other developing countries both in economic and energy terms. Per capita energy use in the region could stay below 0.7 tonnes in 2040, around 15% of the global average. The fact that the region starting point is far below other countries, coupled with the difficulty of providing energy services to a rapidly growing population will leave significant unmet energy demand and therefore untapped economic opportunities. **Much higher efforts of installed capacity will be required to meet the goal of providing universal energy access in SSA by 2030**. In particular, an annual growth rate of around 13% on average is estimated by Bazilian et al. (2011) to even reach a moderate access case (200–400 MW/mln). In addition, better management of oil and gas revenues to be reinvested in large-scale generation and transmission infrastructures offers potential opportunities for the energy sector to accelerate the Sub-Saharan regional development.

In terms of energy-related **CO2 emissions**, SSA will **contribute to the global share only with a 3%. Providing access to modern energy is expected to have, indeed, a very small impact on global CO2 emissions**, with the improvement in electricity access accounting for around 10% of the increase in SSA emissions or just over 1% of the increase in global emissions from now to 2040 (IEA, 2014).

A crucial component able to accelerate the African path toward a sustainable energy will be the evolution of fuelwood consumption, which currently is an important driver of deforestation and land degradation. Overall, there is agreement on the fact that providing universal access to modern energy will have limited impact on GHG emissions and the related mitigation objective. In particular, Chakravarty and Tavoni (2013) estimate that the global cumulative emissions due to energy poverty eradication programs would be in the range of 44 to 183 GtCO2 over the end of the century, leading to an increase in the mitigation effort by at most 7%. Similarly, Rogelj et al. (2013) find that achieving the **three energy objectives the SE4ALL initiative would not prejudice the goal to keep global temperature increase below 2 °C** but it would rather help to kick-start the necessary energy system transformation.

03 Evaluating energy poverty alleviation programs

The responses to the problem of energy poverty in developing countries date back to the ’80s, when several developing governments set policy interventions to improve and expand access to modern energy, through rural electrification and ICS diffusion programs. Recent elections show that, along with security issues, providing access to energy and reliable electricity is among the top priorities in the electoral campaigns (eg. Nigeria, Ghana).

The main obstacles to be tackled in rural electrification programs pertain to the high investment required vis à vis very limited returns in the short and medium run. The cost of expanding the grid or constructing off-grid infrastructure often exceeds the returns from relatively low connection rates in remote and scattered communities with low electric consumption and low ability to pay for connection. This requires substantial subsidies. Yet, many countries have made progress in connecting remote rural areas to electricity. In particular, several emerging economies have included rural electrification programs in their agenda in order to reduce the strong urban-rural divide. Some examples of **large national rural electrification programs are represented by Brazil, China and India, which have achieved an electrification rate greater than 65% through significant public investments**. Smaller countries such as Thailand, Costa Rica and Tunisia have reached even higher connection rates in the rural population. Successful rural electrification programs have followed several models, which can be considered context-specific, for example through the involvement of the private sector or electric cooperatives. However, some common features seemed to have guided successful programs in their deployment (Barnes, 2007).

First, the introduction of efficient, effective and equitable subsidies. Second, the presence of an adequate and effective implementing agency, with high-degree of operating autonomy (particularly from possible political pressure) and accountability in the targets to reach. Third, adequate expansion plans, which consider the actual needs and possibilities of communities, ensure financial viability and economic impact: premature rural electrification may miss the objective of contributing to sustainable community development, if other conditions enabling economic development are not present. Fourth, tariff policy is an important ingredient as it has to ensure financial sustainability and cost recovery from one side, and, on the other, it has to consider customers' realistic ability to pay. Finding financial solutions for lowering the connection charges is also a driver of higher connection rates.

The **policies** implemented at national level aimed to improve cooking strategies and to avoid health problems related to high exposure to IAP **have followed three main strategies**. The first tried to promote cleaner fuel adoption by **replacing biomass with kerosene and LPG**. This has been the case for Ecuador and Indonesia, where poor households could benefit from subsidized kerosene for cooking (Barnes and Helpern, 2000). However, drawbacks emerged such as the high cost of kerosene and LPG together with difficulties to supply them in remote areas, given poor infrastructure. More recently, a second practice has seemed to prevail: **the development and promotion of improved cooking stoves**, which use wood and biomass in a more efficient way while reducing exposure to air pollutants through the introduction of a chimney. The important pros of the substitution of cookstoves rely on the fact that the technology is relatively easy to up-scale using local materials and producers (which may lead to job creation in the area and use of local materials), prices are affordable even for poor households and the final product is similar to traditional cookstoves, allowing the reduction of the cultural "gap" arising from the introduction of a new technology. A third option is the introduction of **small scale bio-digesters for the production of biogas** at community and household level, though a wide diffusion of such technologies has been slow in several developing countries. As for rural electrification programs, several emerging countries have developed different initiatives for the diffusion of improved cookstoves for the large proportion of households still relying on traditional technologies, some of which have been deemed successful, others less. Key features of successful programs include both supply and demand-side aspects combined with the development of **enabling institutional and market environments**. From the supply-side, product design aspects such as the compatibility with household needs, housing, cultural and environmental conditions have shown crucial factors for large-scale product take-up (Lewis and Pattanayak, 2012). Quality and durability of cookstoves are critical conditions to realize sustained improvements in efficiency and/or IAP reduction. From the demand side, efforts in filling households information gaps about the advantages of ICS take-up through information campaigns and social marketing as well as innovative financial solutions to overcome credit constraints are key drivers of success. **Enabling institutional and market conditions** at local level include the involvement of local institutions, the development of the supply chain for production and after sale services, the use of robust independent monitoring and evaluation tools.

Despite the great effort and investment in the energy sector to increase rural electrification and the diffusion of modern cooking systems, **relatively little is known about the effective impact of such policies** on households' well-being and poverty alleviation. The justification of large public programs to improve the access to modern energy has often relied on supposed benefits and transformative effects on households' health, education, labor market outcomes and, ultimately poverty level. Typical causal chains of impacts of access to electricity and improved cooking stoves are represented in figures 3.1 and 3.2, respectively. However, there is still limited evidence to substantiate such impacts, given the methodological challenges of causal attribution.

After reviewing the literature on the impacts of access to electricity adequately tackling the methodological challenges related to attribution, Bonan et al. (2016) find that the **impact of electrification on time allocation and labour market outcomes seems to be one of the most robust**, although still not definitive.

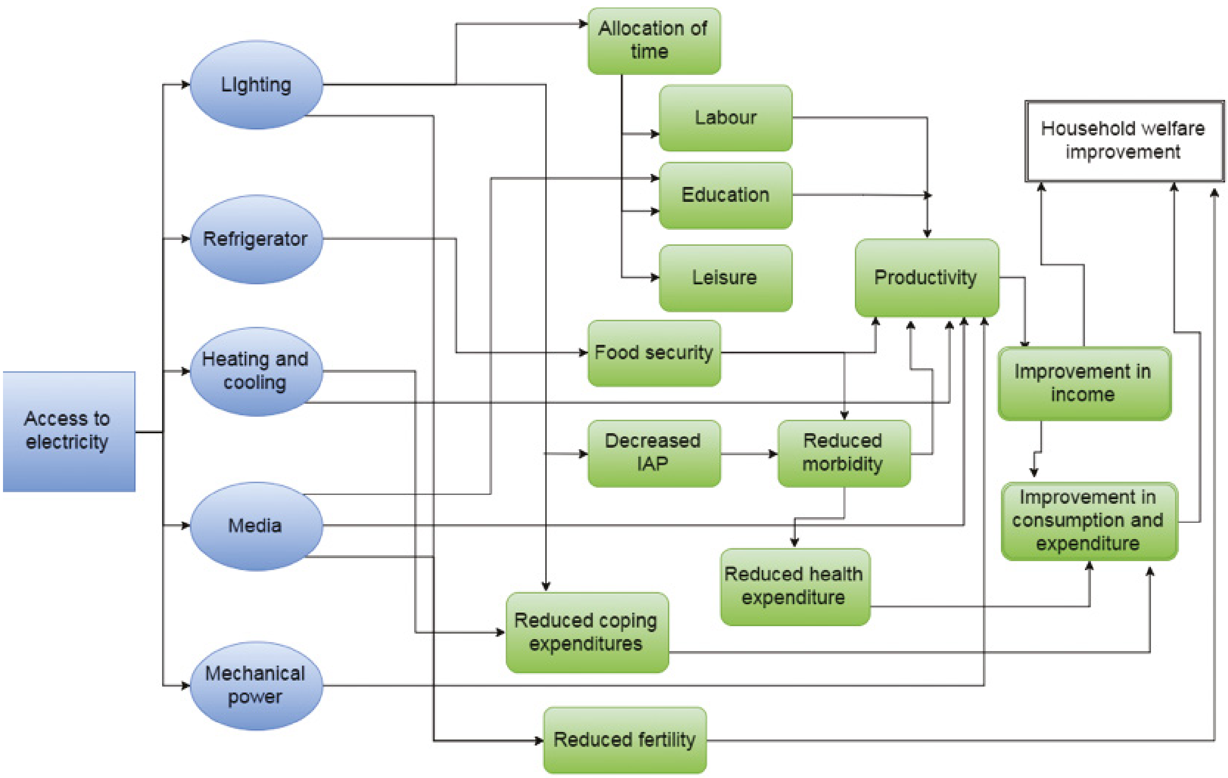

Figure 3.1 *Causal chain of impacts of access to electricity (source: Bonan et al. 2016)*

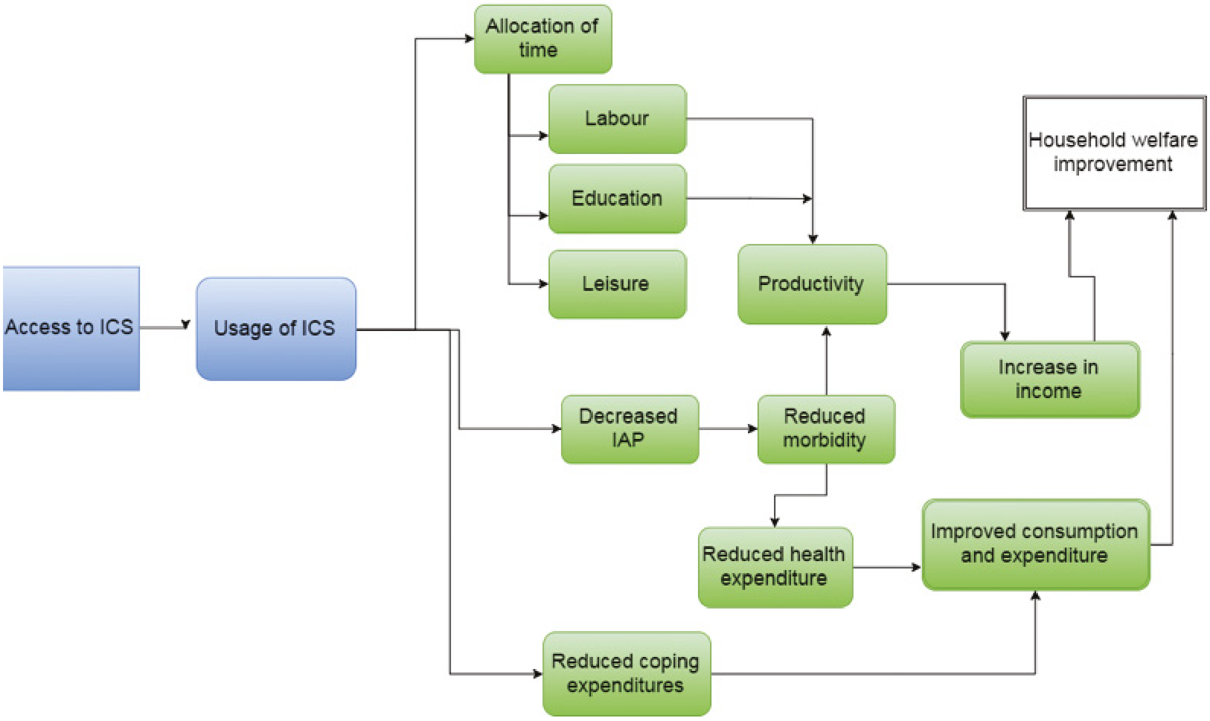

Figure 3.2 *Causal chain of impacts of access to ICS (source: Bonan et al. 2016)*

The results seem to support the mechanism of **substitution from agricultural to non-agricultural activities, leading to gains in productivity and wages**, ultimately leading to income increases and welfare improvements. Impacts on expenditure and wealth are more uncertain, and depend on the type of technology (on-grid vs off-grid). The evidence of the **impact of electricity on health** outcomes is extremely limited but seems to support that the substitution of kerosene lamp with electric bulbs generates **decreases in indoor air pollution exposure and respiratory diseases**. The impact of electricity on schooling outcomes is somehow mixed. Overall, electrification seems to be beneficial for households welfare. However, one has to note that the dimension of benefits seems to vary across geographical regions. In particular, **the impacts in the African context, after excluding the case of South Africa, seem to be quite modest** (Peters and Sievert, 2016). The low access to markets, small role of private sector and the lack of other important infrastructure may have played a role in preventing or slowing down the impacts of access to electricity on productivity and labour opportunities in the non-agricultural sector. Further emerging challenges are related to the evidence that moving away from full subsidization of connection costs leads to low take-up rates: Lee et al. (2016) show that 57 and 29% subsidies in connection fees led to a 23 and 6% connection rates in Kenya, respectively.

The use of modern and improved cooking stoves may have positive consequences on household welfare and sustainable development, from several points of view: health, time allocation and reduced expenditure in fuels, due to efficiency gains. However, the evidence is very sparse, varying significantly in relation to location and products, and generally suggests that the success of programs in generating sustained impacts over time relies on understanding and developing both the supply and the demand side. “Fit for all” products cannot be viable solutions; therefore, improved cookstoves need to fit local contexts and preferences. Given the important private and public benefits they can generate, **innovative interventions should focus on financing mechanisms, coupled with demand-side considerations on household economic and behavioural constraints in climbing the energy ladder**. This may imply the introduction of marketing interventions and post-sale services in order to maximize take-up and sustained usage over time. Once again, drawing on local social dynamics may support the diffusion process.

04 The electrification challenge in Sub-Saharan Africa and the renewables-gas paradigm

Electrification in Sub-Saharan Africa: a twofold challenge

The main challenge in the pathway towards the achievement of universal energy access in Sub-Saharan Africa (SSA) is perhaps represented by electrification.
To understand the relevance of this issue and its global relevance (Figure 4.1), it might be sufficient to recall that only 290 million out of 915 million people (IEA, 2014) living in SSA currently have access to electricity.

This also has a climate implication, as electrification represents one of the key channels to decarbonize economies. Therefore, electrification represents a key tool to tackle energy poverty and GHG emission reduction objectives at one fell swoop.

The number of people living without electricity in SSA is also on the rise, as ongoing electrification efforts are outpaced by rapid population growth.

From a geographical perspective, **electrification rates largely vary across SSA**, from high levels in Gabon (89%), South Africa (85%) and Equatorial Guinea (66%) to very low levels in Chad (6%), Central African Republic (10%) and the Democratic Republic of the Congo (16%). Lack of electricity access in SSA mostly affects rural areas. In fact, only 15% of rural population in SSA have access to electricity, against a world average of 70% (World Bank, Sustainable Energy for All database, accessed in January 2017).

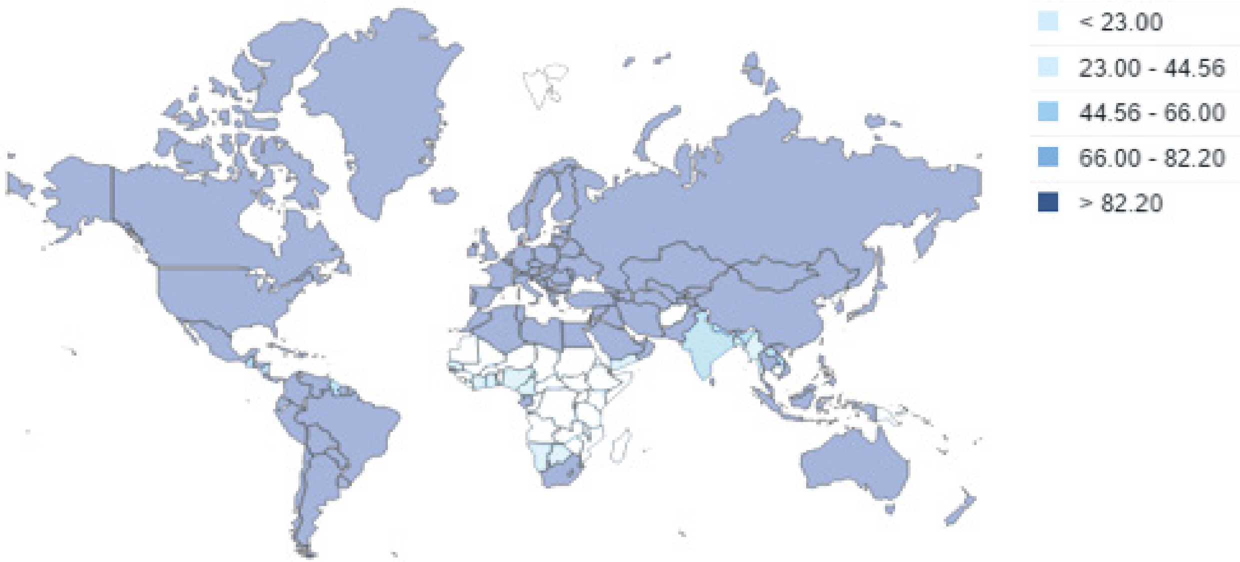

Figure 4.1 *Access to electricity in the world (% of population): the unique situation of Sub-Saharan Africa (source: World Bank, Sustainable Energy for All database, accessed in January 2017)*

Electricity generation between on-grid and off-grid solutions

SSA's installed on-grid electricity generation capacity is limited, but gradually expanding. Total capacity increased from 68 GW in 2000 (IEA, 2014, page 14) to 108 GW in 2014 (Author's calculation on IEA 2016). South Africa accounted for about half of this increase, outlying – again – the inhomogeneity of electricity developments across SSA. **This level of on-grid capacity is not sufficient to meet electricity demand in SSA**, as it is reported to be unavailable for about 540 hours per year on average (IEA, 2014 page 42). As a result, blackouts and brownouts are the norm in many countries across SSA.

This situation is also due to the fact that the amount of **electricity capacity in operation is usually far less than the total installed capacity**, due to several factors like: drought affecting hydropower capacity, poor maintenance causing power plants to fall into disrepair, lack of reliable fuel supply, inefficient grid operations, insufficient transmission capacity.

In this context, **alternative solutions** such as mini-grid systems, off-grid systems and back-up generators **represent an increasingly important element** of SSA's electricity generation. If diesel-fuelled back-up generators are a traditional component of SSA's electricity landscape, new mini-grid and off-grid systems based on solar photovoltaic, small hydropower and small wind are rapidly expanding across the continent.

These solutions are very important, as they represent the most viable means of access to electricity for the large rural population that is distant from the grid (IRENA, 2015).

Electricity transmission and distribution

In several SSA's countries, **electricity transmission and distribution losses remain very high**. For instance, they represent 44% of total electricity output in the Democratic Republic of the Congo, 39% in Botswana, 28% in Namibia, 22% in Ghana and 20% in Tanzania. For the sake of comparison, world's average stands at 8% (IEA, World Energy Statistics database, accessed in January 2017). Such high levels of transmission and distribution losses are mainly due to ageing electricity networks (about 50% of SSA's networks are at least 30 years old (EC, 2014) and lack of maintenance. In order to meet future electricity demand growth, SSA's **electricity network will thus have to be reinforced, modernized and expanded.** This will have to happen at national level, but also at regional level. In fact, developing SSA's four regional power pools (i.e. Southern Africa, Western Africa, Central Africa and Eastern Africa) (Kambanda, 2013) will be key to fully exploit SSA's vast untapped potential for both large-scale hydropower and gas (IRENA, 2012).

Future outlook: towards a renewables-gas paradigm in Sub-Saharan Africa?

But what might be the future outlook for SSA's electricity systems? On the basis of current and proposed SSA's government policies and measures, the International Energy Agency (IEA)'s New Policies Scenario expects SSA's electricity demand to more than triple by 2040, to reach 1,511 TWh. This modelling exercise also illustrates a strong shift in SSA's electricity generation mix between 2014 and 2040, based on three main features: i) a **decrease of coal** from 53% to 24% of the mix; ii) an **increase of gas** from 9% to 25%; iii) an **increase of renewables** (excluding hydro) from 2% to 16% (Figure 4.2).

It should be outlined that the factual future development of SSA's electricity demand and generation mix will -of course- depend on a number of different variables, such as the trajectory of socio-economic development.

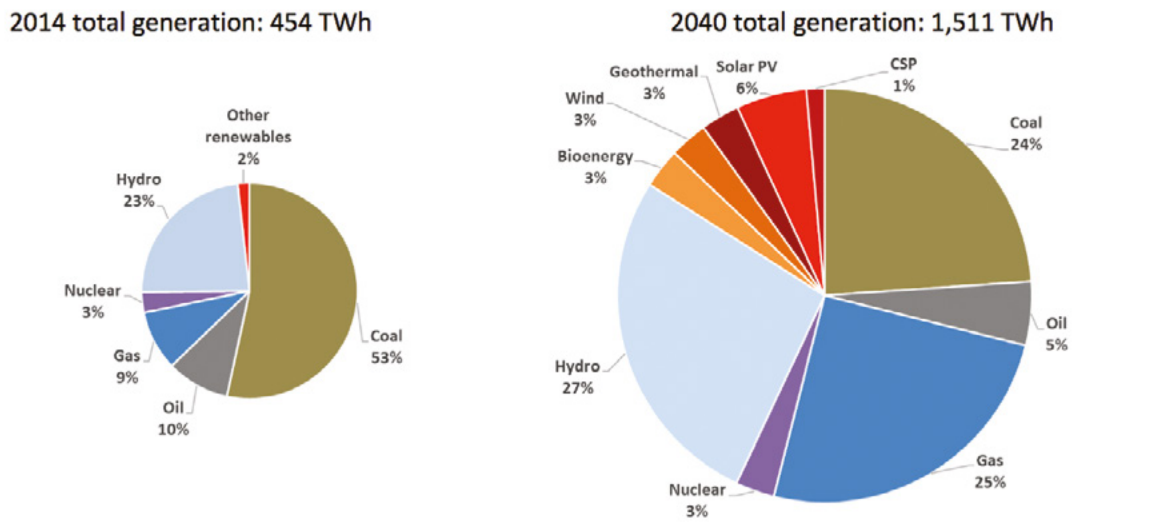

Figure 4.2 *Electricity generation by fuel in Sub-Saharan Africa in IEA New Policies Scenario, 2014 and 2040 (source: author's elaboration on IEA 2016*

For instance, Figure 4.3 provides an illustration of how electricity generated by gas in the Middle East and Africa might develop over the next decades in five different socio-economic scenarios, based on different assumptions on demographics, human development, economy and lifestyle, policies and institutions, technology, and environment and natural resources (O'Neill et Al., 2017).

Should the renewables-gas paradigm portrayed by the IEA policy-based model factually emerge in the future, this could be considered as a positive development for SSA. This notably because such a development would cut by half SSA's utilization of coal in electricity production. This would represent a major step to ensure a sustainable energy transition in SSA, both under the climate and environmental perspectives.

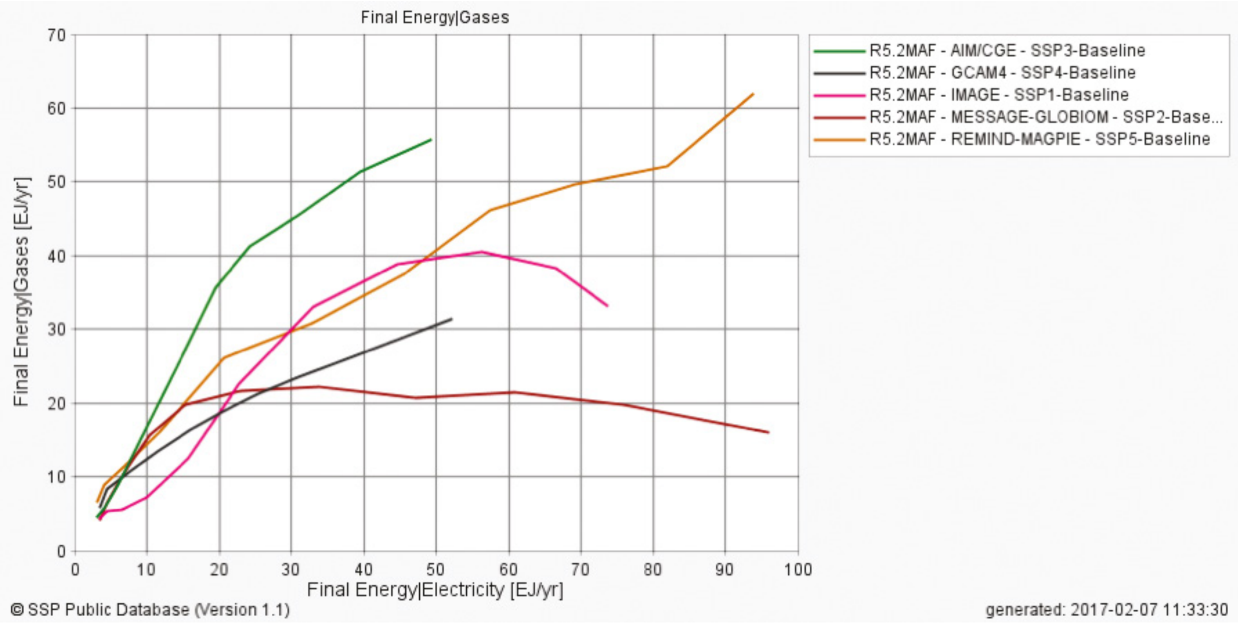

Figure 4.3 *Scatter plot of electricity generated by gas over electricity for the period 2010-2100 for the region Middle East and Africa, for 5 different socio-economic scenarios (source: SSP Public Database)*

Investing in Sub-Saharan Africa sustainable electricity: challenges and opportunities

According to the IEA, expanding SSA's electricity system as projected in the New Policies Scenario would require a **cumulative total investment of around USD 1.2 trillion between 2014 and 2040**. This estimation rises to more than **USD 2 trillion** between 2014 and 2040 in the African Century Scenario, which has a focus on energy alleviation (Table 4.1) (IEA, 2014, p. 222).

IEA New Policies Scenario	Investments in electricity plants	608
	Investment in transmission and distribution lines	640
	Total investment in electricity	**1,248**
IEA African Century Scenario	Investments in electricity plants	993
	Investment in transmission and distribution lines	1,091
	Total investment in electricity	**2,084**

Table 4.1 *Investment in electricity in Sub-Saharan Africa in two IEA scenarios, 2014-2040 (USD billion) (source: author's elaboration on IEA, 2014)*

It should be outlined that under the New Policies Scenario, around 70% of SSA's population have access to electricity in 2040, while this rate raises to 83% under the African Century Scenario. Therefore, none of these two scenarios is in line with the SDGs, which call for universal access to affordable, reliable and modern energy services by 2030. As a result, **investments in SSA's electricity sector would have to be much higher** than the ones projected by the IEA **in order to comply with the SDGs**.

For such large investments to materialize, **government action will be needed** in order to reduce risks arising from macroeconomic or political instability and from weak protection of contract and property rights. Furthermore, government action will also be needed in order to reform electricity markets in a way that international investors could act within clear and stable regulatory frameworks. With this regard, the case of South Africa (which, through its Renewable Energy Independent Power Producers Procurement Programme, created a business-friendly atmosphere for international investments) is there to show how public policy frameworks could reshape the electricity system.

To conclude, **international (European) development banks might also contribute to the electrification of SSA by putting in place risk-mitigation and credit-enhancement tools** aimed at covering part of the non-commercial risks faced by international energy companies in SSA. Such schemes should not be considered as a form of international aid, but rather as facilitating mechanisms for international (European) energy companies entrance into a sector – SSA's electricity – that due to its quick development certainly encloses vast business opportunities.

05 The Sustainable Development Goals (SDGs) and Europe: setting the policy context

Since the historic first Africa-EU Summit in Cairo in 2000 “Africa and Europe are bound together by history, culture, geography, a common future, as well as by a community of values: the respect for human rights, freedom, equality, solidarity, justice, the rule of law and democracy” (EU Council, 2007). This is recalled by the **Joint Africa-EU Strategy (JAES)** launched at the Africa–EU Summit in Lisbon in 2007 as a political vision and roadmap for future cooperation between the two continents. One of the priorities of the Africa-EU partnership is to help Africa improve its own productive capacities and become less dependent on raw materials and simple processed products, which in the long term is the best way to avoid a natural resources depletion and participate in, and benefit from, the global economy and international trade.

This JAES aimed to ensure that the Millennium Development Goals (MDGs) are met in all African countries by the year of 2015. According to Modi et al. (2006): “by scaling up the availability of affordable and sustainable energy services, there is a greater chance of achieving the MDGs, as energy services have a multiplier effect on health, education, transport, telecommunications, safe water, and sanitation services, and on investments in and the productivity of income-generating activities in agriculture, industry, and tertiary sectors” (Modi et al., 2006). Therefore, although energy access is not recognized as one of the MDGs per se, despite MDG 7 calls for ensuring a broad “environmental sustainability” objective, energy is considered as a central driver for the achievement of the other Goals by 2015. Against this background, the United Nations General Assembly launched in 2012 the initiative **Sustainable Energy for All** (SE4ALL), with three specific objectives to be reached by 2030: i. ensure universal access to modern energy services; ii. double the global rate of improvement in energy efficiency; iii. double the share of renewable energy in the global energy mix. The United Nations Resolution 67/215 recognized the importance of giving appropriate consideration to energy in the elaboration of the post-2015 development agenda, and decided to declare 2014–2024 the United Nations Decade of Sustainable Energy for All (United Nations, 2012).

2015 can be recalled as the year of sustainable development. In September 2015 the world’s leaders came together to agree on **17 Sustainable Development Goals** (SDGs) and adopted the 2030 Agenda for Sustainable Development (United Nations, 2015a). This Agenda is a road map for the planet that will build on the success of the MDGs but extend them and aspires to be universal and address all countries and not only the developing ones.

Alike MDGs, the 2030 Agenda contains an

ad-hoc Goal, SDG 7 calling to secure access to affordable, reliable, sustainable and modern energy for all by 2030, and a specific Target on energy access, Target 7.1: ensure universal access to affordable, reliable and modern energy services. The adjectives affordable, reliable, and modern are explicitly included in Target 7.1, while the remaining adjective, sustainable, is included in Target 7.2: increase substantially the share of renewable energy in the global energy mix and, indirectly, in Target 7.3: double the global rate of improvement in energy efficiency. What is interesting to note is that the achievement of Target 7.1 does not pass through the development of renewable energy systems per se, but it might be achieved through other types of modern energy systems, provided that they are affordable and reliable. **The 2030 Agenda recognizes energy as an enabling factor for the achievement of all the other Goals** and in particular of SDG 13, the goal on climate action. This relation is bidirectional, meaning that mitigation of climate change is positively driven by the deployment of sustainable energy services, and that the integration of climate change mitigation strategies into national policies positively contributes to the deployment of sustainable energy solutions.

Another pivotal momentum in the path towards sustainable energy is represented by the Paris Agreement negotiated in December 2015 Paris Climate Conference (COP21), signed and ratified by 127 Parties of 197 Parties (as of January 2017) to the United Nations Framework Convention of Climate Change (UNFCCC) and entered into force on 4 November 2016.

Energy is central to social and economic well-being, but it is also the dominant contributor to climate change. Therefore, transforming our energy system into a sustainable and modern one is the driver of social and economic growth and will also play a crucial role in the achievement of the 2030 Agenda objectives and in closing the gap to the mitigation targets of 2°C and 1.5°C defined by the Paris Agreement (UNFCCC, 2015).

The EU has played an active role throughout the whole process and is committed to implementing the 2030 Agenda and the SDGs within the EU and beyond its borders in development cooperation with partner countries. The Agenda reflects many of the EU's priorities for sustainable development, as set out in recent European Commission Communications and Council Conclusions.

On 22 November 2016, the EU has presented its response to the 2030 Agenda and the SDGs and has adopted a sustainable development package consisting in:

1. An overarching Communication on next steps for a sustainable European future accompanied by a Staff Working Document that describes in broad terms the contribution of the various EU policies and legislation to the SDGs (European Commission, 2016a).

2. A new common vision for development policy for the EU and its Member States included in a European Commission Communication that will serve as the basis for further discussions with the Council and the European Parliament (European Commission, 2016b).

3. A post-Cotonou framework on the future relations and a renewed partnership after 2020 with the African, Caribbean and Pacific Group

of States, included in a Joint Communication to the Council and the European Parliament (European Commission, 2016c).

In addition, the European Parliament resolution of 1 December 2016 on access to energy in developing countries acknowledges Africa as the continent with the greatest potential for renewable energy and at the same time as "the one lagging further behind in terms of electrification"(European Parliament, 2016).

The priorities proposed by the European Commission and the Africa-EU Strategic Partnership, the formal channel through which the EU and the African continent interact, are to focus on achieving peace and stability, unleashing economic opportunities, managing migration, achieving strong institutions and good governance and ensuring access to affordable and reliable energy sources. If it is true that Africa still faces several challenges, it is also a continent of huge opportunities.

In conclusion, the renewed partnership with African countries will be realized on the basis laid down in the Joint Africa-EU Strategy, the Agenda 2030, the Paris Agreement and around the idea launched in Davos by the President of the EIB, Werner Hoyer, to consider Africa in terms of economic perspectives and opportunities and not just as a recipient of donations.

06 Financing energy access in Africa

The Addis Ababa Action Agenda on Financing for Development (United Nations, 2015b), adopted by the Third International Conference on Financing for Development in July 2015, is a pivotal component of 2030 Agenda and in particular of its Goal 17 and Target 17:3 as a means of implementation: mobilize additional financial resources for developing countries from multiple sources.

In Addis, it has been acknowledged that for development efforts to take hold **Official Development Assistance (ODA) would have to be complemented by domestic resource mobilization** (because "each country has primary responsibility for its own economic and social development" - United Nations, 2015b) and global practices allowing to generate investments from the private sector and to promote affordable and stable access to credit. These changes are required so that the international community and the EU can support partner countries in tackling economic, social, and environmental challenges.

Different mix of policies and energy portfolios aimed at expanding access to energy involve different investment needs. The first **challenge** in the expansion of electricity infrastructure lies in the **difficulty to finance large-scale projects in risky and institutionally unstable environments** that contribute to raise the cost of capital. Country risk due to political instability, policy risk due to lack of a stable regulatory framework, and financing risk due to immature financial institutions and markets, are the most typical risks investors need to face if they mean to invest in developing countries, and in particular in Africa.

Public-Private Partnership (PPP) has become the most valuable instrument for energy projects financing, where challenges for access to capital can be greater, given the large up-front investment required, and risk can be higher due to the long-term investment horizon of each investment decision. If risk is the main driver of supply and demand for finance, risk sharing is the fundamental characteristic of a PPP agreement because it facilitates the commitment of the public actors and at the same time the attractiveness of investment for the private actors (Alloisio I., Carraro C., 2015).

While a lot of attention has been focused on PPP advantages in terms of fiscal leveraging of projects, **governments look to the private sector to help them deliver infrastructure** for a number of other reasons: i. using PPPs as a way of gradually **exposing governments and state-owned enterprises to increasing levels of private sector participation** and structuring PPPs in a way to ensure transfer of skills; ii. exploring PPPs as a way of introducing private sector technology and innovation in order to provide better public services through improved operational efficiency; iii. utilizing PPPs as a way of **developing local private sector capabilities through joint ownership with large international firms**. In this perspective, the private sector has a crucial role as an engine of development of the African continent, balancing business and the local socio-economic growth objectives in a long term perspective.

The European Commission Communication of 2011 “An Agenda for Change” reads as follows: “The EU will further develop blending mechanisms to boost financial resources for development, building on successful experiences such as the European investment facilities or the EU-Africa Trust Fund for infrastructure”. “(…) **a higher percentage of EU development resources should be deployed through existing or new financial instruments**, such as blending grants and loans and other risk-sharing mechanisms, in order to leverage further resources and thus increase impact” (European Commission, 2011).

Established in 2007 the EU-Africa Infrastructure Trust Fund (EU-AITF) aims to increase investment in infrastructure in Sub-Saharan Africa by blending long-term loans with grant resources to gain financial and qualitative leverage as well as project sustainability. One of the two financing envelopes of the EU-AITF, the SE4ALL envelope, is addressed to finance access to energy in Africa. Therefore, Sub-Saharan Africa was identified among the regions the most in need for development cooperation and financial contribution by the EU.

In 2012 José Manuel Barroso launched a new initiative named Energising Development to provide sustainable energy access for an additional 500 million people in developing countries by 2030. The Commission’s proposals include a new EU Technical Assistance Facility worth 50 million euros over two years to develop technical expertise in developing countries, and to promote capacity building and technology transfer.

Against this background, in September 2016 a new **European External Investment Plan** (EIP) (European Commission, 2016d) to encourage investment in Africa and in the EU-Neighbourhood, to strengthen partnerships and contribute to achieve the Sustainable Development Goals was announced. The EIP has been conceived with a dual objective to face EU migration challenges by developing stronger and more developed societies beyond EU boarders and, at the same time, to facilitate EU private enterprises exporting their businesses outside the EU in countries with a more stable economic and political environment. The EIP will support the implementation of the new Partnership Framework and the achievement of Agenda 2030 in Africa.

At the centre of the EIP lies the creation of a new **European Fund for Sustainable Development** (EFSD) (European Commission, 2016e) composed of regional investment platforms, which will combine financing from existing blending facilities and the EFSD Guarantee from resources stemming from the EU budget and the 11th European Development Fund. The EFSD is expected to trigger additional public and private investment volumes, mobilising total investments of up to 44 billion euros (based on EUR 3.35 billion contribution from the EU budget and the European

Development Fund) and up to 88 billion euro should Member States also contribute to the blending financing mechanism (Figure 6.1).

The concept of **blending finance** is very important because by combining EU grants with loans or equity from public and private financiers allows to attract needed private capital and engage the local private sector. Indeed, the engagement of local stakeholders and civil society and the alignment with beneficiary countries' development plans and with their National Determined Contribution (NDCs), submitted under the Paris Agreement, is fundamental for an inclusive sustainable development in Africa.

The importance of local ownership and the need for adequate financial flows are underlined in the European Parliament resolution of 1 December 2016 on access to energy in developing countries. The resolution reads as follows: "inconsistent flows of climate finance and technology transfer in relation to climate change may jeopardise African leaders' willingness to develop renewable energy to fulfil the industrialisation agenda of the continent" (European Parliament, 2016) and calls for a substantial portion of funding to be devoted to train local and highly specialised staff in order to ensure access to energy in developing countries.

The resolution calls on the Commission to avoid granting funds to any project, which would be viable as such, and acknowledges the need for a growing contribution from private investment in order to achieve access to energy (SDG 7). Finally, the resolution emphasizes the role of energy as an enabler for the achievement of other SDGs, such as health for all (SDG 3), quality education for all (SDG 4), clean water and sanitation (SDG 6), zero hunger (SDG 2).

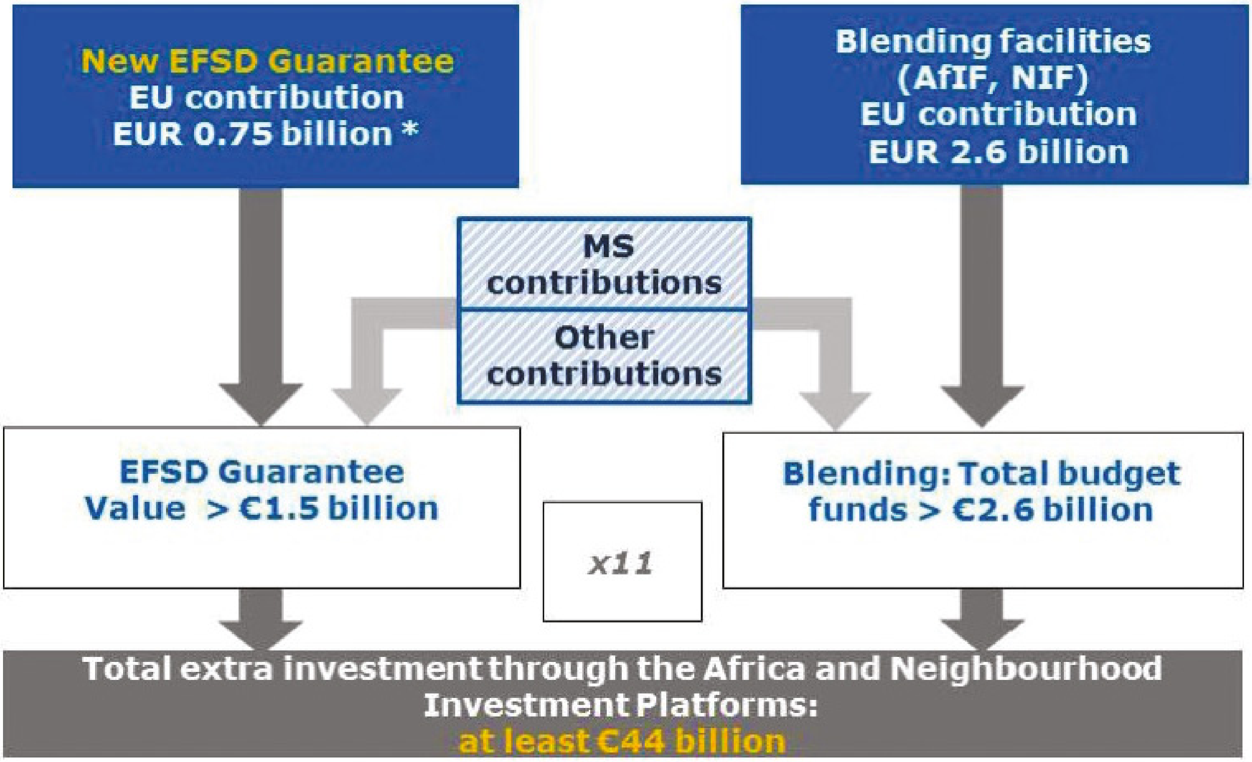

Figure 6.1 *The European Fund for Sustainable Development (source: EU, 2016e)*

**plus 0.75 billion euros of contingent liability*

Policy conclusions

This report has reviewed the current status and future trends of energy poverty alleviation policies in Africa, highlighting a series of challenges and policy priorities. The main issues which emerge from this appraisal can be summarized as follows:

• Lack of access to electricity and reliance on traditional cooking methods is pervasive in Africa, and are not expected to significantly improve without dedicated policies (section 1).

• This is hindering Africa's ability to transition from an agricultural to a manufacturing and service based economy, thus impeding economic growth and wellbeing, and exacerbating inequalities (Section 2).

• Energy poverty alleviation programmes have been implemented in a number of developing economies in and outside Africa, but require enabling institutional and market conditions to become successful (Section 3).

• Providing electricity access will require investments both off and on grid, with expected investment needs in the next 20 years possibly exceeding 1 USD Trillions (Section 4).

• The combination of natural gas and renewables provides the most affordable option to simultaneously achieve energy access and other sustainable goals (Section 4).

• The 2030 Agenda provides a unique opportunity to facilitate the energy transition in Africa, and the EU commitment, both in financial and political terms, will be crucial in ensuring it (Section 5).

• Financing large scale energy projects will be possible only thorough collaboration between governments and the private sector, de-risking instruments allowing for a lower overall capital cost, and blending finance giving blended return for investors. In this context, EU investments funds can play a significant role (Section 6).

• The development of clean energy sources in Africa is a further and great opportunity for partnership with private sector and international institutions (Section 6).

• At the household level, innovative financing mechanisms coupled with behavioral interventions can alleviate credit constraints and help climb the energy ladder. The EU can help implement and evaluate such policy programmes (Section 3).

Africa enormous untapped potential, in terms of human capital, physical resources and ecosystems, coupled with rapidly expanding population and economy, make it the ideal target of innovative policy interventions and private investments aimed at sustainable development. The policy agenda of the Sustainable Development Goals and the EU commitments to African development open up new public private collaborations for filling the investment gaps, especially for what concerns electrification of the energy system.

The combination of low carbon fuels such as natural gas and bioenergy with renewables offers a promising avenue for alleviating energy access while promoting a sustainable and low carbon energy system.

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Fondazione Eni Enrico Mattei
Corso Magenta 63, Milano – Italia

Tel. +39 02.520.36934
Fax. +39.02.520.36946

E-mail: letter@feem.it
www.feem.it

Fondazione Eni Enrico Mattei