

## 1. Stylized facts

Energy is a key condition to guarantee access to clean water, sanitation, schooling and business in developing countries and represents a key factor for growth and development. From a general point of view, it is still debatable whether access to affordable, reliable, safe and clean energy should be considered a human right or an instrumental right, as fundamental needs may be guaranteed through energy. However, not only the clear correlation patterns between modern energy and economic and human development, but also the strong evidence on the causal relationship of access to modern energy on welfare and quality of life are sufficient elements to clearly underline the crucial role of access to modern energy in sustainable development.

Access to modern energy services is intended as access to electricity and to modern and clean cooking facilities. Access to modern energy may allow reallocation of household time (especially by women and children) from energy provision to improved education and income generation. People can benefit, through better lighting, from greater flexibility in time allocation through the day and evening. It also allows access to IT and media. When combined with other infrastructures, access to modern energy services lowers transportation and communication costs, favors better access to markets and information. Access to electricity may also improve rural productivity, due to the introduction of technology and therefore may directly contribute to household income and push labor supply in non-agricultural activities. It is also a key element for safer food processing and storage, for example through refrigeration.

Energy poverty is defined as lack, scarcity or difficulty in accessing modern energy services by households; in particular it refers to access to electricity and to modern and clean cooking facilities. The International Energy Agency estimates that currently 1.26 billion people (18% of worldwide population) lack access to electricity and 2.64 billion (38% of global population) rely on traditional cooking methods based on the use of biomass with severe consequences on health due to indoor air pollution (IEA, 2013). This is “only” 300 million people less than in 2000, the first year in which the International Energy Agency has started tracking electricity access data. The global trend hides very stark differences among regions (IEA, 2014b).

The geographical distribution of such phenomena is uneven across the world: 84% of people lacking access to modern energy services live in rural areas; people without electricity are mostly in developing Asia (51%) and Africa (44%), similarly those still relying on traditional cookstoves and fuels are concentrated in developing Asia (72%) and Africa (25%). Today the largest populations without electricity are in India, Nigeria, Ethiopia, Bangladesh, Democratic Republic of Congo and Indonesia, even though some of those countries have electrification programs in place. Progress has been registered in some countries in Africa, but overall in most Sub-Saharan African countries the extension of electricity access struggles to keep pace with a fast growing population that outpaces the efforts in place. This feature is confirmed by the distribution of energy use in which results are stubbornly unequal among human beings living in different parts of the planet: in 2010 world per capita energy use was 1.9 ton of oil equivalent (henceforth toe) with a minimum in Eritrea (0.13 toe) and a maximum in Iceland (16.9 toe), a range that is 9 times the average.

Energy poverty is becoming more and more important even in developed countries. Although there is not a consensus on the definition, fuel poverty in developed countries describes the situation whereby households struggle to afford adequate energy services (Thomson and Snell, 2013). For example, it has been estimated that 9.8% of households in EU27 and 15.8% of households in the 12 new Member States could not afford to heat their home adequately in 2011 (Thomson and Snell, 2013).

Regarding access to modern cooking stoves, 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., 2012; 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 IEA's scenarios, global energy poverty will not change significantly by 2030: about 1 billion people will still lack electricity, with strong improvements in Latin America, Middle East and developing Asia but no progress in Sub-Saharan Africa. 2.5 billion people will still rely on biomass for cooking, basically with no progress in absolute terms with respect to the current situation.

The achievement of universal access to modern energy, one of the international targets to reach by 2030, is also complicated by the urgent need to reduce the role of fossil fuels in the world energy mix in order to curb greenhouse gas (GHG) emissions. The risks of climate change have been underlined by the last Intergovernmental Panel on Climate Change (IPCC) report: global temperatures are projected to rise over the 21st century under all scenarios and called for action to boost mitigation efforts to reduce GHG emissions, which continue to grow driven by economic and population dynamics (IPCC, 2014).

Universal access to modern energy services, environmental sustainability and economic development may be seen as a trilemma: it seems impossible to reach all targets at the same time under budget constraints which have become even tighter after the recent crises. Solutions which could reconcile these three elements are possible, but dedicated strategies and policies need to be developed by several actors at different levels of decision-making, from individuals to international organizations, including governments, private sector and civil society. The present paper analyzes the different components of the trilemma and their inter-connections, then it provides a short description of current most important international initiatives, finally we propose some policy suggestions which could contribute to the ongoing debate.

