

Modern energy for all¹

There is growing recognition that modern energy is crucial to achieving a range of social and economic goals relating to poverty, health, education, equality and environmental sustainability, and this recognition is reflected in a number of new initiatives. A United Nations High Level Panel of Eminent Persons has recommended that universal access to modern energy services be included in the Post-2015 Development Agenda. The United States has launched a Power Africa initiative, aimed at doubling electricity access in sub-Saharan Africa over five years. At the time of writing, 77 developing countries have signed up to the UN Sustainable Energy for All (SE4All) initiative, including many of those with the largest populations lacking access to modern energy. Many businesses, aid organisations and non-governmental organisations have also joined the SE4All initiative.

Alongside this increase in political focus, the last year has seen new analysis which increases our understanding of energy access. The first major analytical report produced under the SE4All initiative, *Global Tracking Framework*, which was led by the IEA and the World Bank, defines the starting point against which progress can be measured and the scale of the challenge understood (IEA and World Bank, 2013). In addition, new research finds that there are 3.5 million premature deaths each year as a result of household air pollution from using solid fuels (rising to 4 million, if the contribution of household air pollution to outdoor air pollution is included). This figure is much higher than previous estimates, primarily due to the inclusion of new diseases, such as cardiovascular disease and lung cancer (Lim, *et al.*, 2012).

Current status of energy access

Modern energy for all is far from being achieved. We estimate that nearly 1.3 billion people, or 18% of the world population, did not have access to electricity in 2011 – 9 million fewer than in the previous year (Table 2.3).² The global improvement since last year is modest, while the picture for some countries has worsened. Sub-Saharan Africa and developing Asia account collectively for more than 95% of the global total. The population without access to electricity in sub-Saharan Africa is now almost equal to that of developing Asia and, if current trends continue, will overtake it in the near future.³ Since 2000, around two-thirds of the people gaining access to electricity have been in urban areas and the population without electricity access has become more concentrated in rural areas.

1. In this analysis, we define access to modern energy services as household access to electricity and clean cooking facilities. It is recognised that this excludes some important categories, such as access to energy for productive use, for community services and for heating. While this is an imperfect situation, such categories are often excluded from quantitative analysis of energy access due to the lack of comprehensive, reliable data. See *WEO-2012* and our energy access methodology for a fuller discussion of these issues, both available at www.worldenergyoutlook.org/energydevelopment.

2. Our estimates are based on 2011 data where available or an estimate based on latest available data.

3. *WEO-2014* will include a special focus on energy developments in Africa.

Table 2.3 ▶ Number of people without access to modern energy services by region, 2011 (million)⁴

	Without access to electricity		Traditional use of biomass for cooking*	
	Population	Share of population	Population	Share of population
Developing countries	1 257	23%	2 642	49%
Africa	600	57%	696	67%
Sub-Saharan Africa	599	68%	695	79%
Nigeria	84	52%	122	75%
South Africa	8	15%	6	13%
North Africa	1	1%	1	1%
Developing Asia	615	17%	1 869	51%
India**	306	25%	818	66%
Pakistan	55	31%	112	63%
Indonesia	66	27%	103	42%
China	3	0%	446	33%
Latin America	24	5%	68	15%
Brazil	1	1%	12	6%
Middle East	19	9%	9	4%
World***	1 258	18%	2 642	38%

* Based on World Health Organization (WHO) and IEA databases. ** Since *WEO-2012*, population numbers for India have undergone a significant upward revision (See Chapter 1 for population assumptions), meaning that, while the electrification and clean cooking access rates have not changed, the number of people estimated to be without access has significantly increased. See also footnote 19. *** Includes OECD countries and Eastern Europe/Eurasia.

At a country level, the latest estimates confirm the progress that China and Brazil have made over many years in increasing access to electricity and that they are now getting close to the goal of universal electrification. In Asia, the latest estimates reveal improvements in electricity access in Bangladesh, Indonesia and Sri Lanka. India remains the country with the largest population without electricity access at 306 million people.⁵ Experience in Pakistan serves to highlight a different element of the energy access challenge, that of achieving reliability of supply, as fuel shortages have jeopardised electricity supply there and resulted in prolonged load-shedding (Box 2.2). In Africa, the latest estimates reveal

4. For a complete country-by-country breakdown, the IEA *World Energy Outlook* electricity access database can be accessed at www.worldenergyoutlook.org/resources/energydevelopment.

5. Our estimates for India are based on the latest National Sample Survey and are in line with those published in India's 12th Five-Year Plan (Planning Commission of India, 2013). However, the Five-Year Plan also notes that the 2011 Census of India reports a 67.2% national electrification rate, which is lower than the latest National Sample Survey. Applying the rate reported in the Census results in the estimated number of people in India without access to electricity increasing to around 410 million in 2011, which would change our global estimate to around 1.4 billion. India's 12th Five-Year Plan notes this difference in estimates, stating that it is possibly due to differences in questionnaire design and that it needs to be looked into further.

improvements in South Africa, Ghana, Cameroon and Mozambique, all of which have explicit plans in place to boost electricity access. The Power Africa initiative is supporting these efforts, with the US government having committed more than \$7 billion, through a combination of loans, guarantees, credit enhancements and technical assistance. Private companies have agreed to put up an additional \$9 billion (US Government, 2013). Partner countries already include Ethiopia, Ghana, Kenya, Liberia, Nigeria and Tanzania; around 40% of those without access to electricity in sub-Saharan Africa live in these countries. In Latin America, the overall level of access to electricity is high, but some countries still have relatively low electrification rates, such as Honduras (83%), Guatemala (82%) and, particularly, Haiti (28%).

Box 2.2 ▶ Fuel shortages in Pakistan

Pakistan faces economic and energy challenges that intersect most clearly in relation to electricity supply. Around 55 million people – more than 30% of the population – do not have access to electricity. Of those that do have electricity, the quality of supply they receive can be a major source of frustration. While Pakistan has 23 GW of installed power generation capacity, the cost of fuel has proved to be a significant financial burden to generators, relative to the price they can charge for power, resulting in shortages and power cuts. The share of oil in the generation mix is relatively high and the doubling of electricity tariffs since 2008 has not been sufficient to compensate for rising fuel costs. The problem is made worse by a long legacy of unpaid energy bills and distribution losses (often due to theft). State-owned power companies have faced large losses and accumulated debt that government subsidies are unable to cover fully. This has resulted in power companies being unable to buy sufficient fuel, which, in turn, has prompted extensive load shedding – up to 12 hours per day in urban areas and 20 hours per day in rural areas (NEPRA, 2012). Such prolonged power shortages have a major impact on Pakistan's economy, cutting GDP growth by an estimated 2% (ADB, 2013).

The Asian Development Bank is supporting government efforts to increase power generation capacity, improve transmission and distribution, and deliver renewable energy projects. Pakistan has also recently agreed funding support from the government of Saudi Arabia to complete a 1 GW hydro project (Arab News, 2013) and, in September 2013, reached agreement with the International Monetary Fund on a \$6.7 billion loan, linked to energy sector reforms. In mid-2013, the government also took steps to help clear the debt of independent power producers. In the longer term, the power sector will need to be restructured, including the introduction of tariffs that fully reflect underlying costs and better revenue collection and enforcement. Such reforms can be easier to implement as the quality of service improves.

We estimate that more than 2.6 billion people, or 38% of the global population, relied on the traditional use of biomass for cooking in 2011 – 54 million more people than in the previous year.⁶ This deteriorating situation is primarily due to population growth outpacing improvements in the provision of clean cooking facilities. The estimates reveal a worsening situation in sub-Saharan countries such as Nigeria, Uganda, Kenya and Tanzania. Developing Asia accounts for more than 70% of the global total and includes seven of the ten largest populations without access to modern cooking facilities. In India, 818 million people, or around two-thirds of the population, rely on traditional biomass – almost twice as many as in China, which is ranked second. In China, the predominance of coal for cooking has decreased over the last decade, but around one-third of the population still relies on traditional biomass. While the number of people relying on biomass is larger in developing Asia than in sub-Saharan Africa, the share of the population is lower: 50% in developing Asia, compared with 80% in sub-Saharan Africa.

Several countries are taking action to expand access to clean cooking facilities. Indonesia has set a highly ambitious target of enabling 85% of households to use LPG or natural gas for cooking by 2015. The kerosene-to-LPG conversion programme implemented in 2007 has successfully decreased the use of kerosene, a relatively polluting fuel, but the shift from biomass to gas remains a challenge. While subsidies to LPG represent an important cost of transition to clean fuels in Indonesia, they represent a net saving in cases where households are switching from kerosene, which receives higher subsidies. In Africa, Ghana's government has committed to the very ambitious goal of bringing LPG to half the number of households, more than doubling the current level. Nigeria, Africa's most populous country, has set a national goal of helping 10 million households (around one-third of the total) to switch to clean cooking facilities by 2021; Nigerian households currently rely heavily on traditional biomass for cooking despite the country's abundant fossil fuel resources. International efforts are also being stepped up. The Global Alliance for Clean Cookstoves plans to promote the adoption of clean cookstoves and fuels to 100 million households by 2020 (GACC, 2012). It has prioritised action in six countries: Bangladesh, China, Ghana, Kenya, Nigeria and Uganda. While relatively small in scale, some other new clean cookstove projects are noteworthy because of the involvement of multinationals and the commitments made to manufacture clean cookstoves in Africa, bringing economic, as well as health, benefits. Examples include partnerships between the firm Philips and the Industrial Development Corporation of South Africa, and between the firms General Electric, Burn Manufacturing, and the US Overseas Private Investment Corporation. Such developments are encouraging, but evaluation is needed of their success in increasing adoption and changing behaviour (and, ultimately, improving health).

6. This chapter focuses on the traditional use of biomass for cooking, but there are also 200-300 million people (not included in Table 2.3) that rely on coal for cooking and heating purposes, which can potentially have serious health implications when used in primitive stoves. These people are mainly in China, but there are also significant numbers in Liberia, Democratic People's Republic of Korea and Paraguay.

Outlook for energy access in the New Policies Scenario

In the New Policies Scenario, the number of people without access to electricity is projected to decline by more than one-fifth to around 970 million in 2030, or 12% of the global population (Table 2.4).⁷ Around 1.7 billion people are expected to gain access over the period to 2030 but, in many cases, these gains are offset by population growth (increases by 1.4 billion to 2030). While there is an improving global picture, the regional trends are very diverse. Developing Asia sees the number of people without access to electricity decline by around 290 million between 2011 and 2030. China is expected to achieve universal access within the next few years. India sees a significant improvement: its electrification rate rises from 75% today to around 90%, but the country still has, in 2030, the largest number without access to electricity in any single country.

Table 2.4 ▶ Number of people without access to modern energy services by region in the New Policies Scenario, 2011 and 2030 (million)

	Without access to electricity		Without access to clean cooking facilities	
	2011	2030	2011	2030
Developing countries	1 257	969	2 642	2 524
Africa	600	645	696	881
Sub-Saharan Africa	599	645	695	879
Developing Asia	615	324	1 869	1 582
China	3	0	446	241
India	306	147	818	730
Latin America	24	0	68	53
Middle East	19	0	9	8
World	1 258	969	2 642	2 524

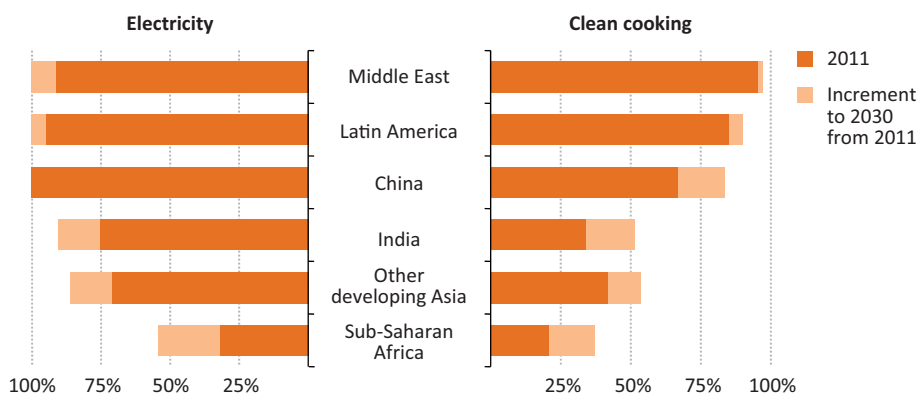
In sub-Saharan Africa, the number of people without access to electricity in 2030 is projected to reach 645 million, 8% more than in 2011. It is the only region where the number of people without access to electricity deteriorates over the *Outlook* period, resulting in sub-Saharan Africa's share of the global total increasing from less than half in 2011 to two-thirds in 2030. Developments in sub-Saharan Africa are not uniform across the projection period, with the rise in the numbers lacking access levelling off in the 2020s and a decline beginning just before 2030. Brazil is projected to achieve universal access in the next few years – the aim of its “Luz para Todos” (Light for All) programme (see the Brazil Energy Outlook in Part B) – while the rest of Latin America is projected to achieve universal access around 2020.

The number of people relying on the traditional use of biomass for cooking is projected to drop slightly, to just over 2.5 billion in 2030 – around 30% of the global population at that time. Economic growth, urbanisation and clean cooking programmes all help improve the

7. While the *Outlook* period for *WEO-2013* is 2011 to 2035, analysis in this section is based on the period 2011 to 2030, so as to be consistent with the timeframe of the SE4All initiative.

situation in developing Asia, where the number of people without clean cooking facilities declines by around 290 million. Despite this, India still has around 730 million people without clean cooking facilities in 2030, equivalent to half of the population (Figure 2.17). While the overall picture has improved slightly compared with *WEO-2012*, our projections continue to show a worsening situation in sub-Saharan Africa, where nearly 880 million people (63% of the population), do not have access to clean cooking facilities in 2030.

Figure 2.17 ▶ Shares of population with access to electricity and clean cooking facilities by region in the New Policies Scenario



Energy for All Case

A trajectory consistent with achieving universal access to electricity and clean cooking facilities by 2030 has been drawn up in the Energy for All Case. To arrive at the required trajectory, in the case of electricity, we assess the required combination of on-grid, mini-grid (such as village or district level generation) and isolated off-grid solutions (such as solar PV) in each region, taking account of regional costs and consumer density in determining a regional cost per megawatt-hour (MWh). When delivered through an established grid, the cost per MWh is cheaper than other solutions, but extending the grid to remote areas can be very expensive and incur high transmission losses.⁸ In developing Asia, around three-quarters of people gaining access are connected to the main grid or to mini-grid systems. In sub-Saharan Africa, more people gain access through off-grid solutions, as a larger proportion of the population lacking access live in rural areas. In the case of clean cooking facilities, access is also assumed to be achieved through different technologies: one of the most common options is LPG stoves, adopted by 7 million households per year on average in developing Asia and 5 million households per year in sub-Saharan Africa over the projection period.

8. We assume that grid extension is the most suitable option for all urban zones and around 30% of rural areas, but not in more remote rural areas. The remaining rural areas are connected either with mini-grids (65% of this share) or small, stand-alone off-grid solutions (the remaining 35%), which have no transmission and distribution costs.

Universal access to modern energy has only a small impact on global energy demand and related CO₂ emissions. The additional energy demand for electricity generation is around 120 Mtoe, pushing total primary energy demand up by less than 1% relative to the New Policies Scenario in 2030; but only around 35% of the additional generation comes from fossil fuels, with the remainder coming from renewables. For cooking, an additional 0.82 mb/d of LPG is required in 2030. The additional CO₂ emissions in the Energy for All Case are negligible, 260 Mt higher in 2030, and only 0.7% higher than in the New Policies Scenario. This small increase in CO₂ emissions is attributable to the low level of energy per capita expected to be consumed by the people gaining modern energy access and to the relatively high proportion of renewable solutions adopted. The total impact on greenhouse-gas emissions of achieving universal access to clean cooking facilities needs to be treated with caution, but it is widely accepted that advanced cookstoves, more efficient than traditional biomass stoves, would reduce emissions.

Chapter 2 – Extract: Modern energy for all

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