Sub-Saharan Africa continues to depend on inefficient cooking technologies

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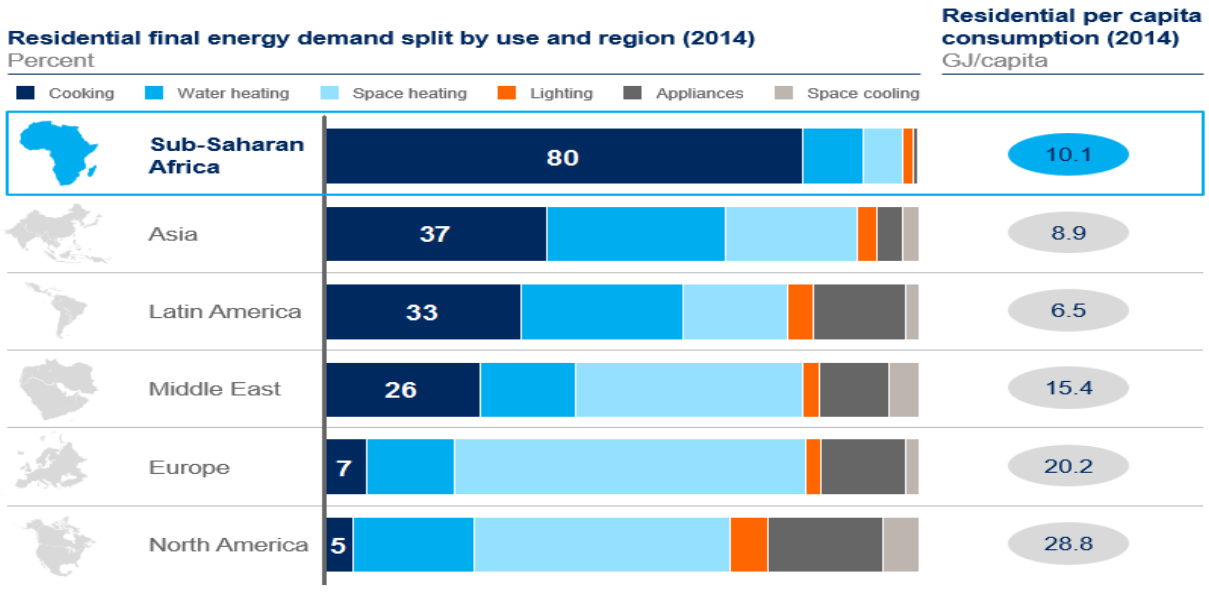
Residential energy demand in Sub-Saharan Africa is strongly dominated by cooking. Most of the cooking is done using inefficient and dirty biomass and basic technologies. Compared to modern technologies elsewhere in the world, Africa currently uses ten times as much energy to cook similar amounts of food. There are immense opportunities to improve energy efficiency, living standards, and the environment. However, in spite of continuous improvements, inefficient cooking technologies are expected to remain an environmental Achilles heel in Africa's energy landscape. McKinsey Energy Insights projections show that more than 1.8 billion people (65%) in Sub-Saharan Africa will remain dependent on wood or charcoal for their cooking even in 2050.

Cooking represents 80% of residential energy consumption across the Sub-Saharan region today (Exhibit 1). The vast majority (76%) of households depend on inefficient cookstoves, which consume twice as much energy as more efficient wood-based cookstoves and around ten times as much as alternative fuels such as natural gas or electricity. As a result, per capita residential energy consumption levels are higher in Sub-Saharan Africa than in Asia and Latin America. This is despite lower income levels and lagging infrastructure development in Africa, which keeps non-cooking residential energy use at less than half the level anywhere else.

Exhibit 1: Residential energy consumption in Africa is dominated by cooking

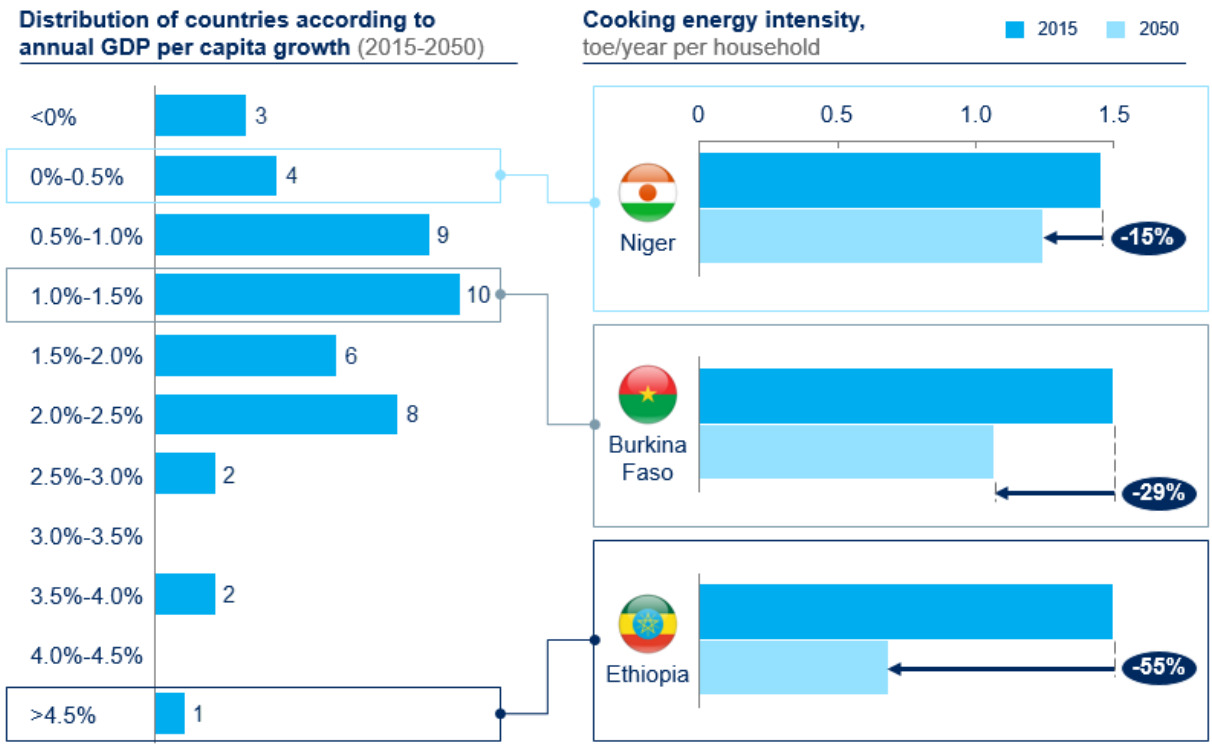


SOURCE: McKinsey Energy Insights Energy Demand Intelligence; Based on IEA data from World Energy Balances

The widespread use of basic cooking technologies also has a harmful impact on health, with an estimated 600,000 yearly deaths in Sub-Saharan Africa[1] caused by cooking fume inhalation. Furthermore, it causes environmental degradation through deforestation. Therefore, using more efficient methods would lead to major social and environmental benefits.

Africa will gradually adopt more efficient cooking technologies with economic development as the prime driver. The development will happen at multiple speeds (Exhibit 2), with leading countries expected to quickly transition to more efficient, lower energy-intensity cooking methods. As an example, Ethiopia with an expected average economic growth of 5% per annum from 2016 to 2050 will see an improvement of 55% in cooking energy intensity, while Niger's stagnating economy means it is only likely to achieve a 15% improvement over the same period. Urbanization, which tends to rise in tandem with economic growth, reinforces the trend toward greater efficiency, as does a faster development of distribution infrastructure.

Exhibit 2: The emergence of 'multi-speed Africa' also affects energy use for cooking, as richer countries reduce their energy intensity more rapidly



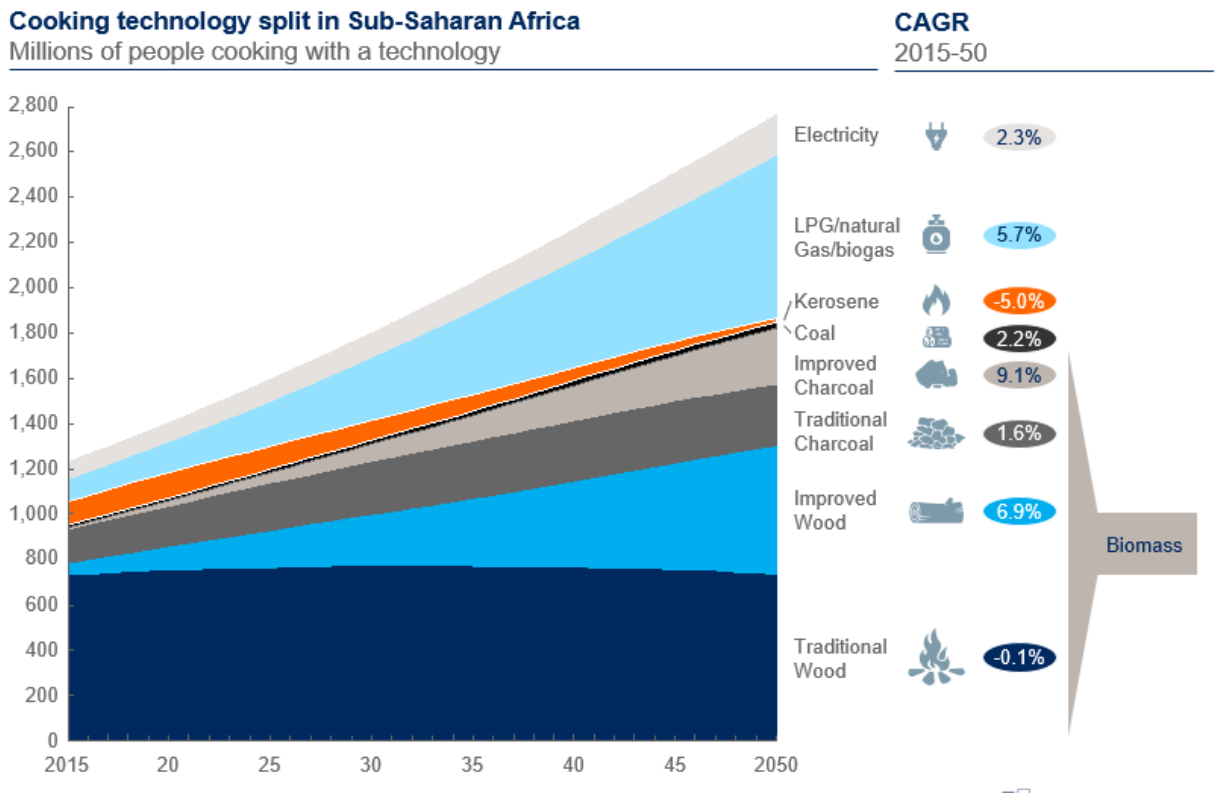
SOURCE: McKinsey Energy Insights Energy Demand Intelligence; GDP forecasts from McKinsey Global Institute and IHS (2016); United Nations Population Division (2016)

The transition to cleaner cooking will be hampered by rapid rural population expansion. Projections show the population in Sub-Saharan Africa will grow to 2.8 bn by 2050, from 1.2 bn today[2]. Many of these people are likely to remain relatively poor and rural, due to both limited

per capita economic growth and a strong dispersion of that growth. This makes it more difficult to expand access to cleaner cooking fuels as biomass is almost free and often widely available, while more modern technologies require both infrastructure and a recurring spend on cooking fuels.

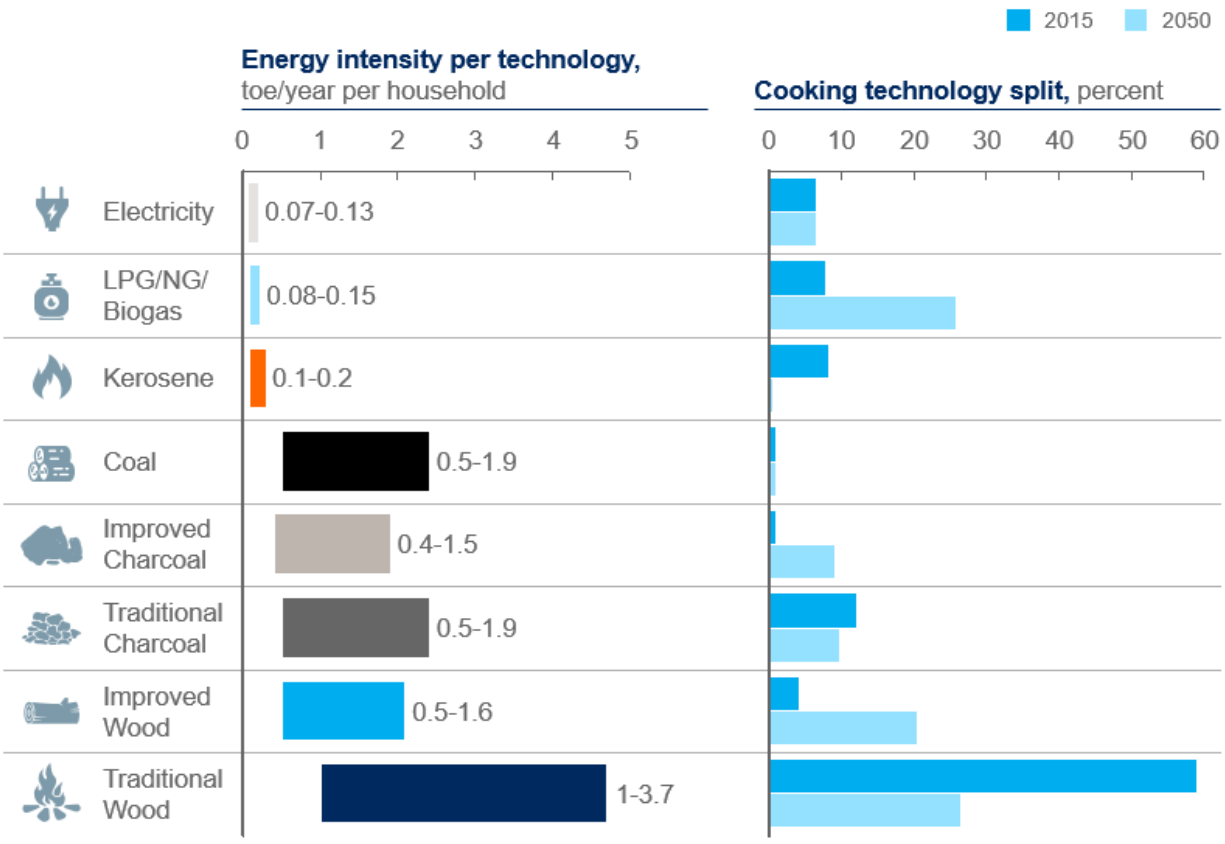
As a result, two thirds of the population will still depend on wood or charcoal by 2050 (Exhibit 3), representing 92% of residential energy demand in Sub-Saharan Africa. Nevertheless, we project a shift from traditional wood and charcoal cooking methods to improved and more efficient technologies, especially for wood: by 2050, only 55% of biomass stoves will be traditional three-stone fires, compared to 93% today.

Exhibit 3: Households gradually shift to cleaner cooking technologies, but more than 1.8 billion people will remain dependent on biomass by 2050



SOURCE: McKinsey Energy Insights Energy Demand Intelligence

Exhibit 4: Traditional biomass is inefficient for cooking



SOURCE: McKinsey Energy Insights Energy Demand Intelligence; © OECD/IEA 2014 Africa Energy Outlook, IEA Publishing

In terms of liquid fuel, LPG is expected to pick up significantly, whereas kerosene will be phased out (Exhibit 4). Underlying this is the cost difference between the two fuels, with kerosene being more expensive and often dependent on government subsidies. These subsidies will most likely be gradually reduced, making LPG not only a cleaner but also cheaper alternative. India saw a similar trend. In contrast to other regions, the role of electricity is likely to remain limited at 7% of population, since this depends heavily on infrastructure developments. Today, coverage remains patchy across the continent, although distributed solar grids could make a difference going forward.

The improvements in cooking efficiency will lead to an overall estimated fall in household cooking energy intensity of about 30% (from 1.1 toe/household to 0.77 toe/household) for the Sub-Saharan region. Yet, despite these improvements, our projections suggest the gap to the rest of the world will remain substantial.

Three important factors have the potential to improve this outlook.

Stronger economic growth. Other regions (for example, South East Asia) have shown that sharp income growth can lead to rapid improvements in cooking fuel efficiency.

Infrastructure development. Establishing an infrastructure for energy sources that can substitute inefficient wood and charcoal will accelerate progress. This also includes distributed solar-based grids that may make rural electrification easier and cheaper.

Effective policies and financing. Education, regulation and financial incentives, and aid can lead to rapid switches to more efficient cooking technologies (for example, the switch to LPG in Indonesia). A role can be played both by governments, that see the switch toward more efficient technologies as a lever to reduce carbon emissions, and international organizations targeting universal access to clean cooking by 2030.

Whether these factors will indeed lead to a brighter picture for Sub-Saharan Africa remains to be seen. Our base case projections show that huge efforts are required to significantly reduce the use of inefficient biofuels in the region.

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[1] Source: Institute for Health Metrics and Evaluation, Global Burden of Disease (GBD) 2015

[2] Source: United Nations Population Division (2016), The 2015 Revision of World Population Prospects to 2045