Energy Use in the Developing World by 2040

Dynamics of future energy demand in view

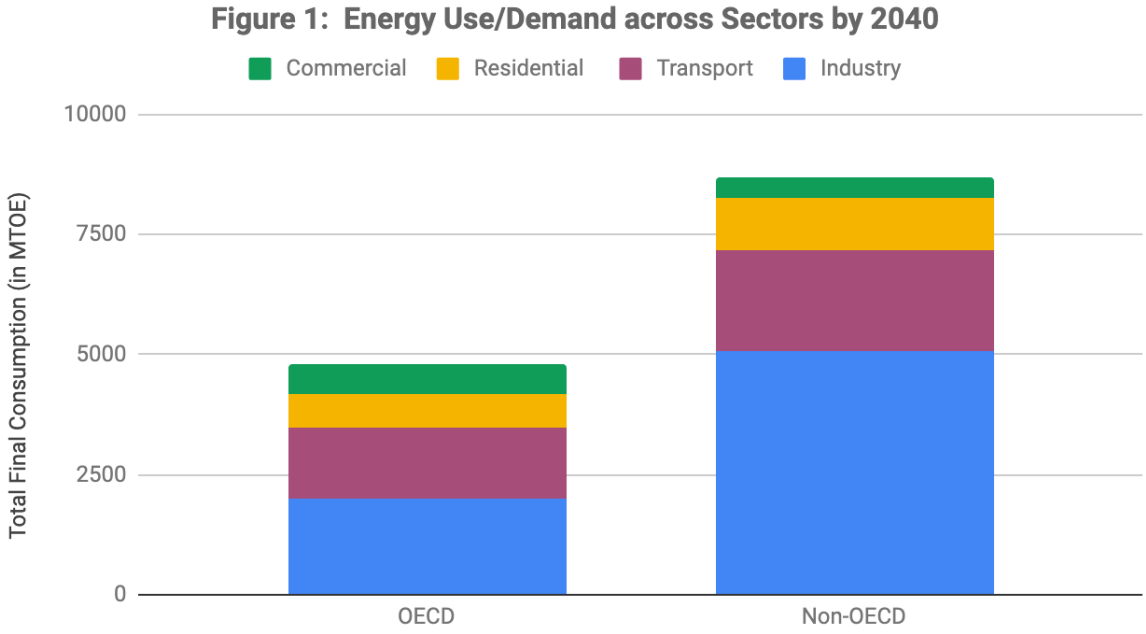
By
Precious C. Akanonu

At recent United Nations climate negotiations, the U.S under Trump administration, emphasize the message that "energy access and poverty eradication" are important goals that are not well addressed in climate negotiations. On the other hand, China is seen calling on rich countries to do better to "pay their climate debt" by reducing their energy use emissions and helping poor countries do the same. Both concerns are valid as they have implications for meeting poverty reduction and climate goals as enshrined in the Sustainable Development Goals (SDGs 1 and 13 respectively). In light of these concerns and the long-standing debate between green growth and degrowth, this analysis throws more light on the dimensions of future energy use and its implication for global goals, especially in the context of the developing world.

Energy demand projections[1] show that a global energy transition is underway. Based on projections by the US Energy Information Administration (EIA), BP, Exxon Mobil and IEA, developing countries would have a larger share of energy use, and thus should play a key role in future climate goals. While these studies have varying model assumptions, they reach similar conclusions regarding energy use growth between developed and developing countries. Specifically, they find that by 2040, developing countries will have around 67% of global energy use, up from 57% in 2017. China of course maintains the largest share of energy use. However, the fastest growth by far is expected to occur in India -- and to a lesser extent in Africa & other non-OECD Asia. But the slowest growth will occur in developing Europe & Eurasia, particularly, Russia.

Across sectors, industry will remain the largest contributor to overall growth in energy use for developing countries but will contribute twice as much as commercial, residential and transport sectors combined *(figure 1)*. Strikingly, by 2040, the industrial sector of developing countries is also expected to contribute more energy than all the sectors of developed countries combined *(figure 1)*. Within the industrial sector, chemicals production energy demand could grow by the fastest rate, but the heavy industry (e.g. steel and cement manufacturing) will maintain the highest share of energy demand growth and emission. For commercial and residential sectors, energy demand is overshadowed by electricity demand for lightning, electrical appliance and space cooling, as living standards rise in Asia and to a lesser extent Africa and the Middle East. For transport sector, energy demand by Heavy-Duty Vehicles (HDV) and Light-Duty Vehicles (LDV) are expected to be the largest by volume, but marine and aviation could grow the fastest by percentage. Importantly, the relative significance of industrial energy use suggests that development efforts which narrowly targets household demand for energy may not be as effective in reducing energy poverty, improving human development, and controlling the climate impact of energy demand.

[1] Projections are based on modelled assumptions about GDP growth, demographic changes, technological changes, and the impact of existing and proposed government policies. Projections discussed are baseline/reference scenarios showing where existing policies/measures (as at 2017-2018) might lead the energy sector.



Data Source: EIA International Energy Outlook (2017)

Why developing countries will consume around 67% of the world's energy by 2040.

Rising energy use for the biggest users is expected to be driven by economic growth - measured by Gross Domestic Product (GDP), urbanization, and population growth. For India specifically, energy use growth will be mostly driven by expanding economic output --well above rates in China and the rest of the world. For Africa, energy use growth is expected to be mostly driven by fast growing population and urbanization –fastest rates globally *(table 1)*.

However, for China, its current fast-growing energy use will begin to slow down around 2030s due to slower population growth and increasing transition away from energy-intensive industrial sectors towards less-energy intensive manufacturing and service sectors-- enabling it generate additional economic activity with lower energy use. This transition will be partly driven by stricter industrial standards in light of serious pollution concerns in China. This gives way for India, other developing Asia and Africa to pick up more heavy industrial production for global consumption by 2030s.

The slowest energy use growth for developing countries, however, is expected to come from developing Europe and Eurasia group, especially Russia, largely due to low population and economic growth as well as significant energy efficiency gains.

Table 1: Key Indicators for Energy Use, 2017-2040 (annual growth rate, %)

	Real GDP growth (%)	Population growth (%)	GDP per capita (%)	Urbanization rate (%)
India	11.0	0.83	7.1	2.8
Africa	3.8	3.15	3.8	5.6
China	5.4	0.01	6.7	1.4

Data Sources: Calculated using data from EIA International Energy Outlook (2017); IEA World Energy Outlook (2018); and World Bank Population Estimates and Projections (2018)

Energy intensity will decline, but not enough to stay on track with climate goals

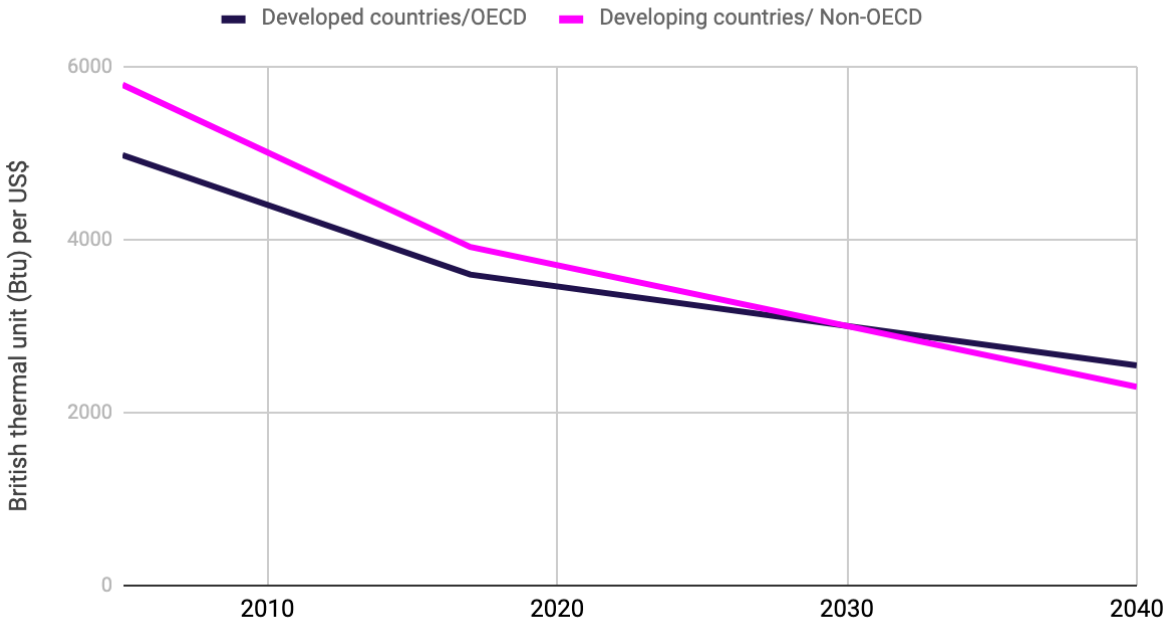
These energy demand projections also show that energy intensity (amount of energy used per GDP) in both developed and developing countries will continue to decline in the future.

This would lead to a reduction in energy intensity from around 1% p.a. (1950-2015) to around 2% p.a (2015-2040). The decline in energy intensity will be mostly driven by the decoupling of economic growth from energy demand, already ongoing in some developed countries. This decoupling is characterized by slower economic and population growth as well as shifts in economic structures from lower-skilled manufacturing to services and higher-skilled advanced manufacturing.

Interestingly, developing countries are expected to decouple by twice the rate of developed country grouping, on average, from around 2030s *(figure 2)*. This would come mostly from China where environmental concerns and air pollution will force the Chinese government promote better climate-sensitive industrial policies. Although decoupling occurs at a faster rate in the developing world, overall energy intensity remains high.

However, a 2% reduction in energy intensity is not enough to put the world on the path to meeting climate goals.

Figure 2: Declining Energy Intensity



Data Sources: Calculated using data from EIA International Energy Outlook (2017); IEA World Energy Outlook (2018); and World Bank Population Estimates and Projections (2018)

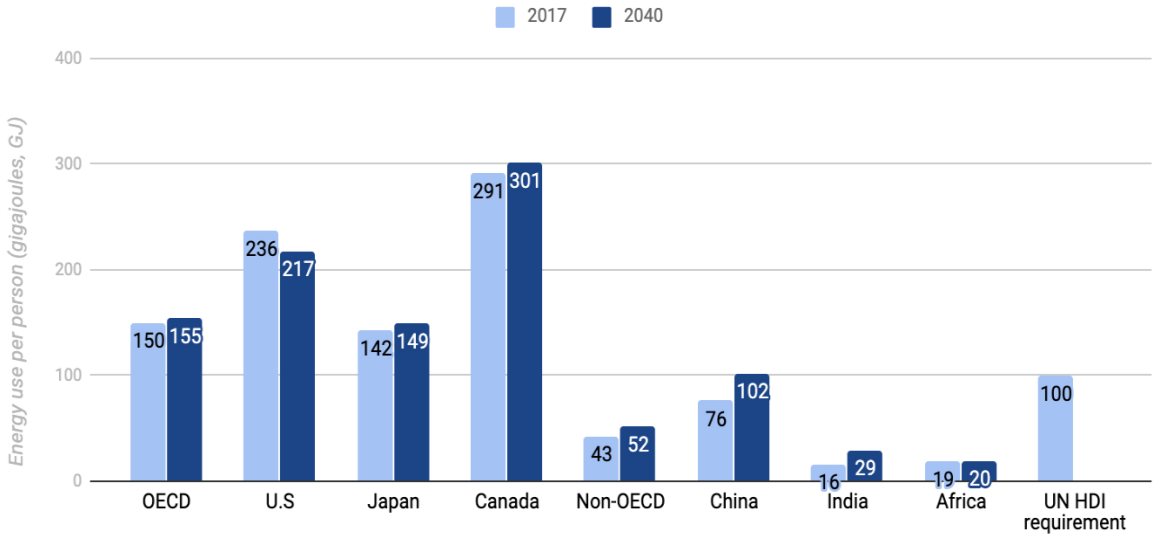
Despite energy demand growth, average energy use in many developing countries will remain below levels required for human development

The UN's Human Development Index (HDI) suggests that increases in energy consumption up to around 100 gigajoule (GJ) per head are associated with substantial increases in human development and well-being, after which the relationship flattens out. However, many developing countries will not attain that level by 2040 *(figure 3)*. Despite economic growth and prosperity of the Indian people, energy use per head increases only marginally. For Africa, its fast-growing population is expected to suppress the prosperity of its people, thus energy use per capita only rises by one unit to 20 GJ.

But interestingly, energy use per head in China (at 102 GJ) could meet UN standards for human development by 2040. Perhaps this would classify China as a developed country by 2040. It is important to note that, while China struggles environmental degradation due to the

high energy use and pollution of its industries, China's high energy use has also allowed for faster development, that will potentially transform it to a developed country by 2040. This case of China buttresses the environmental cost, yet value of high energy in driving development.

Figure 3: Energy use per person (gigajoules)



Data Sources: EIA International Energy Outlook (2017) and World Bank Population Estimates and Projections (2018)

Key Takeaways

Environmental and climatic concerns are vital variables for consideration, given its immediate long-term impact for our world. However, limiting energy demand through degrowth, especially for developing countries, would be inappropriate -- given the need for energy to drive human development and poverty reduction. Therefore, we need to think of a lower carbon and higher energy planet, bearing in mind both climate and socio-economic development goals, especially for developing countries where high energy level is required to lift people out of poverty.

Drawing on my recent grounding in the Ecomodernist ideology at The Breakthrough Institute, I believe any progress at advancing the twin goal (climate and poverty reduction) will require both: advanced technological innovations and piecemeal incremental policy changes to guide household and especially industry behavior. It would require unusual and equitable energy policy decisions to decrease the climate impact of energy use without reducing consumption, especially for developing countries where high energy is much needed.

The global community and developed countries will need to work with fast developing countries to minimize the environmental footprint of their industries, without minimizing production. Policies that encourage investments in initiatives that reduce emissions from industries, without constraining output, should be prioritized over household energy demand that are often in the forefront of development efforts. Carbon capture and storage for steelmaking, as well as non-emitting ways to produce cement are some good examples. Lastly, reducing the social and political barriers to a high and clean energy transition will require relevant stakeholders to continuously spread the message of hope and possibilities that will fuel government action and human ingenuity. As advocates of energy equity emphasize, "the way we use energy will become increasingly clean not by limiting consumption but by using expanded access to energy to unleash human ingenuity"