International Journal of Engineering Science Invention (IJESI)
ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726
www.ijesi.org || PP. 50-52

Energy for Human Development

V. Venkataramana
. Department of Economics, Sir C.R. Reddy Autonomous College, Eluru- 534 007, A.P., India.
Corresponding Author: V. Venkataramana

Access to modern energy services is fundamental to fulfilling basic social needs, driving economic growth and fueling human development. This is because energy services have an effect on productivity, health, education, safe water and communication services. Modern services such as electricity, natural gas, modern cooking fuel and mechanical power are necessary for improved health and education, better access to information and agricultural productivity. There are wide variations between energy consumption of developed and developing countries, and between the rich and poor within countries, with attendant variations in human development. Furthermore, the way in which energy is generated, distributed and consumed affects the local, regional and global environment with serious implications for poor people's livelihood strategies and human development prospects.

The linkage between energy services and human development is becoming a burning issue. It does so by comparing modern energy use in developed and developing countries and argues that a threshold of modern energy is required to achieve growth and improvement in human development. The effect of fossil fuel use is on greenhouse gas emissions and developing countries' capacity to adapt to climate change. It explores the dual challenge of mitigating climate change and meeting the energy demands of developing countries in a sustainable way. There are three main sections to examine this view. Section one examines inequalities in access to modern energy services and how they impact on livelihood strategies, health, education and human development in general. Section two looks at adaptation capacities of developing countries, whilst section three discusses strategies for mitigating climate change while at the same time meeting the energy demands of developing countries.

Energy development is the field of activities focused on obtaining sources of energy from natural resources. These activities include production of conventional, alternate and renewable sources of energy, and for the reuse of energy that would otherwise be wasted. Energy conservation and efficiency measures reduce the demand for energy development, and can have benefits to society with improvements to environmental issues. Societies use energy for transportation, manufacturing, illumination, heating and air conditioning, and communication, for industrial, commercial, and domestic purposes. Energy resources may be classified as primary resources, where the resource can be used in substantially its original form, or as secondary resources, where the energy source must be converted into a more conveniently usable form. Non-renewable resources are significantly depleted by human use, whereas renewable resources are produced by ongoing processes that can sustain indefinite human exploitation.

Thousands of people are employed in the energy industry. The conventional industry comprises the petroleum industry, the natural gas industry, the electrical power industry, and the nuclear industry. New energy industries include the renewable energy industry comprising alternative and sustainable manufacture, distribution, and sale of alternative fuels.

There is, however, a rich history to draw from. Over the last two hundred years, nations around the world have made concerted efforts to bring electricity and modern fuels to most or all of their populations. While the context and details have varied, there are a number of consistent features that have characterized successful efforts. Nations that have achieved universal electrification and access to modern transportation and fuels have uniformly moved the vast majority of their populations off of the farm and out of the agricultural sector. There is no nation on earth with universal electricity access that remains primarily agrarian. To date, urbanization and industrialization have been preconditions for universal access to modern energy systems.

The relationship between rising incomes and rising energy consumption is bi-directional. Modern energy infrastructure enables large-scale economic enterprise that creates opportunities for off-farm employment, higher labor productivity, and rising incomes in the wage economy. Rising incomes allow people to afford modern fuels and electricity and the appliances that turn modern energy into useful energy services. Similarly, levels of energy consumed within households cannot be disentangled from energy consumed outside the household. Unless there is energy and infrastructure to support large-scale employment outside of the household and the subsistence agricultural sector, there is little income available to purchase energy or appliances for household use.

Contemporary efforts to address energy poverty in developing nations that ignore this history are unlikely to succeed and will, at best, provide very limited development benefits. Programs that target household energy consumption without attending to broader economic factors are unlikely to raise household energy consumption, even if they check the box marked "energy access," and risk, instead, confusing charity with development.

Achieving modern levels of energy consumption for three billion people who currently are locked out of the modern energy economy, consistent with achieving the human development goals with which energy consumption is highly correlated, can be achieved with more or less impact on the environment and the climate. But tradeoffs are inevitable and policies that condition development of energy infrastructure to a limited set of zero-carbon energy sources are unlikely to succeed at either their development or climate ambitions.

Decentralized renewable and off-grid energy technologies can play an important role in some contexts, where they are targeted to increase agricultural productivity or otherwise support productive economic enterprises capable of raising incomes, particularly when they are deployed in ways that augment expanding centralized grid electricity. They cannot, however, substitute for energy and other infrastructure necessary to support industrial-scale economic enterprise. Micro-finance, micro-enterprise, and micro-energy are no substitutes for industry, infrastructure, and grid electricity.

Developing economies do still have choices, however, and some of those choices might result in significantly lower carbon trajectories. Sub-Saharan Africa, for instance, is rich in both natural gas and undeveloped hydroelectric capacity, suggesting that African development might largely bypass coal. China and India, both with large populations without access to modern levels of energy consumption, have made significant commitments to both conventional and advanced nuclear energy and to utility-scale wind and solar development.

The right mix of fossil and low-carbon energy technologies for any given economy will depend upon local resources, technological and institutional capabilities, geo-political considerations, and a range of other factors. Given current technological options, however, no practical path to universal access to modern levels of energy consumption is likely to be consistent with limiting global atmospheric concentrations of carbon dioxide to 450 parts per million (ppm).

While this reality brings with it unquantifiable risks of dangerous climate change, insisting – either implicitly or explicitly – that the poorest people on earth forego basic economic development in order to mitigate climate change would seem to be, at the very least, a morally dubious proposition, particularly given that energy development generally increases societal resilience to climatic extremes and natural disasters. Moreover, even without eradicating energy poverty, most plausible projections of future emissions find stabilization at 450 ppm increasingly unlikely.

However, climate mitigation and a world beyond 450 ppm do not represent a zero-sum proposition. A world of 500 or 550 ppm is one less likely to experience catastrophic impacts than one that stabilizes at 700 ppm. More importantly, there are plausible decarburization pathways that could bring significant climate mitigation benefits that are consistent with a world in which every person consumes energy at modern levels. Whether 450 ppm or beyond, any practical path to deep global decarburization will likely require low-carbon energy systems capable of supporting a global population with fully modern standards of living. Key priorities for achieving modern levels of energy consumption for the global population as quickly as possible include the following:

1. **Prioritize energy development for productive, large-scale economic enterprises.** Economic opportunity at scales consistent with broad improvements to household incomes is not possible without significant growth in non-farm and non-household economic sectors.
2. **People to the power.** There is no pathway to significantly higher levels of energy consumption without moving most people out of subsistence agrarian poverty and into higher productivity off-farm employment and livelihoods in the formal knowledge, service, and manufacturing economies.
3. **Energy and electricity are not the same.** Efforts to address energy poverty must address needs for transportation fuels and infrastructure, and for fertilizer and mechanization of agriculture.
4. **Maximize bang for the buck.** Given the enormous population still lacking access to basic energy services and consuming energy at extremely low levels, national and international investments in new energy infrastructure must prioritize bringing most energy to the most people.
5. **Energy abundance is a public good.** Successful efforts to end energy poverty have and will continue to succeed when they are not pursued piecemeal but through strategic government industrial and agricultural policy, strong institutions, public utilities, and regulated monopolies.

None of the above assures decarburization at levels consistent with meaningfully mitigating climate change. Building a high-energy, low-carbon planet demands accelerating the transition out of energy poverty for the world's poor while also making progress towards deep decarburization. These parallel social and environmental goals suggest several imperatives for policy and development:

1. **Focus on carbon intensity.** The key to mitigating emissions to the greatest extent possible while addressing energy poverty will be to accelerate the long-term trend toward higher-density, more efficient, lower-carbon fuels and technologies.
2. **Leapfrog dirty energy, not development.** In some cases, energy development may "leapfrog" some high-carbon fuels and technologies, but key steps in the development process such as urbanization, industrialization, and agricultural modernization cannot be leapfrogged.
3. **Innovate for a high-energy planet.** Current-generation low-carbon technologies cannot meet growing global energy demand at the necessary scale. Innovation must take center stage if all the world's inhabitants are to enjoy secure, free, prosperous, and fulfilling lives on a high-energy, low-carbon planet.

In conclusion, the pursuit of a development path primarily driven by abundant, cheap fossil fuels is coming up against diminishing reserves, rising prices and global warming. Managing the growing tensions resulting from this situation requires increased cooperation on the part of industrialized countries, emerging economies and poor countries, with each country bearing differentiated responsibilities and having different financial and technological capacities. Now, more so than ever, policy decisions must incorporate the insights and evidence-based knowledge produced by scientists. For several years experts have insisted on the urgent need to take corrective action to prevent serious crises in future that will require painful adjustments. The lack of resolute policy decision reflects the fact that politics and economics follow short-term cycles and are disconnected from the geological temporality and realities. In all probability, the energy crisis looks up to provoke shocks of much greater severity before key decision-makers eventually take appropriate action. It is to be hoped that, as the portents increase, international cooperation in the energy sector will become much more efficient so as to prevent the escalation of violent confrontations over the control of energy resources and to boost the development of renewable energy.

References

[1] Engineering » Energy Engineering » "Energy Efficiency - A Bridge to Low Carbon Economy", book edited by Zoran Morvaj, ISBN 978-953-51-0340-0, March 16, 2012 under CC BY 3.0 license. © The Author(s).

[2] Barnes, D., Floor, W.M., 1996. Rural Energy in Developing Countries: A Challenge for Economic Development, Annual Review of Energy Environment 2, p.497-499.

[3] Kaplan, M., Ozturk, I., Kalyoncu, H., 2011. Energy Consumption and Economic Growth in Turkey: Cointegration and Causality Analysis, Romanian Journal of Economic Forecasting, 2, p. 31-41.

[4] Energy Consumption for Human Development ; Wikipedia