

Q&A

India's net-zero energy future: Aman Srivastava and Leena Srivastava

Dr. Aman Srivastava, research fellow at the Centre for Policy Research, and Dr. Leena Srivastava, deputy director general for science at the International Institute for Applied Systems Analysis (IIASA), recently spoke with *One Earth* about challenges and opportunities in India's net-zero energy transition. The views expressed by Aman and Leena are theirs only and not those of the Centre for Policy Research or IIASA.



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India is set to become the world's third-biggest economy by 2030. To what extent is this growth complicating India's net-zero transition?

India is set to become the world's third-largest economy by 2030, based on current growth assumptions. However, a per-capita income of about USD 5,600 by 2030, will just about push it into the upper-middle income bracket of countries, leaving unsatisfied growth aspirations. Much of the growth is expected to be services led, for which there is no historical precedent. Assuming India does grow rapidly in the next nine years, we can expect that consumption—of goods, food, electricity, travel, etc.—will increase significantly, with huge implications for overall energy demand. According to the International Energy Agency's (IEA) latest India Energy Outlook 2021, energy demand will increase by about 25–50% between now and 2050. Today, over 80% of India's energy comes from coal, oil, and solid biomass, and it is likely that the emissions reductions from an enhanced share of renewable energy will merely offset the emissions from this demand growth.

At the same time, a significant share of India's infrastructure in 2030 does not yet exist today. We can thus expect huge infrastructure development, in terms of buildings and construction, roads, avia-



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tion, and so on. How this infrastructure is developed will greatly impact energy and non-energy emissions. The model of urbanization we follow, the way we provide connectivity to our population, the mix of grey-green infrastructure, etc., will all inform India's net-zero transition.

India has tremendous opportunities to cut emissions by transforming the energy system and avoid locking into emissions-intensive infrastructure, which can help it meet future energy demand sustainably. Given India's commitment to net-zero emissions by 2070, it can be reasonably expected that all of the above issues, influencing India's development pathways, will be hotly debated in the coming months.

Currently, the vast majority of India's electricity is generated by burning coal. What are the ramifications of phasing out coal use in India?

India's continued dependence on coal should also be seen as a reflection of its development challenges. The coal sector in India is in the top ten employers in the

country, providing livelihoods to nearly 4 million people directly and indirectly, most of them in the poorest regions of the country. The coal-bearing regions are distinct from those that are richer in renewable energy resources. As such, until the time that we reach a technology and market maturity in renewables to substantially and reliably substitute for coal, it will be difficult to truly commit to this. It should also be borne in mind that India still has a significant percentage of its population that does not have access to adequate and reliable electricity or clean cooking options, although theoretically 97% of the population is connected to the grid.

Coal further contributes 44% to rail freight revenues, which allows the railways to subsidize passenger fares and enable mobility. The railways are India's largest employer. Adding the employment implications from structural shifts in these two sectors to the high current unemployment in India, the scale of the challenge becomes immediately obvious.

Lastly, many public sector banks have heavily financed coal plants, with significant coal assets on their balance sheets.

A coal phase out will thus impact employment opportunities, regional development, domestic mobility patterns, rail and public revenues, and the stability of the financial sector. All of this will have to be considered while ensuring that a transition to other energy sources is technologically and economically feasible.

India has made a great deal of progress in recent years, increasing electricity access and scaling up renewables. What are the co-benefits of this and how can this trend be sustained?

India has put in place many policies and innovations that have resulted in notable

improvements in both energy access as well as an increase in share of renewable energy. Since the year 2000, 700 million people have been supplied with electricity, and the share of solar PV and wind power has doubled in electricity generation during this time. Policy innovations such as the reverse bidding mechanisms, accompanied by well-defined state support measures, have driven down the costs of renewable electricity to grid parity levels. The volume increases in renewable energy demand from India would have had a substantial impact on driving down global prices too. Having said that, the share of renewable electricity in total electricity, at less than 20% in a growing market, is still too small to result in significant reductions in air pollution or in creating green jobs. It doesn't help that India has still a limited domestic manufacturing capacity. Additionally, with a major focus on utility-scale renewable energy projects, India has not been able to fully exploit the livelihood and access benefits arising from small-scale modular options.

However, demonstrable evidence exists, from other government schemes, of the co-benefits of renewable energy projects. Solar water pumps have improved irrigation, allowing for better and more productive farming practices. Many small villages in remote areas, which were not connected to the grid, are now able to provide better healthcare services, support education, and reduce indoor wood and biomass cooking. Avoided additional generation from coal has prevented additional air pollution, likely preventing further morbidities and mortalities.

This can be sustained by better aligning climate, energy, and development policies, at the national and subnational levels, and ensuring better horizontal and vertical coordination at all levels of government.

From an energy infrastructure perspective, what are the barriers preventing further large-scale deployment of renewable energy sources?

The biggest barrier to large-scale deployment of renewable energy sources lies in not only the investments required in these projects but also those required in the sup-

porting infrastructure. An old and over-stretched grid with high aggregate transmission and distribution losses, the absence of requisite smart features, a poorly developed demand-response market, and a highly price-sensitive consumer base driving demand for energy-inefficient appliances all contribute to the challenge of rapid up-scaling of renewable energy. The absence of a well-integrated, robust national grid permitting the free flow of renewable electricity to take advantage of state-specific purchase obligations and the under-development of storage systems and mechanisms also contribute to the challenges faced by this sector.

India hasn't done too well with decentralized renewable opportunities—in particular, its solar rooftop program has under-delivered substantially. The lack of policy coherence in urban areas, the pattern of urbanization, non-uniform building codes, etc., all contribute to this under-achievement.

A successful energy transition will require actions from both the private and public sectors. What commitments have been forthcoming from these sectors, and where does there remain room for improvement?

The private sector has responded enthusiastically to the government's policy and regulatory initiatives, both as a producer and consumer of renewable energy. On production, close to 90% of renewable energy generation in the country today is by the private sector—a clear recognition of the support and fiscal incentives provided by governments, not the least of which related to covering the crucial risks of land acquisition for renewable energy projects. The public sector has provided key support to such projects by creating green corridors and playing the role of being a guarantor between renewable power producers and distribution companies.

On consumption, an increased number of companies are signing up to enhance climate action through internal carbon pricing and other commitments to carbon neutrality. Green business coalitions are receiving increasing interest and serve as useful platforms for sharing best practices.

Going forward, the increased emphasis on renewable energy will draw a similar response if the private sector gets a clear assessment of risks and risk-mitigation opportunities. The falling subsidies and support measures to the renewable energy sector in recent months risks stalling the growth of this sector. However, the prime minister's recent announcement at COP26 to commit to net zero by 2070 based on 500 GW of non-fossil electricity and 50% of energy coming from renewable energy, among other actions, will provide a major boost to this sector once again.

To help facilitate a slower energy transition in emerging economies, the Indian minister for electric power recently called for developed countries to achieve net-negative emissions. What are your thoughts on this pathway to decarbonization?

To meet a global net-zero target by 2050, in line with the principles of common but differentiated responsibilities, developed countries should decarbonize sooner to allow developing countries the carbon space to grow and transition. This may require developed countries to strive towards net-zero emissions well before 2050, particularly to balance out China's target to achieve net zero only by 2060 and India by 2070! While these stated targets will be challenging in themselves for India and China, enhanced action from developing countries could be feasible provided additional, predictable, and sustained financial support from developed countries is forthcoming, given respective capabilities.

Additionally, net-zero pledges made by developed countries do not sufficiently explain the "net" component—how much carbon will be captured and through what means. For instance, an overreliance on carbon sinks through reforestation in poorer countries could raise issues of land and food security for these countries. It is critically important for the developed countries to achieve their net-zero targets (or more) through domestic action so as to pave the way for the developing countries to follow.