TRANSFORMATION OF INDIA TOWARDS NET ZERO TARGETS: CHALLENGES AND OPPORTUNITIES

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Received December 29, 2021& Revise February 22, 2022& Accepted May 2, 2022

Abstract

According to the International Energy Agency (IEA) existing energy production is responsible for about 80% of the world's carbon emissions which cause global warming. Net zero is a part of Paris Agreement in which several nations agreed to renovate their energy policies to solve the purpose. To combat this, the Indian Prime minister Modi unpredictably and boldly pledged at the COP26 Summit (Glasgow), to cut India's carbon emissions to net zero by 2070. Prime minister also promised for India to get 50% of its energy from renewable resources by 2030, reduce its total estimated carbon emissions by 1 billion tons from 2021 to 2030, construct 500 GW of renewable electricity capacity by 2030, and lessen emissions of GDP by 45% by 2030. Top global leaders and organizations have welcomed India's move to achieve the targets of net zero by the year 2070. Although the declared goal for carbon neutrality by 2070 is far away the mid-century goal, but experts believe that it is essential and excellent beginning by India to avert the consequences of global warming. The net zero pathway will identify major multi-sectoral efforts and investment for India which still has massive reliance on coal for power and industrial manufacturing. Nevertheless, achieving net zero goals for India is challenging job. Experts believe that with a growing populace and socio-economic development, the probable increase in energy demand coupled with the massive hole in climate finance will undoubtedly be two key challenges in achieving India's climate goals. Yet, this can be tackled with tactical planning, technically designed guidelines, strict execution of sectoral policies, and better investments in green technologies. Experts also believe that the private sector will also require taking a proactive role in adjusting its business strategies and policies with the country's climate objectives. Lastly, climate actions will also require being fast-tracked and supported at the state and district level. Finally, we advocate to create our own and flexible energy path for the future to keep the interests of our poorest and vulnerable populations at the cent**er** of any pledges we make.

Keywords: COP26, Energy politics, India, Issues and opportunities

Introduction

The Indian topography comprises 7,000 km-long coastline, the Himalayan glaciers in the north (https://www.cs.mcgill.ca/). The rich forest regions house contains natural resources like coal and iron ore which make the state inimitably vulnerable to climate change. A recent study advocates that if carbon emissions carry on to rise this century, the country's genuine GDP per capita could fall by 10 per cent by 2100 (Patel, S., et al 2021).

Climate change and pollution control are the two big global issues (Reddy, P.B. & Gangle, G.R., 2015, Srivastava, B. & Reddy, P.B., 2021). Hence, it is our responsibility to pay proper attention. During Paris agreement 2015, several countries have declared a particular year to be as net zero emitter. UK, US and few European countries declared it as 2050. China has set 2060 as target year. Nevertheless, it is to be noted that many of the rich nations who are known as "developed" today, are because of emitting uncontrolled GHG for nearly 2 centuries which blames them responsible for historical emissions and historical responsibilities. India on the other hand did not get to exploit the same so in order to bring millions of people out of poverty we will have to run engines to the maximum for rapid growth which will result in emissions and no afforestation can make that net zero. So In order to do big, we are already on track by having 40% of our energy requirements through green technology (https://www.nrdc.org/). It is also to be noted that our per capita energy consumption is only a third of the global average, yet India is the only country among G-20 to achieve Paris Agreement targets. India emitted 1.9 tonnes of CO2 per head in 2019, compared with 15.5 tonnes for the US and 12.5 tonnes for Russia (https://tickernews.co/is-indias-2070). India has already achieved 21% of its emissions' intensity reduction target as a proportion of its GDP in line with its pledge in Paris Agreement to a 33-35% reduction by 2030 (https://economictimes.indiatimes.com/news/).

With the immensity and variedness of India's geography, the climate impacts will vary very differently at local levels. The net-zero pathways for India will have a lot of opportunities and challenges. India has to focus on funding, research collaboration, new policies and capacity and areas to facilitate the action. India needs to stay strong on its commitment of economic growth and use the carbon space that we have to use for a better and greener India for tomorrow's population.

At COP26 summit (31 October to 12 November 2021**,** in the Scottish Event Campus (SEC) in Glasgow, UK), the Indian Prime Minister Narendra Modi criticizes developed countries for breaking pledges to aid poor nations to cope up with climate impacts. Despite accounting for 17% of the world's population, the country is emitting 5% of the total emissions which is the lowest per capita emissions of the world's major economies emitting 5% of the total, despite accounting for 17% of the world's population (https://www.bbc.com/news/world-asia-india). If we intensify the emission cutting process it would reduce 45% of the GDP by 2030.Modi made it clear that emissions-cutting pledges from India and other developing countries would need funding ($100 billion a year by 2020) from rich nations who are the major historic emitters, to decarbonise the economies and to cope up with climate impacts. Modi defended his commitment against criticism that India represents 17% of the world's population but is responsible for "only 5% of global emissions".

Modi demanded for tracking and strict monitoring of the flow of climate finance in the same way as improvement on reducing greenhouse gas emissions. Recently, The Climate Action Tracker which tracks government climate action against the Paris Agreement targets, put India's climate action as "highly insufficient" just because coal represents about 70 per cent of the country's energy supply (https://climateactiontracker.org/countries/india/) while India has already invested Rs 5.2 trillion in renewable energy sector in the past seven years (https://indianexpress.com/article/opinion).

Finally**,** after years of refuse, our Prime Minister Narendra Modi's has pledged to achieve net-zero emissions by 2070 while China, US and EU would reach the same in 2060 and 2050

respectively. Modi's climate commitments in Glasgow do set an example on urgent main concerns. Despite significant national challenges and the COVID-19 induced economic crisis, India is coming up with better pledges by which Modi send an indication to the rest of the world. Therefore, in the present review we analyze the opportunities, challenges and concern of India towards the journey of net zero targets.

Methodology

We carried out a systematic peer-reviewed literature survey using online databases including Google Scholar, news media, government IEA, Scopus, Elsevier, IPCC and Web of Knowledge to obtain the up-to-date literature. Information was also obtained from the WebPages of IEA and IPCC. Keywords like 'climate change, green technology, Paris Agreement and COP26 were used for the search indifferent combinations of climate change. A separation of all applicable literature was selected, sorted by part, further reviewed, and assembled in the document. Information was also gained from local print media and periodicals.

Results

Nevertheless, achieving net zero goals for India is challenging job. Experts believe that with a growing populace and socio-economic development, the probable increase in energy demand coupled with the massive hole in climate finance will undoubtedly be two key challenges in achieving India's climate goals. Yet, this can be tackled with tactical planning, technically designed guidelines, strict execution of sectoral policies, and better investments in green technologies. Experts also believe that the private sector will also require taking a proactive role in adjusting its business strategies and policies with the country's climate objectives. Lastly, climate actions will also require being fast-tracked and supported at the state and district level. Finally, we advocate to create our own and flexible energy path for the future to keep the interests of our poorest and vulnerable populations at the center of any pledges we make.

Discussion

Based on the above literature survey we believe that the energy challenges of the next generation will require multidisciplinary approaches across several fields. It also requires a strong joint effort across academic world and industry, which will be a key focus of this initiative. Apart from severe uncertainties about their techno-financial viability, there are certain three grounds to question the pledges made by India at COP26. If mid-century is set as the target to decarbonise, the rich nations should assign to bring emissions down to zero a decade or two and should keep freedom for developing nations to transition at a practical pace as they have exploited most of the carbon space to advance their economies. The net-zero approach of energy transformation will require spectacular changes in the employment and industrial processes. The switch to net-zero and to remove carbon emissions from energy systems requires being sustained and translational technology and human capital (Passer, A et al 2020). Rich nations have to support the efforts of developing nations by providing funding ($100 billion per year from 2020) and essential machinery to meet the key targets. We found that the developed countries will not begin fulfilling that promise until at least 2023. Modi pledges are not only important for the world, but also we that can offer ample economic prospects along with few obstacles for India. Challenging decarbonization targets set by budding market royals (China and India) for the next 5 to 10 years

will likely add long-term stress to the financial systems as it involves a major transformation in energy sourcing, production and usage.

Required technologies

To achieve net-zero emissions the country would need major transformations in use, production and removal of GHG (greenhouse gases) from the atmosphere. The most practicable pathways to net-zero emissions include four main strategies:

Generate electricity without emissions: It can be possible by combining the modern technology with traditional renewable sources (wind, solar, nuclear, and water power) which can offer a large amount of the country's electricity with negligible CO_2 emissions.

Use of electric equipment and vehicles: The replacement of traditional apparatus with modern tools like incinerators, gravitational settling chambers, electrostatic precipitators, catalytic reduction systems, fabric filters, and biofilters can help to reduce the GHG emissions. Switching to electric cars and trucks and using electric heating for houses would also significantly reduce emissions (Capurso, T., et al 2022).

Efficient use of energy: Energy efficiency basically denotes use of less energy to perform the same task. Use of natural energy along with certain modern smart and automated technologies and practices can efficiently reduce the energy loss significantly and also reduce emissions significantly. Use and regular practice of such automated modern technology not only help in reducing greenhouse gas emissions, reducing demand for energy imports, but also help in lowering costs on a domestic levels (Wang, Q. and Wang, S., 2020).

Carbon capture, utilization and storage (CCUS): This is an essential and modern emissions' reduction technology that can be applied in the industrial energy systems. At present CCUS is used to stop roughly 40 million tons of carbon dioxide (CO2) emissions per year from escaping into the atmosphere. By using this technology we can directly capture CO_2 from the air and entrap permanently in oil and gas reservoirs, saline aquifers or coal beds.

Opportunities

Experts believe that Net Zero will prove to be a Net positive for India as huge green investments will likely drive rapid economic growth and generate high-quality jobs (Chaturvedi, V. & Malyan, A., 2021).

As India's economy jumps towards net-zero targets, the nation's GDP will get higher by USD 406 billion by 2050 and more than 43 million jobs will be created (https://www.orfonline.org).

Massive investments in green technologies and equipment will take place in the transformation of green energy technology that includes electricity generation, transport, construction, real estate, farming, cement, steel, and many other industries. As renewable energy technologies tend to be more labor intensive than usual energy technologies, it can offer better access to global technology, funding and markets (Qayyum, M., et al 2021).

22 million more jobs will be created by 2030 and 43 million more jobs by 2050 in the renewables sector (Ram, M., et al 2022).

The country can potentially advanced into new green technology, which could generate a more accountable and sustainable economy.

Upon achieving a "green stamp", they may find superior market access, particularly if the world imposes a carbon tax on exports which are a decisive factor of overall GDP growth.

Domestic industry to become more efficient due to international competition.

Once the transition is complete we can see an improved level of GDP growth, sustainability and constancy.

Obstacles

Green transition will be a multi-stage process which involves switching from fossil fuel to electricity, generating, electricity from renewables, and removing emissions from the atmosphere. It will crash all financial agents.

To meet the Net Zero targets set by the Paris Climate Agreement, India will need huge investments in green technologies and infrastructure, which is anticipated at US$200 billion annually. How and where we will procure funding are therefore critical questions in any debate (https://www.structuredfinanceinbrief.com/2021/12/india). Together with this, a similar funding will be required for transportation and other infrastructure.

Traditional jobs will be lost.

The finances companies need to distribute and support the network upgrades compulsory for the promotion of renewables.

The technology conversion years will be potholed.

Inflation could be unstable till renewables attained their full potential.

Economic profits from oil and coal should fall gradually.

The trade shortage could rise if the switch to electric vehicles is quicker than the increase in domestic battery production.

Challenges

India has been severely shocked by the second wave of COVID-19 in the first half of 2021 which further delayed the resilience of climate change actions. India is the world's third-biggest emitter of GHG (Reddy, 2015). But its per capita CO2 emissions are at 1.8 tonnes per person in 2015 which is about a ninth of those in the USA and approximately a third of the global average of 4.8 tonnes per person.

By 2050, the nation's total electricity demand would be about 5500 to 6000 terawatt-hours (TWh), roughly a factor of five on today's level (https://energy.economictimes.indiatimes.com/news).

India is trying to balance its rising energy needs with load to cut emissions, which could make the target of getting carbon neutrality difficult.

The International Energy Agency (IEA) projects that the energy demands for India will grow up over any other nation over the next 20 years. Even though renewable energy's share of India is increasing, coal is responsible for almost 70 per cent of the country's electricity generation which plays a major role in global warming (Chaturvedi, V. and Malyan, A., 2021).

India must also meet the desires poverty elimination with faster economic development. This will limit India's development potential.

Experts criticize that Net Zero is not reasonable fair for India as it does not split the developing and rich nations in giving out the load of mitigation (https://economictimes. indiatimes.com /topic/Net-zero-goal).

Carbon neutrality seems to be an emerging technology to absorb CO2 from the atmosphere. Few also argue that permitting uncertain technologies today to control emissions while relying on to equalize emissions in the future (McLaren, D.P., et al 2019).

Several Net Zero pledges are based upon trading and neutralizing emissions, permitting the rich to carry on releasing and buying their way out.

Due to the promotion of coal use, although the Indian government has spent much in renewable energy and announced Net Zero targets by 2070, there is a big gap between the announcements and the ground reality (De Angelo, J. et al 2021).

Major issues with India's to achieve net zero targets

1.Sustainability issues:

Pledges made by India at Glasgow (COP26) summit regarding non-fossil fuel and renewable energy production involve both ecological and social costs. For example nuclear and huge hydro projects will cause deforestation, people's migration, more GHG emissions, and even harmful radiation. Massive amounts of land are required for the establishment of wind, solar and other mega energy parks in India. For instance, recently 60,000 hectares approximately of Kachchh's ecologically fragile grassland-desert ecosystem have been chosen to establish energy mega-parks.

2.Continued use of coal and thermal power:

Even after the COP26 pledges, the government has continued in promoting coal mining and thermal power, and has proven no intentions of even flattening fossil fuel use or reducing it. If the same trend is continued, the country's emissions may go beyond the US and China. It also reflects constant damage most precious forests resources for mining that cause migration of population. Thousands of tribal people have been complaining against future mining in the biologically rich Hasdeo forests of Chhattisgarh, but still the government is active clearing it.

3.Net zero targets are simply a greenwash:

Net zero merely means that emissions of a particular location can be counterbalanced somewhere else by some other activities like planting trees, or by capturing carbon etc. It is to be noted that net zero doesn't necessarily talk about sinking the emissions rather just removing them out. In India, the chase of Net Zero target might result in capturing the land from communities for huge new plantations.

4.2070 is too late a target:

Furthermore, some experts have opinion that we need to cut emissions considerably within a decade or so. Waiting till 2050 or 2070 is just too late to protect the planet earth. To reduce this span, developed countries should provide adequate climate finance ($3.5 trillion) along with technology transfer for developing countries.

Conclusions

The world is not going to reach its targets of climate crisis unless India is able to reduce its carbon emissions and now India changed its path right now. India is now faithfully acknowledged for having come of times and becoming a major global power. Availability of cheap energy is very much essential to achieve sustainable developmental goals (SDG). India is clearly not part of the climate crisis, but part of the solution, which is evidently visible in India's position at COP26. The Sub-continent shares only 2.4 per cent of the global surface area but has to feed 17.5 per cent population, out of them approximately 30 per cent are suffering from intense poverty. The country is suffering a severe shortage of shelter, electricity, and even drinking water. As India has pledged for big shift in energy transformation from traditional dirty coal to clean energy, the global leaders should not doubt India in this regard. India is sincerely working on it, and creating additional carbon sink of 2.5-3 billion tonnes through extra forest and tree cover. Nevertheless, the rich nations also must deliver on their pledges. If collectively we work, we can even meet the technical deadline of net-zero by 2050. Modi also recommended the world leaders to change the modern lifestyle and to adapt the mitigation measures. It is true that India's energy conversion would be in its personal interest because, otherwise, economic growth will not be sustainable and human security will be at stake shocking consequences of climate change. At the same time as we, like others, has an accountability and responsibility to our citizens to be planned and attentive about a decision as important as India's climate pledge.

Conflict of Interest Statement

authors certify that we have NO affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this document.

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