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India's Ambition to Achieve Net-Zero Emissions by 2070:
Uncertainty and Opportunity

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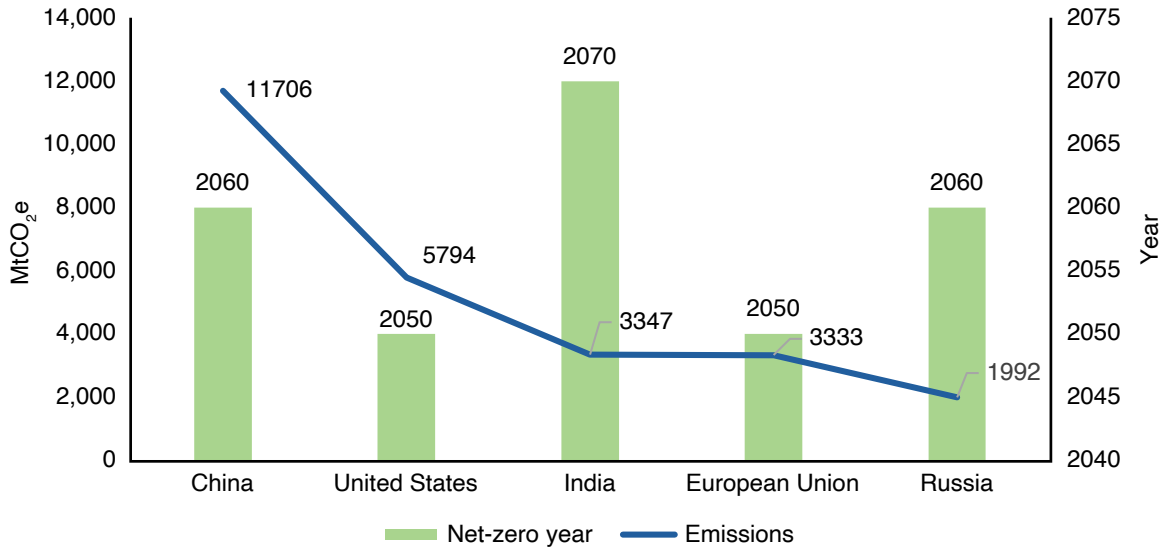
The special report by the Intergovernmental Panel on Climate Change (IPCC) on the impacts of global warming of 1.5 degrees Celsius (°C) above pre-industrial levels highlighted the importance of achieving net-zero emissions or a carbon-neutral future (IPCC 2018). There has subsequently been growing international pressure for net-zero commitments, with major emitting countries such as China and the United States (U.S.) announcing their targets of net-zero by 2060 and net-zero by 2050, respectively. Indeed, even major hydrocarbon producers, such as Saudi Arabia (net-zero by 2060) have joined the growing body of support. At the same time, it is difficult for developing countries to absorb the enormous cost of the transition from inexpensive energy, particularly when it requires not just new installation of renewable energy, but also the replacement of existing coal-powered electricity production. Further, carbon capture, utilization, and storage (CCUS) technology is relatively new. It is also more costly for India and many other developing economies than for developed economies. Hence, if implemented, CCUS would require collaborations between the developed and developing world. The lag in financing from the developed world to support the economic and fiscal challenges facing the developing world, with COVID-19 only adding to the fragility of the latter's economic situation, has made such commitments difficult. However, the world's third-largest emitter of greenhouse gases, India, announced its commitment to a net-zero future on the first day of the 26th session of the Conference of the Parties (COP 26) under the United Nations Framework Convention on Climate Change (UNFCCC) in Glasgow.

On November 1, 2021, at the opening of COP 26, Prime Minister Narendra Modi of India made an unexpected pledge, announcing India's commitment to reach net-zero emissions by 2070. Further, during the speech, Prime Minister Modi went on to announce four supporting initiatives, including that 50% of India's energy will be sourced from renewable energy sources and the country's intent to reduce its total projected carbon emissions by one billion tonnes by 2030. India also pledged to reduce its emissions intensity per unit of gross domestic product (GDP) to less than 45% and install 500 gigawatts of renewable energy by 2030 (Bloomberg Green 2021).

Figure 1. Top-five greenhouse gas emitters and their net-zero target year.



Sources: World Resources Institute (2020) and Climate Action Tracker (2021).
Note: $MtCO_2e$ = megatonnes of carbon dioxide equivalent.

India's declaration of a net-zero target was diplomatically important in the face of strong advocacy from the activist environmental lobby, both domestically and internationally. Most experts and stakeholders in India did not expect an Indian net-zero commitment at this time. A developing country, India represents 17% of the world's population, yet only accounts for 5% of the world's carbon emissions (CNBC 2021). Moreover, a net-zero commitment has significant ramifications for energy-intensive sectors such as electricity, transport, building, and industry. Consequently, most Indian industrial companies have not taken positions in shaping the agenda for net-zero targets, and have waited for the government to take the first step.

Despite the hopes of wealthy countries in the developed world that India would adopt a more aggressive target, such as to be net-zero by 2050, experts in India believe that it has put forth an ambitious target by announcing a net-zero target of 2070 (Vaidyanathan 2021). To achieve this goal, in the absence of CCUS India would need a renewable generation capacity of about 7,422 gigawatts (GW). Further, coal-based power generation must peak by 2040, and must decline by 99% between 2040 and 2060. However, the availability of CCUS would allow a 19% to 30% share of fossil fuels in India's primary energy (Chaturvedi and Malyan 2021). In the net-zero era, CCUS could be a breakthrough technology, transforming the outlook of energy system transitions. Though there are risks associated with CCUS, the technology has been regaining momentum in India.

The scale of the changes needed to achieve India's net-zero target is massive, and financial support from the developing world is likely to be needed for the country to sustain its economic expansion.

Of most significance is the transportation sector, which will need a complete overhaul of both passenger and freight transport, especially for road travel. Transportation is the fastest growing sector and has the third-highest greenhouse gas emissions of any sector in India. Within the transport sector, road transport contributed more than 90% of total carbon dioxide (CO_2) emissions in 2018 (The Times of India 2021). Economic development has driven a tremendous rise in vehicle ownership, with almost 300 million registered vehicles in 2019 (Ministry of Road Transport and Highways 2021). India's crude oil imports, which are largely consumed by the transportation sector (70% of domestic crude is consumed by the road transportation sector), have increased steadily over the past several years, as stagnating domestic production has barely kept pace with rising domestic demand. India and China remain the two most promising markets for oil-producing countries (Bhatt and Roychoudhury 2019). In 2018, India imported more than 82% of its crude oil requirement, mainly from Saudi Arabia and Iraq (Bhatt and Dua 2021).

While a shift to electric vehicles may be possible for developed countries (and even that will present a significant challenge), in India this would mean almost entirely replacing its massive vehicle fleet (Ministry of Road Transport and Highways 2021).

Before the announcement of India's net-zero target, the International Energy Agency (IEA) in its World Energy Outlook 2021 estimated that India's crude oil demand could rise to 9.2 million barrels per day (MMb/d) by 2050 and 7.2 MMb/d by 2030 from about 4.8 MMb/d in 2019 (IEA 2021). However, the announcement of India's net-zero commitment may see a dramatic reduction in estimates of its future crude oil demand.

In the absence of CCUS, India's net-zero target would require electric cars to make up 84% of total car sales by 2070. The share of electric trucks used for freight would need to reach about 79% by 2070, with the rest run mainly on hydrogen. Further, the share of biofuel blend in oil for cars, trucks, and airlines would need to reach 84% by 2070 (Chaturvedi and Malyan 2021). However, if CCUS becomes commercially viable, it could allow a significant increase in the consumption of crude oil in the economy (as compared with no CCUS). India's refined liquid use is expected to be 24.5% higher when CCUS is available. CCUS could lead to negative emissions, which could balance the country's higher use of crude and the related emissions from the transport sector. Hence, this would significantly reduce the use of biofuels in the transport sector (Chaturvedi and Malyan 2021).

The transition to electric vehicles would come with a commensurate increase in the burden on the electricity system, which would have to optimize the total supply of electric power to meet this new demand. One of the major concerns surrounding biofuels is the amount of land that is required to grow enough biomass to meet current energy demands. However, CCUS could lessen the burden on the transportation sector and its stakeholders compared with no CCUS. Further, the commercial availability of low-emission fuels such as hydrogen could reduce the dependence of the transportation sector on electrification (Chaturvedi and Malyan 2021).

India will need to bear the fiscal cost of a transitional shift in investments across sectors, and this will likely have negative economic consequences for the country. There remains a significant need and expectation that India will receive financial support from the developed world for this transition, as Prime Minister Modi made clear on the first day of COP 26. He urged "the world's developed nations make $1 trillion available as climate finance as soon as possible for the developing world" (Bloomberg Green 2021). Ideally, this financial support will not come in the form of loans from the West that must be paid back. Otherwise, the fiscal burden simply shifts to the future with the onset of enormous debt.

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