

ISSUE BRIEF

THE ROAD FROM PARIS: INDIA'S PROGRESS TOWARD ITS CLIMATE PLEDGE

Under the Paris Agreement, India has committed to cutting its greenhouse gas (GHG) emissions intensity by 33 to 35 percent below 2005 levels by 2030, and to achieving 40 percent of its electricity generation from nonfossil sources by the same year. India's economic plan gives priority to clean energy to fuel economic growth, and includes ambitious targets of 100 gigawatts (GW) of solar power and 60 GW of wind power by 2022.¹ India was instrumental in forging an agreement to cut heat-trapping pollutants known as hydrofluorocarbons (HFCs) under the 2016 Kigali Amendment to the Montreal Protocol.

NATIONAL OVERVIEW

India is an emerging economic powerhouse and global leader. With annual gross domestic product (GDP) growth of 6 to 7 percent expected through at least 2030, India is one of the world's fastest-growing economies, and is now the world's third-largest energy consumer and GHG emitter, even though per capita and historical emissions are low.² The Government of India is working to combat climate change while sustaining rapid development and providing energy for cities and villages, including more than 200 million people without access to modern electricity.³

To build a low-carbon future and curb climate change, the Indian government has committed to deploying expansive solar and wind energy capacity and adopting an array of ambitious climate actions. India is on track to meet, or even surpass, its Paris climate targets.⁴ In 2017, India cancelled 13.7 GW of planned coal plants, reduced coal imports by 21.7 percent, and announced that no new plants would be built until at least 2026.⁵ Meanwhile, solar and wind energy prices are reaching record-low prices and compete with fossil fuel prices.



**INDIA WILL CUT
ITS EMISSIONS
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LEVELS
BY 2030.**



THE PARIS AGREEMENT

In late 2015, the 21st session of the Conference of the Parties (COP21) to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) was held in Paris. The 196 nations that are part of the UNFCCC approved the Paris Agreement, which aims to limit global temperature rise to 2 degrees Celsius, and to make best efforts to keep it to 1.5 degrees. To that end, countries submitted intended nationally determined contributions (INDCs) detailing the level to which they planned to cut emissions and their plans to reach that goal. The Paris Agreement entered into force on November 4, 2016—and the INDCs are now formally enshrined as part of the Agreement—and hereafter referred to as nationally determined contributions (NDCs).

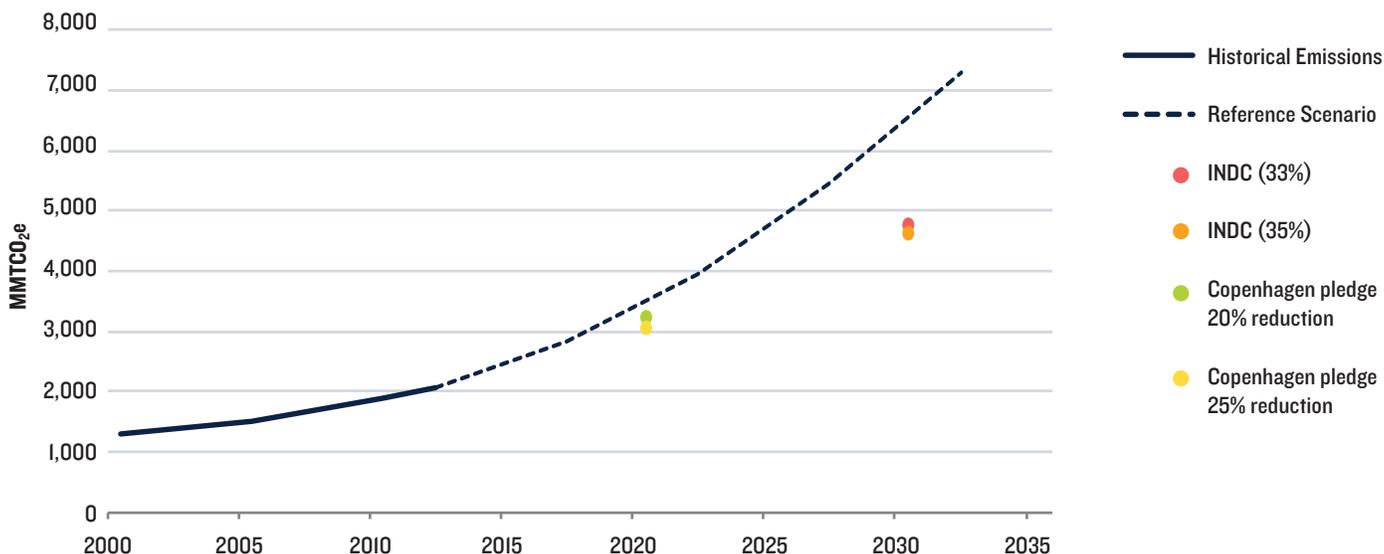
INDIA'S CLIMATE PLEDGE

The Paris Agreement entered into force on November 4, 2016, and was formally adopted by India on October 2, 2016.⁶ The agreement enshrines climate pledges, or Nationally Determined Contributions (NDCs), from individual countries that outline domestic plans to reduce GHG emissions after 2020.

India's pledge lays out a comprehensive approach to curb the worst impacts of climate change while fostering economic growth, increasing energy access, creating jobs, protecting biodiversity, building resilience in communities to climate impacts, and providing cleaner air and water for its citizens. India's pledge includes the following commitments:⁷

- To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation.
- To adopt a path that is climate-friendly and cleaner than the one followed hitherto by others at a corresponding level of economic development.
- To reduce the emissions intensity of its GDP by 33 to 35 by 2030 from 2005 levels.⁸
- To achieve about 40 cumulative electric power installed capacity from non-fossil-fuel energy resources by 2030 with the help of technology transfer and low-cost international finance, including support from the Green Climate Fund.
- To create an additional carbon sink of 2.5 to 3 billion tons of carbon dioxide equivalent through additional forest and tree cover by 2030.
- To better adapt to climate change by enhancing investments in development programs in sectors vulnerable to climate change, particularly agriculture, water resources, the Himalayan region, coastal regions, health, and disaster management.
- To mobilize domestic funds and new or additional funds from developed countries to implement the above mitigation and adaptation actions, in view of the resources required and the resource gap.
- To build capacities and create domestic and international frameworks for quick diffusion of cutting-edge climate technology in India and for collaborative research and development for future technologies.

INDIA'S GHG EMISSIONS INCLUDING LULUCF



Source: Natural Resources Defense Council; Reference Scenario, based on Government of India Biennial Update Report, emissions projections from IESS 2047's Least Effort Scenario, India's INDC submission to the UNFCCC and calculations using World Bank 2005 GDP and OECD GDP growth projections of 5.8 percent.

CLIMATE MITIGATION POLICY

Renewable Energy

Renewable energy is the centerpiece of India's strategy to meet its Paris goals.⁹ India aims to install 175 GW of renewable energy (100 GW solar, 60 GW wind, and 15 GW biogas) by 2022. In just one year, from 2016 to 2017, India increased its renewable energy capacity by 11.3 GW.¹⁰ To propel this expansion, India is making significant strides in developing strong policies supporting both wind and solar energy that could create up to 1 million job opportunities for over 300,000 workers by 2022, primarily for semiskilled and unskilled workers during the construction and operation project phases.¹¹

India's solar energy market is expanding rapidly, and the country has the largest solar park in the world, with a 1,000 megawatt (MW) capacity, at the Kurnool Ultra Mega Solar Park in Andhra Pradesh.¹² As of October 2017, more than 13 GW of solar capacity have been installed nationwide, with more than 8 GW in the last two years alone.¹³ India's flagship National Solar Mission, which originally aimed to install 20 GW of solar power capacity by 2022, is now targeting 100 GW of solar by 2022. Although these goals are ambitious, future solar energy growth far beyond them is possible, given India's 750 GW of solar energy potential.¹⁴ If fully harnessed, the sun could provide enough energy to power India more than twice over, as India's total energy use in 2017 was only about 330 GW. In 2016, Indian solar power prices hit a record low, falling to below ₹3.0 (about \$0.04 USD) per kilowatt-hour (kWh) for utility-scale solar, undercutting fossil fuels. Prices have dropped because of supportive national and state policies, less-expensive solar cell imports from China, and specialized financing deals for creditworthy developers.

India's wind energy industry also continues to grow robustly and help shift the nation to a low-carbon path. India has moved up to be the world's fourth-largest wind energy producer, with 32 GW of installed capacity, representing about 10 percent of India's total installed power capacity.¹⁵ India plans to install 60 GW of utility-scale wind power and 1 GW of distributed wind power by 2022. In 2016-2017, India added a record 5.4 GW of wind power, exceeding its annual target of 4 GW.¹⁶ Wind prices have dropped to ₹3.42 (about \$0.04 USD) per kWh as of October 2017.

Some renewable energy areas, however, have received insufficient attention. While large-scale solar and wind markets are growing at a rapid clip, many clean-energy markets are underdeveloped. Rooftop solar installations are lagging far behind the national target, barely reaching 1 GW of the total 40 GW target.¹⁷ Other underserved areas include off-grid microgrids for village applications as well as battery storage, energy-efficiency projects, and electric vehicles.

To expand energy access, Prime Minister Narendra Modi announced in 2017 the Pradhan Mantri Sahaj Bijli Har Ghar Yojana, called Saubhagya Yojna, a ₹163 billion (\$2.5 billion USD) program that aims to electrify all households by

December 2018, prior to the next Indian general election. Run by the Rural Electrification Corporation, the program will cover about 30 million households and will provide free power connections to poor families, including the distribution of solar packs and LEDs for remote villages that are not connected to a grid.¹⁸ To improve the financial health of nearly bankrupt distribution companies (DISCOMs), the 2015 Ujwal DISCOM Assurance Yojana (UDAY) program works with state governments to cover more than 75 percent of DISCOM debt and pay back lenders by selling bonds.

Energy Efficiency

India is expecting 400 million more people to move to already resource-strapped urban areas by 2050, triggering extraordinary growth in energy-intensive construction and infrastructure.¹⁹ This rapid urbanization presents a tremendous opportunity for energy efficiency. India has created and implemented a National Mission for Enhanced Energy Efficiency (NMEEE), which encompasses a variety of programs designed to improve efficiency across all sectors of energy use. The NMEEE is delivering savings of millions of tons of fuel and conserving gigawatts of energy while reducing greenhouse gas emissions.²⁰ The Perform Achieve Trade scheme to improve energy efficiency in industries under the NMEEE resulted in a reduction of 8.67 million tons of oil equivalent between 2012 and 2015.²¹

Green Buildings

One major opportunity for energy-efficiency expansion in India involves new building construction. To spur energy-saving building construction, the Bureau of Energy Efficiency (BEE) launched the Energy Conservation Building Code (ECBC) in 2007. In 2017, BEE extensively reviewed and updated the code to ECBC-2017, which is scheduled to be added as an amendment to the Energy Conservation Act in 2018.²² Many Indian states are in the process of incorporating the ECBC into state and city bylaws. The leading states of Andhra Pradesh and Telangana are working on online compliance systems for commercial buildings. As of 2015, eight states had made the ECBC mandatory and 15 more plan to follow, which will account for 90 percent of infrastructure development.

India ranks third in the world for Leadership in Energy and Environmental Design (LEED)-certified buildings, with more than 15 million square meters of certified LEED space.²³ Key ministries and cities are adopting green building programs that require Green Rating for Integrated Habitat Assessment (GRIHA) certification for new buildings. If states across India adopt energy-saving building codes and leading developers go beyond minimum code requirements for commercial buildings, an estimated 3,453 terawatt-hours (TWhs) of cumulative electricity could be saved by 2030. This is the equivalent of powering as many as 358 million Indian homes annually between 2014 and 2030.²⁴

Green Appliances

India has also made significant progress on energy-efficient appliances. Through the BEE, the Ministry of Power has established a mandatory efficiency star-rating system for refrigerators, air conditioners, tube lights, and transformers, and a voluntary star-rating labeling system for more than a dozen other appliances.²⁵ Looking ahead, stronger codes and standards for appliances will be essential for driving energy-efficiency savings. Improving the efficiency of air cooling systems is especially important because their use is expected to grow dramatically in the coming decades, and air cooling systems both consume significant amounts of energy and emit highly potent climate-damaging HFCs. Making air cooling more efficient and replacing HFCs with more climate-friendly alternatives will be priorities for India in the immediate future.

India successfully implemented one of the largest light-bulb replacement programs in the world, which replaced inefficient incandescent lamps with 3.4 million LEDs by 2017. The ongoing UJALA LED program, implemented by Energy Efficiency Services Limited (EESL), has already saved over 34,500 million kWhs of energy, mitigating 27 million tons of carbon dioxide from 2015 to 2017.²⁶ Building on this success, EESL has launched a demand aggregation program for air conditioners, which can have a significant impact in making high efficiency air conditioner models more affordable for customers.

India was a key player in negotiating the Kigali amendment of the Montreal Protocol, and will freeze HFC use at 2024 levels, starting reductions in 2028. Recently, six of India's largest air conditioner manufacturers announced plans to leapfrog from outdated R-410A refrigerants to more climate friendly and lower-global warming potential refrigerants, such as R-32 and R-290.²⁷ The Indian government has also announced plans to develop a National Cooling Action Plan. The plan aims to bring together experts in the cooling, energy efficiency, and alternative refrigerants (low- and zero-global warming-potential) industries and key stakeholders to formulate a national cooling framework.

The Smart Cities Mission, launched in June 2015, has identified more than 90 cities that have begun putting in place programs for sustainable and smart development, with more than ₹10 billion (about \$152 million USD) committed to the mission.²⁸

Transportation Sector

The Indian government has decided to leap from the more polluting BS IV vehicle emission standards straight to BS VI (equivalent to Euro VI emission standards) by 2020. The stronger standards aim to fight air pollution and address the burgeoning automobile market. The 2015 Corporate Average Fuel Consumption standards require that passenger vehicles improve fuel mileage by 15 percent by 2022. In addition to stronger vehicle emissions standards, India released the Auto Fuel Vision and Policy 2025 to increase fuel quality designed to reduce emissions by 2025.²⁹

In 2017, India established an ambitious but encouraging target of selling only electric vehicles by 2030. The National Electric Mobility Mission Plan 2020 was launched in 2013 to subsidize the cost and facilitate the sale of 6 to 7 million hybrid and electric vehicles over the next five years.

Building mass transit systems across urban centers will also help reduce emissions from the transportation sector. For example, New Delhi's mass-transit system serves 2.6 million daily riders, reducing the number of vehicles on the streets and avoiding the associated emissions.³⁰ Other major cities are following New Delhi's lead: Chennai, Bengaluru, Gurgaon, Mumbai, Kochi, Hyderabad, Ahmedabad, Lucknow, Pune, Nagpur, and Jaipur have also developed metro rail networks. Kolkata has upgraded its existing rail network.³¹

MOBILIZING GREEN INVESTMENT

India needs to unlock domestic and international investment to bring clean energy to scale. The cost of capital for large-scale renewables and availability of capital for distributed renewables continue to be barriers to rapid scaling-up of renewable energy in India. Of the current installed 13 GW of solar power in India, a large portion is concentrated on utility-scale projects. To deepen and diversify the market, specialized funds and targeted instruments for risk mitigation are needed.

More than \$140 billion in financing is needed over the next six years to reach India's solar, wind, and efficiency targets.³² Even greater financing—\$834 billion USD—is needed to achieve India's 2030 Paris targets.³³ In addition to scaling up grid-connected solar and wind power as well as village and rooftop applications, the availability of affordable storage solutions could trigger a transformative shift toward renewables.

To achieve its 175 GW clean-energy target, the Modi government is actively seeking up to \$100 billion in investments by 2022.³⁴ India is working to provide funding for clean energy through government programs, private investment, and international assistance. In 2010, an innovative coal cess, or tax, was introduced to fund and accelerate the expansion of clean energy. India has quadrupled this coal cess to approximately \$6 per metric ton to generate \$4 billion annually for its National Clean Energy Fund (NCEF).³⁵ The NCEF's future is evolving since its funds are likely to be used to compensate Indian states for losses under India's new Goods and Services Tax or Ganga River cleanup, but the NCEF has already contributed billions of dollars to clean-energy projects in India.³⁶

As part of the Ministry of New and Renewable Energy, the Indian Renewable Energy Development Agency Limited (IREDA), a leading Government of India enterprise for financing renewable energy, disbursed over \$700 million in loans to clean-energy projects in 2015 and 2016, and are targeting \$984 million for 2017. It aims to raise its annual sanctions to \$6.3 billion by 2024. In 2016, IREDA was responsible for nearly 10 percent of the domestic project

finance for renewable energy projects in India. The State Bank of India and IDFC have also been active in lending to renewable energy projects.

Finance is a challenge for small-scale renewable systems, such as rooftop solar and off-grid. The market needs more debt and equity investments. Cumulative investment in rooftop solar from 2013 to 2016 has been only \$600 million, much less than the needed \$48 billion.

Despite the existing programs, public funds remain limited. Private investments must be ramped up to achieve India's 175 GW renewable energy goal by 2022. India is exploring ways in which innovative financing that leverages limited public funds to bring in greater private investment can help foster low-carbon economic growth and development. India's leadership on clean-energy financing has the potential to transform global markets and tip the scales toward rapid, global clean-energy deployment. Innovative financial mechanisms and institutions, such as green bonds and green banks, have proved successful from the local to the international level. Greenko Energy Holdings, for example, raised \$1 billion USD with green bonds solely for clean-energy investments in July 2017.³⁷ These bonds can help propel India's solar and wind energy markets while supporting critical energy-saving and climate resilience projects.

STRENGTHENING CLIMATE RESILIENCE AND ADDRESSING AIR POLLUTION

Extreme weather events fueled by climate change are increasing both in number and severity in India. These include lethal heat waves, erratic monsoons, drought, and severe flooding that are resulting in widespread deaths and economic losses. Recognizing the growing threat of climate change, cities and states are developing resilience programs to expand disaster planning for extreme weather. For example, the city of Ahmedabad implemented its first-ever Heat Action Plan in 2013, providing an early warning and preparedness system to increase residents' resilience to extreme heat events. Since then, 30 cities across 11 states in India have followed suit.³⁸ Climate solutions, such as cool roofs, are critical for protecting communities from extreme heat. In 2017, both Ahmedabad and Hyderabad piloted cool

roofs programs.³⁹ The National Adaptation Fund on Climate Change aims to support resilience activities in states that are particularly vulnerable to climate change impacts.⁴⁰

Alarming air pollution levels continue to threaten public health in India. To protect communities, the cities of New Delhi, Mumbai, Pune, and Ahmedabad have implemented real-time air quality monitoring and alert systems.⁴¹ Ahmedabad implemented a voluntary Air Information and Response Plan in 2017, which includes a school flags program that increases awareness among children about air quality.⁴² New Delhi is also developing a mitigation plan following a court order and local action.

THE ROAD AHEAD

India is on track to achieve and exceed its Paris climate commitments.⁴³ With government programs, private investment, and international partnerships propelling renewable energy growth, India is poised to become a clean-energy powerhouse. India also continues to make strides in energy-efficient buildings, appliances, and transportation.

India is also an emerging global leader. Leading up to the Paris conference, India laid strong foundations for greater cooperation on climate action through its pledge. India was critical in achieving the amendment to the Montreal Protocol to phase down HFCs, which have a climate impact thousands of times greater than that of carbon dioxide. In October 2016, India formally joined the Paris Agreement on climate change, demonstrating once again its commitment to a sustainable, low-carbon future. At the 21st Conference of the Parties (COP 21) in Paris, India and France launched the International Solar Alliance, which aims to mobilize more than \$100 billion USD by 2030 toward promoting solar power on all fronts, including both generation and storage.⁴⁴ India is also engaging in bilateral partnerships. For example, the U.S.-India Clean Energy Finance Initiative will mobilize \$400 million for clean and renewable electricity for up to 1 million households by 2020.⁴⁵

As India works to fulfill its climate pledges, it continues to show the world that combating climate change is compatible with rapid economic growth and rising standards of living.

ABOUT THE NATURAL RESOURCES DEFENSE COUNCIL

Since 1970, our lawyers, scientists, and other professionals have worked to protect the world's natural resources, public health, and the environment. NRDC's India Program on Climate Change and Clean Energy, launched in 2009, works with partners in India to advance a low-carbon, sustainable economy. For more information, visit www.nrdc.org and www.nrdc.org/india.

ABOUT A S C I

Established in 1956 at the initiative of the government and the corporate sector, the Administrative Staff College of India (A S C I), Hyderabad, has pioneered post-experience management education in India. A S C I equips corporate managers, administrators, entrepreneurs and academicians with the skills to synthesize managerial theory and practice; and respond to the ever-increasing complexity of managerial issues confronting government, industrial enterprises and non-government organizations.

ABOUT SEWA

SEWA is a trade union registered in 1972. It is an organisation of poor, self-employed women workers. These are women who earn a living through their own labour or small businesses. Constituting 93% of the labour force, these are workers of the unorganised sector. SEWA organises women to ensure that every family obtains full employment. By self-reliance we mean that women should be autonomous and self-reliant, individually and collectively, both economically and in terms of their decision-making ability. We follow the principles of satya (truth), ahimsa (non-violence), sarvadharm (integrating all faiths, all people) and khadi (propagation of local employment and self reliance).

ABOUT PHFI/IIPHG

Launched by Public Health Foundation of India (PHFI), Indian Institute of Public Health Gandhinagar (IIPHG) aims to strengthen the overall health system in the country through education, training, research, and advocacy/policy initiatives. The institute started its operation in July 2008 from its interim location in Ahmedabad with the commencement of its 1st batch of Post Graduate Diploma in Public Health Management (PGDPHM).

ABOUT CEEW

The Council on Energy, Environment and Water (CEEW) is one of South Asia's leading not-for-profit policy research institutions. CEEW uses data, integrated analysis, and outreach to explain—and change—the use, reuse, and misuse of resources. Visit our website: <http://ceew.in/>. Follow us on Twitter at @CEEWIndia.

ABOUT TERI

The Energy and Resources Institute (TERI) is a leading think tank dedicated to conducting research for sustainable development of India and the Global South. TERI was established in 1974 as an information centre on energy issues. However, over the following decades, it made a mark as a research institute, whose policy and technology solutions transformed people's lives and the environment. TERI's key focus lies in promoting: Clean energy, Water management, Pollution management, Sustainable agriculture, Climate resilience.

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