

# Climate Change: Challenges and Opportunities

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**O**n April 1, the Indian Meteorological Department put out its forecast for the April to June season: the average temperatures in most parts of the country are likely to be 0.5 degree Celsius higher than normal with some areas registering temperature increase of more than 1 degree Celsius. This was no April 1 joke. The mercury has been inching up since, giving credence to the forecast.

The IMD's forecast for last summer of higher than normal summer temperatures and heatwaves, too, was

borne out. As a matter of fact, the IMD's data from its observational network finds that in keeping with the rising trend of earth's temperature, annual mean temperature in India between 1901 and 2017 has shown a significant increasing trend (0.66°C per hundred years). Global average temperature is now 1°C above pre-industrial levels.

As in other parts of the world, rising temperatures and warming are not the stuff of the future. And neither are the impacts of a warming planet. India has already been experiencing the impacts of 1°C warming. It was evident in Uttarakhand, Chennai,

**Climate change is about rising temperatures, shifting precipitation patterns, extreme weather events.**

**It is also much more. It is about changing the way we consume and produce. It is about creating more sustainable economies. And for a country such as India, filling the backlog of development in a climate constrained world poses a real and immediate challenge.**

**However we cannot just grow our way out of this crisis.**





Srinagar, Malin, and more recently in Kerala and north-east India, the heat waves of the past summer and the uneven rainfall across the country with floods affecting some regions and very severe drought conditions facing many parts of the country. With global temperature increase likely to overshoot the “well below 2°C” goal of the 2015 Paris Agreement, the events of the past few years portends a huge and expanding danger.

The warning issued by scientists of the UN climate science body, the Intergovernmental Panel on Climate Change from Busan, South Korea in October last year of the immediate and grave consequences of continuing to emit greenhouse gases at current rates was not entirely unexpected for India.

Scientists working on the IPCC special report, Global Warming at 1.5°C, concluded that without a rapid and appreciable reduction in greenhouse gas emissions, the world was on a path to temperature increase of 1.5 degrees Celsius in twelve years that is by 2040. A warming of 1.5°C would mean that large tracts of the existing coasts would be inundated and droughts and floods would intensify exposing billions of people to social and natural dangers. The warning even more dire given that global collective effort as pledged by countries through their national efforts to slow down global warming under the Paris Agreement put the world on a temperature increase trajectory of well over 2°C.

**TABLE 1: Impact of warming of global temperatures in South Asia/India**

	1.5 °C	2 °C
Average temperature increase	2.3 °C	3 °C
Increase in annual highest maximum temperature	1.2 °C	1.7 °C
Increase in frequency of warm extremes	160 per cent	438 per cent
Increase in heat waves in India by 2050	5 times	9 times
Increase in duration of heat waves in India	2 times	3 times
Increase in maximum population exposed to heat wave days	9 times	15 times
Change in average rainfall	No change	Decrease by 3 per cent
Increase in extreme monsoon rainfall	20 per cent	25 per cent
Increase in population exposed to water scarcity	20 million	30 million
Increase in economic damage from river flooding	358 per cent	546 per cent

Source: IPCC SR 1.5 and Carbon Brief

## Climate change will require economy-wide transformation. India will need to make dramatic changes across the spectrum-energy, transportation, urban and agriculture systems. It will require investing in human capital, innovation and research and development.

Though no stranger to the adverse impacts of a warming planet, the IPCC special report had a clear message for resource poor and vulnerable countries such as India that it would be among those most adversely affected if warming exceeds 1.5°C.

Sounding the alarm UN Secretary General António Guterres told a gathering at the United Nations headquarters in New York last year: “Climate change is the defining issue of our time, and we are at a defining moment. Climate change is moving faster than we are – and its speed has provoked a sonic boom SOS across our world. If we do not change course by 2020, we risk missing the point where we can avoid runaway climate change, with disastrous consequences for people and all the natural systems that sustain us.”

### India In A Warming World

As a relatively poor country that is vulnerable to climate change, India will be among those most adversely affected if warming exceeds 1.5°C. It is now clearer than ever before that many of the adverse impacts of climate change are unavoidable. South Asia, particularly India is a hotspot, and will be exposed to multiple and overlapping

hazards as the planet warms. The impacts even at 1.5 °C warming is considerable-intensified droughts and water stress, heatwaves, habitat degradation, and reduced crop yields.

Rising temperature and the variations in rainfall will impact water supplies. The overall impact of climate change on water resources will manifest as a rise in floods and droughts. The intensity and area affected by floods, river floods due to snowmelt and coastal flooding due to sea level rise-will increase considerably. India’s heavily populated 7,500 km long coastline will mean that a sizeable population will be affected by sea-level rise and resulting coastal flooding. Experts say that it could directly affect 50 million people, many of whom are directly dependent on the sea for their livelihood. Cities such as Mumbai and Kolkata too would be under threat.

### Acting On Climate Change

India has been stepping up on its efforts to slow down the rate of greenhouse gas emissions and to adapt to impacts that are already being experienced.

In 2008, India launched the National Action Plan on Climate Change. Eight missions—solar energy, energy efficiency, forestry, sustainable habitat, water, agriculture, Himalayan ecosystem, and developing strategic knowledge for climate change—form the core of the multi-pronged, long-term, and integrated strategies for addressing climate change. Besides a national level plan, 32 states and union territories have prepared state level climate action plans. These plans comprising programmes in sectors such as health, industries, disaster management, tourism, and coastal development are focused on reducing greenhouse gas emissions and adapting





to climate change while addressing broader development goals.

The progress however has been uneven. Most of the efforts have been focused on the energy-related missions. Though efforts are underway to align policies and programmes to goals set out in the national action plans. Financial and technological constraints have hampered the effective implementation of the state plans.

As part of its pledges under the Paris Agreement, India has committed to increase the share of non-fossil

fuel power generating capacity to 40 per cent of its installed total power capacity by 2030. This shift from fossil fuel-based generation, that is from coal- and gas-fired thermal power plants to solar, wind, hydro and nuclear-based generation is an important shift given that the energy sector accounts for 73 per cent of India's total emissions.

As of February 2019, non-fossil fuel sources-based installed capacity accounted for 36.3 per cent of the country's total power generation capacity of 350.16GW.<sup>1</sup> Though the

share of non-fossil fuel sources that is renewable, hydro, and nuclear has increased, fossil fuels still account for the bulk of the power-generating capacity.

The dependence on fossil fuels, particularly coal, will according to the Central Electricity Authority projects a total power generating capacity of 619GW by 2026-27. Renewable energy sources will account for 275GW or 44 per cent of the total installed capacity while 263.88GW of capacity will be fossil fuels-based (coal, lignite, and gas).<sup>2</sup>

**TABLE 2: Electricity Capacity Targets According to the National Electricity Plan**

Technology	2017-18		2021-22		2026-27	
	MW	per cent of Total Capacity	MW	per cent of Total Capacity	MW	per cent of Total Capacity
Coal	197122	57 per cent	217283	45 per cent	238181	38 per cent
Gas	24897	7 per cent	24897	5 per cent	24897	4 per cent
Diesel	838	0 per cent	838	0 per cent	838	0 per cent
Nuclear	6780	2 per cent	10080	2 per cent	16880	3 per cent
Hydro	45293	13 per cent	51301	11 per cent	63301	10 per cent
Solar	21651	6 per cent	100000	21 per cent	150000	24 per cent
Wind	34046	10 per cent	60000	13 per cent	100000	16 per cent
Small Hydro	4486	1 per cent	5000	1 per cent	8000	1 per cent
Biomass	8839	3 per cent	10000	2 per cent	17000	3 per cent
Total Installed Capacity	344002	100 per cent	479399	100 per cent	619047	100 per cent

Source: Thomas Spencer et al, *Coal Transition in India*, TERI



## Highlights of India's Climate Actions

- Total annual GHG emissions have increased from 2,136.8 million tonnes (Mt) of CO<sub>2</sub>e (1,884.3 Mt with Land Use, Land Use Change and Forestry (LULUCF)) in 2010 to 2,607.5 Mt of CO<sub>2</sub>e in 2014 (2,306.3 Mt with LULUCF).
- Emission intensity of India's GDP has reduced by 21 per cent over the period of 2005-2014.
- Solar installed capacity has increased by about 9 times from 2.63GW to 23.28 GW between March 2014 and August 2018.
- The share of non-fossil sources in installed capacity of electricity generation increased from 30.5 per cent in March 2015 to 35.5 per cent in June 2018.
- Supercritical thermal power units have risen from 40 (27.48 GW in 2015) to 66 (45.55 GW in 2018) with avoided emissions amounting to 7 MtCO<sub>2</sub> in 2016-17.
- A total of 170 old thermal generation units having a higher heat rate and a cumulative capacity of 10.64 GW, have been retired till March 2018.
- Forest and tree cover increased from 24.01 per cent of the total geographical area as reported in India State of Forest Report (ISFR) 2013 to 24.39 per cent as reported in ISFR 2017.
- Perform Achieve and Trade (PAT) scheme for energy efficiency in industries and other energy-intensive sectors, covering 478 designated consumers, avoided emissions of 31 MtCO<sub>2</sub> in cycle I (April 2012 to March 2015). In total, 846 DCs from 13 sectors are undergoing implementation of PAT cycle II, III and IV with a total targeted energy savings of 19 Mtoe.
- India in partnership with France launched the International Solar Alliance at the UN Climate Summit in Paris 2015. The alliance is an effort to bring countries, particularly developing ones, together to harnessing the untapped potential of solar energy to provide universal energy access at affordable rates. The International Solar Alliance is treaty-based intergovernmental organisation headquartered in India.
- India is partnering 22 member countries and the European Union in the 'Mission Innovation' on clean energy, and is a co-lead in smart grid, off-grid and sustainable biofuels innovation challenges.

India has also committed to reducing the emissions intensity of its GDP by 33 to 35 per cent by 2030 from 2005 level. Earlier in 2010, India took a voluntary pledge to reduce the emission intensity of its GDP by 20-25 per cent by 2020 from 2005 levels. Between 2005 and 2014, India has reduced the emission intensity of the economy by 21 per cent. An analysis by Australia-based think tank Institute for Energy Economics and Financial Analysis (IEEFA) finds that India is likely to achieve its energy capacity and emissions intensity goals by 2020, that is a decade before the deadline of 2030 it set in its NDC.<sup>3</sup> The emissions

intensity of GDP, India has been able to bring it down by 21 per cent below 2005 levels by 2014. At this average annual rate of 2 per cent, India will meet its Paris goal nearly a decade ahead of 2030.

Another commitment made is to create an additional carbon sink of 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent through additional forest and tree cover by 2030. However, as regards the forestry goal, India's achievements are not as robust. "Our commitment is to create additional carbon sink of 2.5-3 billion tonnes of CO<sub>2</sub> equivalent, given our present pace it may be a

little difficult to achieve this target," said Mishra. But the situation is being addressed. "We are conscious of this, so a new strategy has been formulated, and put in place by which between now and 2030 this pace is going to almost be doubled. This should help meet the goal."<sup>4</sup>

## What Next?

Science and mounting evidence on the ground leaves no doubt that the impacts of climate change are not far in the future but already being felt. The impacts being experienced now whether it is extreme weather events or changing patterns of rainfall is only the beginning. From here onwards the impacts will only increase in their intensity, periodicity, and the numbers of those affected will mount. It is clear that even with the best efforts of all governments and stakeholders, actions far exceeding the pledges made under the Paris Agreement, the world has to adapt to and deal with a certain level of warming.

The IPCC Special Report gives the world about 12 years to slow down warming to levels that will limit the damage resulting from a warming planet. Since the IPCC's October report, other scientific panels such as the United Nations Environment's Sixth Global Environment Outlook have warned about the adverse impact that the damage to the environment is having on health and well-being. There is no doubt that climate change is real and its impacts more far reaching than previously understood.

UN Secretary General Antonio Guterres' warning holds true particularly for large economies with limited resources such as India. Rising temperatures will disproportionately affect disadvantaged and vulnerable populations through food insecurity, higher food prices, income losses, lost livelihood opportunities, adverse health impacts, and population displacements.

The climate change poses a complex challenge for an emerging economy such as India. How does



a large developing economy with considerable development deficits and millions still living in poverty grow its economy and sustain that growth while limiting its carbon footprint so as to slow down warming to avoid the more dire impacts of climate change on its people? How does a developing country with limited resources ensure that it can bridge the development gap of its people without endangering their well-being in a climate constrained world while at the same time is able to take advantage of the opportunities of the future?

Material resources and energy are the drivers of economic progress. Growing the economy and bridging the development gap will inevitably require increasing India's consumption of material resources and energy. A recent assessment, *Global Resources Outlook 2019*, by the International Resource Panel, a United Nations Environment-sponsored science body, reports that the global extraction and processing of material resources—biomass, fossil fuels, metals, and non-metallic minerals—contributes to more than 50 per cent of the greenhouse gas emissions. As a lower-middle income country, India's material footprint is smaller than its high and upper-middle income counterparts. However, it is already experiencing the adverse impacts of a materials-intensive growth model: polluted air, water stress and climate change-induced weather events. Clearly, as India moves ahead urbanising at a rapid pace, building the nearly 70 per cent of its yet unbuilt infrastructure, increasing its manufacturing base, creating jobs in the non-agricultural and mining sectors, it will need to transition to production and consumption systems that are sustainable, produce less waste and use resources and products more efficiently and in a manner that they can be reused, remanufactured, recycled or recovered. It is clear that India cannot afford to adopt the growth models that have underpinned the rise of developed industrialised economies and developing economies such as China.

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For India to bridge the developmental gap of its people and ensure sustained economic growth, it will have to go beyond the four corners of its international climate change and sustainable development commitments. It will require more than swapping coal power plants for solar panels and wind turbines, and switching from fossil fuel-powered internal combustion vehicles to electric vehicles. Slowing down the rate of growth of emissions is important. Equally important for a developing country such as India is the need to build its ability to withstand the changes that a warming earth necessarily imposes—to augment its resilience capabilities and the ability to convert the challenge of climate change into opportunities.

Climate change will require economy-wide transformation. India will need to make dramatic changes across the spectrum—energy, transportation, urban and agriculture systems. It will require investing in human capital, innovation and research and development. This is the moment for India to invest in re-skilling the 500,000 people who depend directly and indirectly on coal mining as the energy mix changes. It must invest in innovations that minimise the social cost of a climate-induced transformation of the economy.

Reducing material and carbon footprint and energy efficiency of production and consumption systems will require higher levels of research and development. Issues like improving the efficiency and productivity of solar

and wind energy capacities so as to truly phase out fossil fuels, developing the support system to change agricultural and cropping systems to alleviate water stress, improve productivity in the face of changing temperature and rainfall patterns. India will need to reconsider its investment decisions so as to build the industries of the future. It requires balancing the needs of the present, the material aspirations of its people with the opportunities of the future.

Climate change is about rising temperatures, shifting precipitation patterns, extreme weather events. It is also much more. It is about changing the way we consume and produce. It is about creating more sustainable economies. And for a country such as India, filling the backlog of development in a climate constrained world poses a real and immediate challenge. However we cannot just grow our way out of this crisis. The path forward must focus on creating wealth that will provide the resilience to deal with the real and physical challenges that a warming earth presents, and to sustain the economic growth that will ensure a better life for all its people. For India, it has to be about creating the capacities to seize the opportunities that the climate crisis presents.

#### Footnotes

1. Central Electricity Authority, February 2019, All India Installed Capacity of Power Stations
2. Central Electricity Authority, 2018b, *National Electricity Plan (Volume I): Generation*
3. Institute for Energy Economics and Financial Analysis, 2018, India on track to meet majority of Paris goals
4. Urmi A. Goswami, 2018, India to achieve climate goals before schedule, *The Economic Times* (<https://economictimes.indiatimes.com/news/politics-and-nation/india-set-to-increase-share-of-renewables-and-reduce-carbo-dioxide-pollution/articleshow/66924213.cms>)

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