CLIMATE ACTION TRACKER

India

History: 2017 2016 2015 2014 2013 2012 2011

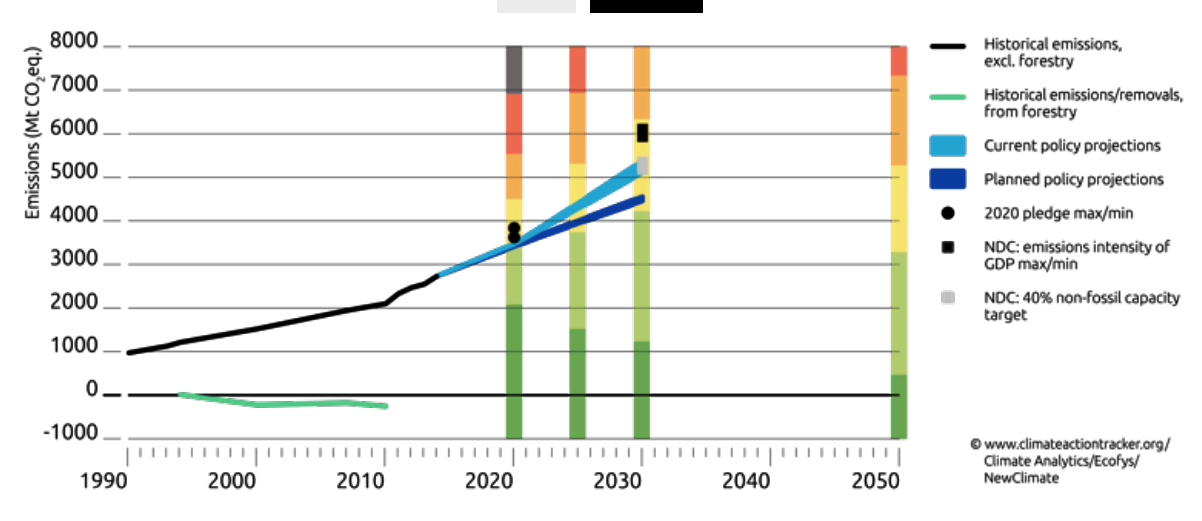
Page last updated: 7th November 2017

Rating

CRITICALLY INSUFFICIENT | HIGHLY INSUFFICIENT | INSUFFICIENT | 2°C COMPATIBLE | 1.5°C PARIS AGREEMENT COMPATIBLE | ROLE MODEL

Current Rating: **2°C COMPATIBLE**

Basic | Detailed



Assessment

India's current climate policies will see it reaching its 2030 non-fossil capacity target, and overachieving its emissions intensity target submitted under the Paris Agreement. If India also fully implements its Draft Electricity Plan (shown as planned policy pathway in the CAT assessment) it could even achieve the capacity target more than eight years earlier. It is therefore clear that India could strengthen—and still achieve—the Nationally Determined Contribution (NDC) it has submitted under the Paris Agreement. If it did this, the CAT could upgrade its "2°C Compatible" rating to "1.5°C Paris Agreement Compatible," which would make India a global climate leader.

India is already set to take a global leadership position in the transport sector, following the government announcement that no diesel or petrol-powered vehicle should be sold in India by 2030. However, we question the need for India to expand domestic fossil fuel production and distribution, which could lead to more GHG emissions. The current coal plant construction programme will lead to a greater lock-in of carbon-intensive power infrastructure than appears necessary.

India's Nationally Determined Contribution (NDC) sets targets for 2030 to lower the emissions intensity of GDP by between 33%–35% below 2005 levels, increase the share of non-fossil based power generation capacity to 40% (equivalent to 26–30% of generation), and to create an additional (cumulative) carbon sink of 2.5–3 $GtCO_2e$ through additional forest and tree cover. We rate India's NDC "2°C compatible," meaning that if all countries were to follow India's approach, warming could be held below—but not well below—2°C.

Two 2017 publications by a government think tank (NITI Aayog, 2017a, 2017b) have raised concerns about India's commitment to low-carbon economic growth: the government's Draft National Energy Policy and the Three Year Action Agenda (2017–18 to 2019–20), both include recommendations to increase domestic production and distribution of coal, oil and gas. While the stated aim of this expansion of domestic fossil fuel production and distribution is to enhance India's energy security, they may stimulate additional fossil-based energy demand, leading to higher GHG emissions.

India has large renewable energy resources, so expansion of domestic fossil fuel production is not the only way to meet its energy security objective. The ramp-up of renewables in India shows these resources can provide access to affordable power - at scale, and quickly. For the electricity sector, however, the Draft National Energy Policy projects that more than 60% of generation capacity will be based on renewables by 2040. The Draft National Energy Policy's analysis seems to be in line with the renewable energy deployment ambitions that were published in 2016 in the Draft Electricity Plan.

Existing policies and measures are described in detail in India's NDC. However, the description of the targets is very brief. India could increase the transparency of its NDC by describing the greenhouse gases, sectoral coverage and metric for the intensity target (e.g. constant or nominal GDP), as well as the way it envisages achieving the non-fossil power capacity target.

Given that the coverage is not specified, we have assumed that the 2030 intensity target excludes the agriculture sector, consistent with India's Copenhagen pledge to reduce the emissions intensity of GDP by 20%–25% by 2020 below 2005 levels.

Assuming an annual GDP growth of 7.2%, we rate the absolute emissions levels resulting from India's 2030 intensity target "2°C compatible." The non-fossil generation target would result in lower absolute emissions than the intensity target alone, effectively leading to a larger reduction in intensity than in the NDC target itself (see below). As the non-fossil generation target is conditional on the provision of resources, the CAT has based its rating on the intensity target.

Our analysis shows that India can achieve its NDC target with currently implemented policies, where we project the share of non-fossil power generation capacity will reach 38–48% in 2030, corresponding to a 25–31% share of electricity generation, and India's emissions intensity in 2030 will be 42–45% below 2005 levels. Thus, under current policies, India is likely to achieve its 40% non-fossil target, and is set to exceed its emissions intensity target by a wide margin. Absolute emissions from the NDC's non-fossil power generation target are projected to be 747–758 $MtCO_2e$ lower than the emissions from the NDC's emission intensity target; however, the non-fossil fuel generation target would still be rated "2°C compatible."

Although India's 2022 renewable energy target of 175 GW capacity represents a rapid increase in renewable energy generation, this is not enough to keep up with growth in electricity demand. Between 2014 and 2030 under current policies, we estimate the average annual growth rate for solar and wind power generation at around 3%—about half the growth rate of overall electricity production. During the same period, under our current policy pathway, we project capacity additions of 154–267 GW for solar and wind power, and 186–217 GW for coal power. As of July 2017, nearly 43 GW of coal fired capacity is under construction, with another 100 GW announced or planned (at the pre-permit and permitted stages) (EndCoal, 2017). Were all these plants to be built, this would result in considerable overcapacity. Ultimately, this would lead to a greater lock-in of carbon-intensive power infrastructure in India than appears necessary.

However, there is still substantial uncertainty about the future of coal power capacity in India as illustrated by the Energy Ministry's proposal to cancel the construction of four coal-fired Ultra Mega Power Plants (UMPPs) in June 2016. Leading coal power producers such as Adani appear to have suspended investments and further development in this area and instead have scaled up investments in solar and renewable energy in both India and Australia. Also, the Draft Electricity Plan confirms that no new coal capacity is needed after 2022, apart from the 50 GW that was already under construction in 2016 and is likely to be ready by 2022. The Draft Electricity Plan further assumes that no gas-fired capacity will be deployed after 2022, as the availability of natural gas is uncertain in India due to increasing dependency on imports.

Based on the Draft Electricity Plan, we calculate that India will significantly reduce its emissions and, by 2030, its emissions intensity will be 51–53% below 2005 levels, exceeding its NDC target.

Pledges and targets

Paris Agreement targets

India ratified the Paris Agreement exactly one year after the submission of its Intended Nationally Determined Contribution (INDC), on 2 October 2016. Since India did not submit an NDC prior to ratification, the INDC became its first NDC. It includes the following main elements (Government of India, 2015c):

- To reduce the emissions intensity of GDP by 33%–35% by 2030 below 2005 levels.
- To increase the share of non-fossil based energy resources to 40% of installed electric power capacity by 2030, with help of transfer of technology and low cost international finance including from Green Climate Fund (GCF)
- To create an additional (cumulative) carbon sink of 2.5–3 $GtCO_2e$ through additional forest and tree cover by 2030.

Copenhagen pledge	
2020 target	20% to 25% below 2005 emissions intensity of GDP by 2020 [272–294% above 1990 by 2020 excl. LULUCF]
Coverage	Excluding agriculture sector
Conditions	None
Paris Agreement target	
Ratified	Yes
2030 unconditional target	33% to 35% below 2005 emissions intensity of GDP by 2030 [510–527% above 1990 by 2030 excl. LULUCF] Non-fossil share of cumulative power generation capacity 40% by 2030
Coverage	Not specified
LULUCF	Additional (cumulative) carbon sink of 2.5–3 $GtCO_2e$ by 2030
Long term goal(s)	
Long-term goal(s)	Per capita emissions never to exceed those of the developed world

India does not specify the coverage and metrics of the emissions intensity target in its NDC. In our analysis, we have assumed that the target excludes the agricultural sector, consistent with India's 2020 pledge. Under the assumption of a 7.2% annual GDP growth rate (IEA, 2016), the emissions level resulting from this target would be 5.9–6 $GtCO_2e$ (excluding LULUCF) by 2030. These emissions are 510–527% above 1990 emissions level excluding LULUCF.

Depending on the way India plans to achieve its 40% non-fossil capacity target (e.g. by additional capacity of renewable energy sources, nuclear power, or a combination of both), we estimate that reaching this target would result in an emissions level of 5.2–5.3 $GtCO_2e$ (433–449% above 1990 emissions level excluding LULUCF) by 2030. The range of 5.2 and 5.3 $GtCO_2e$ stems from the fact that the target is capacity based and the load factors for renewable sources and nuclear power differ. The emissions reduction implied by the NDC non-fossil capacity target are in line with emissions levels expected from the current policy pathway. Under current policies, India is also already meeting the emissions level required by its intensity target. In addition to these mitigation targets, India's NDC also strongly emphasises adaptation measures.

Although not stated in the NDC, we assume that the target to create an additional carbon sink of 2.5–3 $GtCO_2e$ through additional forest and tree cover by 2030 is cumulative, representing an average annual carbon sink of 167–200 $MtCO_2e$ over the period 2016–2020. Over half of this target could be achieved by the Green India Mission, which is expected to enhance annual carbon sequestration by about 100 $MtCO_2e$ (Government of India, 2015c).

2020 pledge

India has pledged to reduce the emissions intensity of its GDP by 20–25% in 2020 below 2005 levels. This target does not cover emissions from the agricultural sector. India proposed the target during the Copenhagen negotiations and submitted it to the Copenhagen Accord on 30 January 2010. The quantification of this pledge covers a range of emissions between 3.6–3.8 $GtCO_2e$ in 2020 (excluding LULUCF). These emissions are 3.7–3.9 times greater than 1990 emissions levels.

Long-term goal

In 2007, at the G8+5 Summit in Germany, then Indian Prime Minister Singh pledged that India's per capita emissions would never exceed those of the developed world. Given India's low per capita emissions, meeting this pledge does not require any emissions reductions compared to current policy projections up to 2030, and this pledge is not shown in the figure. However, we take this pledge into account in the global pathway to 2100, when calculating the associated rise in global temperature. During the period 2016–2030, India's population is projected to increase by 13% (or 177 million people), reaching 1.49 billion people (World Energy Outlook 2016 projections for India) by 2030. Over the same period, we project per capita emissions to reach around 3.4–3.6 tCO2e per capita (excluding LULUCF) by 2030. Despite this strong growth, per capita emissions in 2030 are projected to be about 30% below the world average in 2013 (World Bank, 2017).

The Indian Government is considering long-term growth strategies for India over the period 2030–2045 that would result in a decoupling of carbon emissions with economic growth. In 2017, it commissioned three research institutes (the Energy Research Institute, the Observer Research Foundation and the Centre for Study of Science, Technology and Policy) to develop these long term low-carbon growth strategies (Scroll.in, 2017). The results of these studies will be published in 2018.

Fair share

We rate India's 2030 NDC "2°C compatible".

The "2°C compatible" rating indicates that India's climate commitment in 2030 is within the range of what is considered to be a fair share of global effort but is not consistent with the Paris Agreement. This approach requires other countries to make deeper reductions and comparably greater effort to limit warming to 1.5°C.

If all countries were to follow India's approach, warming could be held below—but not well below—2°C, and hence would still be too high to be consistent with the Paris Agreement's 1.5°C temperature limit. The 2°C compatible category refers to the 2°C goal adopted by the Copenhagen Agreement in 2009, now replaced by the 1.5°C limit in the Paris Agreement, providing a historical reference point and bridge to the Paris Agreement compatible category rating.

If the CAT were to rate India's projected emissions levels in 2030 under current policies, India would also be rated "2°C compatible."

India's climate commitment has received a higher rating than in previous CAT assessments because the new studies we include in our ratings update allow for a higher emissions level for India, not because India has changed its targets.

For further information about the risks and impacts associated with the temperature levels of each of the categories click here.

Current policy projections

Our analysis shows that India can achieve its NDC target with currently implemented policies, i.e. it would not have to put any other policies in place. Under current policy projections, greenhouse gas emissions (excluding LULUCF) are projected to reach a level of 3.5 $GtCO_2e$ in 2020 and 5.1–5.4 $GtCO_2e$ in 2030. This is a 65% increase in emissions from 2010 levels by 2020 and a more than doubling of 2010 levels by 2030. While this growth is in line with both the 2020 and 2030 intensity pledges, the achievement of India's targets depends on actual economic growth levels.

We use a 7.5% and 7.0% GDP (real) annual growth between 2014–2020 and 2021–2030, respectively (IEA, 2016c). This translates into an average annual growth rate of 7.2% from 2014–2030. These GDP growth projections are used for both the targets and current policy projections (IEA, 2016c). The Indian Government aims for higher GDP growth of around 8% per year in its 12^{th} Five Year Plan (Government of India, 2013) and NDC (Government of India, 2015c), but has not yet been able to achieve its aspirations. In a speech to members of the U.S. Congress, Prime Minister Modi said that its annual growth goal must "be achieved with a light carbon footprint, with greater emphasis on renewables" (Buckley, 2016).

India's total emissions have been growing steadily since 1990. The overall growth slowed down around 2000 as land use changed from being a small source of emissions in the first inventory year—14 $MtCO_2e$ in 1994—to a large sink, with removals of 223 $MtCO_2e$ in 2000, 175 $MtCO_2e$ in 2007 and 253 $MtCO_2e$ in 2010.

Population growth is one of the main drivers of India's projected GHG emissions. By 2028, India is projected to overtake China as the largest country in terms of population. By 2030, India's population is projected to grow to ~1.5 billion but the per capita emissions would still be far below the world average in 2013 (World Bank, 2017).

India launched its National Action Plan on Climate Change (NACC) in 2008, which outlines eight national missions in the area of sustainable development (Government of India, 2008). India's 12th Five Year Plan for the period 2012–2017 (Government of India, 2013) proposed a re-organisation of the NACC. The Five Year Plans provide the basic direction for government activities, addressing all sectors and policy areas. Our analysis includes the policies and measures listed in the 11th and 12th Five Year Plans.

Sector specific policies implemented in India are described below.

Energy supply

The power sector accounted for 38% of India's total emissions (excluding LULUCF) in 2014. Given that the fuel mix is dominated by coal-fired generation which is 75% in 2014 (IEA, 2016c), the emissions intensity of electricity supply in India is relatively high (812 gCO_2/kWh in 2014).

On the other hand, per capita electricity demand in India is very low, at around 783 kWh/capita in 2013, or about one fourth of the global average in that year (IEA, 2016b). In 2014, 19% of the population—244 million people—still had no access to electricity (IEA, 2016c). In June 2014, the Government of India announced its commitment to achieving a reliable electricity supply for all by 2019 (Forum of Regulators, 2014) . Population growth, increased access to electricity and economic development are expected to result in a rapid growth of electricity demand in India. Over the next decade, India is likely to have the fastest-growing electricity market of any of the world's biggest economies (IEEFA, 2015). In our projections, we assume a growth of electricity demand of 5.2% a year, as projected in the IEA's World Energy Outlook (IEA, 2016c).

At the federal level, India has implemented two major renewable energy-related policies. The 'Strategic Plan for New and Renewable Energy' provides a broader framework (outlining the mission, objectives, goals, implementation, and evaluation plan for India's renewable energy sector) and the 'National Solar Mission', launched in 2010, contains capacity targets for solar energy. Since the election of Prime Minister Modi in May 2014, India's government has put climate change policy higher on the political agenda.

The original targets of the 'National Solar Mission" were 10 GW of solar power capacity by 2017 and 20 GW by 2022 (MNRE, 2010). As of March 2017, India has installed 12.2 W of utility scale solar PV capacity (Bridge to India, 2017). In November 2014, the government announced plans to increase its solar capacity to 100 GW installed capacity by 2022. This scaling-up of the national solar mission was officially adopted in August 2015 (MNRE, 2015a). In the first half of 2015, targets for other renewable energy sources were also increased. India currently targets a cumulative installed capacity of 175 GW by 2022. This target consists of 100 GW solar, 60 GW wind, 10 GW biomass and 5 GW small-scale hydro (MNRE, 2015b).

Wind power is supported via a Generation Based Incentive, while state-level feed-in tariffs apply for all renewables. These are regulated by the Electricity Act (2003) and the National Tariff Policy (2006). Renewable Energy Certificates (RECs) are in place that promote renewable energy and facilitate Renewable Purchase Obligations (RPOs), which legally mandate a percentage of electricity to be produced from renewable energy sources. In April 2015, the RPO was revised upwards, from 3% by 2022 to 8% by 2019. The Ministry of Power announced in April 2015 that every new coal-fired power plant would have to be accompanied by the installation of renewable power plants with a total capacity of at least 10% of the capacity of the new coal-fired power plant (IEEFA, 2015; Kenning, 2015).

In 2010 the Indian Government introduced a coal tax of 50 rupees (0.8 USD) per metric tonne of coal produced and imported to acknowledge the externalities related to coal use and to encourage a shift away from coal-fired power. Since then, the government has double this tax—now called the Clean Environment Cess— three times, reaching 400 rupees per tonne in the 2016–2017 budget. The revenues from the coal tax feed into the National Clean Environment Fund, which provides finance to renewable energy projects. Part of the revenue has been earmarked for the implementation of 'Ultra Mega Solar Power' projects (IEEFA, 2015; Mahapatra, 2016).

Apart from rapid electricity demand growth, another challenge India faces is its high electricity transmission and distribution system losses. India has the highest aggregate technical and commercial (AT&C) grid-loss rate in the world (IEEFA, 2015), estimated at 26%. In May 2015 the "National Smart Grid Mission" was approved to bring efficiency in power supply and facilitate the reduction in grid losses and outages (Government of India, 2015a).

With current policies, we project the share of non-fossil power generation capacity to reach 43% by 2022, the target year for 175 GW renewable energy. This share will either decrease to 38% or increase to 48% by 2030, depending on whether the renewable energy deployment trend is continued post-2022. Under the higher bound of emission projections, CAT assumes that no additional deployment of wind and solar capacity will take place after 2022, whereas under the lower bound, the deployment trend continues after 2022. The 38–48% share of non-fossil capacity corresponds to 25–31% non-fossil power generation. If India were to achieve its ambitious targets for 2022, then the 40% target of non-fossil power capacity generation by 2030 would be within reach. If renewables continue to grow after the 2022 target is met, then India is likely to overachieve its non-fossil capacity target.

Although committed to diversifying power supply and supporting renewable energy, India's government also supports the domestic coal industry. This is reflected in its aim to double India's domestic coal production to 1.5 billion tonnes by 2020, and reduce its dependency on coal imports (IEEFA, 2015). Under current policies, we project India's coal-fired power capacity to double in the period 2014–2030. However, the Energy and Resources Institute (TERI) in a recent study, assessed that no new coal based capacity may be needed before 2026 (The Energy and Resources Institute, 2017). India's 12^{th} Five-Year Plan set a target of 60% for new coal plants using supercritical technology, but most plants still have less efficient subcritical technology (IEA, 2015).

In December 2016, the Central Electric Authority (CEA) published the Draft Electricity Plan, which provides electricity demand forecasts for the period 2017–2027, and calculates installed capacities from conventional and renewable energy sources needed to meet that demand (Central Electricity Authority, 2016). To finalise the Draft Plan, the CEA is undertaking a consultation process.

The Draft Plan incorporates the impact of demand-side management as well as numerous energy efficiency and conservation measures that substantially reduce electricity demand. Considering additional capacity from nuclear, hydro, gas and renewables, the study reveals that no new coal-fired generation capacity is required during the years 2017–2022. However, it assumes that additional coal-based capacity of 44 GW is needed in the period 2022–2027 to meet increasing electricity demand as per the Draft Plan. This capacity can be supplied by the 50 GW of coal-fired plants already under construction, and likely to be commissioned by 2022.

The Plan essentially means that the 178 GW of coal fired generation capacity in the permitting pipeline is likely to be suspended until at least 2027 (Mathiesen, 2016). This is in line with the assessment from The Energy and Resources Institute (TERI) which indicates that no new coal based capacity will be deployed before 2026 (The Energy and Resources Institute, 2017). The report also estimates that after 2024 all new capacity can be renewable if they become cost competitive and the grid is able to accommodate increased amounts of variable sources of generation (The Energy and Resources Institute, 2017).

The Draft Electricity plan also assumes that no additional gas-fired power plants will be deployed after 2022 as the availability of gas is very uncertain in India. Our estimates for the Draft Electricity Plan result in power sector emissions level of 1.24 and 1.26 $GtCO_2e$ in 2022 and 2027, respectively. These estimates are higher compared to figures calculated by the Draft Electricity Plan which are 0.98 and 1.16 $GtCO_2e$ for 2022 and 2027, respectively (Central Electricity Authority, 2016). The discrepancy is due to the use of different emission factors (i.e. gCO_2/kWh): the Draft Plan uses lower CO_2 emission factors while the CAT uses higher emission factors based on WEO 2016.

Uncertainty around the future construction of coal power capacity is illustrated by the June 2016 proposed cancellation of four coal-fired Ultra Mega Power Plants (UMPPs) by the Energy Ministry (Buckley, 2016; IEEFA, 2016). Leading coal power producers such as Adani appear to have suspended investments in this area and have instead scaled up investments in solar and renewable energy in both India and Australia (Parkinson, 2016; Smiti, 2016).

The Draft National Energy Policy published in June 2017 by a government think thank, the National Institute for Transforming India (NITI) Aayog[1] also developed projections for the electricity sector. It forecasts the share of renewable energy capacity to move above 60% by 2040 and the electricity generation from solar and wind in electricity mix to increase to 14–8% and 9–11%, respectively (NITI Aayog, 2017a). The CAT assessment of India's Draft Electricity Plan projects a share of 12% and 9% for solar and wind, respectively for 2030. In this respect, the Draft National Energy Policy seems to be in line with the projections from the Draft Electricity Plan published in 2016.

The Draft National Energy Policy also projects India's primary energy mix, which includes energy consumption in the power sector, as well as other sectors such as industry and transport. The share of coal in India's primary energy supply falls in relative terms to 44–50% in 2040 from 58% in 2015, whereas in absolute terms the coal consumption nearly doubles according to this document. This indicates that if it were to follow this Draft National Energy Policy, India's economy would continue to rely on coal to meet its energy demands in the coming decades, reducing the share of fossil fuels by just 3%, from 81% in 2012 to 78%, in its primary energy supply in 2040.

The Draft National Energy Policy also provides a view on the technological and market developments in the energy sector towards 2040. It is built around the main objective of reducing energy poverty in India, increasing energy security and providing energy access to all its citizens at affordable prices. The Draft Policy forecasts a primary energy supply growth to 2.7–3.2 times of 2012 levels by 2040 and an increasing share of renewable energy in the primary energy mix to 7-10%, up from 3% in 2012 (NITI Aayog, 2017a).

To enhance energy security, the plan also suggests that India needs to decrease its dependency on overseas energy supply by ramping up domestic exploration and production of coal, as well as refining and distribution of oil and gas. This increase in domestic production could lead to an increase in emissions if it stimulates additional demand rather than simply displacing imports. An expansion of domestic fossil infrastructure may also risk fossil infrastructure lock-in in the coming decades making it difficult for India to decarbonise energy demand in the long term.

In our CAT assessment, we did not quantify the Draft National Energy Policy since it presents a vision for India's energy sector towards 2040 and does not suggest concrete measures for achieving the underlying objectives. The Plan is considered a guidance document for the government to plan their actions towards becoming more energy independent and sustainable.

The three year Action Agenda (2017-18 to 2019-20) published by NITI Aayog in August 2017 also advocates for reduced reliance on imports of coal, oil and gas (NITI Aayog, 2017b). At the same time, the plan appears to confirm all of India's major existing energy policies. It mentions measures to achieve the 2022 renewable energy targets, reaffirms various energy efficiency measures, such as the Perform Achieve Trade (PAT) I and II industrial energy efficiency programmes as well as the National Mission for Enhanced Energy Efficiency (NMEEE). It also sets short term targets to increase the efficiency of fossil fuel generation, e.g. through renovation and modernisation of existing thermal plants and by setting a requirement for new coal power projects to be based on ultra-super critical technology. Similar to the Draft National Energy Policy, the Action Agenda also suggests an increase in domestic production of fossil fuels. This increased production may impact India's NDC targets if it stimulates additional fossil-based energy demand or affects the implementation of the renewable energy and energy efficiency measures stated above.

Industry

The main instrument to increase energy efficiency in industry is the Perform, Achieve and Trade (PAT) Mechanism, which is implemented under the 'National Mission on Enhanced Energy Efficiency. PAT resembles an emissions trading scheme (ETS). The first phase of the PAT scheme ran from 2012 to 2015. Currently the scheme is in its second phase (2016–2019). PAT differs from traditional cap-and-trade systems as it sets intensity-based energy targets. The scheme covers 478 of the country's industrial and power generation facilities in eight sectors that, in total, cover 60% of India's 2007 GHG emissions.

The target is to achieve, on average, energy savings of 6.7 Million toe of the participating facilities in 2015 below the 2007–2010 baseline level (Government of India, 2016). These targets are calculated for each installation separately; more efficient plants have lower SEC targets compared to more inefficient plants. Installations that exceed their targets can sell Energy Saving Certificates to installations that did not meet their target (EDF, CDC Climat Research, & IETA, 2015). In the second phase, PAT scheme has incorporated more units from the existing sectors as well as including additional sectors like railways, electricity distribution and refineries as stated in its NDC (Government of India, 2015c). The second phase covers 621 facilities from 11 different sectors, and the target is to achieve on average energy savings of 8.9 Million toe from the participating facilities in 2019 below the 2014–15 baseline level (Government of India, 2016).

Transport

India finalised its first light vehicle fuel-efficiency standards in 2014. These were scheduled to take effect in April 2016, but their implementation was postponed by a year (Transportpolicy.net, 2017). The standards came into force in April 2017, setting efficiency targets for new vehicles that weigh under 3,500 kg with no more than 9 seats (The International Council on Clean Transportation, 2014; Transportpolicy.net, 2017) . The efficiency targets start at the equivalent of 130 gCO_2/km in 2017 and fall to 113 gCO_2/km in 2022 (Transportpolicy.net, 2017). The standards are based on the average weight of the fleet that manufacturers will sell in a year and the Ministry of Road Transport and Highways (MORTH) is responsible for implementing the standards under the regulations of Bureau of Energy Efficiency (BEE). Currently there are no CO_2 emission standards for light commercial vehicles.

In 2013, the Indian Government set up the National Electric Mission Mobility Plan (NEMMP) 2020 (Government of India, 2015b). As part of the Mission, the Department of Heavy Industry launched the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME India) scheme. The scheme aims to support the development of the hybrid/electric vehicle market and targets a deployment of 6–7 million vehicles per year by 2020 (Government of India, 2015b). India's vision for electrification of vehicles was also reflected in a recent statement by Indian Power Minister Piyush Goyal who said: "by 2030, not a single petrol or diesel car should be sold in the country." (The Times of India, 2017).

Footnotes

[1] NITI Aayog is a Government of India's policy think-tank. The stated aim for NITI Aayog's creation is to foster involvement and participation in the economic policy-making process by the State Governments of India. Given its role, the proposed vision for the energy sector holds great importance for national climate policy making.

Assumptions

Historical emissions

Historical emissions are taken from UNFCCC (2016) for 1994, 2000 and 2010. The 2007 data point was obtained from the Second National Communication, (Government of India, 2012). Between these data points trend interpolation was performed. Before 1994, trend extrapolation was performed to complete the series from 1990–2010. From 2011 to 2014, a combination of different sources was used to complete the emissions trajectory from 1990–2014 excluding LULUCF. Energy related CO2 emissions were obtained from IEA Energy Statistics and Balances (IEA, 2016a), non-CO2 emissions were based on US EPA projections and other CO2 emissions were based on extrapolations using historical data from UNFCCC and growth rates for cement production from IEA (IEA & WBCSD, 2013).

Pledge

For consistency with the current policy projections, the intensity targets for 2020 and 2030 are quantified based on GDP assumptions from the World Energy Outlook (IEA, 2016c). GDP is assumed to grow by on average 7.5% in the period 2014–2020, and 7% in the period 2020–2030. This is roughly in line with the historical GDP development until 2016 and projections to 2022 from the World Economic Outlook database (IMF, 2017) . The 2020 pledge excluded agriculture. We assumed this is also the case for the 2030 target, even though it is not mentioned in the NDC. If agriculture were to be included, the resulting emissions level would be 8% higher (5.9–6.1 $GtCO_2e$).

For the lower end of the current policy pathway, 48% non-fossil power generation capacity can be achieved. If no additional deployment of renewables is assumed after 2022 then 38% non-fossil capacity is achieved. Using the lower bound of current policy we analysed two ways of achieving the additional capacity needed to get to the 40% non-fossil capacity target: 1) based on solar power, and 2) based on nuclear power. These two options represent the extremes in terms of emissions reductions. With the second option, an additional 51 $MtCO_2e$ can be reduced compared to the scenario in which only solar power is deployed. This is due to the fourfold higher load factor of nuclear energy compared to solar energy.

Current policy projections

Current policy projections are based on the World Energy Outlook 2016 Current Policy Scenario for CO_2 emissions from fuel combustion combined with the US EPA non-CO_2 emissions projections until 2030 (US EPA, 2012) and extrapolation of other CO_2 emissions based on (IEA & WBCSD, 2013). The increased renewable energy target for 2022, which are not included in the World Energy Outlook 2016 Current Policy Scenario, was additionally quantified and included in our current policy projection. A scenario range was developed with higher end indicating no ambitious deployment of renewables after the target year (2022) whereas the lower end considers a continuation of the renewables deployment trend after 2022. The increased renewable energy deployment is expected to result in emissions savings of 74 $MtCO_2e$ beyond the World Energy Outlook Current Policy Scenario in 2020 and 12–181 $MtCO_2e$ in 2030.

Planned policy projections are also based on the World Energy Outlook 2016 Current Policy Scenario (IEA, 2016c) with power sector emissions adjusted as per the Draft Electricity Plan. The projected installed capacities for 2022 and 2027 from the Draft Electricity Plan are used to estimate the average annual installed capacity additions between 2014 and 2027.

The average annual capacity additions from different sources of generation are estimated under the assumption that no new coal and gas power plants are installed after 2022. With average annual installed capacities, total installed capacity for 2030 is projected. Installed capacities serve as a basis to calculate the electricity generation and the corresponding emissions from the power sector using the generation factors (i.e. gCO_2/kWh) from the WEO 2016.

With CAT calculations, the power sector emissions for the years 2022 and 2027 are higher compared to the estimates from the Draft Electricity Plan. The discrepancy is due to the use of different emission factors: the Draft Plan uses an average CO_2 emission factor while the CAT uses higher emission factors based on WEO 2016. We used emission factors from the WEO 2016 because it forms the basis of our current policy projections. The difference in power sector emissions from the Draft Plan and the Current Policy Scenario is used to derive emission trajectory for the planned policy pathway.

Sources

Bridge to India. (2017). INDIA SOLAR HANDBOOK 2017. New Dehli. Retrieved from http://www.bridgetoindia.com/wp-content/uploads/2017/05/BRIDGE-TO-INDIA_India-Solar-Handbook_2017-1.pdf

Buckley, T. (2016). Cancellation of 4 Ultra Mega Power Plants Underscores India's Commitment to Transition. Retrieved from http://ieefa.org/ieefa-asia-note-cancellation-4-ultra-mega-power-plants-underscores-indias-commitment-transition%E2%80%A8%E2%80%A8/

Central Electricity Authority. (2016). Draft Electricity Plan (Vol. 1). Retrieved from http://www.cea.nic.in/reports/committee/nep/nep_dec.pdf

EDF, CDC Climat Research, & IETA. (2015). India: An Emissions Trading Case Study. Retrieved from https://ieta.memberclicks.net/assets/CaseStudy2015/india_case_study_may2015.pdf

EndCoal. (2017). Coal Plants by Country (MW). Retrieved from https://endcoal.org/wp-content/uploads/2017/07/PDFs-for-GCPT-July-2017-Countries-MW.pdf

Forum of Regulators. (2014). Strategy for Providing 24x7 Power Supply. Retrieved from http://www.forumofregulators.gov.in/Data/WhatsNew/24x7.pdf

Government of India. (2008). National Action Plan on Climate Change. Retrieved from http://www.moef.nic.in/sites/default/files/Pg01-52_2.pdf

Government of India. (2012). India Second National Communication to the United Nations Framework Convention on Climate Change. Retrieved from http://unfccc.int/resource/docs/natc/indnc2.pdf

Government of India. (2013). Twelfth Five Year Plan (2012–2017) Faster, More Inclusive and Sustainable Growth (Vol. I). Retrieved from http://planningcommission.nic.in/plans/planrel/fiveyr/12th/pdf/12fyp_vol1.pdf

Government of India. (2015a). 1st Year achievements and initiatives of Ministry of Power, Coal and New & Renewable Energy. Retrieved from http://mnre.gov.in/file-manager/UserFiles/Power-Brochure-English.pdf

Government of India. (2015b). First Biennial Update Report to the United Nations Framework Convention on Climate Change. Ministry of Environment, Forest and Climate Change, Government of India. Retrieved from http://unfccc.int/resource/docs/natc/indbur1.pdf

Government of India. (2015c). INDIA ' S INTENDED NATIONALLY DETERMINED CONTRIBUTION?:WORKING TOWARDS CLIMATE JUSTICE. Retrieved from http://www4.unfccc.int/submissions/INDC/Published Documents/India/1/INDIA INDC TO UNFCCC.pdf

Government of India. (2016). Presentation on Perform , Achieve and Trade (PAT) Scheme. Retrieved from https://www.iea.org/media/training/eetw2016/industry/Mr.HanumantharayappaPresentationonPerformAchieveandTradePATScheme.pdf

IEA. (2015). World Energy Outlook 2015.

IEA. (2016a). Energy Statistics and Balances. Paris, France.

IEA. (2016b). Key World Energy Statistics.

IEA. (2016c). World Energy Outlook 2016. International Energy Agency. Paris.

IEA, & WBCSD. (2013). Technology Roadmap Low-Carbon Technology for the Indian Cement Industry.

IEEFA. (2015). India's Electricity-Sector Transformation. Retrieved from http://ieefa.org/wp-content/uploads/2015/08/IEEFA-Indian-Electricity-Sector-Transformation-11-August-2015.pdf

IEEFA. (2016). India's Questionable Ultra Mega Power Plans. Retrieved from http://ieefa.org/wp-content/uploads/2016/08/India?s-Questionable-Ultra-Mega-Power-Plans-Viability-Issues-Continue-to-Complicate-New-Coal-Fired-Projects-August-2016.pdf

IMF. (2017). Real GDP Growth. Retrieved September 26, 2017, from http://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD/IND

Kenning, T. (2015). New India renewable targets put country on path to 69GW of PV by 2019. Retrieved September 1, 2015, from http://www.pv-tech.org/news/india_ramps_up_renewable_purchase_obligations_target

Mahapatra, S. (2016). India Doubles Tax On Coal Again. Retrieved September 4, 2017, from https://cleantechnica.com/2016/03/04/india-doubles-tax-coal/

Mathiesen, K. (2016). INDIA HALTS NEW COAL PLANTS AFTER 2022, LEAVES 178 GW ON THE DRAWING BOARDS. Retrieved September 4, 2017, from http://theenergymix.com/2016/12/19/india-halts-new-coal-plants-after-2022-leaves-178-gw-on-the-drawing-boards/

MNRE. (2010). Jawaharlal Nehru National Solar Mission.

MNRE. (2015a). New Solar Energy Policy. Retrieved September 1, 2015, from http://pib.nic.in/newsite/pmreleases.aspx?mincode=28

MNRE. (2015b). Schemes for Installing Large Solar Power Plants. Retrieved from http://pib.nic.in/newsite/pmreleases.aspx?mincode=28

NITI Aayog. (2017a). Draft National Energy Policy.

NITI Aayog. (2017b). India Three Year Aciton Agenda.

Parkinson, G. (2016). India's Adani Identifies 650 MW Of Australian Large-Scale Solar Projects. Retrieved September 4, 2017, from https://cleantechnica.com/2016/05/26/indias-adani-identifies-650-mw-australian-large-scale-solar-projects/

Scroll.in. (2017). Climate change: India begins work on meeting its obligations under the Paris Agreement. Retrieved September 4, 2017, from https://scroll.in/article/843416/climate-change-india-begins-work-on-meeting-its-obligations-under-the-paris-agreement

Smiti. (2016). Adani Power Signs 10 GW Solar Power Park Deal In India. Retrieved September 4, 2017, from https://cleantechnica.com/2015/06/17/adani-power-signs-10-gw-solar-power-park-deal-india/?utm_source=dlvr.it&utm_medium=twitter

The Energy and Resources Institute. (2017). Transitions in the Indian Energy Sector -Macro Level Analysis of Demand and Supply Side Options. Retrieved from http://www.teriin.org/files/transition-report/files/downloads/Transitions-in-Indian-Electricity-Sector_Report.pdf

The International Council on Clean Transportation. (2014). FACT SHETT INDIA: LIGHT-DUTY VEHICLE EFFICIENCY STANDARDS. Retrieved from http://www.theicct.org/sites/default/files/info-tools/pvstds/India_PVstds-facts_dec2014.pdf

The Times of India. (2017). India aiming for all-electric car fleet by 2030, petrol and diesel to be tanked. Retrieved September 4, 2017, from http://timesofindia.indiatimes.com/auto/miscellaneous/india-aiming-for-all-electric-car-fleet-by-2030-petrol-and-diesel-to-be-tanked/articleshow/58441171.cms

Transportpolicy.net. (2017). India: Light-duty: Fuel Consumption.

UNFCCC. (2016). GHG Profiles - Non-Annex I. Retrieved September 4, 2017, from http://di.unfccc.int/ghg_profile_non_annex1

US EPA. (2012). Global Anthropogenic Non-CO 2 Greenhouse Gas Emissions?: 1990 - 2030. Retrieved from http://www.epa.gov/climatechange/Downloads/EPAactivities/EPA_Global_NonCO2_Projections_Dec2012.pdf

World Bank. (2017). CO2 emissions (metric tons per capita). Retrieved from https://data.worldbank.org/indicator/EN.ATM.CO2E.PC