

## DDP

The DDP is an initiative of the Institute for Sustainable Development and International Relations (IDDRI). It aims to demonstrate how countries can transform their economies by 2050 to achieve global net zero emissions and national development priorities, consistently with the Paris Agreement. Analyses are carried out at the national scale, by national research teams. National research teams openly share their methods, modelling tools, data and the results of their analyses to share knowledge between partners in a collaborative manner and to facilitate engagement with sectoral experts and decision-makers.

### About this project

Thanks to the support of the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), and building on the [Deep Decarbonization Pathways \(DDP\) Initiative](#) and the collaboration with the [2050 Pathways Platform](#), an IDDRI-led consortium with outstanding partners in four emerging economies has developed granular deep decarbonization pathways to 2050 for Brazil, India, Indonesia and South Africa. These pathways have been brought to public debate and domestic decision-making processes. Methodological insights from this work are shared with researchers and practitioners around the world and with members of the 2050 Pathways Platform to support their process of developing long-term strategies.

### Disclaimer

The results presented in this factsheet are outputs of the academic research conducted under the DDP BIICS project as per the contractual agreement. The academic work does not in any way represent our considered opinion for climate negotiations and also does not reflect the official policy or position of the Government of India.









## DDP INDIA

# COUNTRY FACTSHEET

This document presents a synthesis of key results of the decarbonization scenarios developed for India. It describes the key national and sector level techno-economic transformations to 2050, their main socio-economic aspects and resulting emission profiles. It also highlights some main policy implications and challenges, investment insights and necessary developments in international enablers.

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### High-level characterization of DDS 1 and DDS 2 trajectories

| Drivers  | 2020  | 2030  | 2050                      |
|--|-------|-------|---------------------------|
|  GDP Growth (in relation to 2020) | -     | 6.8%  | 6.0%                      |
|  GDP/capita (\$USD 2015/capita)   | 1,423 | 2,468 | 6,318                     |
| <b>DDS1 Emissions</b>  | 2020  | 2030  | 2050                      |
|  GHG                              | 3,221 | 4,169 | 2,453 MtCO <sub>2</sub> e |
|  GHG Cumulative from 2020         |       | 37    | 104 BtCO <sub>2</sub> e   |
| <b>DDS2 Emissions</b>  | 2020  | 2030  | 2050                      |
|  GHG                              | 3,221 | 3,897 | 1,823 MtCO <sub>2</sub> e |
|  GHG Cumulative from 2020         |       | 36    | 86 BtCO <sub>2</sub> e    |

### Dates

|   |            |
|---|------------|
|  CO <sub>2</sub> Net Zero date | After 2050 |
|  GHG Net Zero date             | After 2050 |

 without LULUCF  with LULUCF (includes CH<sub>4</sub> and N<sub>2</sub>O emissions from agriculture)

**India, with the second largest population in the world is the only large nation amongst the G20 countries on track to achieve its commitment to achieve the Paris goal of 2C** (CAT, 2020). India's Nationally Determined Contributions (NDCs) submitted to the UNFCCC in 2016 has been formulated keeping in mind the developmental imperatives of the country (NDC 2015).

In this study, we have attempted to develop multiple pathways: the **current policy scenario (CPS) considers ongoing developmental policies** along with the mitigation and adaptation strategies established in 2015 NDC. The CPS scenario extrapolates trends of ongoing and planned policies till 2050. Two deep

decarbonization scenarios (DDS) propose alternative visions of transformations consistent with the Paris Agreement to inform short-term policies and the revision of the Indian NDC. The DDS scenarios simulate ratcheting the ongoing policies with DDS1 emphasizing on synchronizing development with deeper climate **actions**, and DDS2 ratcheting climate actions to move **towards net zero emissions**. Both DDS1 and DDS2 scenarios focus on achieving development, however DDS2 prioritizes acceleration of climate actions thereby increasing mitigation costs in the near term. The implementation of policies and actions are at slower pace in DDS1 when compared to DDS2 in the short term.

## ECONOMY-WIDE TRANSFORMATIONS

**Key message 1:** The emissions will reach 4.6 GtCO<sub>2</sub>, 4.43 GtCO<sub>2</sub>, and 4.24 GtCO<sub>2</sub> under CPS, DDS1 and DDS2 scenarios in 2030. CPS reiterates and solidifies India's commitment above and beyond to achieve the 2C. While DDS paves the way to well below 2C and move towards Net Zero world goals. The Indian CPS scenario reduces the emission intensity of GDP by 41% by 2030 with respect to 2005, while the DDS1 and DDS2 scenarios will reduce by 44% and 47% respectively.

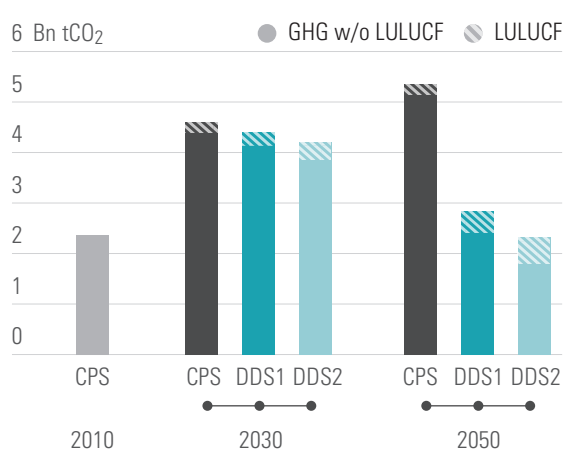
**Key message 2:** India will require carbon space of 136-142 GtCO<sub>2</sub> under CPS scenario (including LULUCF) until it achieves Net Zero. Under DDS scenarios, the estimate ranges between 86 and 114 GtCO<sub>2</sub> (including LULUCF). India's historical cumulative emissions sum

less than 5% from 1850 to 2019. . Based on remaining carbon budget from 2020 for 2C global warming limit (~ 900-2300 GtCO<sub>2</sub>) (AR6 WGI SPM), India's future carbon budget share ranges between 5.9%-15% in CPS scenario and 3.7%-11.6% in DDS scenarios.

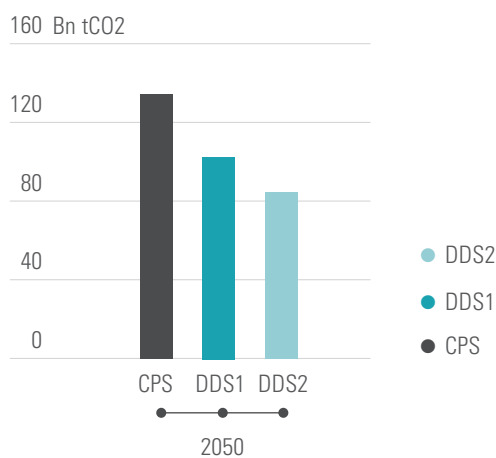
**Key message 3:** The net-zero discussion requires to include the entire basket of all six GHGs and not CO<sub>2</sub> alone.

**Key message 4:** Feasibility of deep decarbonization scenarios is dependent on various factors, the most important of which being incremental mitigation targets, technologies (CCUS, hydrogen, nuclear, coal to other chemicals), socio-economic-political considerations, and financial support commitments (domestic and international).

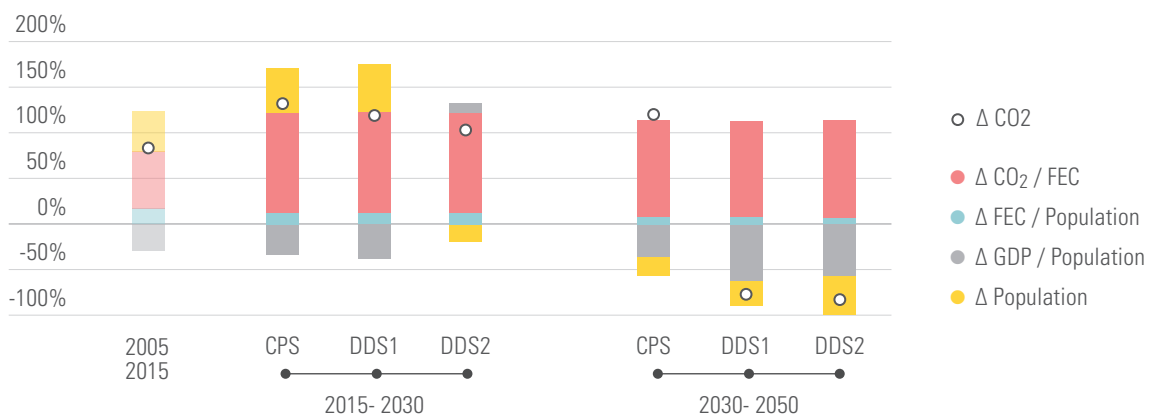
**Figure 1.** CO<sub>2</sub>e emissions including LULUCF



**Figure 2.** Cumulative emissions including LULUCF



**Figure 3.** Decomposition of Indian energy-related CO<sub>2</sub> emission changes for historical (2005-2015) and two future ranges (2015-2030, 2030-2050)



## NATIONAL-SCALE SOCIO-ECONOMIC ASPECTS

India is rapidly moving towards becoming a middle-income economy with population projected to overtake China by 2025, and urbanization exceeding 50% by 2050 (UN 2019). **Development has been and will remain a fundamental priority for India's climate policy.**

**Key message 5:** Transformational and resilient structural changes are required to reduce energy intensities and carbon intensities.

**Key message 6:** Stranded assets in the form coal investments already made (e.g. plants, mines, transport) could increase as consequences of selected alternate pathways. Coal value chains directly and indirectly impact about 20 million plus people in India. It is a source of revenue for eastern and south-central states. Coal transitions will impact locality, states, regions and people at social, political and economic level if implemented in a haphazard

manner. A long-term vision (30-50 years) and mission is needed to explore the transition towards alternative and lucrative sources of employment for unskilled and skilled labour, in addition to diversification to alternative lucrative businesses and revenue for cities, states, private firms and Indian railways.

**Key message 7:** India is committed to achieve its SDG and NDC goals by 2030. NDC policies will result in the achievement of targets under SDG3-6-7-8-9-11-13-15. Achieving the SDG targets can also help accomplish resource-use efficiency goals, in addition to NDC and Paris Agreement goals. In India, SDGs impact vast rural as well as low-income population, resulting in enhanced resilience for climate change impacts and adaptation capacity. However the discussion on adaptation needs to be brought back on the table along with net-zero.

## INTERNATIONAL KEY ENABLERS

**Key message 8:** India will not be Net-Zero by 2050. For the world to be Net Zero by 2050, the developed countries need to have ambitious plans to become overall net negative economies. Additionally, more work is required on the management of carbon sinks (nature-based and geo-engineered).

**Key message 9:** Facilitating the provision of cheaper finance through global financial institutions for climate action is needed, especially for MSMEs that employ over 110 million people in India. India puts in about \$100 billion each year for climate adaptation and ring-fencing its population and systems. This is likely

to touch \$300 billion by 2050. In accordance to Art. 9 (para 3) of the Paris Agreement, the developed countries need to provide financial assistance of USD 100 billion annually from 2020 to the green climate fund (for developing countries).

**Key message 10:** There is a need to create a common technology development pool (battery storage, grid integration, electric vehicles, CO<sub>2</sub> capture utilization and storage (CCUS), hydrogen, advanced bioenergy and nuclear power) in which industrialized and developing countries are equal partners. These technologies are required to upscale DDS scenarios for even earlier Net Zero by India.

**Key message 11:** We need to involve multi-national/transnational businesses and industry in climate change discussions and actions (for technology transfer, financial investment and capacity building). Some major Indian businesses have committed to become net zero and are gradually internalizing carbon price. This action would gain more momentum with an internationally consolidated expression by large businesses.

**Key message 12:** International support and facilitation is required to create a vibrant carbon market in India, and link it with other carbon markets around the world. This will enhance economic efficiency of GHG mitigation all over the world. Article 6 of the Paris Agreement covering Internationally Transferred Mitigation Options (ITMOs) could also support such linking of domestic markets through carbon price signals, however due diligence needs to be ensured to avoid double counting of emission mitigation.

## SECTORAL SYSTEM TRANSFORMATIONS

For India, power sector is the largest contributor to emission reduction possibilities followed by transport, industry, and forestry sectors.

**Key message 13:** Coal is a global concern with 12 countries accounting for 88% of global coal consumption. There must be a global solution for coal phase-out, including technology and financial transfers. **If left to developing countries alone, energy security concerns could result in continuation of coal.**

**Key message 14:** Decarbonization of electricity sector is essential to move towards carbon-neutral India, as it subsequently impacts end-use sectors (transport, industry and building). Bioenergy and nuclear power should be actively explored in the Indian context for domestic energy security, economic benefits to the farmers and earlier Net Zero.

**Key message 15:** Industry is observed to be one of the 'hard to abate' sectors, especially for cement and steel sectors. Installation of CCS and hydrogen technologies will require global support in both technology and finance. There is need to facilitate the provision of cheaper finance, especially to MSMEs, through global financial institutions.

**Key message 16:** Electric vehicles, fuel efficient technologies, bioenergy (including energy plantations, BioCNG, ethanol and biodiesel) and multi-modal logistics will play a crucial role in decarbonization of transport sector.

**Key message 17:** Agriculture is a **difficult to abate** sector for India (~14% of Indian GHG emissions in 2016) due to dispersed sub-sustenance activities such as livestock and urea use at farm and poor household levels. It would need specific attention from policymakers for not only mitigation actions but also from impacts, resilience building and climate change adaptation perspective. These would require a global initiative on agriculture sector GHG mitigation, such as for the Green Revolution – an evergreen revolution.

**Key message 18:** Agro-forestry, afforestation and reforestation especially reforesting degraded forestlands present as one of largest mitigation opportunities after power and transport for India till 2050. Increasing soil carbon in croplands presents a win-win scenario for improving yields and food security as well as for climate change mitigation.

**Figure 4. Sectoral CO<sub>2</sub>e emissions (million tonnes)**

