BCC&I

THE BENGAL CHAMBER

Sustainability Forum

Thought Paper on

Sustainability Practices and Recommendations for West Bengal

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AIDING BUSINESS
SINCE 1833

BCC&I SUSTAINABILITY POSITION PAPER ON CLIMATE ACTION PLAN

BACKGROUND

The Bengal Chamber of Commerce and Industry (BCC&I), India's oldest Chamber of Commerce dating its origins to 1833, has constituted **BCC&I Sustainability Forum** with the objective of promoting sustainability as part of core business plans. **Sustainable Development Goals (SDGs) 2030 is the guiding principles of the said forum.**

The Forum is chaired by **Shri M K De, IAS (Retd),** Former Chief Secretary to Government of West Bengal and mentored by **Shri P S Bhattacharyya**, Chairman, Peerless Group and Former Chairman, Coal India Ltd.

The other eminent Special Invitee Advisors include **Dr. Ajay Mathur**, Director General, International Solar Alliance, **Mr. Aloke Mookherjea**, Former President, BCC&I, **Dr. Meera Mitra**, Member, Governing Body, Centre for Responsible Business, **Mr. Ravindra Chamaria**, Group Chairman, Infinity Infotech Parks Limited, **Prof. Runa Sarkar**, Professor Economics, IIM Calcutta, **Mr. Subir Chakraborty**, Immediate Former President, BCC&I, **Mr. Sushil Kumar Soonee**, Former Founder & CEO, POSOCO now Grid India, **Mr. Sutirtha Bhattacharya**, IAS (Retd), Chairman – WEBEL and Chief Adviser, Swastha Sathi Prokolpo, GoWB & Former Chairman, Coal India Limited and **Mr. U K Bhattacharya**, Former Director-Projects, NTPC Limited & Chairperson, Energy, Environment and Water National Committee, BCC&I.

The objective is to lay out the route/path that we will be taking through research and workshop backed platform for industries; major projects on the ground which promote resilience and adaptability & by working with civic bodies, Governments and Industry at large and recommending preferred, sustainable, efficient courses of action.

Given the above our work in BCC&I's Sustainability Forum has been divided into addressing the following:

A. Renewable energy for the State of West Bengal:

The Indian Government is emphasizing offshore wind projects and solar power. Viability gap funding is supporting offshore wind energy, particularly in Gujarat and Tamil Nadu, with a target of 1 GW capacity. Additionally, rooftop solar initiatives aim to reduce carbon emissions and encourage private sector investment in renewable energy sources. The bio-economy is another focus area. The Government is promoting biodegradable polymers, bio-plastics, and bio-agri inputs to foster sustainable economic development. These initiatives are part of a broader strategy to reduce reliance on fossil fuels and support environmental restoration. In the IT sector, Green IT initiatives are tackling electronic waste and energy consumption. The National Mission on Enhanced Energy Efficiency (NMEEE) promotes energy efficiency across various industries. The Green Passport initiative ensures IT equipment meets environmental standards, and the E-Waste (Management) Rules govern the disposal of electronic waste.

These efforts are complemented by initiatives like compressed biogas blending, which aims to reduce carbon emissions and enhance energy security. The promotion of biomass aggregation and use of compressed biogas in transportation and domestic sectors also supports a circular economy. These initiatives collectively aim to create a sustainable and environmentally friendly economic landscape in India.

WBREDA is already providing electricity in 6 remote villages in Sundarbans with Solar PV Home Lighting System for individual households and Solar PV Street Lighting System for community uses. Further, the State of West Bengal should :

- Actively promote the installation of domestic grid-connected rooftop solar power plants under the net metering arrangement. This allows consumers to generate their own electricity, reducing their reliance on the grid and contributing to cleaner energy generation.
- Open Access Solar may be implemented which would help heavy users of power, with more than 1 MW connected load, to buy power at a much lesser price from the open market. The concept is to allow the customers to choose from a number of competitive power companies. Open access helps consumers meet their Renewable Purchase Obligations (RPOs) as well.
- Energy Storage Systems or ESS, whether mechanical or battery driven, will need to be deployed at a rapid pace for achieving the targets.
- Collaborate with Discoms (Distribution Companies) to develop a user-friendly IT application for facilitating online applications, approvals, and monitoring of rooftop solar projects. This will streamline the process and encourage wider participation.

- Provide subsidies and incentives to rooftop consumers as per the guidelines established by MNRE (Ministry of New and Renewable Energy) and the State Government. This will make solar installations more financially attractive for residents and businesses.
- Integrate appropriate provisions within the Urban Building Byelaws to promote and facilitate the installation and use of rooftop solar systems. This will provide a clear regulatory framework for smooth implementation.
- Encourage and support startups specializing in rooftop solar installations within the urban area of the state. This will foster innovation, competition, and wider accessibility to solar solutions.

Potential benefits from this approach include

- **Reduced Transmission and Distribution Losses:** Decentralized solar generation minimizes energy losses associated with long-distance transmission and distribution.
- **Cost Savings:** Lower T&D losses and reduced reliance on conventional energy sources translate to lower electricity costs for consumers and the city.
- **Increased Grid Resilience:** Decentralized solar power plants can provide backup power during grid outages, enhancing the overall resilience of the electricity system.
- **Environmental Benefits:** Widespread adoption of solar energy contributes to a cleaner and more sustainable environment by reducing greenhouse gas emissions.

By implementing this comprehensive approach, West Bengal can establish Green Energy Zones within the city, promoting clean energy generation, reducing reliance on fossil fuels, and paving the way for a more sustainable future.

B. Climate Action Plan for Energy & Industry:

Areas to focus on

- Energy efficient and low cost Housing/Real Estate
- Transportation & e-mobility
- Urban greening and biodiversity
- Water management: Surface & Ground Water
- Air pollution
- Energy use and shift from fossil fuel sources
- Waste management
- Drainage & Urban Flooding
- Health
- Industry
- Overall Disaster Risk Reduction

A Position Paper has been prepared based on the inputs collated from the industry, which is available with the BCC&I. A summary of specific issues is attached as Annexure I

C. Potential Goals and Strategies for West Bengal:

- Specific Net Zero Target: Setting a state-specific Net Zero target, ideally well before 2070, would provide a clear roadmap and timeline for achieving carbon neutrality.
- Accelerated Renewable Energy Deployment: Significantly increasing the pace of renewable energy installations, including solar, wind, and biomass, is crucial to decarbonize the power sector.
- Sustainable Industrial Practices: Promoting the adoption of cleaner technologies and processes within industries, particularly in sectors with high carbon footprints.
- Carbon Sequestration: Exploring and implementing nature-based solutions like large- scale afforestation and wetland restoration to enhance carbon sequestration.
- Public Engagement and Awareness: Raising public awareness about climate change and promoting sustainable lifestyle choices are essential for long-term success.

A summary of specific considerations for India for attaining a net zero target is attached as Annexure II. To start with, the following sectors would be given priority:

Energy sector: India aims to achieve 500 GW of renewable energy capacity by 2030, focusing heavily on solar and wind power. Major initiatives include the National Green Hydrogen Mission, which targets the production of 5 million metric tonnes of green hydrogen by 2030, and extensive development of solar parks and offshore wind projects. The shift from fossil fuels to renewables is expected to reduce the carbon intensity of the economy and lower energy costs over time.

Agricultural sector: This sector is also making strides in sustainability. Sustainable farming practices that improve productivity and income, such as organic farming, precision agriculture, and water conservation methods are projected to boost farmers' incomes significantly. The focus includes Government Policies and subsidies promoting sustainable agriculture improving agricultural productivity and optimizing land use, which is crucial given the high land demand for renewable energy projects and carbon sinks. These would ultimately result in increased farmer incomes, improved food security, and reduced environmental impact.

Transport sector: There is a strong push towards electrification. The sale of electric vehicles (EVs) is rising, supported by government incentives and investments in EV infrastructure. This transition is part of a broader effort to reduce emissions and reliance on fossil fuels. Other focus areas include development of sustainable public transport systems, like metro expansions and electric buses. These would reduce greenhouse gas emissions and improve the urban air quality.

Mining sector: This sector is undergoing changes to align with sustainability goals and ensure a just energy transition. As India moves towards decarbonization, the demand for coal and other fossil fuels is expected to decline significantly. This will necessitate support and reskilling programs and alternative industrial development for affected communities dependent on coal mining, along with the development of alternative industries in these regions. Sustainability Practices also includes adoption of cleaner mining technologies and rehabilitation of mining sites.

D. Climate Risks and Forecasting for West Bengal

West Bengal is one of the most climatically vulnerable states of India — with a history of a high number of severe cyclones in the Bay of Bengal coast, severe thunderstorms, a high sea-level rise and projected flood risk. These observations were pointed out in India's first official climate assessment report.

The Bay of Bengal region was struck by the highest number of cyclones in May and November according to the long-term analysis between 1891 and 2018, revealed the report Assessment of Climate Change over the Indian Region. It was released by the Ministry of Earth Sciences recently.

The region was hit by 41 severe cyclonic storms and 21 cyclonic storms in May during the given period. The figures jumped to 72 and 55 in November during the 127-year timeline. During the period, the Arabian Sea coast was struck by fewer cyclones.

From 2000 to 2018, the Bay of Bengal region experienced 16 Category 4 and above level cyclones — very severe cyclonic storms and extremely severe cyclonic storms — out of 22 cyclones that struck the region. There is a significant eastward shift in tropical cyclone genesis locations in the Bay of Bengal region during post-monsoon seasons, which may enhance the risk for the coastal regions of West Bengal.

During 2019-20, West Bengal coast witnessed landfalls of two extremely severe cyclones — Cyclone Bulbul and Cyclone Amphan — in November, 2019 and May, 2020. While cyclone Bulbul had a maximum wind speed of 155 kilometre per hour, Amphan had maximum wind speed of 185 km per hour. Both made landfalls nearthe western part of Indian Sundarbans close to Sagar Island. Maximum landfalls happened in Sundarbans area within the Bay of Bengal coast line ranging from Orissa to Bangladesh.

The flood risk increased over the east coast of India, with West Bengal being one the vulnerable states. The flood risk has increased over the east coast; West Bengal, eastern Uttar Pradesh, Gujarat and Konkan region, as well as a majority of urban areas such as Mumbai, Kolkata and Chennai.[1]

There is also a predicted substantial increase in short-duration extreme rainfall events, leading to waterlogging. Local scientific projections indicate that the sea-level near Sunderbans, about 100 km south of Kolkata, may rise by approximately 60 centimetres by the end of this century. This could cause more frequent and severe flooding incidents in Kolkata, especially during high tides. Flood simulation results indicate that more than 90% of Kolkata is likely to get flooded in an extreme rainfall event. A flood depth of more than 25 cm is expected to affect 41% of the city area and 47% of the population by 2050. Surprisingly, the city is also exposed to drought and earthquake risk.

West-Bengal coasts, including Kolkata and neighbouring areas are likely to be impacted by an increasing number of Category 3-5 cyclones (extremely severe or super cyclones). Tropical cyclone Aila formed over the Bay of Bengal in May'09 and caused extensive damage and devastation in the city. Cyclone Amphan was the strongest cyclone to strike Kolkata in May'20, which resulted in the loss of a substantial portion of the city's green cover. It was the largest source of displacement in 2020, with 2.4 million displacements in India.

Climatic changes, including warming, more frequent heat waves, cyclones, droughts and increasing emissions have been clearly linked to human influence. As per IPCC report on Climate Change 2022, Kolkata is one of the eight megacities most vulnerable to disaster related mortality. Hence, it is essential for governments, municipal bodies, communities, and individuals to protect the city from challenges posed by climate change.

West Bengal Metropolitan is home to many industrial units operated by large public and private sector corporations; major sectors include Steel, Heavy Engineering, Mining, Minerals, Cement, Pharmaceuticals, Food processing, Agriculture, Electronics, Textiles, and Jute.

Urbanisation accounts for more than 80 per cent of the temperature rise in major city of West Bengal. Certain regions of the city face severe Urban Heat Island Effect. Factors such as reduced ventilation, heat trapping due to proximity of tall buildings, heat generated directly from human activities, unplanned waste management, the heat-absorbing properties of concrete and other urban building materials, and limited vegetation also contribute to this effect. The city has witnessed rapid, unplanned urbanisation over the past few decades, as evident in the mushrooming of multi-storeyed buildings that came up after felling trees or on plots that were once water bodies.

[1] https://www.downtoearth.org.in/news/climate-change/bengal-most-vulnerable-to-climate-risk-flags-india-s-first-assessment-report-72117

Major sources of air pollution include automobile exhausts (50%), industrial emissions (48%) and cooking (2%). Automobile exhausts include sulphur dioxide, nitrogen dioxide, carbon monoxide, carbon dioxide, hydro-carbons and particulates PM 2.5 and PM 10. It is indisputable that human activities are causing climate change, making extreme climate events. Efforts should be made to enhance resiliency to address such underlying conditions of vulnerability in the city.

West Bengal is committed to play its fair role in reducing carbon emissions and setting a roadmap to becoming carbon neutral aligned with the Paris Agreement and in accordance to UN SDGs. The city is a part of C40 Cities Climate Leadership Group.

E. Linking the Initiatives of BCC&I with those across the nation

BCC&I would like to play a crucial role in promoting and implementing sustainable business practices across the country and to facilitate the adoption of environmentally friendly practices by providing businesses with resources, training, and support on sustainability issues. We can organize seminars, workshops, and conferences to educate members on the latest trends and technologies in sustainability. Additionally, we can advocate for favourable policies and incentives from the government to encourage green practices. By fostering collaboration between businesses, government agencies, and environmental organizations, BCC&I can help create a network that supports sustainable development goals and drives the transition to a greener economy.

Annexure I: Climate Action Plans for West Bengal:

Few Action Plans to restrict climate changes across sectors are detailed below.

Housing/Real Estate:

- Sharing / Spreading awareness on both theoretical and practical information on how to improve the thermal performance and energy efficiency level of buildings like usage of high-performance glazing & shading devices, suitable ventilation strategies, better airtightness etc. to general masses.
- Encouraging new buildings to be built and operated according to Green Building Norms (double glazing system in windows, controlled use of water, recycling of grey water, and mandatory use of solar panels, etc.).
- Mandating mechanisms for dust suppression at construction sites, industrial exhausts, and other point sources within/around the city.
- Implement ECO-Niwas Samhita guidelines. Mandate heat-resistant roof and wall materials in all new building structures, including in housing schemes for economically weaker sections, government offices and commercial buildings.
- Mandate new water fixtures to be low-flow ones. Introduce water less no-flush urinals at public toilets.
- Mandate building management system in all new buildings offering energy savings making buildings achieve net zero goals.
- Prohibition of use of deep tube-well in housing projects to preserve ground water.

Transportation & E-mobility:

- Encouraging sustainable mode of travel like walking, cycling, using E-bikes & EVs etc. to citizens. Developing dedicated corridors for pedestrians and cyclists. Creation of designated 'safe' routes free from encroachments.
- Promote EV transition in line with the West Bengal EV policy.
- Develop publicity campaigns to promote low carbon modes of public transport such as metro, and Ferry.
- Conversion of diesel buses to CNG / bio-CNG buses. Electrification of public and private buses plying in and around the city
- Introduction of Public Bike and 4-Wheeler Sharing System.
- Decongesting important road junctions by introducing road flyovers.
- Introduce a Congestion Tax for vehicles entering central Kolkata to reduce pollution and city congestion; demarcate an appropriate inner zone and procure new technology required for developing appropriate infrastructure.
- Implementation of EV charging infrastructure at the building level following existing building regulations.
- Increase ethanol blending in petrol and diesel.
- CBM buses to be deployed in mining belt as particulate emissions from CBM vehicles is lesser than that in diesel and petrol buses.

Urban Greening and Biodiversity:

- Improper planning of greening covering proper selection of tree , sites of planting , resistance to storm or cyclone or flooding are the few root causes for uprooting during cyclone , disturbances in electricity supplies and similar few.
- Here also one task force may be needed to form for submitting proper planning within a period of 2 months. Experts may be shortlisted from Bidhan Chandra Krishi Vishwavidyalaya, Calcutta University, Botanical Survey of India, Biodiversity Board West Bengal, and similar institutions.
- Adoption of trees may be considered at a cost. Housing societies , hospitals , clubs , schools and other organisation may be invited for beautification by designing an app for ease in implementation where tariff and formalities would be detailed there in that app.
- Promoting Local greening through tree plantation. Increased green spaces will increase the city's carbon sequestration potential.
- Promoting tree banking schemes for public agencies.
- A Landscape Strategy for Kolkata should be prepared to develop a hierarchy of 'green spaces' to enable carbon sequestration and reduction of urban heat island effect through avenue plantations, rooftop, and vertical gardens. Rooftop and vertical gardens will improve the local green index. The use of native plants should be encouraged to help with water conservation.
- Offer incentives in the form of property tax rebates for individuals and housing corporations showing initiative in urban greening.
- Conduct GIS mapping of habitat degradation and demarcation of biodiversity hotspots.
- Establish Tree Helpline to file grievances and illegal activities.

Water Management: Surface & Ground Water.

- Developing a water pollution reporting system via mobile application where individuals and communities can report pollution hotspots in rivers, by uploading pictures, videos, and geographical co-ordinates.
- Eco-restoration of the water bodies through bio-remediation, phyto-remediation, and floating garden.
- Undertake 100% conversion of footpaths and on-street parking to permeable surface material to reduce run-off and enhance water recharge. Construction of new footpaths with same philosophy.
- Digitization of open and bore wells, with sub-soil details.
- Online monitoring of all pumping stations and their functioning parameters.
- Install automated Water ATMs across the city.
- RWH (Rooftop Rainwater Harvesting) – Either direct use of rainwater or ground water recharging for new buildings or expansion of existing buildings as per Environmental Impact Assessment Guidelines of West Bengal State/GoI.

Air Pollution:

- Deploying air quality measuring / monitoring sensors at strategic locations to enable air pollution hot-spot based monitoring and forecasting system.
- Retrofit particulate filters in diesel vehicles.
- Build awareness of and strengthen enforcement of the policy on scrapping of older vehicles, by giving incentives if possible.
- Scouting for alternatives of SF6 and other greenhouse gases in various plants & applications.

Energy Use & Shift from Fossil Fuel Sources:

- Nudge masses to set air-conditioner (AC) at a higher temperature (which uses lower energy than setting it at lower temperature).
- Developing a mobile application to enable households to view their historical energy consumption pattern (and if possible, to measure their consumption in real-time) & promote Demand Side Management (DSM) initiatives
- Promotion of RE technologies like roof-top Solar PV in buildings to reduce dependence on conventional energy and to reduce GHG emissions.
- Encouraging masses to shift to energy efficient and smart appliances like LED lighting, high efficiency chillers etc.
- Tapping into the decentralized renewable energy (RE) potential of distributed rooftop solar plants through peer-to-peer (P2P) energy trading (block chain technology may be utilized).
- Promotion of Electric Cooking. Encouraging citizens to buy new apartments with inbuilt electrified cooktops and making these available to a variety of demographics.
- Rolling out of highly efficient and economical District Cooling System, where cooling is provided as a service.
- Exploring Green Hydrogen for Mobility.
- Knowledge Dissemination and conducting Workshop at Schools, Universities, Housing Complex, Localities to promote Energy Efficiency, Environment and Sustainability enhancement.

Waste Management:

- Promoting behaviour change for waste segregation (like vegetable waste, plastic waste etc.) at source among the city dwellers. Improvement of city-wide solid waste management services through improved technology options for decentralised waste management, dry waste collection and recycling operations, eco-friendly management of landfills etc.

- Currently, plastic wastes are used for land filling or sewage-based dumping which takes many years to get degraded when buried or submerged in water. A two-way collection mechanism may be implemented at housing complexes where the residents may place their used plastics at designated collection centres. From the collection centres, such plastics shall be collected by plastic recyclers for recycling in low-risk and low-hazardous manner.
- Inorganic waste such as waste plastics, disposable pet bottles etc. to useful products such as planter bags and artefacts.
- Promoting post-consumer packaging as a resource instead of waste by giving it value even after it has served its intended purpose and incentivizing consumers for packaging circularity for reuse.
- Setting up Bio-gas plants at strategic locations within the city. Installations of biogas capture systems at the wastewater treatment. The gas may be utilised to generate electricity.
- Introducing Mechanized Compaction System of solid wastes.
- Installation of Construction and demolition (C&D) processing plant at strategic locations for converting the C&D waste to ready mix concrete, cement bricks, hollow bricks, pavement blocks, kerbstones, concrete bricks, and manufactured sand.
- Treatment of sewage may be undertaken to prevent the flow of untreated sewage into the open drains.
- Transportation of Sanitary waste and processing of the same in the local Common Biomedical Waste Treatment Facility to make value added products.
- Central dumpsites (eg. Dhapa) containing legacy waste to be remediated by biomining. The land thus recovered may be converted into an integrated waste treatment facility constructed only for receiving the rejects generated from various waste treatment units ensuring that only negligible waste fraction is disposed of in the landfill.
- Scientific disposal of garbage through composting and engineered land fill (Municipal Solid Waste Rules 2000 and 2016 under sections 3 & 25 of Environment Protection Act, 1986.
- Providing bio-bins to households for practising home composting thereby ensuring that wet waste is treated in decentralized manner significantly reducing the transportation cost and burden on landfills.
- Monitoring littering at public places through CCTV cameras, and inculcating awareness among citizens that not only his/her home but up keeping of the entire city is his/her responsibility.
- RFID-based attendance system for garbage collector in charge of municipal collection vehicles and geo tagging of collection routes to monitor the waste management services.
- Adoption of a decentralised and community-driven model with micro-composing centres and material recovery facilities.
- Detailed land mapping study, using GIS for identification of land for decentralised solid waste management system and landfill.

- Develop a rating agency involving government representatives, municipal authorities, and private bodies for waste management across the city.
- Engaging a company as the producer responsibility organization (PRO) to manage city's e-waste.
- Implement nature-based sewage treatment solutions, deploying natural elements and processes to remove pollutants from wastewater.
- Install Refused Derived Fuel (RDF) Plants at strategic locations.

Drainage & Urban Flooding:

- Promoting preservation of rainwater to meet household requirements. Rainwater harvesting may be made compulsory for all multi-storied buildings.
- Construction should be restricted in low-lying areas.
- Installation of Automated tidal flow prevention valves to prevent tidal back flow in storm water drainage and sewage system. It will help in risk reduction by preventing local flooding and water logging due to tidal effects.

Health:

- Promoting sustainable sanitation with Bio-Toilets instead of Conventional Toilets in slums, industrial estates, parks, schools, convention centres etc. that improves sustainability and efficiency of sanitation systems.
- Introduction of an IT-enabled Grievance Response Mechanism to increase operational readiness in the event of a disease outbreak.
- Deployment of AI enabled predictive models for water borne and vector borne diseases.
- Organize regular free health camps among the low-income group to measure their level of exposure to air pollution.

Industry:

- Making 'Consent to Operate' from the West Bengal Pollution Control Board (WBPCB) mandatory for grant of trade license to companies.
- Relocation of sites of hazardous emission-prone activities e.g. central cement unloading sites (eg. Chitpur) to outskirts of the city.
- Mandate for bulk power users, such as multiplexes, malls, and commercial buildings, to undergo energy audits at regular intervals.
- Ensure transition of all industrial units and power plants within city limits to the usage of natural gas, renewable energy, and low-sulphur fuel. Promoting Process Electrification of C&I Consumers.
- Sharing of assets like poles, land, optical fibre (spare capacity i.e. communication bandwidth) among utilities.
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- Sharing of assets like poles, land, optical fibre (spare capacity i.e. communication bandwidth) among utilities.
- Promoting IoT Sensor driven optimization of Energy Usage in office buildings.
- Promoting waste water recycling in large industry establishments (Zero Discharge Technology), so that partial / full water demand is met through this process.

Overall Disaster Risk Reduction:

- Conversion of overhead power and telecom network to underground.
- Replacing transformer Mineral Oil with Natural Ester Oil
- Planning location of waste processing units outside flood risk zones.
- Community Based Disaster Risk Management Approach (CBDRM).
    - Tidal upsurge – Banks or river channels, EWS
    - Cyclone – Green belt barricade & retrofitted building roofs. EWS.
    - Flooding – Restoration of old canal systems on the city's flanks, acting as natural drains.

Annexure II: India's Goals towards Net Zero

Current Status for 2024-2025

- **Global Pledges:** The majority of countries have pledged net-zero emissions by 2050, but current commitments fall short of what's necessary to meet the Paris Agreement's 1.5°C target.

- **Emission Trends:** Despite increasing pledges, global CO2 emissions from the energy sector continue to rise, highlighting the need for significant acceleration in emissions reduction efforts.

Key Areas for Action:

- **Energy Transition:** Rapidly transitioning away from fossil fuels and towards renewable energy sources like solar, wind, and geothermal is crucial.

- **Carbon Capture and Storage (CCS):** Exploring and implementing technologies to capture and store carbon emissions from remaining fossil fuel use.

- **Technological Advancements:** Continued development and deployment of clean technologies across various sectors, including transportation, industry, and agriculture.

- **Policy and Regulations:** Implementing stricter regulations and carbon pricing mechanisms to incentivize decarbonization efforts.

Projected Status for 2030-2035, Crucial Milestones:

- **Significant Emissions Reductions:** The period between 2030-2035 is expected to be crucial for achieving substantial emissions reductions across all sectors. Experts often highlight a target of at least a 40-50% reduction in greenhouse gas emissions compared to 2005 levels by 2030 as a necessary milestone for achieving Net Zero by 2050.

- **Renewable Energy Dominance:** The 2030-2035 timeframe should see a significant acceleration in the deployment of renewable energy sources like solar, wind, and others. These sources are projected to become the dominant source of global electricity generation, potentially reaching 70-80% of the energy mix by 2035.

Future projection (recommendation towards Net Zero) for 2040-2045: Accelerated Decarbonization:

- **Deeper Emissions Cuts:** Aiming for at least 50% reduction in greenhouse gas emissions b y 2040 compared to 2010 levels.
- **Rapid Renewable Energy Deployment:** Renewables like solar and wind will become the dominant source of global electricity generation by 2040, with continued advancements and cost reductions.

Technological Advancements:

- **Carbon Capture and Storage (CCS) at Scale:** Large-scale implementation of CCS technologies will be necessary to capture and store emissions from sectors where complete electrification might be challenging, such as heavy industries.
- **Breakthrough Technologies:** Continued research and development efforts focused on breakthrough technologies like advanced batteries, green hydrogen, and direct air capture could significantly accelerate progress.

Policy and Societal Transformation:

- **Ambitious Climate Policies:** Governments worldwide need to implement significantly stricter climate policies, including carbon pricing mechanisms and regulations that incentivize rapid decarbonization.
- **International Cooperation:** Enhanced international collaboration and financial support for developing countries are crucial to ensure a just and equitable transition towards Net Zero.
- **Societal Shifts:** Public awareness, behavioural changes, and lifestyle adjustments that prioritize sustainability will be essential for achieving long-term success.

While achieving Net Zero by 2040-2045 is an ambitious goal, it is necessary to limit global warming to 1.5°C and avoid the most catastrophic impacts of climate change. The coming decades will require an unprecedented level of global collaboration, technological innovation, and societal transformation to make this vision a reality.

Annexure III– Statistics & Information

- **Power Generation**

As in June 2023, total installed capacity was 417,668 MW (417.7 GW). Coal & Lignite being 50.7% of the total (at 211,855 MW), total fossil fuel being 56.8% of total, Hydro (11.2%), Wind Solar & Other RE at 30.2% and Nuclear at 1.6% (total non fossil share being 43%). In 2022–2023, India generated 1,844 TWh of electricity, with 1,618 TWh coming from utilities. This was a 7.2% increase from the previous year's generation of 1,624.158 BU. As of April 2024, India's total installed capacity was 442.86 GW. India aims to install 500 GW of non-fossil energy capacity by 2031-32. In 2023–2024, 8,269 MW of India's new generation capacity came from non-fossil fuel sources.

- **Emissions**

India's GHG emission is approximately four billion metric tons of carbon dioxide equivalent ($GtCO_2e$) per year. During this time, India's fossil CO_2 emission was about 2.7 $GtCO_2$ in 2022. However, India's per-person carbon emissions are still less than half the world average and seven times lower than the US average. Nevertheless, India has the lowest per capita emissions in the G20**, at just 1.9 t CO_2 per person, or roughly an eighth of what the average American emits per year. Its contribution to historical cumulative CO_2 emissions is also far lower than that of other major polluters, at just three percent.**

- **Carbon Budget & Targets Globally**

Climate science has established that global surface temperature increase is directly proportional to cumulative emissions and limiting it requires **global GHG emissions** to be kept within a specific limit, called **the global carbon budget**. It is no secret that a disproportionately large part of the **global carbon budget** has been used by developed countries. The world, from 2020, has a remaining carbon budget of 500 gigatonnes of **carbon dioxide** equivalent, for a 50% probability of limiting **global warming** to 1.5°C to pre-industrial levels and a remaining carbon budget of 1,350 gigatonnes of carbon dioxide equivalent to have a 50% probability of limiting global warming to an increase of 2°C.

- **Temperature**

Between 1901 and 2018, India's temperatures rose by 0.7 °C (1.3 °F). By 2030, India could warm by 0.5 °C, and by the end of the century, it could warm by 2–4 °C, with the largest increase in the north.

- **Heat waves**

The frequency and intensity of heat waves in India are increasing. From 2010 to 2022, India averaged 172 heat wave days per year**. IPCC 6th Assessment Report (2021) projects more heat waves & humid heat stress/cyclones. NDC goal of lowering emission intensity of GDP by 30-35% from 2005 baseline by 2030.**

- **Droughts**

The number and severity of droughts in India are expected to increase by the end of the century, with 26% of land already affected.

- **Floods and landslides**

Landslides and floods are likely to become more common in states like Assam.

- **Rivers**

Changes in the flow of the Indus, Ganges, and Brahmaputra rivers could impact irrigation, which could affect food production and the livelihoods of millions of people.

India's Long-Term Low Greenhouse Gas Emissions Development Strategy (LT-LEDS)

1. **Low-carbon development of electricity systems** consistent with development growth in the power sector focusing on demand-side management, moving to rational utilisation of fossil fuel resources, with due regard to energy security, assessing enablers for low carbon development, determining green taxonomy and optimum energy mix.
2. **Integrated, efficient, inclusive low-carbon transport system** improved fuel efficiency, promoting a phased transition to cleaner fuels, modal shift towards public and less polluting modes of transport, electrification across multiple modes, strengthening demand side management, traffic management and intelligent transport systems.
3. **Adaptation in urban design, energy and material-efficiency in buildings, and sustainable urbanisation** encouraging adaptation measures to promote sustainable urban design in the context of expanding cities, promoting resource efficiency within urban planning guidelines, promoting climate responsive and resilient building design in existing and future buildings and in urban systems and promoting low-carbon municipal service delivery through resource efficiency, management of water, solid, and liquid waste.
4. **Economy-wide decoupling of growth from emissions** Industrial growth is a major objective with policies directed at increasing the share of manufacturing in the GDP. The government is making efforts to recognise the informal sector and the development of the micro, small and medium enterprises. Low-carbon options are being explored.
5. **CO2 removal and other engineering solutions:** CO2 removal is a new sector being explored. The move requires substantial international support through innovation, technology transfer, climate-specific finance and capacity building. India is training, capacity building and planning to minimise socio-economic, livelihood and ecosystem impacts of the move. We are exploring public-private partnership frameworks in view of the intensive resource requirements.
6. **Enhancing forest cover consistent with socio-economic and ecological considerations:** Enhancing natural resources, preserve resource heritage and promote biodiversity is driving the strategy. It will be an inclusive approach taking note of the livelihood, social and cultural dependence of the population. The approach involves restoration, conservation, and management of forests; restoration, conservation, and management of trees outside forests; strengthening infrastructure of state forest departments.

7. **Economic and financial aspects of low-carbon development:** Low-cost international climate finance is essential to achieve low-carbon development. India is assessing financial requirements, mobilising, and delivering climate specific finance, especially multilateral climate finance, mainstreaming of climate finance, linkages to international trade and new multilateral mechanisms to support innovation, and technology development.

Reducing the carbon intensity of the economy by at least 45% by 2030 compared with 2005 levels, meeting 50% of energy demand through non-fossil fuel-based energy sources by 2030, and achieving net-zero carbon emissions by 2070. India's energy transition has made considerable headway in recent years, with the country emerging as a global leader in the renewable energy market, particularly with regards to solar power capacity.

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