

## Future-Proofing for Climate Change and the Environment

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### ABSTRACT

The industrialised countries' disproportionately high cumulative emissions of greenhouse gases (GHGs), as well as their high yearly per capita emissions of GHGs, are mostly to blame for climate change. Although contributing only 4% of the total worldwide emissions (from 1850 to 2019) and maintaining significantly lower per capita emissions than the global average, India is one of the most vulnerable regions due to the problem's global nature. Even though India isn't as much to blame for the huge stock of emissions, it has shown that it is a leader in the world by taking many steps and committing to a growth path with low emissions and a goal of net-zero emissions by 2070.

India has combined its ambitious climate action goals with its development objectives, whether it be through increased solar power capacity (installed), higher energy saving targets announced in PAT cycle-VII, or improved green cover made possible by the Green India Mission, among other focused government initiatives. India presently has 75 Ramsar sites for wetlands as part of its commitment to preserving ecosystems, in addition to several legal and promotional initiatives to save and conserve mangroves. With Namami Gange and the National River Conservation Plan (NRCP), people are working all the time to protect rivers and bring them back to life.

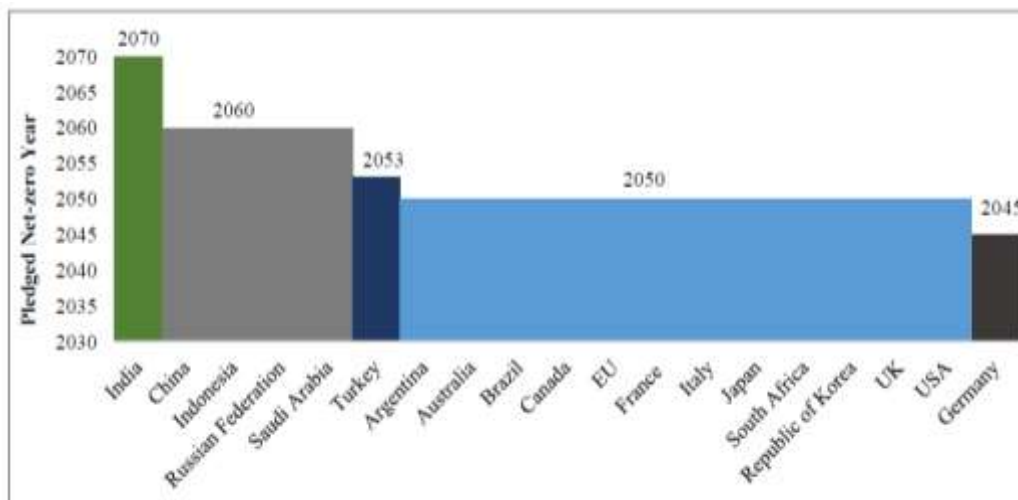
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## I. INTRODUCTION

Climate change is the phrase used to describe long-term changes in temperature and weather patterns. Although they can happen for natural reasons, since the start of the industrial revolution in the 19th century, these changes have been mostly brought on by human activity. The sun's heat is trapped by GHG emissions because they linger in the atmosphere for tens to hundreds of years. The increased emissions have caused temperatures to rise, which could cause the sea level to rise, change the way the monsoons work, and change the way land systems work, even though the temperatures are still within the range that makes our planet more habitable and gives us nice weather.

The greatest danger to humanity and an unavoidable reality that the world must face are GHG emissions. The world has already begun to feel the effects of climate change, so urgent action is needed to cut carbon emissions and adapt to them. For instance, it's predicted that by 2030, over 700 million people will be at risk of being displaced due to drought worldwide (U.N. SDG Portal). Climate change and global warming are therefore actual phenomena. Despite the fact that climate change has happened in the past even when Earth was sparsely populated, there is little doubt that human activity is the primary cause this time.

Notwithstanding agreement on the aforementioned, there can still be significant disagreement on what should be done in response to climate change. The release of GHGs, specifically carbon, is the source of much of the world's anxiety related to climate change. The longer GHGs are held in the atmosphere, the faster global warming becomes. Hence, the argument goes, global warming must be stopped, slowed down, and, if feasible, reversed if some of the disastrous consequences are to be averted. Reducing GHG emissions, particularly carbon emissions, is one approach to work towards it. By 2050, many countries promise to have zero net emissions. Some want to accomplish it by 2060 or 2070.



**Figure 1:** Shows the nations' pledges to achieve net zero emissions by the year 2060

This is where things start to get interesting, though. On whether more carbon reduction will definitely guarantee a halt or reversal of global warming, science is not entirely certain. The reason is that a significant amount of carbon dioxide and other GHGs have already been released throughout the past 2.5 centuries of industrialization-driven economic growth in today's wealthy countries, mostly in North America and Europe. In comparison to wealthy countries, the participation of emerging countries in the stock of GHGs (often expressed as carbon dioxide equivalent) has been negligible. The Intergovernmental Panel on Climate Change (IPCC), which emphasises that the problems caused by global warming are mostly caused by accumulated historical and present-day GHG emissions of developed countries, supports this. The impact of the buildup would also be unfair because developing nations would not only be burdened by climate change but also limited in their ability to address its problems. High human vulnerability global hotspots are mostly found in West, Central, and East Africa, South Asia, Central, and South America, Small Island Developing States, and the Arctic, according to the IPCC's Sixth Assessment Report (AR6).

Also, the report states that Asia is the region most at risk from climate change, particularly from high heat, flooding, sea level rise, and variable rainfall. Unfortunately, those who have contributed the least to global warming bear the brunt of the adaptation load. Because of this unpleasant certainty, it's possible that the amount of GHGs in the air has already set off a chain of events that reducing emissions in the future won't be able to stop or slow down very much. Some people properly believe that failing to do everything in our power to make the earth more livable and less dangerous may constitute criminal negligence, even if the answer to this issue is ambiguous or unknown. The issue is that while the people and nations making this argument have the right interests for themselves, they do not have the same priorities for the nations who have not yet ascended the ladder of wealth. The idea that there are always trade-offs and competing uses for resources is a fundamental tenet of economics.

So, emerging countries today are faced with a conundrum. How much money should be set aside for basic developmental needs, how much for adjusting to the already-changing environment, and how much for reducing GHG emissions? The unfettered use of fossil fuels, such as coal, crude oil, and natural gas, has contributed to the prosperity of today's developed countries. Theoretically, it makes sense to claim that switching to non-fossil or renewable energy would lead to investments and employment creation. Yet in reality, things rarely go so neatly.

For instance, China has stated that before abandoning current energy sources, future energy supplies, including alternative ones, must first be guaranteed. Countries may find themselves in the situation of not retiring coal-fired power plants and the alternatives may be hampered by a lack of technology, money, skilled labour, or a combination of all three. Governments have also discovered that, compared to traditional industries, the employment that will likely be produced in the so-called "green economy" are more skill- and technology-intensive. Another counterargument is that it might be simpler to talk about retraining and relocation than to really carry it out.

Thomas Schelling, a Nobel Prize winner, suggested in 2005 that allowing countries to expand first would be the best way to address climate change:

"Vulnerability to climate change should decrease and resources for adaptation should increase if per capita income growth in the next 40 years is comparable to the 40 years just gone. I don't say this to downplay concern about climate change, but rather to consider if emerging nations should sacrifice some of their progress in order to reduce the emissions of gases that could negatively affect their economies. Their own ongoing evolution may be their best line of defence against climate change.

Students of corporate finance won't be surprised to learn that economic expansion would make it possible to generate resources. Businesses make money and have internal resources, which they use to finance investments. Before turning to markets, a company's own resources represent the single largest source of funding for capital investments. That would also apply to countries.

It is a feasible idea for another reason: it is challenging to obtain funds from rich countries or multilateral organisations. The public sector in affluent nations is overstretched and doesn't appear to be motivated to mobilise sufficient funding for climate action in developing nations. In order for international institutions to be able to lend more money or mobilise more resources, they also lack the appetite to do so. But it's not clear that the private sector wants to take on long-term projects or that it has the right incentives to do so.

Last but not least, when one considers that developed countries ignored their obsession with climate change and global warming to burn more coal to produce electricity this year, it does not seem so strange or irresponsible that developing countries must put their own growth and development aspirations ahead of their global climate obligations. Countries in Europe were forced to convert to coal in order to maintain their homes' warmth and lighting in order to lessen their reliance on Russian crude oil and natural gas<sup>3</sup>. It is clear from the behaviour of European countries in 2022 that energy security is once again a top priority for governments. Hence, it makes sense that developing economies would experience the same thing. In order to understand why measures to address climate change have proven difficult to execute, the OECD and the Social Economics Lab at Harvard teamed up earlier this year and conducted surveys of more than 40,000 people in 20 of the nations with the highest carbon emissions (representing 72 per cent of global CO<sub>2</sub> emissions). The results were startling<sup>4</sup>. The majority of people in affluent nations exhibited great reluctance to alter their eating, travelling, and driving behaviours in a way that would minimise their emissions. In all European nations, implementing carbon pricing policies has not been simple. 2018 saw France try and retreat. A referendum in 2021 rejected Switzerland's idea.

As if these difficulties weren't enough, many analysts also caution that the supply of crucial minerals (CM) and rare earth elements (REE) will likely become the next global flashpoint, just like crude oil has over the past fifty years.

As is well known, REE and CM are necessary for producing renewable energy. The issue is that they are generated in a small number of nations and processed in an even smaller number of nations. If sufficient REE and CM are not accessible, a globally synchronised energy shift to non-fossil fuels may be challenging to implement. That would leave the economies of many countries with assets depending on fossil fuels stuck!

The Bruegel Institute's Jean Pisani-Ferry, a consultant to the French government, has started to raise awareness of the enormous short-term macroeconomic implications of climate change. Daniel Yergin quotes him in his piece for the International Monetary Fund's "Finance and Development"<sup>6</sup>.

"The economist Jean Pisani-Ferry, cofounder of Bruegel, Europe's top economic think tank, has observed that aggressively accelerating the targets for net carbon emission reductions could result in much more significant economic disruptions than generally expected—what he called "an adverse supply shock—very much like the shocks of the 1970s." Pisani-Ferry foresaw the current energy crisis in 2021 and predicted that such a shift is "unlikely to be peaceful and policymakers should prepare ready for painful choices." In 2022, he continued, "Climate action has emerged as a significant macroeconomic issue, but the macroeconomics of climate action is far from the level of rigour and accuracy that is now required to offer a solid foundation for public conversations and to appropriately advise policymakers. For logical reasons, advocacy has far too frequently trumped analysis. Nevertheless, at this point in the conversation, complacent scenarios are no longer helpful. Methodical, peer-reviewed analyses of the possible costs and advantages of alternative action plans are currently needed in the policy discussion.

Nonetheless, whether we like it or not, the problem of climate change will become more pertinent and dominate the media and the focus of decision-makers. Governments must take steps to build the resilience and adaptability of their populations to climate change, even if they wait for the financial, technological, and human resources for emissions abatement. As a result, additional steps are required, such as resource estimation, lifestyle modifications, etc. One of the best examples of this is India, which is regarded as one of the most vulnerable nations due to its extensive coastline, reliance on the monsoon, and substantial agrarian economy. Its total contribution to global emissions (up until 2019) is less than 4%, and its emissions per person are much lower than the average for the whole world.

The pledges in the United Nations Framework Convention on Climate Change (UNFCCC) and its Paris Agreement are based on the widely acknowledged concept that climate change is a global phenomena and necessitates joint measures. They call for a collective action based on the principles of equity and Common But Differentiated Responsibility and Respective Capabilities, acknowledging the differentiated responsibility of countries (in light of their role in GHG emissions) and the higher developmental needs of the developing countries (CBDR-RC). The result of the group work is the NDCs, which are pledges from each country to work towards a common goal of keeping temperature rise to less than 2°C above pre-industrial levels.

India has worked hard to achieve the objective of sustainable development. By its NDCs, which include a comprehensive plan for global renewable energy transitions, it leads one of the strongest climate efforts. Despite the negative

effects of Covid-19 on the economy, the nation has significantly increased its climate ambition and begun a long-term strategy towards a development based on low GHG emissions.

After establishing the background, this chapter provides an updated analysis of the climate change problem from India's perspective. Topics covered include forests and their role in reducing carbon emissions, a strategy for switching to renewable energy sources, and the recently submitted low emissions development strategy. The chapter also discusses the conclusions of the 27th Conference of Parties (COP 27) session, advancements made in enabling funding for sustainable development, and India's participation in international efforts to combat climate change. Together with this, recent modifications to environmental laws and other environmental features like biodiversity and animals are also included.

## II. INDIA'S CLIMATE ACTION MAKING PROGRESS

India's plan for development, which focuses on ending poverty and making sure all of its people have basic needs met, is inextricably linked to its vision for the environment. Even before the Paris Agreement was established, climate action was being taken. In 2008, India introduced the National Action Plan on Climate Change (NAPCC), which established eight national missions and covered a number of initiatives and measures in the areas of solar, water, energy efficiency, forests, sustainable habitat, sustainable agriculture, maintaining the Himalayan ecosystem, capacity building, and research and development (R&D).

National Solar Mission	•Solar power capacity of 61.62 GW installed by October 2022
National Mission for Enhanced Energy Efficiency	•PAT Cycle-VII notified in October 2021 for energy saving target of 6.63 Million Tonnes of Oil Equivalent (MTOE)
National Mission on Sustainable Habitat	•721 km of metro rail network made operational by August 2022. •62.79 lakh individual household toilets and 6.21 lakh community and public toilets constructed by April 2022
National Mission for a Green India	•₹ 626.96 crore for afforestation targets over an area of 2.1 lakh ha
National Water Mission	•Jal Shakti Abhiyan: Catch The Rain 2022
National Mission on Strategic Knowledge for Climate Change	•Created and strengthened 12 Centres of Excellence for climate change (June 2021)
National Mission for Sustaining Himalayan Ecosystems	•Inter-University Consortium •8 Major R&D Programmes initiated
National Mission for Sustainable Agriculture	•Key targets for FY 2022-2023 covering 0.15 lakh ha under organic farming and 10 lakh ha under micro irrigation

**Figure 2:** The NAPCC's progress on its eight national missions, emphasising accomplishments in a variety of fields.

The National Adaptation Fund for Climate Change (NAFCC), a central sector programme, was established in 2015–16 to provide financial assistance for adaptation efforts in India's states and union territories (UTs) that are particularly susceptible to the negative effects of climate change. A total of 30 projects totaling 847.5 crore have been approved so far across 27 states and UTs as part of the NAFCC's project-based implementation. NAFCC supports adaptation initiatives, including those involving agriculture, water, forestry, livestock, and ecosystem restoration. At this time (November 2022), 28 projects are being carried out.

The Indian government updated its Nationally Determined Contribution (NDC) on August 26, 2022, showing that it wants to do more to fight climate change. The Hon. PM's vision was laid out in the "Panchamrit" at the UNFCCC Conference of Parties (COP 26) in Glasgow in November 2021, and it is reflected in the new NDC with better goals. Climate justice and living in a way that is good for the environment are mentioned in the vision as ways to protect the weak and poor from the bad effects of climate change. In line with this goal, the amount of power that doesn't come from fossil fuels has grown quickly over time. Non-fossil sources, such as large hydro, are expected to make up about 40.4% of the total installed electrical capacity on September 30, 2022. This is up from 27.3% in 2014–15. The percentage of installed electricity capacity made up of

solar and wind energy has significantly increased during this time, rising from 8.9% in 2014–15 to 25.1% in 2022–23 (April–Sept).

### III. FOREST AND TREE COVER CONDITIONS

The addition of 2.5 billion to 3.0 billion metric tonnes of carbon sinks through increased forest and tree cover by 2030 is one of India's NDC's three quantifiable targets. For the past 15 years, India's forest and tree cover have steadily and gradually increased.

The country is third in the world in terms of the average net gain in forest area each year between 2010 and 2020. Most of this change is because the federal and state governments have strong structures and policies that have helped and protected forests. The most significant programmes include the Green India Mission (GIM), Compensatory Afforestation Fund Management and Planning Authority (CAMPA), National Afforestation Programme (NAP), Green Highway Policy 2015, Policy for Enhancing Urban Greens, National Agro-forestry Policy, and Sub-Mission on Agro-forestry (SMAF), among others.

### IV. ECOSYSTEM PRESERVATION ADAPTATION STRATEGY

Ecosystems do a lot more than just provide services like cultural, spiritual, or tourist attractions. They also store carbon, protect coastal zones, and improve water quality. Wetlands act as natural barriers to drought, floods, and tropical cyclones. Wetlands can act as sponges, holding onto peak rainfall and slowly releasing it during the dry season. Floods in Chennai, India, in December 2015 and the Kashmir Valley, India, in September 2014 serve as reminders of how wetland devastation can put lives in danger. One of the earliest intergovernmental agreements signed by signatory nations to protect the ecological integrity of their globally significant wetlands is the Ramsar Convention, which was established on February 2, 1971. Declared wetlands are protected as Ramsar areas. 13.3 lakh acres are covered by India's 75 Ramsar sites, 49 of which have been added in the past eight years.

For coastal communities, mangroves and coastal wetlands act as the first line of defence against rising storm surges, flooding, and storms. A recent study found that by 2070, certain mangrove species in India's Chilika and Sundarbans on the east coast and Dwarka and Porbandar on the west coast are likely to decrease and move inland as a result of a decline in suitable habitats as a result of precipitation and sea level changes.

In order to protect and keep mangroves alive, the government has taken both legal and public relations steps. 'Conservation and Management of Mangroves and Coral Reefs' is the focus of the National Coastal Mission Programme, which is now being carried out. The Coastal Regulation Zone (CRZ) Notification (2019) is used to implement regulations under the Environment (Protection) Act of 1986, the Wild Life (Protection) Act of 1972, the Indian Forest Act of 1927, and the Biological Diversity Act of 2002, as they have been amended from time to time. According to ISFR 2021, the country's mangrove cover rose by 364 sq. km. in 2021 compared to 2013.

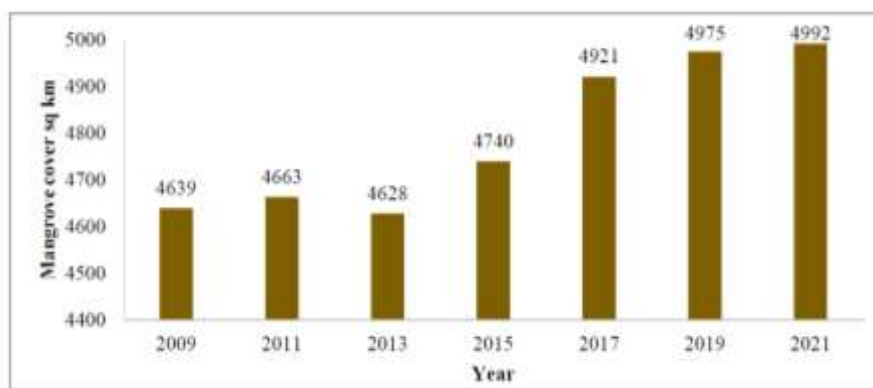


Figure 3: Increasing Mangrove cover in India

### V. RIVER RESTORATION AND CONSERVATION

The 5Ps — people, policy, plan, programme, and project — are being mapped and converged by the government. Through the Central Sector Scheme of Namami Gange for the River Ganga and its tributaries and the Centrally Sponsored

Scheme of the National River Conservation Plan (NRCP) for other rivers, it has been assisting the States and Union Territories (UTs) in their efforts to reduce pollution in identified polluted stretches of the country's rivers.

Additionally, the Indian Council of Forestry Research and Education (ICFRE), Dehradun, in collaboration with the state forest departments and other line departments, has produced Detailed Project Reports (DPR) for the rejuvenation of 13 key rivers. These DPRs include projects like planting trees along riverbanks to increase green cover, recharging the groundwater table, capturing carbon dioxide, treating catchment areas, ecological restoration, preserving moisture, improving livelihoods, generating money, etc.

## **VI. THE PRESERVATION AND PROTECTION OF WILDLIFE**

India has a long history of trying to protect wildlife and a lot of different kinds of wildlife. In fact, caring about animals also means caring about the individual. Because human, animal, and plant life are all so intricately entwined, any disturbance in one causes an imbalance in the others. The Wildlife (Protection) Act 1972 is a comprehensive piece of law that was passed in 1972 to give our wildlife and endangered species of animals specific legal protection.

Keystone and flagship species like tigers, lions, and elephants are important for maintaining healthy ecosystems. As of August 10, 2022, India was home to 53 Tiger Reserves, which collectively covered over 75,796.8 square kilometres in 18 states and contained roughly 75% of the world's wild tiger population. India doubled its tiger population in 2018, four years ahead of schedule compared to 2022. Also, two Tiger Reserves in the nation have obtained International Tx2 7.75 certification, and 17 Tiger Reserves nationwide have CA/TIS accreditation. Parallel to this, the number of Asiatic lions has grown steadily, reaching 674 animals in 2020, an increase of 28.87% (one of the fastest growth rates to date) over the 523 lions in 2015. As of 2020, India is home to 12,852 leopards, up from a 2014 estimate of 7,910. There has been a population rise of more than 60%. There are currently between 50,000 and 60,000 Asian elephants estimated to exist worldwide. India is home to more than 60% of the world's population. Moreover, the Indian Elephant has been added to Appendix I of the Convention on Migratory Species, which will be discussed at CMS 13's Conference of Parties in Gandhi Nagar, Gujarat, in February 2020.

In order to boost conservation efforts and fulfil global agreements on wildlife preservation, the Act has been altered numerous times. The Wild Life (Protection) Amendment Act, 2022, was introduced by the government in an effort to make further improvements in wildlife conservation. The Act aims to implement the Convention on International Trade in Endangered Species of Wild Fauna and Flora (16) and enhance the number of species protected by law (CITES). There are six schedules in the Wild Life (Protection) Act of 1972. By (i) decreasing the number of schedules for specially protected animals to two, (ii) eliminating the schedule for vermin species, and (iii) adding a new schedule for specimens listed in the CITES Appendices, the Act seeks to rationalise the schedules (scheduled specimens). The Act also gives the government the authority to control or outlaw the importation, trade, possession, or spread of invasive alien species.

## **VII. MAKING BIODIVERSITY PROTECTION A PRIORITY**

Biodiversity needs to be protected because it gives people and other living things the resources and services they need to stay alive. It increases ecosystem production, where each species—no matter how minor—plays a crucial role. Every year, the 22nd of May is observed as International Day for Biological Diversity to raise awareness among stakeholders and the general public about the value and necessity of biological diversity protection.

India is the fourth-most varied nation in Asia and the eighth-most diverse nation overall. It also has a diverse biodiversity, with the Western Ghats being the primary habitat for over 62% of the amphibian species that have been reported. India is ranked seventh in the world for the origin and diversity of crop plants since it has more than 300 wild species that are near cousins of domesticated plants and are naturally thriving there. Significantly, over 9,500 plant species are employed in traditional indigenous medicine. Moreover, local and indigenous people employ more than 3,900 plant species for a variety of purposes, including food, fibre, fodder, pesticides and insecticides, gum, resin, dyes, and wood.

The Convention on Biological Diversity (CBD) was made at the Rio de Janeiro Earth Summit in 1992. It is a legally binding agreement with the goals of protecting biological diversity, using resources in a way that is good for the environment, and sharing benefits in a fair way. The Conference of Parties to the Convention on Biological Diversity (COP 15) held its fifteenth summit in Montreal, Canada, from December 7 to December 19, 2022. The COP 15's main results include:

- At least 30% of the world's land, inland waters, coastal areas, and oceans must be protected and managed well. 10% and 17%, respectively, of the world's terrestrial and marine areas are currently protected.
- Decrease the loss of regions with high biodiversity significance to almost zero.
- Reduce overconsumption and waste production by a large amount while halving global food waste.
- Reduce by half the overall risk caused by pesticides and extremely dangerous compounds, as well as excess nutrients.

- By 2030, at least US\$500 billion worth of harmful subsidies will be slowly taken away or changed, and incentives to protect biodiversity and use it in a sustainable way will be increased.
- By 2030, get at least US\$ 200 billion a year from the public and private sectors for projects related to biodiversity in the United States and around the world.

Increase international financial transfers from developed to developing nations, with a focus on least-developed nations, small island developing states, and nations undergoing economic transition, to at least \$20 billion annually by 2025 and \$30 billion annually by 2030.

India passed the Biological Diversity Act in 2002 in accordance with the CBD's principles. The National Biodiversity Authority at the national level, the State Biodiversity Boards at the state level, and the Biodiversity Management Committees at the local body level are required by the Act to implement the objectives through a decentralised system. Each of these organisations is a statutory, independent body with particular duties and authority to aid in the efficient application of the Act's and the Rules' provisions.

In order to strengthen and improve coordination and cooperation in the areas of forests, wildlife, environment, biodiversity conservation, and climate change, including the restoration of corridors and interlinking areas and the sharing of knowledge and best practises between the two countries, India and Nepal signed a Memorandum of Understanding (MoU) on biodiversity conservation in August 2022. The MoU would support cooperation between the parties in the areas of climate change, biodiversity conservation, restoration of interconnected areas, forests, wildlife, and the environment.

## VIII. CONCLUSION

India is leading one of the most ambitious transitions to clean energy in the world, and its commitment to stopping climate change has never wavered. India has made big changes to its climate goals and started a long-term plan for a Low GHG Emission Development Strategy using a multi-pronged approach, even though COvid-19 is hurting the economy.

With the energy transition plan, many policies are used to strengthen the ecosystem and make it possible to use new technologies like green hydrogen. To assist the creation and uptake of new technologies, the nation has continually changed or amended regulatory norms and adopted policy-level measures. The fact that India has increased its non-fossil fuel-based installed capacity objective in its updated NDC to 50%, up from the original NDC's aim of 40%, provides insight into the country's progress in the energy transition.

Most crucially, the global climate agenda will advance if developed nations can serve as role models for behavioural and policy changes that are successful in their own communities and whose trade-offs are widely acknowledged and accepted by their people. Thus, with appropriate adaptation, it could be reasonable to anticipate that such policies and behavioural expectations of households will succeed in emerging countries.

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