

CLIMATE CHANGE MITIGATION AND ADAPTATION IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

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ABSTRACT

The effects of climate change are a worldwide problem that calls for immediate action to be taken in order to adapt to the shifting conditions and protect against their effects. In the framework of the Sustainable Development Goals (SDGs), this abstract focuses on the efforts that have been made in the city of Ujjain, which is located in India, to mitigate and adapt to the effects of climate change. As is the case with a great number of other metropolitan places, Ujjain is susceptible to the impacts of climate change, which include higher temperatures, altered patterns of rainfall, and extreme weather events. These repercussions present substantial dangers to the socioeconomic growth of the city as well as to the well-being of the people who work and live there. Ujjain has taken a multi-faceted approach that blends plans for climate change adaptation and mitigation with the Sustainable Development Goals (SDGs) in order to make headway against these issues. Concerning the reduction of greenhouse gas emissions, there have been attempts made to reduce emissions via the implementation of measures such as the promotion of renewable energy, the improvement of energy efficiency, and the implementation of sustainable transportation systems. These activities not only help to the mitigation of climate change, but they also contribute to the achievement of several Sustainable Development Goals (SDGs), such as energy that is both cheap and clean (SDG 7) and sustainable cities and communities (SDG 11). Ujjain has taken steps to improve its resilience and lessen its susceptibility to the effects of climate change. These interventions fall under the category of adaptation. This includes enhancing water management methods in order to adapt to shifting patterns of precipitation, introducing climate-smart agriculture techniques in order to guarantee food security, and boosting early warning systems in order to better respond to catastrophic weather events. The Sustainable Development Goals (SDGs) include "zero hunger" (SDG 2) and "climate action" (SDG 13) are aligned with these adaptation efforts. In spite of the progress that has been made, Ujjain is still facing difficulties in properly implementing measures to mitigate and adapt to the effects of climate change. These constraints include a lack of suitable infrastructure, limited financial resources, and the requirement for stakeholders to increase their understanding and competence to undertake capacity development. Increasing the level of collaboration between government agencies, encouraging community engagement, and forming partnerships with organisations from the commercial sector and civil society are all necessary steps towards overcoming these problems. Therefore, moving forward, it is imperative that Ujjain places a high priority on the incorporation of climate change issues into the processes of urban planning and development. In order to do this, climate change must be included into laws, regulations, and choices on investments. In addition, there is a requirement to develop monitoring, evaluation, and reporting procedures in order to track progress, identify gaps, and guarantee accountability in the process of reaching the Sustainable Development Goals (SDGs) concerned with climate change.

keywords: *Climate Change, Mitigation*

INTRODUCTION

In the edition of the Economic Survey that was published the year before, the chapter that was given the title "Sustainable Development and Climate Change" was presented for the very first time. As a result of important weather events that took place both locally and globally, these topics continued to be at the forefront of the headlines. The efforts to achieve an agreement on what decisions should be made both at home and abroad gathered momentum, despite the fact that they were sailing through some challenging waters and seas that were unpredictable in many respects. The situation remained the same despite the fact that they were making headway. In the year 2012, both the natural world and the scientific community conveyed a sense of urgency over the necessity of taking action. The relevant facts, on the other hand, provide a picture that is contradictory: it demonstrates a strong acceptance of scientific discoveries, but it only reflects on the connected international measurements in a moderate way, which indicates that there is still a significant amount of work to be done on the latter.

Together with the issues of poverty and hunger, a volatile combination of changeable weather, natural disasters, and major limits on the availability of clean air, water, and energy continues to be of considerable concern for policymakers, particularly in developing nations. This is especially true in countries where the economy is still in the process of developing. In particular, this is the situation in nations where the rates of poverty and hunger are at an all-time high. As a result of the publishing of the Twelfth Five Year Plan at home, there was a building of forwards momentum both locally and internationally. Additionally, in 2012, there were three high-profile events that took place in the global arena. Rio + 20, commonly known as the Earth Summit in Rio, marked its 20th anniversary this year. Rio + 20 is another name for Rio + 16. This was followed by the eleventh session of the Conference of Parties (COP 11) to the Convention on Biodiversity (CBD), which took place in Hyderabad and was hosted by India. To conclude the year, the 18th session of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) was held in Doha in December. This event marked the end of the year. These multi-national collaborations have resulted in the production of well-balanced packages, despite the fact that they have not achieved their goals but have made progress in terms of their efforts. Through the implementation of the Twelfth Five Year Plan, we kicked off the process of achieving "faster, more inclusive, and sustainable growth" in our own country. One of the primary goals of this plan was to achieve "faster growth." A five-year plan has never before placed such a major focus on environmental stewardship. This is the first time that this has happened. In the Twelfth Plan, which developed strategies for development that produce less carbon, the government's ongoing policies and programmes relevant to the environment and climate change were given a boost of vigour, which was a result of the Twelfth Plan. The National Action Plan on Climate Change (NAPCC) would be adapted to regional, socio-economic, and ecological circumstances through the implementation of a new initiative called State Action Plans on Climate Change (SAPCC). This would be in addition to the aforementioned. It is envisaged that the South African Police Commission would get off the ground as a component of the plan strategy for states. In light of these developments, it is plainly clear that issues regarding climate change and sustainable development are being addressed in a manner that is of the utmost importance.

Despite the continuous decline in population growth rates, the number of people living on our planet has officially surpassed the 7 billion mark. This is a significant achievement. Due to the fact that the pace of

urbanisation is continuously growing, there is a corresponding increase in the demand for resources. "Keeping Track of Our Changing Environment: From Rio to Rio + 20 (1992-2012)" is the title of an investigation that was carried out by the United Nations Environment Programme (UNEP). This study tells the narrative of where the entire world currently stands collectively in terms of preservation of the environment and sustainability. Despite the fact that there is still a large amount of variation and inequality throughout the world's regions, the findings of this research indicate that both the global gross domestic product (GDP) and the human development index (HDI) are continuing to improve. The HDI for example climbed by 2.5 percent per year. As a result of the research, the burden that is being placed on resources such as land, water, fisheries, and agriculture is brought to light. Despite the fact that there has been a reduction in emissions as well as the consumption of energy and materials per unit of output, which is an indication that efficiency levels have improved, there has been an increase in the amount of pressure placed on natural resources. This is reflected in the per capita worldwide use of natural resource materials, which has increased by approximately 27 percent between the years 1992 and 2005. While this has been going on, the overall quantity of glasshouse gases (GHG) that have been released into the atmosphere has been gradually growing (Figure 12.1). In terms of million metric tonnes of carbon dioxide equivalent (MtCO₂e), the World Resources Institute reports that the amount of glasshouse gases that were released into the atmosphere increased by 25.9 percent between the years 1990 and 2005. There is a conflict between the contradictory patterns that are taking place in the current state of the environment and the good and expanding trends that are occurring in efforts conducted all over the world. An additional all-time record of \$257 billion was reached by global investments in the field of renewable energy in 2011. This figure represents a 17% increase over the previous year's total. When it comes to the new capacity that was added in 2011, renewable power (with the exception of large hydro) accounted for 44 percent of the total new generating capacity that was added worldwide (Frankfurt School of Finance and Management's 'Global Trends in Renewable Energy investment 2012'). According to the findings of the research that was released by the Frankfurt School of Finance and Management, this is an increase from the 34 percent that was recorded in 2010. The international community is now working on a set of Sustainable Development Goals (SDGs), which have the potential to be integrated with Millennium Development Goals (MDGs) for the global policy architecture that will be in place after the year 2015. The international community has signed a large number of new environmental agreements over the course of the past decade. These accords have been struck within the same time period. In addition to the participation of government authorities, the private sector has also been of assistance. On the other hand, the global and bilateral funds that were designated for environmental reasons underwent volatility and were met with a substantial number of promises that were not fulfilled.

Furthermore, there are significant 'co-benefits' connected with climate action that are related with equitable and sustainable development, as stated in the strategy that is detailed in the Twelfth Plan. India, which is a big responsible player while having a relatively low income, has the added duty of ensuring that these efforts are matched by equitable and fair burden sharing between nations, taking into mind the duties that have been incurred in the past for emissions. At the moment, these concerns are being discussed under the United Nations Framework Convention on Climate Change.

The approach that India takes towards a growth plan that reduces carbon emissions acknowledges categorically that policies need to be all-encompassing and differentiated across industries according to the goals of the nation. In order to guarantee that the policy is in accordance with a burden-sharing system that is equitable on a national scale, this is done in order to decrease the transaction costs that are connected with the

implementation of the government policy. For the purpose of producing an overview of lower carbon solutions for important potential carbon mitigation businesses, the Planning Commission has tasked an Expert Group on Low Carbon solutions with the following responsibility:

- (i) **Power** : In terms of supply, it is recommended to implement super-critical technologies in thermal power plants that utilise coal as an input, use gas in combined heat and power systems, put money into renewable energy, and create sustainable hydropower. On the demand side, we need to speed up the adoption of energy-efficient home appliances through various market and regulatory channels; upgrade the efficiency of farm pump sets and manufacturing machinery with newer, more effective technology; update the power grid so that technical and commercial losses are at global average levels; ensure that everyone has access to electricity; and speed up the reforms in the power sector.
- (ii) **Transport** : Complete the dedicated rail corridor, increase the share of rail in overall freight transport, improve the efficiency of rail freight transport, make it price competitive by reducing the levels of cross-subsidization between freight and passenger transport, improve the share and efficiency of public transport, and improve the fuel efficiency of vehicles through market-based and regulatory mechanisms. These are the goals that need to be accomplished.
- (iii) **Industry** : Existing facilities, especially those that are small and medium in size, should modernise and adopt environmentally friendly technology at a faster pace, with transparent financing arrangements. Greenfield projects in the iron and steel and cement industries should embrace the best available technology.
- (iv) **Buildings** : Evolve and institutionalize green building codes at all levels of government.
- (v) **Forestry** : "Green India Mission" to enhance the density of forest and tree cover on 10 million hectares of forest, waste, and communal lands; regenerate at least 4 million ha of degraded forest; raise the density of forest cover on 2 million ha of moderately thick forest; and increase the overall density of forest and tree cover on 10 million ha of forest.

SUSTAINABLE DEVELOPMENT AND CLIMATE CHANGE IN THE INDIAN CONTEXT

The most pressing environmental issues in India have become more severe over the course of the previous two decades. According to the State of the Environment Report compiled by the Ministry of the Environment and Forests (MoEF), the problems may be grouped under five primary difficulties that India is now attempting to manage: climate change, food security, water security, energy security, and managing urbanisation. The natural world is being altered as a result of climate change.

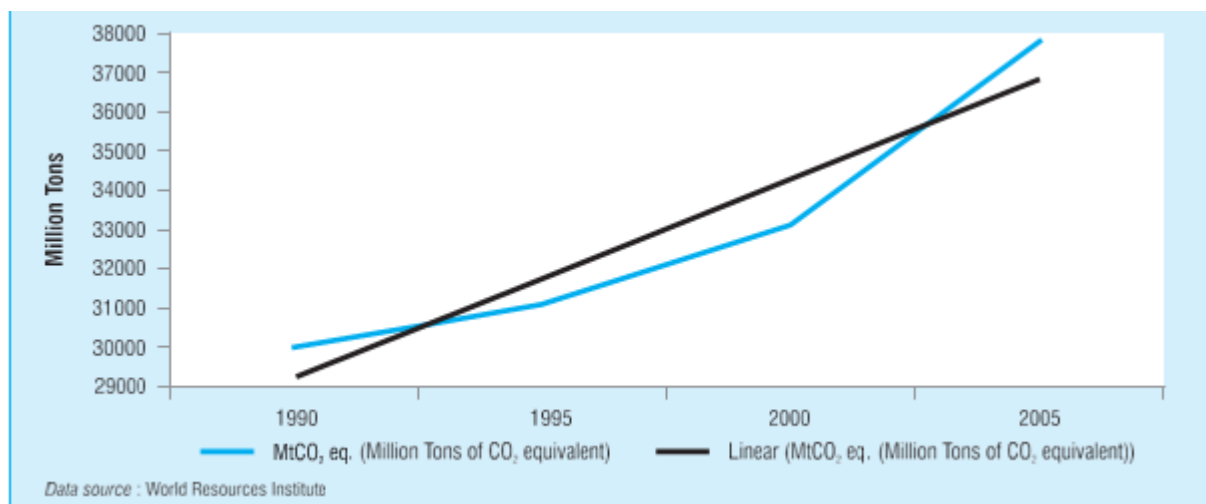


Figure 1 Global GHG Emissions

ecosystems and is expected to cause significant harm in India, particularly to agriculture—the sector on which 58% of the population relies for survival—to water storage in the Himalayan glaciers—the headwaters of important rivers and recharge sources for groundwater—to rising sea levels—and, finally, to India's extensive coastline and human settlements. Climate change will also lead to an increase in the frequency of extreme weather occurrences. As a result, these elements will impact the problems of food and water security in India. The Indian government has predicted a range of 3.5 to 4.3 degrees Celsius in the yearly mean surface air temperature increase by the century's end in its Second National Communication to the UNFCCC. However, sea levels around the coast of India have been increasing at an average pace of about 1.3 mm per year. Both of these modifications are anticipated to take place. Human health, water resources, natural ecosystems, biodiversity, and agricultural practices are all expected to be impacted by the predicted consequences of climate change.

The Indian government is more concerned about protecting the environment and implementing sustainable practices in response to the threats posed by climate change and the depletion of natural resources. India has been a signatory to no less than ninety-four separate international environmental treaties. India has also committed voluntarily to reduce its GDP's emission intensity by 20-25 percent compared to 2005 levels by 2020. The assessment of India's emissions intensity will not take agriculture emissions into account. A recent decline in the carbon intensity of India's economy is indicative of a trend towards a greener, less carbon-intensive economic model. With the implementation of initiatives to cut carbon emissions, this trend is expected to persist. Global per capita emissions in 2005 were 4.22 metric tonnes of carbon dioxide equivalent (CO₂eq), while India's per capita emissions in 2031 are expected to be below 4 metric tonnes of CO₂eq, indicating that India will maintain a lower per capita emission level than the world average. While there are many initiatives underway on a national level, India is also cognizant of the reality that rural areas are particularly vulnerable to the pressures brought on by resource extraction. Plans to develop rural regions and efforts to improve people's livelihoods are especially important in this setting. Most of the work done under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) is focused on natural resources, including land, soil, and water. Soil health and fertility enhancement, organic and low-chemical farming, and livelihoods based on non-timber forest products are all goals of these projects. The sustainability of livelihoods dependent on agriculture is the overarching goal of all these programmes. Community

institutions are mobilised and their capacity to use natural resources sustainably is developed via these activities. Consequently, these institutions may be able to realise their full potential.

Not only is India working to include sustainability into rural development, but the country is also trying to incorporate the three tenets of sustainable development into national policy. Actually, our Constitution (Articles 48 A and 51 A [g]) guarantees the protection of the natural environment. There are a number of new policy efforts underway in the fields of renewable energy, water management, forestry, pollution control, and the marine and coastal environment. Such policies include, but are not limited to, the following: Joint Forest Management, Green Rating for Integrated Habitat Assessment, Coastal Zone Regulation Zone, Eco-Labeling, Energy Efficiency Labelling, Fuel Efficiency Requirements, and many more. In order to safeguard the environment, a consistent organisational structure has been put in place over a period of time. With a 62% surge to \$12 billion in 2011, the country showcased the world's quickest rate of investment expansion among major renewable energy markets (Frankfurt School of Finance and Management 'Global Trends in Renewable Energy investment 2012'). Additionally, the nation's potential to generate energy from renewable sources has been expanding at a rapid pace. There are a plethora of such opportunities under the Twelfth Five Year Plan, which prioritises environmental protection.

The total elimination of poverty is the stated objective of several policies, initiatives, and specialised activities. These endeavours rest on sustainable development's social and economic foundations. A direct focus on economic indicators like job creation, youth mobilisation, and asset accumulation among the poor is one way to achieve this goal; an indirect focus on social indicators of human development, such as health, education, and women's empowerment, is another. Several other initiatives have also shown promise in this area. As to the 2011 Census of India, the literacy rate for males is predicted to be 82.14% and for women it is 65.4%. This percentage has been steadily rising. Between 2004–2005 and 2009–2010, the poverty head-count ratio fell 7.3%. Between 2001 and 2003, the maternal mortality rate (MMR) was 301 per 100,000 live births; between 2007 and 2009, it dropped to 212. Regardless, by 2015, India will have failed to achieve a few of the most crucial MDGs. Arguments in favour of expanding the standard GDP statistic to include the environmental damage caused by product and service creation have been considered throughout the years. An expert committee has been formed to develop guidelines for India's "Green National Accounts," with Professor Sir Partha Dasgupta assuming the role of chairman. Actually, since 1997, the Central data Office (CSO), which is part of the Ministry of Statistics and Programme Implementation (MOSPI), has made available to the public precise environmental statistics. In 2002, the first step towards establishing a system for accounting natural resources was taken by MOSPI, the agency in question.

Despite our best efforts, the environmental situation is what it is: a complex and challenging reality. The growing urban population and the corresponding increase in demand for water and soil resources have had a devastating impact on both their quantity and quality. A further reason for concern is the continuously rising need for energy. Also, the energy supply will need to grow proportionally to accommodate rapid increase. Given the tremendous increase in energy demand and the constraints caused by existing resources, it is anticipated that coal and oil will continue to fulfil a substantial amount of our energy demands. The complexity of energy challenges is being exacerbated by both the prevalence of energy poverty and the steadily increasing prices of energy. Energy and water usage, along with other development indicators like the infant and maternal mortality rates (MMR), sanitation facilities, and public health services, have a great deal of room for

improvement in India. There is great potential for economic instruments, regulatory actions, and market processes to play a pivotal role in helping to attain sustainable development and growth.

Conclusion:

The sustainable development of Ujjain is being threatened by climate change, which necessitates combined efforts to adapt to the changing climate and reduce its impact. In response to these threats, the city has adapted its strategies to account for climate change and bring them in line with the SDGs. Ujjain has prioritised the reduction of greenhouse gas emissions by promoting renewable energy, energy efficiency, and sustainable mobility as part of its mitigation efforts. These steps help accomplish many Sustainable Development Goals (SDGs) pertaining to renewable energy and environmentally friendly urban planning, in addition to reducing the impact of climate change. Ujjain has taken steps to adapt to climate change by making itself less susceptible to its effects and more resilient. Some examples of these are early warning systems, climate-smart farming, and better water management. There will be no more hunger or climate change since these adaptation activities are in line with the SDGs. Nevertheless, there are obstacles to adopting climate change adaptation and mitigation strategies in Ujjain. These include a lack of suitable infrastructure, a lack of funding, and a need to raise awareness and increase ability. Government agencies, community members, and business and nonprofit organisations must work together to overcome these difficulties. Urban planning, policy, and laws in Ujjain must prioritise the incorporation of climate change issues if the city is to progress. To keep tabs on development and guarantee responsibility in accomplishing the SDGs connected to climate change, it should furthermore fortify systems of monitoring, assessment, and reporting. Building a more resilient and sustainable city is within Ujjain's reach if we tackle these difficulties and take use of the synergies between sustainable development and climate action. Ujjain has the potential to play a significant role in achieving the SDGs by 2030 and providing a sustainable future for its inhabitants through the successful implementation of climate change adaptation and mitigation methods, with the help of dedicated teams, sufficient funding, and active participation of all relevant stakeholders.

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