6. India's Efforts in Coping the threats of Climate Change

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The global Climate Change has unprecedented consequences in terms of scale and severity over human life. The accumulation of greenhouse gases and CFCs has increased environmental deterioration which is called global warming. Erratic changes in weather, brutal blizzards and floods, vicious heat wave etc. are only some of the effects of climate change. But the most dangerous effect of climate change is the melting of ice caps on the poles due to which sea levels are rising dangerously and life at the poles is threatened. It is also a reality that habitation in several countries , not very much above the sea-level, for example, Maldives, Sri Lanka, Bangladesh and Indonesia, which have a threat of huge displacement of human beings and domestic animals due to global warming. The survival of millions of people in developing countries like India is more vulnerable to the negative impacts of climate change because of their limited capacity in terms of human financial and institutional resources. India is the world's fourth largest economy and fifth largest greenhouse gas (GHG) emitter, accounting for about 5% of global emissions. India's emissions increased 65% between 1990 and 2005 and are projected to grow another 70% by 2020. The major impacts of Climate Change on India are major shifts in temperature, effect on monsoons, rising of sea levels, change in crop cycle, etc. India has prepared the National Action Plan on Climate Change (NAPCC) in 2008 for energy efficiency and sustainable development. India is a part to the United Nations Framework Convention on Climate Change. Under the Ministry of Environment and Forests, a National Inventory Management System (NIMS) has been formed to generate a comprehensive knowledge base on scientific issues related to climate change and mitigation. This paper highlights the issue of impacts of climate change and measures adopted by the government to minimize the dangers.

Introduction

Mahatma Gandhi had rightly opined that "The earth has everything man needs; only it cannot satisfy his greed". But human overpopulation and man's endless greed has urged him to exploit natural resources that have further worsened the situation of environment. There are several environmental concerns posing threat to the life and Climate Change is one of them affecting adversely the whole world. The greenhouse gases, such as CFCs and carbon dioxide, let out in the atmosphere have a devastating effect on the environment, thus making the earth planet vulnerable to a range of problems, including global warming and climate change. Maldives and Nepal have convened their cabinet meetings inside the sea and on the Everest respectively to highlight the danger before the world. **(Lahiry, 2010).**

India is a developing country and besides other entities agriculture is the backbone of the economy. The two third population of India is engaged in farming. The danger of climate change is petrifying the farmers, policy makers and scientific experts. Climate change will make monsoons unpredictable. As a result, rain-fed wheat cultivation will suffer in a big way and total cereal production will also go down and the crop yield per hectare will be hit badly in India. The rising levels of the sea in the coastal areas will damage fisheries, causing coastal erosion and flooding. India needs to sustain an 8 to 10 per cent economic growth rate, over the next 25 years, if it is to eradicate poverty and meet its human development goals, according to a 2006 report on an integrated energy policy prepared by the Planning Commission. India currently is one of the fastest growing economies in the world. With a government target of 8% GDP to achieve developmental priorities, a share of one sixth of the global population, and changing consumption patterns, India's emissions are set to increase dramatically. But maintaining the correct ratio of the development and greenhouse emissions is a million dollarquestion.

Objectives of the Study:

a) To brief about climate change.

b) To describe the possible impacts of climate change in India.

c) To specify the India's international obligations regarding climate change.

d) To know about provisions made by Indian Constitution to protect the environment.

e) To specify the efforts being done by Indian government in coping the threats of Climate change.

f) To mention the steps taken by Indian provinces on the issue of climate change.

g) To enlist the recent initiatives taken in India on climate change.

h) To suggest the ways for proper implementation of policies related with climate change.

Scope of the Study:

This study is an attempt to ascertain the impacts of Climate Change in India which are changing the scenario of health, agriculture, natural resources, industries and economy. This study covers the laws made by Indian government in connection to the climate change. The main focus has been given on NAPCC and five state level action plans, one from west, two from north and two from south.

Methodology:

The information was collected mainly from secondary sources for which government reports and publications, journal articles and websites of UNEP and various ministries of Union and Provincial governments were consulted. The Interview and Observation Methods have also been applied for getting the facts. Some primary data were received through field observation from Uttarakhand Himalaya during 2001-2004 and from Karnataka in 2008. Some personal interviews were conducted with the farmers in 2010 to know about the change of agricultural pattern due to climate change in the Bundelkhand region of Uttar Pradesh.

What is Climate Change?

Climate Change, is primarily caused by the building up of greenhouse gases (GHG) e.g. carbon dioxide, methane, nitrous oxide and others in the atmosphere. The global increases in carbon dioxide is due primarily to fossil fuel use and land use change, owing to human activities taking place since pre-industrial times, while methane and nitrous oxide are primarily due to agriculture. According to Oxford concise dictionary of politics " A phenomenon otherwise known as ' global warming' or the ' greenhouse effect' whereby solar radiation has reflected back off the surface of the earth remains trapped at atmospheric levels, due to the build - up of CO_2 and other greenhouse gases , rather than being emitted back into space ." **(Mclean & Mclean, 2009).**

Key factors about Climate Change in India:

India's emissions increased 65% between 1990 and 2005 and are projected to grow another 70% by 2020. On the basis of per capita, our county's emissions are 70% below the world average and 93% below to the United States. India's GHG intensity is currently 20% lower than the world average (and 15% and 40% lower than the United States' and China's respectively). Although, India's emissions are low in comparison to other major world's economies but country is already facing high degree of climate variability and may face additional challenge because of climate change. It has been felt that variation in GDP is due to annual rainfall variations. The rising temperature will disturb the Himalayan ecosystem leading to the water insecurity. **(Rashmi and Satapathy, 2010).**

Why India is worried from Climate Change?

The various anthropogenic activities have led to increase in the atmospheric temperature which in turn is creating many visible and invisible problems in the Indian environment today. Some of them are enumerated hereunder:

1). Low Agricultural Production - Agriculture will be adversely affected not only by an increase or decrease in the overall amounts of rainfall, but also by shifts in the timing of the rainfall. Higher temperatures reduce the total duration of a crop cycle, leading to a lower yield per unit area, especially for India's wheat and paddy crops. The farmers of Bundelkhand in Uttar Pradesh have almost stopped the paddy crop and trying for other less water required crops. Soil erosion, increased numbers of pests and weeds brought by climate change will also affect agriculture in India. For instance, the amount of moisture in the soil will be affected by changes in factors such as rainfall, runoff and evaporation.

2). **Sea Level Rise -** A 10-year study in and around the Bay of Bengal points to the sea rising 3.14 mm a year in the mangrove swamps of the Sunderbans delta against a global average of 2 mm, threatening the low-lying area which is home to about 4 million people. A trend of sea level rise of 1

cm per decade has been recorded along the Indian coast. The major delta area of the Ganga, Brahmaputra and Indus rivers, which have large populations reliant on riverine resources, will be affected by changes in water regimes, salt water intrusions and land loss. The rise in sea temperature also causes coral bleaching, which negatively affects fishes, sponges, giant clams, and other sea creatures. The El Nino event of 1998 resulted massive mortality of corals in the Lakshadweep and Andaman and Nicobar islands. **(Kumar, 2010).**

3). Health – The relationship between climate change and health outcomes is complex. Rise in temperature and change in humidity will adversely affect human health in India. Heat stress could result in heat cramps, heat exhaustion, and heat stroke and weaken immune systems. Increased temperatures can increase the range of vector-borne diseases such as malaria, particularly in regions where minimum temperatures currently limited the spread of such diseases.

4). Monsoon - Various studies show that surface air temperatures in India are going up at the rate of 0.4 degrees Celsius every 100 years, particularly during the post-monsoon and winter seasons. While mean winter temperatures could increase by as much as 3.2 degrees Celsius in the 2050s, summer temperatures could go up by 2.2 degrees Celsius in the 2050s, spurring climate variability. This trend can alter patterns of monsoon rains, vital for India's agriculture and water needs. Scientists warn that India will experience a decline in summer rainfall by 2050. Winter rains are also predicted to fall by 10-20 percent. The Himalayan glaciers of Uttarakhand, Himachal Pradesh and Jammu and Kashmir are melting abnormally causing to flood disasters in the Himalayan catchment areas and crisis of potable water in plains. **(Krishna Murari, 2010).**

5). Poverty - Although the per capita growth rate during last five years has been nearly 7.5% in India but is a harsh reality that we have a third of the world's poor, and flood, heavy rains and droughts etc. due to climate change will hit this section of society the hardest. Set to be the most populous nation in the world by 2045, the economic, social and ecological price of climate change will be massive. **(Maulick, 2011).**

6). Deforestation – Deforestation is one of the future impacts of climate change, identified by the Government of India's National Communications (NATCOM) in 2004. Studies indicate that over 50% of India's forests are likely to experience shift in forest types, adversely impacting associated biodiversity, regional climate dynamics as well as livelihoods based on forest products.

7). Energy Challenges – India is mainly dependent on fossil fuels for their energy requirements. As per data published by Central Electricity Authority, CO_2 emission in the power sector is continuously at the annual rate of 4.43% in the country. Therefore the country is poised to become a major contributor to global warming. India's energy demands will be affected by climate change as rise in temperature will reduce winter heating and raise demand for summer cooling. Hydroelectric capacity would reduce by diminution of river flows, reducing the potential for it to substitute for fossil fuels in power generation.

8). Threats to Cities - The Indian cities will face the impact of climate change in various forms. Indian urban infrastructure is less advanced and over-stressed in most cities. The floods and heavy rains caused by climate change will devastate the urban dwellings and make havoc to the lakhs of poor lives. Nowadays rural population is migrating towards cities increasing the demands of power, housing and drinking water and transportation. The water scarcity due to glacial melting and irregular rainfalls will reduce the availability of clean drinking water.

What Efforts are being done by India to Mitigate the Climate Change?

India has been making sound efforts to reduce the challenges of this global phenomenon directly and indirectly. There are some focal points which can be highlighted here:

- **Indian Constitution and protection of Environment-**

  India is one of the few leading countries whose constitution makes certain provisions on environmental protection. The 42nd amendment, 1976 mentions two articles 48-A and 51-A (g). Article 48-A states, "The State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country." This is a fundamental obligation of the

state since its violation has fatal implications. Article 51A (g) creates a fundamental duty on every individual to obey the mandate of environment and ecology.

(The Constitution, 1976).

- **India's International Obligations –**

India is one of the founder members of United Nation Organizations thus actively participating in the schemes initiated by United Nations Environment Programme. The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) to provide the world with a clear scientific view on climate change. Currently 194 countries are members of the IPCC and India is a very vocal member of this body raising the concerns of developing countries. India attended the COP-15 and COP-16 of United Nations Framework Convention on Climate Change (UNFCCC) held in Copenhagen and Mexico in 2009 and 2010 respectively. India is a part of BASIC nations indicating towards more responsibility on the shoulders of developed countries to reduce GHGs. As a part of its global obligations under the UNFCCC, India prepares periodically the National Communication (NATCOM) that gives an inventory of the GHG emissions in the country and suggests suitable ways regarding social, economic and technological measures for coping with the climate change. As a non-Annex I (developing) country according to Kyoto Protocol, India has no binding emission limits under the Protocol. However, India is an active participant in the Clean Development Mechanism (CDM) established by the Protocol.

(Kala & Saxena, 2010).

- **National Action Plan on Climate Change -** India is very conscious of its global responsibility to minimize adverse effects of climate change on its large population. India is determined to contribute to climate protection by de-coupling the growth of its emissions from the rising economic development. India's climate modeling studies show that its per capita emissions will be around 2-2.5 tons and around 3-3.5 tons of carbon

dioxide equivalent by 2020 and 2030 respectively in comparison to around 1-1.2 tons presently. Prime Minister Dr. Man Mohan Singh announced in 2009 that India will never allow its per capita emissions to exceed that of the developed countries.

The Prime Minister's Council on Climate Change was constituted in June 2007 to develop India's first plan of action on climate change which came into existence as a National Action Plan on Climate Change (NAPCC) released on 30th June, 2008. The NAPCC focuses on adaptation to climate change and further enhancement of the ecological sustainability with the goal of sustainable development. This plan has 8 National Missions running through 2017 and directs ministries to submit detailed implementation plans to the Prime Minister's Council on Climate Change by December 2008.

- National Solar Mission aims to expand the scope of other renewable and non-fossil options such as nuclear energy, biomass and wind energy. India is a tropical country where sunshine is available for longer hours per day with great intensity. Solar energy, therefore has, great potential as future energy source.
- National Mission on Enhanced Energy Efficiency sets a high goal for energy saving. Energy conservation Act 2001 provides legal mandate for the implementation energy efficiency measures through Bureau of Energy Efficiency (BEE). A number of schemes have been initiated to save 10,000 MW by the end 11th Five Year Plan in 2012.
- National Mission on Sustainable Habitat focuses on making habitats sustainable through improvements in energy efficiency in buildings, management of solid waste and modal shift to public transport.
- National Water Mission tries to ensure integrated water resource management helping to conserve water, minimize wastage and more equitable water distribution both across and within states. The mission considers the provisions of National Water Policy and gives a framework to optimize water use by 20% and ample storage capacity.

- National Mission for sustaining the Himalayan Ecosystem would, *inter-alia* seek to understand, whether and the extent which, the Himalayan glaciers are in recession and how the problem could be addressed. The Himalayan ecosystem has 51 million people who practice hill culture and are vulnerable to climate change.
- National Mission for a Green India aims to increase the total forest cover from present 24 % to 33% which will preserve the ecological balance and maintain bio-diversity. An initial corpus of over Rs. 6000 crore has been earmarked for degraded forest land.
- National Mission for Sustainable Agriculture formulates strategies to make Indian agriculture more resilient to climate change. It identifies and develops new varieties of crops and alternative cropping patterns capable of withstanding extremes of weather, long dry spells, flooding, and variable moisture availability.
- National Mission on Strategic Knowledge for Climate Change ensures funding of high quality and focused research into various aspects of climate change. It also supports the establishment of dedicated climate change related academic units in a networked manner in Universities and other scientific research institutions. It also disseminates the new knowledge based on research findings.Besides the 8 above listed Missions, the NAPCC also outlines 24 initiatives aimed at promoting technologies pertaining to energy generation, transport, disaster management and capacity building , etc. that will have substantial benefits in addressing the climate change. **(National Action Plan, 2011).**
- **State level Action Plans on Climate Change -** Prime Minister Dr. Man Mohan Singh urged the state governments in August, 2009 while chairing the meeting of Ministers of Environment and Forests of various states that they should prepare State level Action Plans on Climate Change in pursuance of NAPCC. Some of the Indian states have already responded and taken positive actions. Himachal Pradesh has drawn a programme with the assistance of World Bank. Karnataka has started activities and proposed a technical assistance programme. A steering committee has been set up by Kerala government to

prepare the action plan for climate change. In November 2009, Delhi government has prepared a roadmap to combat the adverse effects of climate change. The Uttar Pradesh government has formed a high level core group to study the situation. The state level plans will enable communities and ecosystem to adapt to climate change effectively.

- **Recent Initiatives in India on Climate Change.**

Area	Imitative/Event	Contribution
Science & Research	1. Indian Network for Climate Change Assessment	Network of 120 research institutions and 250 scientists launched major conferences planned in May and November 2010
	2. Himalayan Glaciers Monitoring Programme	To scientifically monitor the Himalayan Glaciers Phase-I completed; Phase-II launched.
	3. Launch of Indian Satellite to Monitor Greenhouse Gases	ISRO launched a micro-satellite in 2010 to study aerosols and a satellite in 2011 to monitor GHGs.
Policy Development	4. India's GHG Emissions Profile	As per different assumptions made in public India will remain a minor per capita emitter even in 2030
	5. Expert Group on Low Carbon Economy	Planning Commission-led Group set up to develop strategy as a low carbon economy; to feed into 12th plan process.
	6. National Policy on Biofuels	A policy approved by cabinet to promote cultivation, production and use of Bio-fuels for transport and in other applications.
Policy Implementation	7. National Missions under NAPCC	National Mission on Solar Energy, Energy Efficiency and Strategic Knowledge approved; other missions in final stage of preparation.
	8. Ist National Conference on Green Building –Materials and Technologies	To stimulate green building sector to set an example the Govt. proposes that all its new buildings will be GRIHA 4* compliant.

Policy Implementation	9. 30 "Solar Cities"	Approval given to 30 'Solar Cities' aiming 10% deduction in projected demand of conventional energy using combination of energy efficiency and renewables.
	10. Energy Efficiency Standards for Appliances	The ratings made mandatory for 4 key appliances – refrigerators, air conditioners, tube lights and transformers w. e. f. January 7, 2010
	11. Fuel Efficiency Norms	All new vehicles will be EURO-IV compatible w.e.f.2010
	12. CDM Programmes	India assessed as best CDM country ; Indian projects to neutralize 10% emissions by 2012
International Cooperation	13. India to host ' Rio + 20'	India to host 11th COP of Convention on Biodiversity (CBD) in 2012, mark 20th anniversary of Rio.
	14. UN Climate Technology Conference	India hosted global Conference on technology at Delhi, statement adopted.
	15. SAARC Environment Ministers Conference	Successfully hosted SAARC Environment Ministers Conference in 2010 and agreed for joint actions on climate change.
	16. Submissions to UNFCCC	Report mentioning India's 12 proactive submissions to UNFCCC released.
Forestry	17. State of Forests Report 2009	Latest report released shows continued rise in India's forest cover.
	18. Launch of CAMPA	Ambitious Rs. 11,700 crore (USD 2.5Bn) programmes for forest conservation launched.
	19. Green India Mission	New mission under NAPCC to fast-track re-forestation.
	20. Intensification of Forest Management	New Rs. 600 crore (USD 125Mn) scheme to improve forest management , infrastructure, fires, etc.

	21. Inclusion of Forestry within NREGS	Forestry related activities have been included in India's flagship employment guarantee scheme to increase re-forestation.

- **Some Major Achievements :**
- Population Control and family welfare policies indirectly contributed to GHG emission abatement.
- National Highway development plan thus reduces traffic congestions and resulting fuel consumption.
- Metro rail project in Delhi saves fuel and reduces local pollutants. More than 8 other large cities have started metro rail projects.
- CNG compulsory in Delhi and Mumbai and in other large cities like Kanpur, Lucknow, Faridabad Bengaluru and Hyderabad. Auto LPG is being supplied in 10 most polluted cities. Euro- III and Euro- IV vehicles have been launched from 2006 and 2008 respectively for clean road transport.
- Energy conservation Act 2001 has been enacted which encompasses energy conservation norms for each industry and establishment of Bureau of Energy Efficiency.
- India has one of the most active Renewable energy programmes in the world which include 3.26 million biogas plants, 34.3 million improved wood-burning stoves, Solar energy plants , wind mills, etc. to help the save the climate. **(Gupta, 2010a)).**
- Rural Electrification Policy, 2006 promotes renewable energy technologies where grid connectivity is not possible or cost-effective.
- Biodiesel Purchase Policy mandates biodiesel procurement by petroleum companies.
- Ethanol Blending of Gasoline: The regulation mandates five percent blending of Ethanol with gasoline from 1, January 2003 in nine states and four Union Territories.

The Way Forward:

- In India's view, appropriate plans must be prepared by the government and experts according to country's need without external dictation or 'adjustment of ambitions'.
- Minimum use of fossil-fuels should be encouraged. The then president APJ Abdul Kalam said on the eve of 59th Independence Day on August 14, 2005 that we have 30 million acre land for 'Jatropha' plantation which is a source of bio-diesel. India has a potential to produce nearly 60 million ton of biofuels thus making less dependence upon fossil fuels.
- The use of Organic fertilizers instead of Nitrogen fertilizers.
- There should be awareness campaigns to least use of CFCs.
- The honest and strict execution of National and International norms related to pollution and GHGs emissions is another way out.
- There should be decentralization of Industries to minimize the congestion.
- There should be a synergy between climate mitigation strategies and developmental policies. **(Gupta, 2010b)**

Conclusion:

Growing at an almost breakneck pace, and guzzling coal, gas and oil in large quantities, we are today, the fourth largest emitter of greenhouse gases worldwide. Although our per-capita emissions are among the lowest in the world but the most recent IPCC report suggests that India will experience the greatest increase in energy and greenhouse gas emissions in the world if it sustains a high annual economic growth rate. The IPCC predicts that India will become the third largest emitter of greenhouse gases by 2015. Although India has maintained its clear economic and social development imperatives, the government recognizes that climate change is a serious problem. India has committed to actively engage in multilateral negotiations in the UNFCCC, in a 'positive and forward-looking manner'. Under the UNFCCC agreement itself, India is not subject to any binding emission reduction targets until the year 2012. In spite of this guarded stand, India has

'declared' that even as it pursues its social and development objectives, it will not allow its per capita emissions to exceed those of developed countries. The NAPCC (2008) outlines a strategy by which India will adapt to climate change, while maintaining a high growth rate, protecting poor and vulnerable sections of society. The 11th Five Year Plan does make headway in reducing energy intensity per unit of GHG by 20 percent while boosting cleaner and renewable energy. The Mission on Energy Efficiency within the NAPCC has identified small-scale industries as one of the focal areas for improving energy efficiency. In India, Global Environment Facility (GEF) and Clean Development Mechanism (CDM) have been proving significance. The governmental and community based awareness and result oriented research will be beneficial for coming generations to understand the mitigation of the climate change.

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