

Climatic Changes and the Indian Economy

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Introduction

Climate change is not a new phenomenon in the history of Earth, which has gone through many episodes of change. It is one of the greatest challenges facing the world's environment, society and economy today. Climate change - bringing higher temperatures, unpredictable rainfall, sea-level rise, and more droughts, floods and storms - raises the pressure on men and women in delivering these daily essentials. But it also undermines the natural resources that they rely upon to do it. And with few alternative resources to turn to, poor may be forced to cope with climate impacts in extreme ways. This study points out that the analysis of the socio-economic damages of climate change in India, and to identify the past trends of climate change in India.

The India's mean surface air temperature has increased by about 0.4°C during the past century. It appears that the anticipated climate change may have adverse implications for agriculture in India. Cereals production is estimated to decrease over the region due to

shortening of the cropping season length and other physiological effects. The nutrition security of the population-rich but land-hungry region of India would, therefore, be hampered. Studies based on climate model results have indicated that a 30 to 60% increase in tropical cyclone activity in the north Indian Ocean may occur over the next century. Climate change is not a new phenomenon in the history of Earth, which has gone through many episodes of change. It is one of the greatest challenges facing the world's environment, society and economy today. Climate change - bringing higher temperatures, unpredictable rainfall, sea-level rise, and more droughts, floods and storms - raises the pressure on men and women in delivering these daily essentials. But it also undermines the natural resources that they rely upon to do it. And with few alternative resources to turn to, poor may be forced to cope with climate impacts in extreme ways.

How Climate Change affects India

Precisely at a time when India is confronted with development imperatives, we will also be severely impacted by climate change. Like other developing countries, several sections of the Indian populace will not be able to buffer themselves from impacts of global warming. With close economic ties to natural resources and climate-sensitive sectors such as agriculture, water and forestry, India may face a major threat, and require serious

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adaptive capacity to combat climate change. As a developing country, India can little afford the risks and economic backlashes that industrialized nations can. With 27.5% of the population still below the poverty line, reducing vulnerability to the impacts of climate change is essential.

It is in India's interest to ensure that the world moves towards a low carbon future. Many studies have underscored the nation's vulnerability to climate change. With changes in key climate variables, namely temperature, precipitation and humidity, crucial sectors like agriculture and rural development are likely to be affected in a major way. Impacts are already being seen in unprecedented heat waves, cyclones, floods, salinisation of the coastline and effects on agriculture, fisheries and health. India is home to a third of the world's poor, and 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.

The future impacts of climate change, identified by the Government of India's National Communications (NATCOM) in 2004 include:

- Decreased snow cover, affecting snow-fed and glacial systems such as the Ganges and Brahmaputra. 70% of the summer flow of the Ganges comes from meltwater
- Erratic monsoon with serious effects on rain-fed agriculture, peninsular rivers, water and power supply
- Drop in wheat production by 4-5 million tones, with even a 1°C rise in temperature
- Rising sea levels causing displacement along one of the most densely populated coastlines in the world, threatened freshwater sources and mangrove ecosystems
- Increased frequency and intensity of floods. Increased vulnerability of people in coastal, arid and semi-arid zones of the country
- 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.

India stands to lose on too many counts to allow a 'climate-politics-as-usual' scenario. Therefore, positive engagement with global climate negotiations at the next UNFCCC meeting in December 2009 is crucial.

Objectives of the study

The main objective of the study is to analyse the socio-economic damages of climate change in India, and to identify the past trends of climate change in India. It suggests the adoptive measures in Indian context.

Methodology

This paper is a desk research paper. All information and data has been gathered from secondary sources like reports and web search. Few observations are also used in this review paper.

Climate Change Damages on Society

Poverty

The poverty challenge becomes more severe when compounded with climate change. The effects of climate change include food insecurity, water scarcity, ill health, migration, loss of biodiversity and an increase in the frequency and severity of extreme weather events, all of which hit the poorest hardest.

The proportion of the poor living below the poverty line may rise due to reduced incomes of farmers many of whom may be living just above the poverty line. But it must be acknowledged that this effect may also go the other way if the net effect of climate change is to increase rather than reduce agricultural productivity. An increase in poverty may also result from reduced opportunities for the bottom deciles elsewhere in the economy and

reduced revenues available to the government to carry out anti-poverty programs. Whether or not the effect would be large depends how large climate related changes in temperatures, floods, cyclones and droughts are and how close the connections between these changes and the resultant reduced farm incomes.

Turning to climate-change-related extreme events such as floods, cyclones and droughts, a prima-facile case can be made that they would asymmetrically hurt the poor. The poor are more exposed to floods. Disproportionately large number of them being landless workers or marginal formers, they also bear the greatest burden of droughts. Natural calamities are also likely to adversely impact indigenous populations that are less able to shelter themselves. Floods and heavy rains are also likely to asymmetrically damage the urban poor who live in dwellings that readily collapse under heavy downpour. Thus it is said that "India is more vulnerable to climate change than the US, China, Russia and indeed most other parts of the world (apart from Africa). The losses would be particularly severe, possibly calamitous, if contingencies such as drying up of North Indian Rivers and distribution of Monsoon rains came to pass. Consequently, India has a strong national interest in helping to secure a climate deal."

Unemployment

Climate change policies will affect all sectors differently. Each sector and business will face its own set of challenges and opportunities. The study concludes that the required expenditure to meet carbon reduction targets reflects a redirection of economic activity and employment and not necessarily a reduction of GDP. The degree to which net employment is expanded as a result of climate change policy will be in part affected by the size of the pool of unemployed labour and the natural rate of unemployment in the economy. This natural rate can be reduced through improving the skills of the workforce (which reduces occupational immobility). However, some workers may still be hurt by restructuring due

to climate change policy, and there may be geographical differences across the nation.

Climate Change Damages on Economy

Risk of Lower Agricultural Production

The FCCC objective states that GHG concentrations should be stabilised at levels where food production is not threatened (UN, 1992). Thus, by examining the impact on agriculture of different climate change scenarios, one can get an idea of what is tolerable. Rosenzweig and Parry (1994) have estimated significant adverse impact on the agriculture of many developing countries. In a more detailed study of India, Kumar and Parikh (2001a and 2001b) examined the impact of climate change on agricultural crop yields, GDP and welfare. Considering a range of equilibrium climate change scenarios which project a temperature rise of 2.5oC to 4.9oC for India, Kumar and Parikh (2001a) estimated that: (a) without considering the carbon dioxide fertilization effects yield losses for rice and wheat vary between 32 and 40%, and 41 and 52%, respectively; (b) GDP would drop by between 1.8 to 3.4%. Their study also showed that even with carbon fertilization effects, losses would be in the same direction but somewhat smaller. Using an alternative methodology Kumar and Parikh (2001a) showed that even with farm-level adaptations, the impacts of climate change on Indian agriculture would remain significant. They estimated that with a temperature change of +2°C and an accompanying precipitation change of +7 %, farm level total net-revenue would fall by 9%, whereas with a temperature increase of +3.5°C and precipitation change of +15%, the fall in farm level total net-revenue would be nearly 25 %. For a developing country, these are very large changes which can cause much human misery. From India's point of view, a 2°C increase would be clearly intolerable. Other developing countries may be even more vulnerable (possibly Bangladesh or Small Island States).

From Ground water level has been progressively declining and the supply of river

water may also shrink over time. Progressive division of land holdings over last several generations has led to extremely low size of land holdings: in 2002-03, 70 percent of land holdings were less than one hectare (2.47 acres) and the average land holding was 1.06 hectares. Land leasing laws in various states result in vast volumes of land being left uncultivated in some states while leading to highly inefficient methods of farming in virtually all states. Increased droughts and floods can lead to partial destruction of crops with greater frequency. Compression of the monsoon season and increased intensity of rains may also impact agricultural productivity.

Increased sea levels can reduce the availability of arable land. Rising maximum temperatures in drought prone areas lead to reduced productivity while those in cooler areas raise productivity. Increased carbon dioxide levels in the air lead to increased productivity in certain crops. According to the World Bank 2009, C3 crops, which include rice, wheat, soybeans, fine grains, legumes, and most trees, benefit significantly from such a change; C4 crops including maize, millet, and sugarcane, benefits low.

A number of studies try to estimate the effects of rising temperatures, increased or reduced rain, increased carbon dioxide levels and other climate related changes on yields in different crops and regions. World Bank (2009) summarizes the results of many studies. The effects vary widely according to crops, specific climate changes assumed and region. For example simulates various IPCC climate change scenarios for parts of northern, eastern, southern, and western India and predict gains in rice yields ranging from 1.3 percent by 2010 to 25.7 percent by 2070. On the other hand, assuming increases of 2°C in maximum and 4°C in minimum temperature, 5 percent reduction in the rainy days, 10 percent reduction in monsoon rains and an increase in carbon dioxide levels to 550 ppm (parts per million) from 430 ppm, predicts 9 percent reduction in rice yields and 2,3,10 and 3

percent increases in yields of groundnut, jowar, sunflower and maize, respectively.

Health

Global warming is expected to expose millions of people to new health risks. The most vulnerable to health are those communities living in poverty, those with a high incidence of under nutrition, and those with a high level of exposure to infectious diseases. In general, the relationship between climate change and health outcomes is complex. Therefore, as in other areas, we can only speak in terms of possible outcomes. Heatstroke related deaths might rise as well. Warmer climate also makes air pollution more harmful and contributes to airborne diseases with greater potency. Increased dampness and water pollution accompanying floods are likely to increase the risk of spread of diseases such as Malaria. Water contamination that may accompany floods and draughts may also lead to increased incidence of intestinal diseases such as diarrhea. On the other hand, warming in colder season and in minimum temperatures may reduce health risks associated with cold waves.

Increased rains in currently dry regions may also reduce the risk of heat waves. To the extent that the climate change is expected to be associated with increased health problems, the change represents an intensification of some of the existing public health problems in India. Our detailed analysis of health sector (Panagariya 2008) shows that the government is already behind the curve in addressing these problems. The possibilities outlined above call for renewed vigour in implementing major policy reforms in the sector. India needs to accelerate medical education at all levels to ensure access to trained medical personnel. It also needs to improve access to medicines. And, of course, it needs to take a variety of public health measures to combat the spread of infectious diseases by ensuring proper drainage and supply of clean drinking water.

India on climate change

India has committed to actively engage in multilateral negotiations in the UNFCCC, in a 'positive and forward-looking manner'¹⁵. The government recognizes that 'global warming will affect us seriously' but maintains that the 'most important adaptation measure to climate change is development itself'⁸. This has ensured that India's position at the UNFCCC has stubbornly remained 'common but differentiated responsibility'. 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 11th 5-year plan does make headway in reducing energy intensity per unit of GHG by 20 percent while boosting cleaner and renewable energy. In June 2008, the Prime minister released the much awaited National Action Plan on Climate Change (NAPCC). The NAPCC outlines a strategy by which India will adapt to climate change, while maintaining a high growth rate, protecting poor and vulnerable sections of society and achieving national growth objectives¹¹. It focuses on eight areas intended to deliver maximal benefits to development and climate change (mitigation and adaptation). However, detailed action plans for each mission, and any clear targets are missing from the report. Although the action plan may be a missed opportunity for leadership on climate change, the good news is that change is coming⁸. Realising that the market is changing, and not to be left behind in the global race, Indian businesses are beginning to take on climate change as a business issue.

Conclusion

India's mean surface air temperature has increased by about 0.4°C during the past century. It appears that the anticipated climate change may have adverse implications for

agriculture in India. Cereals production is estimated to decrease over the region due to shortening of the cropping season length and other physiological effects. The nutrition security of the population-rich but land-hungry region of India would, therefore be hampered. Studies based on climate model results have indicated that a 30 to 60% increase in tropical cyclone activity in the north Indian Ocean may occur over the next century. This would pose serious problems as large areas in the coastal regions have a dense population associated with fertile delta areas.

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