

Social Impact of Climate change in India

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Abstract

Overwhelming scientific evidence has demonstrated that the earth is moving towards a point of no return, where ecological catastrophe brought about by climate change will be unavoidable. Climate change has the potential to undermine human development across many countries, including India, and may even lead to a reversal of current developmental progress. Actions taken, or indeed not taken, in the years ahead will have a huge impact on the future course of human development. Because of avoidance by ignorance, in India we are facing problem with climatic /weather change in various regions, not only that it has created many problems related to ecological imbalances in various parts of country. Hence this paper focused on how sustainable steps can be taken to preserve the environment and human life by adopting various adaptive and mitigation strategies.

Introduction

India is confronted with the challenge of sustaining rapid economic growth amidst the increasing global threat of climate change. Evidence has shown that climate change will affect the distribution and quality of India's natural resources, which will ultimately threaten the livelihoods of the most poor and marginalised sector of the population who are closely tied to India's natural resource base. More than 56% of workers are engaged in agriculture and allied sectors, while many others earn their living in coastal areas through tourism or fishing; indeed most of the poorest people live in rural areas and are almost completely reliant on natural resources for their food and shelter (UN Human Development Report 2007/8).

There is still opportunity to avoid the most damaging climate change impacts, but time is quickly running out: the world has less than a decade to change course and it is time to act.

India's climate is both diverse and changing. The south experiences tropical climates, through to more temperate conditions to the alpine regions of the north where elevated areas receive sustained winter snowfall.

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The Himalayas provide a barrier to the cold winds of continental Asia and helps the development of the monsoon during the rainy season (June-September) when over 70% of the annual precipitation in India falls (World Bank 2008). This results in a warm climate across most of India throughout the year, where temperatures can exceed 40 degrees, but also fall below freezing in the deserts of the north and Kashmir (Liggins 2008).

Throughout the 21 century, India and other countries in south-eastern Asia are projected to experience warming above the global mean. India will also begin to experience greater seasonal variation in temperature, with more warming in the winter than summer (Christensen et. al. 2007). The longevity of heat-waves across India have extended in recent years, leading to warmer temperatures at night and hotter days– this trend is set to continue (Cruz et. al. 2007). These heat-waves will lead to increased variability in summer monsoon precipitation, with drastic effects on the agricultural sector in India (Bhadwal 2003).

Global temperatures have already increased by 0.7 degrees over the past century and are projected to further increase by a minimum of 1.8 degrees to a maximum of 4 degrees before the end of this century, depending on our ability to act quickly to combat climate change (Ananthapadmanabhan et. al. 2007). As surface temperatures increase, it is expected that there will be an increase in severe precipitation events across the south Asian region. Indeed, predictions state that tropical cyclones will intensify by 10-20% in response to a 2-4 degree rise in sea temperatures (Knutson et. al. 2004).

The climate change issue is part of the larger challenge of sustainable development. As a result, climate policies can be more effective when consistently embedded within broader strategies designed to make national and regional development paths more sustainable. The impact of climate variability and change, climate policy responses, and associated socio-economic development will affect the ability of countries to achieve sustainable development goals. The pursuit of these goals will in turn affect the opportunities for, and success of, climate policies. In particular, the socio-economic and technological characteristics of different development paths will strongly affect emissions, the rate and magnitude of climate change, climate change impacts, the capability to adapt, and the capacity to mitigate.

Climate Change Explained

Phase 1: Greenhouse Gases

Greenhouse gases are chemical compounds in the atmosphere. They allow sunlight to enter the atmosphere where it warms the Earth's surface and is reradiated back into the atmosphere

as longer wave energy or heat. Greenhouse gases absorb this heat and trap it in the lower atmosphere to warm up the Earth's surface.

Since the industrial revolution there has been a rapid increase in the production of human-made greenhouse gases – in particular carbon dioxide, methane and nitrous oxide. Fossil fuel combustion, increasingly intensive agriculture, and an expanding global human population have been the primary causes for these changes.

Phase 2: Global Warming

The ongoing over-production of greenhouse gases has meant that more and more heat is being trapped in the Earth's atmosphere, so we are essentially heating up! This is what is known as global warming.

Since industrialisation, the Earth's temperature has risen by 0.7 degrees – if we do not take action soon, by 2100 temperatures could increase by as much as 5 degrees. This temperature increase will have a dramatic and devastating effect upon the world around us, leading to more extreme weather events and further widespread extinction of many animal and plant species

Phase 3: Climate Change

The effect of the rising temperatures across the Earth's surface will lead to changes in average temperatures, rainfall patterns and monsoon timings. Indeed the climate has already begun to change and if we do not act fast, it has the potential to undermine human development in India and across the world. (UN Human Development Report 2007/8)

Social Impact of Climate Change in India

While climate change affects everyone, it is the world's poor who are on the front line. This section seeks to document some of the devastating impacts that climate change is having on the people of India and highlight the threat to sustainable social and economic development.

Agriculture and Food Security

Although agriculture contributes only 21% of India's GDP, its importance in the country's economic, social, and political fabric goes well beyond this indicator. Rural areas are still home to some 72% of India's 1.1 billion people, most of whom are poor and marginalised and rely on agriculture as their main source of income (World Bank 2009).

Smaller farms are dependent on timely and sufficient rainfall during the monsoon for high crop yields. However with the changing climate, rainfall patterns have become erratic and reduced leaving farmers exposed to many risks including droughts, floods, disease of both

crops and animals and unpredictable market irregularities (Venkateswarlu 2009). Indeed it is estimated that every 1°C increase in temperature is likely to lead to a 5-10% reduction in yields of some crops (Pachauri 2009).

Food security has deteriorated since 1995 and reductions in child malnutrition are unlikely to reach targets set by the Millennium Development Goals (MDGs) by 2015. Climate change will have a significant impact on food security and malnutrition, as changes in patterns of extreme weather events will affect the stability of, and indeed access to, food supplies (Cohen 2008).

Health

As the climate changes, there is going to be an increasing impact on human health. Temperatures will rise and lead to an increasing frequency of heat waves, ultimately increasing incidences of illness and death in India. Food and water supplies will be affected and the rate of disease will escalate, predominantly affecting the poor and marginalised who are often forced to live in overcrowded conditions with limited access to water and sanitation. As coastal populations are further displaced by rising sea levels, migration will increase, which will perpetuate levels of disease and infection due to the unstable living conditions with limited sanitation facilities and access to clean water and food (McMichael et. al. 2004). Below are just some examples of the health implications that can be linked with climate change:

Bacterial Infection: Rates of diarrhoeal, cholera and other bacterial diseases are set to rise as temperatures rise and water quality issues increase. Bacterial infection from contaminated water is expected to increase as heavy rainfall and rising temperatures lead to pollution of drinking and recreational waters. The occurrence of Salmonella and E. Coli, amongst other food poisoning bacteria, are further known to be associated with rises in ambient air temperature (Fleury et. al. 2006).

Vector-borne Disease: With climate change, geographical ranges and survival of species bearing diseases will vary. Warmer, wetter climes, particularly during breeding season, could enable malarial mosquitoes to spread their range and survive longer, leading to increased rates of dengue fever and schistosomiasis (Battacharya et. al. 2006).

Respiratory Disease: The quality of air is likely to decrease as surface ozone concentrations begin to rise with increasing temperatures. This will lead to an increasing incidence of asthma and other cardiovascular and respiratory diseases (Liggins 2008).

Under-nutrition: Rising temperatures and variable rainfall will ultimately lead to an increase in crop failures and therefore a decline in food security, especially for crop staples such as rice and wheat. Poorest regions will be the most affected and rates of under-nutrition will begin to increase (Cohen et. al. 2008).

Population Displacement

India's population is currently in excess of 1.1 billion people and predictions state that by 2050, the population will have grown by another 500 million (UN 2008). This increase in population will undoubtedly lead to a strain on resources, especially when coupled with the impacts of climate change. The widespread affect that climate change is expected to have on agriculture and rural livelihoods will lead to greater migration from rural areas to urban, further straining resources in these centres (Liggins 2008).

The term 'environmental refugee' has now been coined for those populations who are displaced by environmental events/disasters which are linked directly with climate change. Whole communities are forced to migrate, often inland, from coastal areas. Indeed, according to the Inter-governmental Panel on Climate Change (IPCC), sea-level rise is the greatest threat and challenge for sustainable adaptation within South Asia. The consequences in terms of flooding of low lying deltas, retreat of shorelines, salinisation, and changes in the water table, cause very serious concern for the well-being of local populations.

Women

Climate change will lead to increased hardship for India's poorest women. Women in India, especially in rural areas, are often responsible for providing daily essentials such as food and water. When climate change related disasters strike, research has shown that the workload of women and girls increases, thus leading to their exclusion from opportunities like education and a diminishment in their equal participation in development. For example, deforestation increases the time women need to spend looking for fuel. Research has further shown that women have fewer means to adapt and prepare for extreme weather conditions.

Many poor women are also actively engaged in agricultural activities, including paddy cultivation and fishing that will be affected by changing weather patterns in India; loss of livelihood will increase their vulnerability and marginalisation (UNDP 2007/8).

Case Study: Sundarbans, West Bengal

The Sunderban Islands in West Bengal are sinking. 7,000 people have already been displaced and by 2030, it is anticipated that over 70,000 people from this area will be exposed to the risk of losing their homes and livelihoods due to sea level rise, increased cyclone intensity and flooding. These environmental refugees are forced to reside in refugee colonies where poor sanitation and limited water supply can lead to the spread of disease and further health implications.

In addition to the widespread community displacement, the mangrove forests, which are the largest of such forests in the world and are well known for their biodiversity and habitat for threatened species (including the Royal Bengal Tiger), will have diminished by over 75% in the next 20 years due to climate change.

(Hazra, S. 2006. Vulnerability Assessment of the Sunderbans Island System in the Perspective of Climate Change)

Addressing the Impact of Climate Change

The time to act is now. A combination of adaptive and preventive measures is urgently required to combat climate change and ensure sustainable development for future generations in India. Failure to respond to this growing crisis at both a national and global level will result in certain environmental catastrophe that will affect us all.

Adaptation: A response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities. In human systems, adaptation can be both anticipatory and reactive and can be implemented by public or private actors (UNDP 2007/8).

It is the poorest, who have the least resources and the least capacity to adapt who will be hit hardest by the changing climate. They rely largely on climate sensitive activities, largely in the agricultural sector. Supporting these people to adapt to the affects of climate change is critical in order to secure sustainable development.

India's immense geographic diversity adds to the difficulty of developing an adaptation strategy. Broad generalisations on ways to promote adaptation to climate change will be misleading – there can be no one size fits all approach to developing a climate risk management strategy.

Approaches will need to be tailored to meet local vulnerabilities and conditions. This is why it is important to conduct in depth vulnerability assessments to identify which areas of India will be most affected by climate change and how. Indeed while there are existing efforts to

assist people in India to adapt to the impacts of climate change, it is imperative to understand fully the risks that these people face in order to be able to support them effectively. In order for adaptation strategies to be successful, they must be integrated into planning at the national, state and local level.

Further support must be given to communities already suffering from the impacts of climate change to enable them to spread their risks by diversifying sources of income and helping them build their resilience.

Mitigation: All human interventions which reduce the sources of greenhouse gases or which embrace the sinks of greenhouse gases (UNDP 2007/8).

'It is not too late to cut greenhouse gas emissions to sustainable levels without sacrificing economic growth...rising prosperity and climate security are not conflicting objectives' UNDP Human Development Report 2007/8.

Historically, responsibility for climate change lies with rich, industrialised countries and it is these countries that must take the lead in cutting greenhouse gas emissions. However, it is imperative that all nations use fossil fuels in a sustainable manner and endeavour to become low carbon economies. Global warming is a truly global problem and must be addressed as such.

In India, over 40% of households are still without electricity. Research indicates that the demand for energy will increase across India over the 21 century, potentially to one fifth of the world's energy consumption by 2100 (Parikh et. al. 2004). Presently India uses fossil fuels in abundance to provide cheap and reliable supplies of energy, especially to the rural poor. In fact around 80% of India's electricity generation comes from fossil fuels (Liggins 2008). However, the burning of these fuels is highly inefficient and this is the largest contributor to the excessive emission of greenhouse gases. Indeed, India must also address the issue of energy security in the long term; presently India is largely dependent on imported sources for primary energy, which is not sustainable.

Improving Energy Efficiency

Improving energy efficiency for achieving sustainable economic and social development offers a powerful tool by reducing the need for investment in new infrastructure, by cutting fuel costs, and by increasing the competitiveness for business and welfare for consumers. Importantly though, energy efficiency leads to extensive environmental benefits through reduced emissions of greenhouse gases.

In 2001, the Energy Conservation Act was passed which provides a legal mandate for the implementation of energy efficient measures through the institutional mechanism of the Bureau of Energy Efficiency (BEE) in the central government and designated agencies in each state. Through this Act, a number of schemes and programmes have been initiated and it is anticipated that these will result in a saving of 10,000MW by the end of the 11 Five Year Plan in 2012 (NAPCC 2009).

Renewable Energy

Apart from energy conservation and efficiency improvements, the need to find and develop non-conventional energy sources has been recognised by the Government of India. Many of these non-conventional energy sources are both clean and renewable and need to be seriously considered for sustainable low carbon and high growth strategies (Parikh et. al. 2002). The key to the success of such initiatives is community involvement in taking activities forward, supporting them through a package of appropriate technology, community mobilisation, training and financing (UNDP 2007/8).

SOLAR ENERGY: The radiant light and heat from the sun that is harnessed by human made technologies, which generates electricity. In many parts of rural India, solar energy is being used widely to meet the needs of the poor. For example the Ministry of New and Renewable Energy has introduced the Remote Village Electrification Programme in over 4000 villages and hamlets. This solar technology enables children to study after dark due to solar powered lighting and it can illuminate street lights. Furthermore, solar powered cookers emit no harmful gases during cooking and so women who traditionally cook everyday in the home are not exposed to the excessive carbon emissions expelled during cooking (UNDP 2007/8).

HYDRO ENERGY: The production of power through the use of gravitational force of falling or flowing water; it is the most widely used form of renewable energy. Hydro energy produces no direct waste and has a considerably lower output level of the greenhouse gas carbon dioxide than fossil fuel powered energy plants. Hydroelectricity currently supplies about 715,000 MW or 19% of the world's electricity, accounting for 63% of the total electricity from the renewable energy sector. Hydro Power has a prominent role to play in responding to the energy challenges. The electricity generated from small hydro power projects is cost-effective. Such projects are simple to operate, have a relatively short gestation period and are environmentally friendly. In addition, these hydro energy projects can be

located in remote areas for generating power. The global estimated potential of SHP is about 180,000 MW (Gonsalves 2006).

BIOMASS/BIOFUEL: Material derived from recently living organisms. This includes plants, animals and their by-products. For example, manure, garden waste and crop residues are all sources of biomass. It is a renewable energy source based on the carbon cycle, unlike other natural resources such as petroleum, coal and nuclear fuels.

In addition to providing energy security and a decreased dependence on oil imports, biofuels offer several significant benefits such as reduced emission of pollutants and greenhouse gases and increased employment in the agricultural sector. In India, the National Biodiesel Mission promotes the use of *Jatropha*, which research shows to have the following advantages: it requires low water and fertilizer for cultivation, is not grazed by cattle or sheep, is pest resistant, is easy propagated, has a low gestation period, has a high seed yield and oil content and produces high protein manure.

The main problem in getting the biodiesel programme up and running in India has been the difficulty in initiating the large-scale cultivation of *Jatropha* as farmers do not consider *Jatropha* cultivation rewarding enough. The Government needs to sponsor confidence-building measures such as establishing a minimum support price for *Jatropha* oilseeds and assuring farmers of timely payments. It is also important to note that bio fuel production should be based non-agricultural land, or at least on land that is not substituting agriculture, so as not to jeopardise food security (Gonsalves 2006).

WIND ENERGY: The conversion of wind energy into a useful form, such as electricity, using wind turbines. Wind power is produced in large scale wind farms connected to electrical grids, as well as individual turbines for providing electricity to isolated locations. Wind power accounts for 6% of India's total installed power capacity, and it generates 1.6% of the country's power— currently India has the 5 largest installed wind power capacity in the world. Short gestation periods for installing wind turbines and the increasing reliability and performance of wind energy machines has made wind power a favored choice for capacity addition in India. Wind power is also cost competitive to other fuel sources as it is the least expensive of all renewable energy resources. Because wind is free, it can provide a stable long term price for power production. In Tamil Nadu, there is a wind farm called Muppandal – this is the largest farm of its kind in Asia.

It supplies all the surrounding villages with electricity for work. However in India, despite the high installation capacity, the actual utilisation is low because policy incentives are geared

towards installation rather than operation of the plants. This is why only 1.6% of power production in India comes through wind despite the installed capacity being 6% (Wind Power India 2009).

Conclusion

It is of serious concern for every country and their living citizens to be aware of problems evolved due to various misconducts from business, society and other stakeholders. Hence, Need for overcoming problems related to climate change and its social impact required to be addressed by Govt and non Govt organisations with importance. IT has been noticed that if every citizen and other stake holder takes active role in mitigating the problems then to a large extent we would be able to curb the menace created by ecological imbalance and their effects on climate.

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