Impact Of Climate Change On Economy

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Vulnerability to climate change will mainly depend on economic position and infrastructure capacity of nations. Climate change effects will impose significant additional stress on ecological and socioeconomic systems, but currently these systems are burdened by pollution, natural resource scarcities and other unsustainable practices.

Technologically advanced countries are prepared well for responding to climate change, particularly by developing and establishing suitable policy, institutional and social capable for dealing with the consequences. But the poor and developing countries are mostly affected by climate change, because they are not having enough and sound technologies or scientific development to deal with this impact.

In developing countries like India, climate change is an additional burden because ecological and socioeconomic systems are already facing pressures from rapid population, industrialization and economic development. India's climate could become warmer under conditions of increased atmospheric carbon dioxide (Longerman S, 1998). The average temperature change is predicted to be in the range of 2.33° C to 4.78° C with the doubling in CO2 concentrations (IPCC 1998). The following sections provide an overview of impact of climate change in various sectors.

Agriculture and Food

Agriculture production is direct dependence on climate change and weather, is one of the widely studied sector in the context of climate change. The possible changes in temperature, precipitation and CO2 concentration are expected to significant impact on crop growth. So that overall impact of climate change on worldwide food production is considered to be low to moderate with successful adaptation and adequate irrigation, global agricultural production could be increased due to the doubling of CO2 fertilization effect.

There are two ways to climate change can affect the food production system. One is direct and another is indirect. In direct changes through temperature, water balance and atmospheric composition as well as extreme weather events and indirectly changes through in the distribution, frequently and severity of pest and disease outbreaks, incidence of fire and in soil properties. These direct and indirect effects on agricultural system will not only responding to climate change but through fluctuating yield have a negative impact on production and distribution.

The social-economic impacts associated with the above physical impact on crops will be influenced by the interaction between producer and consumer behaviour as well as the possible adaptation that farmers could undertake in response to climate change.

Agricultural and allied activities constitute the single largest component of India's economy. It is contributing 22% of the total Gross Domestic Product (GDP) in the year 2003-2004. Indian's agricultural activity continues with fully dependence of the weather. A few studies on the impact on agriculture have been reported for India in the IPCC Third Assessment Report (IPCC 2000). Saseendran et al., have reported decrease in rice yields by 3% to 10% under a scenario of 1.50C rise in temperature and a 2 mm day-1 increase in precipitation. Most of the recent studies found that possible adverse effect on developing countries agricultural sector, but all of them focus on physical impact alone.

Matthews et al. (1994) have estimated the impacts on rice yield for many countries in Asian region. The results shoe that the impacts vary widely across countries. Kumar and Parikh (1997, 1998) examined the impact on agricultural yields, output, income and prices in India. They estimated yield losses of winter wheat would be more than that of rice and that the associated economic impacts would affect the lower income groups of the society more adversely. The

studies also showed that both carbon fertilization effects and farm-level adaptations would have substantial nullifying effects on the adverse impact on climate change.

To study the micro level implications of vulnerability, detailed case studies are being conducted in India. The case studiers focus on how economic factors within the context of domestic policies have either enhanced or reduced the capacity of farmers to cope with climate change. The pilot case study was undertaken in district Jhalawar of Rajasthan. Three other case studies are to be conducted over in 2003-2004.

Forests

Climate is an important determinant of the geographical distribution, composition and productivity of forests. Forest area would be affected by climate depends on various factors like species and age of trees, possibilities for forests to migrate, and quality of forest management (Suthir Sharma and K.S.Kavikumar 1998). Climate change over forestry turn to have profound implications for traditional livelihood, industry, biodiversity, soil and water resources and these leads to changes in agricultural productivity. Most of the estimates of the forestry sector have been carried out without considering the influence of land use changes in the future.

Forests have a large capacity to stock the sequester carbon. Increasing level of carbon loads to increase the Net Primary Productivity of forests. So that Net Primary Productivity and Carbon have a direct relationship. But some forests are also likely to disappear due to higher temperature and an increase in the number of pests and pathogens. But the how is the net effect from these phenomena on the level of carbon is not yet found clear from existing research. Climate will have the greatest impact on boreal forests. But temperature first will be affected to a lesser extent and tropical forests will be least affected under climate change condition (Catrinus J. Jepma and Mohan Munasinghe, 1998).

Fankhauser (1995) has estimated the annual forestry losses to be US$1.8 billion in the OECD and US$2 billion for the world as a whole due to the climate change. There were few studies have estimated economic impacts, and even the physical impacts are restricted to estimates the loss in wood supply.

Ravindranath N H AND Sukumar R (1998) studied the impacts of climate change scenario on tropical forests in India. Their study dealt with green house gas forcing and incorporating the effects of sulphate aerosols. First scenario associated with increased temperature and rainfall, could result in increased productivity. Second scenario involved in increased temperature and a decreased precipitation, could have adverse effect on forests.

Aquatic Ecosystems

Aquatic ecosystems include lakes and streams, non-tidal wetlands, coastal environs, and oceans. Temperature increases caused by climate change may due to the diversity and geographical distribution of species, the productivity of organism in ecosystem and the mixing priorities of lakes. Increase in air temperature of -- can shift the geographic range of species by about 150 km. Poleward.

Most favourable effects of warming will be felt at high latitude, where biological productivity and species diversity are likely to increase. Most significant negative effect will be experience by cold or cool water species in low latitudes where extinction is likely to increase and biodiversity will decline.

Climate change will affect biological, biogeochemical and hydrological functions of wetlands. An increasing our temperature could affect the wetland by thawing permafrost, which is crucial for maintaining the water table in ecosystem.

Economically and ecologically important coastal ecosystems are significantly damaged from climate change effects, such as sea level rise, changes in atmospheric temperature and variation in the rainfall patterns. And many valuable economic and ecological functions including tourism, fisheries, storm and floodwater protection and biodiversity would be threatened by climate change.

The greatest impacts of climate change on many aquatic ecosystems would be the exacerbation of already existing stresses resulting from human activity. Over the past few decades costal wetlands, saltwater marshes, and mangrove systems have disappeared at a rate of 0.5 to 1.5% per year in some regions. Temperature changes and sea level rise will accelerate these trends.

Fankhauser (1995) estimated the annual loss due to land loss to be about $ 45.6 billion world wide, following a 50 cm rise in sea level. In the context of developing countries, 1 m rises in sea level would affect nearly 30000 sq.km (Asaduzzaman 1984) in Bangladesh. . The overall macroeconomic impact of sea-level rise would amount to about 30% of current GNP in the coastal zone, which is about 5% of overall GNP of Bangladesh. UNEP identifies India as a one of the country among the 27 countries that are most vulnerable to sea level rise. Asthana (1993) estimated that a 1 m rise in sea level would place 7.1 million people are risk of displacement or other server disruption in India. The total estimated land loss is about 5763 sq.km, which is 0.41% of the total area of coastal states. IPCC (1992) carried out the study at Orissa and West Bengal, that the absence of protection, a one-meter sea level rise would inundate 1700 km2 of predominantly prime agricultural land. The 1999 tropical cyclone that hit Orissa resulted in a death of thousands of people, implies related to variability.

Water Resources

Impact estimation of water resources is complex because of the interaction of various climate as well as non-climate factors. Hydrological models show that water availability could vary widely among nations and within nations. Experts also not able to project whether human water supply system will advance sufficiently to counteract the anticipated negative impact of climate change and increased demand. Some of the factors such as vegetation, projected water demand, population complicate to assess the impact of climate change on water resources. However, on the basis of general circulation models have significant impact on regional water supplies. So far these model have capable to providing only larger scale geographical projections.

Several countries including Kuwait, Jordon, Rwanda, Somalio, Algeria and Kenya, the availability of water will fall below the level of 1000m3 per person annually, which is used benchmark for water scarcity. Above countries are particularly vulnerable to reductions in water supply.

The impact of climate change on water resources will affect human well-being to various digress, depending on how country-specific water management methods can accommodate such change. Developed countries with better water management system will be dealing with consequence of climate change, at the same time poorer countries are more dependent on seasonal rain fall will be more vulnerable. Ingenerally irrigation is the first activity to be significantly affected in many countries due to the water shortage.

Based on the estimates made by Fankhauser (1995) annual losses will be about US $ 34.8 billion for the CECD and US $46.7 billion for the world as the whole. Most of the studies in developing countries still look over the physical impact only. Annual average runoff in the river Brahmaputra will decline by 14% by the year 2050, the assessment scenarios developed from Hadley Center Model Simulations. Impacts will be observed more in the western Himalayas as the contribution snow to the runoff major rivers on the western side is about 60% compared to 10% on the eastern side (IPCC. 2001). Singh (1998) suggests that an increase in the surface temperature will lead to a rise in the snowline, increasing the risk of floods in North India during the wet season.

Human Health

As the quality of life strongly depends on climate, climate change would affect human amenity. Though warm climate is generally preferred over cooler climate, if the warming were beyond optimal temperature, it would have adverse effects. The vulnerability of human health is depends on function of causative factors. But the causative factors depend on nutrition status, population health, and health infrastructure. These factors are relatively poor in the developing countries, so that health impacts due to climate change in these countries are expected to be more adverse.

One of the major direct health impacts of climate change would be an increase in heart-related deaths and illness (primarily from cardio respiratory failure). Studies have been shown that heart-related deaths could increase because of climate change, at the same time deaths due to cold weather conditions would decrease as a result of global warming.

The indirect effect of climate change would expansion of the area under the influence of the malaria mosquito, these leads to increased global population exposed to malaria from current 45% to 60% by the latter half of the next century. However actual increase in the number of people with malaria-estimated to be between 50 and 80 million. Matsuoka and Kai (1995) have concluded that population exposed to risk of malaria would increase by about 30% in the Asia-Pacific region under a 2 x CO_2 climate.

Increase the heart related diseases (asthma, allergic disorders, and cardiorespiratory) would probably also occur due to climate-induced changes. Based on studies in US, Cline (1992) and Fankhause (1995) have estimated that climate change would increase the mortality by about 27-40 persons per million populations. Regarding the human loss in monetary terms is controversial. So far there has been no consensus in this regard (IPPC 1996). Africa is expected to be increasingly vulnerable due to climate change because most of the countries in African continent are poor and low level of health standard.

Following figure illustrates the adverse effects on human produced and directly and indirectly by climate change.

CLIMATE CHANGE: TEMPERATURE, PRECIPITATION AND WEATHER

MEDIATING PROCESS	HEALTH OUTCOMES
DIRECT	
Exposure to thermal extremes (especially heat waves)	Altered rates of heat- and cold-related illness and death (especially cardiovascular and respiratory diseases)
Altered frequency and / or intensity of other extreme weather events (floods, storms etc.)	Deaths, injuries and psychological disorders; damage to public health infrastructure
INDIRECT	
Effects on range and activity of vectors and ineffective parasites	Change in geographic ranges and incidence of vector-borne diseases
Altered local ecology of water-borne and flood-borne ineffective agents	Changed incidence of diarrheal and certain other infectious diseases
Altered food (especially crop) productivity due to changes in climate, weather events, and associated pests and diseases	Regional malnutrition and hunger, and consequent impairment of child growth and development.
Sea level rise with population, displacement and damage to infrastructure.(e.g., sanitation)	Injuries, increased risks of various infectious diseases (due to migration, crowding and contamination of

	drinking water), psychological disorders
Levels and biological impacts of air pollution, including pollens and spores	Asthma and allergic disorders: other acute and chronic respiratory disorders and deaths
Social, economic, and demographic dislocations due to adverse climate change impacts on economy infrastructure, and resource supply	Wide range of public health consequences (e.g. mental health, nutritional impairment, infectious diseases, civil strife)

Source: Catrinus and Munasinghe

Ecosystem and Natural Habitats

Human societies are mainly depends upon goods and services provided by the terrestrial and aquatic ecosystem. Bit the global climate change will lead to a reduction in the goods and services that ecosystem provides, as well as decline in genetic and species diversity. Mean annual temperature and precipitation can be correlated with the distribution of biological habitats throughout the world. Fluctuations and temperature and precipitation caused by climate change affect the geographical distribution of biological habitats. Adaptation tom such changes will vary among the animals and species of the plants. Some of the species will be able to migrate or adopt, those who cannot adopt quickly enough may become extinct.

Estimation of species loss in terms of monetary would invariably, because of large amount of subjectivity involved. Even though Pearce (1993) and Fankhauser (1995), estimate the total costs of species and habitat loss from climate change to be about US $40 billion per annum for the whole world. One third of this loss is expected from the developing countries. The monetary estimates of biodiversity loss are generally based on willingness to pay (WTP).

Human Infrastructure and Habitat

There are direct and indirect effects on human infrastructure and habitats caused by climate change. Changes in temperature, precipitation, and sea level or extreme weather events can directly damage physical infrastructure. Indirect effects are likely to be felt through market sensitive to climate change. Effects on human infrastructure could be exacerbated by human migration caused by large-scale flooding, destruction of crops, droughts, or spread of disease.

The impact of climate change on agricultural and ecosystem will be higher than the hard infrastructure sectors such as energy, transport, and industry. The impact on hydroelectric power generation will depend on frequency and quantity of rainfall and evaporation. Deforestation and other effects of climate change on forests will reduce the availability of fuel wood. Many nations will face the risk of losing capital valued at over 10% of GDP.

Costal communities will be vulnerable in erosion due to the sea level rise. Assuming no increase in population and no adaptive behaviour, a 50 cm rise in sea level would be affect the more than 90 million individuals. Generally developing nations with high population densities and weak coastal defense system. So that they are facing problems at internally even some time at international forced migration of large number of people. For instance nearly 70 million people affected by 1 m sea level rise in Bangladesh and China.

Sea-level rise

The rise in global sea level is the major impact of global warming after the temperature changes due to climate change. An increase in the average global temperature will results in a rise in sea level, due to the thermal expansion of the oceans and the melting of glaciers and ice sheets. The global average sea level has already increased by 10 to 25 cm during the past century. Based on the model calculation, IPCC estimates a mean value of sea level rise by 46 at the time of 2100. This rise is 2 to 5 times greater than rise experienced over the past 100 years.

Fankhauser (1995) estimated the annual loss to land loss to be about $ 45.6 billion world as whole, followed by a 50 cm rise in sea level. However, this aggregate figure does not reflect in developing countries. Asaduzzaman (1994) found that 1 m rise in sea level would affect nearly 30,000 sq.km in Bangladesh. He estimated the overall macro economic impact due to sea level rise would be 30% of current GNP in the coastal zone, which is nearly 5% of overall GNP of Bangladesh. Asthana (1993) estimated 1 m rise in sea lvel would take 7.1 million people at risk of displacement in India. The total estimated loss is about 5763 sq.km, which is 0.41% of the total area of coastal zone.

Conclusion

The effects of global climate change could be potentially serious over the next century include regional increases in floods and droughts, inundation of coastal areas, high-temperature events, fires, outbreaks of pests and diseases, significant damage to ecosystem, and threats to agricultural production. Climate change will also pose a major risk to human health and safety, especially among poorer communities with high population densities in areas like river basins and low-lying coastal plains, which are vulnerable to estimate related natural hazards such as storms, floods, and droughts. The world’s leading experts working under the aegis of the IPCC have recently concluded that increases in global mean surface temperature during the past century are unlikely to have been caused entirely by natural effects, and that changes in both average temperature and the geographic, seasonal, and vertical patterns of temperature indicate the influence of human actions on global climate.