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THE ECONOMIC IMPACT OF CLIMATE CHANGE IN INDIA

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Introduction

Environmental pollution is the undesirable change in the physical, chemical or biological characteristics of air, water, soil, energy pattern, biota, etc. resulting in the deterioration of raw material resources. This may cause direct or indirect change in one or more components of the environment causing adverse effects on living organisms, especially human beings. Many types of environmental pollutions are air, water, soil, marine, noise, thermal and nuclear pollutions. Natural defenses break down due to prolonged exposure to pollution, it may result lung cancer, asthma, bronchitis and emphysema. Cholera, jaundice, and diarrhea. Changing climate, rapid urbanization and uncontrolled urban migration are very challenging issue in India. The trends in climate are often uncertain, cities should prepare for the extremes.

The Global average temperatures have been increasing steadily in the last 150 years: 2016 was the hottest year since records began, reaching 0.99°C above the mid-twentieth century mean. The world's nine warmest years since records began have all occurred since 2005, and the five warmest since 2010. It now seems close to impossible that we will meet the target of 1.5°C of warming. A 2018 landmark report by the Intergovernmental Panel on Climate Change (IPCC) said this would involve bringing CO2 emissions down by 45% from 2010 levels by 2030. Beyond 2°C, the Earth's non-linear feedback loops and tipping points, such as melting sea-ice and the release of reserves of methane in permafrost and sea beds, become very difficult to predict. The fear is that they could lock us into major and potentially irreversible changes, and trigger runaway climate change a scenario commonly referred to as 'Glasshouse Earth'.

India has the 2nd largest urban system in the world, with 310 million people in over 5161 cities as of 2005. Although presently the 5100 urban centers hold less than 30% of the total Indian population, this figure is expected to rise to 40% by 2030 in an estimated 70,000

urban settlements, as urban population is likely to grow by 575 million over the next 50 years. By 2025, 70 Indian cities are expected to have more than 1 million inhabitants.

Some Major Disasters in India

The following table reveals about the frequency, name of the disasters and the victims of the some natural disasters in India.

Year	Name of the Event	State and Area	Victims
1972	Drought	Large part of the country	200 million people affected
1977	Cyclone	Andhra Pradesh	10,000 deaths, hundreds of thousands homeless, 40,000 cattle deaths
1987	Drought	15 States	300 million people affected
1990	Cyclone	Andhra Pradesh	967 people died, 4,35,000 acres of land affected
1993	Latur Earthquake	Latur, Marathwada region of Maharashitra	7,928 people died, 30,000 injured
1996	Cyclone	Andhra Pradesh	1,000 people died, 5,80,000 housed destroyed
1999	Orissa Cyclone	Orissa	Over 10000 deaths
2001	Gujarat Earthquake	Rapar, Bhuj, Bhachau, Anjar, Ahmedabad and Surat in Gujarat State	13,805 deaths, 6.3 million people affected
2004	Tsunami	Coastline of Tamil Nadu, Kerala, Andhra Pradesh, Pondicherry and Andaman and Nicobar Islands of India	10,749 deaths, 5,640 persons missing, 2.79 million people affected
2005	Maharashtra Floods	Maharashtra State	1094 deaths, 167 injured 54 people missing

2008	Cyclone Nisha	Tamil Nadu	204 deaths
2008	Kosi Floods	North Bihar	527 deaths, 19,323 livestock perished, 2,23,000 houses damaged, 3.3 million persons affected
2009	Floods	Andhra Pradesh, Karnataka, Orissa, Kerala, Delhi, Maharashtra	300 people died
2009	Drought	252 Districts in 10 States	-
2010	Cloudburst	Leh, Ladakh in J&K	-
2011	Sikkim Earthquake	North Eastern India with epicenter near Nepal Border and Sikkim	Most recent disaster
2012	North Indian cold wave	Uttar Pradesh. Rajasthan, Punjab, Haryana, New Delhi, Jammu and Kashmir, Himachal Pradesh, Madhya Pradesh, Bihar and Tripura	killed at least 92 people
2013	Uttarakhand Flash Floods	Gobindghat, Kedar Dome, Rudraprayag district, Uttarakhand, Himachal Pradesh, Western Nepal	5000 plus people died
2014	Kashmir Floods	Srinagar, Bandipur, Rajouri	500 plus people died
2016	Cyclonic Storm Vardah	Tamil Nadu,Andhra Pradesh, Andaman and Nicobar Islands	About 10,000 people have been evacuated
2017	Cyclone Ockhi	Tamil Nadu, Kerala,	30 plus people died
2018	Cyclonic Storm Gaja	Tamil Nadu	Around 76,290 people evacuated

The above table depicts that in recent years the frequencies of natural disasters are showing a very narrow trend.

Economic impacts of Climate Change

Cities form the center of the economy in our country, so climate change's impact on urban populations also damages the nation. For every one-meter rise in sea levels, the World Bank estimates a loss of

2% in national Gross Domestic Product due to shortage of fresh water, damage to agriculture and fisheries, disruption of tourism, reduced energy security, and other consequences.

Health consequences of climate change especially, heat waves, could have a great impact on economy. Episodes of heat cramps, heat exhaustion and heat stroke would affect the population, primarily the large poor section of the society. As the immune system weakens due to heat stress, susceptibility to diseases would further increase. The resulting increase in expenses on health care by individuals would escalate leading to greater stress. Hence, this vicious cycle would lead to depreciation of human resources. As temperatures increase, the workable days for heavy works like construction will decrease and this may have a negative impact on economic growth.

Climate change through more frequent and intense drought or floods is already severely affecting the agricultural sector and food production. One of the side effects of this rural and agricultural crisis can increase in food and biomass fuel prices in cities.

Impact of climate change on the urban areas

There are several impacts of climate change, especially in the water sector. Demand for water increases sharply in all cities whereas, the available resources are being fast deteriorated. Changing climate conditions and conflicts over allocation of water resources leads to the crisis. Slow and incapable administrative mechanism often fails to provide basic facilities, controlling illegal settlements and in preventing degradation of resources. Since population is fast rising and agricultural production is falling, another agricultural revolution may become necessary. Measures for food security always demand more water and this will further cut the water supplies to the cities.

Level of pollution in urban centers, especially near industrial sites is far above all safety limits. Release of gases from industries and vehicles add to the rise in temperature related to climate change. Industrial outflow is to be continuously increasing the pollution.

Wells, ponds and incoming canals to cities are to be protected to maintain water quality and water availability. Careless disposal of solid wastes obstructs water flow in the drainages and is a major reason for urban water logging. Studies indicate that less than 10% of the population uses water sufficient for 50%. There should be a mechanism to supply the treated wastewater for the purposes like

flushing, gardening, car washing etc. In cities, price of water from private parties is not affordable to middle class families.

Studies were identified that the major challenges climate change are groundwater depletion, distribution system, groundwater harvesting uncontrolled urbanisation increasing slums, open defecation, vehicle pollution deforestation conversion of forests and agricultural land into urban use, decreased rainfall water quality sewage treatment, drinking water management, vector borne diseases, solid waste management, heat wave effects ect.,

The Problem is pollution management measures and implementation of the same. The approach and involvement of community were ranked according to importance and urgency among this group, the groundwater depletion ranked as the most important and likely to deteriorate in the near future. The second most significant challenges were sewage management and deforestation. However, sewage management is currently being improved in addition; to it deforestation, as well as unplanned urbanisation and the conversion of agricultural land to urban areas will increase in the future. Concern was also raised about open defecation, solid waste management and, more generally, pollution. To a lesser extent, heat wave effects and hot water from thermal power plants were regarded as problematic.

Impact of Climate Change on Human Health

Climate change influences human health in numerous ways. Public health can be affected by disruptions of physical, biological and ecological systems including disturbances. The health effects of these disruptions include increased respiratory diseases, cardiovascular diseases, injuries, premature deaths related to extreme weather events, changes in the prevalence of food and water-borne diseases, other infectious diseases and threats to mental health.

- **Air Pollution related Diseases**

There are numerous diseases caused by air pollution. Pollution-related diseases range from mild to severe, which can significantly affect a person and quality of life. Air pollution is a significant risk factor for the number of health conditions including respiratory allergies, cardiovascular diseases and lung cancer.

The health risks associated with the polluted environments especially among children have the relative respiratory and other risks.

- **Vector borne Diseases**

Vectors are living organisms that can transmit infectious diseases between human being or from animals to human being. Mosquitoes are the best known disease vector. Others include ticks, flies, sand flies, fleas, triatomine bugs and some freshwater aquatic snails. Vector-borne related diseases such as Malaria, Dengue, Japanese encephalitis and chikungunya are some infectious diseases which are more sensitive to climate change in urban areas.

- **Increasing allergies**

Climate change affects air quality through several pathways, including production and allergen city of allergens and increase regional concentrations of Ozone, fine particles and dust. Some of these pollutants can directly cause respiratory disease or exacerbate existing conditions in susceptible populations, such as children and the elderly.

- **Extreme Heat related Diseases**

Heat related illness and deaths are increaseing in response to climate change but aggressive public health interventions such as heat wave response plans and health alert warning systems can minimize morbidity and mortality.

- **Severe Weather related Diseases**

By causing or contributing to extreme weather events, climate change may result in geographic displacement of populations, damage to property, loss of loved ones and chronic stress, all of which can negatively affect mental health.

- **Water borne diseases**

Water-borne diseases are any illness caused by drinking water contaminated by human or animal faces, which contain pathogenic micro organisms. Over the past decades, the picture of water-related human health issues has become increasingly comprehensive, with the emergence of new water-related infection diseases (cholera, typhoid, diarrhea, dengue etc.,) and the re-emergence of one's already known.

Suggestions

- Cities should have adequate mechanism for the timely removal of wastes and treatment of waste water. Recent ban on thin plastic carry bags have some positive effect on this. Households should minimise the usage of detergents and also of fertilizers and pesticides in gardens. Use of bio-fertilizers and biological pest control are to be encouraged. Household waste may be segregated from industrial waste so that less

toxic water can be treated and then used to non-drinking purposes.

- Polluting industries should be strictly penalized. Innovative and cost-effective methods are to be employed in urban water purification, storm water harvesting and storm water treatment.
- Water treatment is expensive for the local governments, but collecting money from the poor for this is unfair. Small treatment plants may be made mandatory for classy residential areas and big industries, or the expense for treatment to be met by additional tax from the high income group that consume most of the water.
- An appropriate tariff is to be fixed, charging heavily for over use, while providing water free to the extreme poor.
- Groundwater provides considerable share of water supply in many cities, it is important to ensure its recharge. Deep bore wells are to be banned immediately.
- Paddy fields and wetlands are natural water purifiers and flood controllers and they have to be protected from further encroachment.
- In coastal cities, they invite salinity intrusion. In rich rainfall zones, rainwater harvesting should be made mandatory for all buildings.
- Disputes over resources allocation can be solved only by consensus, equity sharing and impartial political decisions. Administration is to be made stricter and corruption free and different departments should be more cooperative in implementing projects and avoiding delays. Better institutional capacity and good governance could improve the urban life.
- Planners should be able to foresee the changes in land-use, population and climate in coming decades. Water development schemes for the city should be separated from the remaining area. In urban planning, separate guidelines should be there for the wet and dry cities. What works for Mumbai need not be ideal for Chennai. Private sector participation becomes necessary for the success of development projects.
- With the current rate of urbanization and urban migration, governments have to struggle hard to provide basic necessities, especially water. There should be a strict control in urban migration and the spreading of slums. This can be done by provide facilities in satellite cities and shifting industries to out of the city limits wherever possible. For rehabilitation in slums, it is better to provide free

accommodation rather than giving permanent ownership, to avoid the renting and selling of houses.

- Requirements of the thousands of people coming to the city for work during day time are to be counted. India urgently needs a comprehensive and appropriate urban policy with maintaining urban water quality and ensuring satisfactory supplies of water as important objectives. In climate change adaptation strategies, special care is to be given for the urban sector.

Conclusion

The consequences of climate change are thus wide enough to alter spatial and temporal distribution of vector borne diseases, heat related mortality, air pollution related diseases, respiratory diseases and water borne diseases. It has become critical to determine the scope and focus of both basic and applied research on climate change and the associated health impact at local, regional, national and global levels. Integration of environment, public health and meteorological observations are needed to protect the real time public health issues. A joint effort of the Governments, civil society and the private sector and an impartial political interest with a national vision only can save the urban centers of India from the challenges associated with climate change and population impact.

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