

Climate Change And Its Impact On Maharashtra

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ABSTRACT

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Maharashtra is the third largest and the second most populous state in the country. It accounts for 9.4% of the total geographical area and occupies a substantial portion of the Deccan Plateau in the western peninsular of the subcontinent. The Western Ghats, which run parallel to the coast at an average elevation of 1200 metres form one of the three watersheds of the country, from which originate several important rivers, the most notable being Godavari and Krishna. To the north of the state, the rivers Tapi and Narmada flow westwards into the Arabian Sea. Administratively, the state is divided into 35 districts, Based on socio-political and other geographical considerations, the state is divided into five main regions: Vidarbha (north-eastern region), Marathwada, Khandesh, Northern Maharashtra (Desh) and Western Maharashtra (Konkan). Covering the entire Western Ghats, the Konkan region is known to receive the maximum rainfall in the state.

The Article Is Published On August
2014 Issue & Available At
www.scienceparks.in

Keywords:

Climate Change , total geographical area and occupies .

DOI:[10.9780/23218045/1202013/49](https://doi.org/10.9780/23218045/1202013/49)

Introduction

The capital city of Maharashtra, Mumbai is the commercial capital of the country. It is one of the most industrialized states of the country contributing about 13% of national industrial output. Although, the state is highly industrialized, agriculture continues to be the main occupation employing over 64.14% of the people. High dependency on climate sensitive sectors like agriculture, and a long coastline of over 840km make the state vulnerable to the impacts of climate change including changes in temperature, precipitation pattern, increase in the frequency and intensity of extreme events including droughts, floods, cyclones, storm surges, heat wave occurrence etc. Each of these predicted changes has adverse implications for Maharashtra's agriculture, water resources, forestry and disaster management strategies.



Study Area

The area selected for the present study is situated between 20°00'N latitude and 76°00' longitude. Maharashtra is the second largest state in India both in terms of population and geographical area spread over 3.08 lakh sq. km. The State has a population of around 10 crore (2001 Census) which is 9.4 per cent of the total population of India. The State is highly urbanized with 42 per cent people residing in urban areas whereas at national level it was around 28 per cent.

Data base and methodology

The study is based on the secondary information supplemented with primary data collected through field survey. Obtained data have been analyzed based on both qualitative and quantitative method.

Objective

The study will seek to assess changes in the climate at regional scales, carry out impact assessments for various sectors including agriculture, water and health, develop vulnerability indices and suggest adaptation strategies. Six case studies have also been proposed to develop district level action plans. The potential for replication of these plans at larger representative scales will be investigated. Through the medium of this research paper we are going to show that Climate change effects have been linked to the collapse of various civilizations. Though change in earth's climate is a natural process, it has been accelerated since last few decades.

Climate Change Impacts in the context of Maharashtra State

Maharashtra experiences extreme climatic conditions and the impacts of climate change will further exacerbate its current vulnerability. Maharashtra has its economy inextricably tied to climate-sensitive sectors, primarily agriculture, which is the backbone of the economy. Altered rainfall and precipitation patterns could affect hydrological systems and agricultural production and productivity. This is likely to endanger livelihoods of communities dependent on it and food security of the state. Interlinkages between different sectors would have a ripple effect on the entire economy. The impacts will be most felt on the vulnerable and poor sections of the society. The state of Maharashtra therefore underlying Climate change vulnerabilities associated with the prevalence of drought in the central belt and sea level rise, wide variations in development within the state. Climate change impacts in the state are summarized as

Impacts on Human Health

- It has been observed that currently 2% of the total reported malarial cases in India are from Maharashtra. Considering a 3.8°C increase in temperature and a 7% increase in relative humidity by the 2050s the changing climatic conditions could increase the frequency and intensity of the disease.
- Malnutrition, under nourishment; injuries and deaths caused by extreme hydro-geological events; and thermal stresses cause due to an increase in the frequency and intensity of heat and cold waves.
- Impacts on Agriculture
- The state of Maharashtra faces many pressures that directly impact the agriculture sector like; high population growth rate, increased use of fertilizers due to increased production demand, increased pressure on canals, wells and tube wells for irrigation etc. Skewed distribution of rainfall in the state, pose drought as a recurrent phenomenon in certain regions. More than 30% of the state falls under the rainshadow area where scanty and erratic rains occur and about 84% of the total area under agriculture in the state is directly dependent on the monsoon rainfall. While annual rainfall in the coast is found to vary between 1600-4800 mm, in the interiors/ central belt, it is less than 600 mm. This comprises the drought-prone regions of the state.
- Of the 100 talukas in the state, 45 have been identified as being drought prone, according to the Central Water Commission statistics (CWC, 2005). Due to regular drought frequency, low levels of irrigation coverage, literacy, and infrastructure development and poor coping & adaptive Capacity, this region is highly vulnerable; to impacts of climate change. Uneven distribution of rainfall in the state & high rainfall variability has contributed to huge economic losses in the state.
- The frequency of droughts is projected to increase in future through changes in the hydrological cycle viz. precipitation, evapo-transpiration (ET), soil moisture etc. ET being the major component of hydrological cycle will affect crop water requirement, future planning & management of water resources.
- A study on sensitivity of ET to global warming for arid regions, has projected an increase of 14.8% in total ET demand with increase in temperature. It is also concluded that marginal increase in ET demand due to global warming would have a larger impact on the resource-poor, fragile arid zone ecosystem that constitutes a bulk of Maharashtra.

Impacts on Water Resources

According to preliminary assessment as part of India's first national communication to UNFCCC and a study on hydrological modeling of the river basins, it can be inferred that River Tapi is likely to experience constant water scarcities. It also adds that Narmada and Krishna are likely to experience seasonal or regular water stressed conditions and Godavari is projected to experience water shortages in few locations. While rivers Tapi and Narmada irrigate most of North Maharashtra, Krishna and Godavari irrigate most of the central and eastern Maharashtra.

Impacts on Coastal Zones

- Maharashtra, with a long coastline of 720km furthermore faces a grave risk from sea level rise, which could flood land and cause damage to coastal infrastructure and other property.
- With a one-meter sea level rise, over 13 lakh people are at risk in the state. Mumbai in particular is highly vulnerable to sea level rise.
- One estimate put the cost of climate change related damages for Mumbai, India's largest city at 2,28,700 crore rupees if no adaptation actions are taken to reduce vulnerability.
- Sea level rise, salinity intrusion and, changes in sea surface temperature and pH have significant impacts on the coastal ecosystems like the corals along the Malwan coast of Maharashtra. Impacts on Species & Natural Areas
- Increased susceptibility of species/varieties adapted to cooler climates.
- Increase in frequency of rainfall & increased evaporation rate due to high temperature will adversely affect grasses, plant species & natural habitats.
- There will be high risk for hybrid varieties of domestic animals. Scarcity of fodder & green manure will cause threat to these animals.
- Due to climatic change many species of flora & fauna will go towards extinction which will cause loss of biodiversity. New weeds & diseases will be introduced.
- Uncontrolled grazing & forest fire will destroy important plant species & other nutritious grass species. Non-nutritious grass varieties will become dominant.
- Due to depletion of soil organic matter, microbiota and micronutrients, there will be degradation of soil quality in forest & grasslands. Excessive use of chemicals and loss of crop and livestock will cause decline in genetic diversity.

Climate change: Irresistible change

Universally 'change' is the only 'constant' thing. Life on earth evolved from 'amoeba' to 'human being' only due to 'change'. Change has been integral part of all facets of life. From the 'Big bang' to till date only persistent thing about universal climate is 'change'. Archaeological evidence, oral history and historical documents can offer insights into past changes in the climate. Climate change effects have been linked to the collapse of various civilizations. Though change in earth's climate is a natural process, it has been accelerated since last few decades.

Earth's Atmosphere:

The Earth is the only planet in our solar system that supports life. The atmosphere carries out the critical function of maintaining life-sustaining conditions on Earth. Energy from the sun (largely in the visible part of the spectrum, but also some in the ultraviolet and infra red portions) is absorbed by the land, seas, mountains, etc. If all this energy were to be absorbed completely, the earth would gradually become hotter and hotter. But actually, the earth both absorbs and simultaneously releases it in the form of infra red waves. All this rising heat is not lost to space, but is partly absorbed by some gases present in very small (or trace) quantities in the atmosphere these gases re-emit some of this heat to the earth's surface. If they did not perform this useful function, most of the heat energy would escape, leaving the earth cold and unfit to support life. These heat-trapping gases are known as Greenhouse gases (GHGs) and these include - Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Chlorofluorocarbons (CFCs), Sulphur hexafluoride (SF₆), Trifluoro-methyl sulphur pentafluoride (SF₅CF₃).

Greenhouse Effect

The radiation absorbed by green gases is partly reemitted to the earth's surface. The net result is that the earth's surface gets heated. This mechanism is somewhat analogous to the way that glass keeps the air inside a greenhouse warm and thus is known as the Greenhouse effect.

Due to this the Earth's climate system constantly adjusts so as to maintain a balance between the energy that reaches it from the sun and the energy that goes from Earth back to space. This means that even a small rise in temperature could mean accompanying changes in cloud cover and wind patterns. Some of these changes may enhance the warming (positive feedback), while others may counteract it (negative feedback).

Conclusion

Since last few decades it has been seen that the climate change in Maharashtra proved to be awesome issue. It has left its impact on water resources, agriculture, human health, forest, coastal zones and species and natural areas. After having analyzed it thoroughly we come to the following conclusion-

- A sea level rise of one metre will inundate 0.18% of Maharashtra putting 1.3 million people at risk.
- Sugarcane yield in Maharashtra could go down by 30% under climate change.
- The cost of climate change related damages for Mumbai could be around Rs 2287 billion.

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