

IMPACT OF CLIMATE CHANGE ON THE COASTAL ECOSYSTEM: A CASE STUDY OF KERALA

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Abstract

Coastal ecosystems give a wide scope of capacities and qualities. Expanding proof in the course of recent many years demonstrate that critical changes in climate are occurring worldwide and its belongings are dreamlike. The Kerala coast is, basically, going through uncommon changes and has been confronting intense biological emergency regarding the previous fifty years. Both regular and man-made causes are behind this emergency. Temperature ascend because of the emanation of greenhouse gases has truth be told begun influencing the Arabian Sea and its ecosystem on an enormous scale. Temperatures are relied upon to rise, especially in the south and east of the Kerala. Climate change may bring about incredible danger to food security of human being and the deficiency of natural surroundings because of sea level ascent, especially in the coastal region. Without a doubt, climate change will unfavorably influence the employment opportunities of people of this coastal zone. The rise in sea level builds the quantity of people in danger of coastal flooding. Fundamental confirmations for climate change in coastal and marine habitats of Kerala incorporate sea level change, increased introduction to natural cataclysms, increment in sea temperature, sea acidification and impacts on fisheries and biodiversity. There is likewise a requirement for flood mapping, flood forecasting, advancement of hydrological framework and downscaled climate change projection displaying combined with strengthening coastal protection strategies with the participation of nearby networks.

Keywords: Impact, Climate, Coastal, Ecosystem, Kerala, etc.

1. INTRODUCTION

Coastal ecosystems give a wide scope of capacities and qualities. These incorporate the backhanded use esteems like guideline and supporting administrations, for example, shoreline stabilization, flood control, detoxification of polluted waters, and waste removal. The immediate use esteems estimated through a creation work are essential as it catches the utility got straightforwardly from the use of many living and nonliving assets.

Expanding proof in the course of recent many years demonstrate that critical changes in climate are occurring worldwide and its belongings are dreamlike. Significant cause to climate change has been credited to the increased levels of greenhouse gases like carbon dioxide (CO₂), methane (CH₄), nitrous oxides (N₂O), chlorofluorocarbons (CFCs) past their characteristic levels because of uncontrolled human exercises, for example, consuming of fossil fuels, increased use of Refrigerants and improved agricultural exercises Global normal sea level has increased since 1961 at a normal rate of 1.8 (1.3 to 2.3) mm/yr and since 1993 at 3.1 (2.4 to 3.8) mm/yr, with commitments from thermal extension, dissolving icy masses and ice covers, and polar ice sheets. The climatic changes are bringing about

inconsistent weather examples and the impacts are now being showed in numerous pieces of the world and coastal agricultural frameworks are approaching emergency point. The IPCC has extended that during the 21st century the global surface temperature is probably going to rise a further by 1.1 to 2.9°C according to their most minimal assessment model and by 2.4 to 6.4°C according to their higher assessment model.

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Temperature ascend because of the emanation of greenhouse gases has truth be told begun influencing the Arabian Sea and its ecosystem on an enormous scale. The arising current way of life and the manner by which we manage nature likewise have in fact irritated the current emergency. Uncontrolled hunger for industrialism has become the way of life and way of life of most of Malayalees.

Untidy expansion of transport, criminal degradation of forests, hills, rivers and other water bodies to advance infrastructure, air and water pollution as a result of informal industrialization, the by-product of fossil fuels by domestic exercise, and so on, are causing rising temperatures and unresolved climatic changes. In Kerala, a State with a long coastline, the consequences of climate change will be horrendous. If the sea level increases, salt water enters the coastal lowlands and, consequently, the sources of vegetable agriculture, underwater and drinking water become defiled and useless. "It is assessed that there can be an ascent in sea level from 8.8 cm to 87.8 cm during the period from 2000 to 2100. This will bring about pollution of coastal underground water with salt water, disintegration of marshland and discontinuous flooding making important coastal land useless."

1.1 Causes of coastal climate change

The all out ascent in sea-level around the Kerala coast may surpass one meter by 2100. The recurrence of exceptional tempest occasions is required to increment and lead to more coastal flooding. Temperatures are relied upon to rise, especially in the south and east of the Kerala. Winter precipitation is probably going to increment uniquely on the northern and western Kerala coastline. Coastal disintegration is additionally expected to increment, mostly because of sea-level ascent. Low-lying and soft dregs coasts in the east of England will be generally powerless as they are most effectively dissolved. The most-uncovered areas and estuaries might be especially defenseless. Climate and coastal-change impacts will be felt along the entire of the Kerala coast. Thirty million individuals live in urban coastal territories in the Kerala, and these dangers will be felt especially acutely in networks that depend on the coastal territory for their economic and social prosperity going up against existing difficulties that influence man-made framework and coastal ecosystems, for example, shoreline disintegration, coastal flooding, and water contamination, is a worry in numerous zones.

Global warming is the main cause of climate change. Global warming is the increase in normal earth's temperature; the earth's atmosphere depends on the equilibrium between leaving the worlds. As the energy enters from the sun, the Earth's framework absorbs it heats up. The earth abandons warming at

that point, when energy from the sun is again reflected in space. The Planet is cooling at the moment when energy is again delivered into space. Earth's energy balance components cause changes are:

- Changes in the greenhouse impact, which influences the measure of warmth held by Earth's climate.
- Varieties in the sun's energy arriving at Earth.
- Changes in the reflectivity of Earth's air and surface.

2. IMPACT OF CLIMATE CHANGE

Climate change may bring about incredible danger to food security (because of diminishing harvest, fish and meat yields) of human being and the deficiency of natural surroundings because of sea level ascent, especially in the coastal region. In coastal regions agriculture and hydroponics exist together as significant livelihood of provincial networks. The impacts of climate change on coastal ecosystem are quickly given underneath;

- **Agriculture:** There might be extensive impact on organisms, microbes and bugs, which may bring about more invasions of harvests by disease and vermin and disintegration of soil quality. Expansion in temperature and soil-water saltiness and diminishing in new water accessibility would diminish crop yield definitely. The impact is required to be exceptionally serious in significant waterway flood fields of the world including Indo-Gangetic plain.
- **Water resource:** The ground water quality will deteriorate by saline water interruption. There might be changes in the water cycle and new water accessibility might be more alarm in coastal zones. Global normal sea level has increased since 1961 at a normal rate of 1.8 (1.3 to 2.3) mm/yr and since 1993 at 3.1 (2.4 to 3.8) mm/yr, with commitments from thermal extension, liquefying icy masses and ice covers, and polar ice sheets.
- **Natural ecosystems:** Mangroves, coral reefs, sea grass, marine life, and so on are helpless because of successive changes in precipitation design, sea level ascent and hotter sea temperature. Coastal wetlands including salt bogs and mangroves are probably going to be gravely influenced via sea-level ascent particularly where they are famished of silt.
- **Fisheries and hydroponics:** Increasing Sea and stream water temperatures are probably going to influence fish rearing, their migration and creation migration of various marine and inland species to great climate region.
- **Livelihood of people:** Sea level ascent will make numerous coastal families destitute. Climate change may expand high tides levels, storms, floods, seismic sea waves (tsunami), erosion and more climatic dangers like, tornado, and so forth for which coastal zones will be presented to expanding hazards. This will undermine essential framework, settlements and offices that help the livelihood of coastal networks including the island networks. Another gathering of displaced people will arise called the environmental evacuees. In India, Vishakhapatnam Sea shores are seriously dissolving.

3. DECLINING EMPLOYMENT OPPORTUNITIES

The Kerala bank is sparsely populated with a length of 590 km. The prospects for jobs of the people in this coastal region would without a doubt be adversely affected by climate change. Although only 10% of the entire coastal region of the Indians is located along the Kerala coast, 25% of the Indian fishery network's absolute population occupies this area. Fisheries are therefore proportionate to population thickness. Climate change would have different impacts on job prospects in the fisheries sector. Sea level rise and surprising sea breaches irritate the coastal erosion, which completely dissolves protected areas to store fishing equipment. In recent years, the vast majority of the focuses on the fish landing of previous days have disappeared. Another indication of the present situation is Veli, a town of Thiruvananthapuram. A few years ago, about sixty houses representing over 30 years were totally destroyed in three days in a wild maritime violation that occurred here.

Accessibility inconsistency and the types of fish species have also led to the reduction of opportunities for employment in this region. From the reasoning of fishermen, fish such as pelagic sardines and mackerels, bountiful in the Kerala coast; have started moving to other regions or lower seas because of the variety of sea temperature in the fish. This vulnerability in fish accessibility causes both job problems and market problems.

The transit of new and conventional species is a vital new marvel and thus fishermen figure out how to adapt to the current situation. The researchers warn of the increasing temperature of the sea as unpredicted climate variations occur, and that the weakness in fish accessibility will rapidly increase. Pelagic fish such as sardines and mackerels have been seriously affected by the production and circulation of these, which have a high degree of market value. Verifiably, the Malabar Sea area in the south-western part of India in 80 to 160o latitudinal territory has found sardines and other comparative fish species. In any event, since 1989, the appropriation of these fish has undeniably changed. The South Eastern seas of Oil Sardine became important and the Mackerel migrated into the North West. Sporadic rises and declines are also evident because of other tropical pelagic organisms. This is confirmed by meetings of the fishing society on the Malabar coast.

4. MITIGATIONS STRATEGIES TO CLIMATE CHANGE

Evaluate biophysical and financial implications of mitigation of climate change prior to creating strategy for their implementation. The IPCC characterizes mitigation as exercises that decrease greenhouse gas (GHGs) emissions, or upgrade the limit of carbon sinks to assimilate GHGs from the environment. Climate change mitigation additionally incorporates acts to upgrade natural sinks, for example, reforestation, and increased carbon sequestration in soil through fitting management of agriculture; and so on most nations are presently members to the United Nations Framework Convention on Climate Change (UNFCCC), whose extreme goal is to forestall hazardous anthropogenic climate change exercises. The member nations of the (UNFCCC 2011) have concurred that pressing actions are to be taken to lessen the emission of GHGs and that future global warming should be restricted to beneath 2.0°C comparative with the pre-mechanical level. Many accept that an ascent of 2.0°C is the edge beyond which impacts are probably going to be serious, and perilous to environmental systems. Agriculture, forestry and land use practices may have a significant task to carry out in mitigation measures. As per IPCC, forestry represented 17% of greenhouse gas emissions

in 2004. Yet, on the off chance that deforestation can be stopped, reforestation started and existing forests are overseen all the more reasonably by networks, forests could turn out to be important for the solution rather than a contributor to the issue. Agriculture contributes about 14% of GHGs emission. However, on the off chance that soils can be better overseen it can store more carbon. Agro-forestry is likewise an underutilized mitigation option in agriculture; it can store more carbon in trees and in soil, while improving the soil quality. A significant number of the options that relate agriculture and natural resources management will have quick improvement benefits towards, the profitability of the natural resource or system.

4.1 Adaptations strategies to climate change

Indian farmers have huge experience of adapting to unfavorable climate and countless indigenous practices have been advanced over the long run. The nearby information is considerably more significant in adaptation, while mitigation require a national exertion, new technologies and a few arrangement activities. The diverse adaptation strategies might be embraced for coastal zones are summed up as follows.

- **Crop And Cropping System Based Strategies:** These are predominantly fixated on advancing the cultivation of crops and assortments that fit into the changed crop schedules and seasons, improvement of assortments with changed duration that can overwinter the transient impacts of change, assortments for high temperature and warmth stress tolerance, salinity, dry spell and sub-mergence tolerance and assortments which respond emphatically to high CO₂. Farmers will jump at the chance to have their crops/assortments performing admirably in troublesome environments, yet additionally to create high yields when conditions are more ideal. Changing demonstrating season of crops concurring the changing example of rainfall, soil-water salinity, humidity, temperature and other climatic factors may diminish the misfortunes to crop production.
- **Integrated pest and disease management (IPDM):** Changing climate will change the example and force of assault of pests and diseases to crops and livestock. Temperature, humidity, rainfall and other weather boundaries impact the spread of pests and diseases. Higher temperatures accelerate the lifecycle of certain pests and diseases, and their vectors accordingly; infestation by pests and diseases may rise. Anticipation of pest and disease flare-ups, and integrated pest and disease management (IPDM) is an earnest need considering climate change.
- **Resource conservation based technologies:** The significant resource conservation based technologies in battling climate change are; in situ dampness conservation, rainwater reaping and reusing, productive use of irrigation water, conservation agriculture, energy proficiency in agriculture, and use of low quality water. Bad quality water/saline water can be overseen and used in conjunction blending in with great quality water and more tolerant crops/assortments are to be created. Agriculture in non-industrial nations generally uses the traditional technologies for irrigation. Agriculture consumes around 70-90% of total use of water. Elective improved technologies should be used to deliver more food with less water to take care of the developing population. Watershed approach has numerous components which help both in adaptation and mitigation. The little ranch reservoirs (ranch pond, wrinkles, channels, and so forth) innovation

created by Central Agricultural Research Institute, Port Blair, India for reaping rainwater in homestead and its various uses went to be fruitful for coastal regions of India. Wastewater is wealthy in a few plant supplements however it might contain heap of destructive microorganisms and hefty metals. Research at Central Soil Salinity Research Institute, Kamal has demonstrated that waste water can be used effectively for irrigation of agro-forestry, non-eatable crops and in any event, for grain crops like wheat.

5. CLIMATE CHANGE ON THE COASTAL ECOSYSTEM OF KERALA

Coastal habitats on the earth are normally lucrative and strongly undermined. This is where people live and the transmission of biodiversity administrations from aquatic ecosystems has an impact on the spate of human movements. The rapid growth of population size and economic development close to coastal regions raises their vulnerability altogether. These regions are also daunting and predict potential SLR risks. Nonetheless, the true floods are based on SLR, but also on individuals, basic financial conditions and security assumptions in general. Kerala has no many islands in its jurisdiction over 8000 km of long coastline.

About 60 regions in 9 coastal states are protected by the coastline. In certain respects, the two coasts (east and west) are varied. Roughly 33% of the population of Kerala lives in coastal regions and the population size is increasing at an alarming rate. Cyclones, hurricanes and environmental destruction can visit thickly populated and low-population coastal lands.

5.1 Flood, cyclones and other events

Climate impacts may also be identified with the biodiversity deficiency in coastal areas. Kerala's weakness maps show that a total of 283 cyclones (among those 106 extremely cyclones) occurred in a 50-km wide stretch on the east coast between 1877 and 2005. However, relatively minor cyclones happened in the area between 1891 and 2005, 5 percent of the land in Kerala was helpless from cyclones, and 1 million houses were helpless from the floods (total 35 cyclones). The loss of life was more prominent than 10 000 in 19 severe cyclone storms. The 1999 super cyclone has led to devastation of over 30,000 people in coastal Odisha.

Also, in July 2005 the City of Mumbai experienced unusual rainfalls of 944 millimeters, with more than five hundred lives, typically in ghetto settlements, in the 24 hour period and resulting in the most extreme floods in current history. As vulnerability moves from one area to another, an enormous part of the nation faces such natural risks that sometimes become catastrophes that cause the socioeconomic life of networks to become vital destructive. Storm floods are also a big cause of coastal flooding on Kerala's east side. The longer sea level rise due to warming of the greenhouse will affect the storm flux and thus the east coastal floods. Mangrove areas on Kerala's coast, including the Islands of Andaman and Nicobar, block Cyclones, keep away from coastal erosion and fill fish, prawns and crabs, as a refuge for various sea-beds.

6. CONCLUSION

Coastal habitats are in danger from both direct (temperature, rainfall), and roundabout (sea-level rise, coastal erosion) impacts because of an evolving climate. India, with a broad coastal line of 7,500 km

and an Exclusive Economic Zone of 2.02 million sq km harbors rich variety of coastal and marine biodiversity. The amphibian resources bio-assorted coastal and marine habitats give critical contributions to food and nutritional security and economic and social advancement of the nation. Fundamental confirmations for climate change in coastal and marine habitats of Kerala incorporate sea level change, increased introduction to natural cataclysms, increment in sea temperature, sea acidification and impacts on fisheries and biodiversity. There is likewise a requirement for flood mapping, flood forecasting, advancement of hydrological framework and downscaled climate change projection displaying combined with strengthening coastal protection strategies with the participation of nearby networks. As indicated by the IPCC projections, global normal sea level is relied upon to rise, through the twenty-first century, somewhere in the range of 0.18 and 0.86 cm. Such a rise in sea level will altogether impact coastal regions, particularly of lowland, zones with exceptionally low elevation which have a coastal private improvement with an assortment of economic exercises.

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