



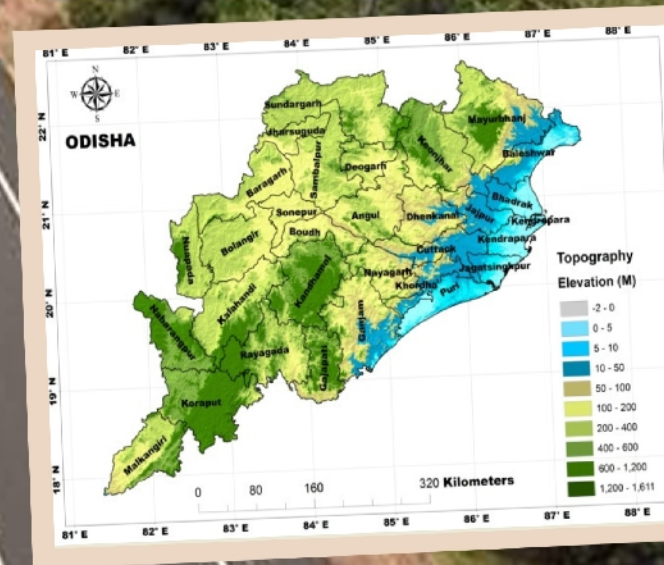
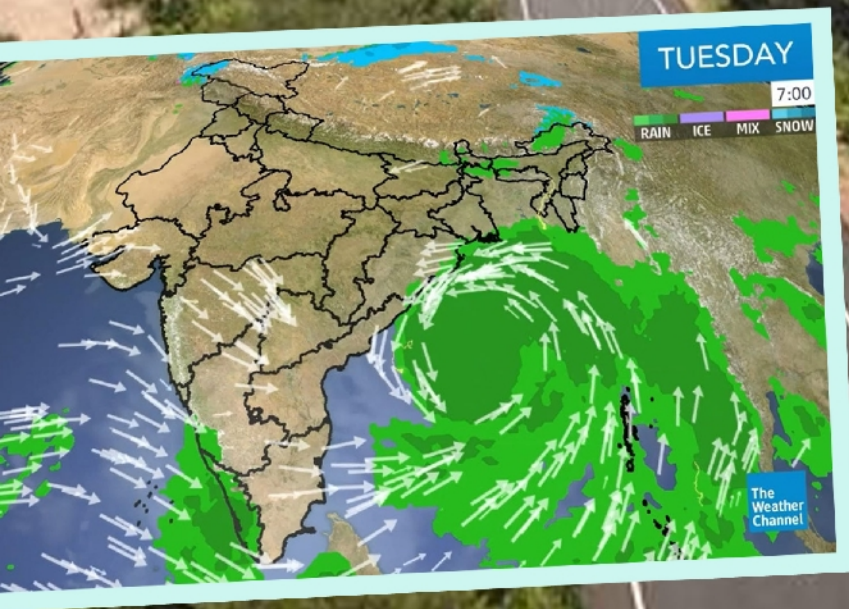
ENVIS-IITM NEWSLETTER

Indian Institute of Tropical Meteorology, Pune

Atmospheric Pollution & Climate Change

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ODISHA & CLIMATE CHANGE



EDITORIAL TEAM

Dr. B. S. Murthy (ENVIS Coordinator)
Samir Dhapare (Program Officer)
Gaurav Shinde (Information Officer)
Bhagyashri Katre (I.T. Officer)
Darshana Jadhav (Data Entry Operator)

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Editorial

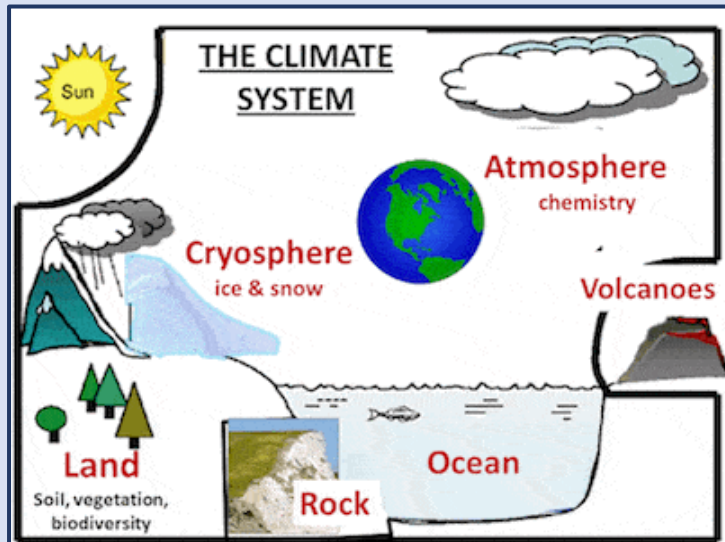
Climate change refers to the change in the environmental conditions of the earth. This happens due to many internal and external factors. The climatic change has become a global concern over the last few decades.

Besides, these climatic changes affect life on the earth in various ways. These climatic changes are having various impacts on the ecosystem and ecology. Due to these changes, a number of species of plants and animals have gone extinct. There is no doubt that climate change and climate-induced disasters pose a significant challenge to poverty reduction, health and development in many developing countries, including India.

Odisha's geographic location on the east coast of India and its climatic condition have meant that the state has historically been highly prone to climate change and multiple hazards, mainly cyclones, droughts and floods. Its fluctuating weather conditions suggest that Odisha is stumbling under climatic chaos.

Odisha and Climate Change

Climate change refers to significant, long-term changes in the global climate. The global climate is the connected system of sun, earth and oceans, wind, rain and snow, forests, deserts and savannas, and everything



people do, too. Climate change includes both global warming driven by human-induced emissions of greenhouse gases and the resulting large-scale shifts in weather patterns. Though there have been previous periods of climatic change, since the mid-20th century humans have had an unprecedented impact on Earth's climate system and caused change on a global

scale.

Global warming is the slow increase in the average temperature of the earth's atmosphere because an increased amount of the energy (heat) striking the earth from the sun is being trapped in the atmosphere and not radiated out into space.

The earth's atmosphere has always acted like a greenhouse to capture the sun's heat, ensuring that the earth has enjoyed temperatures that permitted the emergence of life forms as we know them, including humans.

Without our atmospheric greenhouse the earth would be very cold. Global warming, however, is the equivalent of a greenhouse with high efficiency reflective glass installed the wrong way around.

Factors responsible for global warming and climate change-

Life, as we know today, exists because certain gases like carbon dioxide, methane and nitrous oxide help in maintaining the Earth's temperature at a desired level. These 'greenhouse gases' (GHGs) act like a blanket. They prevent much of the absorbed solar heat from escaping into the atmosphere. This natural phenomenon keeps the Earth warm enough to sustain life.

Problems arise when the concentration of GHGs in the atmosphere starts increasing due to human activities. Burning fossil fuels like coal and oil to

derive energy, deforestation and biomass burning are some such activities. As the world became heavily dependent on carbon-based fossil fuels, the Earth's temperature has increased consistently leading to global warming and climate change.

Industrialised countries with their energy-intensive lifestyle are historically responsible for the problem of global warming. Each person in such countries emits much more than a person in developing countries. For instance, in 1996, one US citizen's emissions were equal to those of 19 Indians. International negotiations aimed at arresting global warming have failed to address the issue of inequality in per capita emissions. The atmosphere is a common property resource to which every human being has an equal right and it is now the turn of developing countries to demand appropriate 'environmental space' for their future economic growth. Moreover, the maximum impact of global warming will be borne by developing countries like India, which have hardly contributed to the problem.

✚ Odisha – Geographical location and Climate –



Odisha borders with 4 states – Jharkhand in north, West Bengal in northeast, Andhra in South West, Chhattisgarh in west.

Odisha, formerly called Orissa, state of India. Located in the north eastern part of the country. The state can be divided broadly into four natural divisions: the northern plateau, the Eastern Ghats, the central tract, and the coastal plains.

The present capitol was subsequently built at Bhubaneshwar, in the vicinity of the city's historic temples in the east-central coastal plains. In late 2011 the state's name was officially changed from Orissa to Odisha. Area 60,119 square miles (155,707 square km). Pop. (2011) 41,947,358.

Odisha is drained by three main rivers – Mahanadi, Brahmani and Baitarni and Subarnarekha and Budhabalanga are the important seasonal rivers.

Chilka lake is the biggest and most famous Brackish water (partial saline) lagoon. This is India's biggest and World's second biggest coastal lagoonis about 64 Km long and about 20 Km wide. There are two beautiful islands in the lake – Parikud and Malud.

Mayurbhanj is the largest district of Odisha by area. Ganjam district is largest by population.

The state has tropical climate, characterized by high temperature, high humidity, medium to high rainfall and short and mild winters. As per Koppen's climatic classifications most part of Odisha comes under the AW having a tropical Savannah type of climate.

The south-west monsoon normally sets in between 5th June and 10th June in the coastal plain, and by 1st July the whole of the state is under the full sway of the south-west monsoons. By 15th October, the south-west monsoon withdraws completely from Odisha.

These are the normal dates which fluctuate from year to year. As per "Thorntwaite's classification", Odisha comes under the "Sub humid" category, implying deficient winter rains.

On the basis of climate type, Orissa has been divided into ten agro-climatic zone. The normal rainfall of

the state is 1451.2 mm. About 75% to 80% of rainfall is received from June to September. Floods, droughts and cyclones occur almost every year varying intensity.

+ Reason behind Odisha been affected the most -

It is placed at the head of the Bay of Bengal where weather is formed. So even a slight change in the sea's behaviour can have an immediate impact on the coast. The Bay becomes the centre of low pressures causing heavy rains and cyclones in the sub-continent and especially in Odisha.

These cyclones and depression involve circulation over thousands of kilometres and form links between Odisha's atmosphere and the entire planetary circulation system. Going by the key parameters of climate like temperature and rainfall, the climate may worsen in Odisha. The full impact of climate change does not show up immediately. It triggers changes slowly but certainly.

✚ Impacts of climate change on a coastal state like Odisha-

The state has been declared disaster-affected for 95 years of the last 105 years: floods have occurred for 50 years, droughts for 32 years and cyclones have struck the state for 11 years.

Rising Sea Level –

Apart from more frequent extreme weather events like floods and droughts, large-scale impact of climate change will include an increase in sea level



causing economic loss and disruption of life.

With sea level rise, many coastal systems will experience increased levels of inundation and storm flooding, accelerated coastal erosion, seawater intrusion into fresh groundwater and encroachment of tidal waters into river systems. Big cities situated on coasts, flood plains and river deltas, supporting a large number of people and industries can expect increased flood damage causing loss of structures and property. Disappearing shorelines also mean some loss of social amenities. Coastal

The economic impact of a one metre sea-level rise on a coastal district like Balesore could be Rs 360 crore.

erosion will increase substantially, endangering natural protective features such as mangroves and barrier islands, and exacerbating flood risk.

Consequently, many coastal communities dependent on these and fisheries will suffer. Deltas and low lying coastal areas will be inundated by sea level rise. Increased rainfall during the monsoons will increase the frequency of floods. Areas already prone to floods will suffer more. Both religious and resort-based coastal tourism will suffer. It is important to note that all this implies displacement of large numbers of people leading to rapid urbanisation, straining resources and putting more pressure on civic amenities. Agriculturally fertile coastal regions with paddy fields are vulnerable to inundation and salinisation. Orissa normally produces around

five million tonnes of rice each year. The rice crop on the coast contributes about 40 per cent to the total rice grown in the state.

- **Drought –**

Drought in 2001 caused an economic loss of about Rs 643 crore due to crop damage and affected 11 million people.



Drought is the slow onset disaster. It occurs mostly due to lack of adequate rain in the dry land areas or even distribution of rainfall during a particular year. About 70 percent of the total cultivated areas in the state are prone to drought.

These areas lack not only irrigation facilities but also get scanty rainfall. However, in some areas, even through rainfall is plenty, it is erratic. The severity of drought is measured by crop cutting experiment and accordingly declaration of drought area is made.

It is observed that Odisha has experienced 11 years of drought since 1965. Out of this, the state has experienced seven years of severe drought in 1965, 1974, 1976, 1979, 1996, 2001, and 2012. Odisha has faced drought in most of the years in the latter half of the 90s. Comparing the drought situations of different districts in the State since second half of the 90s, during 1996-97, all districts (except Korapur and Malkangiri) were affected by drought. The drought was so severe that more than 50 percent villages in the state had crop loss of 50 percent.

- **Flood –**

Like drought, flood is also a major natural calamity in the state of Odisha. The unusual rainfall in different district causes flood in all the major rivers system of the state. The state has a number of major rivers, viz. Mahanadi, Brahmani, Baitarani, Rushikulya, Bansadhara, Budhabalanga, Subarnarekha and others.



These rivers flow towards the Bay of Bengal. The Coastal district has therefore, the chance of being affected more by flood due to these major river systems. The inland district is also affected by flood. Odisha has faced flood

in most of the years since 1965, but it has faced two severe floods, in 1982 and 2001.

Odisha is a land of many large and small rivers and due to erratic behaviour of the monsoon the state is off and on affected by the problems of floods and droughts.

• Cyclones Formation –

Orissa has a 480 km vulnerable coast line, which is a periodic recipient of climate risks such as cyclones and coastal erosion.

With rising temperatures, A possible increase in cyclone intensity of 10-20 per cent against a rise in sea surface temperature of 2 to 4°C is very likely to happen. Climate change has already intensified the Asian monsoon and increased river flows.

In September 16,2008 due to heavy rainfall and a tropical storm came ashore over the Mahanadi river nearly 1,850 villages goes under water, officials called the floods is the worst in 50 years, said BBC News. As of September 23, the floods had killed 29 and affected more than four million people and destroyed more than 400,000 hectares of paddy crop in Orissa

The state of Odisha sustained the most catastrophic damage associated with Cyclone BOB 06, 1999 which was considered the state's severest cyclone of the 20th century.

• Adverse Effect on Marine Biodiversity –

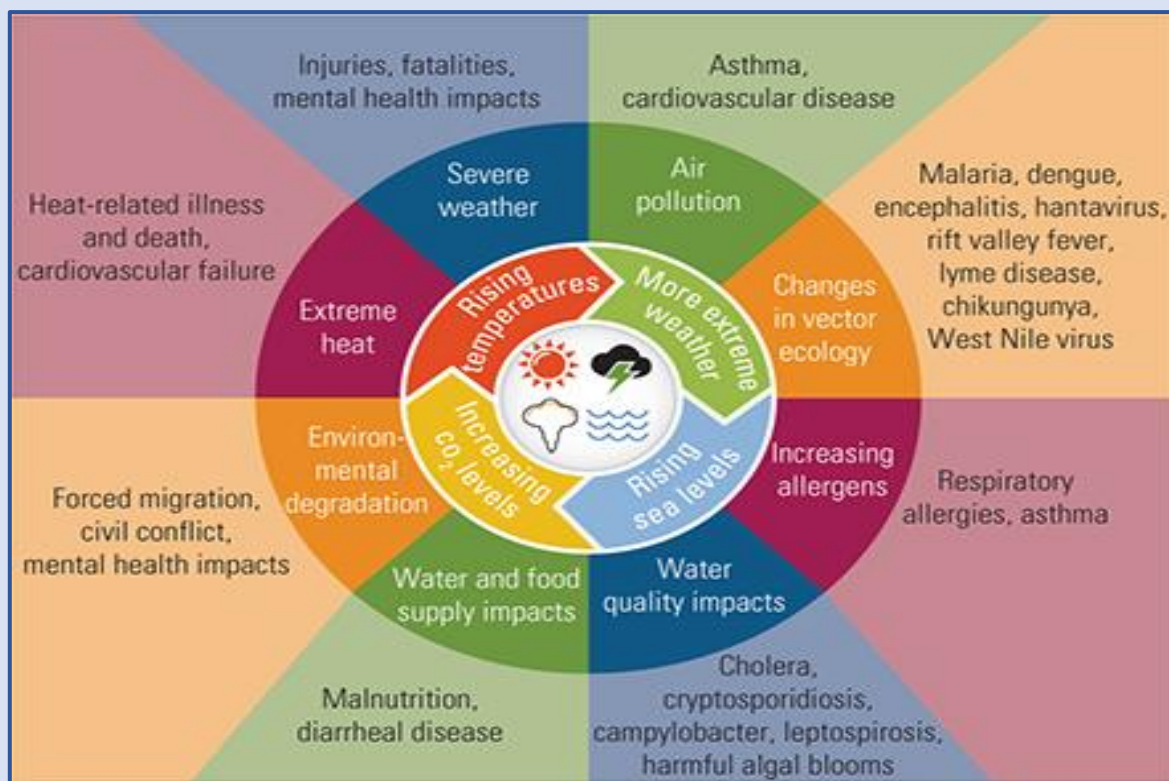
Rising sea levels due to climate change require corals to grow to stay close enough to the surface to continue photosynthesis. Also water temperature changes will induce coral-bleaching as and killing many reefs.



Warming seawater may also encourage an emerging problem: coral disease coral is much more prone to diseases including black band disease, white band disease and skeletal eroding band. If global temperature increases by 20C during the twenty-first century, corals may be able to adopt quickly enough. Further rise in

global temperature by 4.20C will result in an end to coral reefs.

- **Effect on Human Health –**



As the quality of life strongly depends on climate, climate change affects human amenity. Climate Change is projected to increase threats to human health, particularly in lower income populations, predominantly within tropical/sub-tropical countries. There are both direct and indirect effects of climate change on health.

The consequences of climate change on human health can be categorized as asthma, respiratory allergies and airway diseases; cancer; cardiovascular disease and stroke; food-borne diseases and nutrition; heat-related morbidity and mortality; human developmental effects; mental health and stress-related disorders; neurological diseases and disorders; vector-borne and zoonotic diseases; and water-borne diseases.

Odisha is a relatively poor State of India having low nutritional status and poor health infrastructure, and thus, prone to climate induced health related problems. In Odisha, damp, humid and hot weather, and frequent flooding have caused the spread of vector-borne diseases such as malaria, dengue, chikungunya, filariasis, etc.; changes in sea temperature, reduced access to clean drinking water (due to drought and food damaged water & sanitation infrastructure) have increased the risk of diarrhoeal disease; increased salinity in soil and drinking water due to sea level rise in coastal belts have caused elevating blood pressure; the intensity and frequency of extreme weather events like heat-waves, cyclones, droughts and floods have increased health related issues such as heat strokes, skin diseases,

eye diseases, injuries, psychological distress and human mortality; air pollution from industrial pollutants and automobile emissions has increased the diseases like allergies, asthma, bronchitis, heart attacks and other cardio-vascular diseases; altered food productivity and associated pest and diseases especially in agriculture have resulted in malnutrition, hunger, impaired child growth and development.

+ Mitigation – Climate Change Action Plan

Climate Change has a special relevance for Odisha because of its location and geophysical conditions. Climate Change has the potential to derail the current growth strategies and deepen poverty. The direct impacts of extreme climate induced events could include loss of life, livelihood, assets and infrastructure. Considering the concern, Odisha has taken early initiative to formulate Climate Change Action Plan in a holistic manner. Climate Change Action Plan for the State of Odisha assumes greater significance.

Odisha is one of the first states to formulate a comprehensive action plan to address the climate change issues. The plan which has been formulated by an inter-departmental team is a coordinated government response to this important problem which looms large. Eleven sectoral missions such as Agriculture, Coast and Disaster, Energy, Fisheries and Animal Resources, Forests, Health, Industries, Mining, Transport, Urban and water Resources were identified. The plan also incorporates civil society inputs. The activities as envisaged in the Climate Change Action Plan are being implemented by various departments and agencies. The implementations of the activities are also being reviewed by a Monitoring and Advisory Committee of Climate Change Action Plan which is headed by the Chief Secretary.

Career as a Meteorologist

The atmospheric sciences are traditionally divided into three topical areas— meteorology (the study and forecasting of weather), climatology (the study of long-term atmospheric patterns and their influences), and aeronomy (the study of the physics and chemistry of the upper atmosphere).

- **About Meteorologist**

Meteorology is a sub-discipline of Atmospheric Science that majorly focuses on weather processes and forecasting. Meteorology includes both climate and weather and is concerned with the physical, chemical and dynamical state of the Earth's atmosphere and its interactions between the Earth's surface and atmosphere. The major responsibility of the meteorologist is to monitor and analyse its changes to make predictions and interpretations about weather conditions for the benefit of the man.

- **Eligibility to become Meteorologist**

A student desiring to become a Meteorologist must take up Science stream in Class 12. After completing Class 12 in science stream, students can take up B.Tech course in Meteorology. In India, most IITs offer this course. Students can also take up Diploma in Engineering course in Meteorology in Class and get direct second-year admission in B.Tech Meteorology course through lateral entry.

After B.Tech, students can take up M.Tech or M.Sc in Meteorology for higher level jobs or research positions. Students can also appear for recruitment exam conducted by Staff Selection Commission or Government of India/UPSC for the posts of meteorologists.

Subjects Combination: If students want to take up B.Sc or B.Tech in Meteorology, they should have passed Class 12 in Science stream.

Eligibility: -

- For pursuing a Diploma in Meteorology, Class 10 is the major qualification.
- For pursuing B.Sc or B.Tech on Meteorology, Class 12 in Science stream/ Diploma in Meteorology is the major qualification. Candidates need to qualify national-level entrance tests like JEE Main/ JEE Advanced or state-level engineering entrance exams to get admission.
- For M.Tech or M.Sc in Meteorology, B.Tech/ B.Sc in Meteorology is the major qualification.
- For taking up M.Phil or Ph.D., M.Tech/ M.Sc is the major qualification.
- Many institutes offer admission to M.Tech/ M.Sc through a valid GATE score.

- **Types of Job Roles Meteorologist**

Meteorologists are required for diverse jobs. The following are some of the job profiles that Meteorologists can take up after obtaining the necessary skills.

Industrial Meteorologist: The major responsibility of the industrial meteorologist is to study and solve problems associated with industrial pollution and emissions.

Physical Meteorologist: The major responsibility of the physical meteorologist is to study the physical nature of the atmosphere, its chemical composition and optical, acoustical and electrical properties. They also study environmental problems and figure out solutions for the same.

Research Meteorologist: These meteorologists study the patterns of climate and weather. They analyse and interpret the data relating to precipitation, humidity, wind, temperature etc. They also study phenomena such as the greenhouse effect.

Professor or Lecturer: After qualifying UGC NET, the eligible candidates can up teaching jobs in Meteorology at colleges that offer a course in Meteorology.

- **Employment Opportunities for Meteorologists**

Meteorologists get employment mostly in the government sector, and there is limited to zero scope for employment in the private sector. A person with required skills and qualification can get employment in the following departments. However, they will have to clear a written test or recruitment process for jobs in these sectors or areas or departments: -

- Meteorological Research Centre
- Meteorology Department in States and Centre
- Agricultural Planning Divisions
- Air Crafts and Missile Manufacturers
- Weather Consulting Organisations
- Navy
- Air Force

- **Top Recruiting Agencies for Meteorologists**

Meteorologists can find employment in government sector after clearing a written test and interview: -

- Indian Meteorology Department (IMD)
- Defence Research and Development Organisation (DRDO)
- National Remote Sensing Agency
- Space Application Centre
- Indian Air Force
- Indian Institute of Tropical Meteorology (IITM)
- Department of Science and Technology
- Indian Space Research Organisation (ISRO)
- Department of Agriculture Organisation
- Universities and Colleges
- Agricultural Universities

All queries and feedback regarding this newsletter should be addressed to:

**Dr. B. S. Murthy, Scientist F &
ENVIS – Coordinator**

**Indian Institute of Tropical Meteorology,
Dr.Homi Bhabha Road, Pashan, Pune – 411008, India
Phone: +91-20-2590-4212 | Fax: +91-20-2586-5142
www.iitmenvis.nic.in | iitm-env@nic.in**