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Climate *SAR* सार

Climate Science And Research

Climate Change & Marine Ecology

Climate Change Research Institute
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HAPPY NEW YEAR

2020

FROM EDITOR

"India has a coast line of 7517 km in length which sustains and provides a source of livelihood to over 250 million people."

With the long coastline, India is also the second largest producer of fish in the world. Oceans are storehouse of 2.2 million species. Marine ecosystem is getting affected by anthropogenic activities in various ways.

Impact of pollution caused by increasing CO2 and solid plastic waste is giving rise to new threats to Marine Ecology. Due to ozone layer depletion, increasing exposure to solar UV radiation threatens growth and survival of tiny creatures in the oceans. Oceans are getting acidified and deoxygenated. They are becoming under saturated with certain minerals and affecting growth of marine living resources causing harm to society.

In this issue you learn about Climate Change and Marine Ecosystem. Please do send your feedback or information update to contactus@ccri.in

Dr. (Mrs.) Malti Goel
President and Chief Executive
Climate Change Research Institute

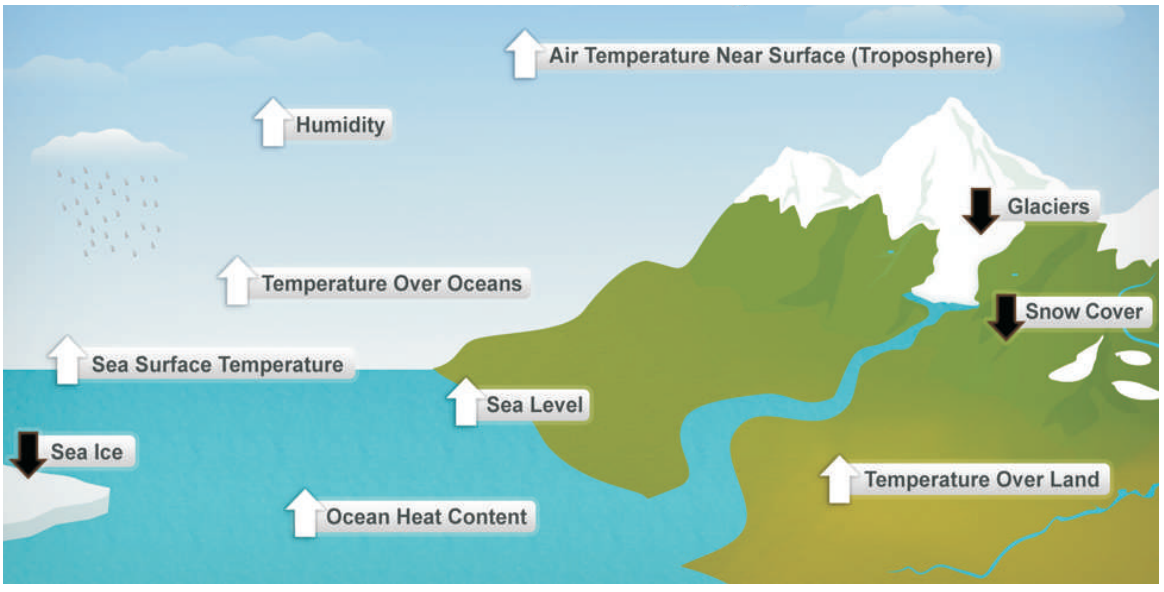
OCEANS AND CLIMATE CHANGE

Oceans cover 71 percent of the Earth's surface, and are storehouse for 97% of water on Earth. Increasing human population and their over-exploitation of resources have drastically intensified pressures on Marine Ecosystem. The oceans have partly managed to buffer these multiple pressures, but every single area of the oceans is getting affected to some degree by human activities.

The oceans have two way relationships with Weather and Climate. The local as well as global weather are influenced by oceans. Climates of different regions near and far from Oceans are different. Burning of fossil fuels, deforestation, mining, and other activities have increased the concentration of CO2 in the atmosphere and oceans, giving rise to enhanced greenhouse and increasing temperatures, resulting in Climate Change.

The oceans store three times as much heat as the atmosphere and absorb about one third of the human-induced CO2 emitted into the atmosphere. Changes in ocean temperatures and currents brought about by Climate Change lead to alterations in climatic patterns around the world. Climate change modulates the effects of solar UV radiation on biogeochemical cycles in aquatic ecosystems, affecting Marine Ecology.

Warmer waters may lead to development of stronger storms in the tropical regions, which can cause property damage and loss of life. Coastal communities are severely threatened by sea level rise.



PLASTIC WASTE AND MARINE DEBRIS

Plastics have impacted every aspect of our life. Plastics provide many critical sanitary, safety, health preservation, reliability and cost benefits.

As the use of plastics has grown rapidly it has resulted in a dramatic increase in plastic waste. Most plastics like; thin plastic bags, plastic cutlery, straws, packing material and mineral water bottles etc. after use get thrown on land in the dustbins, on roads, in gardens, parks and get accumulated in landfills. More than 1.5 trillion plastic bags are used worldwide in a year. Pollution from these grouped as 'single use plastics' can have harmful effects, not only on the land by affecting wildlife and surroundings, but also in the Oceans affecting marine ecosystem. One of the vital environment concerns in today's world has become plastic pollution caused by accumulation of plastic waste in the environment.

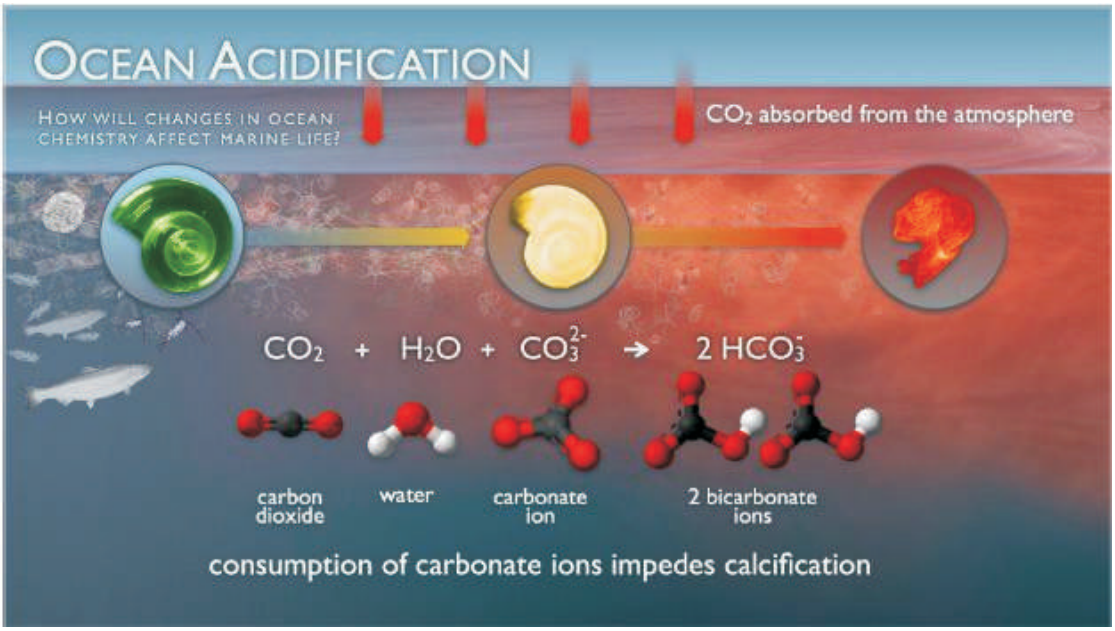
80% of the ocean plastic comes from land-based sources. Once in oceans it gets collected as marine debris causing harm to aquatic life and food chain. Small organisms feed on tiny bits of broken-down

plastic, called micro-plastic and absorb the chemicals from the plastic into their tissues. Since, animals often ingest micro-plastic it can build up in their stomach. Tiny pieces of plastic have been detected in sea creatures that humans like to eat such as fish, shrimp, mussels, and oysters.

Plastic bags resemble jellyfish, a common food for sea turtles, while some seabirds eat plastic because it releases a chemical that makes it smell like natural food. It was noticed that the corals readily ate plastic over food. Plastic fishing nets lost at sea are notorious for ensnaring and killing unsuspecting animals, especially whales, dolphins, seals, sea lions, birds, and sea turtles.

Micro-plastics have been found in seawater and sea salt.

OCEAN ACIDIFICATION AND MARINE ECOLOGY



As excess carbon dioxide dissolves in sea water, it forms carbonic acid, decreasing the ocean's pH and causing Ocean Acidification, which has the potential to change marine ecosystem. Continued ocean acidification is causing many parts of the ocean to become under saturated with calcium carbonate minerals, which are the basis for the skeletons and shells of many marine organisms.

Ocean acidification has impacted ocean species on a number of levels.

- **Photosynthetic algae and sea grasses may benefit from higher CO_2 conditions in the ocean.**
- **Oysters, clams, sea urchins, shallow water corals, deep sea corals, and calcareous plankton as are at risk, thus putting the entire food web at risk.**
- **Mussels and oysters are expected to grow less shell by 25% and 10% respectively by the end of the century.**
- **Beyond lost biodiversity, acidification will affect fisheries and aquaculture, threatening not only food security for millions of people, but also tourism and other sea-related economies.**

Many ocean-related benefits to society such as coastal protection or provision of food and income are getting affected by these.

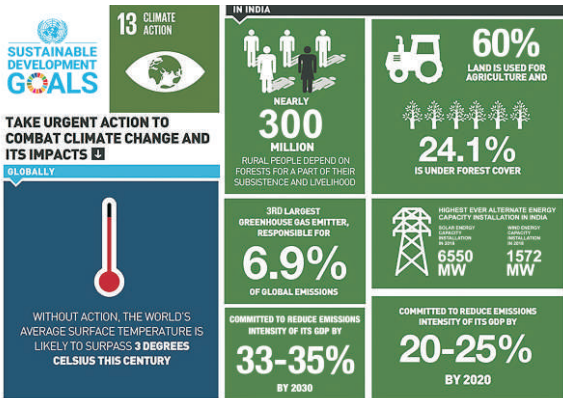
OZONE DEPLETION AND MARINE ECOSYSTEM

SDGS 13 - CLIMATE ACTION

Ozone layer in the Stratosphere at the height of 25 km is very important for all the living organisms. It protects us from harmful UV Radiations. Due to anthropogenic activities, the stratospheric ozone is getting depleted and is having adverse effect.

A major consequence of stratospheric ozone change is altering the intensity of solar UV-B radiation reaching earth which in turn affects the biogeochemical cycle of carbon. Increased UV radiation threatens growth and survival of microscopic organisms like phytoplanktons and zooplanktons that provide the original food source for the rest of the ocean food chain. As plankton make up the base of the marine food chain, changes in their number and species composition will influence fish and shellfish production world-wide. These kinds of losses will have a direct impact on the food supply.

Because UV-B radiation is absorbed by only a few layers of cells, large organisms are more protected, whilst smaller ones, such as unicellular organisms in aquatic ecosystems, are among the most severely affected . Solar UV-B radiation has also been found to cause damage to the early developmental stages of fish, shrimp, crab, amphibians and other animals. The most severe effects are decreased reproductive capacity and impaired larval development.



SDG 14: LIFE BELOW WATER

Centre for Marine Living Resources and Ecology (CMLRE), Ministry of Earth Sciences, Government of India, under the leadership of its Director, Dr. M. Sudhakar, has brought out a publication Our Strides into Deep Biosphere in 2019 to highlight 25 years of novel contributions to Marine Ecology.

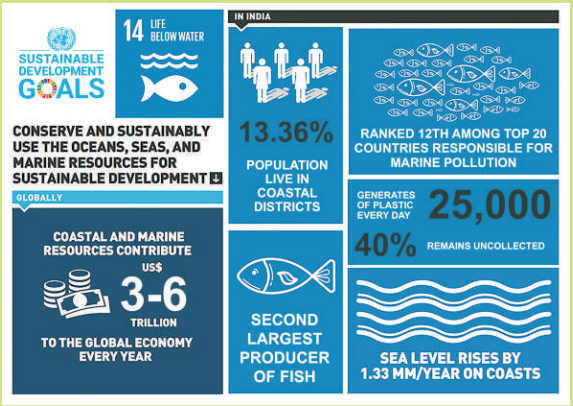
Publication of Ministry of Earth Sciences

Brochure on Implementing SDG14 and S&T Solutions

The Climate Change Research Institute partnered in the 'Marine Ecology: Implementing Sustainable Development Goals 14' workshop promoted by Centre for Marine Living Resources & Ecology (CMLRE), Ministry of Earth Sciences and the Swadeshi Science Movement (SSM) held at Kochi on 21st September 2019. On this occasion Director CMLRE, Dr. M. Sudhakar, welcomed and introduced the Deep Sea Mission of Ministry of Earth Sciences to the students and faculties.

DO YOU KNOW

- **The set of Climate Change pressures on the marine environment – Heat, Acidity and Oxygen loss is often referred to as deadly TRIO.**
- **The interplay between stratospheric ozone depletion and climate change affects atmospheric circulation, the speed and direction of winds, and as a consequence Ocean Mixing.**
- **Plastic eating Mushroom has been grown, which when seeded in landfills, can get rid of plastic waste.**
- **'WaterShark' is a technology Device which can eat or capture plastics floating in ocean waters and help in reducing marine debris.**



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