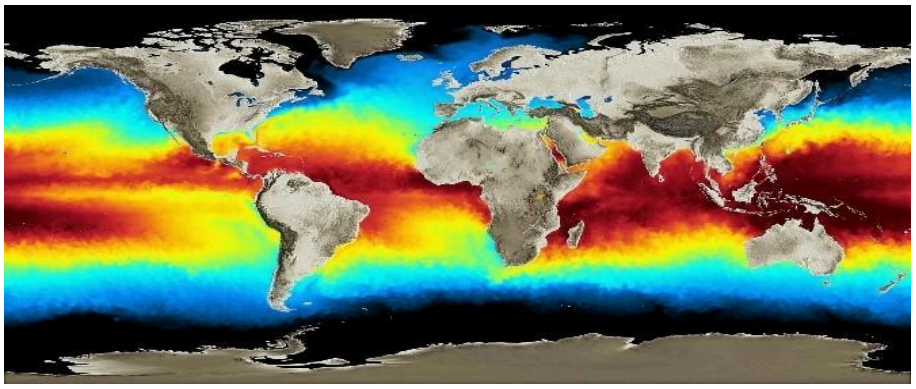
UPSC CURRENT AFFAIRS NOTES 13-01-2024

GLOBAL OCEAN HEAT CONTENT



The amount of heat stored in the upper 2,000 metres of the global ocean or the ocean heat content reached 286 Zetajoules (ZJ) in 2023 relative to the 1981–2010 average, according to a new study published in Advances in Atmospheric Sciences.

Findings

The 2023 ocean heat content value was 15 ZJ more than the preceding year.

The 2023 estimate represents around 4**.6 billion Hiroshima nuclear bombs.**

Warming in much of the Atlantic, North Pacific, Western Pacific and Southern oceans is occurring at a faster rate than the global average.

The ocean covers 70 per cent of the planet and absorbs about 90 per cent of the heat from global warming. When the ocean warms, it releases extra heat and moisture into the atmosphere, making storms more severe with heavier rain, with stronger winds and more significant flooding.

Ocean heat content also plays an essential role in Earth's energy, water, and carbon cycles, and significantly affects human society.

The 2023 ocean heat content is ranked as **one of the five hottest years of the world's ocean since 1955**. The upper 2,000 m of the world's ocean has warmed on average by 6.6 ± 0.3 ZJ per year from 1958-2023.

Both ocean heat content and sea level rise are robust indicators of climate change.

Ocean heat content also plays an essential role in Earth's energy, water, and carbon cycles, and significantly affects human society.

Global Ocean Heat Content (OHC):

Global Ocean Heat Content (OHC) refers to the total amount of heat stored in the world's oceans.

It is a crucial indicator of climate change and plays a significant role in understanding the Earth's energy balance.

The OHC is measured in terms of the amount of heat energy (in joules) absorbed by a unit mass of seawater.

Key Points:

Climate Indicator:

OHC is a key metric for assessing climate change. Monitoring changes in ocean heat content helps scientists understand how the Earth's climate system is responding to increasing greenhouse gas concentrations.

Warming Trend:

- Over the past few decades, there has been a notable increase in global OHC, indicating a warming trend. The oceans absorb and store much of the excess heat trapped in the atmosphere due to human activities such as the burning of fossil fuels.

Impact on Sea Levels:

- The thermal expansion of seawater due to increased ocean heat content contributes significantly to rising sea levels. This poses a threat to coastal areas and low-lying regions.

Ocean Circulation and Climate Patterns:

- Changes in OHC influence ocean circulation patterns and, consequently, climate variability. Understanding these changes is essential for predicting and adapting to shifts in weather patterns.

Measurement Techniques:

- OHC is measured using a combination of satellite observations, autonomous floats, and ship-based measurements. These technologies

provide comprehensive data on temperature variations at different depths and locations.

Deep Ocean Warming:

- Studies indicate that not only the surface waters but also deeper layers of the ocean are experiencing warming. This underscores the significance of OHC as a comprehensive metric for assessing overall oceanic warming.

Thermal Inertia:

- Oceans have a high thermal inertia, meaning they can store and release heat over long periods. This delayed response has implications for long-term climate projections.

Ecosystem Impact:

- Changes in OHC can impact marine ecosystems, affecting the distribution of marine species, coral reefs, and fisheries. Warmer oceans can lead to coral bleaching events and disrupt marine biodiversity.

Global Climate Models:

- OHC data are crucial for validating and improving global climate models. Incorporating accurate information about ocean heat content helps enhance the reliability of climate projections.

International Collaboration:

- Monitoring global OHC requires international collaboration. Organizations such as the Intergovernmental Panel on Climate Change (IPCC) and international research initiatives contribute to the collection and analysis of OHC data.

Reasons behind rising Global Ocean Heat Content (OHC)

The rising Global Ocean Heat Content (OHC) is primarily attributed to human-induced climate change and various factors related to the Earth's energy balance. Here are key reasons behind the increasing OHC:

Greenhouse Gas Emissions:

- The predominant factor driving the rise in OHC is the increased concentration of greenhouse gases in the atmosphere, particularly carbon dioxide (CO2). These gases trap heat, leading to a warming of the Earth's surface, and much of this heat is absorbed by the oceans.

Increased Radiative Forcing:

- The enhanced greenhouse effect results in increased radiative forcing, which is the imbalance between incoming solar radiation and outgoing infrared radiation.
- This imbalance leads to a net gain of heat in the Earth's system, with the oceans absorbing a significant portion.

Ocean Thermal Inertia:

- Oceans have high thermal inertia, meaning they can store and release heat over extended periods. Even if greenhouse gas emissions were to stabilize, the oceans would continue to absorb heat for some time, contributing to the ongoing rise in OHC.

Surface Warming and Deep Ocean Heating:

- While surface warming is evident, studies indicate that deep layers of the ocean are also warming. This vertical mixing of heat throughout the ocean contributes to the overall increase in OHC.

Natural Climate Variability:

- Natural climate variability, such as El Niño and La Niña events, can influence ocean heat content. El Niño tends to increase ocean heat uptake, while La Niña events can contribute to heat release.

Decreased Heat Loss to the Atmosphere:

- Changes in atmospheric circulation patterns and cloud cover can impact the exchange of heat between the ocean and the atmosphere. If there is a

reduction in heat loss to the atmosphere, more heat remains stored in the ocean.

Changes in Ocean Circulation:

- Alterations in ocean circulation patterns, which can be influenced by climate change, can impact the distribution of heat within the ocean. Changes in circulation can lead to regional variations in OHC.

Melting Ice and Glaciers:

- The melting of polar ice caps, glaciers, and sea ice contributes freshwater to the oceans. The addition of this freshwater alters ocean salinity and density, affecting circulation patterns and heat distribution.

Long-Term Warming Trends:

- Observations reveal a long-term warming trend in ocean temperatures. This trend is indicative of the ongoing accumulation of heat in the oceans, driven by the factors mentioned above.

Human-Induced Climate Change:

- Ultimately, the overarching reason behind the rising OHC is human-induced climate change. Activities such as burning fossil fuels, deforestation, and industrial processes release greenhouse gases, leading to a warmer Earth and oceans.

Way Ahead

- **Decarbonize Energy:** Rapidly transition to renewable energy sources to reduce carbon emissions, a primary driver of ocean warming.
- **Sustainable Fisheries:** Implement and enforce sustainable fisheries management to protect marine ecosystems and mitigate stress on ocean biodiversity.
- **International Cooperation:** Strengthen global collaboration to address climate change, emphasizing shared responsibilities and coordinated efforts.
- **Afforestation:** Increase afforestation and conservation of coastal ecosystems to enhance carbon sequestration and protect against rising sea levels.

- **Plastic Reduction:** Implement measures to reduce plastic pollution in oceans, preventing harm to marine life and ecosystems.
- **Renewable Shipping:** Promote the use of sustainable fuels and technologies in the maritime industry to minimize its impact on ocean health.
- **Climate-Resilient Infrastructure:** Develop and implement adaptive strategies, including climate-resilient coastal infrastructure, to protect vulnerable communities.
- **Marine Protected Areas:** Establish and expand marine protected areas to preserve critical habitats and promote ecosystem recovery.
- **Innovation for Carbon Capture:** Invest in innovative technologies for ocean-based carbon capture and storage to mitigate ocean acidification.
- **Public Awareness:** Increase public awareness and education on the importance of oceans, fostering support for sustainable practices and policies.

New Generation Akash missile

Defence Research and Development Organisation (DRDO) conducted a successful flight-test of the New Generation AKASH (AKASH-NG) missile from the Integrated Test Range (ITR), Chandipur off the coast of Odisha.

It is surface-to-air new generation missile.

The missile intercepted the high-speed unmanned aerial vehicle at a very low altitude.

The test has validated the functioning of the complete weapon system consisting of a missile with an indigenously developed radio frequency seeker, launcher, multi-function radar and command, control and communication system.

This was the first trial of the missile against a live target, which was successfully intercepted and destroyed.

Features

It is a new generation state-of-the-art surface-to-air missile (SAM) for the Indian Air Force (IAF) to destroy high manoeuvring low radar cross section agile aerial threats.

This advanced variant comes with an active electronically scanned array (AESA) multi-function radar that features all three functions - search, track and fire control in one platform.

It can defend an area 10 times better compared to any short-range SAM and is capable of engaging up to 10 targets simultaneously.

It can strike targets up to 40 km as against the earlier variant's maximum range of 30 km.

Centre set to roll out vaccine drive to fight cervical cancer

The government is set to roll out a human papillomavirus (HPV) vaccination campaign for girls in the 9-14 years age group.

It is a significant step which has potential to reduce the incidence of cervical cancer in India.

Cervical cancer

Almost all cervical cancer cases are linked to certain strains of HPV, a common virus that is transmitted through sexual contact.

The body's immune system usually gets rid of the HPV infection naturally within two years.

However, in a small percentage of people the virus can linger over time and turn some normal cells into abnormal cells and then cancer.

It is preventable as long as it is detected early and managed effectively.

Prevalence

Cervical cancer is the second most common cancer type and the second leading cause of cancer death in women of reproductive age (15-44) worldwide.

According to the World Health Organization's International Agency for Research on Cancer (IARC-WHO), India accounts for approximately one-fifth of the global burden.

India witnesses 1.25 lakh cases and approximately 75,000 deaths each year (one woman every eight minutes).

About 83 per cent of invasive cervical cancer cases are attributed to HPV 16 or 18 in India.

Prevention

Cervical cancer screening and vaccination are two effective preventive measures.

There is still little awareness among women about this cancer prevention, and less than 10% of Indian women are screened.

All women aged 30-49, regardless of symptoms, should be screened for cervical cancer and their adolescent daughters vaccinated against HPV.

Vaccination drive planned in three phases over three years

The immunisation drive, planned in three phases over three years.

Every year for three years, one-third of girls aged 9 to 14 will get vaccinated.

Also, in states where this happens, each new group of 9-year-olds will receive the vaccine during these three years.

Vaccines to be available for free

Currently, the two-dose HPV vaccine is available commercially for about Rs 2,000 per dose.

But once the government includes it in its immunisation programme, it will be available for free.

Vaccine to be use in the immunisation drive

Cervavac, an indigenously developed quadrivalent vaccine by the Serum Institute of India (SII) in Pune, will be used for this drive.

Cervavac offers protection against four HPV strains – 16, 18, 6 and 11.

Besides CERVAVAC, two vaccines licensed globally are available in India;

A quadrivalent vaccine (Gardasil, marketed by Merck) and

A bivalent vaccine (Cervarix, marketed by Glaxo Smith Kline).

These vaccines are costly and hence are unaffordable for the vast majority of Indians.

Place of vaccination

The immunisation drive will be conducted through schools and existing vaccination points.

Single dose vaccination drive

While none of the HPV vaccines available globally recommend a single-dose schedule, the World Health Organisation says that a single-dose regimen can be followed for public health programmes.

Challenges

Production for public vaccination

At present, SII has a production capacity of about 2-3 million doses of Cervavac per year.

However, it needs to increase this capacity, with a target of 60-70 million doses.

Allocation of resources

The biggest task will be in allocating adequate resources and manpower for vaccinating the massive demographic of adolescent girls aged between 9 and 14.

Awareness

There is a huge need for stepping up awareness about the disease and the vaccine in the community.

Unlike Covid and the vaccination programme, there is very little awareness about cervical cancer.

There is an urgent need to have a communication strategy in place and to ensure that any myths circulating online are promptly busted.

Pulses Production in India

Various representatives of governments, as well as commercial and nonprofit organisations involved in the production and processing of pulses, will attend the Global Pulse Convention to be held in New Delhi in February.

About Pulses (Details, Climate Requirements, Production in India, Govt. Schemes, etc.)

Pulses are annual leguminous crops yielding between one and 12 grains or seeds of variable size, shape and color within a pod, used for both food and feed.

The term “pulses” is limited to crops harvested solely for dry grain, thereby excluding crops harvested green for food, which are classified as vegetable crops.

Besides serving as an important source of protein for a large portion of the global population, pulses contribute to healthy soils and climate change mitigation through their nitrogen-fixing properties.

Bengal Gram (Desi Chick Pea / Desi Chana), Pigeon Peas (Arhar / Toor / Red Gram), Green Beans (Moong Beans), Chick Peas (Kabuli Chana), Black Matpe (Urad / Mah / Black Gram), Red Kidney Beans (Rajma), Black Eyed Peas (Lobiya), Lentils (Masoor), White Peas (Matar) are major pulses grown and consumed in India.

Climate Requirement:

Pulse crops are cultivated in Kharif, Rabi and Zaid seasons of the Agricultural year.

Rabi crops require mild cold climate during sowing period, during vegetative to pod development cold climate and during maturity / harvesting warm climate.

Similarly, Kharif pulse crops require a warm climate throughout their life from sowing to harvesting. Summer pulses are habitants of warm climates.

Seed is required to pass many stages to produce seed like germination, seedling, vegetative, flowering, fruit setting, pod development and grain maturity / harvesting.

Pulses Production in India

India is the largest producer (25% of global production), consumer (27% of world consumption) and importer (14%) of pulses in the world.

Pulses account for around 20 per cent of the area under foodgrains and contribute around 7-10 per cent of the total foodgrains production in the country.

Though pulses are grown in both Kharif and Rabi seasons, Rabi pulses contribute more than 60 per cent of the total production.

Gram is the most dominant pulse having a share of around 40 per cent in the total production followed by Tur/Arhar at 15 to 20 per cent and Urad/Black Matpe and Moong at around 8-10 per cent each.

Government Programme w.r.t. Pulses in India:

Department of Agriculture & Farmers Welfare is implementing National Food Security Mission (NFSM)-Pulse.

It has been launched with the objectives of increasing production through area expansion and productivity enhancement.

Under NFSM-Pulses, assistance is given through States/UTs to the farmers for interventions like cluster demonstrations on improved package of practices, demonstrations on cropping system, seed production and distribution of HYVs/hybrids, etc.

In order to increase the productivity potential of pulses crops in the country, the ICAR is undertaking basic and strategic research on these crops.

The idea is to develop location-specific high yielding varieties and match production packages.

During 2014-2023, 343 high yielding varieties/hybrids of Pulses have been notified for commercial cultivation in the country.

Further to ensure remunerative prices to farmers, Government implements an umbrella scheme PM-AASHA comprising Price Support Scheme (PSS), Price Deficiency Payment Scheme (PDPS) and Private Procurement Stockist Scheme (PPSS) in order to ensure Minimum Support Price (MSP) to farmers for their produce of notified oilseeds, pulses and copra.

During the year 2021-22, a total of 30.31 lakh tonnes of pulses were procured under PSS benefitting 13,90,737 farmers, while during 2022-23 (as on 31.07.2023) 28.33 lakh tonnes of pulses have been procured so far, benefitting 12,43,977 farmers.

The Global Pulse Convention is scheduled to be held in New Delhi in February.

The Global Pulse Convention is jointly organised by the National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED) and the Global Pulse Confederation (GPC).

The conference will see experts in the field sharing their views and experiences with various stakeholders and policymakers.