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1. Mumbai's Declining Air Quality

Introduction

Over recent years, Mumbai has witnessed a noticeable decline in air quality, causing growing concern among residents. This article explores the factors contributing to this decline and the recent changes that have made the city more susceptible to poor air quality.

Mumbai's Historical Advantage

The direction and strength of winds are often the key factor in determining Mumbai's air quality. The city does not generate a lesser amount of pollutants than Delhi. The emissions from vehicles, industries and other sources are just as bad as in Delhi and in other major urban centres in the country. But strong winds, characteristic of any coastal location, turn out to be quite beneficial here.

Winds usually alternate between moving from the sea towards the land, and moving from the land towards the sea. This cycle repeats every three to four days during this time of the year. When the wind is directed towards the sea, the dust particles get swept away. This acts as a natural cleansing mechanism. Sometimes, when the cycle gets temporarily disrupted for some reason, it has an impact on the city's air quality.

Recent Decline

In the last two years, Mumbai's air quality has deteriorated significantly. The city experienced an extended period of poor air quality from November to January, with some days surpassing even Delhi in pollution levels.

Possible reasons

Several meteorological conditions have played a role in these severe pollution events. These are as follows:

1. Change in wind patterns: Last year's unusually bad air quality was attributed to frequent and prolonged disruptions in this normal cycle of wind patterns. Instead of alternating between land and sea every 3-4 days, the winds were sometimes changing directions after eight or ten days. Such change in wind pattern was on account of prevailing La Nina conditions in the eastern Pacific Ocean. La Nina is a condition in which the sea surface temperatures in the eastern Pacific Ocean become cooler than normal.

2. Current Factors Impacting Air Quality: With La Nina having passed, the recent decline in air quality in Mumbai is attributed to different factors, including the retreat of the monsoon and increased construction activities in the vicinity.

Impact of Increasing Pollutant Sources

The consistent deterioration in Mumbai's air quality can be attributed to the city's high baseline level of pollution. Factors such as economic growth, rising vehicle numbers, increased construction, and emissions have overwhelmed the city's capacity to maintain clean air.

Haze-Like Conditions and Visibility Issues

Mumbai is now experiencing haze-like conditions on some days, a phenomenon that was not common in the past. This deterioration in visibility is reminiscent of the winter months in Delhi.

Relevance: GS Prelims & Mains Paper III; Environment Source: The Indian Express and The Hindu

2. China's Giant 'Ghost Particle' Detector

Introduction

China is constructing the world's largest neutrino detector, known as "Trident." This detector is being constructed in the western Pacific Ocean. Neutrinos, often called "ghost particles," are incredibly tiny and elusive particles that are challenging to detect.

Understanding Neutrinos

To grasp what neutrinos are, it's essential to understand atoms, the building blocks of our universe. Anything with mass, from people to objects, is composed of atoms. Atoms were once believed to be the smallest particles until scientists discovered subatomic particles like protons, electrons, and neutrons. Neutrinos, similar to electrons, are a type of subatomic particle but possess no electric charge. They were initially considered massless until evidence showed they have a minuscule mass.

Ghostly and Hard to Detect

Neutrinos are challenging to observe because they rarely interact with other particles. Their interactions with other particles are so rare that they're often referred to as "ghost particles" because they mostly go undetected.

Detecting Neutrinos

Ghost particles rarely interact with other particles. But rarely doesn't mean "never". Sometimes they interact with water molecules, which is why China is building its ghost molecule telescope underwater. Scientists have observed ghost particles in fleeting instances when the particles create byproducts after traveling through water or ice. These "muons" create flashes of light that can be detected by sophisticated underwater telescopes and offer one of the fews ways to study the energy and source of neutrinos.

The Impressive Trident Telescope

The University of Madison-Wisconsin's "IceCube" telescope in Antarctica is currently the largest neutrino detector, spanning about 1 cubic kilometer. China's Trident telescope in the South China Sea will be significantly larger, covering 7.5 cubic kilometers. Its size will enhance sensitivity and enable the detection of more neutrinos, making it "10,000 times more sensitive" than existing underwater telescopes.



The Significance of Detecting Neutrinos

Understanding neutrinos is crucial because these abundant particles behave mysteriously and defy established physics principles. Scientists are unsure of their origins and suspect they may have played a role in the early universe after the big bang. This hypothesis remains unproven.

Neutrinos are linked to cosmic rays, another scientific mystery. Researchers believe that comprehending neutrinos can help explain the origins of cosmic rays, something

scientists have sought to understand for centuries. The study of neutrinos could provide insight into the origins of our universe, bringing us closer to solving significant scientific mysteries.

Relevance: GS Prelims & Mains Paper III; Science & Technology Source: The Indian Express

3. India's Olympic Hosting Aspirations

Introduction

Prime Minister Narendra Modi has publicly expressed India's interest in hosting the Olympics, potentially in 2036. This article explores the process of selecting Olympic host cities and the changes introduced in recent years.

Traditional Host City Selection

In the past, cities interested in hosting the Olympics followed a multi-year evaluation process, submitting letters of interest to the International Olympic Committee (IOC). This process involved rigorous inspections and voting at the IOC. It often led to excessive spending among the bidders, to secure rights. The host city was decided seven years in advance as per the Olympic Charter.

The Olympic Agenda 2020

Under the leadership of Thomas Bach, the IOC introduced the Olympic Agenda 2020, which aimed to make host city selection more flexible, sustainable, and cost-effective. This marked a shift from the traditional approach. Thomas Bach became president of IOC in 2013.

Emphasis on Flexibility

The new approach allows for flexibility by eliminating the seven-year rule. Host cities can now be selected as late as after 2030 (for 3026 Olympics). It involves a two-stage process, including a continuous dialogue and a targeted dialogue, allowing potential hosts to engage with the IOC in a non-committal manner.

Continuous Dialogue

The continuous dialogue is a preliminary stage where potential hosts discuss their vision for the Games and long-term legacies. They can develop their own master plans and even collaborate with other cities or countries.

Targeted Dialogue

In the targeted dialogue phase, preferred host candidates engage in more determined discussions, answering the IOC's questions and providing guarantees on various aspects, including infrastructure, security, and public services.

Sustainability and Cost-Effectiveness

To ensure long-term sustainability, host cities are encouraged to use existing or temporary venues and align new infrastructure with existing development plans. All Olympic Games from 2030 onward must adhere to the IOC's climate positive commitment.

Potential 2036 Olympic Hosts

Apart from India, several nations have expressed interest in hosting the 2036 Olympics, including Mexico, Indonesia, Turkey, and Poland. Other potential bidders include Egypt, South Korea, China, Qatar, Hungary, Italy, Denmark, Canada, and Germany, each with unique considerations and potential impacts.

In conclusion, the new norm in Olympic host city selection emphasizes flexibility, sustainability, and cost-effectiveness, marking a departure from the traditional process. India's aspiration to host the Olympics in 2036 aligns with this evolving approach to selecting host cities.

Relevance: GS Prelims & Mains Paper II; International Organisations Source: The Hindu