



Uttarkashi Tunnel Collapse

For Prelims: Silkyara-Barkot Tunnel, [Char Dham Project](#), National Highways and Infrastructure Development Corporation Ltd, Drill and Blast Method, Atal Tunnel, Pir Panjal Railway Tunnel, Dr Syama Prasad Mookerjee Road Tunnel.

For Mains: Issues Related to Tunnel Construction in India, Challenges Related to Indian Himalayan Region.

[Source: TH](#)

Why in News?

Recently, an under-construction **Silkyara-Barkot tunnel** along the **Yamunotri National Highway in Uttarkashi district, Uttarakhand**, collapsed, trapping a significant number of workers inside.

- The incident raises concerns about **tunnel construction**, prompting closer examination of **potential causes and preventive measures**.

What Could be the Potential Cause of Tunnel Collapse?

- **About:**
 - The **Silkyara-Barkot tunnel** is part of the ambitious [Char Dham all-weather road project](#) of the Central Government.
 - The construction of the tunnel was tendered to **Hyderabad-headquartered Navayuga Engineering Company** by the **National Highways and Infrastructure Development Corporation Ltd (NHIDCL)**, a fully owned company of the Ministry of Road Transport & Highways, Government of India.
- **Potential Causes of Tunnel Collapse:** The exact cause of the tunnel collapse is yet to be ascertained, but a possible factor could be:
 - The collapsed section, **situated around 200-300 meters from the tunnel mouth**, might have contained a **hidden loose patch** of fractured or weak rock, undetectable during construction.
 - Water seepage through this compromised rock could have **eroded it over time, creating an unseen void atop the tunnel structure**.

What are the Critical Aspects of Tunnel Construction?

- **Tunnel Excavation Techniques:**
 - **Drill and Blast Method (DBM):** Involves **drilling holes into rock** and detonating explosives to break it apart.
 - DBM is often used in regions like the **Himalayas (Jammu & Kashmir and Uttarakhand)** due to the challenging terrain.
 - **Tunnel-Boring Machines (TBMs):** It bore through rock while supporting the tunnel behind with precast concrete segments. It is a more expensive but safer method.
 - TBMs are ideal when the rock cover is up to 400 metres tall. Underground tunnels

for the Delhi Metro were dug using a TBM at shallow depth.

▪ **Aspects in Tunnel Construction:**

- **Rock Investigation: Thoroughly examining the rock's strength and composition through seismic waves and petrographic analysis** to assess its load-bearing capacity and stability.
- **Monitoring and Support: Continuous monitoring using stress and deformation meters**, along with various support mechanisms like **shotcrete, rock bolts, steel ribs, and specialized tunnel pipe umbrellas**.
- **Geologist Assessments: Independent geologists play a crucial role in examining the tunnel, predicting potential failures**, and determining the rock's stability duration.

What are the Other Major Tunnels in India?

- **Atal Tunnel: [Atal Tunnel](#) (also known as Rohtang Tunnel)** is a highway tunnel built under the **Rohtang Pass in the eastern Pir Panjal range** of the Himalayas on the **Leh-Manali Highway in Himachal Pradesh, India**.
 - At a length of 9.02 km, it is the **longest tunnel above 10,000 feet (3,048 m) in the world**.
- **[Pir Panjal Railway Tunnel](#):** This 11.2 km long tunnel is **India's longest transportation railway tunnel**.
 - It runs through the Pir Panjal mountain range between **Quazigund and Baramulla**.
- **Jawahar Tunnel:** It is also called Banihal Tunnel. The length of the tunnel is 2.85 km.
 - The tunnel facilitates round-the-year road connectivity between **Srinagar and Jammu**.
- **Dr Syama Prasad Mookerjee Road Tunnel:** It was previously known as Chenani-Nashri Tunnel and is the longest road tunnel of India. The length of this road tunnel is **9.3 km**.

Way Forward

- **Regular Maintenance:** Implement a stringent maintenance schedule, including **inspections for structural integrity, drainage systems, and ventilation** to identify and rectify issues promptly.
 - Employ **sensors and monitoring technologies to continuously assess structural health**, detecting any potential weaknesses or anomalies early.
- **Risk Assessment and Preparedness:** Conducting third party risk assessments periodically, considering **geological, environmental, and usage factors**.
 - Developing contingency plans and emergency protocols in case of any structural concerns.
- **Training and Awareness:** Training personnel in **tunnel management and emergency response procedures**. Public awareness campaigns can educate users and nearby residents about safety measures and reporting mechanisms.
- **Technology Integration:** Explore innovative technologies like **Artificial Intelligence, drones, or robotics for more efficient inspections**, maintenance, and early detection of potential issues.

India-Australia 2+2 Ministerial Dialogue

For Prelims: India-Australia 2+2 Ministerial Dialogue, **[Maritime Domain Awareness \(MDA\)](#), [Artificial Intelligence \(AI\)](#), [Anti-Submarine Warfare](#)**, Nuclear Non-Proliferation Treaty, Comprehensive Strategic Partnership.

For Mains: India-Australia 2+2 Ministerial Dialogue, Bilateral, regional and global groupings and agreements involving India and/or affecting India's interests.

Source: [PIB](#)

Why in News?

Recently, the 2nd **India-Australia 2+2 Ministerial Dialogue** was held in New Delhi, India, where foreign Affairs Ministers and Defense Ministers of both countries attended the Meeting.



What are the Key Highlights of the India-Australia 2+2 Ministerial Dialogue?

- **Enhanced Cooperation:**
 - Both nations emphasized further cooperation in information exchange and Indo-Pacific **Maritime Domain Awareness (MDA)**, underlining the importance of these aspects in strengthening their strategic ties.
 - The Quad's Indo-Pacific MDA is in the implementation phase, slated to be a prominent agenda item at the upcoming Quad summit hosted by India.
- **Implementing Arrangements:**
 - Both sides discussed the implementing arrangements on **hydrography cooperation** and cooperation for **air-to-air refueling, signaling** a step toward concrete collaboration in defense areas.
- **Niche Training Areas:**
 - There's a **shared vision to collaborate in specialized training areas** such as **Artificial Intelligence (AI), Anti-Submarine Warfare**, anti-drone warfare, and the cyber domain, highlighting a commitment to developing advanced defense capabilities.
- **Defense Industry Collaboration:**
 - Both countries recognized **the potential of deepening cooperation in defense industry and research** as a means to enhance their already strong relationship.
 - They Identified potential areas of collaboration including shipbuilding, ship repair and maintenance, as well as **aircraft maintenance, repair, and overhaul.**
- **Research in Underwater Technologies:**
 - Discussion on joint research in underwater technologies and collaboration between defense start-ups **signifies a push for innovation and technological advancement** in defense strategies.
- **Reaffirmed Bilateral Defense Relations:**
 - Both countries reaffirmed **commitment to strengthen bilateral defense relations** and expressed satisfaction over increasing military-to-military cooperation, joint exercises, exchanges, and institutional dialogues.

How have been the India- Australia Relations so far?

▪ Historical Perspective:

- Australia and India for the first time established diplomatic relations in the **pre-Independence period**, when the Consulate General of India was first opened as a **Trade Office in Sydney in 1941**.
- India-Australia relations touched a historic low when the **Australian Government condemned India's 1998 nuclear tests**.
- In 2014, Australia signed a Uranium supply deal with India, the first of its kind with a country that is a non-signatory to the **Nuclear Non-Proliferation Treaty**, in recognition of India's "impeccable" non-proliferation record.

▪ Strategic Ties:

- In 2020, Prime ministers of both the countries elevated bilateral relationship from Strategic Partnership to **Comprehensive strategic Partnership during India-Australia Leaders' Virtual Summit**.
- In 2021, the prime ministers of both the countries met during **COP26** at Glasgow.
- In 2022, there has been a series of high-level engagements and exchange of ministerial visits in 2022 and in 2023 including India-Australia virtual summit and Foreign Ministers meet. Several key announcements were made during 2nd India-Australia Virtual Summit including:
 - A Letter of Intent on Migration and Mobility Partnership Arrangement to foster the exchange of skills.

▪ Defence Cooperation:

- The **2+2 Ministerial Dialogue** took place in September 2021, and the Deputy Prime Minister and Defence Minister of Australia visited India in June 2022.
- The **Mutual Logistics Support Agreement (MLSA)** was signed during the Virtual Summit in June 2020 to enhance defence cooperation.
- Joint military exercises:
 - Australia will host the "**Malabar**" exercises in August 2023, with participation from India, Japan, and the US.
 - India has been invited to join the Talisman Sabre exercises in 2023.

▪ China Factor:

- Australia-China ties became strained due to several reasons including Australia banning Huawei from the 5G network, call for enquiry into the origins of Covid-19 and Slamming **china's human rights violations in Xinjiang** and Hongkong.
 - China responded by imposing trade barriers on Australian exports, and by cutting off all ministerial contact.
- India is facing Chinese aggression along the border which has been highlighted by incidents such as **Galwan valley clash**.
- Both Australia and India support a rules-based international order and they are seeking to forge regional institutions in the Indo-Pacific which are inclusive, promote further economic integration.
 - The countries' participation in **Quad** (India, Australia, US, Japan) is an example of their convergence of interests, based on shared concerns.

▪ Multilateral Cooperation:

- Both are members of the **Quad, Commonwealth, Indian Ocean Rim Association (IORA), ASEAN Regional Forum**, Asia Pacific Partnership on Climate and Clean Development, and have participated in the **East Asia Summits**.
- Both countries have also been cooperating as members of the Five Interested Parties (FIP) in the **World Trade Organization** context.
- **Australia is an important player in Asia Pacific Economic Cooperation (APEC)** and supports India's membership of the organisation.

▪ Economic Cooperation:

- **Economic Cooperation Trade Agreement (ECTA)**:
 - It is the first free trade agreement signed by India with a developed country in a decade which entered into force in December 2022.
 - It has resulted in an immediate reduction of duty to zero on 96% of Indian exports to Australia in value (that is 98% of the tariff lines) and zero duty on 85% of Australia's exports (in value) to India.
- **Supply Chain Resilience Initiative (SCRI)**:
 - India and Australia are partners in the trilateral arrangement along with Japan

which seeks to enhance the resilience of supply chains in the [Indo-Pacific Region](#).

- **Bilateral Trade:**
 - Australia is the 17th largest trading partner of India and India is Australia's 9th largest trading partner.
 - Bilateral trade between India and Australia was US\$ 27.5 billion in 2021, there is potential for it to reach around US\$ 50 billion in five years.
- **Cooperation on Clean Energy:**
 - In February 2022, countries signed a Letter of Intent on New and Renewable Energy for cooperation to reduce the cost of renewable energy technologies, including ultra low-cost solar and clean hydrogen.
 - India announced Australian Dollars(AUD) 10 million for Pacific Island Countries under [the International Solar Alliance \(ISA\)](#).
 - Both the countries committed USD 5.8 million to the three-year [India-Australia Critical Minerals Investment Partnership](#).

What are the Challenges in India-Australia Relations?

- **Adani Coal Mine Controversy:**
 - There was controversy over the Adani coal mine project in Australia, with some activists protesting against it, which created a strain in the relationship between the two countries.
- **Visa Issues:**
 - There have been concerns over visa restrictions for Indian students and professionals seeking to work in Australia.
- **Violence with Indian Diaspora:**
 - Attacks on Indian Diaspora and temples in the recent past by Khalistan supporters have been an issue of strain.

Way Forward

- The India-Australia relations have strengthened in recent years due to shared values, interests, geography, and objectives.
- Both countries envision a free, open, inclusive, and rules-based Indo-Pacific region, unilateral or coercive actions are not preferred and are to be avoided in resolving any disagreements or conflicts.
- Renewed relationship between India- Australia through initiatives such as India Australia bilateral Summits give an opportunity to further strengthen the ties between the two countries to play an active role in ensuring rule-based order in the Indo-Pacific.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Q.1 Consider the following countries: (2018)

1. Australia
2. Canada
3. China
4. India
5. Japan
6. USA

Which of the above are among the 'free-trade partners' of ASEAN?

- (a) 1, 2, 4 and 5
- (b) 3, 4, 5 and 6
- (c) 1, 3, 4 and 5
- (d) 2, 3, 4 and 6

Ans: (c)

- The Association of Southeast Asian Nations (ASEAN) has free trade agreements with six partners, namely the People's Republic of China, Republic of Korea, Japan, India as well as Australia and New Zealand.

Haryana's Private Sector Quota Law

For Prelims: [Article 16\(4\)](#), [Article 19](#), [Right to Equality](#), [Fundamental rights](#)

For Mains: Employment reservations in the private sector, Local Reservation in Jobs and Implications.

Source: [IE](#)

Why in News?

The Punjab and Haryana High Court has recently quashed the [Haryana State Employment of Local Candidates Act, 2020](#), which mandated 75% reservation for local candidates in private sector jobs.

- The court has declared the law as **unconstitutional** and violative of the [fundamental rights](#) of citizens and employers.

What is the Haryana Private Sector Quota Law?

- The Haryana State Employment of Local Candidates Act, 2020 was enacted by the state government in March 2021.
 - The law provided for 75% reservation for local candidates in private sector **jobs with a monthly salary of less than Rs 30,000(originally Rs 50,000)** for 10 years.
- The Act covered various entities, including companies, societies, trusts, partnership firms, and large individual employers.
 - Employers with 10 or more employees were included, but **central or state governments and their organizations were exempt.**
- The law required the employers to register their employees on a government portal and to obtain a certificate of domicile for the local candidates.
 - A **"local candidate" domiciled** in the State of Haryana could avail the reservation by registering on a designated online portal.
- The law was aimed at providing employment opportunities and skill development for the local youth, especially the unskilled and semi-skilled workers, and to reduce the influx of migrants from other states.

Note:

- Job reservation Bills or laws for domiciles have also been announced in other States including Andhra Pradesh, Madhya Pradesh and Jharkhand.
- The job quota Bill passed in the Andhra Pradesh Legislative Assembly in 2019, also reserved three-fourths of private jobs for locals.

What are the Concerns Regarding the Haryana Private Sector Quota Law?

- The Faridabad Industries Association and other Haryana-based associations went to high court, contending that Haryana wanted to create reservations in the private sector by introducing a policy of “**sons of the soil**”, which was an infringement of the **constitutional rights of employers**.
 - The petitioners argued that private sector jobs are **purely based on skills and an analytical bent of mind**, and employees have a fundamental right to work in any part of India.
 - They asserted that the government's act of forcing employers to hire local candidates **violated the federal structure of the Constitution**, acting contrary to the public interest and benefiting only one class.
- The Haryana government argued that it had the power to create such reservations under **Article 16(4)** of the Constitution, stating that the **right to equality in public employment** doesn't prevent the state from providing reservations for any backward class not adequately represented in state services.
 - The Haryana government said the law was necessary to **protect the right to life and livelihood of the people** domiciled in the state and to protect their health, living conditions and their right to employment.

What Did the High Court Rule?

- The court noted that Section 6 of the Act, mandating quarterly reports on local candidates, and Section 8, enabling authorized officers to demand verification, were criticized as establishing an “**Inspector Raj**.”
 - Inspector Raj refers to over regulation/supervision by the Government of factories and industrial units.
- The court said the law violated the fundamental right to equality **under Article 14 of the Constitution**, as the law discriminated against the citizens and employers **based on place of birth and residence**.
 - Article 14 guarantees equality before the law and equal protection of the laws to all persons within the territory of India.
- The law also violated the fundamental right to **freedom of trade and commerce under Article 19 (1) (g) of the Constitution**, as it imposed unreasonable restrictions on the employers to hire local candidates, irrespective of their merit and suitability.
- The court believes that forcing private employers to hire only local candidates goes **against the Constitution's vision**, as it could lead to widespread enactments by states **providing similar protection for their residents, creating barriers** that were not intended by the framers of the Constitution.

Legal Insights: [Judgment on Haryana Domicile Reservation](#)

<https://www.drishtijudiciary.com/en>

Sand and Dust Storms

For Prelims: [United Nations Convention to Combat Desertification, Sand and dust storms, Agriculture, Deforestation, Aral Sea, United Nations Food and Agriculture Organization.](#)

For Mains: Sources of Sand and Dust Storms, Effective Ways to Minimize the Impacts of Sand and Dust Storms.

[Source: DTE](#)

Why in News?

The recent meeting of the [United Nations Convention to Combat Desertification \(UNCCD\)](#) shed light on the **far-reaching consequences of sand and dust storms** and proposed crucial policy recommendations to mitigate their effects.

What are Sand and Dust Storms?

▪ About:

- **Sand and dust storms** are meteorological events that occur when **strong winds lift large amounts of sand and dust particles** from the ground and transport them over long distances.
 - They mainly **affect arid and semi-arid regions**, but can also impact areas far from their source.
- Annually, over **two billion tonnes of sand and dust traverse extensive distances across the Earth's atmosphere**, creating a global phenomenon with profound implications.

▪ Sources of Sand and Dust Storms:

- According to the **UNCCD**, sand and dust storms are caused by **both natural and human factors**.
 - About **75% of global dust emissions originate from natural sources** in the world's drylands, such as **hyper-arid regions**, topographic depressions, and dry ancient lake beds.
 - The remaining **25% are attributed to human activities**, mainly agriculture.
- Some of the **Anthropogenic Causes of Sand and Dust Storms** are:
 - **Unsustainable Agricultural Practices:** [Agriculture](#) stands as a primary anthropogenic source, with activities like **tillage, land clearing, and abandoned croplands** contributing to dust emissions.
 - **Land Use Changes:** Alterations in land use patterns, **including deforestation and urbanization**, contribute to the destabilization of surfaces, enhancing dust emissions.
 - **Water Diversion:** Excessive diversion of water from rivers for agricultural purposes can lead to the shrinkage of water bodies, creating new sources of sand and dust storms.
 - For example, **the excessive diversion of water from rivers in Central Asia** over several decades towards agriculture has shrunk the [Aral Sea](#), a pre-existing lake between Kazakhstan to its north and Uzbekistan to its south.
 - It has now become the **Aralkum Desert**, a significant new source of sand and dust storms.
- **Climate-Related Amplifiers:**
 - **Aridity and Minimal Precipitation:** High air temperatures, minimal precipitation, and arid conditions act as drivers, amplifying the likelihood and intensity of these storms.
 - **Extreme Weather Events:** Intensified wind patterns and **prolonged droughts due to climate change** exacerbate the severity and frequency of sand and dust storms.

▪ Impacts:

- **Environmental Impacts:**
 - **Soil Degradation:** Sand and dust storms **strip away fertile topsoil, affecting soil quality and fertility**.
 - This degradation reduces the land's ability to support vegetation, impacting agriculture and leading to desertification.
 - The loss of fertile soil also **affects water retention and nutrient availability**.

- **Ecosystem Disruption:** These storms can alter ecosystems by burying vegetation, disrupting natural habitats, and affecting wildlife.
 - **Invasive species carried by the storms** might outcompete native species, leading to biodiversity loss and ecological imbalance.
- **Socioeconomic Impacts:**
 - **Health Effects:** Health impacts are wide-ranging, **affecting respiratory health, causing allergies**, and exacerbating existing conditions like asthma.
 - Recent incidents, such as a **two-day storm in Mongolia in 2021**, illustrate the devastating impact on human lives, displacing thousands and causing casualties alongside substantial livestock losses.
 - **Economic Losses:** Sand and dust storms cause substantial economic losses by **damaging infrastructure, reducing agricultural productivity, disrupting transportation**, and increasing healthcare costs.
 - These events can also **impact tourism and trade**, affecting local and regional economies.
 - **Social Disruption:** Disrupted daily life due to these storms can lead to social unrest, migration, and displacement.
- **Global Implications:**
 - **Transboundary Impact:** Sand and dust storms do not adhere to **geopolitical boundaries**; they can cross borders, affecting multiple countries.
 - **Climate Feedback:** The transportation of dust particles globally due to these storms can **influence climate feedback loops**, impacting weather patterns and potentially contributing to climate change.

Note: Sand and dust storms also present a formidable challenge to **achieving 11 of the 17 Sustainable Development Goals**, according to the [United Nations Food and Agriculture Organization \(FAO\)](#) report *Sand and dust storms: A Guide to Mitigation, Adaptation, Policy, and Risk Management Measures in Agriculture*.

What are Effective Ways to Minimize the Impacts of Sand and Dust Storms?

- **Preventive Measures:**
 - **Soil Moisture Management:** Implement effective water conservation methods to retain soil moisture and prevent desertification.
 - **Regulatory Framework:** Enforce strict land-use regulations to **curb activities leading to soil degradation and dust emissions**, such as overgrazing or improper land development.
 - **Eco-friendly Practices:** Promote sustainable **agricultural techniques like agroforestry and contour plowing** to preserve soil structure and reduce wind erosion.
- **Preparedness:**
 - **Early Warning Systems:** Developing and implementing **effective early warning systems to forecast sand and dust storms**. This allows communities to prepare and take necessary precautions.
 - **Education and Awareness:** Educating communities about the **risks, impacts, and protective measures** against sand and dust storms can help reduce vulnerability.
 - **Emergency Response Plans:** Establishing plans to respond effectively during and after sand and dust storms, including **providing shelter, medical care, and support for affected communities**.
- **Mitigation Strategies:**
 - **Infrastructure Development:** Building infrastructure like **windbreaks, barriers, or green belts** to reduce the speed and impact of wind carrying dust and sand.
 - **Technological Solutions:** Researching and investing in innovative technologies for **dust suppression and soil stabilization**.

What is the United Nations Convention to Combat Desertification?

- The **UNCCD is the only legally binding framework set up to address desertification and the effects of drought.**
 - There are currently **197 Parties** to the Convention, including **196 country Parties and the European Union.**
- The Convention based on the principles of participation, **partnership and decentralization, is a multilateral commitment to mitigate the impact of land degradation, and protect our land so we can provide food, water, shelter and economic opportunity to all people.**
- The Convention addresses specifically the **arid, semi-arid, and dry sub-humid areas**, known as the drylands, where some of the most vulnerable ecosystems and peoples can be found.

UPSC Civil Services Examination, Previous Year Questions

Prelims

Q. What is/are the importance/importances of the ' United Nations Convention to Combat Desertification' ? (2016)

1. It aims to promote effective action through innovative national programmes and supportive international partnerships.
2. It has a special/particular focus on South Asia and North Africa regions, and its Secretariat facilitates the allocation of major portions of financial resources to these regions.
3. It is committed to a bottom-up approach, encouraging the participation of local people in combating desertification.

Select the correct answer using the code given below:

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (c)

Mains

Q. The process of desertification does not have climate boundaries. Justify with examples. (2020)

Emissions Gap Report 2023: UNEP

For Prelims: Emissions Gap Report 2023, [United Nations Environment Programme \(UNEP\)](#), [Global Warming](#), [Greenhouse Gas Emissions \(GHG\)](#), Nationally Determined Contributions (NDCs), Net-Zero.

For Mains: Emissions Gap Report 2023: UNEP, Environmental pollution and degradation.

Why in News?

Recently, [United Nations Environment Programme \(UNEP\)](#) has released a report titled- **the Emissions Gap Report 2023: Broken Record - Temperatures hit new highs, yet world fails to cut emissions (again)**, stating that urgent Climate Action is crucial to avoid the alarming trajectory of Temperature Rise.

- The report is the 14th edition in a series that brings together many of the world's top climate scientists to look at future trends in greenhouse gas emissions and provide potential solutions to the challenge of [Global Warming](#).

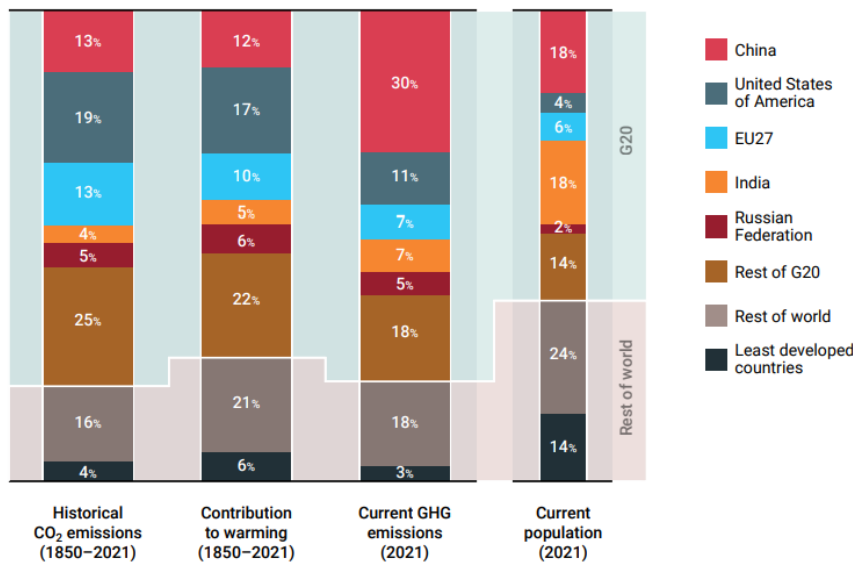
What Emissions Gap Report (EGR)?

- The EGR is UNEP's spotlight report launched annually in advance of the Annual Climate negotiations.
- The EGR tracks the **gap between where global emissions are heading with current country commitments** and where they ought to be to limit warming to 1.5°C.

What are the Key Highlights of the Report?

- **Temperature Rise Trajectory:**
 - Current pledges under the [Paris Agreement](#) set the world on a course for a **2.5-2.9°C temperature rise above pre-industrial levels** by the end of this century.
 - Paris Agreement (also known as the Conference of Parties 21 or COP 21) is a landmark environmental accord that was adopted in **2015 to address climate change and its negative impacts**.
 - To limit warming to 1.5-2°C, substantial emission cuts of **28-42% by 2030 are necessary**.
- **Global Emissions Trends:**
 - [Greenhouse Gas Emissions \(GHG\)](#) hit a new record of **57.4 Gigatonnes of Carbon Dioxide Equivalent (GtCO₂e) in 2022**, with a 1.2% increase from the previous year.
 - Fossil CO₂ emissions account for approximately two thirds of current GHG emissions using 100-year global warming potentials.
 - According to multiple datasets, fossil CO₂ emissions grew between 0.8-1.5% in 2022 and were the main contributor to the overall increase in GHG emissions. In 2022, fluorinated gases emissions grew by 5.5%, followed by Methane at 1.8% and nitrous oxide (N₂O) at 0.9%.
 - GHG emissions across **the G20 also increased by 1.2% in 2022**. However, members vary widely in their trends with increases in **China, India, Indonesia and the United States of America**, but decreases in Brazil, the European Union and the Russian Federation. Collectively, the **G20 currently accounts for 76% of global emissions**.

Current and historic contributions to climate change
(% share by countries or regions)



▪ Emissions from Major Economic Sectors:

- Emissions can be split into five major economic sectors, Energy supply, industry, agriculture and Land use, land-use change and forestry (LULUCF), transport and buildings.
- In 2022, energy supply was the largest source of emissions at 20.9 GtCO₂e (36% of the total), followed by Industry (25%), followed by agriculture and LULUCF CO₂ (18%), transport (14%) and buildings (6.7%).

▪ Mitigation Efforts:

- If current policies and pledges continue, **global warming will likely reach 3°C above pre-industrial levels** by the end of the century.
- Implementing unconditional **Nationally Determined Contributions (NDCs)** could limit the rise to 2.9°C, while conditional NDCs might cap it at 2.5°C.

▪ Net-Zero Pledges:

- Although countries have made **Net-Zero Pledges**, none of the **G20 Countries** are reducing emissions at a pace **consistent with their targets**.
- Even in the most optimistic scenario, the likelihood of limiting warming to 1.5°C is only 14%.

▪ Progress and Challenges:

- Policy progress since the Paris Agreement has reduced the implementation gap but is not sufficient.
- Nine countries updated their NDCs, potentially reducing emissions by **about 9% annually by 2030**.
- However, further reductions are essential to establish least-cost pathways for limiting global warming to 1.5°C.

What are the Recommendations to Bridge the Emissions Gap?

▪ Low-Carbon Development:

- There is a need for **global, low-carbon development transformations**, especially focusing on the energy transition.
- The extraction and **planned use of fossil fuels far exceed** the carbon budget for meeting temperature goals.

▪ Support and Financing:

- Countries with greater capacity and responsibility for generating emissions will **need to take more ambitious action** and provide financial and technical support to developing nations.
- Low- and middle-income countries, which already account for more than two-thirds of global emissions, **must meet their legitimate development needs and aspirations**

with low-emission growth trajectories.

▪ **Carbon Dioxide Removal:**

- Carbon dioxide removal will be needed more in the future. However, there are many risks with new methods of carbon dioxide removal, one of the main ones being that the technology isn't in place yet.
- Essentially, the longer we wait, the harder it's going to be. The world needs to lift the needle out of the groove of insufficient action and begin setting new records on cutting emissions, green and just transitions and climate finance – starting now.

What are the Initiatives to Reduce Emissions in India?

- [Bharat Stage-IV \(BS-IV\) to Bharat Stage-VI \(BS-VI\) emission norms.](#)
- [UJALA scheme.](#)
- [International Solar Alliance.](#)
- [National Action Plan on Climate Change \(NAPCC\).](#)
- [Ethanol Blending in India by 2025.](#)
- [India Updated its NDC.](#)

What is the United Nations Environment Programme?

▪ **About:**

- It is a leading global environmental authority established on 5th June 1972.
- It sets the global environmental agenda, promotes sustainable development within the United Nations system, and serves as an authoritative advocate for global environment protection.

▪ **Headquarters:**

- Nairobi, Kenya.

▪ **Major Reports:**

- Emission Gap Report, [Adaptation Gap Report](#), [Global Environment Outlook](#), Frontiers, Invest into Healthy Planet.

▪ **Major Campaigns:**

- Beat Pollution, UN75, [World Environment Day](#), Wild for Life.

UPSC Civil Services Examination Previous Year Question

Prelims

Q. The 'Common Carbon Metric', supported by UNEP, has been developed for

- (a) assessing the carbon footprint of building operations around the world
- (b) enabling commercial financing entities around the world to enter carbon emission trading
- (c) enabling governments to assess the overall carbon footprint caused by their countries
- (d) assessing the overall carbon footprint caused by the use of fossil fuels by the world in a unit time

Ans: (a)

Mains

Q. Discuss global warming and mention its effects on the global climate. Explain the control measures to bring down the level of greenhouse gases which cause global warming, in the light of the Kyoto Protocol, 1997. (2022)

Distant Gamma-Ray Burst Disturbed Earth's Upper Atmosphere

[Source: TH](#)

Why in News?

According to recent researchers, [gamma-ray burst \(GRB\)](#) triggered by a [supernova](#) explosion in a galaxy situated **nearly two billion light-years from earth**, induced a notable disruption in the [ionosphere](#) of Earth.

What are the Major Takeaways from the Research?

- **Background:**
 - Approximately **two billion years ago**, in a distant galaxy outside our Milky Way, a large star met its end in a colossal explosion known as a supernova. This event released an **immense surge of gamma rays**.
 - The journey of these waves spanned across the cosmos, reaching Earth in **2022**.
- **Takeaways from the Research:**
 - The effects of the gamma-ray burst were studied with the help of the **China Seismo-Electromagnetic Satellite (CSES)**, also called **Zhangeheng**, a **Chinese-Italian mission launched in 2018**.
 - It housed the **Electric Field Detector (EFD) instrument**, providing unprecedented resolution for analysis.
 - The GRB induced a remarkable disturbance in Earth's ionosphere, a zone extending 30-600 miles above the planet's surface, **detected in October, 2022**.
 - The European Space Agency's Integral (**International Gamma-Ray Astrophysics Laboratory**) and several satellites near Earth registered the impact, revealing a **strong variation in the ionosphere's electric field**.
 - The gamma rays lingered for about 13 minutes, affecting the ionosphere for several hours, even **triggering lightning detectors in India**.
 - Scientists **identified this GRB as the most potent ever recorded**.

What is a Gamma Ray Burst?

- **About:**
 - **Gamma-ray bursts are short-lived explosions of [gamma rays](#)**, the most energetic form of light.
 - Lasting from a **few milliseconds to several hours**, they shine hundreds of times brighter than a typical supernova and about a million trillion times as bright as the Sun.
 - Observed in distant galaxies, they are the **brightest electromagnetic events known to exist in the universe**.
- **Types:**
 - Astronomers classify gamma-ray bursts into **long- and short-duration events**. While the two types of events are likely created by different processes, both result in the **creation of a new [black hole](#)**.
 - **Long-duration bursts** last anywhere from **2 seconds to several hours**. Although they are associated with the deaths of massive stars in supernovas, **not every supernova results in a gamma-ray burst**.
 - **Short-duration bursts last less than 2 seconds**. They appear to result from the **merger of two neutron stars into a new black hole**, or the merger of a neutron star and a black hole to form a larger black hole.

What is the Ionosphere?

- **About:**

- The ionosphere is a region of **Earth's upper atmosphere**, spanning an altitude of approximately **30 to 600 miles (50 to 950 kilometers)** above the Earth's surface.
- The ionosphere is **ionized by solar radiation** that creates a layer of charged particles.
 - It is highly sensitive to changing magnetic and electrical conditions in space, usually connected to solar activity. It also **expands and contracts in response to solar radiation**.
- **Significance:**
 - **Radio Propagation:** The ionosphere affects the **propagation of [radio waves](#) by reflecting and refracting them back to Earth**.
 - This phenomenon enables long-distance communication via radio transmissions.
 - **Protection from Solar Radiation:** It shields the Earth's surface from harmful solar radiation, particularly from the sun's extreme ultraviolet rays.
 - **Auroras Formation:** Interactions between charged particles from the sun and the Earth's magnetic field in the ionosphere **create phenomena such as** auroras, which are luminous displays predominantly seen at high latitudes.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q. Recently, scientists observed the merger of giant 'blackholes' billions of light-years away from the Earth. What is the significance of this observation? (2019)

- (a) 'Higgs boson particles' were detected.
- (b) 'Gravitational waves' were detected.
- (c) Possibility of inter-galactic space travel through 'wormhole' was confirmed.
- (d) It enabled the scientists to understand 'singularity'.

Ans: (b)

Rapid Fire Current Affairs

ICMR Debunks Link Between Covid-19 Vaccines and Sudden Deaths

A recent study by the [Indian Council of Medical Research \(ICMR\) dispels concerns about Covid-19 vaccines causing sudden deaths](#).

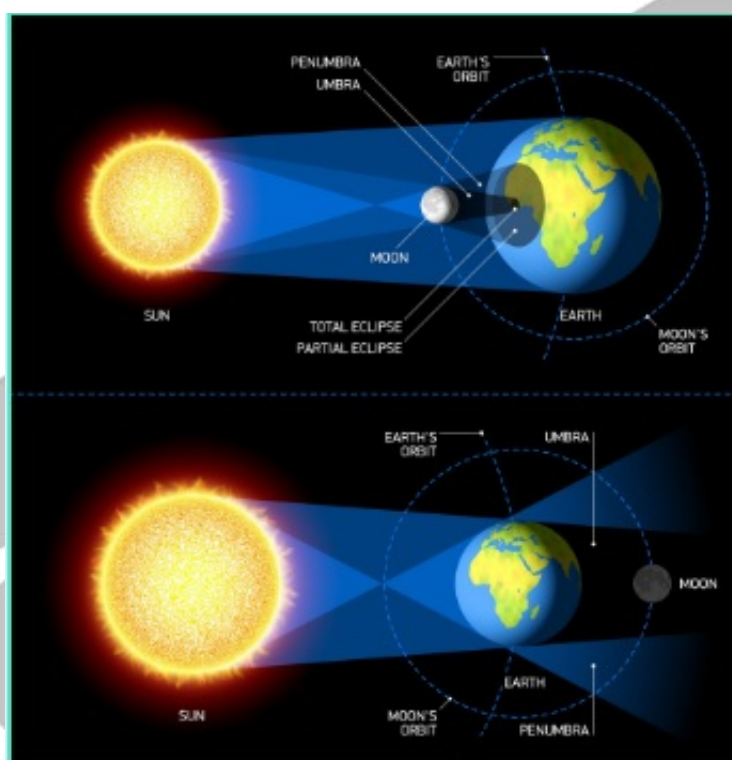
- The study suggests that **vaccination lowers the risk of sudden deaths**, especially in seemingly healthy individuals discharged within 24 hours.
 - Most sudden deaths are **attributed to heart conditions**, including irregular heartbeat, obstructed blood flow, and reduced heart muscle functionality.
 - Family history of sudden death, smoking, binge drinking, and vigorous exercise are identified as other risk factors for sudden deaths.
- The study highlights potential mechanisms through which **Covid-19 might impact heart health**, including damage to heart muscles and blood vessels.
 - **Severe Covid-19 cases** requiring hospitalization are **linked to an increased risk of sudden deaths**, with those experiencing severe illness four times more likely to face such outcomes.

Read more: [Post-Hospitalization Mortality in Covid-19 Patients](#)

Eclipses

Eclipses are astronomical phenomena that occur when **the sun, the moon, and the earth lie in a straight line**. However, eclipses **do not happen on every new moon and full moon day**.

- The moon's orbit around the earth is **tilted by about 5 degrees** to the earth's orbit around the sun.
 - This means that the moon is usually too high or too low to **cast a shadow on the Earth (solar eclipse)** or to **enter the Earth's shadow (lunar eclipse)**.
- Eclipses only occur when the moon crosses the ecliptic plane, which is the plane of the earth's orbit around the sun, **at the same time as it is new or full**.
 - The line of intersection of the planes is called the **line of nodes**. For an eclipse to occur, the moon has to be near one of the nodes.
 - This does not happen on all new moon and full moon days.
- Eclipses happen in pairs, with one solar and one lunar eclipse occurring in two weeks, which is called an **eclipse season**.
 - There are usually two eclipse seasons in a year, at varying times, depending on the alignment of the nodes and the sun.



Read more: [Types of Eclipses](#)

VAJRA PRAHAR 2023: Indo-US Special Forces Unite

The **14th edition of the Indo-US Joint Special Forces exercise, "VAJRA PRAHAR 2023,"** kicked off at Umroi Cantonment, Meghalaya. The first edition was conducted in the year **2010 in India**.

- The US contingent, comprising personnel from the **1st Special Forces Group**, joins forces with **India's Eastern Command-led Special Forces contingent**.
- This exercise, fostering collaboration between the Indian and US armies, focuses on sharing **tactical strategies, mission planning, and operational tactics**.

Read more: [Exercise VAJRA PRAHAR](#)

Thailand's Cabinet Approves Marriage Equality Bill

Recently, **Thailand's Cabinet greenlit an amendment to the Civil and Commercial Code**, paving the way for [same-sex marriage](#) rights in the country.

- The change in language within the code, replacing **"men and women" with "individuals" and "husband and wife" with "marriage partners,"** aims to grant equal rights to same-sex couples.
- It would guarantee the right to form a family in a relationship between same-sex couples, adding that the next step will be an amendment to the pension fund law to recognize same-sex couples as well.

Read more: [Same Sex Marriage: Struggle for Equality](#)

Uttar Pradesh Imposes Ban on Halal Certification

The recent ban imposed by **Uttar Pradesh Food Safety and Drug Administration Commission** on the **production, storage, distribution, and sale of Halal certified food products** within the state under **Section 30 (2) (d) of the Food Safety and Standards Act, 2006** and powers under the **Section 30 (2) (a) of the same Act.**

- The order contends that **halal certification creates confusion regarding the quality of food items**, labeling various products such as dairy goods, bakery items, edible oils, and more.
- Section 30 (2) of the Food Safety and Standards Act, 2006:
 - (a): Restricting for the sake of public health, the **production, storage, circulation, or vending of any food item**, within the entire State or specific regions thereof, for a duration not surpassing one year, as delineated in the order announced and published in the Official Gazette.
 - (d) ensure an **efficient and uniform implementation of the standards and other requirements** as specified and also ensure a high standard of objectivity, accountability, practicability, transparency and credibility.

Read more: [Food Safety and Standards Act, 2006](#)

Tantalum

Source: [IE](#)

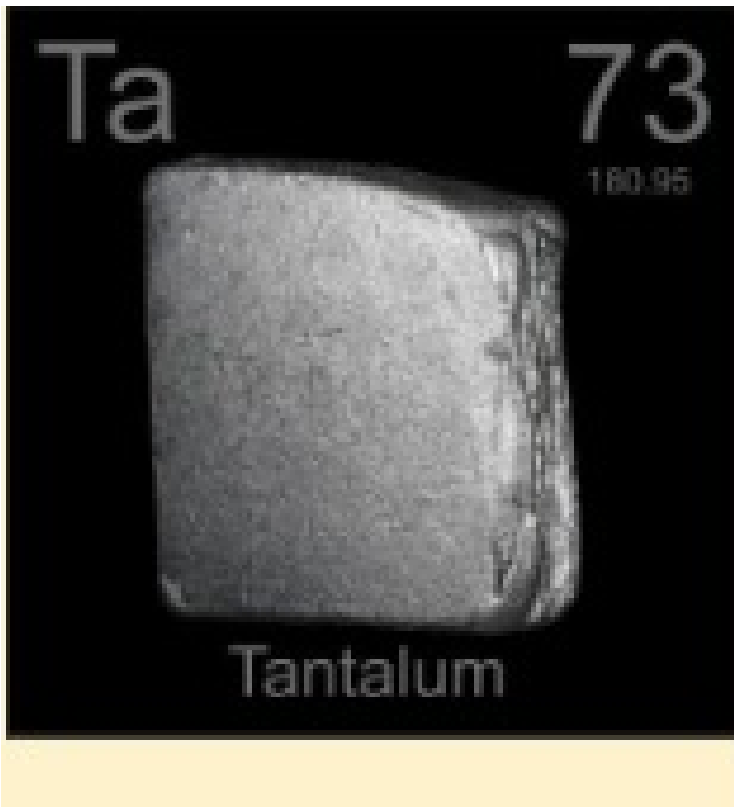
Why in News?

Tantalum, a rare metal with remarkable properties, has been discovered in the sands of the [Sutlej River in Punjab](#) by a team of researchers from the Indian Institute of Technology (IIT), Ropar.

What are the Key Facts About Tantalum?

- **Discovery:**
 - Tantalum is a rare metal with the **atomic number 73**. It was first discovered in 1802 by

Swedish chemist **Anders Gustaf Ekenberg**.



▪ **Properties:**

- It is **grey, heavy, and highly corrosion-resistant**, forming an oxide layer when exposed to air.
- **Pure tantalum is ductile**, allowing it to be stretched into **thin wires without breaking**.
- Extremely **resistant to chemical attack** at temperatures below 150°C, it is affected only by hydrofluoric acid, acidic solutions with fluoride ions, and free sulphur trioxide.
- Tantalum also has an **extremely high melting point**.

▪ **Uses of Tantalum:**

◦ **Electronic Sector:**

- **Capacitors** made from tantalum are vital for storing more electricity in smaller sizes, ideal for portable electronic devices.
- A committee of experts within the Ministry of Mines has recognized a collection of 30 **critical minerals for India**, with **Tantalum** being among them.
- It is also used to make components for chemical plants, nuclear power plants, aeroplanes and missiles.

◦ **Substitute for Platinum:**

- It has a high melting point, and is frequently used as a **substitute for platinum**, which is more expensive.

◦ **Medical Applications:**

- Tantalum **does not react with bodily fluids** and is used to make surgical equipment and implants, like artificial joints, according to the US Department of Energy.

◦ **Cutting-Edge Material:**

- Composite with **tantalum carbide (TaC)** and **graphite** is one of the hardest materials, used in high-speed machine tool cutting edges.

What is the Significance of the Discovery of Tantalum in Sutej?

- The discovery of tantalum in the Sutej River sand indicates that there may be a potential source of tantalum in India, which could **reduce the dependence on imports and increase the domestic supply**.

- India imports most of its Tantalum metal from the United States, United Kingdom and Germany.
 - The discovery of tantalum can help in enhancing [India's electronics and semiconductor Industry.](#)
-

PDF Refernece URL: <https://www.drishtias.com/current-affairs-news-analysis-editorials/news-analysis/22-11-2023/print>

