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Time: 45 Min

Date: 22-03-2024

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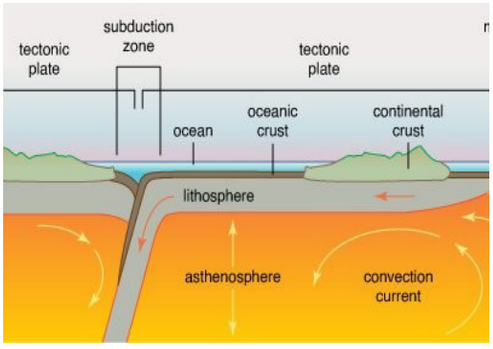
SUBDUCTION ZONE BELOW THE GIBRALTAR STRAIT

Context:

- Recently, scientists predicted the **'Ring of Fire' Subduction Zone** beneath the **Gibraltar Strait**.

Understanding the Subduction Zones:



- They are the regions where **tectonic plates collide** and one plate is thrust beneath another, descending into the Earth's mantle at rates of 2-8 centimetres per year.
  - There are **three ways** in which convergence/ collision can occur
    - Between an oceanic and continental plate;
    - Between two oceanic plates;
    - Between two continental plates.
- The process of subduction is **driven by the temperature difference** between the subducting slab and the **surrounding asthenosphere**, as the colder **oceanic lithosphere** has, on average, **a greater density.**
  - The subducting plate, or 'slab' sinks into the mantle **largely under its weight**.
- These are responsible for the planet's most powerful **earthquakes, tsunamis, volcanic eruptions, and landslides**.

Subduction Zones and the Plates:

- The Earth's lithosphere is divided into **two types of plates: continental and oceanic**, and is **divided into seven major and some minor plates**.
- The **oceanic plates are comparatively heavier**, so when these collide with the continental plates, they subduct downwards, **forming a subduction zone.**

Indian Plate:

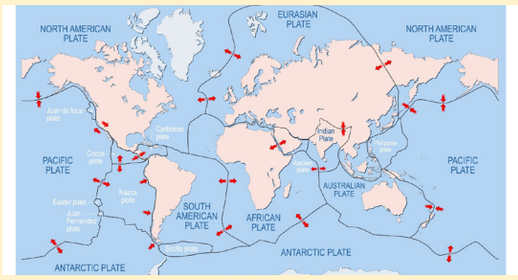
- It includes **Peninsular India** and the **Australian continental portions.**
- The **northward movement of the Indian plate** has significant consequences on the physical environment of the Indian subcontinent.

Major Plates:

- Antarctica and the surrounding oceanic plate;
- North American (with western Atlantic floor separated from the South American plate along the Caribbean islands) plate;
- South American (with western Atlantic floor separated from the North American plate along the Caribbean islands) plate;
- Pacific plate;
- India-Australia-New Zealand plate;
- Africa with the eastern Atlantic floor plate;
- Eurasia and the adjacent oceanic plate;

Minor Plates:

- Cocos Plate : Between Central America and Pacific plate;
- Nazca Plate : Between South America and Pacific plate;
- Arabian plate : Mostly the Saudi Arabian landmass;
- Philippine plate : Between the Asiatic and Pacific plate;



Subduction Zones and Seismic Activity:

- At shallow depths the interface between the plates may become **'locked'** and stresses build along these giant **'megathrust'** faults.
- Eventually, stresses exceed the fault's strength and it breaks free, releasing the **stored energy as seismic (shaking) waves** in an earthquake.

- The massive size of these faults **produces the largest earthquakes on Earth**.

Subduction Zones and Volcanic Activity:

- As the subducting plate descends into the mantle, it undergoes **changes in pressure and temperature** that cause the release of water.
  - This water can trigger the **melting of the overlying mantle**, leading to the **formation of magma** that can rise to the surface, resulting in volcanic eruptions.

Future Implications:

- Subduction zones are **not static** and can evolve over time.
- For instance, the scientists, in a recent study, raised **concerns about the future of the Atlantic Ocean.**

> **Strait of Gibraltar:**
> - It is a channel connecting the **Mediterranean Sea with the Atlantic Ocean**, lying between southernmost Spain and northwesternmost Africa.

- They identified **a subduction zone, known as the 'Ring of Fire'**, that could potentially **swallow the Atlantic Ocean** near the **Strait of Gibraltar**.
  - It is predicted to expand westwards over the next 20 million years.

Source: TOI

SC STAYS CENTRE'S FACT CHECK UNIT NOTIFICATION

Context

- The Supreme Court stayed the **operation of the amended Information Technology (IT) Rules,** which empowered the government to **identify fake news through a Fact Check Unit (FCU).**

Amended Information Technology (IT) Rules

- The amendment to The Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021 notified in 2023 did two things:
  - they brought in a **legal framework** for the online gaming eco-system
  - and introduced a **legal mechanism for the government to fact-check online** content pertaining to **"government business".**
- The Rules made it **obligatory** on intermediaries like social media platforms "to not to publish, share or host fake, false or misleading information in respect of any business of the Central Government".
- The changes raised concern that the FCU will make the government the **"sole arbiter of truth"** in respect of any business related to itself.
- Subsequently, the **rules were challenged before the Bombay High Court.**

Concerns Raised Due to Amended Rules

- IT Rules 2021 as being **violative of Article 14, Article 19(1)(a) and (g), and Article 21 of the Constitution**, and Section 79 and the Information Technology Act, 2000 (IT Act).
- The amendment essentially expanded the **general term "fake news" to include fake news involving government business.**
- The petitioners argued before the court that this would have a **"chilling effect" upon the freedom of speech and expression.**
  - Section 69 of the IT Act empowers the government to issue directions to **block public access to any information through any computer resourc**e. The Rules were framed essentially in exercise of this power.
- The Bombay High Court examined if these Rules were violative of free speech, and were arbitrary in nature.
- **The SC stayed the amended Rules until the Bombay High Court reaches a final conclusion.**
  - The stay will remain in place till the Bombay High Court finally decides the **constitution validity of the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Amendment Rules 2023.**

What is the Fact Check Unit?

- It was established under the **Press Information Bureau (PIB)** and started its **operations in 2019.**
- It was constituted to flag **"fake, false or misleading online content related to the government.**
- The FCU would flag off the fake, false, and misleading facts about the business of the government **to social media intermediaries.**

- Once such a post is flagged off, the **intermediary has the option of either taking down the post or putting a disclaimer on the same.**
  - In taking the second option, the intermediary loses its safe harbour/immunity and stands **liable for legal action.**
- Recently, The government notified the Fact Check Unit **under Information Technology Rules, 2021.**

Source: LM

INDIA'S PLASTIC WASTE MANAGEMENT (AMENDMENT) RULES, 2024

Context

- The **Ministry of Environment and Forests (MoEF)** has introduced a new set of amendments to **India's Plastic Waste Management (Amendment) Rules, 2024.**

About

- It defines **biodegradable plastics** as **not only capable of degradation** by biological processes in specific environments such as soil, landfill but **also as materials that do not leave any microplastics.**
- **Rules** specify that the **makers of disposable plastic ware** can label them as biodegradable **only when they do not leave any microplastics behind.**

Need for the Amendment

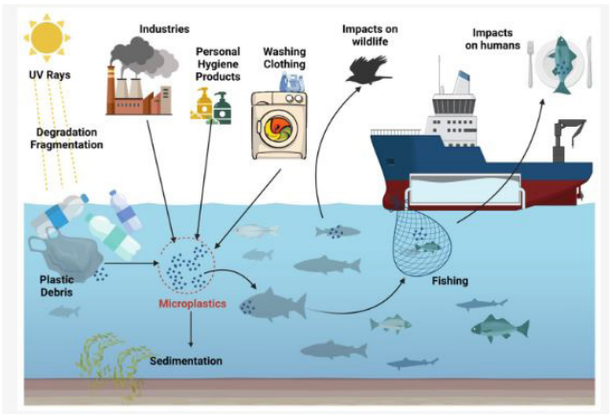
- **Ambiguity:** After the Union government banned single-use plastic in 2022, and recommended the adoption of biodegradable plastic, the question of **what exactly constituted biodegradable plastic was unanswered.**
- **The Central Pollution Control Board (CPCB)** refused to provide a **'provisional certificate'** to licence the products as biodegradable because the CPCB only considers as biodegradable a plastic sample that has **90% degraded, and such a process takes at least two years.**

Biodegradable and Compostable Plastics

- **Biodegradable plastic** involves plastic goods being **treated before they are sold.**
  - When discarded, the **material is expected to decompose naturally** over time though there are no tests yet to determine if such plastics completely degrade.
- **Compostable plastics,** on the other hand, do degrade, but **require industrial or large municipal waste management facilities to do so.**
- Biodegradable plastic and compostable plastic are projected as the **two broad kinds of technological fixes** to India's burgeoning problem of plastic waste pollution.

What is Plastic and Microplastics?

- The word plastic is derived from the Greek word **plastikos,** meaning "**capable of being shaped or moulded."**
- Plastic refers to a **wide range of synthetic or semi-synthetic materials** that use **polymers** as a main ingredient with their defining quality being their **plasticity** – the ability of a solid material to undergo permanent deformation in response to applied forces.
  - This makes them extremely **adaptable, capable of being shaped as per requirement.**
- The basic building blocks of plastics are **monomers,** which are small molecules that can join together to form long chains called **polymers through a process called polymerization.**
- **Microplastics:** Plastics break down into their smaller units called **microplastics** – officially defined as plastics **less than five millimetres in diameter.**
  - These microplastics find their way across the planet, from the depths of the Pacific Ocean to the heights of the Himalayas.
  - According to the most recent global estimates, **an average human consumes at least 50,000 microplastic particles annually** due to contamination of the food chain, potable water, and air.



Environmental Concerns of Microplastics

- **Marine Pollution:** Microplastics enter oceans through various pathways, including direct disposal, runoff from land, and fragmentation of larger plastic debris.
  - Marine organisms such as fish, seabirds, and marine mammals ingest microplastics, leading to physical harm, blockages in digestive systems, and potential transfer of toxins up the food chain.
- **Freshwater Contamination:** Microplastics are also found in freshwater environments, such as rivers, lakes, and streams.
- **Bioaccumulation and Biomagnification:** Microplastics have the potential to accumulate in the tissues of organisms through processes like ingestion and adsorption.
  - As predators consume prey containing microplastics, these contaminants biomagnify, reaching higher concentrations in organisms at the top of the food chain, including humans.
- **Habitat Degradation:** Microplastics presence interfere with nutrient cycling, sediment stability, and the behavior of organisms.
  - In some cases, microplastics create microenvironments that favor the growth of harmful bacteria or invasive species, further disrupting ecosystem dynamics.
- **Global Distribution:** Microplastics have been detected in diverse environments worldwide, including remote and pristine locations far from major sources of plastic pollution.
  - Their global distribution highlights the pervasive nature of plastic contamination and underscores the need for coordinated international efforts to address this issue.

India's Efforts In Tackling Plastic Waste

- **Ban on single-use plastics:** India has banned the production, use, and sale of single-use plastics such as bags, cups, plates, cutlery, and straws in many states.
- **Extended Producer Responsibility (EPR):** The Indian government has implemented EPR, making plastic manufacturers responsible for managing and disposing of the waste generated by their products.
- **Plastic Waste Management Rules:** India introduced the Plastic Waste Management Rules in 2016, which provide a framework for managing plastic waste through various measures, including recycling and waste-to-energy initiatives.
- Plastic Waste Management (Amendment) Rules, 2022:
  - The guidelines on EPR(Extended Producer Responsibility) coupled with the prohibition of identified single-use plastic items.
  - It banned the manufacture, import, stocking, distribution, sale and use of carry bags made of virgin or recycled plastic less than seventy-five micrometers.
- **Swachh Bharat Abhiyan:** The Indian government launched the Swachh Bharat Abhiyan, a national cleanliness campaign, which includes the collection and disposal of plastic waste.
- **Plastic Parks:** Government has set up Plastic Parks, which are specialized industrial zones for recycling and processing plastic waste.
- **Beach clean-up drives:** The Indian government and various non-governmental organizations have organized beach clean-up drives to collect and dispose of plastic waste from beaches.
- **India is a signatory to MARPOL (International Convention on Prevention of Marine Pollution).**
- **The "India Plastic Challenge – Hackathon 2021**
  - It is a unique competition calling upon start-ups /entrepreneurs and students of Higher Education Institutions (HEIs) to develop innovative solutions to mitigate plastic pollution and develop alternatives to single-use plastics.

Source: TH

MULTILATERAL TREATIES REQUIRED FOR INDUS, GANGA, BRAHMAPUTRA MANAGEMENT

Context

- With erratic rainfall and flooding affecting people in south Asia, an **integrated river basin management approach for the Indus, Ganga and Brahmaputra** rivers can help those living across these river basins.

About

- The recent report on integrated river basins has been authored by **Kathmandu-based International Centre for Integrated Mountain Development (ICIMOD)** and **Australian Water Partnership**, a body funded by the Australian government.

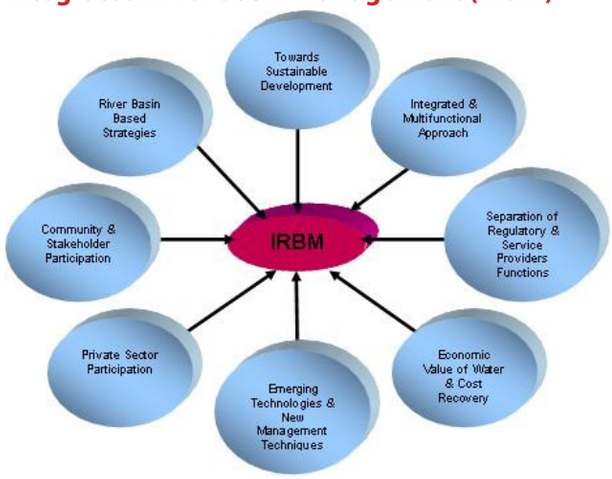
Highlights of the study

- **Growing challenge:** People in India, China, Pakistan, Afghanistan, Nepal and Bhutan **depend on these three rivers for their food and water security**, the study highlighted.
  - The **Indus is a lifeline for 268 million peopl**e who live in its river basin whereas approximately **114 million people depend on the Brahmaputra** for water, electricity, food, agriculture and fishing.
- **No multilateral treaty:** Even as there are bilateral treaties such as the **Indus Water Treaty** between India and Pakistan or agreements on Brahmaputra between India and China, **no multilateral agreements or treaties exist on this issue.**
  - The report said **600 million Indians, 29 million from Nepal and millions in Bangladesh live in the Ganga** river basin area. However, there is no agreement involving Nepal, India and Bangladesh.
- There were **substantial data and knowledge gaps** across the Ganga river basin regarding social, economic and environmental realities and even on water usage.

Major recommendations

- **Plug data gap:** The reports recommended that **data gaps on river basins need to be plugged** for better water management, early warning and to facilitate disaster management.
- **Whole basin research approach:** Developing data using a 'whole basin' research approach would yield benefits:
  - Data-sharing would inform more reliable water accounting, underpin strategic basin planning, increase transboundary understanding of the long-term impacts of climate change, secure more reliable water supply to all users even under uncertain conditions.
- **Hydro-solidarity and climate diplomacy:** The report also called for greater 'hydro-solidarity' and climate diplomacy among researchers to build trust between countries and move towards greater dialogue.
- **Importance of harnessing indigenous and local knowledge systems:** It holds so many insights into how local communities can act to resolve problems quickly and effectively during a crisis. Governments need to empower local communities with knowledge and technology to nurture their resilience.
- **Integrated River Basin Management:** A basin-wide approach to river planning, backed by quality data sharing on water availability, biodiversity and pollution between all stakeholders.

Integrated River Basin Management (IRBM)



- IRBM is a **comprehensive approach that aims to harmonize the planning and management of water resources**, sustainable development, and strategies within a river basin.
- IRBM involves **coordinating conservation, management, and development of water, land, and related resources** across sectors within a specific river basin.
- It emphasizes the **integration of ecological, social, and economic aspects** to achieve equitable and sustainable water use.
- **The European Union** has actively promoted IRBM through two key framework directives:
  - Water Framework Directive (WFD) and
  - Flood Risk Management Directive (FRMD).

Challenges:

- **Cross-Sectoral Coordination:** Balancing competing interests across sectors (e.g., agriculture, industry, environment) can be complex.
- **Data and Knowledge Gaps:** Adequate data on water availability, quality, and ecosystem health are essential.
- **Legal and Institutional Frameworks:** Harmonizing policies and regulations across administrative boundaries is crucial.
- **Climate Change:** Adapting IRBM strategies to changing climate conditions is a challenge.

- **Public Participation:** Engaging communities and ensuring their active involvement is also challenging.

Measures:

To enhance IRBM effectiveness, consider the following measures:

- **Holistic Planning:** Develop comprehensive river basin plans that integrate environmental, social, and economic considerations.
- **Stakeholder Engagement:** Involve local communities, NGOs, and industry representatives in decision-making processes.
- **Ecosystem-Based Approaches:** Prioritize ecosystem health and resilience.
- **Monitoring and Assessment:** Regularly assess water quality, quantity, and ecosystem status.
- **Adaptive Management**: Continuously adjust strategies based on new information and changing circumstances.

Conclusion:

- IRBM strives for a **balanced and sustainable approach to managing our precious water resources,** hence needs to be promoted at every level of planning.

Source: IE

NUCLEAR ENERGY

In News

- World leaders gathered in Brussels at the first ever **Nuclear Energy Summit** to highlight the role of nuclear energy in addressing the global challenges to reduce the use of fossil fuels.

About the summit

- The Summit comes in the wake of the historic inclusion of **nuclear energy in the Global Stocktake** agreed at the **UN Climate Change Conference (COP28)** in Dubai in December 2023, which called for accelerating its deployment along with other low carbon energy sources.
  - The declaration signed by 22 world leaders mentioned the need to triple nuclear energy capacity by 2050.
- The summit is an initiative in collaboration with the IAEA's 'Atoms4Netzero' programme, and is part of the multilateral approach to decarbonisation.

Nuclear Energy

- Nuclear energy is a form of energy released from the nucleus, the core of atoms, made up of protons and neutrons.
  - This source of energy can be produced in two ways: fission – when nuclei of atoms split into several parts – or fusion – when nuclei fuse together.
- The nuclear energy harnessed around the world today to produce electricity is through nuclear fission, while technology to generate electricity from fusion is at the R&D phase.

Importance

- Nuclear power is a low-carbon source of energy, because unlike coal, oil or gas power plants, nuclear power plants practically do not produce CO2 during their operation.
- Nuclear reactors generate close to one-third of the world's carbon free electricity and are crucial in meeting climate change goals.
- Most importantly, nuclear power has the capacity to supply uninterrupted energy irrespective of geographical constraints making it a crucial component of the wider renewable energy mix.
- Nuclear power plants (NPP) also have **low operating costs**, **smaller land imprint** and a **longer life cycle** compared to all the other renewable energy sources.
- It enhance energy security and boost economic development

Recent Developments

- Recent developments in nuclear technology including **Small Modular Reactors (SMR), radiation proofing in existing plants**, and **extended fuel cycles**, have the potential to substantially mitigate nuclear-related risks.
- The role of technical advancements in reducing carbon emissions is highlighted by an IAEA study, which predicts that while existing technologies will play a significant role, by 2050, half of carbon reductions will come from technologies currently in the prototype stage.
- There are 440 nuclear reactors in the world, accounting for a quarter of the world's low-carbon energy.
  - The number of nuclear reactors is increasing, with 60 reactors under construction and 110 in the planning stage, most being in Asia, particularly China, which is soon to overtake the U.S. and the nuclear giant France.

Challenges and Concerns

- An uncontrolled nuclear reaction in a nuclear reactor could result in widespread contamination of air and water.
- However, in spite of technical advancements, Multilateral Development Banks (MDBs) and private investors have not made any significant contribution to the industry.
- The World Bank has not provided financing for a nuclear project since its $40 million loan to Italy in 1959.
- The operation of nuclear power plants produces waste with varying levels of radioactivity.

Status in India

- **India's first commercial** NPP in Pahalgarh, Tarapur offers **reliable energy** at 2/kWh lower than solar power tariffs.
- **At Kudankulam**, Tamil Nadu, a newer power plant offers electricity in the range of 4-6/kWh comparable to coal-fired thermal power plants.
- Despite its versatile nature, nuclear power contributes **only 1.6%** of the total renewable energy mix in India.
  - Stigma, weaponization risk, radiation leak, regulation, high upfront cost, and long project overruns are the reasons for low adoption rate of nuclear energy.

Conclusion and Way Ahead

- The nuclear industry has been undergoing novel liberalisation, with ambitious plans for growth in India and abroad.
- Beginning with the invitation of $26 billion in private investments, a phase-wise tripling of nuclear capacity from 7,480 MW to 22,480 MW by 2031-2032, and Prime Minister Modi's attendance at the core loading of the Prototype Fast Breeder Reactor (PFBR) all mark a positive future for the industry.
  - The PFBR's ability to generate fuel and power at the same time represents a significant advancement in India's mostly self-reliant nuclear industry.
- There is also a pressing need to reassess nuclear financing policies of Multilateral Development Banks (MDBs) to accommodate private capital or blended finance models.
- Financial creativity and market support with low interest rates can unravel the potential of nuclear energy at scale.
- There are successful financial practices that can be replicated, for instance the cooperative funding models of France, South Korea, Russia, and the U.K. where a group of investors raise credit from the market and take full responsibility for project delivery.

Source:TH

NEWS IN SHORT

PROJECT GAIA

Context

- The European Central Bank, the Bank for International Settlements, the Bank of Spain, and the Bundesbank of Germany introduced **Project Gaia.**

About

- **Project Gaia** aims to help analysts search corporate climate-related disclosures and extract data quickly and efficiently using artificial intelligence (AI).
- The Project integrated **Large Language Models (LLMs)** into an application and leveraged it for data extraction.

Large Language Models (LLMs)

- A large language model (LLM) is a type of **artificial intelligence (AI)** algorithm that uses deep learning techniques and massively large data sets to understand, summarize, generate and predict new content.
- **Deep learning** involves the probabilistic analysis of unstructured data, which eventually enables the deep learning model to recognize distinctions between pieces of content without human intervention.

Source: ET

INDIA'S 'PROTECTED' BASMATI VARIETIES RENAMED & CULTIVATED IN PAK

Context

- The **Indian Agricultural Research Institute (IARI)** has recently red-flagged the **"illegal" cultivation of its blockbuster varieties in Pakistan.**

About

- IARI has demanded initiation of legal action against unscrupulous seed firms in Pakistan **"to protect the interests of our farmers and exporters".**
  - High-yielding basmati varieties account for **roughly 90% of India's projected $5.5 billion exports of the aromatic rice in 2023-24** (April-March).
- According to IARI, the illicit seed sales and cultivation of IARI varieties in Pakistan **started with Pusa Basmati-1121 (PB-1121).**
- Pakistan is growing other popular IARI-bred varieties too, such as **Pusa Basmati-6 (PB-6) and PB-1509('Kissan Basmati')** released in 2010 and 2013 respectively.

Legal Backing in India

- All the varieties that are bred are **notified under the Seeds Act, 1966** for cultivation in the officially demarcated **Geographical Indication area** of basmati rice within India, covering 7 northern states.
- They are further registered under the **Protection of Plant Varieties and Farmers' Rights Act, 2001.**
  - This Act **allows only Indian farmers to sow, save, re-sow, exchange or share the seeds** of any protected/registered varieties. Even they cannot violate the breeder's rights by selling the seeds in branded, packaged and labeled form.

Key Facts related to Basmati Rice

- India is the leading exporter of Basmati Rice in the World.
- **Major Export Destinations (2022-23) :** Saudi Arabia, Iran, Iraq, United Arab EMTs and Yemen Republic.
- **Areas of Cultivation in India:** J & K, Himachal Pradesh, Punjab, Haryana, Delhi, Uttarakhand and western Uttar Pradesh.

Source: IE

GREAT INDIAN BUSTARD

Context

- **The Supreme Court** constituted an **expert committee** to balance the conservation and protection of the **Great Indian Bustard bird population.**

About

- **Scientific Name: Ardeotis nigriceps**
- **Appearance:** The great Indian bustard can easily be distinguished by its **black crown on the forehead contrasting** with the **pale neck and head.**
  - The body is brownish and the wings are marked with black, brown and grey.

- **Diet:** They feed on grass seeds, insects like grasshoppers and beetles, and sometimes even small rodents and reptiles.
- **Habitat:** Flat open landscapes with minimal visual obstruction and disturbance, therefore adapt well in grasslands.
- **Distribution:** Its population is confined mostly to Rajasthan and Gujarat. Small population occur in Maharashtra, Karnataka and Andhra Pradesh.
- **Threats:**
  - Poaching outside Protected Areas,
  - collisions with high tension electric wires, fast moving vehicles and free-ranging dogs in villages,
  - habitat loss.
- **Conservation Status:**
  - Listed in Schedule I of the Indian Wildlife (Protection)Act, 1972,
  - Appendix I of CITES,
  - Critically Endangered on the IUCN Red List.

Source: TH

SOUND LASER

Context

- **Researchers in China** have **built a new device** that can create a **laser beam out of sound particles.**

About

- It is an unprecedentedly **bright laser that shoots particles of sound instead of light.**
- Unlike regular lasers that emit light particles called **photons,** these **machines release particle-like chunks of sounds called phonons.**
- Also known as **Sound Amplification by Stimulated Emission of Radiation (SASER)**, these "sound lasers" produce a beam of uniform sound waves on a **nanoscale.** The **first successful SASERs were developed in 2009.**
- **Significance:** These particles can be used in optoelectronics, terahertz-frequency ultrasound, signal modulation and manipulating nanoparticles.
  - Laser's ability to move through liquids without being distorted could prove useful in everything from **biomedicine to underwater imaging.**

Source: NDTV

OPERATION INDRAVATI

Context

- India launched '**Operation Indravati'** to evacuate its nationals from Haiti.

Background

- **Haiti** has been witnessing violence for over two years since the July 2021 assassination of President Jovenel Moise.
- Now various armed groups launched coordinated attacks on key installations in Haiti in an attempt to force the resignation of the country's de facto leader Prime Minister Ariel Henry.

About Haiti

- **Capital:** Port-au-Prince
- Haiti, is a country on the island of Hispaniola in the **Caribbean Sea,** east of **Cuba** and **Jamaica**, and south of **The Bahamas.**

Source: HT