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COMMUNITY-BASED FOREST MANAGEMENT (CBFM)

Context

- Residents of 30 villages in Uttarakhand establish a model for public participation in saving forests from wildfires

About the Community-Based Forest Management (CBFM)

- It represents a paradigm shift in forest conservation, emphasizing the active participation and empowerment of local communities.
- It recognizes that the people living in and around forests are best positioned to manage and protect these vital ecosystems.
- By involving **communities in decision-making processes** and giving them a stake in the sustainable management of forest resources, CBFM aims to achieve both **ecological and socio-economic benefits.**

Importance of Forests

- Forests play a crucial role in maintaining ecological balance. They act as carbon sinks, absorbing carbon dioxide and mitigating climate change.
- They also provide habitat for countless species, maintain soil health, and regulate water cycles.
- The destruction of forests leads to biodiversity loss, increased greenhouse gas emissions, and disruption of local communities.

Need for CBFM

- Traditional top-down approaches to forest management often overlooked the knowledge and needs of local communities, leading to conflicts and ineffective conservation efforts.
- In contrast, CBFM acknowledges that local communities have a deep understanding of their environment and a vested interest in its preservation.
- It aims to harness this local knowledge and commitment to achieve sustainable forest management.

Key Principles of CBFM

- **Participatory Decision-Making:** CBFM involves communities in the decision-making process, ensuring that their voices are heard and their knowledge is valued.
    - It fosters a sense of ownership and responsibility among community members.
- **Empowerment and Capacity Building:** CBFM empowers communities by providing them with the necessary skills and resources to manage forest resources sustainably.
    - Capacity-building initiatives, such as training in sustainable practices and legal frameworks, are essential components of this approach.
- **Benefit Sharing:** One of the **core principles** of CBFM is the equitable sharing of benefits derived from forest resources.
    - It includes not only financial benefits but also access to non-timber forest products, such as fruits, nuts, and medicinal plants.
- **Sustainable Practices:** CBFM promotes sustainable forest management practices, such as agroforestry, reforestation, and controlled harvesting.
    - These practices help maintain the ecological balance of forest ecosystems while supporting the livelihoods of local communities.

Success Stories

- **Joint Forest Management (JFM) in India:** India has implemented JFM programs in various states, involving local communities in the management and protection of forest areas.
    - These programs have led to improved forest cover, enhanced biodiversity, and increased incomes for participating communities.
- **Community Forestry in Nepal:** Nepal's community forestry program has been highly successful, with thousands of community forest user groups managing vast forest areas.

- It has not only improved forest health but also contributed to poverty alleviation and social cohesion.

- **Participatory Forest Management in Tanzania:** In Tanzania, participatory forest management has empowered local communities to take charge of forest resources, leading to reduced deforestation rates and increased community resilience.

Challenges

- **Institutional Support:** Effective CBFM requires strong institutional support and legal frameworks to ensure the rights and responsibilities of communities are recognized and protected.
- **Resource Allocation:** Adequate funding and resources are essential for capacity-building and implementing sustainable practices.
  - Ensuring that communities have access to these resources is crucial for the success of CBFM initiatives.
- **Challenge of Wildfires:** Uttarakhand has been grappling with frequent wildfires, which have caused significant damage to its forest cover.
  - The state loses thousands of hectares of forest each year due to these fires, which are often exacerbated by human activities and climate change.
  - The traditional approach to firefighting has involved government agencies and external support, but the involvement of local communities has proven to be a game-changer.

Key Strategies

- **Fire Prevention:** The villagers have implemented preventive measures such as clearing dry leaves and branches, creating firebreaks, and conducting regular patrols to detect and address potential fire hazards.
- **Training and Awareness:** Community members have been trained in firefighting techniques and the use of equipment.
  - Awareness campaigns have been conducted to educate villagers about the importance of forest conservation and the risks associated with wildfires.
- **Collaboration with Authorities:** The community has established strong ties with local forest departments and other relevant authorities.
  - It ensures that the efforts of the villagers are supported by professional expertise and resources.

BANKING ON FLAWED DRUG VOLUNTARY LICENCES

Context

- The Medicines Patent Pool is pushing for more voluntary licenses, but its bad deal with Novartis on a cancer drug shows the pitfalls

About

- The **concept of voluntary licences (VLs)** in the pharmaceutical industry is often hailed as a solution to improve access to essential medicines in low- and middle-income countries (LMICs).
- However, a closer examination reveals that the system is fraught with challenges and inefficiencies.

Illusion of Access

- Voluntary licences are agreements where patent holders allow generic manufacturers to produce and sell their drugs at lower prices in LMICs.
- While this sounds promising, the reality is often different. A case in point is the Medicines Patent Pool's (MPP) deal with Novartis on the **cancer drug nilotinib.**
- Despite the fanfare surrounding the deal, it was later revealed that nilotinib was no longer under patent protection, rendering the VL unnecessary.

Pitfalls of Voluntary Licensing

- **Patent Thickets:** Many new drugs are surrounded by multiple patents, making it difficult for generic manufacturers to navigate the complex intellectual property landscape.
  - It can delay the production and distribution of affordable medicines.

- **Secondary Patents**: Innovator companies often secure secondary patents to extend the exclusivity period of their drugs, further complicating the VL process.
- **Limited Scope:** VLs often cover only a fraction of the global market, leaving many patients without access to affordable medicines.
- **Regulatory Hurdles:** Generic manufacturers must navigate stringent regulatory requirements to gain approval for their versions of patented drugs, which can be time-consuming and costly.

Need for Compulsory Licences

- Compulsory licences (CLs) are a legal mechanism that allows governments to override patents in the interest of public health.
    - Unlike VLs, CLs can be issued without the consent of the patent holder and can cover a broader range of drugs.
- However, few developing countries have utilized CLs due to fear of retribution from wealthy nations where patent holders are based.

Moving Forward

- **Strengthening CL Mechanisms:** Governments should be encouraged to use CLs more effectively to ensure timely access to affordable drugs.
- **Enhancing VL Transparency:** The VL process should be more transparent, with clear criteria for selecting generic manufacturers and ensuring that the drugs covered are truly in need of licensing.
- **Global Collaboration:** International organizations and governments should work together to create a more equitable system for drug access, including addressing the root causes of patent thickets and secondary patents.

150 YEARS OF INDIA METEOROLOGICAL DEPARTMENT (IMD)

Context

- Recently, India Meteorological Department (IMD) celebrated its 150th anniversary on January 15, 2025.

Historical Background

- The roots of meteorology in India can be traced back to ancient times, with early philosophical texts discussing weather phenomena.
- However, modern meteorology gained scientific grounding in the 17th century with the invention of instruments like the thermometer and barometer.
- The establishment of **IMD in 1875** was a response **to the devastating cyclones that hit Kolkata and the Andhra coast in 1864**, highlighting the need for systematic weather monitoring.
    - IMD began its operations with **HF Blanford as the Imperial Meteorological Reporter**.
- Over the years, IMD has grown into a comprehensive organization with permanent observatories and automatic weather stations across the country.
- **Parent Ministry:** Ministry of Earth Sciences, Government of India.

Key Functions

- **Weather Forecasting:** Meteorological departments provide daily weather forecasts, including temperature, precipitation, wind speed, and humidity.
    - These forecasts are crucial for planning daily activities, agricultural practices, and outdoor events.
- **Climate Monitoring:** These departments monitor long-term climate trends and changes, providing valuable data for climate research and policy-making.
    - It helps in understanding global warming, sea-level rise, and other climate-related phenomena.
- **Severe Weather Warnings:** Meteorological departments issue warnings for severe weather events such as cyclones, hurricanes, thunderstorms, and heatwaves.
    - These warnings help communities prepare and take necessary precautions to minimize damage and loss of life.

- **Support for Various Sectors:** Meteorological data is essential for sectors like agriculture, aviation, and disaster management.
    - Farmers rely on weather forecasts for crop planning, while pilots use weather information for safe navigation.
    - Disaster management agencies use weather data to prepare for and respond to natural disasters.

Technological Advancements

- Modern meteorological departments utilize advanced technologies such as satellites, radar systems, and computer models to improve the accuracy of weather forecasts.
- These technologies enable real-time monitoring of weather conditions and provide detailed information on atmospheric phenomena.

Key Achievements

- A METOX Radio Theodolite ground system used in 1970, showcasing advancements in meteorological surveying techniques;
- On February 18, 1911, India's first flight from Allahabad to Naini was supported by IMD's weather information and forecasts;
- IMD adopted radar technology at Safdarjung Airport, New Delhi, in 1958, enhancing weather tracking and disaster preparedness;
- Thiruvananthapuram Observatory, established in 1853, is one of India's earliest centres for meteorological research;
- Pilot balloon observations, critical for wind data measurements, laid the foundation for modern atmospheric studies;

Major Initiatives

- **National Monsoon Mission (NMM):** Improves monsoon forecasts to help agriculture, water management, and disaster planning.
- **Mausam App:** A mobile app for weather updates, forecasts, and severe weather alerts.
- **Doppler Weather Radars (DWR):** Tracks storms, rainfall, and wind patterns for accurate weather predictions.
- **Agro-Meteorological Advisory Services (AAS):** Provides weather-based advice to farmers for better crop planning.
- **System of Air Quality and Weather Forecasting (SAFAR):** Monitors air quality and weather in major cities to guide pollution management.

Challenges and Future Directions

- Despite the advancements, meteorological departments face challenges such as funding constraints, data accuracy, and the need for continuous technological upgrades.
- To address these challenges, there is a need for increased investment in meteorological research, collaboration with international organizations, and public awareness campaigns to emphasize the importance of weather forecasting.

CIRCULAR ECONOMY & PLASTIC POLLUTION TREATY

Context

- The global community is increasingly recognizing the urgent need to address plastic pollution, a crisis that threatens ecosystems, human health, and the planet's future.
- A key component of the solution lies in embracing the principles of the circular economy within the framework of a comprehensive plastic pollution treaty.

World's Waste Problem is Growing Fast

- According to the **World Bank**, over 2 billion tonnes of municipal solid waste are produced each year, and this figure is expected to rise to **3.4 billion tonnes by 2050.**
- This rapid increase in waste poses significant environmental, economic, and public health challenges.

Causes of the Growing Waste Problem

- Rapid urbanization and industrialization have led to increased consumption and production of goods.
- In developing countries, the lack of reliable waste collection services and proper disposal infrastructure exacerbates the issue.
- Additionally, the proliferation of single-use plastics and non-biodegradable materials has added to the waste burden.

Environmental Impact

- Waste disposal in landfills and open dumps releases harmful greenhouse gases, particularly methane, which is 80 times more potent than carbon dioxide.
- Plastic waste, in particular, poses a major threat to marine ecosystems, with millions of seabirds and marine mammals falling victim to plastic debris each year.

Understanding the Circular Economy

- The circular economy is a sustainable economic model that aims to eliminate waste and the continual use of resources.
    - It contrasts with the traditional linear economy, which follows a **'take, make, dispose' approach.**
- Instead, the circular economy focuses on designing products for longevity, reuse, and recycling, keeping materials in use for as long as possible and regenerating natural systems.

Role of a Plastic Pollution Treaty

- A plastic pollution treaty, currently under negotiation at the United Nations, seeks to establish legally binding global rules to tackle plastic pollution comprehensively.
- This treaty aims to address the entire life cycle of plastics, from production to disposal, and promote sustainable practices.

Integrating Circular Economy Principles

- **Eliminate:** Reducing the production and use of unnecessary plastics.
- **Innovate:** Designing plastics that are easier to reuse, recycle, or compost.
- **Circulate:** Ensuring that plastics are kept in use for as long as possible through recycling and reuse.

INTERNATIONAL CARBON EXCHANGE

Context

- **Indonesia** launched its international carbon exchange, allowing foreign investors to buy carbon credits generated by activities that reduce carbon dioxide emissions.
    - The initiative is part of Indonesia's commitment **to achieving carbon neutrality by 2050 and closing coal power plants by 2040.**

About the International Carbon Exchange

- It involves the buying and selling of carbon credits, which represent a reduction of one metric ton of carbon dioxide or its equivalent in other greenhouse gases.
- These credits can be generated from various projects, such as reforestation, renewable energy, and energy efficiency initiatives.
- By purchasing carbon credits, companies and individuals can compensate for their emissions and support climate-friendly projects around the world.

Key Players in International Carbon Exchange

- **United Nations Framework Convention on Climate Change (UNFCCC):** The UNFCCC oversees the **Clean Development Mechanism (CDM)**, which issues **Certified Emission Reductions (CERs)** for emission reduction projects in developing countries.
    - The UNFCCC also partners with platforms like the **AirCarbon Exchange** to promote carbon offsetting.
- **International Carbon Action Partnership (ICAP):** ICAP is a global forum for governments and public authorities that have implemented or are planning to implement **emissions trading systems (ETS)**.

- It provides a platform for sharing best practices and promoting the development of carbon markets.

- **Carbon Trade Exchange (CTX):** CTX is a digital carbon offsetting exchange that allows buyers and sellers to trade carbon credits in a transparent and secure manner.
  - It offers a wide range of certified carbon offsets and supports projects that contribute to global climate goals.
- **Down To Earth Carbon (DTEC):** DTEC focuses on ecosystem restoration and climate change mitigation through afforestation and reforestation projects.
  - It works with smallholder farmers and indigenous communities to restore degraded land and enhance carbon capture.

Benefits of International Carbon Exchange

- **Climate Mitigation:** By supporting emission reduction projects, carbon exchange helps mitigate climate change and reduce the overall carbon footprint.
- **Sustainable Development:** Carbon projects often bring additional benefits, such as job creation, improved air and water quality, and enhanced biodiversity.
- **Corporate Responsibility:** Companies can demonstrate their commitment to sustainability by offsetting their emissions and investing in climate-friendly projects.
- **Market Efficiency:** Carbon markets enable cost-effective solutions for reducing emissions, allowing entities to meet their climate targets in a financially viable manner.

Challenges and Future Outlook

- While international carbon exchange holds great promise, it also faces challenges such as ensuring the integrity of carbon credits, avoiding double counting, and promoting transparency in the market.
  - Addressing these challenges will be crucial for the continued growth and effectiveness of carbon markets.
- As the world moves towards a low-carbon future, international carbon exchange will play a vital role in achieving global climate goals. By fostering collaboration and innovation, carbon markets can drive significant progress in the fight against climate change.

PRELIMS

PRESIDENTIAL ACTIONS OF DONALD TRUMP AS 46TH POTUS

Context

- Just hours after his second (and final) term began on January 20, US President Donald Trump unleashed 46 presidential actions.
- Several of these are centred on the US' climate commitments, energy transition, migration and trade policies, and are likely to have negative global implications.

About

- **Climate Commitments:** Trump declared the withdrawal of the US from the 2015 global Paris agreement to limit global greenhouse gas emissions, and revoked the US International Climate Finance Plan.
  - The US would also withdraw from other international climate pacts and financial commitments under the UN Framework Convention on Climate Change.
- **Out of World Health Organization (WHO):** Trump withdrew the US from who citing reasons like the global health agency's failure to handle the novel coronavirus pandemic.
  - It could cost WHO $130 million in annual funds and hinder global public health response.
- **Domestic Energy Push:** Trump declared a **national 'energy emergency'** and called for reviews and plans to counter activities that hinder domestic energy development, including from fossil fuels.
  - The orders halt some wind energy projects, revoke 12 clean energy initiatives launched during the Joseph Biden administration and

pause fund disbursal under the **Inflation Reduction Act.**

- **Curbs on Immigration:** The slew of orders announced include a revoke of birthright citizenship, closure of borders, strengthened policies to trace illegal immigrants and restrict visas, and realigning refugee resettlement in the US.
    - Separately, Trump **imposed 25% tariffs on imports from Canada and Mexico,** saying the two countries failed to tackle the illegal movement of people and narcotics into the US.

- **Stance on Gender:** With an aim to reverse practices and ideologies that hinder women's safety, all federal documents, policies and practices must recognise only two genders, "male" or "female", in adherence with biological definitions.

- **Foreign Trade and Policies:** A number of orders were announced, including a 90-day halt in US foreign aid and withdrawal from the **Organisation for Economic Co-operation and Development's Global Tax Deal**, which calls for a universal minimum corporate tax.
    - US foreign policies are directed to follow an "America First" approach.

MARBURG VIRUS DISEASE

Context

- Recently, the World Health Organization (WHO) announced a suspected outbreak of Marburg virus disease in Tanzania's Kagera region, which claimed eight lives.

About the Marburg Virus Disease (MVD)

- The **Ebola-like virus *(Filoviridae family)***, which causes symptoms such as h*igh fever, headache, diarrhoea and bleeding*, has a **high fatality rate of 89%.**

- First identified in 1967 in Marburg and Frankfurt, Germany, and Belgrade, Serbia, MVD has since caused sporadic outbreaks across sub-Saharan Africa.

Transmission

- Direct contact with the bodily fluids of infected individuals, contaminated surfaces, or handling of infected animals, such as fruit bats of the Pteropodidae family.

- Human-to-human transmission occurs through close contact with infected individuals' blood, saliva, vomit, or urine.

Prevention and Control

- Avoiding contact with infected individuals or animals, using personal protective equipment, and adhering to strict hygiene practices.

- Early supportive care, such as rehydration and symptom management, improves survival rates.

TRIBAL MINISTRY DIRECTS STATES TO CREATE FRA COMPLIANCE MECHANISM

Context

- Recently, the Union Ministry of Tribal Affairs issued a directive, urging states to establish mechanisms for compliance with the **Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act (FRA), 2006**.

- It comes in response to growing complaints about illegal evictions of forest dwellers, particularly from tiger reserves

Background and Directive

- The directive calls for state tribal departments and forest departments to implement institutional mechanisms for upholding the rights of forest dwellers as mandated by the FRA and other relevant laws.

- The ministry emphasized the need to recognize and address the rights of these communities, especially in light of recent evictions from tiger reserves.

Concerns Over Evictions

- The directive follows a 2024 directive by the N**ational Tiger Conservation Authority (NTCA)**, which ordered the relocation of villagers from tiger reserves.

- It impacted 89,808 families across 848 villages across the country, calling for their relocation on a 'priority basis' with time-bound action plans.
- So far, 257 villages, comprising 25,007 families, have been relocated, but 591 villages, home to 64,801 families, remain within notified core areas.

Legal Protections Under FRA

- The FRA provides legal protections for forest-dwelling **Scheduled Tribes and Other Traditional Forest Dwellers (OTFDs)**, recognizing their rights to land and resources.
- Section 4 (5) of the Act prohibits the eviction or removal of forest-dwelling communities until their rights have been recognized and verified.
- The FRA also mandates obtaining **free, prior, and informed consent (FPIC)** from Gram Sabhas before any resettlement or relocation is undertaken.

Grievance Redressal Mechanism

- The ministry's directive also calls for the establishment of a grievance redressal framework to address complaints related to eviction and relocation efforts transparently.
- It aims to ensure that the rights of forest dwellers are upheld and that any resettlement is carried out with their informed consent and participation.

DEMOISELLE CRANES

Context

- According to state authorities, some **33 migratory Demoiselle cranes** died after **contracting the H5N1 avian influenza virus** in Jaisalmer, Rajasthan.

About the Demoiselle Cranes (Grus Virgo, aka 'Kurja' in India)

- These are **one of the smallest crane species**, known for their long migratory journeys.

- These birds are found in **central Eurosiberia, ranging from the Black Sea to Mongolia and Northeast China**.
- They migrate to the Indian subcontinent during the winter, making it a significant wintering ground for these graceful birds.
- **Khichan, a village in Rajasthan, India,** is a notable wintering site for these cranes, attracting around 20,000 birds annually.
- Conservation efforts are crucial to protect their habitats from threats like habitat loss, human disturbance, and collisions with power lines.

Status:

- IUCN Red List: Least Concern
- CITES: Appendix II; CMS II

Cultural Significance

- In India, Demoiselle Cranes hold symbolic significance and are celebrated in local culture.
- The village of Khichan has become a haven for these birds, thanks to the dedicated efforts of its residents who feed and care for the cranes.

NATIONAL EDIBLE OIL CONSUMPTION SURVEY

Context

- Recently, the Union Ministry of Agriculture and Farmers Welfare launched its first-ever national survey to assess edible oil consumption patterns in the country.

About the National Edible Oil Consumption Survey

- It aims to capture the **consumption patterns and preferences** of edible oils across the country, and gather critical data to support the implementation of the **National Mission on Edible Oils-Oilseeds (NMEO-Oilseeds).**
- The survey aims to address this issue by providing up-to-date data on consumption patterns, which will be crucial for policy decisions and public health initiatives

Significance of the Survey

- **India is the world's largest consumer and importer of edible oils**, with **per capita annual consumption** rising to **over 20 kg**, significantly exceeding the recommended limits of **12 kg by the Indian Council of Medical Research (ICMR) and 13 kg by the World Health Organisation (WHO).**
- The survey aims to address this issue by providing up-to-date data on consumption patterns, which will be crucial for policy decisions and public health initiatives.

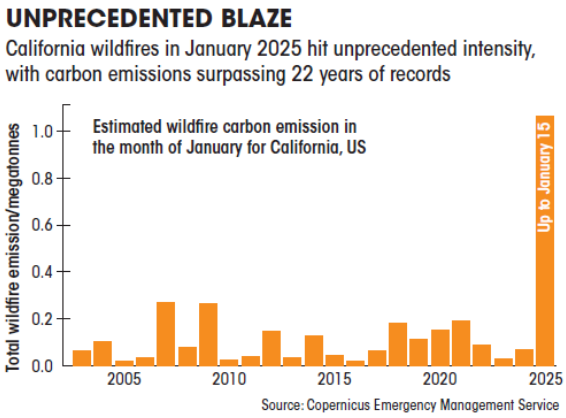
NMEO-Oilseeds Mission

- It, with a financial outlay of ₹10,103 crore **over seven years**, aims to increase domestic oilseed production from 39 million tonnes in 2022-23 to 69.7 million tonnes by 2030-31.
- The mission focuses on boosting the production of oilseed crops like soybean, groundnut, mustard, and palm oil, and promoting self-reliance in edible oil production.

HYDROCLIMATE WHIPLASH

Context

- The three wildfires that have devastated large parts of the Los Angeles city and surrounding areas in the United States, occurred **due to rare meteorological conditions enhanced by global warming** and consequent climate change, mainly **due to a 'hydroclimate whiplash'.**



Understanding Hydroclimate Whiplash

- **Hydroclimate whiplash** refers to the r**apid swings between intensely wet and dangerously dry weather patterns**.
- It has been exacerbated by climate change, leading to more frequent and severe weather extremes.
- In the case of Los Angeles, the region experienced two consecutive wet winters, followed by an exceptionally dry summer and early fall.
- This sequence of events created the perfect conditions for wildfires.

Role of Climate Change

- As global temperatures rise, the atmosphere's ability to evaporate, absorb, and release water increases, leading to more extreme weather patterns.
- In California, this has resulted in periods of heavy rainfall followed by prolonged droughts.
- The excessive rainfall promotes the growth of vegetation, which later dries out and becomes highly flammable during dry periods.

Impact on Wildfires

- The wet winters of 2022-23 led to abundant grass and brush growth.
- However, the record-hot summer and dry start to the 2025 rainy season turned this vegetation into tinder-dry fuel for wildfires.
- The combination of dry vegetation and strong Santa Ana winds created the perfect conditions for the fires to spread rapidly.

Addressing the Challenge

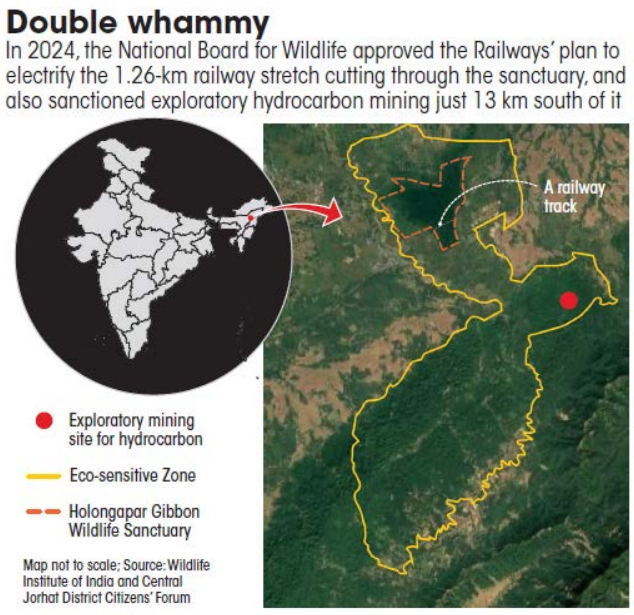
- To mitigate the impact of hydroclimate whiplash and reduce the risk of wildfires, it is crucial to adopt a co-management approach that addresses both extreme rainfall and droughts.
- It includes implementing measures to manage vegetation growth, improving water storage and conservation practices, and enhancing early warning systems for extreme weather events.

HOLLONGAPAR GIBBON SANCTUARY

Context

- In a controversial decision, the **Standing Committee of the National Board for Wildlife (NBWL)** has approved exploratory drilling for oil and gas within the **eco-sensitive zone (ESZ) of the Hollongapar Gibbon Wildlife Sanctuary in Assam.**

About



- The **Hollongapar Gibbon Wildlife Sanctuary**, named after the **country's only ape species, the Hoolock gibbon,** is a vital refuge for biodiversity.
- **Gibbons** are the **smallest and fastest of all apes**.
- The hoolock gibbon, **unique to India's northeast,** is one of 20 species of gibbons found in tropical and subtropical forests in Southeast Asia.
    - They are **diurnal and arboreal.** They are **omnivorous**.

- **Types in India:** Eastern and Western hoolock gibbons.
- **Threats**: The primary threat to the hoolock gibbon is the deforestation caused by infrastructure projects.
- **Conservation Status:**
    - **IUCN Status:**
        - Western hoolock gibbon **Endangered**
        - Eastern hoolock gibbon **Vulnerable**
    - **Schedule I** of Wildlife Protection Act 1972

STEEL SLAG

Context

- With simple curing, steel slag can be used in construction activities to replace river sand and natural aggregates

About the Steel Slag

- Steel slag, often perceived as a waste product from steel manufacturing, is a byproduct that holds immense potential for environmental sustainability.
- Steel slag is generated during the steelmaking process, where impurities are separated from molten steel. The production of virgin steel typically follows a two-step process:
    - **Blast Furnace (BF) Process:** Pig iron is extracted from iron ore in a blast furnace, producing molten slag.
    - **Basic Oxygen Furnace (BOF) Process:** Pig iron is refined in a basic oxygen furnace to

produce steel, with slag generated as a byproduct.

- According to the **'Indian Minerals Yearbook 2022'** by the Union Ministry of Mines, producing one tonne of **pig iron generates 300 to 540 kg of blast furnace slag,** while producing one tonne of **liquid steel results in 150 to 200 kg of BOF slag.**

Innovative Uses of Steel Slag

- **Construction Materials:**
  - **Bhilai Steel Plant:** This plant in Chhattisgarh, India, is conducting trials to replace river sand with steel slag in runners. If successful, this initiative could save the plant Rs 29 million annually and conserve 25,000 tonnes of river sand.
  - **Paver Blocks:** The plant also initiated a pilot project to produce paver blocks by replacing stone chips with steel slag, resulting in cost savings and reduced reliance on natural aggregates.

- **Metal Recovery and Product Innovation:**
  - **Tata Steel Plant, Jamshedpur:** The plant recovers metal elements from steel slag for reuse and selling. It has also set up an open steam ageing plant to accelerate the natural ageing process of non-metallic components.

- **Technological Advancements:**
  - **JSW Steel Ltd, Vijaynagar:** This plant has developed technologies to produce construction aggregates and slag fines suitable for cement making and agricultural applications.
  - In 2022, it set up the world's first steel slag-to-sand facility, recycling 0.27 million tonnes of steel slag annually and reducing demand for river sand by 0.2-0.3 million tonnes.

Environmental Challenges of Steel Slag

- BOF slag, in particular, contains free lime, which reacts with moisture to form calcium hydroxide, leading to volume expansion and cracking in construction applications.
- Additionally, its high phosphorous content and specific gravity can prolong the setting time of concrete and reduce its strength.
- These properties make BOF slag less suitable for traditional construction uses compared to blast furnace slag, which has cementitious properties and is widely used in the cement industry.

Recommendations

- The Bureau of Indian Standards and Union Ministry of Steel need to set standards for steel slag usage.
- Ensure that the plants utilise the current generation slags within one year and legacy slags by September 2027.
- Steam ageing should be considered for maturing of steel slag.
- The government should prepare a model of supply chain to ensure that matured steel slag is used for road construction.

MUNICIPAL SOLID WASTE AS A VIABLE OPTION TO SUPPLEMENT COAL AS FUEL IN CEMENT PLANTS

Context

- Municipal solid waste can be converted as a viable option to supplement coal as fuel in cement plants.

About

- Municipal solid waste, often seen as a burden on landfills and waste management systems, can be transformed into a valuable resource.
- The **Central Pollution Control Board's (CPCB's) annual report for 2020-21** says about 95% of municipal solid waste is collected, of which 50% (29 million tonnes) is treated either in waste-to-energy or compost plants, or used as rdf in cement industries.
- In 2014, the erstwhile Planning Commission estimated that of the 62 million tonnes of municipal solid waste generated in urban India, 12 million tonnes can potentially be converted into rdf, replacing 8 million tonnes of coal.
- By converting MSW into refuse-derived fuel (RDF), cement plants can reduce their reliance on traditional fossil fuels like coal, thereby lowering greenhouse gas emissions and contributing to environmental sustainability.

Benefits of Using MSW as Fuel

- **Environmental Impact:**
  - **Reduction in Greenhouse Gas Emissions:** Using MSW as an alternative fuel can significantly reduce the carbon footprint of cement production. This is because RDF has a lower carbon content compared to coal.
  - **Waste Reduction:** Utilizing MSW in cement kilns helps reduce the volume of waste sent to landfills, alleviating the pressure on waste management systems.
- **Economic Viability:**
  - **Cost Savings:** RDF can be a cost-effective alternative to coal, especially in regions where waste disposal costs are high. Cement plants can save on fuel costs by incorporating MSW into their energy mix.
  - **Resource Optimization:** By using locally available MSW, cement plants can reduce their dependence on imported coal, enhancing energy security and promoting local resource utilization.
- **Energy Efficiency:**
  - **High Calorific Value:** RDF has a high calorific value, making it an efficient fuel for cement kilns. It ensures that the energy content of the fuel is effectively utilized in the production process.
  - **Process Integration:** The cement manufacturing process involves high-temperature operations, which are well-suited for the combustion of RDF.

Challenges and Considerations

- **Quality Control:**
  - **Variability of Waste Composition:** MSW composition can vary significantly, affecting the consistency and quality of RDF. Cement plants need to implement robust quality control measures to ensure the uniformity of RDF.
  - **Pre-treatment Requirements:** MSW requires pre-treatment to remove non-combustible materials and contaminants, adding to the operational complexity.
- **Regulatory and Safety Issues:**
  - **Compliance with Regulations:** Cement plants must adhere to stringent environmental regulations and safety standards when using MSW as fuel. It includes monitoring emissions and ensuring proper waste handling procedures.

- **Health and Safety Concerns:** Handling and processing MSW can pose health and safety risks to workers, necessitating appropriate protective measures and training.

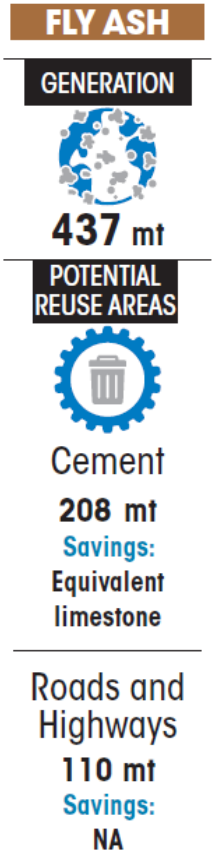
Recommendations

- A new draft notification for **Solid Waste Management Rules, 2024** notifying standards of **refuse-derived fuel (RDF) quality**. The government should implement it.
- Include RDF specifications in urban local bodies' tenders for solid waste management.
- Lack of communication and coordination among players in the RDF supply chain hinder efforts to scale up. Industries, municipal corporations and third-party agencies should come together to sort issues of logistics, costing and other concerns.

COAL COMBUSTION RESIDUE (FLY ASH) IN CEMENT-MAKING

Context

- Use of the **coal combustion residues (CCR)** in cement-making and road construction can curb fugitive dust emissions



About Fly Ash

- **Coal combustion residues, *such as fly ash and bottom ash***, are by-products of coal combustion in power plants. These are composed of fine particles that are driven out of coal-fired boilers along with flue gases.
- Fly ash is categorized into two main types: **Class F and Class C.**
  - **Class F Fly Ash:** Contains low calcium content and is typically produced from burning anthracite or bituminous coal. It is known for its pozzolanic properties, which means it reacts with calcium hydroxide to form cementitious compounds.
  - **Class C Fly Ash:** Contains higher calcium content and is produced from burning sub-bituminous or lignite coal. It can exhibit cementitious properties on its own and is often used in concrete mixes.

Applications of Fly Ash

- **Concrete Production:** Fly ash is widely used as a supplementary cementitious material in concrete. It improves the workability, durability, and strength of concrete while reducing permeability.
- **Road Construction:** Fly ash can be used as a filler material in asphalt and as a base or sub-base material in road construction. It helps reduce dust emissions and enhances the stability of road surfaces.
- **Brick and Tile Manufacturing:** Fly ash can be incorporated into the production of bricks and tiles, reducing the need for virgin materials and promoting sustainable manufacturing.
- **Soil Stabilization:** Fly ash can be used to stabilize soils in construction projects, improving the load-bearing capacity and reducing erosion.
- **Filler in Paints and Plasters:** Fly ash can be used as a filler in paints, adhesives, and plasters, enhancing their properties and reducing the use of natural resources.

Benefits of Using Coal Combustion Residue

- **Reduction of Fugitive Dust Emissions:** By incorporating CCRs in cement-making and road construction, the generation of fugitive dust can be significantly reduced.
  - The stable nature of CCRs minimizes the release of particulate matter into the atmosphere, improving air quality and reducing health risks.

- **Environmental Benefits:**
    - **Reduction in Greenhouse Gas Emissions:** By substituting a portion of Portland cement with fly ash in concrete production, the cement industry can significantly reduce its carbon footprint.
    - **Waste Reduction:** Utilizing fly ash helps divert this byproduct from landfills, reducing the environmental impact of waste disposal.
    - **Resource Conservation:** Fly ash can replace natural aggregates in construction materials, conserving natural resources and promoting sustainable building practices.
- **Economic Benefits:** The use of CCRs can lead to cost savings for the cement and construction industries.
    - By substituting expensive virgin materials with CCRs, companies can reduce production costs and improve their bottom line.

Recommendations

- Implement provisions of the Fly Ash Notification to their full potential. As per a report by the **Central Electricity Authority for 2021-22**, about 4% of fly ash is dumped. Proper monitoring and auditing of plants will promote use.
- Thermal power plants should consider all possible modes of fly ash utilisation and implement measures to increase it.
- Develop fly ash-based industries and ensure availability of the resource. Create and scale up markets for fly ash-based construction materials.

FLUE GAS DESULPHURISATION GYPSUM (FGD GYPSUM)

Context

- Gypsum produced during flue gas desulphurisation is a viable alternative to the rare natural mineral.

Process of Flue Gas Desulphurisation

- Flue gas desulphurisation is a method used to remove sulfur dioxide (SO2) from exhaust flue gases of fossil-fuel power plants.
- It involves the use of an aqueous slurry of limestone (calcium carbonate) or lime (calcium oxide) that reacts with SO2 to form calcium sulfite, which is then oxidized to produce gypsum (calcium sulfate dihydrate).
- It can be further processed and utilized in various industries.

Benefits of Using FGD Gypsum

- **Environmental Benefits:** Utilizing FGD gypsum helps reduce the amount of waste sent to landfills and minimizes the environmental impact of sulfur dioxide emissions.
    - By repurposing this by-product, industries can contribute to a circular economy and reduce their carbon footprint.
- **Economic Viability:** FGD gypsum is a cost-effective alternative to natural gypsum, which is often mined in limited quantities and can be expensive.
    - The availability of FGD gypsum provides a steady and affordable supply for industries that require gypsum, such as the construction and agriculture sectors.
- **Resource Conservation:** By using FGD gypsum, industries can reduce their reliance on natural gypsum reserves, which are finite and subject to depletion.
    - It helps conserve natural resources and promotes sustainable practices.

Applications of FGD Gypsum

- **Construction Industry:** FGD gypsum is widely used in the production of plaster, plasterboard, and cement.
    - Its properties make it an excellent substitute for natural gypsum in these applications.
- **Agriculture:** FGD gypsum can be used as a soil amendment to improve soil structure and fertility.
    - It provides essential nutrients such as calcium and sulfur, which are beneficial for crop growth.
- **Waste Management:** The use of FGD gypsum in waste management processes can help stabilize and solidify hazardous waste, reducing the risk of environmental contamination.

Recommendations

- As per the Central Pollution Control Board's (CPCB's) Guidelines for **Handling and Management of Flue Gas Desulphurization (FGD) Gypsum**, power plants need to utilise a minimum of 25% of FGD gypsum, and eventually all of it.
    - Complete utilisation, ensured by regular assessments of plants by CPCB and state pollution control boards, is recommended.
- National Thermal Power Corporation's initiatives with other agencies to expand application of FGD gypsum should be promoted and emulated by similar efforts.
- CPCB should alleviate the process to transport FGD gypsum by industries for further research and to upscale its usage.

RED MUD: IRON ADDITIVE IN CEMENT PRODUCTION

Context

- Over 40% of red mud is iron oxide which makes it an ideal substitute for iron additive in cement production.

Composition of Red Mud

- **Red mud, also known as bauxite residue**, is generated during the **Bayer process**, which is used to extract alumina from bauxite ore.
- The residue is a fine, reddish-brown material that contains ***various oxides, including iron oxide (Fe2O3), aluminum oxide (Al2O3), and silicon dioxide (SiO2)***.

Benefits of Using Red Mud in Cement Production

- **Resource Utilization:** By repurposing red mud, industries can reduce the environmental impact associated with its disposal.
    - Utilizing this by-product as an iron additive in cement production promotes the efficient use of resources and supports circular economy principles.

- **Cost-Effectiveness:** Red mud is often available at a lower cost compared to traditional iron additives, making it an economically viable option for cement manufacturers.
- **Environmental Impact:** Incorporating red mud into cement production helps reduce the amount of waste sent to landfills, thereby minimizing the environmental footprint of both the alumina and cement industries.
    - Additionally, it reduces the need for mining and processing of natural iron ores, conserving natural resources.
- **Enhanced Cement Properties:** The presence of iron oxide in red mud contributes to the strength and durability of cement.

- Studies have shown that using red mud as an additive can improve the mechanical properties of cement, making it suitable for various construction applications.

Recommendations

- Study feasibility of usage of red mud in areas such as road making, construction activities.
- The Bureau of Indian Standards should define what standard of red mud is required for what type of usage to upscale its utilisation.
- Usage of red mud as an alternative to commercial catalysts should be explored.
- Tests show red mud can be used in manufacture of X-ray shielding tiles and for extraction of rare earth elements. These need to be studied.

BAGASSE, PRESS MUD AND MOLASSES

Context

- The sugar and distillery industry generates bagasse, press mud and molasses, all of which can be completely reused within the sector

About

- The **sugar and distillery industry** is one of the most resource-intensive sectors, **generating significant quantities of by-products** such as **bagasse, press mud, and molasses.**
- **Traditionally seen as waste**, these by-products hold potential for reuse within the sector, contributing to **a circular economy** and promoting sustainable practices.
- By effectively harnessing these resources, the industry can reduce waste, lower environmental impact, and enhance economic viability.

Understanding the By-Products

- **Bagasse:** It is the fibrous residue left after extracting juice from sugarcane. It constitutes about 30% of the sugarcane's weight and is rich in cellulose and lignin.
  - Bagasse is primarily used as a biofuel in cogeneration plants to produce electricity and steam.
  - Additionally, it serves as a raw material for paper, packaging, and building materials.
- **Press Mud**: Also known as **filter cake**, press mud is the residual sludge obtained from the filtration of sugarcane juice.
  - It contains organic matter, nutrients, and micronutrients, making it an excellent soil conditioner and fertilizer.
  - Press mud can also be used in biogas production, contributing to renewable energy generation.
- **Molasses:** It is a viscous by-product of the sugar refining process, containing sugars, vitamins, and minerals.
  - It serves as a valuable feedstock for the distillery industry, where it is fermented to produce ethanol.
  - Molasses is also used in animal feed, food products, and pharmaceuticals.

Reusing By-Products Within the Sector

- **Cogeneration with Bagasse:** One of the most efficient ways to utilize bagasse is through cogeneration, where it is burned in boilers to produce steam and electricity.
  - This not only meets the energy requirements of sugar mills but also allows surplus electricity

to be sold to the grid, generating additional revenue.

- Bagasse-based cogeneration significantly reduces the industry's reliance on fossil fuels and lowers greenhouse gas emissions.

- **Press Mud as Organic Fertilizer**: Press mud's high organic content and nutrient profile make it an ideal organic fertilizer for sugarcane fields.
  - When applied to soil, it enhances soil fertility, improves water retention, and promotes healthy crop growth.
  - Using press mud as a fertilizer reduces the need for chemical fertilizers, contributing to sustainable agriculture practices.

- **Ethanol Production from Molasses:** Molasses is a key feedstock for the production of ethanol, an important biofuel.
  - Ethanol production from molasses not only provides an alternative to fossil fuels but also supports the production of by-products such as biogas and bio-compost.
  - The integration of ethanol production with sugar mills creates a closed-loop system, minimizing waste and maximizing resource efficiency.

Recommendations

- Upscale use of press mud as feedstock to manufacture compressed biogas (CBG).
- Develop pipeline infrastructure to tap the potential of CBG.
- Use spent wash along with bagasse as boiler fuel in distillery complex.
- Promote usage of surplus bagasse in industrial co-firing.

BIOMASS: AN ALTERNATE FUEL TO COAL

Context

- Develop a robust supply chain to promote greater adoption of biomass as an alternate fuel to coal

About

- **Biomass**, derived from organic materials such as ***agricultural residues, forestry waste, and dedicated energy crops***, offers a viable and eco-friendly alternative to coal.
- It encompasses a variety of organic materials that can be converted into energy through processes such as combustion, gasification, and anaerobic digestion.
- However, the widespread adoption of biomass as a fuel hinges on the development of a robust supply chain that can ensure consistent availability, quality, and economic viability.

Key Components of a Robust Biomass Supply Chain

- **Feedstock Sourcing:** It includes agricultural residues (e.g., straw, husks), forestry by-products (e.g., sawdust, wood chips), and dedicated energy crops (e.g., switchgrass, miscanthus).
  - Collaboration with farmers, foresters, and landowners is essential to ensure a steady supply of biomass feedstock.

- **Collection and Transportation:** Investments in infrastructure, such as collection centers, storage facilities, and transportation networks, can help minimize losses and ensure timely delivery of biomass to processing facilities.
  - Developing regional hubs for biomass aggregation can reduce transportation costs and enhance supply chain efficiency.
- **Processing and Quality Control:** It includes drying, pelletizing, and densifying the biomass to improve its energy content and handling characteristics.

- Implementing stringent quality control measures ensures that the processed biomass meets the specifications needed for efficient combustion or gasification.

- **Market Integration:** It requires establishing supply agreements with power plants, industrial users, and other end-users.
  - Policies and incentives that promote biomass adoption, such as feed-in tariffs, renewable energy credits, and carbon pricing, can further enhance market integration.
- **Sustainability and Certification:** Implementing certification schemes that verify the environmental and social impacts of biomass production can promote responsible sourcing practices.
  - Additionally, life cycle assessments can help quantify the greenhouse gas emissions and energy balance of biomass supply chains.

Case Studies and Success Stories

- **Denmark** has invested heavily in biomass for district heating and power generation, with over 70% of its district heating sourced from biomass.
  - It has established a well-coordinated supply chain, involving farmers, cooperatives, and energy companies, to ensure a steady supply of high-quality biomass.
- In **India**, the **'National Policy on Biofuels'** aims to promote the use of biomass and other renewable sources for energy production.
  - It includes measures to develop biomass supply chains, such as financial incentives for biomass-based power projects and support for research and development.

Key Recommendations

- Develop a national inventory of biomass generation and availability to overcome the dearth and non-uniformity of currently available information.
- Build a robust supply chain for biomass to aid thermal power plants that claim inadequacy of biomass pellet suppliers and enable government policies so that their full potential can be realised.
- Ensure a demand-supply balance for biomass with incentives for pellet manufacturing units and encourage farmers to set up such plants.

HAZARDOUS WASTE IN CEMENT INDUSTRY

Context

- Waste generated from myriad industries can be used as raw material and fuel in cement plants.

Nature of Hazardous Waste

- Hazardous waste encompasses a wide range of materials generated from various industries, including chemicals, pharmaceuticals, petroleum refining, and metal processing.
- These wastes often contain toxic, flammable, corrosive, or reactive substances, requiring careful handling and disposal.
- Traditional disposal methods, such as landfilling and incineration, pose environmental risks and contribute to resource depletion.

Benefits of Using Hazardous Waste in Cement Plants

- **Resource Recovery:** Cement plants can serve as resource recovery facilities by incorporating hazardous waste into their production processes.
  - It reduces the need for virgin raw materials, such as limestone, clay, and shale, conserving natural resources and minimizing environmental impact.
- **Energy Efficiency:** Many types of hazardous waste, such as waste solvents, used oils, and industrial sludge, have high calorific values and can be used as alternative fuels in cement kilns.

- Utilizing these wastes as fuel reduces the consumption of fossil fuels, lowering greenhouse gas emissions and promoting energy efficiency.

- **Safe Disposal:** The high temperatures and controlled conditions in cement kilns ensure the complete destruction of hazardous constituents in the waste, converting them into non-toxic compounds.
  - It provides a safe and effective disposal method for hazardous waste, preventing environmental contamination.
- **Economic Viability:** The use of hazardous waste as raw material and fuel can lead to significant cost savings for cement plants.
  - By reducing the need for traditional raw materials and fuels, cement manufacturers can lower production costs and enhance their profitability.

Applications and Success Stories

- The **European Cement Association (CEMBUREAU)** has reported that cement plants in the region co-process around 15% of hazardous waste, contributing to resource recovery and waste management.
- **Cement Manufacturers' Association (CMA) in India** has been actively promoting the use of hazardous waste as a raw material and fuel in cement plants.

Recommendations

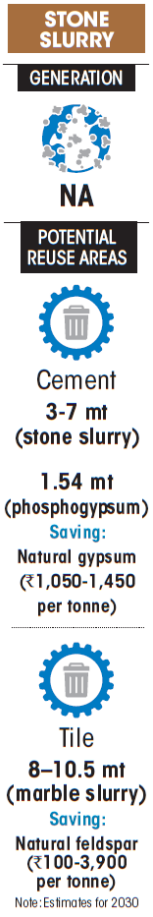
- Currently, the cost of pre-processing is approximately R6,000 per tonne while that of disposal is around R4,000 a tonne.
  - Regulating these expenses will encourage industries, particularly small ones that generate lesser quantities of waste, to opt for co-processing.
- Cement plants that do not have pre-processing and waste storage facilities do not accept waste from industries that generate it in small quantities.
  - Setting up common hazardous waste management facilities in industrial clusters will help.

STONE SLURRY & ITS APPLICATIONS

Context

- Slurry generated from cutting and polishing of stones can be used to make cement, tiles.

Composition of Stone Slurry



- Stone slurry is a by-product of the cutting and polishing processes used to shape and finish natural stones such as marble, granite, and limestone.
- It primarily consists of fine stone particles suspended in water, along with residues of polishing agents.
- The high content of calcium carbonate, silica, and other minerals present in the slurry makes it a valuable resource for various construction applications.

Benefits of Using Stone Slurry in Cement and Tiles

- **Resource Utilization:** Repurposing stone slurry as a raw material for cement and tiles helps reduce the extraction and consumption of virgin raw materials such as limestone and clay.
  - It promotes resource conservation and minimizes the environmental impact of mining activities.
- **Waste Reduction:** By utilizing stone slurry in the production of cement and tiles, the stone industry can significantly reduce the amount of waste generated.

- It helps alleviate the burden on landfills and mitigates the environmental pollution associated with slurry disposal.

- **Cost-Effectiveness:** Using stone slurry as a raw material can lead to cost savings for manufacturers by reducing the need for conventional raw materials.
  - The availability of slurry as a by-product makes it a cost-effective option for cement and tile production.

- **Enhanced Product Properties:** The mineral composition of stone slurry can enhance the properties of cement and tiles, such as strength, durability, and aesthetic appeal.
  - Research has shown that incorporating stone slurry into cement and tiles can improve their performance and quality.

Key Recommendations

- Upscale stone slurry utilisation in cement and tile-making, and explore alternative applications. Stone slurry can be used in wall putty, pesticides, production of lime and bricks.
- Establish regional waste management facilities for effective collection and transportation of the waste to enable its utilisation by different plants and facilities.
- Recognise its potential value in different industries, and identify plants that can uptake stone slurry.

WASTEPAPER RECYCLING IN INDIA

Context

- India's wastepaper collection rate is close to the global average, but there is still scope for improvement.

About

- Wastepaper recycling is an essential component of sustainable waste management and resource conservation.
- In recent years, India has made significant strides in improving its wastepaper collection rate, bringing it closer to the global average.
- However, there remains substantial scope for improvement to achieve higher efficiency and sustainability in the recycling sector.

Current Status of Wastepaper Collection in India

- India's wastepaper collection rate currently stands at approximately 45%, which is close to the global average of around 50%.
- It is a result of increased awareness, government initiatives, and the efforts of various stakeholders, including non-governmental organizations (NGOs), recyclers, and the paper industry.
- Its emphasis on circular economy principles has also contributed to the progress in wastepaper recycling.

Benefits of Wastepaper Recycling

- **Resource Conservation:** Recycling wastepaper reduces the need for virgin pulp, conserving forests and natural resources.
  - It also decreases the environmental impact associated with deforestation and paper production.
- **Energy and Water Savings:** The recycling process consumes significantly less energy and water compared to producing paper from raw materials.
  - It results in lower greenhouse gas emissions and reduced strain on water resources.

- **Waste Reduction:** Efficient wastepaper collection and recycling help divert waste from landfills, reducing landfill space usage and minimizing the

environmental pollution caused by decomposing paper waste.

- **Economic Opportunities:** The recycling sector provides employment opportunities and supports the livelihoods of waste collectors, recyclers, and small-scale entrepreneurs.
    - It also contributes to the economy by supplying raw materials to the paper industry.

Challenges and Areas for Improvement

- **Informal Sector Integration:** A significant portion of wastepaper collection is managed by the informal sector, which lacks proper infrastructure, training, and support.
    - Integrating the informal sector into the formal waste management system can enhance efficiency and ensure better working conditions for waste collectors.
- **Infrastructure Development:** Insufficient infrastructure for waste collection, segregation, and transportation poses a significant challenge.
    - Investing in robust and efficient waste management systems, including sorting facilities and recycling plants, is crucial for improving the collection rate.
- **Public Awareness and Participation:** Raising awareness about the importance of wastepaper recycling and encouraging public participation are essential for increasing collection rates.
    - Educational campaigns, community initiatives, and incentives can motivate individuals and businesses to actively participate in recycling efforts.
- **Policy and Regulation:** Strengthening policies and regulations to support wastepaper recycling is vital.
    - Implementing **Extended Producer Responsibility (EPR)** frameworks, providing financial incentives for recycling, and enforcing strict waste management laws can drive improvements in the sector.

Recommendations

- An integrated system for wastepaper recycling, including both the formal and informal sectors (which handles 95% of wastepaper).
- Develop extended producer responsibility (EPR) guidelines.
- Introduced quality standards for raw materials to optimise percentage of virgin paper used with recycled paper.
- Restrict the usage of imported finished paper by increasing the customs duty from the current rate of 10% to 30%.
- Use alternative materials for secondary applications of wastepaper: Agro straw for packaging of fruits; bamboo-based utensils; use of steel utensils and pattals for roadside eateries.

ROLE OF INDIGENOUS COMMUNITIES IN TACKLING ARIDITY

Context

- For the first time, the UN has recognised the role of indigenous communities in tackling aridity.
    - A repository of traditional knowledge, India has the wherewithal to lead the way.

About

- **Aridity**, characterized by **prolonged droughts and water scarcity**, poses significant challenges to ecosystems and human livelihoods.
- Indigenous communities, with their deep-rooted knowledge and sustainable practices, play a crucial role in addressing these challenges and promoting resilience.

Traditional Knowledge and Practices

- Indigenous communities have a wealth of traditional knowledge that has been passed down through generations.
- It encompasses sustainable land management practices, water conservation techniques, and the use of native plant species that are well-adapted to arid conditions.

- For example, many indigenous communities practice rainwater harvesting, terracing, and agroforestry, which help to conserve soil moisture and improve water availability.

Dry spread

Global population living in drylands has increased by 8.4% in 1990-2020

Region	Drylands (% of total geographical area)		Population in drylands (% of global population)	
	1961-1990	1991-2020	1961-1990	1991-2020
North America	21	21.3	25.7	26.4
Latin America-Caribbean	14.3	18.6	14.9	16.2
Europe	7.3	12.1	5.7	10.7
Africa	66.2	70.5	47.2	49.6
Asia	33.2	36.1	21.8	30.9
Oceania	86.3	87.9	20.7	45.8
Global (without Antarctica)	37.5	40.6	22.5	30.9

Source: The global threat of drying lands: Regional and global aridity trends and future projections

Community-Based Approaches

- Indigenous communities often employ community-based approaches to manage natural resources. These involve collective decision-making, resource sharing, and the establishment of local institutions to oversee resource management.
- By working together, these communities can implement effective strategies to mitigate the impacts of aridity and ensure the sustainable use of natural resources.

Policy and Recognition

- International frameworks, such as the **Sendai Framework for Disaster Risk Reduction** and the **Kunming-Montreal Global Biodiversity Framework**, emphasize the importance of indigenous knowledge and practices in conservation and disaster risk reduction efforts.
- Governments and organizations must work with indigenous communities to develop policies that support their sustainable practices and ensure their participation in decision-making processes.

SUBJECTIVE QUESTIONS

1. How effective do you believe Community-Based Forest Management (CBFM) has been in balancing the needs of local communities with the goals of conservation, and what challenges and opportunities do you see for its future implementation?
2. Discuss the significance of a circular economy in addressing plastic pollution. How might the principles of a circular economy be integrated into an international plastic pollution treaty to create a sustainable and effective solution?
3. Considering the potential of International Carbon Exchange markets to address global carbon emissions, what do you believe are the key challenges and opportunities for their effective implementation, and how can these markets ensure equitable participation from all countries?

MCQS

1. Term '*nilotinib*' sometimes appeared in the news, is related to:
   (a) Enzyme
   (b) Biofuel
   (c) Cancer drug
   (d) Adhesive

2. Which one of the following countries recently launched its '*International Carbon Exchange*'?
   (a) Egypt
   (b) Bangladesh
   (c) Philippines
   (d) Indonesia

3. With reference to the '*Marburg Virus Disease (MVD)*', consider the following statements:
   1. It is caused by an Ebola-like virus (Filoviridae family).
   2. It is transmitted by direct contact with the bodily fluids of infected individuals.

   Which of the statements given above is/are correct?
   (a) 1 only
   (b) 2 only
   (c) Both 1 and 2
   (d) Neither 1 nor 2

4. With reference to the *'Demoiselle Cranes (Grus Virgo, aka 'Kurja' in India)'*, consider the following statements:

   1. These are one of the smallest crane species, known for their long migratory journeys.
   2. Khichan, a village in Rajasthan, India, is a notable wintering site for these cranes, attracting around 20,000 birds annually.

   Which of the statements given above is/are correct?

   (a) 1 only
   (b) 2 only
   (c) Both 1 and 2
   (d) Neither 1 nor 2

5. *'Hollongapar Gibbon Wildlife Sanctuary'*, sometimes appeared in the news, is located in:

   (a) Assam
   (b) Arunachal Pradesh
   (c) Tamil Nadu
   (d) Kerala

Answer Key:

1. (c) 2. (d) 3. (c) 4. (c) 5. (a)

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