30th Sept, 2024

1. <u>Common Practice Standards must have India outlook</u>
GS 3 (Environment)

- **Why in News:** India's agroforestry sector presents a significant opportunity to enhance carbon finance through **Afforestation, Reforestation, and Revegetation (ARR) initiatives.** With the potential to expand agroforestry from 28.4 million hectares to 53 million hectares by 2050, it plays a vital role in both environmental sustainability and economic development. Recent research indicates that, with appropriate policies, the sector could contribute an additional carbon sink of over 2.5 billion tons of CO_2 equivalent by 2030.

Common Practice Standards must have India outlook

India's vast potential in the agroforestry sector is a unique opportunity to integrate with carbon finance projects through Afforestation, Reforestation, and Revegetation (ARR) initiatives. There is a possibility to expand the area under agroforestry from the current 28.4 million hectares to 53 million hectares by 2050. Agroforestry accounts for 8.65% of India's total land area and contributes 19.3% of the country's carbon stocks. Thus, agroforestry plays a significant role in environmental sustainability and economic development.

Recent research suggests that if adequate policies, financial support, and incentives are implemented, the sector could contribute an additional carbon sink of over 2.5 billion tons of CO_2 equivalent by 2030.

'Common Practice' in Carbon Standards

In the realm of carbon finance, "common practice" is a key criterion used to assess whether a project is additional – meaning, it goes beyond what is typically done in a given region. For ARR projects, this involves determining whether similar activities are commonly practised without the financial incentives provided by carbon credits. According to carbon standards such as Verra's Verified Carbon Standard (VCS) or the Gold Standard, if an activity is deemed "common practice", it may not qualify for carbon credits, as it is not seen as contributing additional environmental benefits beyond the norm.

However, the current definition of common practice in global carbon standards often reflects the realities of large-scale agricultural practices found in regions such as Latin America, Africa, or the United States, where landholdings are extensive and contiguous. In contrast, India is characterised by small and fragmented landholdings. Recent data indicate that 86.1% of Indian farmers are small and marginal, with landholdings of less than two hectares. These farmers often engage in agroforestry in a non-systematic, scattered manner, planting trees alongside crops or on small patches of fallow land.

While beneficial, these practices may not meet the additionality criteria set by current carbon standards because they are perceived as "common" within the Indian context. This presents a significant challenge, as it effectively excludes a large number of Indian farmers from participating in ARR carbon finance projects, thereby denying them the opportunity to earn additional income from carbon credits.

Sayanta Ghosh
Associate Fellow, Land Resources, The Energy and Resources Institute

Jitendra Vir Sharma
Senior Director, Land Resources, The Energy and Resources Institute

International carbon finance platforms must revise their standards to better align with the realities of Indian agriculture

Need for India-centric approaches

Given India's unique agricultural landscape, there is an urgent need to redefine and consider the common practice criterion to better reflect the specific challenges and opportunities within the Indian agroforestry sector. An India-centric approach would recognise that even small, incremental changes in land management practices such as adopting more systematic agroforestry techniques or utilising carbon finance to maintain tree cover can be transformative.

Revising and consideration of the common practice standards to accommodate the fragmented, small holder model prevalent in India would unlock the vast potential for carbon sequestration. This would enable a greater number of farmers to participate in carbon finance projects, providing them with additional income streams while contributing to India's climate goals. Further, by acknowledging the fragmented nature of Indian agriculture, carbon credit platforms could design incentives that encourage systematic agroforestry, thereby enhancing both environmental sustainability and rural livelihoods.

Agroforestry, when integrated with ARR initiatives, offers a viable solution to the various challenges faced by India's agricultural sector. By promoting alternative livelihoods and providing additional income streams for farmers, these projects can help address issues such as low productivity, dependence on monsoons, and environmental degradation. The carbon finance provided by ARR projects enables a more systematic and sustained approach to agroforestry, which would otherwise be difficult to achieve given the financial pressures and market constraints faced by many Indian farmers. For farmers grappling with unpredictable weather patterns and fluctuating crop yields, participating in ARR projects presents a pathway to income diversification. By integrating trees into their agricultural landscapes or restoring degraded forest areas on their land, farmers can tap into additional revenue streams through carbon sequestration. Beyond economic gains, ARR projects deliver crucial environmental benefits, such as enhancing soil fertility, improving water retention, and mitigating erosion, thereby bolstering agricultural productivity and ensuring long-term sustainability.

Help small and marginal farmers

Research institutes such as The Energy and Resources Institute (TERI) have already demonstrated the potential of ARR projects in India, spearheading 19 projects across seven States, benefiting over 56,600 farmers. However, for such initiatives to scale up, it is imperative that international carbon finance platforms revise their standards to better align with the realities of Indian agriculture.

As India looks to expand its agroforestry sector and leverage the benefits of carbon finance it is crucial that international standards evolve to reflect the specific conditions of the Indian subcontinent. Revising the "Common Practice" guidelines to be more inclusive of Indian agroforestry practices will enable millions of small and marginal farmers to participate in ARR projects. This would not only drive sustainable development but also provide a much-needed boost to the incomes of millions of rural households, ultimately contributing to the overall economic and environmental resilience of the country.

It is imperative that carbon credit platforms such as Verra and Gold Standard recognise the need for India-centric standards. Only then can the full potential of agroforestry and ARR initiatives be realised, paving the way for a greener, more sustainable, and economically prosperous future for India's farmers.

- **Current Challenges in Carbon Standards**
  - **Common Practice Definition**: The "common practice" criterion in carbon finance assesses whether a project is additional and beyond typical activities. Current standards, like **Verra's VCS and the Gold Standard**, may classify many Indian agroforestry practices as "common," thus excluding them from carbon credits.
  - **Fragmented Landholdings**: India's agricultural landscape is characterized by **small and fragmented landholdings**, with **1% of farmers** owning less than two hectares. This scattered approach often leads to agroforestry practices that fail to meet the additionality criteria set by global carbon standards.
  - **Impact on Farmers**: Excluding small and marginal farmers from **ARR carbon finance projects** denies them the chance to earn additional income from carbon credits, exacerbating economic challenges in rural areas.
- **Need for India-Centric Approaches**
  - **Redefining Common Practice**: An urgent need exists to redefine the common practice criterion to reflect the unique challenges of **India's agroforestry sector**. Recognizing even small, incremental changes in land management can be transformative for farmers
  - **Unlocking Carbon Sequestration Potential**: Revising these standards could unlock significant carbon sequestration potential, allowing more farmers to participate in carbon finance projects and generate additional income streams, thereby supporting India's climate goals.
  - **Promoting Systematic Agroforestry**: Carbon credit platforms should design incentives that encourage systematic agroforestry practices, enhancing both environmental sustainability and rural livelihoods while addressing challenges like low productivity and environmental degradation.
- **Benefits of ARR Initiatives**
  - **Alternative Livelihoods**: Agroforestry integrated with ARR initiatives can provide alternative livelihoods for farmers, addressing issues like dependence on monsoons and low agricultural productivity.
  - **Economic Diversification**: By integrating trees into agricultural landscapes, farmers can tap into additional revenue streams through carbon sequestration, offering a viable pathway to income diversification amidst unpredictable weather patterns.
  - **Environmental Benefits**: ARR projects not only provide economic gains but also enhance soil fertility, improve water retention, and mitigate erosion, thereby promoting long-term agricultural sustainability and resilience.

2. Bridging the chasm of Global Inequality
GS 3 (Economy)

- **Why in News:** The recent **Summit of the Future** has raised critical questions regarding global governance, emphasizing whether the focus should be on great power competition or addressing persistent institutional imbalances and global inequality. The summit's outcomes, including initiatives like the **Global Digital Impact initiative** and a **Declaration on Future Generations**, highlight the need for cooperation while reflecting ongoing challenges in global governance structures.

Bridging the chasm of global inequality

The Summit of the Future raises a set of fundamental questions on global governance: should the focus be on great power competition or continuing imbalance in the institutions, agenda setting, and global inequality? The former looks at the means and not the ends with a continuing debate on the meaning of justice.

Global goals do not resolve challenges; they support new forms of cooperation. The Summit resulted in a Global Digital Impact initiative and a Declaration on Future Generations, an inspirational call for national action. The concrete impact is an International Scientific Panel and a Global Dialogue on AI. An implementation map and intergovernmental consultations mirror how climate change came onto the global agenda 30 years ago. Climate change is now relegated to scaling up adaptation finance, and GDP will include sustainability. Developed countries continue to have the capacity to shape the global agenda.

The Summit did not agree to a clear pathway for Security Council reform and has called for categories of members. Reform of governance of global financial institutions is limited to a pledge to give developing countries a greater say in decision making and review of sovereign debt has been reiterated. Concerns of developing countries have got a short shift.

The problem here is one of definitions. Should the G-7, which continues to set the global agenda, be described as a club of victors of the Second World War or a group of former colonial powers? The U.S. established the G-7 in 1973 to set the global agenda in the United Nations (UN) as an anti-developing country body. The clash between Western capitalism and Soviet communism provided the former colonies who became the world's poor more space and voice. While the world's political geography was reshaped, the 'poor' remained trapped at the bottom of the economic and geopolitical hierarchy. The imbalance in the wider world is reflected in the UN.

For example, recent figures from the UN show that only 17% of the Sustainable Development Goals are on track. Developing countries hold $29 trillion in public debt, with $847 billion in net interest payments, and experienced a negative net resource transfer in 2022. In July, the first joint declaration by G-20 finance leaders on international tax cooperation ended with disagreement over whether the UN or the OECD is the right forum to advance the agenda.

Real change began with the re-emergence of China and India and their BRICS grouping, in 2009, but it still awaits the reversal of colonial imbalances in key areas. In 1950, the U.S. used 40% of the world's natural resources having hegemonic power to set up multilateralism in a unilateral manner. With the reconstruction of Europe by 1970, their share had come down to 26%. Multilateralism evolved into treaties, having the authority to impact national policies. The G-7 share decreased to one-fifth in 2010, when Asia used half of global resource use. In a more equal world, the interests of the Global South gained a voice but not the ability to set the agenda. South Africa in 2023 had to file a case to determine obligations under the climate regime and this is a severe indictment of conference diplomacy.

Foundations of power

The foundations of power will remain with the West for a few decades even as the global trend is in favour of the Global South. In 1800, Asia consumed more energy than the rest of the world. In 1850, it consumed as much energy as the West. In 1950, the West's consumption was three times the rest of the world. In 2000, the West consumed as much energy as the rest of the world. The imbalance in the sphere of technology and endogenous capacity is even more severe with China and India as outliers becoming global leaders only in certain areas. The trend is towards a more equal world in all its dimensions. In 2000, 4.6 billion people lived in countries whose combined GDP was just 20% of the 755 million people who lived in the G-7. By 2016, the GDP share of 17 developing countries as a percentage of the G-7 countries tripled to 63%. The Summit accepts this imbalance but focuses on how progress is measured rather than on measures to bridge the gaps.

The Summit recognises that GDP focuses on the economic performance of societies but seeks to link it to sustainability. A broader understanding of prosperity considers non-monetary factors such as infrastructure, municipal services, affordable energy, educational opportunities, health care, and access to drinking water that better represent the urban living standards in a country. A focus on comparable levels of well-being is overdue.

The big lesson from the Summit is that developing countries have yet to exploit the opportunities presented by the UN system. While the international political process is open in procedural terms, it has been informed by consensual science developed by 'official experts', and this will be the case for global governance of Artificial intelligence (AI) and modification of GDP. Experts frame issues in a manner that determines the "problem" and how it should be "resolved".

As global power shifts back to Asia, both giants are conscious that their ideas are different from the dominant view espoused by the West on how societies work, change, and can be influenced. In a nod to geopolitics, Asia needs to be involved more deeply from the very beginning in expert bodies on AI and GDP to shape global governance by defining global priorities, cooperation, and justice.

Mukul Sanwal

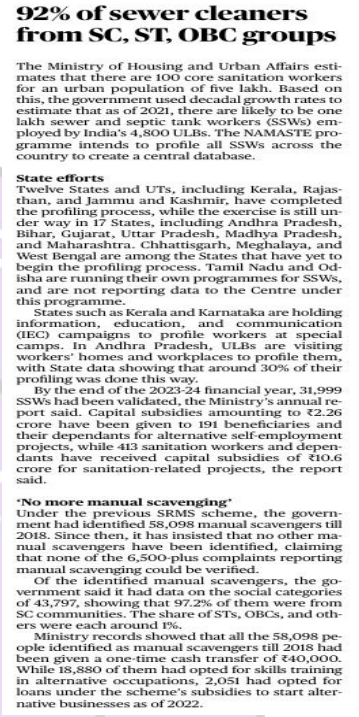
served as policy adviser to the Executive Director of UNEP and later to the Executive Secretary of the UNFCCC and was closely associated with Inter-Agency Relations in the Chief Executives Board of the UN

The big lesson from the Summit is that developing countries have yet to exploit the opportunities presented by the UN system

- **Outcomes and Challenges of the Summit**
  - **Global Initiatives**: The Summit led to the establishment of the **Global Digital Impact** initiative and the **Declaration on Future Generations**, aiming to inspire national actions and foster international cooperation.
  - **Limitations in Security Council Reform**: No clear pathway for **Security Council reform** was agreed upon, with discussions remaining centered on the inclusion of different member categories, reflecting ongoing dissatisfaction among developing nations.
  - **Inadequate Support for Developing Nations**: While there are pledges to increase the voice of developing countries in global financial institutions, the practical support for addressing their concerns remains limited and often overlooked.
- **Historical Context and Current Imbalances**
  - **G-7's Agenda-Setting Role**: The G-7 continues to shape the global agenda, often viewed as a club of former colonial powers rather than a coalition of victors from **World War II**, perpetuating imbalances in global governance.
  - **Economic Disparities Persist**: Despite the emergence of **BRICS nations like China and India**, the structural inequalities rooted in colonial history persist, with developing countries facing severe economic challenges and a staggering $29 trillion in public debt.
  - **UN Sustainable Development Goals Underperforming**: Only 17% of the **Sustainable Development Goals** are currently on track, illustrating the ongoing struggles of developing countries in achieving equitable progress within the global framework
- **Future Directions for Global Governance**
  - **Shift in Global Power Dynamics**: While the foundations of power remain with the West for the foreseeable future, trends indicate a gradual shift towards the Global South, particularly with Asia's rising influence in the global economy.
  - **Redefining Measures of Prosperity**: The Summit recognizes the need to expand GDP metrics to include sustainability and broader measures of well-being, encompassing infrastructure, health care, and education to reflect true living standards.
  - **Engaging Asia in Global Governance**: There is a pressing need for deeper involvement of Asian countries in shaping global governance frameworks, particularly in emerging areas like AI, to ensure that their perspectives and priorities are adequately represented.

3. India's Sewer and Septic Tank Workers: The NAMASTE Initiative
GS 2 (Social Issues)

- **Why in News:** The Indian government has recently launched an ambitious initiative to profile and **support sewer and septic tank workers (SSWs)** across the country. This effort is part of the **NAMASTE programme**, which aims to mechanize sewer cleaning and prevent deaths associated with hazardous manual cleaning. Recent data reveals alarming statistics regarding the demographics of these workers, their conditions, and the need for systemic reforms in sanitation practices.



92% of sewer cleaners from SC, ST, OBC groups

The Ministry of Housing and Urban Affairs estimates that there are 100 core sanitation workers for an urban population of five lakh. Based on this, the government used decadal growth rates to estimate that as of 2021, there are likely to be one lakh sewer and septic tank workers (SSWs) employed by India's 4,800 ULBs. The NAMASTE programme intends to profile all SSWs across the country to create a central database.

State efforts

Twelve States and UTs, including Kerala, Rajasthan, and Jammu and Kashmir, have completed the profiling process, while the exercise is still under way in 17 States, including Andhra Pradesh, Bihar, Gujarat, Uttar Pradesh, Madhya Pradesh, and Maharashtra. Chhattisgarh, Meghalaya, and West Bengal are among the States that have yet to begin the profiling process. Tamil Nadu and Odisha are running their own programmes for SSWs, and are not reporting data to the Centre under this programme.

States such as Kerala and Karnataka are holding information, education, and communication (IEC) campaigns to profile workers at special camps. In Andhra Pradesh, ULBs are visiting workers' homes and workplaces to profile them, with State data showing that around 30% of their profiling was done this way.

By the end of the 2023-24 financial year, 31,999 SSWs had been validated, the Ministry's annual report said. Capital subsidies amounting to ₹2.26 crore have been given to 191 beneficiaries and their dependants for alternative self-employment projects, while 413 sanitation workers and dependants have received capital subsidies of ₹10.6 crore for sanitation-related projects, the report said.

'No more manual scavenging'

Under the previous SRMS scheme, the government had identified 58,098 manual scavengers till 2018. Since then, it has insisted that no other manual scavengers have been identified, claiming that none of the 6,500-plus complaints reporting manual scavenging could be verified.

Of the identified manual scavengers, the government said it had data on the social categories of 43,797, showing that 97.2% of them were from SC communities. The share of STs, OBCs, and others were each around 1%.

Ministry records showed that all the 58,098 people identified as manual scavengers till 2018 had been given a one-time cash transfer of ₹40,000. While 18,880 of them had opted for skills training in alternative occupations, 2,051 had opted for loans under the scheme's subsidies to start alternative businesses as of 2022.

- **Key Findings**
  - **Demographics of Workers**: Over 38,000 workers have been profiled, with **9% belonging to Scheduled Castes (SC), Scheduled Tribes (ST), or Other Backward Classes (OBC).** Specifically, 68.9% are SC, 14.7% are OBC, and 8.3% are ST.
  - The profiling is conducted by the **Ministry of Social Justice and Empowerment** and focuses on various roles related to sewer cleaning, including drivers and helpers as part of its NAMASTE programme.
  - **Hazardous Conditions**: Between 2019 and 2023, at least 377 workers died while performing hazardous cleaning tasks. The **NAMASTE programme** seeks to address these safety issues by providing training and better equipment.
  - **Current Status**: The profiling has been completed in twelve states and Union Territories, while others are still ongoing. The government estimates there are approximately 100,000 SSWs across India.
  - **Economic Support**: Since the program's inception, capital subsidies of Rs 2.26 crore have been disbursed to 191 beneficiaries for self-employment projects.
- **Causes of the Issue**
  - **Historical Discrimination**: Sanitation work in India is locked in with caste and carries social stigma. The majority of SSWs belong to marginalized communities highlights deep-rooted caste-based inequalities in access to better employment opportunities.
  - **Inadequate Mechanization**: The lack of mechanized solutions for sewer cleaning has perpetuated hazardous working conditions, forcing workers to rely on manual methods that pose significant health risks.
- **Need to focus on SSWs**
  - The Union government's rationale is that manual scavenging as a practice has ended across the country and what needs to be fixed now is the **hazardous cleaning of sewers and septic tanks.**
  - It draws this distinction based on a technical difference in how manual scavenging and hazardous cleaning are defined in the **Prohibition of Employment as Manual Scavengers and their Rehabilitation Act.**
  - The NAMASTE programme targets "workers directly associated with sewer and septic tank cleaning including drivers of desludging vehicles, helpers, machine operators and cleaners".
  - There are 100 core sanitation workers for an urban population of five lakh. As of 2021, there are likely to be one lakh SSWs employed by India's 4,800 ULBs.
- **About NAMASTE Scheme**
  - The **National Action for Mechanized Sanitation Ecosystem (NAMASTE) Scheme** is a testament to the Government's human-centric approach where no sanitation workers have to manually engage in the hazardous task of sewer and septic tank cleaning operations.
  - NAMASTE programme is a scheme to mechanise all sewer work and prevent deaths due to hazardous cleaning work.
  - It is jointly initiated by the **Ministry of Social Justice and Empowerment and the Ministry of Housing and Urban Affairs**.
  - **Implementing Agency:** National Safai Karamcharis Finance and Development Corporation (NSKFDC)

- The components of the scheme include:
  - **Profiling of SSWs** in ULBs through digital tools (1 lakh SSW to be identified).
  - **Health Insurance** of SSW under PM-JAY.
  - **Occupational safety training** of SSWs and Sanitation Response Units for NAMASTE.
  - **Capital Subsidy** up to Rs 5 lakh for procurement of Sanitation Related Vehicles/ Equipment.
  - **Distribution of PPE** to SSWs.
  - **Distribution of safety devices to Emergency Response Sanitation Unit (ERSU).**
  - **IEC Campaign** for awareness on SSW safety and dignity.
  - In 2023-24, this scheme was brought in to replace the **Self-Employment Scheme for Rehabilitation of Manual Scavengers (SRMS).**

- **Key-Legislations**
  - In 1993, India introduced the **The Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, 1993,** outlawing manual scavenging. But only on paper.
  - In 2013, The **"Prohibition of Employment as Manual Scavengers and their Rehabilitation Act"** expanded the scope of the 1993 legislation and called for rehabilitation of those employed in the hazardous cleaning of sewers, septic tanks and other kinds of insanitary latrines.
  - Any person or agency who engages any person for manual scavenging in violation of the provisions of the MS Act, 2013 is punishable under Section 8 of the above Act, with imprisonment up to 2 years or fine up to Rs. One Lakh or both.

4. Small Modular N-Reactors
GS 3 (Science and Tech)

- **Introduction:**
  - As the world grapples with the urgent need to decarbonize energy systems and reduce greenhouse gas emissions, nuclear energy is resurfacing as a critical component of the solution.
  - While traditional nuclear power plants are large and costly to build, Small Modular Nuclear Reactors (SMRs) are emerging as a promising alternative.
  - These compact reactors offer the potential to provide safe, scalable, and sustainable energy to meet global demands.

RUSSIA INTERESTED IN COLLABORATING

Small nuclear reactors get traction: Private players offer captive sites for power projects

Small Modular Reactors seen as key for countries to achieve energy transition

ANIL SASI
NEW DELHI, SEPTEMBER 29

INDIA'S PLANS TO get into the manufacturing value chain of Small Modular Reactors is yielding some positives with a handful of private players learnt to have shown interest in deploying these at their captive site. Since the talks are sensitive, sources said disclosing names may not be appropriate at this stage.

SMRs — with a capacity of 30MWe to 300 MWe per unit — are increasingly seen as important for nuclear energy to remain a commercially competitive option in the future. India is pushing for a leadership slot in this

CONTINUED ON PAGE 2

EXPLAINED

What sets SMRs apart

SMRS ARE small reactors offering 30-300 MWe power output per unit, and are seen as effective in not just producing base load power (where thermal is seen as important), but also amongst renewables as a more carbon-neutral source.

- **What are Small Modular Reactors (SMRs)?**
  - Small Modular Reactors are nuclear reactors designed to generate a small amount of electricity—**typically up to 300 MW per unit**.
  - Unlike traditional large nuclear reactors, which generate up to 1,000 MW or more, SMRs are smaller in size, allowing for modular deployment, enhanced safety features, and reduced construction times.
  - SMRs operate on the same fundamental principles as traditional nuclear reactors, using nuclear fission to generate heat.
  - This heat is then used to produce steam, which drives a turbine to generate electricity.
  - **Characteristics of SMRs:**
    - **Modularity**: SMRs can be factory-built in modules and transported to the installation site, which significantly reduces on-site construction time and costs.
    - **Scalability**: The modular nature allows for flexible scaling, enabling utilities to add capacity as demand grows.
    - **Safety Enhancements**: Many SMR designs incorporate passive safety systems, which rely on natural forces like gravity and convection, reducing the need for operator intervention in emergencies.
    - **Lower Capital Costs**: Smaller reactors mean lower upfront investments, making SMRs an attractive option for countries and regions with limited financial resources for energy infrastructure.

- **Types of SMRs:**
  - **Pressurized Water Reactors (PWRs)**: Most SMRs are based on PWR technology, where water is used as both a coolant and moderator.
  - **Fast Neutron Reactors**: These reactors use fast neutrons and liquid metal coolants to achieve higher efficiency in fuel use.
  - **Molten Salt Reactors (MSRs)**: Instead of solid fuel, MSRs use liquid fuel dissolved in molten salt, offering inherent safety benefits by reducing the risk of meltdown.
  - **High-Temperature Gas-Cooled Reactors (HTGRs)**: These reactors use helium as a coolant and can operate at higher temperatures, increasing efficiency.
- **Benefits of SMRs:**
  - **Safety:**
    - SMRs are designed with advanced safety features that significantly reduce the risk of accidents.
    - Many designs feature **passive safety systems** that automatically shut down the reactor without human intervention if certain safety parameters are exceeded.
  - **Cost-Effectiveness:**
    - Traditional nuclear plants are capital-intensive and often face construction delays. SMRs, on the other hand, are designed to be more affordable.
    - With their modular design, they can be manufactured in factories and assembled on-site, lowering construction costs and timelines
  - **Scalability & Flexibility:**
    - One of the primary advantages of SMRs is their scalability.
    - Utility companies can install a single reactor to meet current energy demand and add more modules over time as demand grows.
    - This makes SMRs particularly suitable for smaller grids or regions with fluctuating energy needs.
  - **Lower Environmental Impact:**
    - While nuclear power is already considered low-carbon, SMRs offer further environmental benefits:
    - **Reduced Waste Generation**: Some advanced SMR designs are capable of reusing spent nuclear fuel, reducing the volume of radioactive waste.
    - **Small Physical Footprint**: SMRs occupy less land compared to traditional nuclear plants, making them easier to site in remote or space-constrained areas.
- **Challenges Facing SMR Deployment:**
  - **Regulatory Hurdles:**
    - Nuclear energy, being a highly regulated industry, poses a challenge for SMRs. Existing regulatory frameworks are designed for large nuclear plants, and SMRs will require tailored regulations that account for their smaller size and enhanced safety features.
  - **Public Perception:**
    - The legacy of nuclear disasters such as Chernobyl and Fukushima continues to impact public perception. Gaining public trust and dispelling myths around the safety of SMRs will be critical for widespread acceptance.
  - **High Initial Costs:**
    - While SMRs are more affordable than large nuclear plants, the upfront costs are still higher compared to renewable energy sources like wind and solar.
    - This can make it difficult to secure investment without clear long-term policy support and financial incentives.
  - **Waste Disposal:**
    - Although SMRs produce less nuclear waste, the issue of waste disposal remains.
    - A comprehensive strategy for handling and storing nuclear waste will be essential for the sustainable operation of SMRs.
- **News Summary: Small nuclear reactors get traction**
  - India's ambitions to enter the **Small Modular Reactors** manufacturing value chain are showing positive signs, with **private players expressing interest in deploying these reactors at their captive sites**.

- SMRs, which range between **30 MWe to 300 MWe** per unit, are seen as key to keeping nuclear energy commercially competitive.
- India is positioning itself as a leader in SMRs, both as part of its **clean energy transition** and as a foreign policy initiative.
- **Russia**, a major SMR player alongside **China**, is reportedly looking to expand nuclear cooperation with India in this field.
- Technical discussions are underway to assess the feasibility of SMRs in India, with the **Atomic Energy Act, 1962** guiding policy decisions. The **Indian government is also considering private sector involvement in this sector**.
- Globally, only two SMRs have reached operational status—**Akademik Lomonosov** in Russia and **HTR-PM** in China.
- India aims to emerge as a credible alternative, leveraging its history of operating small reactors and cost-effective nuclear manufacturing capabilities.

- **Steps Taken by Government to Promote SMRs:**
  - **Integration of SMRs into National Energy Plans**: The Indian government has highlighted nuclear energy as a crucial part of its clean energy transition. SMRs, being a flexible and scalable alternative, have been integrated into discussions on future energy policies to diversify the nuclear energy portfolio.
  - **Long-term Strategy for Net-Zero**: India's ambitious target of achieving net-zero emissions by 2070 includes nuclear energy as a key component, and the government is increasingly considering SMRs as a clean and safe option for decentralized energy production.
  - **Budget Allocations for Nuclear R&D**: The Indian government has allocated funds in its budget to enhance nuclear research, focusing on advanced reactor technologies like SMRs. This funding supports R&D efforts and contributes to infrastructure development.
  - In the 2024-25 Indian Budget, the government announced plans to partner with the private sector to develop and set up "**Bharat Small Reactors**", essentially SMRs.

5. Swachh Bharat Mission (SBM) Urban 2.0
GS 2 (Governance)

- **Why in News:** Since the launch of the Swachh Bharat Mission (SBM) Urban 2.0, large cities have not cleared any land in half of their legacy landfill sites, with just 38% of the total dumped waste has been remedied so far.
- **Swachh Bharat Mission (SBM):**
  - **About:**
    - The Government of India had launched **the SBM on 2nd October 2014** to accelerate the efforts to achieve universal sanitation coverage and to put focus on sanitation
    - The mission has two components - rural (**SBM-Gramin,** overseen by the Ministry of Jal Shakti) and urban (**SBM-Urban**, overseen by the Ministry of Housing and Urban Affairs [MoHUA]).
    - Under these components, **all villages, Gram Panchayats, Districts, States and UTs** in India had to declare themselves "open-defecation free" (ODF) by 2 October 2019 - the 150th birth anniversary of Mahatma Gandhi.


10 YEARS OF SWACHH BHARAT MISSION

With 2026 target approaching, clearing of 50% landfill sites in big cities yet to start

Top 20 biggest landfills in India

  - **Achievements:**
    - As one of the largest cleanliness drives in the world, SBM has brought in **a remarkable transformation and traceable benefits** to the society as a whole.
    - Many States have achieved the status of 100% ODF and Individual Household Latrines (IHHL) coverage, thereby **leading to a sea change in the dignity of people, especially women**.
    - This mission acts as a driver for **eliminating the gender disparity** through the construction of gender-specific latrines in public areas such as schools, roads and parks.

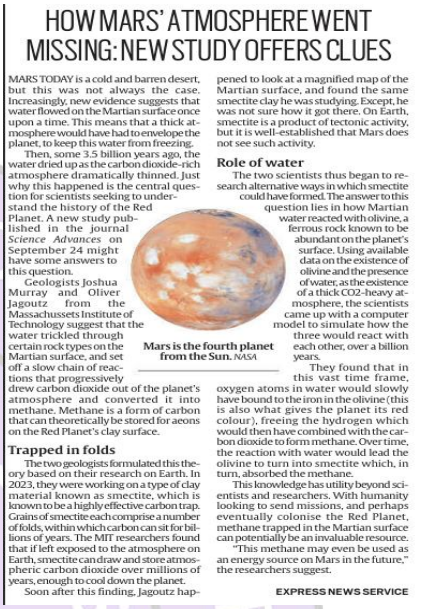
        - This public movement will have an indirect positive impact on society by **increasing the enrolment ratio of girls in schools and improving health standards.**

- **Analysing the SBM Urban 2.0:**
    - **About:**
        - Launched in **2021**, the SBM Urban 2.0 has the target of **clearing around 2,400 legacy landfill sites in the country by 2025-2026**.
        - **Legacy waste dumpsites** are places that contain solid waste that has been collected and stored for years in an unscientific and uncontrolled manner.
    - **Funding:** To get funding from SBM Urban 2.0, **cities are supposed to submit action plans to the MoHUA for bioremediation** of their legacy landfills and then reuse of the land cleared.
    - **Process:** Converting the waste into different categories, leading to the –
        - Creation of **refuse derived fuel (RDF)** for waste-to-energy plants,
        - **Recycling** of construction and demolition waste and **bio-soil** that can be used for road construction.
    - **Performance:**
        - Out of the 69 landfill sites (accounting for 57% of the total waste dumped in landfills in the country) in cities with a population over 1 million, **land is yet to be cleared in 35 sites.**
        - Out of a total area of 3,354 acres with 1,258 lakh metric tonnes of waste in these 69 sites, 1,171 acres with 475 lakh MT of waste have been cleared so far.
    - **Some success stories:**
        - **Ahmedabad** has been able to clear up 4.3 acres of land that used to have 2.30 lakh tonnes of waste. The site has been redeveloped as an ecological park
        - **Nagpur's** legacy landfill spread over 35 acres, with 10 lakh metric tonnes of waste, has also been 100% cleared under the mission.
            - **The bioremediation** of the waste led to generation of refuse derived fuel and manure, which is being sold.
            - The site will be used for an integrated waste management project
        - **Pune's** legacy landfill at Vanaz has been cleared for use as a depot for the Metro in the city.
        - **Lucknow's** landfill at Ghaila was spread over 72 acres, with 8 lakh tonnes of waste. The site has been cleared and is being used to develop a park, Rashtriya Prerna Sthal.
    - **Challenges ahead:**
        - Despite significant progress under the SBM, a large portion of legacy waste and landfills continues to **present environmental, health and space constraints** for cities.
        - The cities are facing the challenge of clearing the remaining 65% of land and remediating 62% of garbage left at the legacy landfill sites, with less than 2 years to go before the scheme is completed.

- **Way ahead**
    - **Proper planning** before starting the bioremediation process.
    - **Stopping dumping fresh waste** on the sites undergoing remediation.
    - Providing alternative locations to process fresh waste.
    - Stopping the use of the fine soil-like material generated from the sites as compost, because of the possibility of contamination due to the presence of heavy metals.

6. Mars Atmospheric Loss
GS 3 (Science and Tech)

- **Why in News:** Recent research has unveiled intriguing findings about **Mars' atmospheric history**, suggesting that the planet's original atmosphere may have been absorbed by **minerals in its clay-rich surface**. This revelation is significant as it provides insights into how Mars transformed from a once habitable world, with abundant water, into the dry, inhospitable environment we see today.



HOW MARS' ATMOSPHERE WENT MISSING: NEW STUDY OFFERS CLUES

MARS TODAY is a cold and barren desert, but this was not always the case. Increasingly, new evidence suggests that water flowed on the Martian surface once upon a time. This means that a thick atmosphere would have had to envelope the planet, to keep this water from freezing.

Then, some 3.5 billion years ago, the water dried up as the carbon dioxide-rich atmosphere dramatically thinned. Just why this happened is the central question for scientists seeking to understand the history of the Red Planet. A new study published in the journal *Science Advances* on September 24 might have some answers to this question.

Geologists Joshua Murray and Oliver Jagoutz from the Massachussets Institute of Technology suggest that the water trickled through certain rock types on the Martian surface, and set off a slow chain of reactions that progressively drew carbon dioxide out of the planet's atmosphere and converted it into methane. Methane is a form of carbon that can theoretically be stored for aeons on the Red Planet's clay surface.

Trapped in folds

The two geologists formulated this theory based on their research on Earth. In 2023, they were working on a type of clay material known as smectite, which is known to be a highly effective carbon trap. Grains of smectite each comprise a number of folds, within which carbon can sit for billions of years. The MIT researchers found that if left exposed to the atmosphere on Earth, smectite can trap and store atmospheric carbon dioxide over millions of years, enough to cool down the planet.

Soon after this finding, Jagoutz happened to look at a magnified map of the Martian surface, and found the same smectite clay he was studying. Except, he was not sure how it got there. On Earth, smectite is a product of tectonic activity, but it is well-established that Mars does not see such activity.

Role of water

The two scientists thus began to research alternative ways in which smectite could have formed. The answer to this question lies in how Martian water reacted with olivine, a ferrous rock known to be abundant on the planet's surface. Using available data on the existence of olivine and the presence of water, as the existence of a thick CO2-heavy atmosphere, the scientists came up with a computer model to simulate how the three would react with each other, over a billion years.

Mars is the fourth planet from the Sun. NASA

They found that in this vast time frame, oxygen atoms in water would slowly have bound to the iron in the olivine (this is also what gives the planet its red colour), freeing the hydrogen which would then have combined with the carbon dioxide to form methane. Over time, the reaction with water would lead the olivine to turn into smectite which, in turn, absorbed the methane.

This knowledge has utility beyond scientists and researchers. With humanity looking to send missions, and perhaps eventually colonise the Red Planet, methane trapped in the Martian surface can potentially be an invaluable resource.

"This methane may even be used as an energy source on Mars in the future," the researchers suggest.

EXPRESS NEWS SERVICE

- **Background**
  - Over 3.5 billion years ago, Mars had a dense, carbon dioxide-rich atmosphere that enabled the existence of liquid water.
  - However, this atmosphere eventually thinned dramatically, leading to the drying up of surface water.
  - Scientists have long sought to understand the processes that caused this atmospheric loss.
  - The recent research provides insights into how water and rock interactions may have contributed to this phenomenon.
- **Key Findings from the Research on Mars' Atmosphere**
  - **Absorption of Atmosphere by Clays**: Researchers suggest that Mars' original atmosphere may have been absorbed by **clay minerals**, particularly **smectites,** which efficiently trap carbon dioxide.
  - **Water Interaction with Rocks**: The study posits that water, which was present in Mars' early history, could have seeped through the planet's crust, interacting with ultramafic rocks. This process would have led to a series of chemical reactions that transformed carbon dioxide into methane, sequestering it in clay.
  - **Historical Geological Processes**: The findings draw parallels between Earth's geological processes and those on Mars, particularly in how smectites are formed. On Earth, tectonic activity creates conditions for these clays, while Mars lacks such activity, prompting researchers to investigate alternative formation mechanisms.
  - **Significant Carbon Sequestration**: The research indicates that a substantial amount of Mars' carbon dioxide could have been stored in clay-rich layers, potentially covering the planet with over 1,100 meters of smectite.
  - **Impact on Mars' Habitability**: The loss of the atmosphere could explain why Mars became uninhabitable, as the lack of a protective atmosphere would have allowed liquid water to freeze and contributed to the planet's current desolate state.
- **About Mars**
  - Mars – the **fourth planet** from the Sun – is a **dusty, cold, desert world** with a **very thin** atmosphere.
  - It has a distinct rusty red appearance and two unusual moons.
  - **Phenomenal dust storms** can grow so large they **engulf the entire planet**, temperatures can get so cold that **carbon dioxide** in the atmosphere condenses directly into snow or frost, and marsquakes — a Mars version of an earthquake — regularly shake things up.
  - The bright rust color Mars is known for is due to **iron-rich minerals in its regolith** — the loose dust and rock covering its surface.
  - **Earth's soil is a kind of regolith, too,** albeit one loaded with organic content.
  - The iron minerals oxidize, or rust, causing the soil to look red.
  - **Important Mars Mission**
    - Mars Reconnaissance Orbiter
    - Mariner 9 (1971)
  - Mars Orbiter Mission (MOM) or Mangalyaan (India's first Mars Mission)

7. Can a variety of rice address farm fires in Punjab & Haryana?
GS 3 (Agriculture)

- **Why in News:**
  - In order to tackle the issue of farm fires in Punjab and Haryana, govt. is looking for different varieties of rice.
  - Pusa-2090 yields nearly as much as Pusa-44, the first choice of farmers. But it can be harvested by early to mid-October, eliminating the need for stubble burning before the sowing of wheat.

A rice variety to curb farm fires

Pusa-2090 yields nearly as much as Pusa-44, the first choice of farmers. But it can be harvested by early to mid-October, eliminating the need for stubble burning before the sowing of wheat

HARISH DAMODARAN

HARPREET SINGH has been cultivating Pusa-44 paddy since 2000, if not earlier. "Why not, when it yields 35-36 quintals of grain per acre, and in some of my land, even 40 quintals?" the 39-year-old from Bourhai Kalan village in Punjab's Malerkotla district said.

Bred by the Indian Agricultural Research Institute (IARI) at New Delhi, and released for large-scale cultivation in 1993, Pusa-44 takes 155-160 days to grow, from the time of sowing its seeds in nurseries to harvesting the grain.

The high yields — more than the 30-32 quintals per acre that its nearest competitor, the Punjab Agricultural University's PR-126, gives over 123-125 days — is Pusa-44's main attraction for farmers. Although taking 30-35 days more to mature, the extra 4-5 quintals yield is worth Rs 9,280-11,600 (per acre) at the Centre's minimum support price of Rs 2,320 per quintal for 'Grade A' paddy.

Pusa-44's environmental cost

But there is a cost to the high yields. The Pusa-44 paddy, transplanted in mid-June after nursery-sowing a month before, can be harvested only towards end-October. This leaves little time for field preparation to sow the winter wheat crop, which should ideally be done before mid-November. Most farmers, then, resort to burning the straw and stubble that remains after harvesting using combines.

The narrow turnaround window between paddy harvesting and the optimal sowing of wheat is at the root of farm fires in Punjab and Haryana — and the severe air pollution it contributes to in much of northern India — from late-October to mid-November.

The problem is more with the cultivation of Pusa-44, which covered an estimated 14.8% of Punjab's total non-basmati paddy area in 2023. That was lower than the 22% of 2022 and 39% in 2012, and even PR-126's 33% share last year. Yet, it remains the farmer's first choice, especially in the south-central districts of Sangrur, Malerkotla, Barnala, Ludhiana and Moga. While the Punjab government has banned Pusa-44 from this crop year, with the IARI also not supplying breeder material for multiplication after 2021, farmers are still growing it — using saved grains from the previous crops as seed.

In the current season, Harpreet Singh has sown Pusa-44 on 90 out of his 100-acre holding, transplanting these between June 10 and June 24 for harvesting from around October 20 to November 2. Singh does not burn the stubble: "I plough it into the soil using a Super Seeder, which also sows the wheat seeds in a single pass".

Not all farmers, though, can afford such expensive tractor-drawn machines.

A viable replacement?

IARI has bred a new, improved shorter-duration variety, Pusa-2090.

A selection from a cross between Pusa-44 and CB-501, an early-maturing Japonica rice line, it has a seed-to-grain maturity of 120-125 days. That's the same as PR-126, but Pusa-2090's paddy yield of 34-35 quintals per acre — now being tested in farmers' fields — is closer to Pusa-44's.

Agricultural scientists have, for long, worked at introducing genes from Japonica (a rice subspecies of East Asia) to the Indica varieties (grown in India and other tropical/subtropical regions) for improving yields and disease resistance. In this case, CB-501 was identified as a male parent line primarily for contributing to earliness (50% of its plants flower in 80 days, as against 120 days for Pusa-44). The resultant cross, thus, combined Pusa-44's high yields with CB-501's lower duration.

"Yields are a function of the number of tillers (branches with grain-bearing ear-heads or panicles) that each plant produces; the number of grains per panicle; and the weight of every 100 grains. The number of tillers per plant and filled grains per panicle are roughly the same in Pusa-44 and Pusa-2090 (around 30 and 260 respectively), while more than that for PR-126 (20 and 200)," A K Singh, former director of IARI, told *The Indian Express*.

Given the lower yield penalty and duration, farmers may find it viable to cultivate Pusa-2090. The new variety also has a strong culm (main stem) that makes it less prone to lodging (bending over or falling due to heavy winds and rains) than PR-126. It is highly responsive to the application of nitrogen (urea), again a trait shared with Pusa-44. And in maturing some 35 days earlier translates into significant water savings, with at least 5-6 fewer irrigations required against the normal 29-30 for Pusa-44.

What farmers think

Harpreet Singh last year planted Pusa-44 on 90 and PR-126 on 10 acres. This time, he has grown Pusa-2090 in place of PR-126 on the same 10 acres.

"I sowed my nursery on June 2 and transplanted on June 28-July 2. As of now, I am expecting a grain yield of 35 quintals, but we will really know only after the crop is harvested by October 4-5 and weighed," Singh said.

Harvesting paddy in early-October should give Singh plenty of time to sow wheat. But he plans to plant potato instead; the 'Diamond' variety, sown in mid-October would be ready for harvesting by mid-February. "After that, I will immediately plant Dekalb-9108 (a maize hybrid) for harvesting in 80-85 days towards mid-May," he added. Farmers wanting to only take wheat after paddy can transplant Pusa-2090 even in mid-July.

Sukhjeet Singh Bhangu, a farmer with 20 acres of land in Kanalowal Bhanguan village of Sangrur's Sunam tehsil, who also grows and markets seeds under his 'A-One' brand, felt that Pusa-2090 may replace Pusa-44 in the areas where it is still dominant: "Most farmers will hesitate growing a banned variety, for fear of it not being procured by government agencies. If Pusa-2090 gives 34-35 quintals, which is almost as much as Pusa-44 and above PR-126, they would go for it".

Vikas Chaudhary, a seed grower from Taraori village in Nilokheri tehsil of Haryana's Karnal district, harvested 35 quintals of paddy from his one-acre trial plot under Pusa-2090 last year: "That was good, as the grains had only 13% moisture (against the normal 16-17% content). This year's crop (nursery-sown on June 6 and transplanted on July 6) should also yield around that level".

Farm yields apart, there is also the issue of milling quality. "PR-126 paddy isn't liked much by millers because the rice recovery from it is hardly 63%, whereas the government's required norm is 67%. If Pusa-2090's grain quality matches that of Pusa-44, there will be acceptability for it from the millers' side too," Bhagwan Dass, secretary-general of the Rakhra (Patiala)-based Young Farmers Association Punjab, pointed out.

LONGER VERSION ON indianexpress.com/explained

Farmer Vikas Chaudhary at his Pusa-2090 paddy field in Taraori village in Haryana's Karnal district. Harish Damodaran

- **Pusa-44**
  - **About**
    - **Pusa-44**, developed by the Indian Agricultural Research Institute in 1993, takes 155-160 days to mature.
    - It has high yield of 35-36 quintals per acre, sometimes reaching 40 quintals.
    - Despite its longer growing period compared to the **PR-126** variety, which matures in 123-125 days and yields 30-32 quintals per acre, farmers prefer **Pusa-44**.
    - This is because the additional 4-5 quintals per acre translates to extra earnings of **Rs 9,280-11,600** at the government-set minimum support price of Rs 2,320 per quintal for 'Grade A' paddy.
  - **Environmental cost associated with Pusa-44**
    - While **Pusa-44 paddy** offers high yields, **its long growing period causes issues for farmers in Punjab and Haryana**
    - Harvesting in late October leaves **little time for wheat sowing**, leading many to burn the remaining straw and stubble for quick field preparation, contributing to severe air pollution in northern India during late October to mid-November.
    - Although **Pusa-44** cultivation has decreased from 39% in 2012 to 14.8% of Punjab's non-basmati paddy area in 2023, it remains popular in many districts of the region.
    - Despite a government ban and lack of new seeds, farmers continue using saved seeds to grow Pusa-44.
- **Pusa-2090**
  - **About**
    - Pusa-2090 is a newly bred, shorter-duration paddy variety developed by the Indian Agricultural Research Institute (IARI) as a potential replacement for Pusa-44.
    - **A cross between Pusa-44 and CB-501** (an early-maturing Japonica rice line), **Pusa-2090** matures in **120-125 days**, similar to PR-126, but with a higher yield of 34-35 quintals per acre, closer to Pusa-44's yield.
  - **Benefits**
    - The variety maintains a high number of tillers (branches with grain-bearing ear-heads or panicles) and grains per panicle, comparable to Pusa-44 and higher than PR-126.
    - Pusa-2090 also features a strong culm, making it less prone to lodging (bending over or falling due to heavy winds and rains) in adverse weather conditions, and it is highly responsive to nitrogen application.
    - Moreover, its shorter duration results in significant water savings, requiring 5-6 fewer irrigations than Pusa-44, which typically needs 29-30.
  - **A viable replacement of Pusa-44?**
    - Pusa-2090 has a lower reduction in yield compared to Pusa-44, as it produces almost as much grain as Pusa-44.

- At the same time, Pusa-2090 matures in a shorter time, similar to PR-126, which allows farmers to harvest earlier and potentially prepare for the next crop without delays.
- Therefore, Pusa-2090 presents a promising, viable option for farmers seeking both high yields and efficient water use.
- Farmers of this region are also considering Pusa-2090 as a potential replacement for Pusa-44, especially since the latter has been banned.
- However, in addition to yields, milling quality is also important.
- PR-126 is less favored by millers due to its low rice recovery rate of **63%**, below the government's standard of 67%.
- If **Pusa-2090** matches the grain quality of Pusa-44, it could gain wider acceptance among millers as well.

MCQ Current Affairs
30th Sept, 2024

1. Peechi - Vazhani Wildlife Sanctuary lies in which state?

a) Tamil Nadu
b) Odisha
c) Kerala
d) Gujarat

2. Consider the following statements:

A. It is a Hindu temple dedicated to Lord Shiva
B. It is located in the ancient city of Ujjain in the state of Madhya Pradesh.
C. It is one of the twelve Jyotirlingas of Lord Shiva.

The above statements correctly describe which one of the following temples?

a) Somnath Temple
b) Mahakaleshwar Temple
c) Trimbakeshwar Temple
d) Kashi Vishwanath Temple

3. Consider the following statements regarding Chikungunya:

A. It is a viral disease transmitted to humans through the bite of mosquitoes.
B. There is currently no approved vaccine or specific treatment for chikungunya infections.

Which of the statements given above is/are correct?

a) A only
b) B only
c) A and B
d) Neither of two

4. Canary Islands archipelogo, recently in news, is located in:

a) Pacific Ocean
b) Atlantic Ocean
c) Arctic Ocean
d) Black Sea

5. Consider the following statements regarding Bioethanol:

A. It is an agricultural by-product which is obtained from the processing of sugar from sugarcane.
B. It is used is an important industrial chemical as well as an additive to automotive gasoline.

Which of the statements given above is/are correct?

a) A only
b) B only
c) A and B
d) Neither of two

MCQ Current Affairs
30th Sept, 2024

1. c
2. b
3. c
4. b
5. c