PRATIYOGITA DARPAN

Gist of Essential Magazines

(Yojana, Kurukshetra, Down to Earth and Science Reporter)

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GIST OF YOJANA

Topic :
Year-End Special

December 2024

REAPING INDIA'S DEMOGRAPHIC DIVIDEND

The demographic dividend refers to the potential economic benefits arising from a large working-age population relative to the dependent population (children and elderly). India, with a significant share of its population in the working-age group, has a unique opportunity to accelerate economic growth, provided it addresses key challenges.

Key Points :

Creating Employment Opportunities in Non-Farm Sector

- The share of agriculture in India's workforce has been steadily declining, projected to fall from 45·8% in 2023 to one-fourth by 2047.
- Hence, 8 million employment opportunities need to be created in non-farm sector by 2030.

Economic Transition

- As India shifts to becoming the world's third largest economy (measured at market exchange rate) by the next decade, structural transformation in employment patterns is essential.
- Policies should focus on enhancing productivity in sectors like manufacturing, services and urban industries.

Labour Force Participation and Employment Generation

- The Periodic Labour Force Survey (PLFS) indicates that more employment opportunities have been generated compared to number of people joining the labour force in the last five years.
- Yet, Labour Force Participation Rates (LFPR) remain a concern, especially among women.

Skill Development and Productivity

- Improving the skill set of the labour force is a critical challenge.
- Workers need better training to adapt to higher-paying, non-agricultural jobs and integrate with global markets.
- Policies like the e-Shram portal are aimed at better tracking and facilitating employment and skilling initiatives.

Structural Issues in Employment

- India's informal economy still dominates, contributing to low job security and wages.
- The transition to formalized employment and social security coverage for workers must be accelerated.

PM Internship Scheme 2024

Providing internship opportunities to 1 crore youth in top 500 companies over 5 years

Launch Date: October 3, 2024

Internship Opportunities: I crore youth across 500 top companies

Monthly Stipend: ₹5,000 / month for selected interns

Portal Opening for Candidates: October 12, 2024

Online Portal: pminternship.mca.gov.in

Focus on Women and Marginalized Groups

- Female workforce participation has improved, but there is significant room for further progress.
- Bridging gender gaps in employment and skilling can significantly enhance economic output.

Role of Policy and Governance

- Proactive measures such as promoting investments in infrastructure and industries, improving labour laws and fostering entrepreneurship are vital.
- The government must balance between social safety nets and economic liberalization to sustain growth.

To harness the demographic dividend effectively, India must ensure equitable job creation, skill upgradation and structural reforms in the economy. This calls for coordinated efforts across sectors, with a focus on inclusivity, technology adoption and sustainable development. With the right interventions, India can transform its demographic potential into a growth driver over the next two decades.

VISION AND ROADMAP FOR SCIENCE AND TECHNOLOGY

India has the potential to create a new paradigm for global scientific progress, offering innovative solutions that combine ancient wisdom with cutting-edge science.

Key Points :

Historical Strengths

- India's foundational contributions, from Ayurveda to chemistry and materials science, provide a strong base for innovation.
- Ancient knowledge systems combined with cutting-edge tools like AI and robotics can create a unique global edge.

Achievements in Science and Technology

- India ranks 3rd globally in scientific publications and 6th in patent filings, showcasing significant improvements in research output.
- Initiatives like the Partnerships for Accelerated Innovation and Research (PAIR) program and support for start-ups have bolstered innovation ecosystems.

अनुसंधान नेशनल रिसर्च फाउंडेशन
Anusandhan National Research Foundation

ANRF's Partnerships for Accelerated Innovation and Research (PAIR) Program

Objective
- Transforming Research and Innovation in Indian Universities
- Fostering research excellence in universities, aligned with NEP 2020

Eligibility

Hub Institutions
- Top 25 NIRF-ranked institutions
- Institutions of National Importance within top 50 of the NIRF ranking

Spoke Institutions
- Central and State Public Universities
- Selected NITs and IIITs

QR code

Start Date: 14 November 2024 | Last Date: 31 December 2024

- Start-ups, particularly in deep-tech areas, have achieved global recognition.

Strategic Focus Areas

- **Healthcare :** Investment in biotechnology, pharmaceuticals and indigenous medicine to create resilient healthcare solutions.
- **Sustainability :** Emphasis on renewable energy, green technologies and climate change adaptation.
- **Digital Infrastructure :** Expanding AI, Big Data and cyber security to strengthen digital and economic ecosystems.
- **Skill Development :** Nurturing human capital to align with technological advancements.

Challenges and their Solutions

- **Sustainability and Fragility :**
  - Challenges of global climate change requires transformative technologies such as e-mobility, green hydrogen, nuclear energy and solar cells.
  - To counter geopolitical threats, including cyber warfare need to develop capablities in AI, Cybersecurity and quantum cryptography.
- **Resource Constraints :**
  - Rapid urbanization and shifting consumption patterns putting strains on critical resources like food and water. To tackle this need to focus on advancement of technologies like precision agriculture.
  - To address vulnerabilities in supply chains for critical minerals, deployment of cutting edge technologies in advance manufacturing, AI driven optimization, quantum sensors, deep-sea mining and deep space exploration will be indispensable.
- **Longevity and Viability of Life :**
  - With increase in elderly population, advances in healthcare and medical technologies needed which includes assitive technologies.
  - With modernising healthcare system, need to focus on preventive healthcare.

India's S&T roadmap reflects a blend of its rich heritage and future-focused innovation. By addressing gaps and fostering collaborative efforts, India can achieve technological self-reliance, contribute to global challenges and secure a leadership position on the world stage.

INDIA'S EMERGENCE AS A HUB OF KNOWLEDGE AND TECHNOLOGY

India has made significant strides in emerging as a global hub for knowledge and technology. By leveraging advancements in research and development (R&D), strategic global partnerships and investments in cutting-edge sectors like artificial intelligence, quantum computing, renewable energy, and space exploration, India is driving economic and technological growth. The nation's focus on innovation and home-grown talent is positioning it as a leader on the global stage.
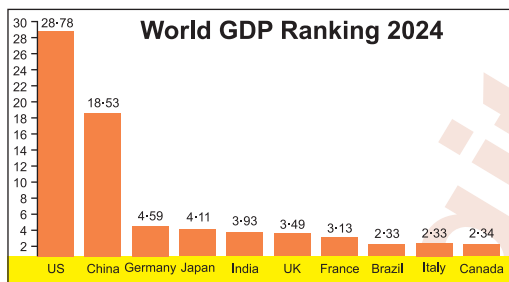
Key Highlights :

Historical Evolution of India's Technological Growth

Targeted investments in science, technology & innovations has made India technologically self reliant economy.

- **Green and White Revolutions :** Strengthened food security and dairy production.
- **Atomic and Space Missions :** India developed into a nuclear power and launched successful space programs.
- **IT and Digital Revolution :** Propelled India into a knowledge economy, establishing dominance in the global IT industry.

Driving Factors Behind India's Technological Growth

- **R&D Investment :** Continuous growth in research and innovation.
- **Global Partnerships :** Strategic collaborations with international organizations and institutions.
- **Skilled Workforce :** A strong pool of scientists, engineers and technology professionals.
- **Government Initiatives :** Programs like *Digital India*, *Startup India* and targeted policies to promote innovation and entrepreneurship.

World GDP Ranking 2024

US	28·78
China	18·53
Germany	4·59
Japan	4·11
India	3·93
UK	3·49
France	3·13
Brazil	2·33
Italy	2·33
Canada	2·34

India's Standing in Global Economy

- With a GDP of $ 3·93 trillion, India showcases consistent economic progress despite global challenges. India is currently ranked 5th in the World GDP Ranking 2024 (nominal GDP).
- Initiatives like the *National Education Policy* and investments in science and technology are expected to further enhance India's role in the global economy.

Key Sectors Leading India's Innovation

- **Quantum Computing :** A focus area to develop next-generation technologies.
- **Artificial Intelligence (AI) :** AI adoption in health, agriculture and governance.
- **Renewable Energy :** Investments in solar, wind and green hydrogen as part of sustainability goals.
- **Space Exploration :** Notable achievements by ISRO, including missions to the Moon (Chandrayaan) and Mars (Mangalyaan).

India's Vision for Technology and Innovation

India's focus on *"Technology as a National Priority"* emphasizes :

- Increasing Investment in Research and development
- The Indian research ecosystem has seen surge in output, with number of scientific publications growing 2·5 times from 2010 to 2020.
- Positioning India as a global leader in fields such as computer science, engineering and health science.

Innovation Ecosystem

- **Global Innovation Index (GII) :**
  - India ranks 39th in the Global Innovation Index 2024.
  - India's innovation growth is driven by improved research infrastructure, start-ups and skilled workforce.
- **Atal Innovation Mission (AIM) :**
  - A flagship initiative to foster innovation and entrepreneurship among youth.
  - **Key Programs :**
    - *Atal Tinkering Labs* : Hands-on learning for school students.
    - *Atal Incubation Centers* : Support for startups and innovators.
    - *Atal New India Challenges* : Addressing societal challenges through technology-driven solutions.

Economic Impact of Technology

- **Transformation Across Key Sectors :**
  - **Agriculture :** Adoption of precision farming, AI-based solutions and drone technology.
  - **Manufacturing :** Growth of Industry 4·0 with automation, robotics and IoT integration.
  - **Energy :** Investments in renewable energy and green hydrogen projects for sustainability.

Shift Towards Translational Research

- Emphasis on converting scientific research into practical solutions for industries and society.
- Example : Innovations in health technology, renewable energy and digital tools enhancing productivity.

Social Impact of Technology

- **Digital India and Social Inclusion :**
  - Bridging the digital divide with internet connectivity in rural and underserved areas.
  - Promoting e-Governance through platforms like *DigiLocker*, *UMANG* and *e-Sanjeevani*.
- **Health and Family Welfare :**
  - Telemedicine platforms like *e-Sanjeevani* ensure healthcare access in remote areas.
  - AI and digital health tools improve diagnostics, maternal care and vaccine delivery.

- **Education and Empowerment :**
  - EdTech and Digital platforms such as *SWAYAM*, *DIKSHA* and *PM e-Vidya* enhance learning access.
  - Empowering women and youth through skilling programs and digital literacy campaigns.

By harnessing innovation, investing in R&D, and focusing on self-reliance, India is poised to achieve sustainable and inclusive economic growth. With advancements in AI, quantum computing, and renewable energy, India is paving the way for a technologically empowered future.

ROADMAP FOR INDIA'S GEOPOLITICAL RECALIBRATION

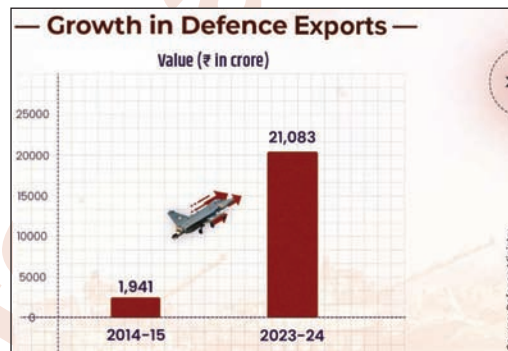### India's Foreign Policy : Anchored in Civilization Values

- India's dynamic foreign policy is rooted in the Indian civilizational ethos of *Dharma* (duty) and *Vasudhaiva Kutumbakam* (the world is one family).
- India has emerged as a credible voice of the Global South, balancing North-South and East-West divides.
- Emphasis on multi-alignment and hedging strategies helps India navigate global uncertainties and power conflicts.

Multilateralism and Strategic Engagements

- India has sought to reform global multilateral institutions like the UN Security Council to reflect current geopolitical realities.
- Partnerships through bilateral and minilateral groupings are preferred to overcome the failures of global multilateral forums.
- Examples include India's engagements through :
  - *QUAD* (India, USA, Japan, Australia).
  - *International Solar Alliance (ISA)*.
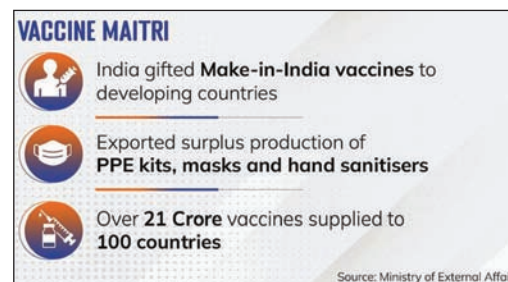 - *Neighbourhood First Policy*.

India's Response to Geopolitical Challenges

- Global challenges such as :
  - **Ukraine Conflict :** A balancing act between Russia and the West.
  - **Middle East Crisis :** Strong diplomatic statements on events like the Gaza-Israel conflict.
- India advocates for convergence, harmony and balance in resolving conflicts to safeguard global peace and economic stability.

— Growth in Defence Exports —

Value (₹ in crore)

- 2014-15 : 1,941
- 2023-24 : 21,083

Source: Defence Ministry

Economic Diplomacy and Defence Exports

- India's rise as a responsible major power is reflected in its economic and military capabilities :
  - **Surge in Defence Exports :** Defence exports reached ₹ 21,000 crore, showcasing the success of *Aatmanirbhar Bharat* (self-reliant India).
  - Strategic partnerships have boosted technology transfer and reduced dependency on imports.

VACCINE MAITRI

- India gifted **Make-in-India vaccines** to developing countries
- Exported surplus production of **PPE kits, masks and hand sanitisers**
- Over **21 Crore** vaccines supplied to **100 countries**

Source: Ministry of External Affairs

India : The Pharmacy of the World

- India's global outreach in healthcare, particularly during the COVID-19 pandemic, enhanced its soft power :
  - India supplied vaccines to 100+ countries under the Vaccine Maitri initiative.

❏ This reflects India's role as a trustworthy partner in global health security.

India's Vision for Geopolitical Future

● **Key Focus Areas** :
  ❏ Strengthening multilateral cooperation.
  ❏ Promoting regional stability and trade partnerships.
  ❏ Leveraging soft power through technology, healthcare and cultural diplomacy.

● India is poised to play a leadership role in shaping a new global order with an emphasis on inclusivity and stability.

India's geopolitical recalibration involves a fine balance between civilizational values, strategic alignments, and economic diplomacy. As India emerges as a strong voice for the Global South, its focus on peace, partnerships and progress ensures a roadmap for a harmonious and multipolar world.

2024 : THE YEAR OF INDIA'S STRATEGIC EMERGENCE

India's Rise as a Global Power

● India's growth in economic strength and political stability is complemented by enhanced capabilities across various sectors.
● Focus on self-reliance (Aatmanirbhar Bharat) has ensured progress in domestic production, research and global outreach.

Milestone Achievements in Defence and R&D

● **Defence production surged to record levels :** ₹ 1,27,265 crore in 2024, reflecting a 174% growth from ₹ 46,429 crore in 2014-15.
● India's significant rank in the Global Innovation Index (GII) (from 81 to 39th place globally) highlights its advancements in research and technology.

Global Leadership in Emerging Initiatives

● India is spearheading key global initiatives :
  ❏ **Voice of Global South Summit :** Addressing the needs of developing nations.
  ❏ Active participation in **G20** and other multilateral platforms ensures India's balanced role in global governance.
● India's inclusion in global partnerships like :
  ❏ International Solar Alliance (ISA).
  ❏ Coalition for Disaster Resilient Infrastructure (CDRI).

Economic and Financial Strength

● India's consistent economic performance is reflected in positive projections by international agencies.
● Global investors and financial institutions recognize India's emerging market as a hub for growth.
● Strong macroeconomic fundamentals combined with reforms have positioned India for further investment and development.

Technological Transformation and Innovation

● India's advancements in cutting-edge technology, startups and digital infrastructure are shaping its development trajectory.
● Key achievements include :
  ❏ Focus on indigenous R&D and industrial capabilities.
  ❏ Establishment of a global innovation ecosystem with strong support for startups.

Strategic Geopolitical Balancing

● India continues to play a pivotal role in the Indo-Pacific region, ensuring maritime security and economic stability.
● Example : Mega biennial exercise led by the Eastern Naval Command of India named Milan Exercise. Along with that Indian Air Force hosted its first multinational exercise - Tarang Shakti 2024.
● Strategic engagements with the West, Africa and ASEAN countries reinforce India's balanced foreign policy approach.

Vision for 2024 : A Rule-Based Global Order

● India emphasizes freedom, transparency and inclusivity in global governance.
● The nation's leadership focuses on creating a fair, rule-based order with an emphasis on addressing challenges of the Global South.

The year 2024 marks a turning point for India as it strategically balances economic growth, defence capabilities and global partnerships. With its inclusive vision, India emerges as a powerful force leading the world toward stability, innovation and progress.

INDIA'S MISSION MODE APPROACH AGAINST SICKLE CELL DISEASE

Sickle Cell Disease (SCD) remains a significant public health challenge in India, especially among tribal populations.

Understanding Sickle Cell Disease (SCD)

Sickle Cell Disease is a genetic blood disorder characterized by abnormal hemoglobin,

known as hemoglobin S, which causes red blood cells to assume a crescent or sickle shape. Unlike normal round red blood cells that can live up to 120 days, sickle cells have a lifespan of only 10 to 20 days. This premature breakdown leads to anemia, reduced oxygen supply, and frequent blockages in small blood vessels, resulting in pain, strokes, organ damage and mortality.
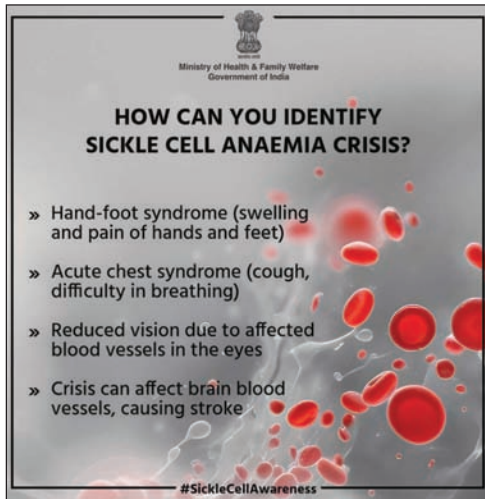
The Impact of SCD in India

According to the World Health Organization (WHO), more than 40 crore people globally are carriers of hemoglobin disorders like SCD and thalassemia. In India alone, approximately 1·2 lakh individuals are affected by SCD. The disease is most prevalent in tribal-dominated regions, where lack of awareness, limited health-are access, and socio-economic challenges exacerbate its impact.

India's Mission Mode Strategy : NSCAEM

The Indian government launched the National Sickle Cell Anaemia Elimination Mission (NSCAEM) in 2023, to eliminate SCD as a public health issue by 2047. The mission focuses on providing affordable, accessible and quality healthcare to all individuals affected by SCD.

Key Objectives of NSCAEM :

1. Early Detection and Screening : Mass screening programs, especially in tribal areas, to identify individuals carrying the sickle cell trait.

2. Accessible Treatment and Management : Ensuring availability of hydroxyurea, a key medication to manage SCD symptoms. Promoting blood transfusion services and improving healthcare infrastructure. Training healthcare workers to provide specialized care for SCD patients.

3. Awareness and Education : Launching campaigns to educate communi-ties about SCD, its hereditary nature, and the importance of genetic counseling. Partnering with local leaders and healthcare bodies to reduce stigma associated with the disease.

4. Research and Innovation : Supporting research to develop advanced treatments and explore curative options like gene therapy. Encouraging innovation in diagnostic tools for faster and cost-effective testing.

Types of Sickle Cell Disease

- **Sickle Cell Anemia :** Occurs when an individual inherits two copies of the sickle cell gene (HbSS). It is the most severe form of SCD.
- **Sickle Hemoglobin-C Disease (HbSC) :** A milder form resulting from one sickle gene and one hemoglobin C gene.
- **Sickle Beta Thalassemia :** A combination of sickle cell disease and beta-thalassemia, which results in reduced hemoglobin production.

Challenges in Combating SCD

Limited awareness among vulnerable populations. Inadequate healthcare facilities in remote areas. Stigma surrounding genetic diseases, leading to delays in seeking treatment.

The Road Ahead

India's fight against sickle cell disease requires a multi-faceted approach. With the NSCAEM as a cornerstone, the focus on early detection, quality treatment and community awareness is critical. Collaborative efforts between the government, healthcare providers, and local communities will ensure the success of this mission and improve the quality of life for millions affected by SCD.

MAKING INDIAN AGRICULTURE FUTURE-READY

Indian agriculture is undergoing a transformative phase to ensure productivity, profitability and sustainability. The Government of India has launched several schemes, strategies, and initiatives aimed at addressing challenges such as climate change, technological gaps and financial security for farmers.

Strategies and Steps Taken

1. Inclusive Development of Farmers :

A six-point strategy has been unveiled to foster the inclusive growth of farmers, with a strong focus on :

- **Welfare and Empowerment** : Special attention is given to small and marginal farmers, youth and women, ensuring financial inclusion and access to resources.
- **Nutritional Security :** Efforts to enhance productivity and tackle nutritional challenges are a key part of the agenda.

2. Leveraging Technology and Research :
- **Frontier Technologies :** Indian agriculture is being upgraded with cutting-edge technologies and scientific research to enhance yields and reduce costs.
- **Extension Programs :** These programs are empowering farmers with knowledge and skills to adopt modern agricultural methods.
- **Focus on Innovation :** Research is being promoted to address climate change challenges and improve food security.

3. Historic Budget Allocation
- The Budget 2024-25 saw a record allocation of ₹ 1·52 lakh crore, showcasing strong support for infrastructure development and innovation in agriculture.
- Allocation to agriculture research has been prioritized to promote advanced farming practices.

4. Ensuring Financial Security
- **Minimum Support Prices (MSP)** for major crops like *kharif* and *rabi* were raised significantly for the seasons 2024-25 to ensure farmers receive remunerative prices. For example :
  - ❏ MSP for rapeseed and mustard saw a notable increase.
  - ❏ Pulses and oilseeds were prioritized to reduce imports and achieve self-sufficiency.
- The government remains committed to providing financial safety nets for farmers.

5. Record Production and Food Security
- Indian agriculture witnessed record production of key crops, including rice, wheat, maize and oilseeds, ensuring food security for a growing population.
- For example, the production of rapeseed and mustard rose to 137·75 LMT, marking a significant achievement for the oilseed sector.

6. Empowering Rural Youth
- Training programs are being implemented to equip rural youth with skills in modern agriculture and allied sectors.
- Programs like Skill Training through Rural Infrastructure aim to foster innovation, entrepreneurship and self-employment among rural youth.

7. Focus on Sustainability
- **Climate-Resilient Agriculture :** Strategies are being developed to mitigate the impacts of climate change on agriculture and ensure long-term sustainability.
- **Soil Health Initiatives :** Steps to improve soil health and reduce over-reliance on fertilizers are being undertaken to make farming environmentally sustainable.

8. Digital Innovation and Infrastructure Development
- Investments in digital agriculture are enhancing access to information, weather forecasts, and market prices.
- Infrastructure development, such as irrigation systems and warehouses, is being prioritized to modernize agriculture and reduce post-harvest losses.

The Government of India's multi-pronged approach toward making agriculture future-ready emphasizes technology adoption, financial inclusion and sustainable practices. With bold budgetary allocations, MSP hikes, and programs for empowering youth, Indian agriculture is on a path to greater resilience, innovation and prosperity. These steps ensure that Indian farmers are equipped to meet the demands of the future while securing the nation's food and nutritional needs.

GOVERNMENT INITIATIVES IN CLIMATE CHANGE : A SUSTAINABLE PATH FOR VIKSIT BHARAT@2047

India, as one of the fastest-growing economies and most populous countries in the world, faces the dual challenge of maintaining economic growth while tackling the escalating impacts of climate change. With its vast ecosystems and unique socio-economic circumstances, the Government of India has embraced a comprehensive strategy to mitigate greenhouse gas emissions and ensure long-term sustainability. These efforts align with the larger vision of Viksit Bharat@2047, envisioning a prosperous and environmentally sustainable nation by 2047.

India's Leadership in Climate Commitments

India has consistently demonstrated global leadership in addressing climate change through ambitious targets and decisive policy measures. By revising its Nationally Determined Contributions (NDCs) under the Paris Agreement, India

has set clear pathways to reduce emissions and promote clean energy adoption.

Achievements Against NDC Targets

1. Reduction in Emissions Intensity :

- As of May 2024, India had successfully reduced this intensity by 30%, well ahead of schedule.
- A revised target aims for a 45% reduction by 2030.

2. Expansion of Non-Fossil Fuel Capacity :

- India's commitment to achieving 50% cumulative installed electric power capacity from non-fossil fuel sources by 2030 is progressing rapidly.
- By 2023, India had achieved 42·6% of its capacity from renewable sources.
- The installation of solar power and wind energy projects has played a significant role, with a focus on reducing dependency on coal-based power.

3. Sustainability and Greenhouse Gas Reduction :

- In August 2022, India further elevated its NDC targets by aiming for a reduction of emissions intensity by 45% and ensuring a 50% share of renewable energy in total installed capacity.

Major Government Programs and Policies

1. PM Surya Ghar : Muft Bijli Yojana :

- Launched on 1 February, 2024, it aims to install rooftop solar systems in 1 crore households, with a total investment of ₹ 75,201 crore.
- The program provides 300 units of free electricity per month, significantly reducing energy costs for families.
- It will lead to reducing carbon and missions, energy independence of households and create opportunities in renewable energy sector.

2. Sustainable Energy Transition :

- The government has prioritized a multi-dimensional energy strategy to transition towards clean fuels like solar, wind and hydroelectric power.
- Investments are being made in solar parks and off-grid solutions, driving energy production and improving energy access in rural and underserved areas.

3. Green Credit and Carbon Sequestration :

- Emphasis is placed on carbon sequestration projects to enhance afforestation, improve soil health and restore ecological balance. Programs like the Green Credit Program

incentivize industries and communities to adopt green practices.

4. Sovereign Green Bonds :

- The issuance of Sovereign Green Bonds has provided financial momentum for green infrastructure, including renewable energy, sustainable transport and climate-resilient agriculture; by mobilizing funds and fostering investor confidence in green economy.

5. Mission LiFE (Lifestyle for Environment)

- Promoted as a global movement, it encourages individuals to adopt sustainable lifestyles. By fostering awareness on energy conservation, waste management and water efficiency, this mission aims to create a people-driven movement for climate action.

Balancing Growth with Sustainability

India's comprehensive climate policies integrate economic growth with ecological restoration.

- **Renewable Energy Goals :** Installation of 500 GW of renewable energy capacity by 2030.
- **Environmental Restoration :** Enhanced focus on afforestation and ecological conservation.
- **Climate Resilience :** Programs to improve rural infrastructure, promote energy-efficient technologies and safeguard vulnerable ecosystems.

Conclusion

Programs like PM Surya Ghar Yojana, Sovereign Green Bonds, and ambitious NDC targets form the foundation for a cleaner, greener, and more resilient future. By aligning its efforts with the vision of Viksit Bharat@2047, India is paving a sustainable path for growth.

GIST
OF
KURUKSHETRA

Topic :
Skill, Development
and Entrepreneurship

December 2024

GOVERNMENT INITIATIVES IN PROMOTING SKILL DEVELOPMENT AND ENTREPRENEURSHIP

The Government of India's initiatives to address the demand-supply gap in the work-force by promoting skill development and entre-preneurship, aims to equip individuals with requisite skills for employment while fostering entrepreneurial spirit, thereby creating a robust and inclusive economy.

Key Points :

1. Skill Development

- The Ministry of Skill Development and Entrepreneurship (MSDE) plays a central role in training workers to match industry needs.

- Programs under the Skill India Mission target building a demand-driven ecosystem through initiatives like the Pradhan Mantri Kaushal Vikas Yojana (PMKVY).

MINISTRY OF SOCIAL JUSTICE & EMPOWERMENT GOVERNMENT OF INDIA

PM-DAKSH

(Pradhan Mantri Dakshta Aur Kushalta Sampann Hitgrahi) Yojana

- Provides skill training to SCs, OBCs and Safai Karamcharis
- Focuses on both short-term and long-term courses
- Enhances employability in various sectors
- Promotes self-reliance through skill-based employment
- Free training with placement assistance

- Public-private partnerships, such as the National Skill Development Corporation (NSDC), focus on skilling youth in voca-tional and technical trades.

2. Entrepreneurship

- Emphasis on empowering individuals with entrepreneurial training to reduce depen-dency on formal employment.

- Financial assistance, mentorship and incu-bation support are provided to startups and micro-enterprises, especially in rural areas.

SFURTI Scheme

BUSINESS पाठशाला

Financial Assistance :

Type of Clusters	Per Cluster Budget Limit
★ Heritage Clusters (1000 - 2500 artisans)	₹ 8 crore
★ Major Clusters (500 - 1000 artisans)	₹ 3 crore
★ Mini - Clusters (Upto 500 artisans)	₹ 1 crore

Eligible Entities

- ★ Corporates and Corporate Responsibility (CSR) Foundations
- ★ Field functionaries of State and Central Governments
- ★ Institutions of the Central and State Governments
- ★ Non-Government Organizations (NGOs)
- ★ Panchayati Raj institutions (PRIs)
- ★ Semi-Government Institutions
- ★ Private sector by forming Cluster-specific SPVs

3. Collaborations

- Partnerships with industries, international organizations and State governments ensure sector-specific skill enhancement.

- Initiatives like agreements with foreign nations, such as Israel, showcase India's focus on creating a globally competitive workforce.

4. Challenges

- Bridging regional skill disparities and add-ressing low participation in formal skilling programs remain hurdles.

By integrating skill development and entre-preneurship, India is addressing employment challenges while fostering self-reliance, by brid-ging skill gaps, boost productivity and contri-bute to the nation's economic growth.

SKILLING INDIA : EMPOWERING THE WORKFORCE

India is paving the way towards becoming the Skill Capital of the World by preparing its youth for global challenges. Efforts are being made to upskill the youth, boost their employ-ability, and create opportunities for a future-ready workforce.

Prime Minister's Internship Scheme 2024

It aims to provide India's youth with hands-on learning and practical work experience. The scheme seeks to :

- Offer internships to 1 crore youth in India's top 500 companies over the next five years.
- Bridge the gap between classroom learning and industry requirements.
- Foster skill development and real-world experience for graduates, diploma holders, and professionals.

The scheme was launched with a pilot project in 2024, achieving significant success with over 1·25 lakh youth interning with leading companies. Under this initiative, companies align their CSR expenditure towards training interns, contributing to the country's skill ecosystem.

Key Benefits for Interns :

The scheme provides financial and skill-based support to ensure a seamless learning experience :

1. Monthly Assistance : Interns receive ₹ 5,000 per month, funded through companies' CSR contributions. This assistance is directly linked to their Aadhaar accounts.

2. Grant for Incidental Expenses : A one-time grant of ₹ 6,000 is offered to cover expenses like travel, meals and onboarding.

3. Training Costs : Companies provide comprehensive training to enhance industry-specific skills, with training costs covered under CSR funding.

4. Accidental Insurance : Interns receive health and accident insurance coverage, ensuring safety and financial security during their training period.

Impact on India's Skilling Mission

The PM Internship Scheme 2024 is part of a broader skilling strategy aimed at addressing youth unemployment and bridging the employability gap. By empowering millions of young people, India is ensuring its workforce remains competitive and capable of meeting global demands.

This initiative, combined with other government programs like the Skill India Mission and National Apprenticeship Training Scheme (NATS), reflects a visionary approach towards building a dynamic and skilled workforce. Additionally, the Union Budget 2024 emphasizes continued investments in employment and skilling initiatives, with plans to upskill 1 crore youth in emerging sectors.

Conclusion

With the PM Internship Scheme and other skilling efforts, India is committed to transforming its demographic advantage into a global strength. These programs will help the youth acquire skills, gain experience, and contribute to a self-reliant and economically vibrant India.

COMPREHENSIVE ECOSYSTEM FOR RURAL WOMEN ENTREPRENEURSHIP

Women constitute nearly 48% of India's population, yet their participation in the workforce remains significantly underutilized. **Rural women** possess remarkable resilience and entrepreneurial spirit, which can serve as a major driving force for India's economic transformation if supported with the right ecosystem.

The Importance of Rural Women in India's Growth

According to the World Bank, women contribute 17% to India's GDP, and reports indicate that enhancing women's participation could add up to USD 0·7 trillion to the country's GDP by 2025. Further, integrating rural women into the entrepreneurial ecosystem could lift 68 million women into India's workforce. However, several bottlenecks like lack of opportunities, limited financial access and awareness gaps hinder their growth.

Challenges Faced by Rural Women Entrepreneurs

1. Limited Access to Finance : Many women lack collateral or awareness about loan opportunities, making it difficult to access funds.

2. Lack of Infrastructure : Rural areas often suffer from poor connectivity, low internet penetration and lack of marketplaces.

3. Low Awareness : Many women are unaware of government schemes or entrepreneurial opportunities.

4. Social Barriers : Traditional gender roles often limit women's decision-making power and access to entrepreneurial networks.

Key Government Initiatives to Empower Rural Women Entrepreneurs

1. Skill Upgradation and Mahila Coir Yojana (MCY) : Mahila Coir Yojana is an exclusive training programme aimed at skill development of rural women engaged in coir Industry.

2. Start-Up Village Entrepreneurship Programme (SVEP) :
- SVEP promotes self-employment and entrepreneurial ventures in rural areas. It provides training, financial support and

access to tools for aspiring entrepreneurs, particularly women.

- It encourages micro-enterprises and helps rural women turn small ideas into profitable businesses.

3. Mahila Kisan Sashaktikaran Pariyojana (MKSP) :

- Launched under the National Rural Livelihood Mission, MKSP empowers women farmers by enhancing their skills, providing resources and improving access to markets.
- It focuses on building capacities of women in agriculture and allied sectors to boost productivity and income.

4. Mahila Shakti Kendra (MSK) :

- This scheme aims to provide rural women with skill development and employment opportunities.
- MSKs serve as one-stop centers at the block and district levels to provide support and guidance to women entrepreneurs.

5. Women Enterprise Development Scheme :

- This program focuses on providing financial assistance to women-led businesses through subsidies, skill training and mentoring.
- The scheme aims to promote sustainable livelihoods and ensure economic empowerment.

6. Annapurna Yojana :

- Targeted at women in the food and catering sector, this scheme provides loans of up to ₹ 50,000 for setting up small food businesses.
- It ensures women can pursue entrepreneurial ventures in food production and catering.

7. Pradhan Mantri Mudra Yojana (PMMY) :

- PMMY provides collateral-free loans to small and micro-enterprises through Shishu, Kishor and Tarun categories.
- Women entrepreneurs are prioritized for loans, fostering their ability to start and expand businesses.

8. Start-Up India Initiative :

- This flagship initiative supports start-ups by providing tax benefits, financial support, and access to mentors.
- The initiative includes a Women Start-up Fund, promoting innovation and growth among women entrepreneurs.

Loopholes in Government Schemes

1. Lack of Promotion : Many rural women are unaware of the schemes due to poor outreach and communication strategies.

2. Skewed Focus : Programs often focus on select sectors like agriculture and food processing, neglecting other emerging industries.

3. Dearth of Targeted Schemes : Existing schemes fail to target specific needs of rural women, such as tech-based skills or modern trades.

4. Neglect of Some Sectors : Areas like manufacturing, technology and e-commerce are often overlooked.

5. Limited Online Access Rural areas suffer from low internet penetration, limiting access to digital platforms where most programs are registered.

Recommendations for Improvement

To enhance the ecosystem for rural women entrepreneurship, the following steps are recommended :

1. Awareness Campaigns : Conduct regular **awareness drives** through community centers, radio, and local influencers to educate women about available schemes and opportunities.

2. Digital Inclusion : Improve rural internet infrastructure and provide digital literacy programs to ensure women can access online portals and financial tools.

3. Sector Diversification : Expand focus to emerging sectors like manufacturing, technology, e-commerce and green industries.

4. Tailored Financial Support : Offer targeted loans and incentives for women entrepreneurs to diversify into higher-value businesses.

5. Monitoring and Mentorship : Set up a monitoring system to track progress and provide mentorship programs to guide women throughout their entrepreneurial journey.

6. Public-Private Partnerships : Collaborate with private companies to fund and mentor rural women entrepreneurs under CSR programs.

Conclusion

Empowering rural women entrepreneurs is critical for India's economic growth and social development. While existing government schemes like SVEP, Mudra Yojna, and MKSP have paved the way for progress, addressing the loopholes and enhancing program delivery is essential. By fostering financial inclusion, skill development, and awareness, India can unlock the untapped potential of its rural women, transforming them into drivers of the country's economic success.

SKILLING THE YOUTH THROUGH TECHNOLOGY

Skilling through technology has emerged as a powerful tool to bridge the skills gap, reduce unemployment and equip young individuals with both soft skills (like leadership, communication, and teamwork) and hard skills (such as coding, machine operation, and problem-solving).

Importance of Skilling

Skilling plays a transformative role in addressing global and national challenges such as :

1. Youth Unemployment : With millions entering the workforce annually, skilling ensures that young people meet the needs of an evolving job market. Programs focused on digital skills, AI and automation create pathways to meaningful employment.

2. Technological Disruption : The rise of Industry 4·0 and automation has disrupted traditional roles. Skilling prepares individuals for the future of work, enabling them to adapt to technological advancements like AI, robotics, and big data.

3. Economic Growth and Productivity : A skilled workforce contributes to increased productivity, driving economic growth and innovation. According to the World Economic Forum (WEF), closing the global skills gap could add trillions to global GDP.

4. Social Inclusion : Skilling ensures **inclusive development** by empowering marginalized groups, bridging gender divides and fostering economic participation across all demographics.

Role of Technology in Skilling

Technology has revolutionized how skilling is delivered, making it accessible, scalable and customized to individual needs :

1. Scalability : Platforms like online learning portals and virtual classrooms can reach millions simultaneously, addressing skilling challenges at scale.

2. Accessibility : Digital tools overcome geographical barriers, enabling youth from remote and rural areas to access quality education and training.

3. Customization and Personalization : AI-powered platforms and adaptive learning tools offer personalized learning experiences based on a learner's pace, interests and goals.

4. Industry-Aligned Curriculum : Technology ensures courses remain aligned with **industry standards** and future job market needs, preparing youth for emerging sectors.

Government Initiatives for Skilling

The Indian government has launched numerous programs to leverage technology and promote skilling :

1. Digital India Campaign : This initiative aims to transform India into a digitally empowered society by enhancing digital literacy, creating job opportunities and improving online infrastructure.

2. Skill India Mission : Launched to provide vocational training, Skill India focuses on making India the skill capital of the world by promoting reskilling and upskilling initiatives.

3. Pradhan Mantri Kaushal Vikas Yojana (PMKVY) : PMKVY provides industry-relevant skill training to youth, with incentives like certification and financial support to encourage participation.

4. Atal Innovation Mission (AIM) : AIM fosters innovation and entrepreneurship through initiatives like Atal Tinkering Labs in schools and Atal Incubation Centers, promoting a culture of problem-solving and critical thinking.

Challenges in Skilling Initiatives

1. Digital Divide : Limited access to the internet and digital devices, particularly in rural and remote areas, restricts the reach of technology-based skilling programs.

2. Lack of Awareness : Many youths and employers remain unaware of government schemes, leading to underutilization of available opportunities.

3. Skill Mismatch : Often, training programs do not align with industry requirements, leading to a mismatch between skills acquired and job opportunities.

4. Quality of Training : While quantity has improved, ensuring the quality and standardization of training remains a challenge.

5. Funding and Infrastructure : Insufficient funding, especially for rural skilling centers and lack of infrastructure hinder the effectiveness of programs.

Way Forward

1. Bridging the Digital Divide : Invest in rural digital infrastructure and provide affordable devices and internet connectivity to ensure inclusive access to technology-based skilling.

2. Strengthening Public-Private Partnerships : Collaborate with private enterprises to

align training programs with industry needs and ensure job placements post-training.

3. Customized Skilling Programs : Develop targeted programs tailored to emerging industries like Cyber security, AI, Quantum computing, blockchain, renewable energy, Internet of things(IOT), Big Data, 3D printing and robotics to reduce the skill mismatch.

4. Awareness Campaigns : Conduct awareness programs to inform youth about government initiatives like Skill India and PMKVY, ensuring maximum participation.

5. Focus on Quality and Certification : Ensure standardized curriculums, assessments, and globally recognized certifications to improve employability outcomes.

6. Integration of AI and Technology : Utilize AI-driven platforms for personalized training, real-time progress tracking and adaptive learning.

SKILLED FARMERS : BRIGHT FUTURE OF INDIAN AGRICULTURE

Skill development in Indian agriculture to ensure food security, prosperity for farmers and the overall growth of the agricultural sector. It also creates significant business opportunities for young entrepreneurs.

Historical Context and Challenges
- Indian agriculture has evolved significantly over the years, from traditional farming to modern techniques.
- Despite advancements, challenges like soil degradation, water scarcity and environmental factors continue to affect productivity.
- The Green Revolution helped increase agricultural production but did not address sustainability concerns.

Importance of Skill Development
- Skill development in agriculture helps farmers adopt modern technology, scientific practices and market strategies.
- Provides farmers with the ability to become business-minded, improving their financial stability.
- Focused training can lead to more efficient farming practices, increasing productivity and reducing resource wastage.

Technological Integration
- Automation, digital farming and sustainable practices are crucial for future agricultural growth.

- Technology adoption can help address challenges like climate change, resource scarcity and low yields.

Opportunities for Young Entrepreneurs
- Skill development can provide young entrepreneurs with opportunities to invest in Food processing, agri-tech, organic farming and value-added agricultural services.

PMFME

PM Formalisation of Micro food processing Enterprises Scheme

A SPECIAL INITIATIVE FOR THE DEVELOPMENT OF MICRO FOOD PROCESSING ENTERPRISES

Benefits to entrepreneurs under the PMFME scheme of the Ministry of Food Processing Industries:
- **35%** Subsidy for Individual Micro Enterprises (Maximum ₹10 lakh)
- Beneficiaries of other schemes can also take advantage of this scheme
- Preference will be given to Micro Food Processing Enterprises applying under **One District One Product (ODOP)**

- These ventures can diversify farmers' income and contribute to economic prosperity in rural areas.

Conclusion
By integrating modern practices, technology and entrepreneurship, India can unlock the full potential of its agricultural sector, creating sustainable growth and opportunities for both farmers and young entrepreneurs.

GIST
OF
DOWN TO EARTH

Topic :
Climate Change (1-15 Dec)
Little Wins(16-30 Nov)

December 2024

DAWN OF A DARK ERA : BEGINNING OF THE EPOCH OF CLIMATE CHANGE

The year 2024 symbolizes a turning point in global dynamics, marked by the escalating climate crisis, growing inequities and the transformative influence of technology and politics.

1. Climate Change and Anthropocene Epoch

- Extreme weather events, record-breaking heat and cold stress and frequent disasters define this era.
- Human activities, driven by economic progress, have breached planetary and ecological boundaries.

2. Technological and Social Shifts

- The dominance of big tech companies transcends borders, influencing politics, economy and daily life.
- Public discourse has become polarized, with freedom of speech sometimes misused for divisive rhetoric.
- Governments are losing control to private corporations and consultancies, eroding the public interest.

3. Inequalities and Global Instabilities

- The divide between the rich and poor has widened post-pandemic and amid wars, bad governance and climate disasters.

- Migration, driven by despair, fuels anger and insecurity, destabilizing democracy further.
- The rejection of knowledge and expertise reflects a class war, especially in developed nations.

4. Climate Finance and Global Cooperation

- Rich nations offer insufficient support to address climate change, sidelining the need for global collaboration.
- Historical climate debtors shift blame, ignoring the need for a united, low-carbon future.

5. Economic Interdependence and Trade Wars

- Globalization aimed at reducing costs has outsourced production and emissions, particularly to China.
- Rising protectionism, like potential US trade wars, threatens the green economy and climate goals.

6. Call to Action

- At the dawn of this critical epoch, humanity must innovate and learn from past mistakes to shape a sustainable future.
- Without urgent and unified action, the consequences of climate change and systemic failures will spiral uncontrollably.

AGE OF GLOBAL BOILING : GENERATION ALPHA IS ENDURING A CLIMATOLOGICALLY CHANGED WORLD

The article focuses on the challenges faced by *Generation Alpha*—the first generation to grow up entirely on a planet irrevocably warmer due to climate change. By 2024, the Earth experienced record-breaking temperatures, crossing the critical 1·5°C warming threshold above pre-industrial levels, a significant marker of climate change impacts.

Key Highlights :

1. Record Temperatures in 2024

- 2024 is projected to be the hottest year on record since the pre-industrial era, partly influenced by *El Niño.*
- October 2024 alone was 1·65°C above pre-industrial levels, marking the 15th consecutive month of unprecedented global warming trends.

2. Human and Environmental Impact

- Generation Alpha has spent most of their lives on a hotter planet, with heatwaves and extreme weather events becoming more frequent and severe.
- India witnessed extreme weather events on 255 of 274 days in the first nine months of 2024, with 3,238 fatalities and significant agricultural losses.

3. Rising Ocean Temperatures and Sea Levels

- Oceans are heating rapidly, causing thermal expansion and accelerated sea-level rise, threatening ecosystems and coastal communities.
- Arctic and Antarctic ice sheets risk crossing tipping points due to prolonged warming.

4. Global Emissions and Carbon Budget

- Carbon dioxide emissions in 2024 are 52% higher than pre-industrial levels.
- At the current rate, the carbon budget to limit warming to 1·5°C will be exhausted in just six years, with the 2°C budget likely depleted within 27 years.

5. Future Outlook

- By 2040, nearly 2 billion urban residents will face a temperature rise of 0·5°C, exacerbating the risks of flooding and heat-related health issues.
- Without stronger commitments to reducing greenhouse gas emissions, the world edges closer to irreversible climate disruptions.

ATTRIBUTION STUDIES : THAT SHOW CLIMATE CHANGE AS THE KEY FACTOR BEHIND EXTREME WEATHER EVENTS

The article discusses the growing evidence of climate change contributing to extreme weather events worldwide, particularly through the work of World Weather Attribution (WWA).

Key Points :

- **Attribution Studies :** Climate scientists use attribution studies to measure the impact of climate change on specific weather events. A new development, rapid attribution studies, allows scientists to assess the influence of climate change within weeks of an event.
- **2024 Weather Events** :
  - ❏ Europe saw extreme cold in January, a severe drought in May and devastating floods in October.
  - ❏ In the US, the 2024 hurricane season experienced more storms than average, with catastrophic events causing significant damage.
  - ❏ Extreme heatwaves in Asia and Africa were found to be significantly intensified by human-induced climate change, with over 6·3 billion people affected by extreme heat globally.
  - ❏ India faced intense heatwaves in April-May, continuing a trend of life-threatening temperatures in recent years.
- **India's Heatwave :** The country recorded persistent heatwaves on 50 days, affecting multiple states. Attribution studies confirmed that climate change contributed to the intensity of these heat events.

The findings highlight the clear link between climate change and increased frequency and intensity of extreme weather events.

MOISTURE, THE MISSING PIECE

India experienced an unusual meteorological phenomenon in August 2024 : Cyclone Asna. Unlike typical cyclones that weaken after landfall due to the loss of moisture, Asna intensified as it moved inland across six states and eventually strengthened into a cyclone upon reaching the Arabian Sea. This anomaly raises questions about how it sustained its moisture supply, possibly from soil moisture recycling or atmospheric transport.

Key Findings :

1. Increasing Atmospheric Moisture

- Rising global temperatures increase atmospheric moisture as per the Clausius-Clapeyron equation, with a 7% rise in water-holding capacity for every 1°C temperature increase.
- Global warming, now at 1·1°C above pre-industrial levels, is driving more intense and unpredictable weather events.

2. Atmospheric Rivers

- These 'flying rivers' transport moisture from the tropics to higher latitudes, becoming longer, wider and more intense due to increased water vapour.
- Such systems are linked to severe rainfall and flooding worldwide, including India's monsoon floods.

3. Feedback Loops and Clouds

- Water vapour, a potent greenhouse gas, amplifies warming by trapping more heat, creating a feedback loop.
- Shifts in cloud patterns—more high-altitude heat-trapping clouds and fewer low-altitude reflective clouds—further intensify warming.

4. Monsoon and ITCZ Shifts

- The Inter-Tropical Convergence Zone (ITCZ), responsible for tropical rainfall, is narrowing and shifting northward due to warming, altering rainfall patterns and contributing to extreme weather, such as flooding in the Sahara Desert and droughts in maritime regions.

5. Challenges in Climate Modeling

- Discrepancies in climate models, especially over dry regions, highlight gaps in understanding hydroclimate processes.
- Accurate modeling is essential to predict and mitigate the impacts of increased atmospheric moisture.

Implications

The rise in atmospheric moisture due to global warming intensifies cyclones, floods and humid heatwaves, while disrupting rainfall patterns. This adds urgency to addressing climate change impacts and improving predictive models for effective mitigation and adaptation strategies.

COSTLY INACTION : WORLD LEADERS NOWHERE CLOSE TO REDUCING EMISSIONS OR ENSURING ADAPTATION

The UN Environment Programme's (UNEP) 2024 reports—the Emissions Gap Report and the Adaptation Gap Report—highlight alarming trends in global climate action. These reports underscore the significant gap between global rhetoric and actual progress in reducing emissions and adapting to climate impacts. The findings, released ahead of the COP29 in Baku, Azerbaijan, warn of severe consequences if countries do not take urgent and enhanced actions.

1. Emissions Gap Report

- **Record Greenhouse Gas Emissions :** Global emissions reached 57 GtCO2e in 2023, marking a 1·3% increase from 2022.
- **Sectoral Contribution :** The power sector was the largest emitter (15·1 GtCO2e), followed by transport (8·4 GtCO2e), agriculture (6·5 GtCO2e) and industry (6·5 GtCO2e).
- **Disparities in Per Capita Emissions :** Developed countries like the US and Russia have per capita emissions much higher than the global average, whereas regions like India and the African Union have much lower emissions.
- **Emissions from Major Emitters :** China remains the top emitter (16,000 MtCO2e), followed by the US (5,970 MtCO2e) and India (4,140 MtCO2e).

2. Adaptation Gap Report

- **Finance Deficit :** The adaptation finance gap for developing countries is $ 387 billion per year until 2030, far exceeding the current finance flows.
- **Increasing Needs :** Though adaptation finance increased from $ 22 billion in 2021 to $ 28 billion in 2022, it remains insufficient to address rising climate impacts.
- **Non-Debt Financing :** The report calls for more grants, concessional loans and innovative financing instruments like resilience bonds and debt-for-adaptation swaps to avoid further debt burdens on developing countries.
- **Capacity Building & Technology Transfer :** Developing nations require stronger technology transfer and capacity-building initiatives, which remain inadequate.

Conclusion

Both reports emphasize the urgent need for enhanced global climate action. The Emissions Gap Report warns that unless significant emissions reductions are made, the planet is headed for a catastrophic rise in temperatures. Simultaneously, the Adaptation Gap Report stresses that developing countries are struggling to meet their adaptation needs without sufficient financial and technical support. To avoid devastating climate impacts, it is imperative for nations to step up mitigation and adaptation efforts, ensuring both stronger climate finance and capacity-building mechanisms.

COP OUT AT BAKU

- COP29 held in Baku, Azerbaijan, amid concerns about its relevance, especially after Donald Trump's victory in the US elections.
- Despite uncertainties, experts considered it one of the most critical COPs since the Paris Agreement in 2015.
- Focused primarily on climate finance, aiming to address the responsibility of developed nations to support the Global South.

Key Issues and Challenges

1. Climate Finance Focus (Finance COP) :

- COP29 was branded a 'finance COP' due to its focus on climate finance.
- Negotiations centered around the New Collective Quantified Goal (NCQG), aimed at replacing the $ 100 billion climate finance commitment.

- Target set for $ 300 billion annually by 2035, though the Global South demanded $ 1·3 trillion annually.

2. Developed Countries' Stance :

- Developed nations, particularly the US, pushed for private-sector contributions rather than meeting obligations under the Paris Agreement's Article 9·1.
- The lack of clear, grant-based financing raised concerns in the Global South.

3. Carbon Market Mechanisms (Article 6) :

- Rules for carbon market mechanisms were adopted after nearly a decade of negotiations.
- Article 6·2 (decentralized systems) faced challenges in transparency, reporting and authorization, allowing low-quality carbon credits to be traded.
- Article 6·4 (global carbon market) also encountered difficulties, including issues with project transitions and low-quality credits.

4. Adaptation Fund and Adaptation Finance :

- Adaptation Fund fell short, with pledges of only $ 61 million against a target of $ 300 million.
- Slow progress in reaching consensus on financing for adaptation and national plans.

5. Lack of Support for Vulnerable Nations :

- The final agreement did not address loss and damage funding effectively.
- Least Developed Countries (LDCs) and Small Island Developing States (SIDS) were not adequately supported.

Outcomes

1. Financial Commitment Shortfall :

- Agreed financial target of $ 300 billion annually by 2035, deemed insufficient by the Global South.
- A roadmap was proposed to increase the target to $ 1·3 trillion by COP30, but it lacked specifics and accountability.

2. Carbon Market Mechanism Issues :

- Although progress was made, the carbon market rules adopted were flawed, especially regarding transparency and credit quality.

3. Adaptation and National Plans :

- Adaptation negotiations showed slow progress, with no clear consensus on how to finance adaptation or implement national plans.

Conclusion

- COP29 concluded with a weak deal that failed to meet the ambitious climate finance needs of developing nations. While $ 300 billion annually by 2035 was agreed upon, this figure was far from sufficient to address the growing climate crisis in the Global South. Developed countries, particularly the US, avoided fully accepting their historical responsibilities.
- The Baku to Belém Roadmap lacked structure and accountability, leaving the future uncertain. Looking ahead to COP30 in Brazil, there are hopes that the Global South, led by Brazil, will push for stronger, equitable climate solutions, despite concerns over Brazil's own oil ambitions and carbon market deals.

Down to Earth-November (16-30)

CARBON CREDIT : A MULTI-MILLION DOLLAR FRAUD HITS CARBON OFFSET INDUSTRY

The article reports on a major fraud case involving the global voluntary carbon market (VCM), highlighting systemic flaws and raising concerns about the credibility of carbon credits.

Key Incident

- **Fraudulent Activity :** Executives of Washington-based C-Quest Capital manipulated data in emissions-reduction projects to secure excess carbon credits and $ 170 million in investments.
- **The Fallout :** The US authorities indicted former executives, with accusations of inflating data from cookstove projects in Africa and Southeast Asia. These fraudulent credits were sold in the unregulated VCM, undermining its integrity.

Carbon Credits Explained

- **Definition :** Carbon credits are issued for activities that reduce or avoid greenhouse gas (GHG) emissions, each representing 1 tonne of CO_2 equivalent.
- **Market :** Credits are bought by companies to offset emissions, primarily in unregulated voluntary markets, which lack global standards.

Systemic Issues in VCM

1. Conflict of Interest :

- Standard setters, verification bodies and developers have financial incentives to overstate claims.

- Example : C-Quest's founder, also on the board of Verra (a leading certifier), pushed for methodologies favouring inflated credit generation.

2. Data Manipulation :
- C-Quest executives allegedly inflated figures like fuel efficiency and stove usage to claim extra credits.
- Loopholes in methodologies allowed over-crediting.

3. Poor Verification Standards :
- Auditors hired by developers often fail to ensure credibility.
- For instance, household surveys for cookstove use rely on flawed recall data, leading to exaggerated claims.

4. Over-Crediting :
- Projects overestimated the adoption of clean stoves and ignored continued use of traditional ones.

- Studies reveal some methodologies over-state credits by as much as 9·2 times.
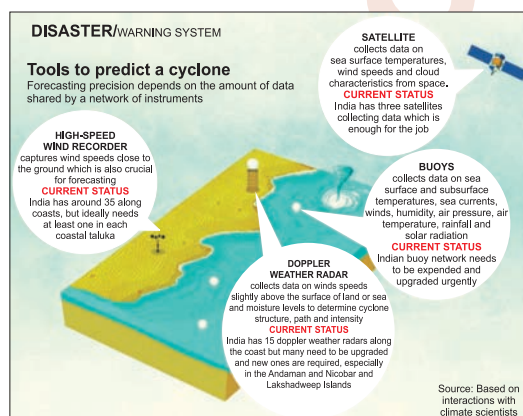
Broader Implications
- **VCM's Credibility :** The case underscores the potential for fraud and inefficacy in carbon markets, which are pivotal for addressing climate change.
- **Regulatory Challenges :** While some efforts for regulation have started (*e.g.*, US Commodity Futures Trading Commission guidelines), the market remains vulnerable.
- **Consumer Trust :** Misleading claims risk eroding trust among buyers, threatening the market's sustainability.

Key Takeaway
The C-Quest fraud case exposes the urgent need for stringent regulations, transparency and robust verification mechanisms in the voluntary carbon market to ensure it contributes meaningfully to climate mitigation.

CYCLONE DANA'S IMPACT AND FORECASTING CHALLENGES

Cyclone Dana, which struck Odisha and West Bengal in October 2024, exposed key gaps in India's weather monitoring and forecasting systems. Conflicting predictions from global models—the US Global Forecasting System (GFS) and the European Integrated Forecasting System (IFS)—highlighted the limitations of international models. The cyclone made landfall near Bhitarkanika National Park, Odisha, deviating from both forecasts. However, the Indian Meteorological Department (IMD) provided a relatively accurate landfall prediction using Doppler weather radars and satellite data.

DISASTER/WARNING SYSTEM

Tools to predict a cyclone
Forecasting precision depends on the amount of data shared by a network of instruments

SATELLITE collects data on sea surface temperatures, wind speeds and cloud characteristics from space. CURRENT STATUS India has three satellites collecting data which is enough for the job

HIGH-SPEED WIND RECORDER captures wind speeds close to the ground which is also crucial for forecasting CURRENT STATUS India has around 35 along coasts, but ideally needs at least one in each coastal taluka

BUOYS collects data on sea surface and subsurface temperatures, sea currents, winds, humidity, air pressure, air temperature, rainfall and solar radiation CURRENT STATUS Indian buoy network needs to be expended and upgraded urgently

DOPPLER WEATHER RADAR collects data on winds speeds slightly above the surface of land or sea and moisture levels to determine cyclone structure, path and intensity CURRENT STATUS India has 15 doppler weather radars along the coast but many need to be upgraded and new ones are required, especially in the Andaman and Nicobar and Lakshadweep Islands

Source: Based on interactions with climate scientists

Key Challenges in Forecasting

1. Rainfall Prediction Errors : IMD underestimated West Bengal's rainfall due to the influence of anti-cyclones, which disrupted the cyclone's moisture flow and led to unexpected localized precipitation.

2. Data Gaps :
- **Ocean Data :** Limited monitoring of sea surface and subsurface temperatures, critical for predicting cyclone intensification, hampers accuracy.
- **Buoy Networks :** India's buoy networks, such as OMNI and RAMA, are under-utilized, with many instruments outdated or non-functional.
- **Wind Recorders :** There is insufficient coverage of high-speed wind recorders, vital for precise surface-level wind speed data.
- **Rapid Intensification (RI) :** Increasingly unpredictable cyclones in the North Indian Ocean are driven by RI, emphasizing the need for better tropical cyclone heat potential measurements.

Recommendations
- **Enhanced Instrumentation :** Deploy more buoys, update existing ones, and increase the density of high-speed wind recorders along India's coasts.
- **Technology Modernization :** Use advanced IoT-based instruments and maintain timely data transmission.
- **Mid-Tropospheric Mapping :** Improve moisture tracking in cyclones for better rainfall forecasts.

Efforts to improve forecasting are constrained by outdated infrastructure, limited instrumentation, and delays in adopting modern technologies. Addressing these gaps is essential to enhance cyclone prediction and disaster preparedness.

CLIMATE GOALS : UNEP'S EMISSIONS GAP REPORT 2024

1. Rising Emissions and Missed Targets

- Global greenhouse gas (GHG) emissions increased by 1·3% in 2023, reaching an all-time high of 57·1 GtCO₂e.

- The world is on track for a 2·6–3·1°C temperature rise by the end of the century, far exceeding the Paris Agreement goals.

ALMOST OUT OF REACH

Nations must collectively commit to cut 42% of annual emissions by 2030 and 57% by 2035 in the next round of nationally determined contributions in February 2025-and back this up with action. Else, the paris Agreeement's 1·5°C goal will be gone within a few years, warms a UN report
ROHINI KRISHNAMURTHY
NEW DELHI

2. Paris Agreement and Emissions Gap

- To limit warming to 1·5°C, emissions must reduce by 7·5% annually until 2035, which would require an ambitious and immediate global effort.

- Current national commitments (NDCs) fall significantly short. Even full implementation of conditional and unconditional NDCs would achieve only 4% and 10% reductions by 2030, against the required 28% and 42% reductions.

3. Sectoral Contributions

- Energy remains the largest contributor, responsible for 68% of emissions in 2023, with power, transport and industry being major sub-sectors.

- Agriculture, forestry and land-use change also require significant investment and reforms to align with climate targets.

4. Renewables and Potential Solutions

- Solar and wind energy are critical, with the potential to provide 27% of emissions reductions by 2030.

- Forest management and reforestation could contribute 20% of reductions.

- Other strategies include addressing methane emissions, which saw a 1·3% rise in 2023, largely from agriculture and fossil fuel industries.

5. Financial Investment

- Achieving the targets requires $ 0·9–2·1 trillion annually until 2050, representing up to 1·9% of the global economy.

- The cost to close the emissions gap is estimated at $ 200 per tonne of CO₂e, necessitating sixfold increases in mitigation investments and financial system reforms.

6. Global Leadership and India's Role

- UNEP calls for a stronger push ahead of the 2025 NDC deadline and the upcoming COP29 summit in Baku, Azerbaijan.

- India, while likely to meet its current NDCs, is urged to adopt more ambitious sectoral targets and demonstrate global leadership in climate action.

7. The Path Forward

- The 1·5°C goal remains technically achievable, but urgent actions, including phasing out polluting activities, scaling up renewables and securing financial commitments are essential.

- The report emphasizes the need for inclusive global efforts, with developed nations taking responsibility for depleting the carbon budget and supporting developing economies.

The UNEP report underscores an urgent need for transformative action to bridge the emissions gap. The next two years are pivotal, with global cooperation and bold commitments being critical to averting the worst impacts of climate change.

COVER STORY : 2024 UNITED NATIONS BIODIVERSITY CONFERENCE (CBD COP16) - TOWARDS A FAIR SHARE

COP16 of the Convention on Biological Diversity (CBD) focused on biodiversity conservation, Indigenous rights, and the issue of Digital Sequence Information (DSI). Key outcomes included the creation of a body for Indigenous involvement in conservation and the

establishment of the Cali Fund for equitable benefit-sharing from DSI use. However, debates over governance and the impact on research and innovation remained unresolved.

Key Points :

Sierra Nevada de Santa Marta and Indigenous Communities

- The Sierra Nevada de Santa Marta in Colombia is a biodiversity hotspot facing threats from climate change, deforestation, mining and illegal agriculture.
- Indigenous communities, such as the Arhuaco, rely on the ecosystem for food, medicine and spiritual practices.
- The endangered plant *frailejón* is vital for water retention and ecosystem health.

Indigenous and Local Communities in Conservation

- COP16 emphasized the role of Indigenous and local communities (IPLCs) in conservation and biodiversity management.
- A new permanent body was established to ensure IPLCs' involvement in the conservation and fair sharing of benefits from biodiversity.

Cali Fund and Benefit-Sharing Framework

- The Cali Fund was created as a multilateral mechanism for equitable benefit-sharing from Digital Sequence Information (DSI).
- Despite this, there was no consensus on how to manage benefits from genetic resources in public databases.
- Developing countries expressed concerns over the lack of sovereignty over their biodiversity and DSI benefits.

Digital Sequence Information (DSI) and Sovereign Rights

- India advocated for maintaining sovereign rights over genetic resources and DSI, pushing for national legislation to govern benefit-sharing.
- India succeeded in ensuring national laws guide DSI benefit-sharing, despite opposition from developed countries like Switzerland and Norway.

Global North vs. Global South in DSI Use

- A divide exists between the Global North (where most DSI users are located) and the Global South (where genetic resources are found).
- Developed countries and companies benefit from DSI without adequately compensating countries that preserve biodiversity.
- There is ongoing demand for better governance and compliance measures to prevent digital biopiracy.

Commercial and Non-Commercial Users

- The DSI Scientific Network (DSN) proposed that non-commercial users contribute to capacity-building and knowledge-sharing, while commercial users, such as biotech companies, should contribute a percentage of profits to the global fund.
- This proposal aims to harmonize DSI benefit-sharing across various UN bodies, including WHO and FAO.

Pharmaceutical Industry Concerns

- The pharmaceutical industry, represented by the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA), voiced concerns that new regulations could hinder research and innovation.
- Some companies, like AstraZeneca, threatened to cut jobs if global levies on DSI are enforced.

Future Discussions and Challenges

- The debate over DSI governance and benefit-sharing mechanisms will continue at future CBD meetings.
- Balancing the interests of scientists, industries, and countries remains a challenge, with a focus on ensuring fair benefits for those contributing genetic resources for research.

Conclusion

- COP16 made progress in defining roles for IPLCs and establishing a global fund for DSI benefit-sharing.
- However, significant challenges remain in ensuring equitable governance and resolving tensions between the Global North and South.

PATENTLY ABSURD : WHY WOMEN SCIENTISTS ARE WAY BEHIND IN INVENTIONS

The role of women in scientific research and innovation has been transformative, yet they continue to face systemic barriers that hinder their full participation and contribution, espe-cially in STEM (Science, Technology, Engineering and Mathematics) fields. Despite ground-breaking achievements by women like Marie Curie, Katalin Karikó, and Anna Mani, the

gender gap in STEM persists, limiting the potential for innovation and scientific progress globally.

Key Challenges Faced by Women Scientists

1. Gender Bias in STEM :

- Women often face prejudice and discrimination in male-dominated scientific institutions.
- Institutional support for women in research and leadership roles is inadequate.

2. Underrepresentation in High-Level Roles :

- Women comprise only 12-17% of high-level leadership roles in STEM.
- Despite higher graduation rates, women are less likely to advance in their careers.

3. Pay Disparities and Limited Recognition :

- Women in STEM are often underpaid compared to their male counterparts.
- They publish fewer research papers, affecting their visibility and recognition.

4. Lower Participation in Patents and Inventions :

- Women made up only 17% of international patent holders in 2022.
- The gap suggests that it could take up to 40 years to reach gender parity in global patenting.

5. Paradox in India :

- India has one of the highest levels of female participation in STEM education (42·3%).
- However, women are concentrated in life sciences and are underrepresented in engineering and technology.

6. Challenges Specific to Personal and Societal Barriers :

- Family concerns and societal expectations often deter women from pursuing or advancing in STEM careers.
- Structural barriers prevent women from rising to leadership positions and making significant contributions.

Notable Women in Science

1. Katalin Karikó :

- Pioneered mRNA vaccine technology but struggled against institutional and financial challenges.
- Eventually awarded the Nobel Prize for her contributions to combating the COVID-19 pandemic.

2. Marie Curie :

- Overcame societal biases to win two Nobel Prizes in different sciences—chemistry and physics.

3. Anna Mani :

- Indian weather scientist who contributed significantly to solar energy, wind power and ozone monitoring despite facing gender-related discrimination.

Conclusion

Despite the notable achievements of women like Karikó, Curie, and Mani, women in STEM continue to struggle against biases and systemic challenges. Addressing these barriers is crucial for ensuring gender equality in science and fostering greater innovation and progress in scientific fields. Women must be provided with better institutional support, pay equity and opportunities for leadership roles to unlock their full potential in shaping the future of science and technology.

WATER DIVINERS OF BUNDELKHAND

A network of over 1,000 women, called **Jal Sahelis** (water friends), has spearheaded remarkable water conservation efforts in Bundelkhand, spanning six districts in Uttar Pradesh and Madhya Pradesh. These women, supported by the NGO Parmarth Samaj Sevi Sansthan since 2011, address water scarcity issues through innovative community-led initiatives.

Key Achievements

1. Pond Restoration :

- In Agrautha village, 300 women cut through a hill to create a channel directing rainwater runoff to a 30 hectare pond.
- This effort revived the pond, ensuring it filled during monsoons.

2. River Revivals :

- **Bachhedi River** : Jal Sahelis constructed check dams, desilted existing ones and planted 2,000 trees. This ensured the river remained full year-round, irrigating over 200 hectares of farmland.
- **Khudar River :** Villages collaborated to build stop-gates and check dams, reviving the river and irrigating 400 hectares of farmland.

3. Village-Level Actions :

- Initiatives include constructing soak pits, planting fruit trees, wastewater reuse for irrigation and promoting fish farming.

4. Economic and Social Impact :

- Farmers reported tripled productivity and increased incomes due to improved water availability.
- Migration to cities has significantly reduced, as villagers now find sustainable livelihoods locally.

5. Empowerment of Women :

- Several Jal Sahelis, like Maya Singh and Babli Adivasi, have been elected village heads, leveraging their water conservation efforts to lead broader developmental initiatives.

Broader Implications

Through sheer determination and community-driven efforts, these women have transformed arid lands, empowered themselves and fostered sustainable agricultural practices. Their success exemplifies the power of grassroots action in tackling environmental and social challenges.

CHRONIC POVERTY AND CLIMATE CHANGE

The World Bank's "The Poverty, Prosperity, and Planet Report 2024" underscores the complex relationship between poverty eradication and climate change mitigation.

Key Insights

1. State of Global Poverty :

- Extreme poverty (living on less than $ 2·15/ day) affects 8·5% of the global population.
- Poverty reduction has slowed, with the 2020-2030 period becoming a 'lost decade'.
- At the current rate, 7·3% of the population will still be in extreme poverty by 2030, far from the goal of 3%.

2. Impact of Climate Change :

- Climate change disproportionately affects the poor, who are the least responsible for GHG emissions.
- 66% of the extreme poor depend on agriculture, making them vulnerable to climatic shocks like floods, droughts and heatwaves.
- Nearly 1 in 5 people risk enduring extreme weather events they may not recover from, trapping them in chronic poverty.

3. Economic Growth vs. Emissions :

- Economic growth, crucial for poverty reduction, is typically GHG-intensive, creating a challenge for balancing development and climate goals.
- However, studies cited in the report suggest that lifting people out of poverty has a minimal impact on global emissions due to the low emission levels of poor households.

4. Findings on Emissions :

- Eradicating extreme poverty would increase emissions by only 4·7% over 2019 levels, a negligible trade-off compared to the benefits of poverty reduction.
- The report highlights that emissions from poverty eradication are not significant enough to derail climate goals.

The report emphasizes the urgent need to eradicate poverty without viewing it as an impediment to climate action. It challenges the narrative that poverty reduction must come at the expense of climate goals, advocating for solutions that address both issues simultaneously.

GIST
OF
SCIENCE REPORTER

Topic :
The Nobel Prize 2024

December 2024

GLOBAL WARMING : IS GEO-ENGINEERING THE SOLUTION ?

Global warming poses an existential threat to humanity, with rising temperatures crossing critical thresholds. The UN Environment Programme's 2022 report, *"The Closing Window,"* confirms that limiting warming to 1·5°C above pre-industrial levels is nearly impossible under current 2030 commitments. Even achieving the 2°C target requires immediate and concerted global action, including net-zero emissions pledges. However, ongoing trends suggest this goal is far from guaranteed. In this context, geo-engineering has emerged as a potential solution to not just arrest but also reverse global warming.

1. The Challenges of Current Emissions

- **Ineffective Progress :** Despite global pledges, actual progress in reducing emissions is slow and insufficient to meet targets.

- **Lingering Impacts :** Even if emissions were stopped today, existing CO_2 in the atmosphere would continue to affect the climate for decades.

- **Tipping Points :** Warming beyond 1·5°C increases the risk of self-reinforcing phenomena, such as Arctic permafrost thaw, releasing methane and frozen CO_2.

2. The Case for Geo-Engineering

- **Definition :** Geo-engineering involves deliberate technological interventions to manage and reverse climate change.

- **Key Techniques :**
  - ❑ **Carbon Capture and Storage (CCS) :** Extracting CO_2 from the atmosphere and storing it underground.
  - ❑ **Solar Radiation Management (SRM) :** Reflecting sunlight back to space to reduce warming.
  - ❑ **Ocean Alkalinity Enhancement :** Increasing ocean's carbon absorption capacity.

- **Necessity :** With mitigation alone proving inadequate, geo-engineering could serve as a complementary tool to tackle the crisis.

3. Risks and Concerns

- **Uncertainty :** Long-term effects of large-scale geo-engineering interventions remain unknown.

- **Ethical Concerns :** Questions about equity and decision-making in implementing such solutions.

- **Over-Reliance :** Geo-engineering could reduce pressure on governments to pursue critical emission reductions.

Conclusion

While geo-engineering presents innovative solutions to combat global warming, it cannot replace traditional mitigation measures like reducing emissions. Instead, it must serve as a supplementary tool, implemented with caution, rigorous oversight and global consensus. The urgency of the climate crisis demands a multi-pronged approach combining policy reforms, technological innovation, and international co-operation to safeguard our planet's future.

MINAMATA CONVENTION AND MERCURY EMISSION FROM COAL-FIRED POWER PLANTS IN INDIA

The article discusses the Minamata Convention on Mercury, a global treaty adopted by the United Nations in 2013 to combat mercury pollution and its adverse effects on human health and the environment. Named after the tragic case of mercury poisoning in Minamata Bay, Japan, in 1956, the convention seeks to control and reduce mercury emissions across various sectors.

Key Points :

1. Historical Background

- The Minamata disaster was caused by mercury-contaminated wastewater from a chemical plant, leading to severe health impacts for communities consuming fish from the bay.

- This incident underlined the need for international cooperation to tackle mercury pollution.

2. The Convention's Objectives

- Reducing mercury emissions into air, water and land.

- Phasing out mercury use in products like thermometers, batteries and certain industrial processes.

- Promoting safe mercury storage and management of mercury waste.

3. India's Role

- India signed the Minamata Convention on 30 September, 2014 and ratified it on 18 June, 2018.

- India has committed to implementing measures to control mercury emissions, especially from industries like coal-fired power plants, a major source of mercury contamination.

4. Significance

- Mercury pollution poses a serious threat to ecosystems and human health, especially in developing nations like India.
- Effective implementation of the convention is crucial for sustainable development and environmental health.

IIT MADRAS RELEASES THE MOST DETAILED 3D HIGH-RESOLUTION IMAGES OF THE HUMAN FETAL BRAIN

IIT Madras has achieved a groundbreaking milestone by releasing the world's most detailed 3D high-resolution images of the human fetal brain. This pioneering work, conducted at the Sudha Gopalakrishnan Brain Centre, positions India as a global leader in brain mapping science.

1. Key Highlights of the Research

- **Data Set 'DHARANI ':** An open-source, publicly accessible dataset available worldwide.
- **Global First :** The first-ever digital capture of 5,132 brain sections using advanced brain mapping technology.
- **Cost-Effective :** Achieved at less than 1/10th of the cost compared to similar projects in Western countries.

2. Research Collaboration

- **Multinational Effort :** Involvement of researchers from India, Australia, the US, Romania and South Africa.
- **Medical Partners :** Mediscan Systems and Saveetha Medical College Hospital from Chennai.

3. Scientific Impact

- **Advancing Neuroscience :** The dataset will aid in understanding brain development and disorders such as autism and learning disabilities.
- **Technological Innovation :** Custom-developed platform created between 2020-2022 despite COVID-19 disruptions.

4. Funding and Support

- Supported by the Office of Principal Scientific Adviser, Infosys Co-Founder Kris Gopalakrishnan, Premji Invest, Fortis Healthcare, Agilus Diagnostics and NVIDIA, demonstrating effectiveness of Public-Private-Philanthropy-Partnership (PPPP).

5. Academic Recognition :

- **Publication :** Findings accepted as a special issue in the Journal of Comparative Neurology.

6. Future Prospects

- **Global Research Resource :** The data will serve as a vital reference for neuroscience research globally.
- **Neurodevelopmental Advances :** Expected to drive innovations in fetal medicine and treatment of brain-related disorders.

The technological feat achieved by the IIT Madras opens new frontiers in neuroscience, fostering future scientific discoveries.

THE SILENT STRUGGLES OF ASTRONAUTS IN SPACE

Space exploration excites humanity, but it comes with unique challenges. The article highlights the struggles faced by astronauts Sunita Williams and Butch Wilmore during an extended space mission aboard the International Space Station (ISS).

1. Mission Overview

- **Launch Details :** Boeing's Starliner spacecraft's first crewed flight on 5 June, 2024 carried two NASA astronauts to the ISS.
- **Planned Mission Duration :** Initially scheduled for eight days (5-13 June, 2024).
- **Unexpected Extension :** Due to technical issues, the spacecraft returned without astronauts, extending the mission to eight months.

2. Challenges Faced in Space

- **Physical Health Risks :** Prolonged stay increases risks such as muscle atrophy, bone density loss, and radiation exposure.
- **Mental Health Struggles :** Isolation, confinement and uncertainty impact psychological well-being.
- **Workload and Stress :** Continuous scientific tasks and equipment maintenance add to the workload.

3. Lessons for Future Missions

- **Improved Spacecraft Reliability :** Technical failures must be minimized to avoid extended missions.

- **Better Health Management :** Advanced medical care and mental health support systems are critical.
- **Enhanced Mission Planning :** Contingency planning must be robust to manage unexpected delays.

Space missions, though exciting, involve silent struggles and significant risks. The extended stay of Sunita Williams and Butch Wilmore aboard the ISS underscores the complexities of human spaceflight, emphasizing the need for advanced technology, healthcare and mission resilience in future space endeavors.

EMPOWERING INDIA'S ELECTRIC FUTURE THROUGH LITHIUM-ION BATTERY TECHNOLOGY

India is advancing rapidly in lithium-ion battery technology to support sustainable energy solutions. The ICeNGESS project, led by the CSIR, plays a pivotal role in establishing a robust domestic lithium-ion battery ecosystem, fostering clean energy and industrial growth.

1. ICeNGESS Project Overview

- **Objective :** To build an indigenous lithium-ion battery production ecosystem.
- **Leadership :** Managed by CSIR-Central Electrochemical Research Institute (CSIR-CECRI).

2. Key Developments

- **Battery Fabrication Facility :**
  - **Location :** CSIR-CECRI Chennai Centre.
  - **Type :** 18650-type cylindrical lithium-ion batteries.
  - **Capacity :** 1,000 cells per day.
  - **Purpose :** Acts as a bridge between research and large-scale production.

3. Future Prospects

- **Expansion Plans :** A larger battery production facility is planned in Phase Two.
- **Industry Impact :** Strengthens India's clean energy sector and reduces import dependence.

The ICeNGESS project, led by CSIR-CECRI, is a significant step toward India's clean energy future. Its efforts in lithium-ion battery production lay the foundation for energy security, reduced carbon emissions and sustainable industrial development.

SILICOSIS : A DEADLY OCCUPATIONAL HEALTH HAZARD

Silicosis is a chronic lung disease caused by prolonged exposure to silica dust, mainly affecting workers in mining, construction and related industries. It leads to severe respiratory issues and is irreversible.

1. Causes of Silicosis

- **Source :** Inhalation of Respirable Crystalline Silica (RCS) particles (up to 3 microns in size).
- **Mechanism :**
  - Silica particles settle in the lungs.
  - They cause inflammation, scarring and tissue damage.
  - This leads to breathing difficulties, persistent coughing, and eventual respiratory failure.

2. High-Risk Industries

- Mining
- Construction (*e.g.*, stone cutting, drilling)
- Quarrying
- Manufacturing of ceramics, glass and cement

3. Health Implications

- Chronic breathing problems
- Lung scarring (fibrosis)
- Increased vulnerability to tuberculosis and lung cancer

Silicosis remains a serious occupational hazard due to exposure to silica dust. Preventive measures like dust control, protective gear and regular health monitoring are crucial to reducing its impact on workers' health.

RETHINKING ABOUT INDIGENOUS TECHNOLOGY

Technology has been an integral part of human evolution, beginning with simple solutions to daily challenges. Jacob Bronowski, in his article *'Technology for Mankind'*, emphasized the natural and scientific basis of early technological innovations like fire, tools and the wheel. Over time, technology has advanced tremendously, incorporating machines to solve complex problems, yet indigenous technologies remain relevant in many areas.

1. Origin and Purpose of Technology

- Early technology focused on solving basic problems using nature-based solutions.

- **Key inventions :**
- ❑ Fire for cooking and warmth.
- ❑ Sharpened tools made of wood and stone for hunting and defense.
- ❑ The wheel for transportation and trade.
- **Aim :** To develop a scientific understanding of nature and enhance daily life.

2. Advancement in Modern Technology

- Transition to machine-based solutions for complex and large-scale problems.

- Modern technology has expanded human capabilities and added new dimensions to life.
- Machines have differentiated humans further from other species.

3. Relevance of Indigenous Technologies

- Indigenous or native technologies continue to be active in several fields.
- These methods often rely on sustainable and nature-aligned practices.
- They demonstrate the value of traditional knowledge in addressing modern challenges.

While modern technology has revolutionized human life, the enduring significance of indigenous technologies cannot be overlooked. They serve as reminders of our roots, blending sustainability with innovation and offering valuable insights for future advancements.

THE NOBEL PRIZE 2024

The Nobel Prizes in Physics, Chemistry and Physiology/Medicine for 2024 recognize groundbreaking advancements across scientific fields, affirming their transformative potential for humanity. Their research and discoveries enhance the understanding and showcase their capability to transform the fields and improve lives. Here, a brief overview of the awards in Physics, Chemistry and Physiology or Medicine.

1. Physics

- **Laureates :** John J. Hopfield (USA) and Geoffrey E. Hinton (British-Canadian).
- **Contributions :** Their work revolutionized artificial neural networks by applying concepts from statistical physics. These networks, foundational to machine learning, enable tasks like pattern recognition and large-scale data analysis, with applications spanning physics, chemistry, medicine and AI development.

2. Chemistry

- **Laureates** : David Baker (USA), Demis Hassabis (British) and John M. Jumper (USA).

- **Contributions** :
- ❑ David Baker was recognized for innovations in computational protein design.
- ❑ Hassabis and Jumper developed methods for predicting protein structures, integral to advancing molecular biology and medical research.

3. Physiology or Medicine

- **Laureates** : Victor Ambros and Gary Ruvkun (USA).
- **Contributions** : Their discovery of micro RNAs, which regulate gene expression at a post-transcriptional level, has opened pathways for understanding cellular functions and addressing diseases like cancer and heart ailments.

The 2024 Nobel laureates highlight the synergy between interdisciplinary collaboration and innovation. From decoding the complexities of neural networks to unraveling the mysteries of proteins and genetic regulation, these discoveries promise profound impacts on science and society.

CALENDAR CURIOSITIES

Calendars are essential tools for measuring and recording time, guiding daily life, and organizing events. They have evolved across civilizations with fascinating historical and mathematical aspects.
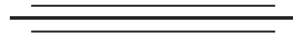
1. Calendar Facts and Trivia

- **Longest Year :** There's historical debate over the longest year in history.
- **Friday the 13th :**
- ❑ At least one occurs every year.

- ❏ Up to three Friday the 13ths can happen in a single year.
- **Same-Day Dates :** Dates like 4/4, 6/6, 8/8, 10/10, and 12/12 always fall on the same weekday each year.
- **Leap Years :** Introduced to align calendars with Earth's orbit around the Sun.

2. Historical Calendar Systems

- **Lunar Calendars :** Used by ancient Greeks and others, requiring extra months to match seasons.
- **Egyptian Solar Calendar :** Based on a 365-day year, more precise than lunar-based calendars.
- **Unique Calendar Event :** February 30th existed briefly in Sweden due to calendar adjustments.

Calendars reflect humanity's attempts to measure time accurately, blending science, culture and history. Their development reveals the ingenuity of ancient civilizations in aligning human life with cosmic cycles.