



SUMMARY OF

YOJANA

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YEAR-END SPECIAL



TOPIC 1: VISION AND ROADMAP FOR SCIENCE AND TECHNOLOGY

1. Introduction

India, with its rich heritage in science and technology, stands at a unique crossroad to blend traditional wisdom with modern advancements. From Ayurveda and ancient architecture to foundational principles of chemistry and material science, our historical contributions offer a wealth of untapped knowledge. By leveraging modern tools such as Artificial Intelligence (AI) and other emerging technologies, India can:

- Create a new paradigm for global scientific progress.
- Offer innovative solutions combining ancient wisdom with cutting-edge science.
- Address critical national challenges, foster sustainable economic development, and
- secure a competitive edge on the global stage.

2. Milestones Achieved

India has made significant strides in the science, technology, and innovation landscape over recent years:

Global Standing and Research Advancements

- Improved global ranking in scientific research from **7th position (2010)** to **3rd position currently**.
- Surpassed countries like the UK, Germany, and Japan in annual scientific publications over the last five years.
- Ranked **3rd globally** in the number of PhDs awarded in Science and Engineering, following the US and China.
- Climbed from **81st position (2014)** to **39th position (2024)** in the Global Innovation Index (GII).

Patent Filings

- **Doubled** between 2018 and 2023.
- Ranked **6th globally** with **82,811 patent filings**.

Startup Ecosystem

- India is now the **3rd largest startup hub globally**, with:

- **140,000 startups (2024)**, up from just 450 in 2016.
- **115+ unicorns**.

Challenges: Despite remarkable progress, India faces several critical challenges:

1) R&D Expenditure

(a) Low R&D expenditure:

- India spends **0.64% of GDP** on R&D, significantly below the global average of **1.79%**.
- Leading economies like China (2.43%), the USA (3.46%), and South Korea (4.93%) spend substantially more.

(b) Low private sector investment in R&D:

Only **37%** of total R&D expenditure comes from the private sector in India, compared to:

- China: 77%.
- USA: 78%.
- South Korea: 79%.

(c) Low number of R&D professionals:

India has **262 full-time equivalent R&D professionals per million population**, lagging behind other major economies.

Strategic Roadmap

A future-oriented roadmap with clear, measurable goals is essential for sustainable growth. Key focus areas include:

1. Sustainability and Resilience

- Addressing climate change with transformative technologies:
 - **E-mobility**, green hydrogen, nuclear energy, photovoltaics, and solar cells for decarbonizing energy systems.
 - Building a strong supply chain capability in these sectors for strategic autonomy.
- Countering geopolitical threats:

Developing capabilities in **AI, cybersecurity, and quantum cryptography** to:

- Enhance national security.
- Achieve strategic autonomy.
- Safeguard infrastructure against technological warfare.

2. Resource Optimization

1. Tackling resource constraints:

- Advance technologies in **precision agriculture** and **advanced materials**.
- Address the growing demand for critical minerals like lithium, nickel, cobalt, and rare earth elements.

2. Enhancing supply chain resilience: Deploy cutting-edge technologies such as:

- Advanced manufacturing.
- AI-driven optimization.
- Quantum sensors.
- Deep-sea mining and space exploration.

3 Longevity and Viability of Life

1. Modernizing healthcare systems: Focus on assistive technologies and preventive healthcare for an aging society.
2. Building sustainable cities: Develop technologies for optimizing transportation, housing, infrastructure, pollution control, and digital connectivity.

Key Initiatives and Accomplishments

(a) India's Leadership in Critical Technologies

India is in the **top quintile** globally across 45 of the 64 critical technologies, including:

(b) Sectors of leadership:

- Smart materials, biofuels, and Natural language processing (NLP).
- AI algorithms, photovoltaics, cybersecurity, quantum sensing.
- Quantum cryptography, advanced optical communications, photonics, drones, and robotics.

Mission-Driven Programs

Key national missions to accelerate progress include:

1. **National Quantum Mission.**
2. **National Mission on Interdisciplinary Cyber-Physical Systems (NMICPS)**
3. **India AI Mission**
4. **India Semiconductor Mission**
5. **National Green Hydrogen Mission**
6. **Mission Mausam**

(a) Biotechnology and Bio-Economy:

- **BioE3 Policy (Biotechnology for Economy, Environment, and Employment):**

- Targets a **US\$ 300 million bio-economy** by 2030.
- Promotes bio-based chemicals, precision biotherapeutics, and lab-grown foods.

(b) Space Exploration

India's ambitious space missions include:

1. **Chandrayaan-4:** Advancing lunar exploration.
2. **Bharatiya Antariksha Station:** India's first space station module by 2035.
3. **Gaganyaan Mission:** Launching a three-member crew into space.
4. **Astronaut Moon Landing:** Expected by 2040.

Private sector participation aims to secure a **15% share of the global space economy**.

Institutional Support: Anundsundan National Research Foundation (ANRF)

Established under the **ANRF Act 2023**, the ANRF aims to transform India's R&D ecosystem by:

Strategic Interventions

1. **Global Positioning:** Aligning R&D with national imperatives.
2. **Inclusive Growth:**
 - i. Building R&D capacities in central and state universities.
 - ii. Ensuring equitable access to scientific resources.
3. **Excellence in Science:**
 - i. Cultivating high-impact research ecosystems.
 - ii. Driving frontier technologies.
4. **Capacity Building:**
 - i. Developing world-class infrastructure and skilled multidisciplinary workforce.
5. **Industry-Aligned Research:**
 - i. Bridging the gap between academia and industry.
 - ii. Accelerating commercialization and fostering entrepreneurship.

Future Funding and Innovation

- Ambitious **Rs 1 lakh crore R&D fund** to:
 - i. Boost private sector innovation.
 - ii. Encourage industrial applications of research.
 - iii. Create globally eminent industries to drive Atma Nirbharta in technology.

Conclusion

India stands poised to lead global advancements in science and technology by:

- Addressing critical challenges in R&D investment and capacity.
- Advancing disruptive and sustainable technologies.
- Integrating ancient wisdom with modern innovations.

By fostering collaboration across government, industry, and academia, and implementing mission-driven initiatives, India can secure its position as a global leader in innovation, sustainability, and strategic technological progress.

TOPIC 2: REAPING INDIA'S DEMOGRAPHIC DIVIDEND

1. Introduction

India is at an **inflection point** in its **demographic transition**. The share of its **working-age population (15-64 years)** increased from **59%** in 2011 to **63%** in 2021 and is expected to remain stable over the next **15 years**. With the aim of becoming a \$30 trillion economy by 2047 and achieving an annual per capita income of **\$18,000**, India faces the challenge of increasing real per capita income sixfold in the next **23 years**. The labor force is central to this endeavor. Faster growth hinges on equipping workers with better skills and creating competitive firms that integrate with global markets.

2. Defining Employment

ILO Definition:

1. **Current Weekly Status (CWS):** "Did you work at least one hour in the preceding week?"

2. **Usual Status (US):** "What was your primary and secondary job for more than six months in the preceding year?"

In India's context, with a significant portion of the workforce engaged in crop agriculture, the **usual status** better reflects employment patterns due to the seasonality of agricultural work.

3) Record of Employment

Key Data Points

1. Employment Opportunities:

- i. Over 8 crore jobs created between **2017-18** and **2021-22**.
- ii. Average annual job creation exceeds **2 crore**.

2. Labor Force Participation Rate (LFPR):

- i. Increased from **57.9% (2022-23)** to **60.1% (2023-24)** for persons aged 15 and above.

3. Worker Population Ratio (WPR):

- i. Improved from **56%** to **60.1%** during the same period.

Reduction in Unemployment

Periodic labor force surveys (**PLFS**) indicate that employment opportunities have grown faster than the labor force, consistently reducing unemployment rates.

Structural Dimensions of Employment

1. **Slow Industrialization:** Industrial growth **lagged** behind demographic transitions. However, recent decades have seen improvements in employment-to-population ratios.
2. **Productivity and Real Wages:**
 - i. Real wages are linked to labor productivity, which depends on better human capital (education, health, skills) and technology.
 - ii. Rising earnings and job creation are essential for leveraging India's human endowment.

Labor Productivity

India's productivity record supports its sustained growth of 6% over three decades. The **Economic Survey 2023-24** highlights the need to generate 8 million annual non-farm jobs to cater to the rising workforce.

Women and Youth

Female Workforce Participation

- i. Increased from **24.5% (2019)** to **37% (2023)**, largely in agriculture and unpaid family work.
- ii. Accelerating women's participation is critical for inclusive growth.

Youth Employment

- i. Youth unemployment reduced from **17.8% (2017-18)** to **10% (2022-23)**.
- ii. However, addressing unemployment among first-time entrants remains a challenge.

Budgetary Support

The Union Budget includes:

- i. Employment incentives and skilling programs.
- ii. Initiatives for women-led development, such as working women's hostels, crèches, and skilling programs.

Challenges in Employment Generation

Smallness of Firms

- i. Indian firms tend to be smaller, less productive, and slower-growing compared to global peers.
- ii. Promoting MSME growth is critical for resilient economic recovery and employment.

Informality in Employment

- i. Over **90% of employment** remains informal.
- ii. Robust wage growth, formalization policies, and higher labor productivity are necessary.

Non-Farm Employment

- i. The employment pattern is skewed towards agriculture, which employs **46.6% of workers**.
- ii. Accelerating non-farm job creation is essential.

Role of States

- i. States must address varied demographic transitions. E.g **Bihar** and **Uttar Pradesh** must focus on creating opportunities for a growing young population. E.g **Kerala** and **Tamil Nadu** need policies for aging populations.
- ii. Integrated labor markets and support for internal migration are crucial for balanced development.

Conclusion

India stands at a unique juncture to leverage its demographic dividend. With a large working-age population, the potential for economic expansion is immense. By implementing focused strategies and fostering collaboration between central and state governments, India can turn its demographic potential into a \$30 trillion economic reality by 2047, cementing its position as a global leader.

TOPIC 3: INDIA'S EMERGENCE AS A HUB OF KNOWLEDGE AND TECHNOLOGY

- **Economic Growth & Technology:** Technology has been the core driver of India's economic evolution, powering sectors like agriculture, manufacturing, and services.
- **Technological Milestones:** From the Green Revolution to advancements in space and renewable energy, India has aimed for self-reliance and innovation.
- **Key Initiatives:** Programs like **Digital India** and **Startup India** promote tech-driven, inclusive growth.

Innovation Ecosystem: Driving Economic and Social Progress

- **Global Innovation Index:** India ranks 39th in 2024, up from 81st in 2015.
- **Unicorns & Startups:** Over 100 unicorns and initiatives like **Atal Innovation Mission (AIM)** foster innovation.
- **Key Programs:** AIM nurtures students and startups, contributing to India's innovation leadership.

Transformative Economic Impact of Technology

- **Agriculture:** AI, drones, and precision farming boost productivity.
- **Healthcare:** Telemedicine and AI diagnostics improve access, especially in rural areas.
- **Manufacturing: Make in India and Industry 4.0** attract global investments.
- **Connectivity:** 5G and IoT drive smart cities and digital infrastructure growth.

Translational Research: Bridging Science and Application

- **Collaborative Innovation:** Programs like NIDHI and BIRAC foster partnerships between academia and industry.
- **Technological Breakthroughs:** Advances in biotech, space, and renewable energy position India as a global leader.

Strategic Impact: Defence and Space Advancements

- **Defence:** Indigenous missile systems and aircraft carriers bolster self-reliance.
- **Space:** ISRO's milestones, including Chandrayaan and Gaganyaan, solidify India's space prowess.

Emerging Technologies: Shaping the Future

- **Quantum Computing:** India's National Quantum Mission (NQM) focuses on next-gen computational technologies.
- **Deep Ocean Mission:** India's exploration emphasizes sustainability and resource management in the ocean sciences.

Social Impact: Digital India and Inclusivity

- **Digital India:** Programs like Aadhaar, DigiLocker, and telemedicine improve service access across India.
- **Education Reforms:** NEP 2020 and the rise of edtech platforms empower all segments of society.

Viksit Bharat: The Vision of a Developed Nation

- **Atma Nirbhar Bharat:** Focus on self-reliance, particularly in AI, quantum computing, and biotechnology.
- **Workforce Development:** Emphasis on STEM education to equip the younger generation for future challenges.

Conclusion : India is leveraging science and technology to build a future-ready, inclusive society. By investing in R&D, promoting global partnerships, and fostering innovation ecosystems, India is positioning itself as a global leader, tackling challenges like climate change and digital equity.

TOPIC 4: ROADMAP FOR INDIA'S GEOPOLITICAL RECALIBRATION

1. Global Context and Challenges

- Multilateral Order in Crisis:** The United Nations Security Council (UNSC) remains in stasis, unable to address shifts in global power dynamics effectively.
- Emerging Trends:** Failure of multilateralism has increased multi-alignment and strengthened bilateral and mini-lateral partnerships.
- Globalization 2.0:** Regional and middle powers, including India, are asserting autonomy and forming issue-based partnerships.

2. India's Current Position

- UNSC Membership:** India lacks permanent membership despite being the world's largest democracy, a leading peacekeeper, and a global health contributor during the pandemic.
- Economic Strength:** As the fastest-growing major economy, India is a trusted partner on global platforms.

3. India's Vision for Growth

- Economic Inclusivity:** Focus on rapid, inclusive growth and improved social indices, including gender equality.
- Defense and Security:** Strengthen capabilities, protect sovereignty, stabilize borders, and build infrastructure in remote areas.
- Global Collaboration:** Work with partner nations on critical technologies, integrate into global value chains, and boost productivity.

4. India's Key Foreign Policy Pillars

- Civilizational Synergy:** Initiatives like the International Solar Alliance and International Day of Yoga emphasize unity and harmony.
- Neighbourhood First Policy:** Aimed at regional prosperity and stability through infrastructure and capacity building.

iii. **G20 Presidency Success:** India led efforts to refocus global attention on economic recovery, climate action, and achieving UN SDGs.

5. Regional Relations

- **China:**
 - a. Border tensions persisted but saw breakthroughs in 2024 with agreements to restore pre-Galwan patrolling along the Line of Actual Control.
 - b. Talks have resumed on bilateral engagements, including trade, direct flights, and technological cooperation.
- **Pakistan:**
 - a. Relations remain strained due to Pakistan's use of terrorism as state policy.
 - b. India's firm stance on zero tolerance for terrorism continues while keeping dialogue open for potential reconciliation.
- **Bangladesh:**
 - a. Concerns over treatment of Hindu minorities and border security issues persist.
 - b. India's engagement emphasizes the importance of addressing illegal migration and fostering stability.

6. Global Leadership and Initiatives

- **Human-Centric Diplomacy:** PM Modi's emphasis on a collaborative approach at the UN and G20 forums positions India as a leader in addressing global challenges.
- **Rule-Based Order:** Advocacy for UN reforms to enhance the effectiveness of the existing international system, rather than creating a new global order.

7. Future Path

- **Strategic Autonomy:** Balancing relations with the US and maintaining dialogue with China.
- **Reforms in Global Governance:** Push for structural changes in multilateral institutions to reflect contemporary realities.
- **Global South Engagement:** Share best practices in healthcare, disaster management, and digital infrastructure.

Conclusion

India's geopolitical recalibration reflects its resilience and pragmatism. By fostering regional stability, advocating global reforms, and leading by example, India continues to rise as a pivotal force on the global stage, ensuring alignment with its long-term vision of peace, prosperity, and harmony.

TOPIC 5: INDIA'S MISSION-MODE APPROACH AGAINST SICKLE CELL DISEASE

1. What is Sickle Cell Disease (SCD)?

- **Definition:** SCD is an inherited condition where abnormal red blood cells take on a crescent or sickle shape.
- **Impact on RBCs:**
 - Irregularly shaped cells obstruct blood vessels, leading to health complications.
 - Sickle cells lack flexibility, reducing their ability to navigate capillaries and causing blockages.
- **Key Differences:**
 - **Normal RBCs:** Biconcave, flexible, 120-day lifespan.
 - **Sickle RBCs:** Crescent-shaped, stiff, 30-40-day lifespan.
- **Health Consequences:**
 - Chronic anemia, frequent infections, pain, and swelling.
 - Damage to organs like the brain, liver, and lungs.
 - Lifelong management required for survival.

2. Types of Sickle Cell Diseases

- **Normal Hemoglobin:** Hemoglobin A (HbA) comprises two β -globin and two α -globin subunits.
- **Sickle Cell Hemoglobin:** Caused by a mutation in the β -globin chain (HbS).

Types:

- a. **HbSS:** Sickle cell anemia, the most severe form, inherited from both parents.
- b. **HbS- β -thalassemia:** Severe form due to one HbS gene and one β -thalassemia gene.

Global Data (WHO):

- 40 crore carriers of hemoglobin disorder traits.
- 3 lakh babies are born annually with severe hemoglobin disorders.

3. Inheritance of SCD

- **Genetic Probabilities:**
 - Both Parents with SCD:** 100% likelihood of the child inheriting SCD.
 - One Parent with SCD, One with Trait:** 50% chance of disease; 50% chance of being a carrier.
 - One Parent Healthy, One with SCD:** 100% likelihood of being carriers.
 - Both Parents with Trait:**
 - 25% chance of disease.
 - 50% chance of being carriers.
 - 25% chance of no inheritance.

4. Features and Symptoms of SCD

- Sickle Cell Trait:** Largely asymptomatic, no treatment required.
- Sickle Cell Disease:** Acute and chronic complications:
 - Painful Episodes:** Acute chest syndrome, avascular necrosis.
 - Organ Damage:** Blood clots and oxygen deprivation leading to failure of the spleen, kidneys, and veins.
 - Immune Deficiency:** Higher susceptibility to infections.
 - Other Symptoms:** Numbness, severe pain, inflammation, fever, and swelling.

5. Global Prevalence of SCD

- Global Data (2000–2021):**
 - Prevalence rose from **54.6 lakh to 77.4 lakh (+41.4%)**.
 - Deaths increased by **20.8%** to **34,000** annually.
 - Mortality burden highest among children under **5 years** in sub-Saharan Africa and India.
- Geographical Distribution:**
 - Concentrated in malaria-endemic regions: Africa, Middle East, South Asia.
 - Significant declines in Central Europe, Eastern Europe, and Central Asia.

6. Prevalence in India

- Statistics:**
 - 12 lakh people affected (2021 GBD Study).**
 - High prevalence among tribal communities.
 - Tribal Health Expert Committee lists SCD among the top 10 health challenges for tribes.
- Demographics:**
 - Tribal population: 8.6% of India's total (Census 2011).
 - 1 in 86 tribal births affected by SCD.

7. Social and Economic Impacts

- Health Challenges:**
 - Routine and lifelong care required for SCD management.
 - Psychological impact: Depression, absenteeism, productivity loss.
- Economic Burden:**
 - Direct Costs:** Screening, treatments, hospitalizations, blood transfusions.
 - Indirect Costs:** Financial strain on families, job loss, decreased societal productivity.
 - Inadequate health infrastructure exacerbates challenges.

8. National Sickle Cell Anemia Elimination Mission (NSCAEM)

- **Launch Year:** 2023.
- **Key Features:**
 - **States Covered:** 17 high-prevalence states, including Gujarat, Maharashtra, MP, Jharkhand, etc.
 - **Target Population:** Individuals aged 0–40 years.
 - **Strategic Interventions:**
 - ◆ Universal screening and early detection.
 - ◆ Awareness initiatives and premarital counseling.
 - ◆ Holistic care at primary, secondary, and tertiary levels.
 - **Integration with NHM Programs:**
 - ◆ Leverages platforms like Rashtriya Bal Swasthya Karyakram (RBSK) and Anemia Mukta Bharat.
 - ◆ Use of teleconsultation services via Ayushman Bharat HWCs.

- **Technological Advances:**
 - ◆ Sickle Cell Disease Portal and Dashboard.
 - ◆ Validation of point-of-care tests by ICMR.

9. Sickle Cell Crisis and Management

- **Crisis Definition:**
 - Clogging of blood vessels by sickle cells, leading to severe pain.
- **Triggers:**
 - Weather changes, dehydration, infections, stress, and exhaustion.
- **Management:**
 - Basic drugs: Hydroxyurea, prophylactic penicillin.
 - Vaccinations and blood transfusions.
 - Day-care facilities at first referral centers for monitoring.
 - Financial support for tertiary care via the **Ministry of Tribal Affairs**.

10. Recent Developments

- **ICMR-Zydus Collaboration:**
 - Phase II clinical trials for Desidustat to treat SCD.
- **Awareness Campaigns:**
 - World Sickle Cell Awareness Day (June 19, 2024).
 - Nationwidescreenings (**6 lakh+ individuals**) and ID card distributions.

11. Conclusion

India's mission-mode approach to tackle SCD reflects a commitment to addressing a critical public health challenge, particularly among tribal communities. Through robust policy interventions, awareness campaigns, and integrated healthcare mechanisms, the NSCAEM aims to alleviate the burden of SCD while enhancing the quality of life for affected individuals.

TOPIC 6: THE YEAR OF INDIA'S STRATEGIC EMERGENCE

1. Introduction

The year 2024 marked a transformative period for India, celebrating its 75th Republic Day and reflecting on its remarkable journey from

a "Fragile Five" economy to one of the world's top five economies. This progress is a result of consistent reforms, political stability, and strategic initiatives that have propelled India's global standing.

2. India's Economic Growth and Global Standing

i. From Fragile Five to Global Leader

- a. **Morgan Stanley**, which once classified India as a "Fragile Five" economy, now praises its economic growth and transformative reforms.
- b. India's rapid ascent has made it a leading destination for **international investment**, as evidenced by its growing economy and investment climate.

ii. Economic Achievements

- a. **Defense Production:**
 - **Rs. 1,27,265 crore** in defense production (up 174% from Rs. 46,429 crore in 2014-15).
 - **Defense Exports** have surged from **Rs. 686 crore** in FY 2013-14 to **Rs. 21,083 crore** in FY 2023-24, a remarkable increase of over **30 times**.
- b. **Sunrise Sectors:**
 - India has led innovations and research in sectors like **space** and **defense**. Initiatives like **Digital India** and **Make in India** have been integral in these achievements.

3. Strengthening Strategic Alliances and Regional Engagement

i. India's Strategic Policy Initiatives:

- a. **Digital India, International Solar Alliance (ISA)**, and the **2023 G20 Summit** emphasized India's leadership role.
- b. India proposed the **No Money for Terror (NMFT) Secretariat** in **New Delhi**, highlighting its active approach to counterterrorism.
- c. India also hosted the **Interpol General Assembly** in 2022, further solidifying its role in international security.

ii. Regional and Global Engagements: India's sphere of influence has extended to key regions:

- a. Indo-Pacific
- b. **Gulf Countries:** Top trade, investment, and energy partners.
- c. **Central Asia:** Strengthened ties with states in the north.
- d. **Africa:** Enhanced cooperation along the East African coastline.
- e. **India-Middle East-Europe Economic Corridor (IMEC):**
- f. A significant initiative connecting India to Europe via the **Arabian Peninsula**, facilitating trade and mitigating maritime shipping risks.
- g. **International North-South Transport Corridor (INSTC):**
- h. Provides an alternative access route to **Eurasia**, expanding India's global connectivity.

4. India's Leadership Role in the Global South

i. Vaccine Diplomacy and Health Initiatives

- a. India's leadership in **vaccine equity** during the COVID-19 pandemic: Over **301 million doses** of vaccines were delivered to **99 countries**.
- d. **International Solar Alliance (ISA):**
- c. **119 countries** have signed the framework; **99 countries** have ratified it by August 2024.

ii. Development Partnerships:

- a. India has provided **\$951.22 billion USD** in **grants and lines of credit** to **78 countries** since 2008.
- b. India's outreach includes **\$3 billion USD** in financial aid for infrastructure development in various countries.

iii. Infrastructure and Maritime Efficiency:

- a. India's **port efficiency** has significantly improved, with **nine major Indian ports** in the top 100 globally as ranked by the **World Bank**.
- b. **Visakhapatnam Port** and **Mundra Port** are ranked among the **top 30 ports** worldwide.
- c. **Median Turnaround Time (MTT)** for Indian ports has reduced from **28 days** to **0.9 days** by 2024, indicating a sharp improvement in operational efficiency. For comparison, MTT in the US is **1.5 days**, **1.7 days** in Australia, and **1 day** in Singapore.

5. Maritime and Military Advancements

i. India as a Maritime Power

- a. India's growing stature as a **maritime security provider** is evident in its strategic role in the **Indo-Pacific**.

INS Arighaat:

- India commissioned its second **Arihant-class Ship Submersible Ballistic Nuclear Submarine (SSBN)** in 2024, reinforcing its **nuclear triad**.
- These submarines are developed with full **indigenous capability**, reflecting India's commitment to **Atmanirbhar Bharat** (self-reliant India).

ii. Major Defense Exercises:

a. Milan-2024:

- A biennial exercise hosted by the **Eastern Naval Command** in **Visakhapatnam** with **51 countries**, **35 ships**, and **50 aircraft**.
- It has grown in scale and complexity since its inception in **1995**, now including assets from **six continents**.

b. Tarang Shakti-2024:

- India's first **multinational air exercise** hosted by the **Indian Air Force (IAF)** in August 2024.
- The exercise included cutting-edge military assets from **F/A-18 Super Hornets**, **French Rafale**, **F-35**, and **Tejas**, **Su-30 MKI**, **Mirage 2000**, among others.

5. India's Global Strategic and Security Framework

- **Five Elements of Security (Barry Busan Framework)**
 - i. **Military:** India's armed forces and deterrent capabilities enhance national and regional security.
 - ii. **Political:** India's democratic governance and ideology of **freedom** and **openness** resonate globally.
 - iii. **Economic:** India's robust economic framework and resources contribute to global prosperity.
 - iv. **Social:** India's diverse cultural and social fabric fosters inclusivity and global collaboration.

- v. **Environmental:** India's commitment to sustainability, exemplified by the **International Solar Alliance (ISA)**, addresses global environmental challenges.
- India's Role in Global Security
 - i. India's evolving deterrence capabilities, leadership in defense diplomacy, and its participation in global security frameworks have made it a **preferred partner** in the international security architecture.
 - ii. India's outreach as a **first responder** to crises and its role in **peacekeeping** initiatives position it as a key player in the global order.

6. Conclusion: India's Ascendancy as a Global Power

India's economic, defense, and strategic advances in 2024 reflect a comprehensive rise on the global stage. The country's commitment to sustainable development, regional cooperation, and global governance, along with its leadership role in the **Global South**, solidifies India's stature as a **key player** in shaping the future of international relations. By balancing economic growth, defense modernization, and diplomacy, India is poised to continue its ascent as a dominant force in the multipolar world order.

TOPIC 7: GOVERNMENT INITIATIVES IN CLIMATE CHANGE: A SUSTAINABLE PATH FOR VIKSIT BHARAT@2047

1. Introduction

India, one of the most populous countries globally, has been actively addressing climate change while striving for inclusive and sustainable economic growth. Key milestones include:

2. Achievements against NDC Targets (2015):

- I. **Emission Intensity Reduction:** 33% reduction from 2004-05 levels by 2019.
- II. **Non-Fossil Fuel Capacity:** Achieved 45.40% installed electric power capacity from non-fossil fuel sources by May 2024.

III. **Solar Power Expansion:** Added 15.03 GW solar power in 2023-24, reaching 82.64 GW by April 2024.

- Revised NDC Targets (2022):
 - I. **Emission Intensity Reduction:** 45% by 2030.
 - II. **Non-Fossil Fuel Capacity:** 50% installed capacity by 2030.



Major Initiatives and Policies

1. PM Surya Ghar Yojana

- **Launched:** February 13, 2024.
- **Budget:** Rs. 75,021 crore.
- **Goals:**
 - Install rooftop solar panels on 1 crore residential homes.
 - Supply 300 units of complementary electricity monthly.
 - Reduce electricity expenses and promote sustainable energy practices.
- **Key Features:**
 - **Financial Assistance:** Up to 60% subsidy for 2 kW systems and 40% for systems up to 3 kW.
 - **Collateral-Free Loans:** To improve affordability.
 - **Target:** Add 30 GW solar capacity, advancing India's renewable energy target of 500 GW by 2030.
 - **Employment:** Expected to generate over 1.7 million jobs.
 - **Environmental Impact:** Significant reduction in CO2 emissions, fostering a transition to cleaner energy.

3. Sovereign Green Bonds

- **Purpose:** Financing climate-resilient projects.
- **Key Statistics:**
 - Initial Issue: Rs. 8,000 crore (2024).
 - Additional Allocation: Rs. 16,000 crore.
- **Focus Areas:** Renewable energy, clean transport, climate adaptation.
- **Challenges:** High risk perception, insufficient return data.
- **Future Scope:** Mobilizing international investments to further climate resilience.

4. GOBAR dhan Initiative

- **Objective:** Transform waste into wealth by establishing 500 biogas facilities.
- **Key Benefits:**
 - Green energy production from organic waste.
 - Methane emission reduction.
 - Supports Swachh Bharat Mission and rural economic opportunities.
- **Extended Applications:** Incorporating urban organic waste and enhancing partnerships with industries.

5. Critical Mineral Mission

- **Objective:** Secure essential minerals like copper and lithium for critical industries.
- **Strategies:**
 - Enhance domestic production and recycling.
 - Reduce import dependency.
 - Foster R&D for resource efficiency and alternative materials.
 - Global Collaboration: Partnering with resource-rich nations for sustainable mineral extraction.

6. MISHTI (Mangrove Initiative for Shoreline Habitats and Tangible Incomes)

- **Launched:** June 2023.
- **Goal:** Conserve and rehabilitate 540 km² of mangroves across nine states and three UTs.
- **Benefits:**
 - Climate Resilience: Natural carbon sinks and storm barriers.
 - Socio-Economic: Eco-tourism, sustainable fisheries, livelihood security.

- Alignment with India's goal to rehabilitate 26 million hectares of degraded land by 2030.
- Biodiversity Enhancement: Strengthening ecosystems for marine and coastal species.

7. Amrit Dharohar

- **Launched:** Union Budget 2023-24.
- **Objective:** Maximize wetland use for biodiversity, carbon storage, and ecotourism.
- **Focus:** Restore wetlands to enhance water quality, biodiversity, and local revenue.
- **Extended Goals:** Inclusion of more Ramsar sites and integration with local community conservation practices.

8. Green Credit Programme

- **Purpose:** Incentivize afforestation and ecosystem restoration.
- **Mechanism:**
 - Participants earn green credits for market exchange.
 - Supports India's net zero emissions target by 2070.
- **Impacts:** Encourages private sector participation and fosters public awareness about ecological balance.

9. Solar Park Scheme

- **Timeline:** Extended to 2025-26.
- **Goal:** Develop large-scale solar parks, addressing land acquisition and infrastructure challenges.
- **Key Projects:**
 - Establishing ultra-mega solar power plants in renewable energy zones.
 - Collaboration with states for land-use optimization.

10. Ecomark Scheme



- **Revised:** Ecomark Rules 2024.
- **Focus:** Label environmentally friendly products.
- **Administration:** Managed by the Bureau of Indian Standards (BIS).
- **Future Prospects:** Expansion to include service sectors like tourism and healthcare.

11. Param Rudra Supercomputers

- **Launched:** 2024.
- **Features:** Advanced computing for climate and scientific research.
- **Cost:** Rs. 130 crore under the National Supercomputing Mission.
- **Applications:**
 - Precision in climate modeling and early warning systems.
 - Enhanced research on renewable energy optimization.

12. National Clean Air Programme (NCAP)

- **Launched:** 2019.
- **Target:** Reduce PM10 and PM2.5 levels by 20-30% by 2024.
- **Coverage:** 132 non-attainment cities under NAAQS.
- **Progress:** Integration of air quality monitoring with real-time public dissemination.
- **Extended Goals:** Inclusion of rural air quality monitoring systems.

13. National Action Plan on Climate Change (NAPCC)

- **Launched:** 2008.
- **Key Missions:**
 - National Solar Mission: 100 GW solar power by 2022.
 - National Water Mission: Efficient water management.
 - National Mission for Sustainable Agriculture: Adaptive techniques.
 - Green India Mission: Afforestation and eco-restoration.
- **Enhanced Framework:** Addition of Urban and Himalayan region-specific sub-missions for localized impacts.

14. Energy Conservation (Amendment) Bill 2022

- **Passed:** December 2022.
- **Features:**
 - Mandates non-fossil fuel energy sources.
 - Introduces carbon credit trading.
 - Strengthens energy efficiency standards across industries.

15. Net Zero Strategy by 2070

- Presented at COP27 (2022):
 - Focus on equity and climate justice.
 - Key Strategic Transitions:
 - ◆ Low-carbon electricity and transport systems.
 - ◆ Urban adaptation and sustainable urbanization.
 - ◆ Enhancing forest and vegetation cover.
 - ◆ Carbon removal technologies.
- **Key Outcomes:** Enhanced global collaboration and technology sharing for low-emission pathways.

Conclusion

India's climate initiatives underscore a multi-sectoral approach to reducing emissions and fostering resilience. Programs like green bonds, afforestation efforts, and renewable energy investments highlight the nation's commitment to sustainable development. Success hinges on robust implementation, community engagement, and global collaboration, ensuring India's leadership in achieving its ambitious climate goals, including net zero emissions by 2070. Continued innovation and international cooperation will serve as the foundation for realizing a sustainable and equitable future.

TOPIC 8: MAKING INDIAN AGRICULTURE FUTURE READY

1. Introduction

This year has been remarkable for the agriculture sector, marked by several milestone achievements:

- **Record Food Production:** Significant increases in rice, wheat, and "Shri Anna" production.

- ii. **Highest Ever MSP:** For both Kharif and Rabi crops.
- iii. **Historic Budget Allocation:** Focused on productivity, profitability, and sustainability.
- iv. **Favorable Monsoon:** Boosting agricultural output.

Building on this momentum, the Government of India has:

- Launched innovative schemes and initiatives to enhance productivity and sustainability.
- Integrated frontier technologies to make agriculture globally competitive.
- Focused on small and marginal farmers, women, and youth for financial inclusion and empowerment.

2. Budgetary Resources and Achievements

i. Budget Allocation 2024-25:

- Record high: **₹1.52 lakh crore** for ongoing schemes and new initiatives.
- Agriculture Research: **₹9,941.09 crore** to strengthen the ecosystem and develop human resources.
- Allied Sectors:
 - ◆ Animal Husbandry and Dairy: **₹4,521 crore.**
 - ◆ Fisheries: **₹2,616 crore.**

ii. Output Achievements:

- **Record Food Grain Production:** 3322.98 LMT, 26.11 LMT higher than the previous year.
- **Horticulture Sector:**
 - ◆ Fruits: Expected increase of **2.29%** to **112.73 million tons.**
 - ◆ Vegetables: Estimated production of **205.80 million tons**, with growth in tomatoes, cabbage, and more.
- **Oil Seeds:** Record rapeseed and mustard production due to mission-mode initiatives.

3. Minimum Support Prices (MSP)

- i. MSP raised for all Kharif and Rabi crops for 2024-25 and 2025-26.
 - Policy ensures MSP is **1.5 times the cost of production.**
 - Promotes crop diversification by incentivizing pulses, oilseeds, and nutri-cereals.

ii. Notable Increase:

- Wheat MSP saw a **73% increase in 10 years**, from **₹1400 to ₹2425 per quintal** (2025-26).

4. Major Government Initiatives

(i) Digital Agriculture Mission

- **Objectives:**
 - Transform agriculture through digital solutions.
 - Provide farmer-centric services.
- **Key Components:**
 - **AgriStack:** Digital farmer identity linked with databases.
 - **Krishi Decision Support System (KDSS):** Geospatial platform for remote sensing data on crops, soil, and weather.
 - **Soil Profile Mapping:** Accurate agricultural production estimates.
- **Employment Generation:** 2.5 lakh jobs for local youth and Krishi Sakhis.

(ii) Climate Resilience

- **Outlay: ₹3,979 crore.**
- Focus on:
 - Efficient management of plant genetic resources.
 - Genetic improvement of crops.

(iii) Livestock and Dairy Development

- **Outlay: ₹1,702 crore.**
- Includes:
 - Modernizing veterinary education.
 - Improving animal genetic resources.

(iv) Sustainable Horticulture

- **Outlay: ₹1,129.30 crore.**
- Focus on:
 - Youth participation in horticulture.
 - Plantation crops, spices, and medicinal plants.

(v) Natural Resource Management

- **Outlay: ₹1,115 crore.**
- Ensures efficient management of water, soil, and other natural resources.

(vi) Umbrella Schemes

- Rationalization into:
 - **Pradhan Mantri Rashtra Krishi Vikas Yojana (PMRKVY):** Promotes sustainable agriculture.

- **Krishnonnati Yojana (KY):** Focuses on food security and self-sufficiency.
- State-specific flexibility for fund reallocation.

(vii) Six-Point Strategy for Agricultural Development

- a. Increase in production.
- b. Reduction in production costs.
- c. Ensure fair prices for farmers.
- d. Compensation for natural disaster losses.
- e. Diversification and value addition.
- f. Promotion of natural farming.

(viii) Key Steps and Digital Innovations

- a. **National Pest Surveillance System (NPSS):**
 - Mobile app and web portal for pest identification and management.
 - Over **22,300 surveys** were conducted.
- b. **Krishi Choupal:**
 - New TV and radio program to empower farmers.
 - Promotes best practices and efficient agri-input use.
- c. **Farmer Grievance Redressal System (FGRS):**
 - Multilingual system for real-time grievance resolution.
- d. **Kisan Credit Card (KCC) Saturation Campaign:**
 - Surpassed targets with **10,000+ infrastructure units** and **₹6,500 crore loans** sanctioned.
- e. **Natural Farming Drive:**
 - Target to involve **1 crore farmers** in two years.
 - **10,000 bio-input resource centers** to supply specific inputs.

(ix) Agriculture Import and Export Decisions

- i. **Onion:**
 - Removal of **minimum export price**.
 - Export duty reduced from **40% to 20%**.
- ii. **Basmati Rice:**
 - Restrictions on varieties costing **\$800-\$950 per metric ton** removed.
- iii. **Edible Oils:**
 - Import duty on crude oil raised from **5.5% to 27.5%**.
 - Refined oil duty increased from **13.75% to 35.75%**.

iv. Integrated Agri-Export Facility:

- First facility approved at Jawaharlal Nehru Port, Mumbai (**₹284.19 crore**).
- Enhances agri-logistics, reduces wastage, and boosts exports.

Conclusion

The year 2024 showcased the government's commitment to making Indian agriculture future-ready by integrating advanced technology, ensuring financial inclusion, and promoting sustainability. With robust policies, enhanced production capabilities, and digital innovations, the agri-ecosystem is evolving to secure the welfare of farmers and cater to global demands.

TOPIC 9: MILESTONES AND INITIATIVES IN SCIENCE AND TECHNOLOGY

1. Introduction:

India has made significant strides in science and technology in recent years, marked by key developments and initiatives aimed at ushering the nation into a new era of innovation. These advancements underscore the country's commitment to enhancing research, technological capabilities, and fostering innovation.

2. Key Milestones and Initiatives:

- i. **Anusandhan National Research Foundation (ANRF):**
 - **Establishment:** The ANRF was established through the ANRF Act of 2023 to enhance research capabilities across various disciplines in India.
 - **Objectives:**
 - ◆ Foster collaborations among universities, colleges, research institutions, and industries.
 - ◆ Focus on solution-oriented research in priority areas such as electric vehicles, advanced materials, solar cells, health technology, and sustainable agriculture.
 - **Funding:** A budget of **Rs. 50,000 crore** for the period 2023-2028.
 - **Recent Initiatives:**
 - ◆ **Prime Minister Early Career Research**

Grant (PMECRG): Designed to attract early career researchers for high-quality research.

- ◆ **MAHA-EV Mission:** Focuses on developing critical electric vehicle technologies, aiming to reduce dependency on imports.

ii. PARAM Rudra Supercomputer:

- **Location:** Inaugurated at the S. N. Bose National Center for Basic Sciences, Kolkata (September 2024).



PARAM Rudra Supercomputer

- **Significance:** Brings high-performance computing capabilities to eastern India.
- **Key Areas of Impact:**
 - ◆ Advanced materials, high-energy physics, earth sciences, and cosmology.
 - ◆ Enhances simulations and computational modeling in material and earth sciences.
 - ◆ Aids in biological sciences using machine learning for disease research.

iii. Bharat Gen: India's Multimodal AI Initiative:

- **Launch:** September 2024.
- **Focus:** Development of generative AI models in language, speech, and computer vision for Indian languages.
- **Goals:**
 - ◆ Promote data sovereignty and cultural preservation.
 - ◆ Make AI accessible across government, educational, and private sectors.
 - ◆ Address underrepresented languages in AI models.

iv. National Quantum Mission (NQM):

- **T-hubs:** Established at leading institutions (IISc Bangalore, IIT Madras, IIT Bombay, IIT Delhi).
- **Focus Areas:**
 - ◆ Quantum computing, communication, sensing, and materials.
 - ◆ Foster collaboration among research groups to enhance national and international partnerships.

v. Vigyan Dhara - Unified Center Sector Scheme:

- **Objective:** Integrate three key initiatives into a single cohesive framework.
- **Focus Areas:**
 - ◆ S&T capacity building, research and development, and technology deployment.
- **Budget:** Rs. 10,579.84 crore for the period 2021-2026.

vi. Women in Space Leadership Program (WiSLP):

- **Collaboration:** Department of Science and Technology (DST) and British Council.
- **Target Group:** 250 early-career researchers.
- **Goal:** Empower women to lead in space sciences and overcome gender biases in research.

vii. Rashtriya Vigyan Puraskar (RVP):

- **Purpose:** Recognize exceptional contributions in science, technology, and innovation.
- **Categories:**
 - ◆ **Vigyan Ratna:** Lifetime achievement.
 - ◆ **Vigyan Shree:** Distinguished scientists across fields.
 - ◆ **Vigyan Yuva Shanti Swaroop Bhatnagar:** Young scientists.
 - ◆ **Vigyan Team:** Recognizes teams like ISRO's Chandrayaan-3 team.

viii. ISRO and DBT Collaboration on Space Biotechnology:

- **Partnership Focus:** Biotechnology research in space technology.
- **Initiatives:**
 - ◆ Bhartiya Antriksha Station.
 - ◆ BioE3 policy to promote biomanufacturing, aiming for a \$300 billion bioeconomy by 2030.

ix. Bio-RIDE Scheme:

- **Objective:** Foster innovation in biotechnology, particularly biomanufacturing and biofoundries.
- **Focus Areas:**
 - ◆ Biotechnology R&D, industrial development, and commercialization of bio-based products.
- **Impact:** Enhances India's position as a leader in biomanufacturing, addressing challenges in healthcare, agriculture, and environmental sustainability.



Technology Transfers to Industry - Pilot Installation of Vegan Leather from Agriwaste by CSIR

x. BioE3 Policy:

- **Focus:** High-performance biomanufacturing across key sectors.
- **Target Areas:** Bio-based chemicals, functional foods, precision biotherapeutics, climate-resilient agriculture, and carbon capture.
- **Goals:** Promote sustainable Biomanufacturing and green growth, aligning with the country's net-zero carbon economy goal.



Technology Transfers to Industry - Converting parali (paddy stubble) straw into hybrid particleboard by CSIR.

xi. CSIR's Technological Innovation and Partnerships:

- **MOU Signings:** CSIR transferred 22 cutting-edge technologies to industry partners.
- **Notable Technologies:**
 - ◆ Water testing kits, energy management systems, electric tractors, vegan leather, etc.
- **Impact:** Drives innovation and sustainability across multiple sectors.

xii. Phenome India Project:

- **Launch:** December 2023, aimed at pioneering precision medicine.
- **Objective:** Develop predictive models for cardiometabolic diseases based on India's diverse demographics.
- **Current Status:** Over 10,000 participants enrolled; 1 lakh samples targeted for comprehensive health data collection.