



**UNLOCK IAS  
PRESENTS**



# **SHERLOCKING REVISION DOC**

**(GS3, MAINS  
CURRENT AFFAIRS)**



**Neil**  
**(Founder, Unlock IAS)**  
**HCS (2021, Rank 93)**



# Unlock IAS Presents Unlocking through 'Sherlocking'

'Sherlocking' inspired by the iconic character Sherlock Holmes, involves using **keen observation** and **logical deduction** to methodically solve complex as well as 'random' questions.

Focus is on developing the right thought process i.e.

**Cognition > Memory**



**AIR 14 (2023) on 'Sherlocking'**

Alpha-Beta-Gamma

Reply

My name is Shaurya Arora (AIR 14, CSE 2023). I stumbled upon Neil sir's Telegram group when it was just 1200 members strong.

I was unable to clear my first Prelims attempt in CSE 2022. A major change in strategy took place after I came across Neil sir's 2022 Prelims Sherlocking video on YouTube the next year and it taught me how to properly analyze PYQ's the right way and identify themes, patterns and Heuristics.

I really want to express my gratitude towards Neil sir's guidance; The Sherlocking 2022 YouTube videos really gave me the required tools and insights about using PYQ's, patterns/heuristics and confidence required for the exam. It totally changed my strategy of preparing for the prelims. Thank you very much sir!



**Neil**  
**(Founder, Unlock IAS)**  
**HCS (2021, Rank 93)**

Contact @helpdeskupsc on Telegram for all module-related queries

















## Sherlocking Mains GS Module(s) (GS I-IV)

- **PYQ-centric Answering Writing Development Module**
- Learn how to use **UPSC CSE syllabus as a cheat sheet** to generate a lot of dimensions.
- **Discussion of every single PYQ from 2013-2023** – learn how to use basic information along with logical reasoning to write holistic answers in a limited time frame!
- Developing the art of answer writing through **2021-2023 'Model Answers'** (handwritten in UPSC sheets, within word limit, not copy pasted from Google).
- Continuous **handholding through live Sessions**/selected live evaluation from copies of enrolled students.

**Know the basics but not how to translate the knowledge into well-written answers?**



**The Sherlocking Mains Module(s) will help you **rewire your approach** – teaching you to **leverage common sense** and foundational knowledge**

**HMM24CK** Reply  
 Sir [neilcantbirdwahtch](#)

Your mains module helped me to optimise my mains preparation. Your techniques like how to contextualise conclusion helped me to write better answers.

I was struggling in dealing with case studies and hardly crossed 2.5 pages but now I am writing 3.5pages with ease.

One of the most important aspect of your mains module is your constant support through online sessions where you answered all my queries in detail.

You are my one stop solution for all my upsc related queries. Thank you so much sir. 😊

👍 4 🏆 2 🍌 1

← 3 19:15

**Sanket** Reply  
 Abhishek

This is interesting and I wanted to share... I saw the first video an... I cannot agree more. An addendum to supplement this.

I was wasting my time trying to study World History from my notes and it was so funny how I had made specific notes for IR in US, IR in Germany, IR in UK, IR in Japan and so forth.

I felt so foolish trying to memorise such intricate notes (definitely felt intellectual af while jotting em down back in time, admittedly so) and later realised Neil's Apple-Fruit analogy and laughed at myself (extends to revolution, decolonisation too)

99.99% common pointers that can help with an above average answer, ain't gonna be wasting any more time

I respect my history teacher from mainstream coaching but I am also high key pissed why he couldn't simplify our prep by just stating the obvious

Thank you Neil for simplifying the prep process in a rather effortless manner 🙏

❤️ 4 🍌 1 🏆 1

edited 15:56



**Neil**  
**(Founder, Unlock IAS)**  
**HCS (2021, Rank 93)**

**Join [t.me/UPSCneil](https://t.me/UPSCneil) to get FREE UPSC guidance and get answers to your academic doubts!**

**FREE!**

**Interested? Contact @helpdeskupsc on Telegram for all module-related queries.**



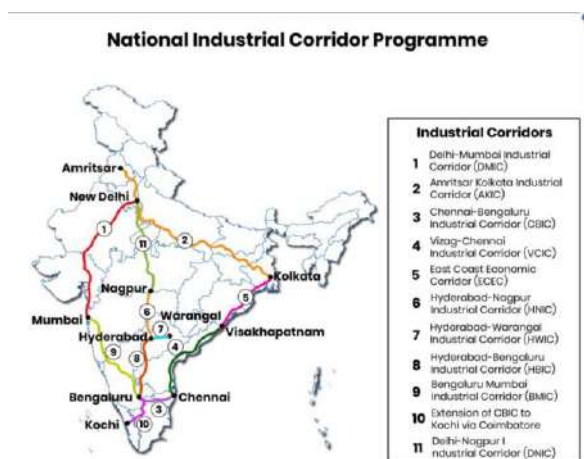






## 10.2. Industrial Corridors

In news: Government of India and Asian Development Bank (ADB) signed \$250 million loan for Industrial Corridor Development in India.



## 10.3. Production Linked Incentive (PLI)

**Need:** Stagnant manufacturing contribution to GDP (15-17% since 1991) + Large number of MSMEs with 90% workforce in informal jobs + Global push for alternatives to China (China+1 strategy) + Initiatives like National Manufacturing Policy, Make in India, etc., had limited success.

**Achievements of PLI Scheme:** Significant increase of 76% in FDI in the manufacturing sector (FY 2021-22) + Exports boosted by ₹2.56 lakh crore + Employment generation of around 3.25 lakh people + Actual investment of ₹62,500 crore realized till March 2023 + Import substitution of 60% achieved in the telecom sector.

## 10.4. Electronics Sector

Electronics sector contributes around **3.4% of GDP**.

Domestic production increased from \$29 billion (2014-15) to \$87 billion (2021-22)

**Schemes/Initiatives** Electronics Development Fund + Production-linked incentive (PLI) scheme for manufacturing + Modified Electronics Manufacturing Clusters (EMC 2.0) Scheme + Scheme for Promotion of Manufacturing of Electronic Components and

Semiconductors (SPECS) + Programme for Semiconductor and Display Manufacturing Ecosystem + Electronics Repair Services Outsourcing (ERSO) Pilot project.

## 10.5. E-commerce Sector

**8th largest** e-commerce market globally

10-15% share in India's retail market

**Policy/Schemes/Initiatives:** Consumer Protection (E-commerce) Rules, 2020 + Open Network for Digital Commerce (ONDC) to prevent monopolies + RoDTEP scheme for e-commerce exports + Prioritize technology under Digital India initiatives (BHIM, BharatNet) + Equalisation Levy Rules, 2016 + 100% FDI in B2B e-commerce + Digital Personal Data Protection Act, 2023.

## 10.6. Tourism Sector

**39th rank** out of 117 countries in Global Travel and Tourism Development Index (2024)

**Schemes/Initiatives:** Loan Guarantee Scheme for COVID-affected tourism sector (LGSCATSS) + Swadesh Darshan 2.0 (Theme-Based Tourist Circuits) + PRASHAD (Pilgrimage Rejuvenation and Spiritual Heritage) + RCS-UDAN 3.0 for tourism routes + MEET in India and INCREDIBLE INDIA 2.0 + National Strategy for Sustainable Tourism + Goa Roadmap for Tourism.

**Medical Tourism:** The Ministry of Home Affairs recently notified the creation of a new category of AYUSH visa for foreign nationals for treatment under AYUSH systems of medicine, i.e. easing medical and wellness tourism in India.

## 11. INFRASTRUCTURE: ENERGY, PORTS, ROADS, AIRPORTS, RAILWAYS, INVESTMENT MODELS

### 11.1. PM Gati Shakti





**Schemes/Initiatives: Revamped Distribution Sector Scheme** (aims to reduce Aggregate Technical & Commercial losses) + Infrastructure development for energy storage systems (focus on grid-scale battery systems for improved energy storage) + Additional borrowing for power sector reforms (**financial support** for sectoral reforms) + **PuSH portal** (for efficient peak demand management) + **PLI** (Production Linked Incentive for power equipment manufacturing), **Ujjwal DISCOM Assurance Yojana (UDAY)** - financial turnaround of power distribution companies), **Integrated Power Development Scheme (IPDS)** - strengthening sub-transmission and distribution networks), **Pradhan Mantri Sahaj Bijli Har Ghar Yojana** (Saubhagya - universal household electrification).

#### 11.12. Tidal Energy

Tidal Energy Potential in India: 12,455 MW (Tidal) + 41,300 MW (Wave)

**Potential Areas:** (Gulf of Khambat, Kutch, Palk Bay, Sunderbans)

**Challenges:** Technological (Low turbine efficiency, corrosion, bio-fouling) + Financial (Capital-intensive, risk mitigation issues) + Environmental (Ecological disruption, wildlife effects).

#### 11.13. Wind Energy

- **Global Position:** 4th in wind power installed capacity (after China, USA, Germany).
- **Energy Share:** 10.3% of India's energy basket.

**Recommendations:** Replace inefficient turbines + Finalize VGF scheme for offshore wind + Approve Repowering Policy 2022 + Bidding trajectory for 37 GW offshore wind capacity by 2030.

**Government Initiatives: National Offshore Wind Energy Policy 2015** (framework for developing offshore wind projects) + Meso-scale Wind Maps (NIWE's maps indicating potential wind energy at different heights) + **Wind-Solar Hybrid Policy 2018** (promotes large grid-connected hybrid systems for

better energy efficiency) + **Generation Based Incentive** (GBI, financial support for wind projects commissioned before 31 March 2017) + ISTS Charges Waiver (waives Inter-State Transmission System charges for solar and wind projects commissioned by 30 June 2025).

#### 11.14. Maritime Sector

**Maritime Amrit Kaal Vision 2047:** Sustainable & green sector (carbon-neutral ports, green fuel, hydrogen hub) + Port modernization (Top 25 global ports) + Shipbuilding (Top 5 centers) + Quadruple port capacity (10,000 million tons, 100% PPP) + Asia Pacific cruise leader (25 terminals) + Boost logistics (12% coastal shipping, double inland waterways) + World-class maritime services (education, research) + Maritime cluster (IMEC, 5000 km waterways) + Efficiency via tech (COEME).

**Significance:** Indian Ocean (vast coastline, 1,382 islands) + Coastal livelihoods (~250 million people) + Food security (second-largest fish producer) + International trade (strategic location) + Regional power (Indian Ocean security provider).

#### Digital Public Infrastructure

Digital Public Infrastructure (DPI) Pillars: Technology (open, scalable) + Governance (transparent, data protection) + Local Ecosystems (barrier elimination, sustainability).

**Foundational Elements:** Identity (Aadhaar) + Payments (UPI, AEPS) + Data Exchange (Digilocker, Account Aggregator).

**Global South Significance:** Inclusion + Resilience + Sovereignty + Innovation + Socio-economic outcomes.

**India's Global Role:** Identity System (MOSIP adopted by 10+ countries) + UPI linkages (Singapore, UAE, etc.) + G20 promotion of DPI + Alternative public ownership model + One Future Alliance (OFA) for LMIC support + Open Source Infrastructure for innovation.

## 12. DEVELOPMENTS AND THEIR APPLICATIONS AND EFFECTS IN

### 12.1. NOBEL PRIZE IN CHEMISTRY 2023

Prize awarded for: The discovery and development of **quantum dots**.

Quantum dots are man-made semiconductor particles, whose sizes are normally not more than 10 nanometers. They exhibit unique optical properties due to their small physical size.

**Applications of Quantum Dots:** Electronics (QLED displays, LED lamps) + Healthcare (targeted drug delivery, tissue mapping) + Other uses (quantum computing, solar cells, flexible electronics, quantum communication).

### 12.2. Blockchain Technology

**Significance/Applications:** E-Governance (digital property and **certificates management**) + Banking (**secure transactions**, reduced fees, crypto-based payments) + Supply Chain (**tamper-proof** product journey records) + Healthcare (**secure patient records** and public health monitoring)

**Initiatives:** **National Strategy on Blockchain (2021)** + Design and Development of a **Unified Blockchain Framework** for offering National Blockchain Service + Telangana has conceptualized **India's first Blockchain District**

### 12.3. Web 3.0

**Significance/Applications:** Blockchain promotes cryptocurrency and **decentralized finance (DeFi)** in the financial sector + Ensures secure and transparent health records in healthcare + Governance becomes more inclusive and efficient through Decentralized Autonomous Organizations (DAO) + Reduces platform dependence by enabling digital activity to be transferable across platforms

### 12.4. Internet of Things (IoT)

**Significance/Applications:** Healthcare (e.g. collect real-time data like heart rate etc) + Manufacturing (e.g. monitor machine performance, detect

equipment failures etc) + Agriculture (e.g. track livestock health, equipment etc) + Transportation (e.g. monitor fuel efficiency)

#### Initiatives:

- Draft Policy on IoT by MeitY.
- Centre of Excellence in Intelligent IoT Sensors.
- MeitY collaboration with NASSCOM on FutureSkills PRIME

### 12.5. Robotic Technology

In terms of annual industrial installations, India **ranks 10th globally** as per the World Robotics Report, 2022.

**Initiatives:** Draft National Strategy for Robotics (NSR) by Ministry of Electronics and Information Technology (MeitY) + ARTPARK (**AI and Robotics Technology Park**) under National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS) + Center for Advanced Manufacturing for Robotics and Autonomous Systems (CAMRAS) + **FutureSkills Prime** (capacity-building initiative) + **Manav** (India's first 3D-printed humanoid robot) + **Daksh** (Remotely Operated Vehicle by DRDO) + **Vyommitra** (ISRO's spacefaring humanoid robot).

### 12.6. 3D Printing Technology

**Additive manufacturing (AM)** = technology that constructs a three-dimensional object from a digital 3D model by adding material layer by layer

**Significance/Applications:** Aerospace & Defence (e.g., 3D printed rocket engine by **Agnikbaan**) + Automotive (engine components, gear boxes) + Electronics (wearable devices, RFID) + Healthcare (surgical models, instruments) + Consumer Goods (jewellery, clothing, toys)

### 12.7. Critical Technologies

Those technologies identified by government as 'Critical' for a nation's future economic growth, national security, and technological advancement.

Examples: AI, Quantum computing, IoT, and Blockchain



which means that any doctor who uses SCT needs to take permission from government.

## 12.9. Nanotechnology

**Significance/Applications:** Energy (nanotubes, nanostructured solar cells) + Agriculture (nano-fertilizers, nano-sensors) + Water Management (nano-membranes, magnetic nanoparticles) + Healthcare (nano-capsules for drug release) + Food Processing (nano-composites for food packaging).

**Initiatives:** Nano Science and Technology Initiative (2002) + Nano Mission (2007) + Nano-electronics Innovation Council by MeitY + INUP-i2i by MeitY + Nano Science and Technology (INST) in Mohali

### Nanotechnology and Agriculture –

**Uses:** **Nano-fertilizers** (increase nutrient uptake) + **Nano-pesticides** (target pests efficiently) + **Nano-biosensors** (real-time data for farmers) + **Nano-materials** (improve soil structure, remove contaminants) + **Crop protection** (silica nanoparticles shield plants) + Nanotechnology in **crop breeding** (genetic manipulation).

Nano Fertilizer Plant – Prayagraj

### Nanotechnology and Health:

**Significance/Applications:** **Clinical investigation** (e.g., Gold nanoparticles used for detecting nucleic acids in disease diagnostics) + **Cancer treatment** (Hybrid Nanoparticles made of gold and copper sulphide show potential in curing cancer) + **Improved imaging tools** (allow earlier diagnosis and more personalized treatment) + **Drug delivery** (nanotech materials protect drugs from degradation and ensure efficient delivery) + **Gene sequencing technologies** (advanced solid-state nanopore materials enhance accuracy in gene sequencing)

### Nanotechnology and Defence:

**Significance/Applications:** **Nano-sensors** (detect chemical/biological weapons and reduce radioactivity) + **Body Armour** (Silicon dioxide nanoparticles harden on ballistic impact) + **Health Aid** (Nanomedicines and

wound-healing bandages) + **Advanced equipment** (**lightweight**, strong materials like aluminium performing like titanium) + Other uses (**antibacterial silver-packed foods**, adaptive camouflage)

## 12.10. ANTIMICROBIAL RESISTANCE

AMR will result in US\$ 1 trillion to 3.4 trillion annual losses to GDP by 2030. (World Bank)

**Reasons for Increasing Antimicrobial Resistance:** Overuse/misuse of antimicrobials in humans and animals + Poor infection control in healthcare settings + Effluent discharge from hospitals and industries (antibiotics entering water systems) + Confusion over treatment guidelines (e.g., duration of antibiotic therapy for common infections like pneumonia).

**National Initiatives on AMR:** National Program on AMR containment (12th FYP, 2012-17) + National Action Plan on AMR (2017, One Health approach) + NARS-Net for AMR surveillance in medical colleges + Drugs and Cosmetics Rules (Schedule H1 for antibiotic prescriptions) + Other initiatives (ban on inappropriate FDCs, Red Line campaign, Operation AMRITH in Kerala).

### E-Cigarettes

India has banned e-cigarettes under the Prohibition of Electronic Cigarettes (Production, Manufacture, Import, Export, Transport, Sale, Distribution, Storage and Advertisement) Act, (PECA) 2019.

WHO: Children 13–15 years old are using e-cigarettes at rates higher than adults in all WHO regions.

### Cervical Cancer

Cervavac is the first indigenous vaccine against cervical cancer in India, developed and manufactured by Serum Institute of India.

When cancer starts in the cervix, it is called cervical cancer.

Second most common cancer among females in India.

Cause: human papillomavirus (HPV)

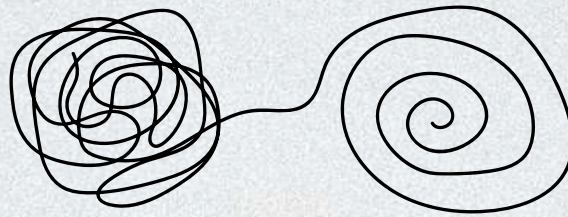
# Unlock IAS Presents

## Sherlocking Prelims Modules

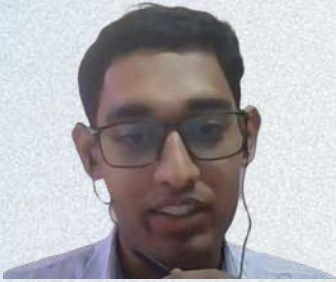


- PYQs-centered module(s) (2011 onwards for GS, 2018 onwards for CSAT)
- Individual Modules available for – History, Geography, Environment, Science & Tech, Polity, Heuristics, CSAT
- Regular live doubt sessions for all modules.

**Done with basics but not able to clear Prelims/apply the knowledge?**



The Sherlocking Prelims Module(s) will help you **rewire your approach** – teaching you to **leverage common sense** and foundational knowledge



**AIR 14 (2023) on 'Sherlocking'**

“ I was unable to clear my first Prelims attempt in CSE 2022. A major change in strategy took place after I came across Neil sir's 2022 Prelims Sherlocking video on YouTube the next year and it taught me how to properly analyze PYQ's the right way and identify themes, patterns and Heuristics. ”



**AIR 230 (2023) on 'Sherlocking'**

Ricky Lohkar Pradhan

@neilcantbirdwahtch thanks a lot for the Sherlocking course. I really could not have cleared prelims if not for Sherlocking.

11:03 AM



**Neil**  
**(Founder, Unlock IAS)**  
**HCS (2021, Rank 93)**

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printed engine and India's first semi-cryogenic engine-powered rocket.

- Space Start-ups have increased to nearly 200 in 2024 from 1 in 2022. (Economic survey 2023-2024)

**Initiative:** Indian Space Policy 2023 + IN-SPACe as independent nodal agency + NSIL promoting private sector + Rs 1,000 crore VC fund in Budget 2024-25

**Constraints/Challenges/Concern:** Multiplicity of regulations (Department of Space, ISRO, Antrix) + Space debris (26,000 large pieces) + Security concerns from private sector involvement + Outdated liability treaties for private entities.

#### 14.4. Aditya-L1

India's **first solar observatory** Aditya-L1 has been successfully placed in a halo orbit around Lagrangian point (L1) of the Sun-Earth system

Launch vehicle: PSLV C57

Aditya – L1 carries 7 payloads

**Objectives:** Understanding **space weather drivers** (solar wind origin and dynamics) + Identifying processes across **solar layers** (chromosphere, corona) leading to eruptions + Observing **plasma and particle dynamics** from the Sun + Studying chromospheric and coronal heating, **coronal mass ejections** (CMEs), and **solar flares** + Analyzing solar upper atmospheric (chromosphere and corona) dynamics

**Uniqueness of the mission:** First mission to capture detailed images of the Sun in a unique ultraviolet spectrum + Equipped with smart systems to automatically detect solar flares + Measures coronal mass ejections (CMEs) and solar flares close to the Sun's surface

**Why L1?** Placing satellite around L1 gives advantage of continuous observation of the Sun without any occultation/ eclipses.

#### 14.5. Solar Storms

**In news:** Earth witnessed G5 level of solar storm, the strongest in two decades and possibly one of the strongest displays of auroras in past 500 years.

Solar storms occur when a magnetic eruption on the Sun, along with solar flares and CMEs, accelerates charged particles to high speeds.

**Implications of solar storms:** Damage to spacecraft + Disruption of power grids and radio communications + Satellite navigation issues + Formation of auroras (northern/southern lights).

#### 14.6. CHANDRAYAAN-3

Shiv Shakti Point

**Key findings of Chandrayaan-3:** Higher surface temperature (70°C) + Presence of sulphur and other elements (Al, Ca, Fe, Cr) + Detection of thin plasma + Possible lunar quake + Identification of 4-meter crater.

#### 14.7. GAGANYAAN MISSION

**In news:** Recently Government revealed names of four astronaut-candidates for first Indian human spaceflight mission, a.k.a. Gaganyaan.

launching a crew of 3 members to an orbit of 400 km for a 3-day mission

LVM3 (Geosynchronous Satellite Launch Vehicle Mk III) rocket is identified as the launch vehicle for the Gaganyaan mission.

- The design of all systems and sub-systems for Gaganyaan has been completed.
- An Astronaut training facility has been commissioned in Bengaluru.

**Significance of the Gaganyaan Mission:** Boosts technological capability in crew safety, spacecraft design, and life support systems + Lays **foundation** for future Indian Space Station + Stimulates **space economy** and increases employment + Enhances **international collaboration** (support from France and Russia).

#### 14.8. X-RAY POLARIMETER SATELLITE (XPoSAT)

Launched by ISRO.

First dedicated satellite from ISRO to carry out research and measure X-ray emission from celestial sources

#### 14.9. Developmental Role of ISRO

**Crop forecasting** with satellites (e.g., FASAL for crops, CHAMAN for horticulture) + **Rural services** through Village Resource Centers (VRCs) and GeoMGNREGA + **Urban planning** using satellite data (e.g., AMRUT) + **Water surface monitoring** with SARAL satellite + **Resource management** via TRISHNA satellite + Railways integrated with NavIC and Bhuvan for navigation + Improved weather forecasting using INSAT satellites + Disaster management with geoportals like Bhuvan and FLEWS in Assam + Education support through EDUSAT connectivity + Regional navigation with NavIC system + Enhanced broadband infrastructure through GSAT-N2.

#### 14.10. LIGO-INDIA PROJECT

A planned advanced gravitational-wave observatory to be located in India as part of the worldwide network.

To be completed by 2030.

Location: Hingoli district in Maharashtra.

**Significance of LIGO:** Direct evidence of gravitational waves (Einstein's General Relativity) + Understanding astrophysical phenomena (black holes, neutron stars, supernovae, Big Bang) + Advanced technology development (e.g., Interferometric displacement sensor).

#### 14.11. Mitigating Space Debris

##### Global Initiatives:

- **Inter-Agency Debris Coordination Committee (IADC):** Established in 1993, coordinates global debris activities.
- **UN Space Debris Mitigation Guidelines:** International guidelines for debris reduction.

- **Zero Debris Charter:** Signed by 12 countries to mitigate space debris.

##### Indian Initiatives:

- **Debris Free Space Missions (DFSM) 2030:** Aims for debris-free space missions.
- **ISRO System for Safe and Sustainable Operations Management (IS4OM):** Ensures safe space operations.
- **Situational Awareness Control Centre (SSACC):** Monitors space debris.
- **Project NETRA (Network for Space Object Tracking and Analysis):** Tracks and analyzes space objects.

## 15. ACHIEVEMENTS OF INDIANS IN S&T

#### 15.1. SATYENDRA NATH BOSE

50th death anniversary.

Referred as "Father of the God Particle"

The fundamental particle 'Bosons' were named after him. Awarded Padma Vibhushan in 1954.

**Scientific Contributions:** Bose-Einstein Condensates (BEC) (state of matter created when particles are cooled to near absolute zero) + Bose-Einstein Statistics (a statistical procedure for counting possible states of a quantum system) + X-ray diffraction cameras

#### 15.2. Contributions of M.S. Swaminathan

- Plant geneticist known as the father of India's Green Revolution.
- First recipient of the World Food Prize (1987).
- Awarded Padma Vibhushan, Ramon Magsaysay Award, among others.

**Scientific Contributions:** Developed new crop varieties like Pusa Basmati and disease-resistant wheat; created frost-resistant potato hybrids like 'Alaska Frostless' and enabled participatory breeding for locally adapted varieties.

**Economic Ecology:** Led the evergreen revolution, integrating organic farming, eco-agriculture, and sustainable practices through concepts like 4Cs (Conservation, Cultivation, Consumption, Commercialization), and promoted biovillages and VKCs.

**Policy and Institutional Contributions:** Recommended MSP 50% above production costs via NCF, established MSSRF for sustainable agriculture, and played a key role in the 'Protection of Plant Varieties and Farmers' Rights Act 2001'.

## 16.AWARENESS IN THE FIELD OF IT, COMPUTER

### 16.1. Artificial Intelligence

AI is expected to raise India's annual growth rate by 1.3 percentage points by 2035 and can add \$1 trillion to India's economy by 2035 (NITI Aayog).

**Potential of AI:** AI is expected to raise India's annual growth rate by 1.3 percentage points by 2035 and can add \$1 trillion to India's economy by 2035 (NITI Aayog).

#### Initiatives:

- India AI Mission
- National Strategy on Artificial Intelligence (NSAI), by NITI Aayog
- Centre of Excellence for Artificial Intelligence by NIC
- New Delhi Declaration of Global Partnership on Artificial Intelligence (GPAI) to mitigate risks arising from AI.
- Future Skills PRIME for Reskilling/Up-skilling of IT Manpower for Employability in 10 new/emerging technologies.
- National Artificial Intelligence Portal, one-stop digital platform for sharing of resources related to AI in India

#### IndiaAI Mission:

### Pillars of IndiaAI and Related Schemes

- **AI in Governance:** BHASHINI (AI language translation tool for Indian languages), India Stack and AI.
- **AI Computing & Systems:** AIRAWAT supercomputer, National Supercomputing Mission, MeitY Quantum Computing Applications Lab.
- **Data for AI:** Data Management Office, India Datasets Program and India Data Platform.
- **AI, IP & Innovation:** Centre of Excellence for AI, MeitY Start-up Hub, Proposed National Centre on AI (NCAI).
- **Skilling in AI:** Future Skills Prime (Nasscom & MeitY), Responsible AI for Youth.
- **AI Ethics & Governance:** RAISE (Responsible AI for Social Empowerment), Digital Sansad app for Parliament transcripts.

### AI and Agriculture

**Significance/Applications:** **Precision agriculture** improves crop quality (e.g., SENSAGRI) + Smart farming aids nutrition, mechanization, and **pest/weather prediction** (e.g., AgroStar) + Farmgate-to-fork **optimizes supply chain** and market efficiency (e.g., Stellapps) + Data-driven agriculture **enhances productivity and market creation** (e.g., BharatAgri App).

**Key Initiatives:** NITI Aayog's **National AI Strategy** emphasizes AI in agriculture + **Kisan-eMitra chatbot** supports PM-KISAN scheme + Microsoft's **AI Sowing App** + NITI Aayog and IBM's AI-driven crop yield prediction model aids farmers.

### AI in Healthcare

#### Significance/Applications

- **Diagnosis and Treatment Planning:** Analyses imaging (such as X-rays), helps in identifying diseases. E.g. **S.A.R.A.H. Smart AI Resource Assistant**, developed by WHO
- **Clinical research and discovery:** Examines data on drug interactions and side effects. E.g. ProteinSGM, a Generative AI model from the

University of Toronto is used for protein designing.

- **Robotic Surgery:** AI integrated Robot surgeries will minimize surgery-related complications.
- **Workforce optimization:** Enables operational and cost efficiencies. E.g. Virtual Assistants and Chatbots.

## AI and Defence

**Significance:** Border Security (e.g. detects intrusions) + AI-based technologies (e.g. in UAV) + to make operations less reliant on human input. **E.g., Vista, AI-controlled F-16** + assists humans to make precise decisions + military robots

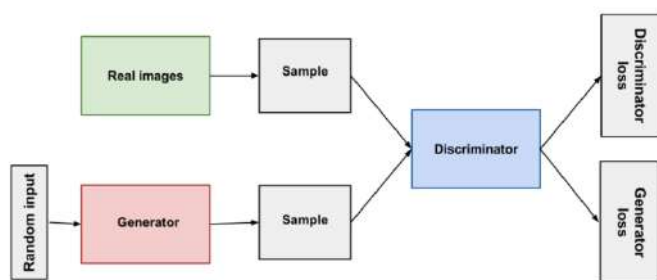
## 16.2. Deepfakes

**In news:** Recently, the Centre issued an advisory to social media intermediaries to identify misinformation and deepfakes.

### How does Deepfake work?

Uses technologies of deep learning, AI and photoshopping to create images of events.

Deepfake uses **GANs (Generative Adversarial Networks) with generators creating new images and discriminators refining them for realism.** It also employs variational auto-encoders, neural networks that detect facial features and enable versatile face swaps by suppressing non-face elements.



**Benefits:** Entertainment: Creative effects with voices and likenesses + E-commerce: Virtual try-on for clothing + Communication: Speech synthesis and facial

manipulation for language translation + Research and Simulation: Realistic scenarios for professional training

**Legal provisions:** No specific laws against deepfake + Section 66E of IT Act: Addresses privacy violations through image misuse + Section 66D of IT Act: Prosecutes malicious intent to cheat or impersonate + Indian Copyright Act: Penalties for copyright infringement.

## 16.3. Quantum Technology

**Uses:** **Quantum communication:** Transmits data using quantum bits along optical cables (e.g., Quantum key distribution) + **Quantum sensing/metrology:** Measures forces, gravitation, etc., using photons + **Quantum computing:** Solves problems beyond classical computing + **Quantum simulation:** Simulates material/chemical reactions with quantum computers

**Initiatives:** **National Quantum Mission** (to drive India's advancements in quantum technologies) + **QuEST initiative** (Quantum-Enabled Science and Technology to boost quantum research in universities) + **QSim toolkit** (Quantum Computer Simulator for education and training) + **Quantum Frontier Mission** (part of PM-STIAC for breakthroughs in quantum computing) + **Dedicated labs** at Mhow (military institute for quantum research) + **UN's 2025 Quantum Science and Tech year** (global recognition of quantum advancements).

### National Quantum Mission

**Mission objectives:** Quantum Communication Network (secure 2,000 km communication infrastructure) + Inter-city QKD (2000 km quantum key distribution for secure communication) + Quantum Computing Power (develop 1,000 qubit quantum computers) + Magnetometers and Atomic Clocks (precision measurement tools and reliable timekeeping) + Quantum Materials Design (novel materials for advanced device fabrication).

## 17. ISSUES RELATED TO IPR

### 17.1. PATENTS IN INDIA

## Recent Developments:

- **Patents (Amendment) Rules, 2024** notified by the Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry.
- **Key Provisions of the Rules:** Certificate of Inventorship (recognizes inventors' contributions) + Time limit for examination request reduced (from 48 to 31 months) + 10% renewal fee discount (if paid in advance electronically for 4+ years) + Statement of working frequency reduced (from yearly to every 3 years).

## Key Data:

- Over 1 lakh patents granted (March 2023 - March 2024).
- 7th position in Resident patent filing activity globally (WIPO Report 2022).

## Global Conventions/Treaties:

- Paris Convention (1883) + Patent Cooperation Treaty (1970) + Budapest Treaty (1977)
- India is a member of all.

## Regulation:

- Global: World Intellectual Property Organization (WIPO), TRIPS Agreement (WTO).
- India: Regulated by the Patents Act, 1970

## Key Initiatives in India:

- National IPR Policy (2016)
  - Scheme for Facilitating Start-Ups Intellectual Property Protection (SIPP)
  - Expedited Examination + National Intellectual Property Awareness Mission (NIPAM) + Patent Facilitation Programme
  - Reduction in filing fees for Start-ups, MSMEs, educational institutes

- IP Mitra + Centre of Excellence in IP + Modernization of IP offices

- Global Innovation Index (GII): India ranks 40th out of 132 economies

## 17.2. TRADITIONAL KNOWLEDGE IN INDIA

**Measures by Government to Protect India's TK and GRs:** TKDL (digital repository to prevent bio-piracy) + India's Patent Act, 1970 (PDR mechanism for disclosure of GRs and TK) + Biological Diversity Act, 2002 (fair sharing of benefits from biological resources) + Forest Rights Act 2006 (community rights over forest resources) + Ministry of AYUSH (dedicated to traditional medicine) + UNESCO's recognition (Yoga as Intangible Cultural Heritage) + Other (Plant Varieties Act 2001, Geographical Indications Act 1999).

## 17.3. Treaty on Intellectual Property, Genetic Resources, and Traditional Knowledge

Adopted by WIPO

Addresses the interface between IP, genetic resources (GRs), and traditional knowledge (TK).

Includes provisions for Indigenous Peoples and local communities.

**Key Provisions of the Treaty:** Mandatory Patent Disclosure Requirements (disclose origin of Genetic Resources and Traditional Knowledge) + National Framework (to remedy failure in PDRs) + Genetic Resources and Traditional Knowledge databases (created in consultation with Indigenous Peoples) + Assembly (representation from each Contracting Party).

## 18. CONSERVATION, ENVIRONMENTAL POLLUTION AND DEGRADATION, ENVIRONMENTAL IMPACT ASSESSMENT.

### 18.1. CLEAN ENERGY TRANSITION

**World Economic Forum released "Fostering Effective Energy Transition 2024" report.**





Adaptation to sea level rise: E.g. Kuttanad Kaliyanam farming which involves below sea level paddy cultivation in Kerala.

Water use efficiency: E.g. Meghalaya's bamboo drip irrigation system.

Traditional Rainwater harvesting: Helps mitigate the effects of drought. E.g., Jhalaras of Rajasthan, Zabo of Nagaland.

### 18.8. Climate Change and Health

Lancet – About 9 million people die annually due to pollution-related morbidities.

**Steps Taken (Global and India):** COP28 UAE Declaration on Climate and Health unveiled (India yet to sign) + World Health Summit (WHS) held annually in Berlin + WHO's Alliance for Transformative Action on Climate and Health (ATACH) initiative + India's National Action Plan on Climate Change and Human Health + Environmental health surveillance + National Health Mission funds for Green/Low carbon measures + Indian Public Health Standards (IPHS), 2022, for Green & Climate Resilient Hospitals.

### 18.9. Climate Change Impact on Indian sub-continent

- India's average temperature has risen by around 0.7 deg. C during 1901-2018.
- Frequency of daily precipitation extremes (>150 mm per day) increased by about 75% during 1950-2015.
- Marine heatwaves expected to increase from 20 days per year to 220-250 days per year.

### 18.10. Climate Change and Mitigation

Global warming is estimated to be limited to 3°C if the current policies continue (Emission Gap Report 2023)

Global GHG emissions increased by 1.2% from 2021 to 2022. (Emission Gap Report 2023)

India:

- India to date has only contributed 5% of warming (Emission Gap Report-2023).

- 2022 share in global CO2 emissions stood at 8%. (3rd highest globally).
- Per capita carbon emissions are still very low at 2 tonnes per person per year in 2021 (Global average 4.7 tonnes)

Adaptation finance needs are 10-18 times higher than current public flows. (Adaptation Gap Report 2023)

#### Initiatives:

- Global: Global Methane Pledge, Powering Past Coal Alliance, Just Energy Transition Partnerships (JETPs), Mission Innovation, etc.
- India: Panchamrit Target declared in COP 26 (Aim to achieve Net-Zero Emissions by 2070), Mission Lifestyle for Environment (LiFE), National Action Plan on Climate Change (NAPCC), etc

### 18.11. Climate Finance

At least USD 4-6 trillion per year for global transformation to a low-carbon economy. (Emission Gap Report 2022)

### 18.12. Impact of Climate Change on Cryosphere

- Last decade has witnessed the seven worst years of ice loss.
- In case of temperature rises by 2°C-
  - Nearly all tropical glaciers, most mid-latitude glaciers, and Polar Regions will disappear. E.g., Venezuela may be the first nation to lose all its glaciers.
  - Himalayas expected to lose 50 % of today's ice by 2100.

**Steps to protect glaciers: Himalayan Monitoring Assessment Programme (HIMAP)** by the International Centre for Integrated Mountain Development (ICIMOD) + **UNESCO's World Glacier Monitoring Services** + 2025 declared International Year of Glacier Preservation (Global) + **National Mission for**

**Sustaining Himalayan Ecosystem (NMSHE)** under the **National Action Plan on Climate Change (NAPCC)** + Himansh research station for glacier monitoring in Himachal Pradesh (India).

### 18.13. India and Arctic

In news: Ministry of Earth Sciences Launched India's 1st Winter Scientific Expedition to Arctic.

**Initiatives for Arctic Region:** Arctic Council for cooperation on environmental protection + UN High Seas Treaty to mitigate climate change impacts + India's Arctic Policy for understanding Arctic's impact on India's climate and energy security + Protection of the Arctic Marine Environment (PAME).

**Significance for India:** Environmental protection due to **Arctic's influence on Indian monsoon** and sea rise + Economic benefits from Arctic's **vast oil, gas, and mineral resources** + Transportation opportunities through **new shipping routes** and mineral extraction + Science and research to **understand global climate patterns** (e.g., Arctic-Himalaya link).

### 18.14. CARBON BORDER ADJUSTMENT

**MECHANISM:** Policy instrument to put a fair price on the carbon emitted during the production of carbon intensive goods that are entering the EU and to encourage cleaner industrial production in non-EU countries + Non-tariff barrier + Can affect India's exports + reporting started + It becomes operational in its definitive phase on 1 January 2026.

### 18.15. Air Pollution

**2023 World Air Quality report, IQAir:** Ranked 3rd globally in air pollution

9 out of 10 World's most polluted cities in India (Begusarai, Guwahati, Delhi in Top 3)

#### Regulatory Measures to Improve Air Quality

- Acts: Air (Prevention and Control of Pollution) Act, 1981

- Statutory Bodies: Central Pollution Control Board (Water Prevention and Control of Pollution Act, 1974), Commission for Air Quality Management (CAQM), (CAQM in the National Capital Region and Adjoining Areas Act 2021)
- For vehicular emissions: BS-IV to BS-VI norms, Roadmap for Ethanol Blending in India 2020-25, Faster Adoption and Manufacturing of Electric Vehicles (FAME) -2 scheme, etc.
- Flagship scheme: National Clean Air Programme (NCAP) to attain National Ambient Air Quality Standards for PM 10 concentrations by 2025-26.
- Monitoring: SAMEER app, System of Air Quality and Weather Forecasting and Research (SAFAR), Swachh Vayu Sarvekshan 2023 etc.
- Other Initiatives: Graded Response Action Plan (GRAP), Wind Augmentation and Air Purifying Unit (WAYU) device, etc

### 18.16. 5 YEARS OF NATIONAL CLEAN AIR PROGRAMME (NCAP):

Ministry of Environment, Forest and Climate Change (MoEFCC) launched NCAP in 2019 due to rising air pollution in the country

To improve air quality in 131 cities (non-attainment cities (NAC) and Million Plus Cities) in 24 States by engaging all stakeholders

Swachh Vayu Survekshan (by MoEF&CC) ranks cities on the basis of the implementation of activities

- PRANA (Portal for Regulation of Air-pollution in NAC) was launched to monitor the implementation of NCAP.

### 18.17. Water Stress

25 countries, including **India faces extremely high-water stress.** (World Resources Institute (WRI))

**31% of global GDP** will be exposed to high water stress by 2050. (WRI Data)

Urban Water Crisis: Recently in Bangalore

**Way Forward: Nature-based solutions** (green-blue infrastructure, wetland restoration) + **Sustainable water management** (Shallow Aquifer Management model in Telangana) + **Community-based solutions** (recycled water acceptance, Orange County, US) + **City-to-city learning** (LOTUS-HR program, Netherlands-India collaboration) + **Private sector involvement** (Dimna Lake, Tata Steel). (Context: Multi-dimensional approaches to improve water management and governance).

**Key Initiatives for Water Crisis:** National Water Mission (integrated water conservation) + Urban River Management Plans (approved for 60 cities under Namami Gange's River-City Alliance) + Jal Diwali (women-led water conservation, "Women for Water, Water for Women" campaign) + Jal Shakti Abhiyan - Catch the Rain (nationwide promotion of water conservation). (Context: Comprehensive efforts addressing India's water crisis through integrated strategies).

#### 18.18. Groundwater

- India is **world's largest user of groundwater** (uses 25% of all global groundwater extracted every year)
- Indo-Gangetic basin in India has already passed the groundwater depletion tipping point. (Interconnected Disaster Risks Report 2023 by United Nations University)
- Water level in more than 60% of wells monitored by CGWB registered a declining trend in the last one decade.

#### 18.19. MINAMATA CONVENTION

In news: Fifth meeting of Conference of Parties (COP 5) to Minamata Convention was held in Geneva.

Adopted in 2013 at Kumamoto (Japan) and came into force in 2017 (India ratified it in 2018)

- For the first time, COP pushed to reduce mercury supply sources and trade by strengthening capacities at national level and developing study on global supply, trade, production and use of mercury compounds.

#### 18.20. Land Degradation

India – Degraded land: ~ **29.7 per cent** (ISRO Atlas, 2021).

50% of plane's topsoil lost via erosion over last 150 years. (WWF report)

Land Degradation Neutrality (LDN) target setting programme (LDN TSP): Global voluntary commitments to restore degraded land reached one billion hectares by 2030.

LDN target: Committed to restore 26 million hectares by 2030.

#### Initiatives:

**Global:** **UNCCD** (legally binding international agreement with Land Degradation Neutrality targets for 2030) + **LDN Fund** (to mobilize private investments for land restoration) + **Bonn Challenge** (global initiative to restore 350 million hectares of degraded land by 2030) + **UN Decade on Ecosystem Restoration (2021-2030)**, aimed at halting and reversing ecosystem degradation) + **Global Soil Partnership** (collaboration for sustainable soil management).

**India:** **NAPCC** (National Action Plan on Climate Change for mitigating land degradation) + **Desertification and Land Degradation Atlas** (to track degraded land) + **Integrated Watershed Management** (to conserve water and soil) + **IIT-Delhi's study on soil erosion** (geospatial mapping) + **Sustainable Land and Ecosystem Management Program** (focused on sustainable land practices).

#### 18.21. Sustainable Development Goals



**Localization of SDGs:** It is the process of taking into account sub-national contexts in achievement of SDGs.

#### 18.22. Mission LiFE:

**Launched by India at UN Climate Change Conference (UNFCCC COP26) in 2021**

Mission LiFE Approach: Change in Demand (nudging individuals for eco-friendly actions) + Change in Supply (adjust supply to meet revised demand) + Change in Policy (shift industrial and government policies for sustainable consumption).

#### 18.23. COASTAL AQUACULTURE AUTHORITY (AMENDMENT) ACT, 2023: Amends the earlier 2005 Act

**Key Aspects:** Broadened coastal aquaculture definition + Registration under Coastal Aquaculture Authority Act valid for CRZ + CAA to set standards for inputs and effluents + Prohibit harmful inputs and regulate emissions + Allow aquaculture activities in CRZ areas + Ban antibiotics and pharmacologically active substances + Promote biosecurity measures.

#### 18.24. High Seas Treaty

**In news:** Union Cabinet approved India to sign the Biodiversity Beyond National Jurisdiction (BBNJ) Agreement or High Seas Treaty with the Ministry of Earth Sciences to spearhead its implementation

High seas are areas outside the national jurisdiction of any country.

**Key provisions of the BBNJ Agreement:** Applies to Areas Beyond National Jurisdiction (**high seas**), establishes the **Conference of Parties (COP)** for governance, and a **Clearing-House Mechanism (CHM)** for open-access data sharing, creates **voluntary**

**financial mechanisms**, prohibits sovereignty claims over **Marine Genetic Resources (MGRs)**, sets a **global Environmental Impact Assessment (EIA) framework**, and ensures fair benefit-sharing from MGRs and associated Digital Sequence Information (DSI).

#### 18.25. Organic Farming

**In news:** Agricultural and Processed Food Products Export Development Authority (APEDA) created dedicated organic promotion division.

India has the highest number of organic farmers in the world (44.3 lakhs) [Economic Survey 2022-23]

Sikkim became the world's first 100% organic state.

**Initiatives:** **NPOP and PGS-India** certifications (organic production standards) + **FSSAI Jaivik Bharat logo** (certification for organic food) + **PM PRANAM**, Nano Urea, Neem coated Urea, and GOBARdhan for EFFs (environment-friendly fertilizers initiatives) + **Pramparagat Krishi Vikas Yojana** and National project on organic farming (promotion of traditional farming) + Organic **value chain** development in Northeast (boosting organic farming in Northeastern regions).

#### 18.26. PLASTIC WASTE MANAGEMENT IN INDIA

Per capita plastic waste generation **doubled over the last 5 years**. (CPCB's annual report in 2020–21)

Ranked **3rd globally** in generation of single-use plastic (SUP) waste (Plastic Waste Makers Index 2019)

#### Initiatives

- Plastic Waste Management Rules and its amendments.
  - Plastic Waste Management Amendment Rules, 2021 banned identified single use plastic item from 1st July, 2022.
- Extended Producer Responsibility on Plastic Packaging, 2022.
- Swachh Bharat Mission 2.0.



dependence) + **Solar Park Scheme** (investment hubs) + PM-KUSUM (34.8 GW target by 2026) + **Pradhanmantri Suryodaya Yojana** (solar rooftop for low/middle-income) + **Cochin Airport** (first solar-powered airport) + **PM Suryah Ghar Muft Bijli Yojana** (roof solar subsidies).

18.32. **PM Surya Ghar Muft Bijli Yojana:** For installing Rooftop Solar in one crore households nationwide.

**Aim:** To provide free electricity up to 300 units every month for one crore households.

Model Solar Village to be developed in each district

Incentives to Local Bodies; National Portal for households to apply for subsidies; Component for payment security for Renewable Energy Service Company (RESCO).

### 18.33. **Hydrogen Energy**

Currently, India produces **6.5 million metric tonnes** per annum (MMTPA) of hydrogen, predominantly for use in crude-oil refineries and fertilizer production. (WEF)

**Initiatives:** National Green Hydrogen Mission + 1st Green Hydrogen Plant in stainless-steel sector + Hydrogen blending in CNG/PNG networks by GAIL + NTPC's Hydrogen Fuel-Cell buses in Leh + 1st Green Hydrogen Fuel Cell Bus by Indian Oil + SERB-supported hydrogen production from methanol.

### 18.34. **Ethanol Blending**

**Key Target:** Targets of 20% ethanol blending in petrol by 2025 (Updated) and 5% biodiesel blending in diesel by 2030. (National Policy on Biofuels, 2018)

Achievement: 10% ethanol blending in petrol by June 2022.

National Policy on Biofuels 2018 (biofuels availability) + EBP targeting 20% ethanol blending by 2025 + Reduced GST on ethanol (18% to 5%) + PM JI-VAN Yojana (2G ethanol projects) + Flexi-fuel engines under PLI scheme + Amendment of IDR Act 1951 (free ethanol movement).

18.35. **SUSTAINABLE ALTERNATIVE TOWARDS AFFORDABLE TRANSPORTATION (SATAT):** Launched in 2018 + Set up Compressed Bio-Gas (CBG) production plants and make available CBG in the market for use in automotive fuels

**Targets under SATAT:** 5000 CBG (Compressed Biogas) Plant + 15 MMT of CBG (Compressed Biogas) + 50 MMT of Bio-Manure

### 18.36. **Forest Conservation in India**

Total forest and tree cover: **24.62% of total geographic area** (increase of 0.28% from 2019), (India State of Forest Report 2021).

17 states have more than 33% of their area under forest cover.

**Initiatives:** Forest Conservation (Amendment) Act 2023 + **Green India Mission** (5 Mha forest/tree cover increase) + **Nagar Van Yojana** (urban green cover) + Accredited Compensatory Afforestation + **Indian Forest & Wood Certification Scheme (IFWCS)** by MoEFCC for sustainable forest management + SC Judgement (**State of Telangana Vs Mohd. Abdul Qasim**, 2024) promoting forests as a national asset with Green accounting.

### 18.37. **50 YEARS OF PROJECT TIGER:**

Centrally Sponsored Scheme + Launched in 1973

**Activities under the project:** Establishment of Tiger Reserves + Core-buffer strategy for tiger management + Use of UAVs under e-Bird project for surveillance + NTCA's M-STrIPES for tiger monitoring + Special Tiger Protection Force (STPF) for anti-poaching operations in Tiger Reserves.

### 18.38. **THE WILDLIFE (PROTECTION) AMENDMENT ACT, 2022**

**Key Amendments:** New CITES schedule replaces vermin + Schedules reduced from 6 to 4 + Centre empowered to regulate invasive alien species + Elephants permitted for religious purposes + Central authority for specimen import/export + Chief Wildlife Warden manages sanctuaries + Centre can notify conservation reserves.

**Concerns:** Possible open sale of elephants + Centre retains control over 'vermin' declaration + Concerns over federal structure weakening State Wildlife Boards + Standing Committee led by Forest Minister replaces Chief Minister-chaired boards.

#### 18.39. Human–Wildlife Conflict

1,510 deaths recorded in the country due to animal attacks in 2022 (Accidental Deaths & Suicides in India 2022).

**Laws and Policies:** Wildlife Protection Act 1972 + Forest and wildlife in Concurrent List + 1022 Protected Areas + SOPs for Human-Wildlife conflicts + Advisory for man–animal conflict management + Species-specific guidelines for Human-Elephant conflict.

**Way forward:** Science-based conflict-mitigation plans + Local community participation + Indigenous Knowledge dissemination + Centre of Excellence for training and awareness under MoEFCC.

#### 18.40. Wetland Conservation

**Data:** India lost 2 out of 5 wetlands in last 3 decades (Wetlands International).

**Schemes/Policies/Initiatives in India:** Wetland (Conservation and Management) Rules 2017 + Establishment of Centre for Wetland Conservation and Management (CWCM) + National Plan for Conservation of Aquatic Eco-systems (NPCA) + National Mission for Clean Ganga (NMCG) + Party to Ramsar Convention + Ramsar sites in India: 82, e.g., Yashwant Sagar (Madhya Pradesh), Tampara Lake (Odisha), Pichavaram Mangrove (Tamil Nadu), Thane Creek (Maharashtra) etc + Blue Flag Certification (India has 12 Blue Flag Beaches).

#### 18.41. Mangrove Conservation in India

##### Initiatives for Mangrove Conservation in India

- India State of Forest Report (ISFR) 2023 by the Forest Survey of India (FSI).
- MISHTI (Mangrove Initiative for Shoreline Habitats & Tangible Incomes) by MoEFCC.

- Sustainable Aquaculture in Mangrove Ecosystem (SAIME)
- Magical Mangroves campaign
- National Coastal Mission Programme on 'Conservation and Management of Mangroves and Coral Reefs'

#### 18.42. CORAL BLEACHING

##### Affected Areas:

- Lakshadweep Islands: Significant risk due to coral atolls.
- Gulf of Mannar: Coral cover decreased from 37% (2005) to 27.3% (2021).
- Palk Bay: Coral cover dropped from 30.8% (2007) to 18.7% (2019).
- Goa: Limited to one species, Goniopora.

##### Conservation Initiatives in India:

- **Coastal Regulation Zone (CRZ) Notification, 1991:** Under Environment Protection Act, 1986.
- **Gulf of Mannar Biosphere Reserve Trust:** Eco-development for local fishing communities.
- **Coral Reef Recovery Project-Mithapur:** Launched in 2008 by Wildlife Trust of India.
- **Zoological Survey of India (ZSI):** Restored coral reefs in the Gulf of Kachchh with Gujarat Forest Department.

#### 19. DISASTER AND DISASTER MANAGEMENT

- 58.6% of the landmass is prone to earthquakes of moderate to very high intensity.
- Over 40 million hectares (12% of land) is prone to floods and river erosion.
- 5,700 km of the 7,516 km long coastline is prone to cyclones and tsunamis.



**Way Ahead:** No construction on slopes above 30 degrees or near spring lines + Perform load-bearing tests and use hazard zonation in urban planning + Grow fast-growing trees and grasses + MNREGA provisions for landslide mitigation in hill areas.

### 19.5. Fire Safety Regulations

In News: Recent fire accidents in a gaming zone in **Rajkot (Gujarat)**, a firecracker factory in Harda (Madhya Pradesh).

Other recent incidents –

Coaching centres in Mukherjee Nagar and Kalu Sarai (Delhi) due to narrow staircases, lack of emergency exits, lack of sprinkler system

AMRI Hospital fire in Kolkata in 2011 due to inactive fire alarms and sprinklers, unsafe storage of flammable material

- 7,435 people were killed in over 7,500 fire accidents in India in 2022 (NCRB).

**Fire Safety Standards:** Fire service is a State subject + National Building Code by BIS sets central fire safety standards + States must incorporate NBC in local bylaws + Additional regulations like Model Building Bye Laws and Fire & Life Safety guidelines.

**Major challenges:** NBC provisions, including 'Fire and Life Safety' audits, are recommendatory in nature + shortage of 5000+ fire stations

**NDMA Guidelines:** Enact Fire Act at the state level for **mandatory clearances** + Expand Fire Services to block and Gram Panchayat levels + Appoint professional heads of fire services at state and district levels + Promote **R&D for water-efficient fire extinguishing technologies**

**13th Finance Commission:** Municipal Corporations with populations over one million must develop fire hazard response and mitigation plans.

### 19.6. Forest Fires in India

Recent: Forest fire in Uttarakhand (2024); Australian bushfire (2019).

22% area falls under highly and extremely fire-prone category.

**Impact:** 1.6% tree cover lost between 2001 and 2023 (Odisha witnessed the highest loss).

**Steps Taken:** National Forest Policy (1988) + National Action Plan on Forest Fire to minimize forest fires (2018) + Centrally Sponsored Forest Fire Prevention and Management Scheme

**NAPFF Guidelines:** Fire risk zonation and mapping + Creation of fire lines + Controlled burning and fire terracing + Counter fire techniques + Firefighter support (aircraft) and community involvement using Joint Forest Management.

### 19.7. Oil Spills

Recent occurrence: Ennore Oil Spill, Tamil Nadu; Nagapattinam Oil Spill, Tamil Nadu

**Initiatives taken:**

**National:**

- National Oil Spill Disaster Contingency Plan (1996): The Indian Coast Guard is the nodal agency for the plan.
- Merchant Shipping Act, 1958 has provisions for the prevention and containment of oil pollution at sea.

**International:**

- International Convention on Civil Liability for Bunker Oil Pollution Damage (2001): India ratified the convention in 2015.
- International Convention for the Prevention of Pollution from Ships or MARPOL Convention (India is a signatory).



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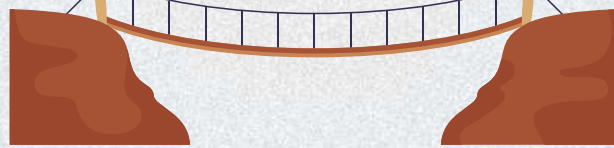
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**Internet penetration (over 880 million as of March 2023, TRAI)**

**Steps to curb misuse of social media:** IT Rules 2021 mandate intermediaries to follow guidelines + Section 67 of IT Act 2000 punishes transmission of obscene material + PIB Fact Check Unit verifies false claims + Platforms must use tech-based measures to filter vulgar content.

## 21.2. Threat of Online Radicalisation

**Online Penetration: Encrypted Apps:** WhatsApp + **Gamification:** Used for engagement and radicalisation

**Initiatives to Curb Online Radicalisation:**

**Global:**

- **UN Global Counter-Terrorism Strategy + EU Digital Services Act (DSA).**
- **Global Internet Forum to Counter Terrorism (GIFCT)** (by Meta, Microsoft, YouTube, and X)
- **Tech Against Terrorism:** (tech companies, governments, and UNCTED)
- **Christchurch Call:** Over 130 governments and organizations to remove extremist content online.

**India:**

- **Legal:** Unlawful Activities (Prevention) Act (UAPA) 1967.
- **Institutional:** Counter-Terrorism and Counter-Radicalisation Division (CT-CR).
- **Cyber-related:** Information Technology Act 2000, Indian Cybercrime Coordination Centre (I4C).
- **State Initiative:** Operation Pigeon (Kerala) – youth counseling.
- **Army Initiatives:** Sahi Raasta – rehabilitate youth in J&K, Operation SADBHAVANA – welfare activities.

- **International Contribution:** UN Counter Terrorism Trust Fund.

## 22. BASICS OF CYBER SECURITY

World Cybercrime Index (2024) **ranks India 10th** as major cybercrime hotspots.

**Existing Framework:** IT Act 2000 (legal framework) + CERT-In (incident response) + National Cyber Security Policy 2013 + NCoE (cybersecurity tech development) + I4C (cybercrime coordination) + NCIIPC (critical infrastructure protection) + Cyber Swachhata Kendra (malware detection) + ISEA (information security awareness) + National Cyber Security Strategy 2020 (secure cyberspace)

Recently, the Standing Committee on Finance released a report about cyber security and the rising incidence of cyber/white-collar crimes.

**Key Recommendations:** Centralized CPA (Cyber Protection Authority for oversight) + Grievance redressal (fair mechanisms) + Enforcement (strengthen cybersecurity at central and state levels) + Global cooperation (enhance ties with leading countries).

**Initiatives to Curb Cyber Threats:**

- **Citizen Financial Cyber Frauds Reporting and Management System:** Part of the National Cybercrime Reporting Portal.
- **Financial Intelligence Unit-India (FIU-IND) + Computer Emergency Response Team - India (CERT-In)**
- **Chakshu:** Initiative to empower citizens to report suspected fraud communications proactively.

## 23. MONEY-LAUNDERING AND ITS PREVENTION

### 23.1. PREVENTION OF MONEY LAUNDERING ACT (PMLA), 2002



**Key highlights:** Disturbed areas declared for restoring order (by Governor, UT admin, or Centre) + Immunity to armed forces personnel (requires Centre's sanction for legal action) + 2016 SC ruling allows investigation for excesses + Army must promptly hand over arrested individuals to police + Applicability in parts of Assam, Manipur, Nagaland, and Arunachal Pradesh.

**Committees related to AFSPA: B P Jeevan Reddy committee (2005):** It called for repeal of AFSPA by terming it a symbol of hate and oppression. o Also, Incorporation of AFSPA in Unlawful Activities (Prevention) Act, 1967 + **Second ARC (2007):** Recommended that AFPSA be repealed to remove feeling of discrimination and alienation among North East people + **Santosh Hegde committee (2013):** Appointed by Supreme Court to review encounter killing in Manipur since 1979.

#### 24.6. Manipur Violence

**Reasons for violence in Manipur:** Meitei demand for ST status (fears of land monopoly) + Instability from Myanmar refugees + Rise in poppy cultivation (linked to Kukis) + Kuki demands for separate state/administration + Asymmetric representation in Assembly + Uneven development.

**Way ahead:** Apply Lokur Committee criteria for ST identification + Implement NRC with 1951 as base year to check infiltration + Strengthen border management (BSF, ITBP) + Streamline legislative representation between hills and valley for balanced governance.

#### 24.7. Free Movement Regime with Myanmar

**In news:** Union Ministry of Home Affairs has scrapped Free Movement Regime (FMR) between India and Myanmar.

Formalized in **2018** as part of India's Act East Policy.

Allows visa-free travel **within 16 km of border** for residents.

**Reasons for scrapping FMR:** Uncontrolled immigration from Myanmar + Meitei-Kuki tensions due to

perceived illegal migration + Exodus of junta soldiers into Mizoram posing security risks + UNODC links Myanmar's unrest to regional narcotics surge.

#### 24.8. PEACE AND STABILITY IN NORTHEAST REGION

##### Initiatives for Peace and Stability

- Reduction of AFSPA Areas:
  - AFSPA lifted from 85% of Assam.
  - Completely withdrawn from Tripura (2015) and Meghalaya (2018).
- North East Special Infrastructure Development Scheme (NESIDS)
- Revised Surrender-cum-Rehabilitation Scheme: For militants.
- PM-DevINE: Central scheme for rapid development.
- Northeast Natural Gas Pipeline Grid Project
- NITI Forum for North East
- Act East Policy

#### 25. LINKAGES OF ORGANIZED CRIME WITH TERRORISM

##### 25.1. Drug Trafficking in India

Highest possession of drugs for trafficking: Punjab (maximum), followed by UP, TN. (NCRB 2022 report).

India is one of the world's single largest opiate markets in terms of users (World Drugs Report 2022).

**Measures taken by India: Operation Samudragupt** (NCB's anti-drug trafficking in Indian Ocean) + **NDPS Act 1985** (legal framework) + Border security enhancements (e.g., Comprehensive Integrated Border Management System) + **SIMS and NIDAAN portals** (databases of offenses and offenders) + **Narco-Coordination Centre** (NCORD) for law enforcement

coordination + Signatory to international conventions (e.g., **UN Single Convention on Narcotic Drugs 1961**).

## 25.2. Terrorism

**India ranked 14th on Global Terrorism Index 2024.**

**Global Initiatives to Counter Terrorism:** UN Global Counter-Terrorism Strategy (**GCTS**, 2006: emphasizes comprehensive global measures) + **UNSC Counter-Terrorism Committee** (CTC: strengthens state capacities) + Global Counter Terrorism Forum (GCTF: international collaboration) + **FATF** (monitoring illicit financial flows) + **SCO RATS** (regional security cooperation).

**Initiatives by India to Counter Terrorism:** Unlawful Activities (Prevention) Act (**UAPA**, 1967: criminalizes terrorist acts) + National Investigation Agency (**NIA**: probes terrorism) + **NATGRID** (links intelligence data) + MHA Counter-Radicalisation and Cyber Security Divisions + Bilateral cooperation (e.g., India-U.S. partnership)

## 25.3. UNLAWFUL ACTIVITIES (PREVENTION) ACT (UAPA) 1967

**In news:** Ministry of Home Affairs declared 'Jammu and Kashmir Democratic Freedom Party' as an 'Unlawful Association' under UAPA 1967.

**2019 Amendment:** Individuals can be designated as terrorists (appealable within 30 days) + Nuclear Terrorism Convention (2005) added to define acts + Terrorist acts threaten India's unity, security, or sovereignty + Cognizable offences (arrests without a warrant) + Penalty: death, life imprisonment, fine, and forfeiture of terrorism proceeds (with approval) + Tribunal for appeal setup.

## 25.4. UNITED NATIONS CONVENTION AGAINST TRANSNATIONAL ORGANISED CRIMES (UNTOC)

20th Anniversary

First comprehensive and global legally binding instrument to fight transnational organized crime

**India's initiatives:** CBI is the national Nodal Authority to receive and respond for transnational crimes. o Criminal Law Amendment Act, 2013 has been enacted wherein human trafficking has specifically been defined

**Issues with UNTOC:** Vague definition of organized crime (excludes terrorism) + Lack of strong enforcement (relies on voluntary cooperation) + Circumvention by powerful nations (e.g., US using extraterritorial jurisdictions) + Inability to keep up with emerging threats (AI, deep web)

## 25.5. Hybrid Warfare

Fusion of conventional and unconventional tools (power + subversion) to exploit vulnerabilities.

**Key Domains of Hybrid Warfare:** Political warfare (e.g. US 2016 US election), Technological warfare (e.g. cyberattacks on nuclear systems), Military warfare (e.g. Israel-Hezbollah 2006), Economic warfare (e.g. supply chain disruption), Social warfare (e.g. propaganda exploitation).

## 26.VARIOUS SECURITY FORCES AND AGENCIES AND THEIR MANDATE

### 26.1. Specific Roles and Functions of CAPFs

**Border Guarding Forces:** Assam Rifles (AR) + Border Security Force (BSF) + Indo-Tibetan Border Police (ITBP) + Sahastra Seema Bal (SSB)

- **Assam Rifles (AR):** Deployed in the North Eastern region, tackling insurgency, guarding the India-Myanmar border.
- **Border Security Force (BSF):** Deployed on the India-Bangladesh and India-Pakistan borders.
- **Indo-Tibetan Border Police (ITBP):** Deployed on the India-China border.
- **Sahastra Seema Bal (SSB):** Deployed on the India-Nepal and India-Bhutan borders.

## 26.2. DEFENSE RESEARCH AND DEVELOPMENT ORGANIZATION (DRDO)

Ministry of Defense (MoD) has constituted **Prof. K Vijay Raghavan committee** to review the functioning of DRDO and suggest restructuring and redefining its role.

**Reasons for inefficient delivery by DRDO:** Lack of harmonization (e.g., LCA Tejas delay due to Kaveri engine) + inadequate monitoring at trial stages + focus on obsolete technologies + bureaucratization + limited private sector involvement + scalability issues.

**Key Recommendations by K. VijayRaghavan Committee:** Create a new **Defence Techno-Industrial Consortium** + **Defense R&D council** with military leaders + integrate with **iDEX** for innovation + collaborate with national institutions + create **tri-service R&D division** + wind up redundant DRDO labs

Misc.

### 27.1. POKHRAN-I

India is celebrating 50 years landmark of its first nuclear tests in Pokhran, Rajasthan, as part of the 'Smiling Buddha' operation conducted on 18th May 1974.

Operation Smiling Buddha (Pokhran I)

India became the first nation apart from P5 countries to conduct the test.

### Evolution of India's Nuclear Programme

- **1944:** Homi Jahangir Bhabha established the *Tata Institute of Fundamental Research (TIFR)*, laying foundations of India's nuclear program.
- **1972:** *Bhabha Atomic Research Center (BARC)* was authorized to develop and prepare a nuclear device for testing.
- **1974:** *Pokhran I (Operation Smiling Buddha)* was successfully completed.

- **1983:** Integrated *Guided Missile Development Programme* for giving shape to the strategic, indigenous missile systems approval.
- **1998:** *Pokhran-II (Operation Shakti)* was a series of five nuclear weapon tests conducted by India.
- **2003:** India declared its *Nuclear Doctrine* with a No First Use policy.

### 27.2. Drones in India

**Steps to regulate drone security risks:** Draft Drone Rules 2021 (ease compliance, ensure safety) + National Counter Rogue Drones Guidelines 2019 (counter rogue drones) + Anti-drone systems (D4S by DRDO) + Digital Sky platform (DGCA drone management) + Import restrictions (ban except R&D/defence) + Drone (Amendment) Rules 2022 (no pilot license required)

#### Drones for defence:

DRDO successfully tested **autonomous flying wing technology demonstrator** - it is an indigenous high-speed flying-wing Unmanned Aerial Vehicle (UAV)

**Drone Technology for Defense in India:** DRDO-developed UAVs like LAKSHYA and NISHANT (target acquisition, surveillance), Black Kite, Golden Hawk, Pushpak (short-range tactical missions), NETRA (real-time reconnaissance), Rustom (long-endurance surveillance), and a counter-drone system (neutralizing rogue drones).

**Government Initiatives to Promote Drones:** **Drone Shakti** (framework for stakeholders) + **PLI scheme** (incentives for drones and components) + **Drone Rules 2021** (support for SMEs) + Procurement of **MQ-9B SkyGuardian (USA)** and **Hermes-900 (Israel)** + D4 system (drone defense) + Anti-drone **Vajra** sentinel (iDEX initiative).

### 27.3. MULTIPLE INDEPENDENTLY TARGETABLE RE-ENTRY VEHICLE (MIRV) TECHNOLOGY

DRDO has conducted first successful flight test (named Mission Divyastra) of indigenously developed Agni-5

