



NATIONAL BIOFOUNDRY NETWORK AND BIOECONOMY

Marking **1 year of BioE3 Policy**, Ministry of Science & Technology launched India's **1st National Biofoundry Network (comprises 6 institutions)** to boost biomanufacturing and scale up lab-to-industry innovations.

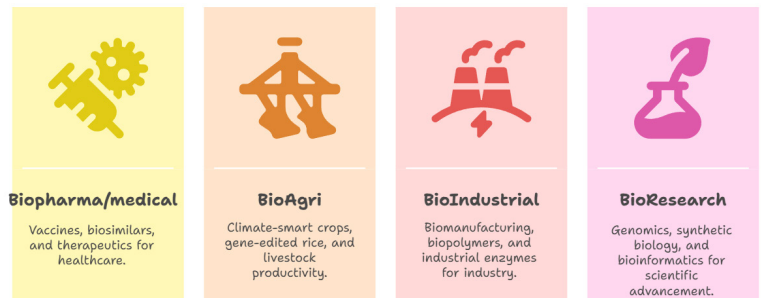
BIOECONOMY

- **Definition:** Production, utilization, and conservation of biological resources using science, tech, and innovation to create sustainable products, processes, and services across sectors.
- **India's Growth:** \$10B (2014) → \$165.7B (2024)
- **India's Target:** \$300B by 2030
- **Significance:**
 - ♦ **Bio-agriculture:** Enables circular economy, biofertilizers, biopesticides, climate-smart farming, and biofortified crops.
 - ♦ **Energy Security:** 20% ethanol blending (2025); saved ₹1.36 lakh crore in crude imports.
 - ♦ **Entrepreneurship:** Biotech startups grew from 50 to 10,000+ in a decade.

BioE3 Policy

- ⌘ **Approved:** 2024
- ⌘ **Aim:** Strengthen biomanufacturing via advanced tech & innovation
- ⌘ **Aligned With:** Green Growth (announced in the Union Budget 2023-24), LiFE, Net-Zero emissions
- ⌘ **Nodal Agency:** Department of Biotechnology (DBT), Ministry of Science & Technology
- ⌘ **Objectives:**
 - ❖ Adopt cutting-edge biomanufacturing tech
 - ❖ Promote sustainable, high-quality bio-based products
 - ❖ Establish **BioEnablers**– Bio-AI hubs, Biofoundries, Biomanufacturing hubs
 - ❖ Skill manpower in interdisciplinary biotech fields

Bioeconomy Sectors



India's Bioeconomic Initiatives: Sectoral Impact

- ⌘ **Biopharma:**
 - ❖ BioE3 boosts **regenerative biomanufacturing**, circular economy & **net-zero** goals.
 - ❖ **National Biopharma Mission** (with World Bank) enhances vaccines & diagnostics.
 - ❖ India: **3rd in pharma volume, 14th in value**, (Consumption value) produces **65% of global vaccines**.
 - ❖ Developed world's **1st DNA Covid-19 vaccine**.
- ⌘ **Bio-Agriculture:**
 - ❖ Climate-smart crops (e.g. **drought-tolerant chickpea, genome-edited rice**),
 - ❖ **Amaranth Genomic Resource Database (AGRDB)** tools improve yield & nutrition.
 - ❖ **Biotech-KISAN** links scientists with rural, tribal, women farmers.
- ⌘ **Bioenergy:**
 - ❖ **Ethanol blending** rose from **1.53% (2014)** to **20% (2025)**; cut imports & emissions, boosted rural income.

⌘ Innovation & Startups:

- ❖ **Biotechnology Industry Research Assistance Council (BIRAC)** supports startups.
- ❖ **Bio-RIDE** promotes innovation & academia–industry links.

⌘ Socio-Economic Impact:

- ❖ Generates jobs in **Tier II/III cities**, supports **MSMEs**, and pushes inclusive, **bio-driven growth by 2047**.

Challenges & Measures to Fortify India's Bioeconomy

CHALLENGES	MEASURES
Insufficient Funding – DBT budget <1% of GDP, limits R&D	Boost Funding: Raise DBT budget, tax incentives, outcome-linked support
High Initial Investment & Risks – long ROI deters private sector	Encourage PPPs , corporate innovation funds, targeted support for high-risk projects
Regulatory & Ethical Issues in biotherapeutics, GM tech	Streamline Regulations: Single-window approvals, clear GMO/gene-editing policies
Skill Gaps shortage in biotech expertise	Human Capital: Centers of Excellence, training via bio-hubs for SMEs & startups
Environmental Risks – deforestation, water stress, poor biowaste mgmt	Sustainable practices via Green Growth, LiFE, and regulatory monitoring
Public Skepticism toward GMOs , biotherapeutics	Public awareness & clear biosafety standards
Scaling & Commercialisation Gap – lab-to-market conversion issues	Enhance Innovation Infra: Support translational research, expand BIRAC & incubators
Legal Ambiguities – overlapping laws hinder progress	Harmonize Laws: Patents Act (1970) & Farmers' Rights Act (2001) to align innovation with inclusivity

INDIAN OCEAN NAVAL SYMPOSIUM (IONS)

Indian Navy hosted the **IONS Emerging Leaders Panel at Kochi**, giving young naval leaders a platform to discuss maritime cooperation and **Indian Ocean Region (IOR)** security.

IONS

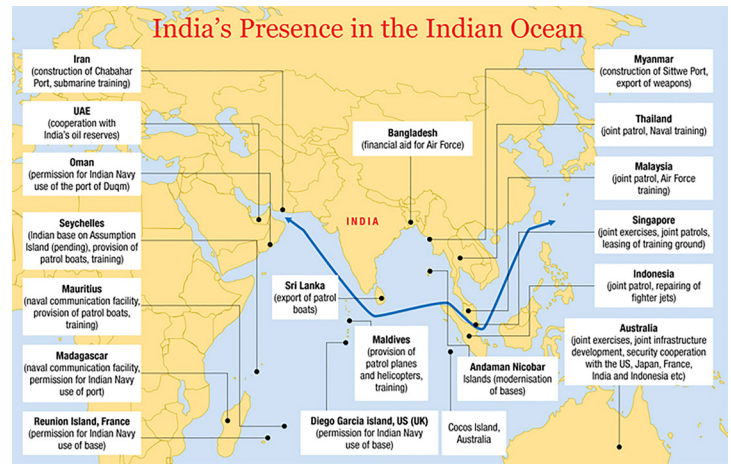
- ⌘ **About:** Voluntary initiative of **IOR littoral states** to enhance maritime cooperation, share info, and find cooperative solutions.
- ⌘ **Members:** 34 states (including India)
- ⌘ **Inaugural:** 2008, New Delhi; India Navy as chair (2008–10).
 - ❖ India to chair again 2025–27 (9th Conclave of Chiefs (CoC); end of 2025).
- ⌘ **Functional Areas:**
 - ❖ **Humanitarian Assistance & Disaster Relief (HADR):** Joint relief operations during natural disasters.
 - ❖ **Capacity Building:** Training exercises & workshops for interoperability.
 - ❖ **Counter-Piracy & Maritime Crime:** Strategies vs. piracy, smuggling, illegal activities.

INDIAN OCEAN REGION (IOR)

- **About:** Covers **1/5th of world's ocean area**; **3rd largest** after Pacific & Atlantic. Bounded by **Asia (N)**, **Africa (W)**, **Australia (E)**, **Antarctica (S)**.
- **Deepest Point:** Sunda Deep, Java Trench (Indonesia).
- **Major Seas/Bays:** **Red Sea**, **Persian Gulf**, Arabian Sea, Andaman Sea, Bay of Bengal, **Gulfs of Aden** & **Oman**, Great Australian Bight.
- **Currents:** Major epipelagic currents influence global circulation.
- **Strategic Significance:**
 - ♦ **40+ states, ~40% global population.**
 - ♦ **Handles ~2/3 oil shipments, 1/3 cargo, ~50% containers.**
 - ♦ **Key Chokepoints**– Suez Canal, Bab el-Mandeb, Strait of Hormuz, Strait of Malacca → critical for global trade, energy flows, strategic security.
 - ♦ **Resources:** Fisheries, offshore oil (~40% global output), mineral sands.
 - ♦ **For India:** 7,500 km coastline; 80%+ energy imports via IOR → vital for trade, defence, energy.
- **Governance:** **Indian Ocean Rim Association (IORA)**; estd- 1997
 - ♦ **Current Chair**– **Sri Lanka**; while **India**, currently Vice-Chair & part of the Troika, will assume the Chairship for 2025–27.

India's Role in the IOR

- ❧ **Shared Vision:** Promotes collective security & sustainable growth via **SAGAR** and **MAHASAGAR**.
- ❧ **Geo-Strategic Engagement:** Expanding Indo-Pacific presence, upholding **UNCLOS**, fostering trust & cooperation.
- ❧ **Security & Defense Cooperation:** Acts as **net security provider** through exercises like **AIKEYME (Africa)**, **MILAN (multinational)**, **SIMBEX (with Singapore)**, joint patrols with island states.
- ❧ **Institutional Role:** India leads **IORA**, **IONS**, **Indian Ocean Conference**; boosts links via **Act East & Neighbourhood First**.
- ❧ **Economic & Development Partner:** Invests in **blue economy**, **trade**, **renewables**, **capacity building**.
 - ❖ India's Navy acts as a "**First responder**" in **HADR** (e.g., 2004 Asian Tsunami).



GANGOTRI GLACIER

RETREAT SIGNALS CLIMATE PERIL

- Gangotri Glacier System (GGS) lost **10% snowmelt flow b/w 1980–2020** due to **rising temperatures** and **climate change** (IIT Indore & ICIMOD Nepal).
- ❧ Himalayan glaciers are thinning at **46 cm/year**; **Gangotri snout** is receding.
- ❧ Increase in **rainfall-runoff** and **base flow** indicates climate-driven hydrological changes.
- ❧ **Glacial lakes and water bodies** expanded by **10.81% (2011–2024)**.

Gangotri Glacier

- ❧ Located in **Uttarkashi (Uttarakhand)**; originates from **Chaukhamba range**.
- ❧ **Compound valley glacier** fed by **Raktvarn**, **Chaturangi**, **Swachand** glaciers and **peaks like** **Shivling**, **Thalay Sagar**, **Meru**, **Bhagirathi III**.
- ❧ **Terminates at Gaumukh**; source of **Bhagirathi**, which joins **Alaknanda** to form the **Ganga** at **Devprayag**.
- ❧ **Gangotri National Park** (est. **1989**) covers **Gaumukh** and **Gaumukh–Tapovan trek**.
 - ❖ Features **coniferous forests** and hosts species like **Black Bear**, **Brown Bear**, **Himalayan Monal**, **Himalayan Tahr**, **Musk Deer** & **Snow Leopard**.

MIRA VARIABLE STARS

IUCAA study (co-authored by Nobel Laureate **Adam Riess**) used oxygen-rich **Mira variable stars** (**Omicron Ceti**) to measure **Hubble constant** with **3.7%** precision.

- ❧ Mira is a pulsating red giant star with **brightness cycles of 100–1000 days** due to outer layer expansion and contraction.
- ❧ First known **variable star** (identified in 17th century); relatively cool (**~3000 K**), and in late stellar evolution.
- ❧ Help measure **cosmic distances**, calibrate the **extragalactic distance ladder** and refine the **Hubble constant**, aiding in resolving the **Hubble tension**.

Hubble Constant (H_0): Proposed by **Edwin Hubble** (1929), it measures the Universe's expansion rate (km/s/Mpc), helping estimate its size and age.

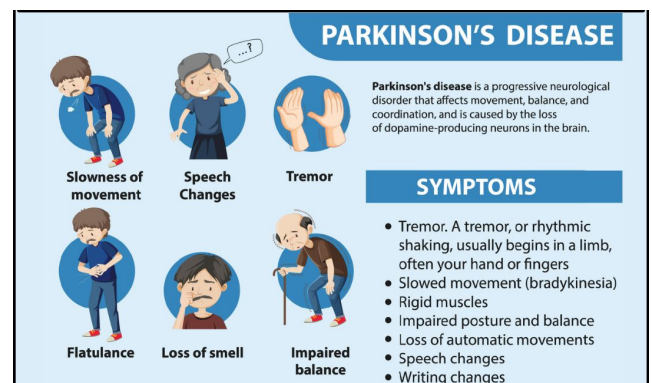
- Hubble observed that more distant galaxies move away faster, **measured by redshift—light shifting toward the red spectrum**—showing the universe is expanding.

Hubble Tension: Difference in the Universe's expansion rate measured from early vs. late-Universe observations.

BIOSENSOR FOR PARKINSON'S DISEASE (PD)

Institute of Nano Science and Technology (INST), Mohali scientists developed a nanotech-based biosensor for early detection of **PD**.

- ❧ The biosensor uses **gold nanoclusters (AuNCs)** coated with amino acids to detect **toxic α -synuclein clumps** (amyloids) that damage brain cells.
- ❧ It enables early, low-cost, label-free PD detection, suitable for point-of-care, with potential for **Alzheimer's** & other protein disorders.



Parkinson’s Disease

- ⌘ **About:** Progressive [neurodegenerative disorder](#) with **motor (tremors, rigidity, instability)** and **non-motor (cognitive, mood)** symptoms.
- ⌘ **Cause:** Loss of dopamine neurons in **substantia nigra (region in the midbrain)**; linked to **genetic mutations & environmental factors** (pesticides & pollution).
- ⌘ **Prevalence: 8.5Mn cases (2019); India 0.58Mn (~10%).**
 - ❖ By **2050: India 2.8Mn (+168%), Global 25.2Mn.**
- ⌘ **Treatment:** No cure; managed with medications (**Levodopa/Carbidopa**), **surgery, rehab to reduce symptoms.**
- ⌘ **Related Initiative:** National Parkinson Network (2024) by MDSI.

NATIONAL SPORTS DAY 2025

- Observed on **29th August** – birth anniversary of **Major Dhyan Chand** (Declared in 2012).
- ⌘ **Theme 2025: “Ek Ghanta, Khel ke Maidan Main”**
 - ⌘ **National Sports Awards** - presented annually on **29th August** by President:

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Awards & Medals Conferred to Major Dhyan Chand

- **Olympics: Gold** (1948, 1952, 1956 & 1964); **Silver** (1960)
- **Padma Bhushan** (1956)

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AWARD	DESCRIPTION
Major Dhyan Chand Khel Ratna Award	India’s highest sporting honour , instituted in 1991–92 as Rajiv Gandhi Khel Ratna , renamed in 2021.
Arjuna Award	2nd highest sporting honour.
Dronacharya Award	Highest honour for coaches .
Rashtriya Khel Protsahan Puruskar	For organisations promoting sports in the last 3 years.

EXERCISE BRIGHT STAR 2025

- India joins 19th edition of Exercise Bright Star in Egypt.
- ⌘ **Type:** Biennial, Multilateral, Tri-service
 - ⌘ **Host:** Egypt + US | **Started:** 1980
 - ⌘ **Region:** Middle East–North Africa (MENA)

Multilateral Naval Military Exercises Involving India

EXERCISE	OTHER KEY PARTNERS
Malabar	US, Japan, Australia
MILAN	Indonesia, Singapore, Sri Lanka, Thailand and others
RIMPAC	US, Australia, Canada, Japan, etc.
IBSAMAR	Brazil & South Africa