BACKGROUNDERS
Press Information Bureau
Government of India

India: A Global Bioeconomy Powerhouse

In 10 Years, grew from USD 10 Billion to USD 165.7 Billion

5 September, 2025

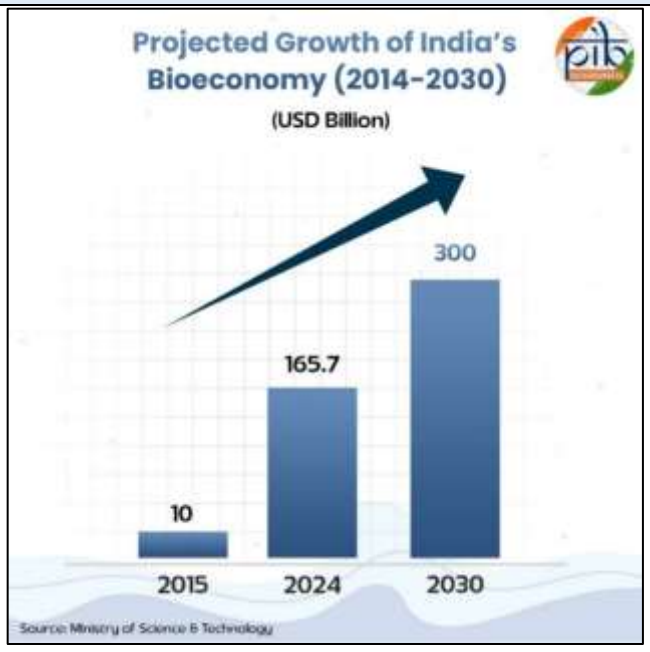
Key takeaways

- India's bioeconomy grew from **USD 10 bn (2014) to USD 165.7 bn (2024), targeting USD 300 bn** by 2030.
- Four key subsectors: BioIndustrial (47%), BioPharma (35%), BioAgri (8%), and BioResearch (9%).
- Achieved 20% ethanol blending in 2025, five years ahead of target, boosting farmer income and forex savings.
- India is a global vaccine hub, with Serum Institute's share rising to 24% in 2024.

Introduction

Over the past decade, India has emerged as one of the fastest-growing bioeconomy in the world. From just **USD 10 billion in 2014**, the sector expanded to **USD 165.7 billion in 2024**, contributing **4.25%** to the national GDP of **USD 3.89 trillion**. With an ambitious target of **USD 300 billion by 2030**, bioeconomy is steadily becoming a cornerstone of India's sustainable growth and innovation, driven by advancements in biotechnology, agricultural innovation, biomanufacturing, and healthcare.

According to the **World Economic Forum**, **bioeconomy** uses renewable resources like plants, animals, and microorganisms to produce food, energy, and industrial goods. It helps cut emissions, reduce dependence on fossil fuels, and support sustainability. With innovations such as gene editing and bioprinting, bioeconomy is creating solutions that protect the planet while driving economic growth and human well-being.



Marking the first anniversary of the **BioE³ Policy** (Biotechnology for Economy, Environment and Employment), on 25th August 2025, Union Minister of Science and Technology Dr Jitendra Singh launched the **BioE³ Challenge for Youth** and the country's first National Biofoundry Network, calling these initiatives vital to making biotechnology a driver of India's economy, environment, and employment.

Key Drivers of India's Bioeconomy Success

India's BioEconomy, valued at **$165.7 billion in 2024**, is powered by four major subsectors. Each reflects India's strength in science, innovation, and sustainability.

- **BioIndustrial**

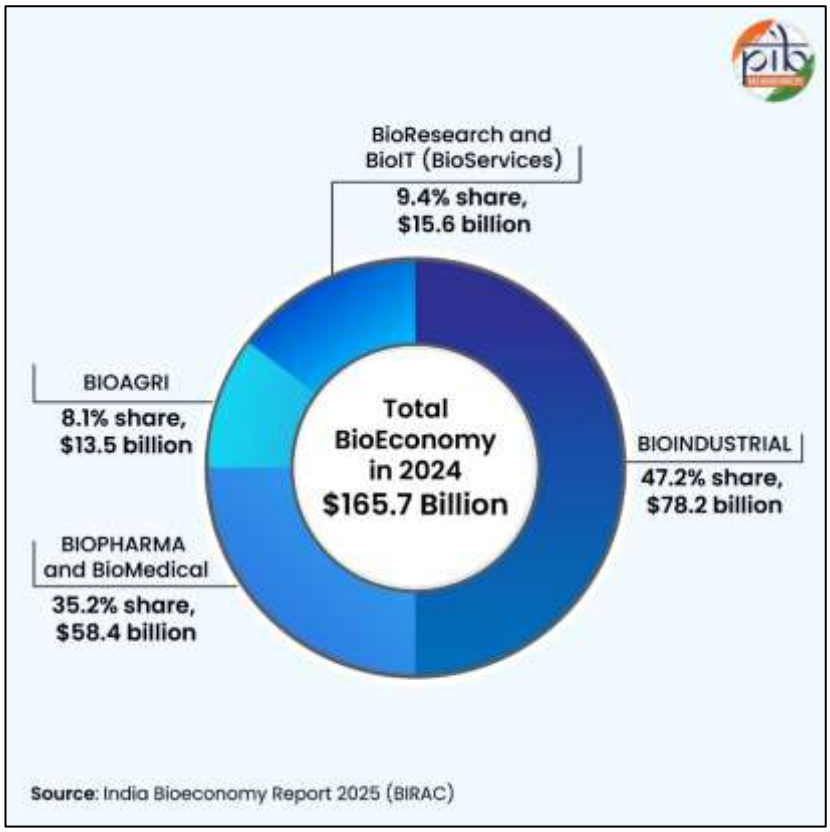
The BioIndustrial segment, representing nearly half of the total BioEconomy, is valued at $78.2 billion in 2024. Its dominance reflects the growing adoption of bio-based solutions across sectors such as biofuels, chemicals, bioplastics, and enzymatic applications in various industries. The push toward sustainability and green technology has positioned this segment as a cornerstone of India's BioEconomy. It uses **biosynthetic processes and recombinant DNA technology**, with applications from **beverages to detergents**. This highlights India's growing shift towards a **green and circular economy**.

- **BioPharma and BioMedical**

With a significant 35.2% share, valued at $58.4 billion, this segment is crucial to healthcare and medical innovation. This sector develops **pharmaceuticals, medical devices, diagnostics, biologics, and lab-grown organoids**. It focuses on areas like **cancer immunotherapy, gene editing, precision medicine, and MedTech solutions**. India is recognized globally for **affordable biopharmaceuticals**.

- **BioAgri**

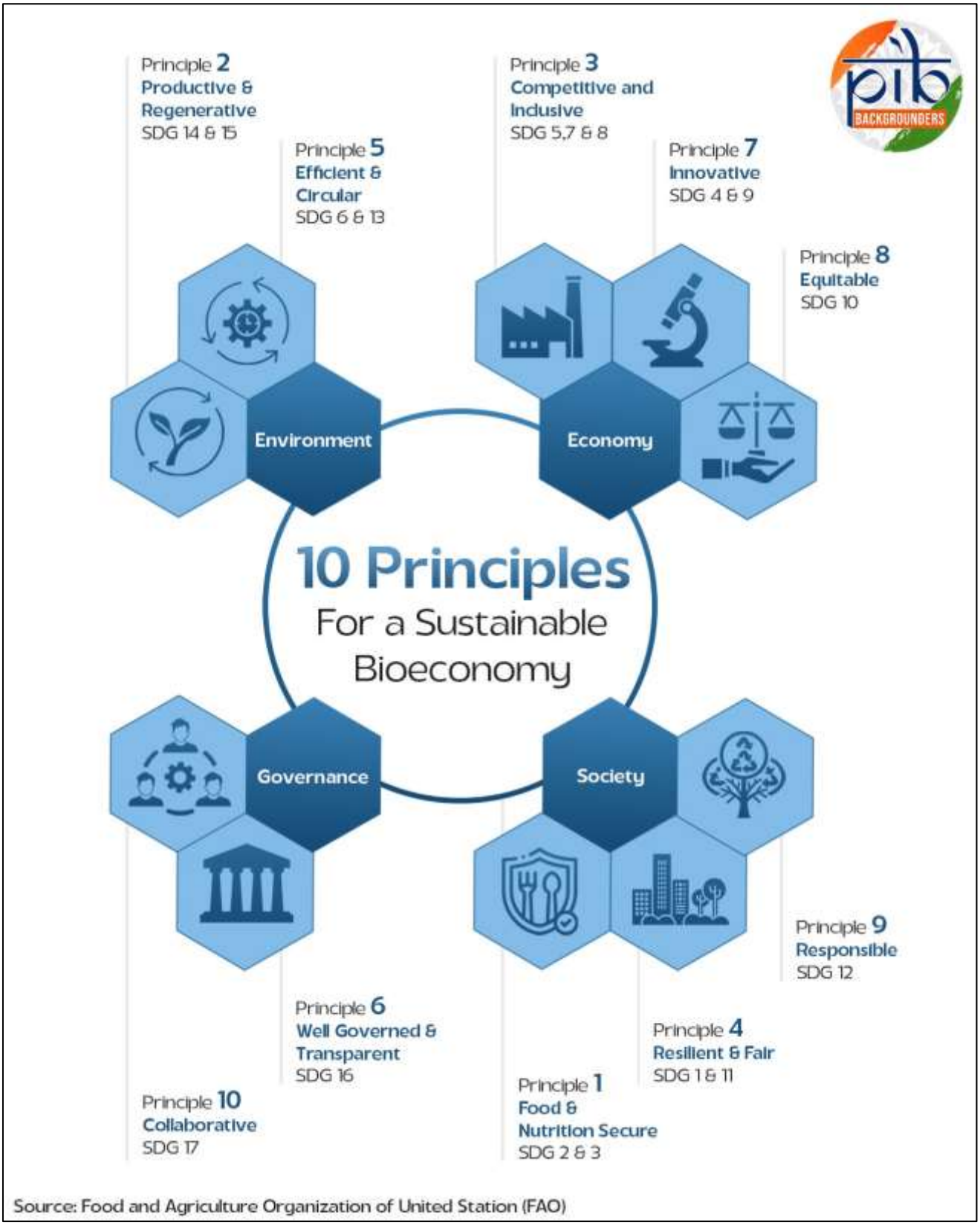
Contributing 8.1% to the total BioEconomy, valued at $13.5 billion,BioAgri centres on agricultural biotechnology.This subsector drives **agricultural biotechnology**. It covers **genetically modified crops, precision farming, and bio-based products**. A key success story is **Bt Cotton**, which has boosted yields and improved sustainability.



- **BioResearch and BioIT (BioServices)**

The BioIT and Research Services segment holds a **9.4% share of India's BioEconomy**, with a value of **$15.6 billion**. It covers contract research, clinical trials, bioinformatics, biotech software, and bioeducation. This segment highlights India's growing position as a global hub for research and development services, providing cost-effective solutions in drug discovery, data management, and related fields.

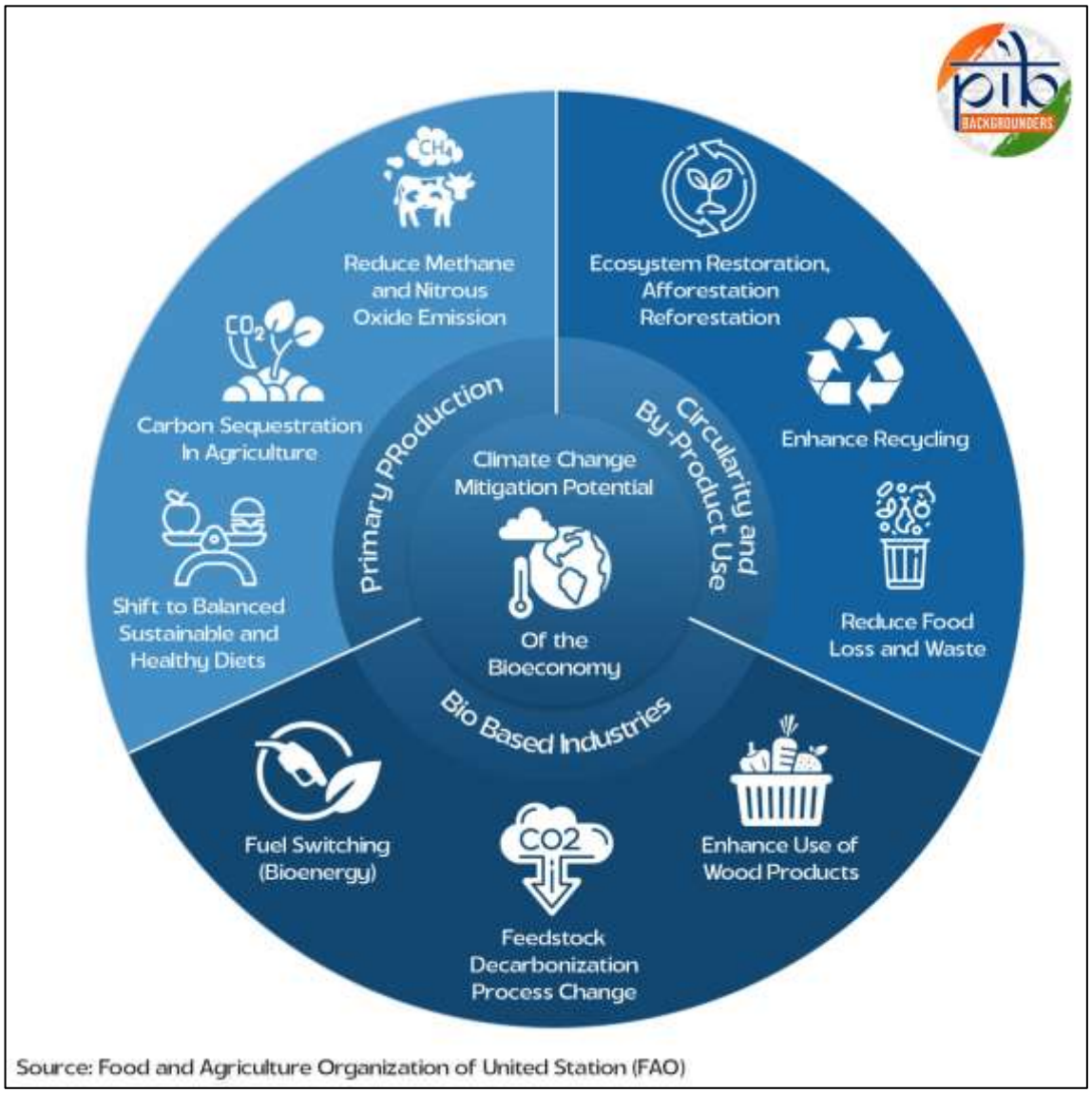
Together, these subsectors showcase how India's BioEconomy is expanding rapidly—linking **healthcare, agriculture, industry, and research** to create jobs, boost sustainability, and provide affordable solutions for the world.



Source: Food and Agriculture Organization of United Station (FAO)

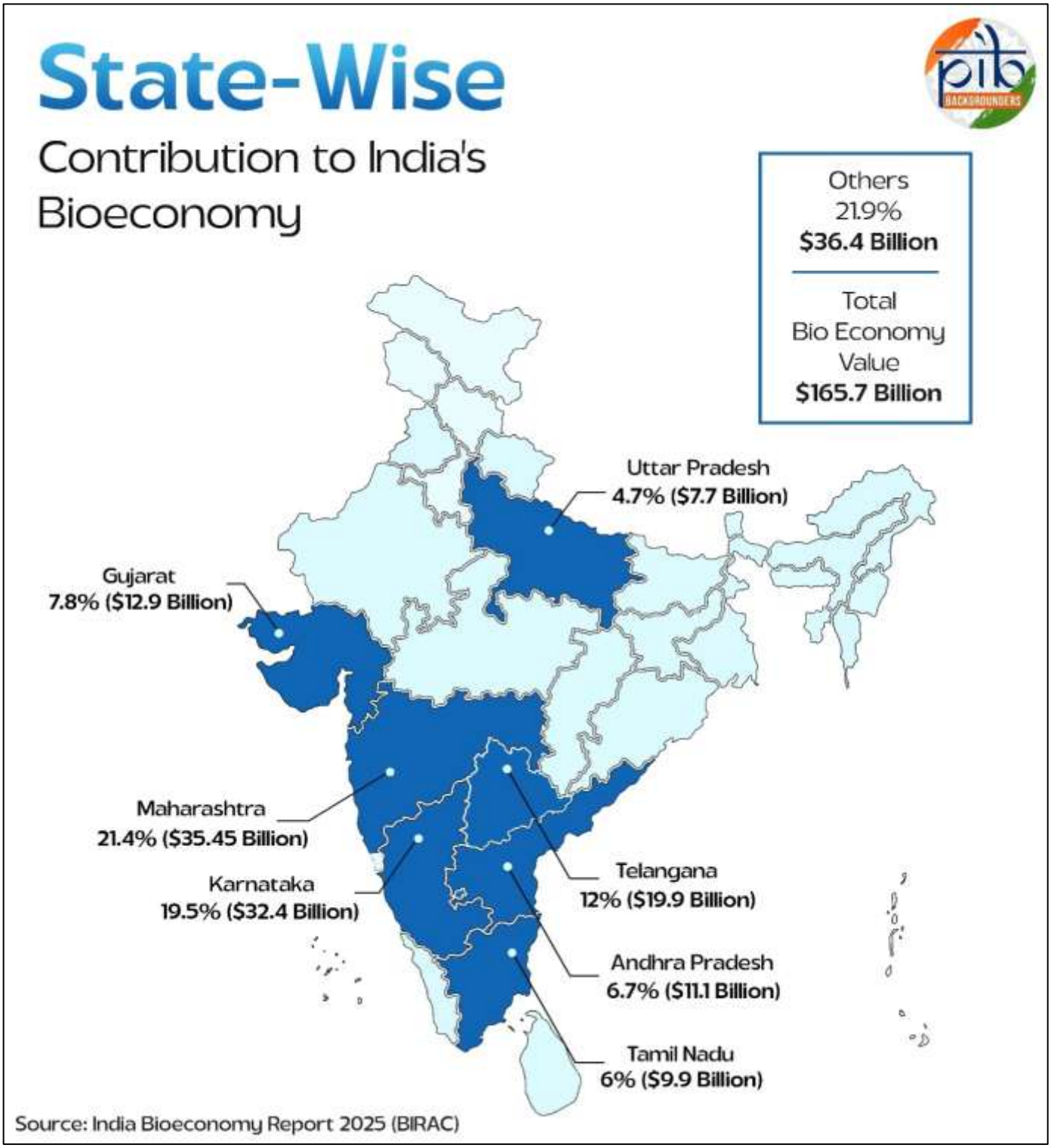
Climate Change Mitigation Potential of the Bioeconomy

The bioeconomy has strong potential to mitigate climate change by reducing greenhouse gas emissions and promoting sustainable practices. It supports cleaner farming methods, carbon storage in agriculture, balanced diets, and forest restoration. At the same time, it encourages recycling, reduced food waste, bioenergy use, and greener industrial processes. By combining these approaches, the bioeconomy helps lower emissions while advancing sustainability and resource efficiency.

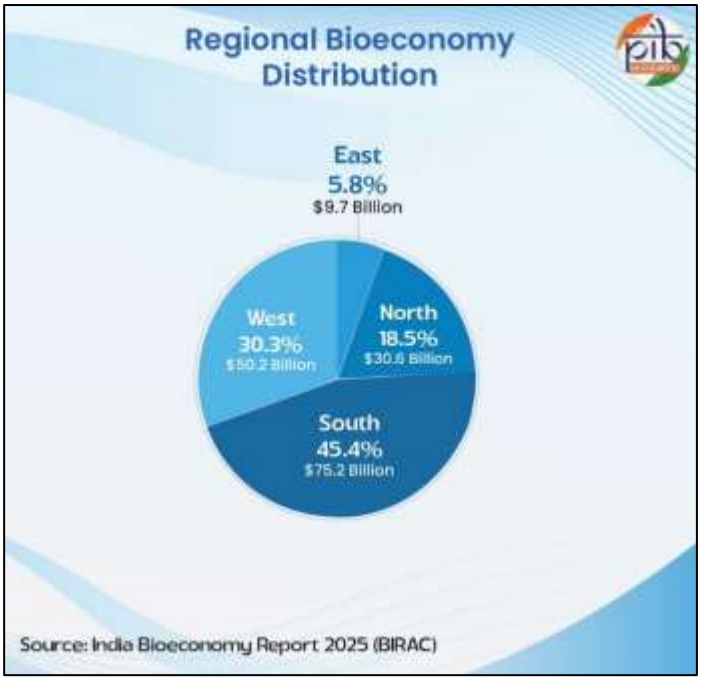


Contribution of Key States

As in 2024, Maharashtra leads India's Bioeconomy with a value of **$35.45 billion**, representing **21.4%** of the total Bioeconomy value of **$165.7 billion**. Karnataka follows closely with **$32.4 billion (19.5%)**, while Telangana contributes **$19.9 billion (12%)**. Gujarat adds **$12.9 billion (7.8%)**, Andhra Pradesh **$11.1 billion (6.7%)**, Tamil Nadu **$9.9 billion (6%)** and Uttar Pradesh contributes **$7.7 billion (4.7%)** respectively. The "Others" category, which includes various smaller states, totals **$36.4 billion**, accounting for **21.9%** of the Bioeconomy value.



The regional distribution of India's BioEconomy highlights the dominance of the **Southern region**, which contributed **45.4% ($75.2 billion)**, reflecting its strong biotechnology base and innovation ecosystem. The **Western region** followed with **30.3% ($50.2 billion)**, supported by major industrial hubs. The **Northern region** accounted for **18.5% ($30.6 billion)**, showcasing steady growth in biotech enterprises. Meanwhile, the **Eastern region** contributed **5.8% ($9.7 billion)**, indicating emerging opportunities and potential for expansion. This regional spread underscores the pivotal role of the South and West, while also pointing towards the growing significance of the North and East in shaping India's Bioeconomy.



BioE3 Policy to Boost Biomanufacturing

The Union Cabinet approved the proposal of the Department of Biotechnology (DBT) on **24 August 2024** for India's first biotechnology policy, the BioE3 Policy (Biotechnology for Economy, Environment and Employment). The policy focuses on fostering high-performance biomanufacturing and lays down the framework for the Biomanufacturing and Biofoundry Initiative. This initiative aims to promote green growth by shifting from consumptive manufacturing to regenerative and sustainable practices**.**

At an interactive meet of DBT and Biotechnology Industry Research Assistance Council (BIRAC) with industry stakeholders, Dr. Jitendra Singh noted that India now accounts for 21 of the 121 Bio-Companies globally, positioning the country among the early movers in institutionalizing biomanufacturing policy. He emphasized that biomanufacturing is central to India's vision of self-reliance, adding that *"BioEnablers are the foundation of India's next wave of biotechnology-led growth."*

To drive this growth, 21 advanced BioEnabler facilities have been launched across the country, offering shared infrastructure for startups, SMEs, industries, and academic institutions. Their focus areas include microbial biomanufacturing, smart proteins, sustainable agriculture, functional foods, carbon capture, marine biotechnology, and next-generation cell and gene therapies.

The Key Questions

Why?	How?	What?
Global threats require concerted sustainable interventions • Climate change • Unsustainable material consumption • Excessive Resource utilization • Waste generation	*Biotechnology: a promising approach* • Living factories & Machines • Engineer flexible designs • Reclaim resources from waste • Effective utilization of in situ resources	*Manufacturing that uses biological systems* • Leveraging living systems to create new sustainable, and efficient manufacturing processes. • Versatile processes, Scalable, Efficient, Cost-effective, reduced environmental impact. • Initiatives to advancing medical treatments, promoting bio-based products and supporting innovation in various industries.

Nationwide BioE3 Challenge to Drive Youth-Led Biotech Solutions

The **BioE3 Challenge** for Youth is a nationwide programme launched by Dr. Jitendra Singh to encourage young innovators under the theme *"Design Microbes, Molecules and More"*. Organised by the Department of Biotechnology, it invites participation from school students (Classes 6-12) and university students, researchers, faculty, startups and Indian nationals. The focus is on developing safe biological solutions to address challenges in health, agriculture, environment and industry.

Starting from October 2025, the challenge will be announced on the first of every month. The ten best entries each month will receive a cash prize of **₹1 lakh** along with recognition and mentoring. In addition, **100** participants will be selected for funding support of **up to ₹25 lakh** through BIRAC to convert their ideas into proof-of-concept solutions. These participants will also get access to incubation facilities and infrastructure at BRIC+ institutions across India.

By empowering young talent and promoting grassroots innovation, the BioE3 Challenge aims to build a culture of **problem solving** and **creativity** while contributing to India's journey towards a sustainable and self-reliant bioeconomy.

Significant Biotech Milestone of 2025

1. India Increased its Influence in Global Vaccine Access

India has consolidated its position as a top vaccine manufacturer. According to the WHO Global Vaccine Market Report, the **Serum Institute of India's** share of the global vaccine market, excluding COVID-19 vaccines, rose from

19% in 2021 to 24% in 2024. This was driven by higher production of pneumococcal conjugate vaccine (PCV), measles-rubella (MR), and tetanus-diptheria (Td) vaccines.

The global vaccine market is highly concentrated, with 10 manufacturers supplying over **80% of vaccines**. Three of these are Serum Institute, Bharat Biotech, and Biological E—are from India. Indian firms supplied 40% of WHO's vaccine purchases, with a large share used domestically. About **20%** of India's vaccine exports went to the WHO African Region.

2. India Achieved 20% Ethanol Blending Ahead of Target

India has achieved **20 per cent ethanol blending (E20) in petrol in 2025**, five years ahead of the original target. This is a steep rise from **1.5 per cent in 2014** and reflects the country's progress towards building a **sustainable bio-economy**. The blending initiative, launched as a pilot in **2001**, has accelerated in recent years through comprehensive policy reforms that unlocked ethanol production potential.

The programme has delivered multiple bio-economy benefits:

- **Farmer income security**: Between Ethanol Supply Year (ESY) 2014–15 and June 2025, farmers received **₹1,21,000 crore** for ethanol feedstock, eliminating sugarcane arrears and improving the viability of maize cultivation.
- **Annual impact**: At 20 per cent blending, it is expected that payment to the farmers in this year alone will be to the tune of **Rs.40,000 crore** and **forex savings** will be **around Rs. 43,000 crores.**
- **Energy independence**: Till July 2025, ethanol blending substituted **245 lakh metric tonnes of crude oil** and conserved **₹1,44,087 crore** in foreign exchange, significantly strengthening energy security.

This achievement underscores the role of ethanol blending in integrating **energy, agriculture and sustainability**, thereby contributing to India's bio-economy.

3. Precision Medicine and Preventive Care

Healthcare is shifting towards personalized and preventive care. India launched Nafithromycin, an indigenous antibiotic targeting antimicrobial resistance (AMR), which addresses Community-Acquired Bacterial Pneumonia caused by drug-resistant bacteria. New vaccines include a quadrivalent influenza vaccine and a 14-valent PCV. Gene sequencing is enabling tailored treatments in oncology and immunology. CAR T-cell therapies are creating new options for blood cancer patients. AI-driven diagnostics and remote monitoring are transforming healthcare delivery.

4. Bioeconomy's Global Impact by 2050

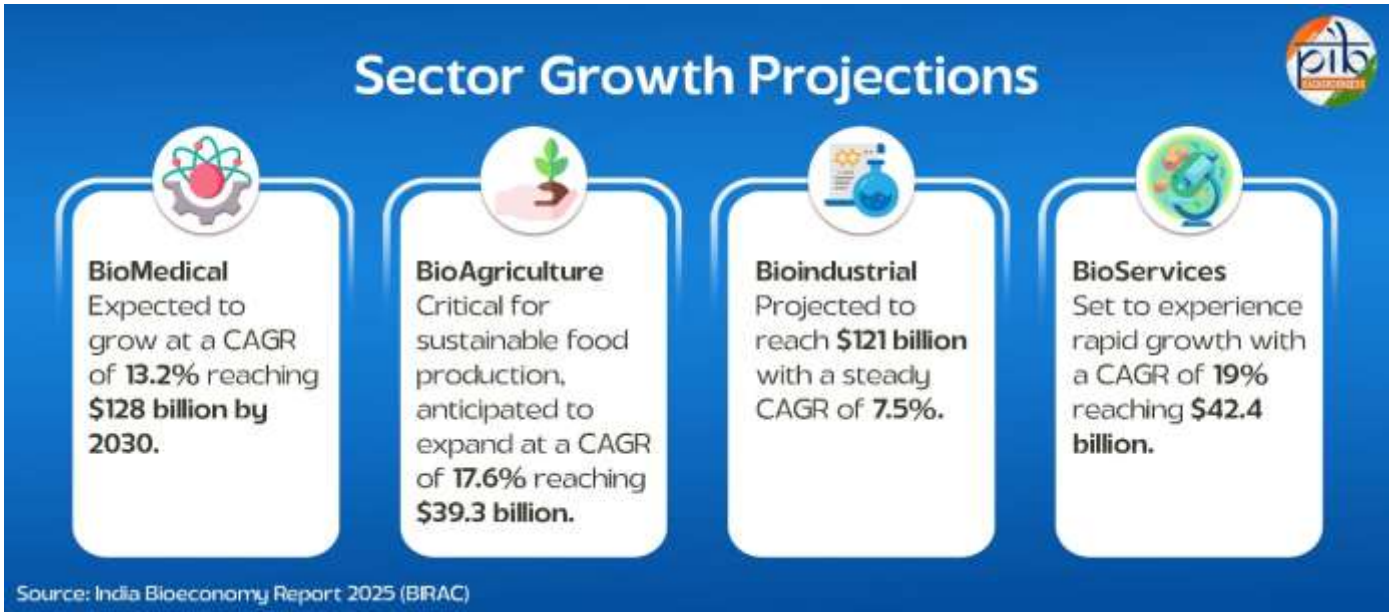
The Bioeconomy contributes significantly to many economies. Italy and Spain have a 22% GDP share, while the US and China record 5% and 4%. India's share is 4.25%. By 2050, the global Bioeconomy is projected to grow from $4 trillion to $30 trillion, about 12% of world GDP. According to PwC's *The World in 2050* report, emerging markets like India, China, and Indonesia will drive this growth.

By 2050, the global BioEconomy is expected to expand significantly, with its contribution to the world economy growing from approximately **$2.9 trillion in 2020** to **$30 trillion**. Representing nearly **12%** of the projected global GDP of **$228 trillion**.

India's Bioeconomy could range between **$1.4 trillion and $2.7 trillion**by 2050, up from $165.7 billion in 2024. With India's GDP projected at $22 trillion, the sector's contribution may range from 6.5% to 12%. This growth is poised to play a critical role as India and other nations work toward achieving net-zero carbon emissions, with sustainability initiative expected to drive economic growth and create millions of high-quality jobs.

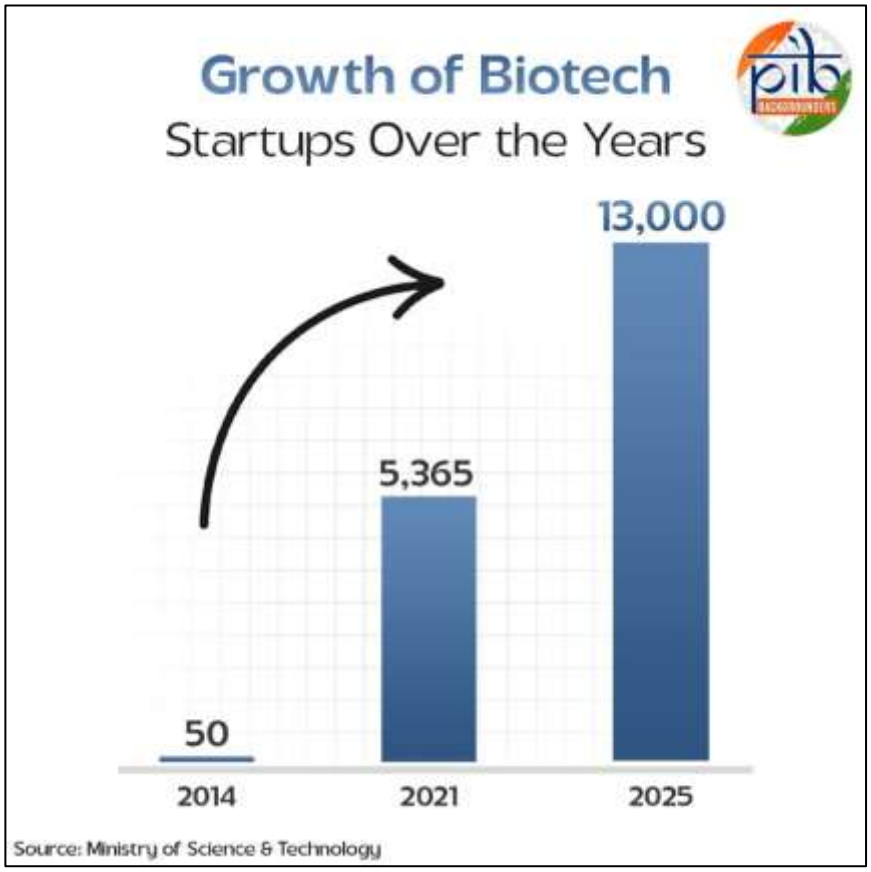
5. India Plans to Develop its Bioeconomy to $300 Billion by 2030

India's Bioeconomy is set to double from $151 billion in 2023 to $300 billion by 2030, with a CAGR of 12.3%. BioMedical is expected to reach $128 billion. BioAgriculture could grow to $39.3 billion. BioIndustrial is projected at $121 billion, while BioServices may rise to $42.4 billion. This growth highlights the Bioeconomy's role in innovation and sustainable development.



6. India's Biotech Startup Ecosystem reached 13,000 in 2025

India's biotech startups grew from 5,365 in 2021 to **13,000 in 2025**, an **142% rise**. Growth has been steady since 2016, with a sharp rise after 2020. BIRAC support programmes and increased investments have fuelled this momentum. Startups have developed over 800 products and raised $600 million in follow-on funding.



FDI in MedTech sector rose from **$370 million in 2022 to $618 million in 2024**. Although funding fluctuated, the ecosystem remains vibrant. Domestic innovation and global collaborations position India as a key player in biotech and health-tech.

Conclusion

As a dynamic and rapidly expanding sector, India's bioeconomy reflects the country's preparedness to lead in the era of sustainable growth. From ethanol blending and vaccine leadership to breakthroughs in precision medicine and biomanufacturing, the sector reflects the nation's ability to turn challenges into opportunities. With an ambitious target of reaching **USD 300 billion by 2030** and projected growth of up to **USD 2.7 trillion by 2050**, India is set to emerge as a global bioeconomy powerhouse. The continued focus on biotechnology, green energy, and youth-led innovation ensures that the bioeconomy will play a central role in achieving the twin goals of **economic prosperity** and **environmental stewardship**, making India a model for the world in building a sustainable future.

References

Ministry of Science & Technology

- https://www.pib.gov.in/PressReleasePage.aspx?PRID=2161247
- https://birac.nic.in/webcontent/indian_bioeconomy_report_2025.pdf

- https://bmi.dbtindia.gov.in/biomanufacturing-initiative.php
- https://bmi.dbtindia.gov.in/biomanufacturing-initiative.php
- https://www.pib.gov.in/PressReleasePage.aspx?PRID=2162751

PIB Backgrounder

- https://www.pib.gov.in/FactsheetDetails.aspx?id=149246&NoteId=149246&ModuleId=16

World Economic Forum

- https://www.weforum.org/stories/2024/07/bioeconomy-sustainable-development/

Food and Agriculture Organisation

- https://openknowledge.fao.org/server/api/core/bitstreams/30267551-2eec-4103-a26f-6efd7d2e8670/content

Ministry of Petroleum & Natural Gas

- https://sansad.in/getFile/loksabhaquestions/annex/185/AU3051_nISpJm.pdf?source=pqals

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