India’s Bioeconomy: Science & Technology

NEWS: Jitendra Singh launches India’s first National Biofoundry Network

India's bioeconomy is rapidly expanding, targeting $300 billion by 2030 through innovations in affordable cancer therapy, vaccines, and biofuels. However, growth is hampered by regulatory hurdles for GM crops and low R&D funding, which policies like BioE3 aim to resolve.

India's Bioeconomy Milestone

The Union Minister for Science and Technology marked one year of the BioE3 (Biotechnology for Economy, Environment and Employment) Policy. India's bioeconomy has seen massive growth, from $10 billion in 2014 to $165.7 billion in 2024. The target is to reach $300 billion by 2030. Bioeconomy is the use of biological resources and knowledge to provide sustainable products and services across all economic sectors.

Key Sectors of India's Bioeconomy

Industrial Biotechnology (nearly 50% share)

Includes biofuels (ethanol), bioplastics, and bio-based chemicals.

Pharmaceuticals & Healthcare (around 35% share)

Dominated by vaccines, biomedicines, and diagnostics.

Agricultural Biotechnology

Involves crop improvement and biofertilizers but is underutilized due to regulatory hurdles with GM crops.

Research, Bioinformatics & IT (fastest-growing)

Covers biotech software, clinical trials, and synthetic biology.

Environmental Biotechnology

Focuses on waste management and climate-resilient technologies.

Niche Sectors (high potential)

Includes marine biotechnology, space biotechnology, and bio-based textiles.

Major Scientific Breakthroughs and Innovations

GenomeIndia Project

Completed the sequencing of 10,074 Indian genomes, creating India's first reference genome for personalized medicine.

Indigenous CAR-T Cell Therapy (Qartemi)

Launched India’s first affordable cancer therapy, costing ₹35–50 lakh versus the global ₹3–4 crore.

Nafithromycin

Developed as India’s first indigenous antibiotic to combat drug-resistant pneumonia.

Advanced Vaccines

New vaccines like PneumoShield 14 (for pneumonia), HILLCHOL (single-dose cholera vaccine), and Cadiflu Tetra (influenza) have been launched.

Ethanol Blending Program

Achieved 15% ethanol blending, making India the 3rd-largest ethanol producer globally.

Climate-Resilient Agriculture

Bt Cotton dominates the sector. The market for biofertilizers/biopesticides is growing, and indigenous IVF media ("Shashthi") is boosting dairy farming.

AI-Driven Biotech

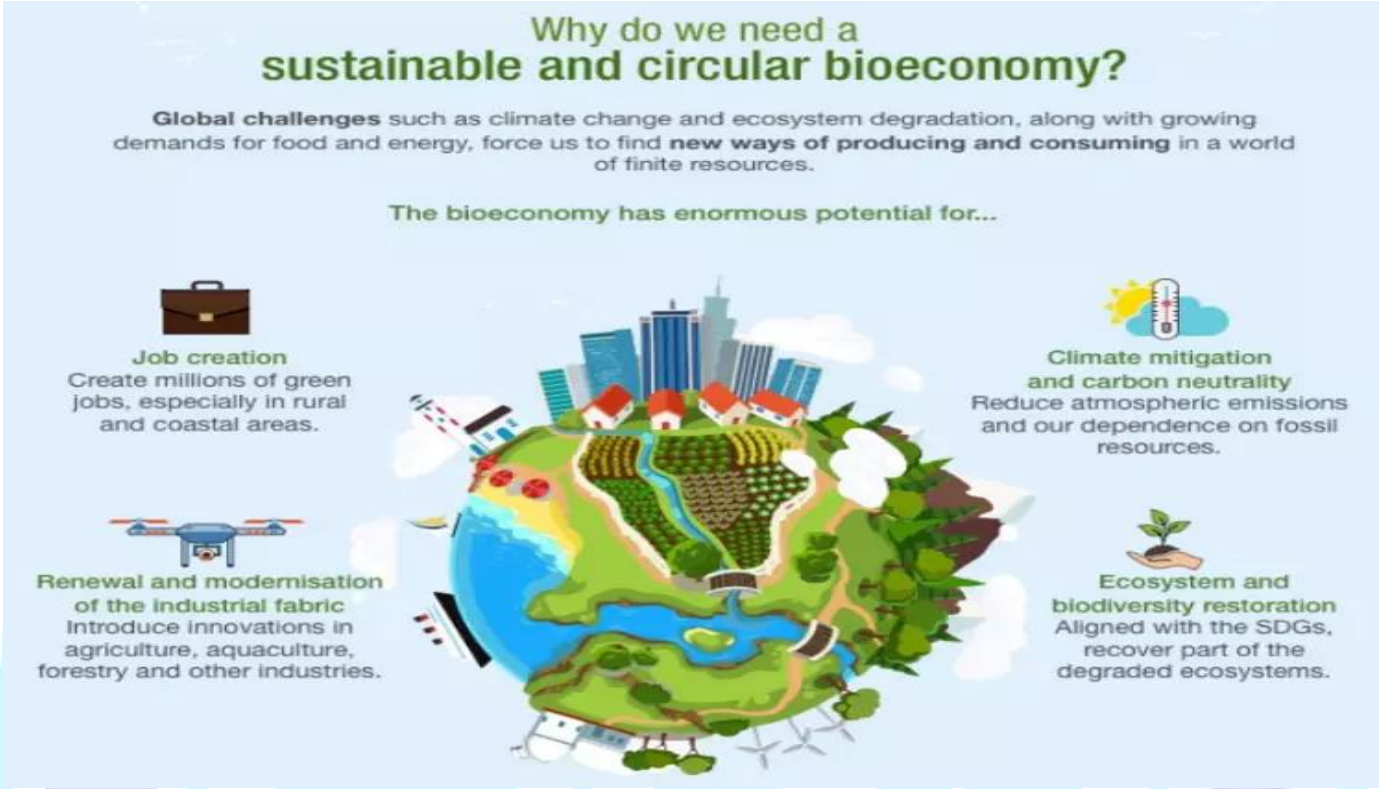
New platforms like Bio-Rad’s kit for single-cell sequencing and Neuberg’s ‘Geniee’ for personalized genomics are emerging.

Drone-Based Healthcare

Drones are now used for medical supply delivery in Kerala, cutting delivery times from hours to minutes.

Global Collaborations

India is leading the Global Biofuel Alliance (GBA) and developing new vaccines under the Ind-CEPI Mission.



Why India's Bioeconomy is Important

Sustainable Growth

Reduces dependence on fossil fuels by using renewable biological resources.

Innovation

Drives R&D in new drugs, diagnostics, and green technologies.

Employment

Projected to create jobs for 35 million people by 2030.

Agricultural Productivity

Improves crop yields and ensures food security.

Environmental Conservation

Helps in waste management, reduces pollution, and lowers emissions.

Global Competitiveness

Aims to position India as a global hub for bio-manufacturing.

Key Government Initiatives

BioE3 Policy (2024)

Aims to make India a global bio-manufacturing and R&D hub.

National Biopharma Mission (NBM)

Accelerates the development of indigenous biopharmaceuticals.

Biotechnology Industry Research Assistance Council (BIRAC)

Supports biotech startups with funding and mentorship.

Other Key Missions

Biotechnology Parks Scheme, Waste to Wealth Mission, and Deep Ocean Mission.

Challenges Facing India's Bioeconomy

Regulatory Hurdles

Slow and inconsistent policies, especially for approving GM crops like GM mustard.

Limited GM Crop Acceptance

Public concerns have limited the adoption of GM technology beyond Bt Cotton.

Inadequate R&D Funding

Low investment in high-risk bio-innovations.

Infrastructure Gaps

Bioeconomy output is concentrated in just five states, leaving other regions behind.

Commercialization Gaps

Difficulty in scaling up lab research into market-ready products.

Low Awareness

Farmers and industries have not widely adopted bio-based solutions over chemical alternatives.

Untapped Potential

Marine and space biotechnology remain largely unexplored.

Global Bioeconomy Policy Frameworks

USA

Focuses on biomanufacturing and AI, similar to India's BioE3 Policy.

EU

Prioritizes a circular bioeconomy and carbon neutrality.

Brazil

Concentrates on Amazon bioresources and biofuels.

Germany

Emphasizes industrial biotech and sustainable chemicals.

Way Forward and Policy Recommendations

Unified Strategy

Develop a single National BioEconomy Strategy to align all efforts.

Promote Sustainable Agriculture

Encourage the use of bio-fertilizers and efficient biomass collection.

Enhance R&D

Increase investment and promote public-private partnerships (PPPs).

Develop Clusters

Establish bio-industrial clusters and bio-refineries across the country.

Skill Development

Launch specialized training programs for the bio-workforce.

Leverage Technology

Use AI, IoT, and blockchain to improve efficiency.

Expand Global Collaboration

Engage with international platforms for knowledge exchange and market access.

Conclusion

India’s bioeconomy has enormous potential to drive sustainable growth and innovation. Overcoming regulatory hurdles and increasing R&D investment are key to achieving the ambitious goal of a $1 trillion bioeconomy by 2047.

Source: https://www.thehindu.com/news/national/jitendra-singh-launches-indias-first-national-biofoundry-network/article69982960.ece