

PARLIAMENT QUESTION: BIOE3 POLICY FOR BIOMANUFACTURING

प्रविष्टि तिथि: 10 DEC 2025 4:41PM by PIB Delhi

The BioE3 Policy aims to set forth a framework that ensures the adoption of cutting-edge advanced technologies, and aligning innovative research for promoting Biomanufacturing. The BioE3 Policy outlines guidelines and principles for enabling mechanisms for '*Fostering High Performance Biomanufacturing*' in the country across diverse sectors. The Policy focuses on revolutionizing biomanufacturing process for enhanced efficiency, sustainability, and quality while also accelerating the development and production of bio-based high-value products in six thematic sectors viz. Bio-based chemicals and enzymes; Functional foods and smart proteins; Precision biotherapeutics; Climate resilient agriculture; Carbon capture and utilization; Futuristic marine and space research. The research and translational activities under these verticals will be catalyzed by BioEnablers including Biofoundries, Biomanufacturing Hubs and Bio-Artificial Intelligence Hubs.

The BioE3 Policy will support innovation and entrepreneurship in the various Biomanufacturing subsectors including bio-based chemicals, biopolymers and smart proteins through implementation of projects in Public Private Partnership. The various thematic sectors/subsectors will be implemented as per the approved Implementation Plan under three categories : (i) Discovery & Application Oriented Network Research, (ii) Bridging the Gap for Scaleup, and (iii) Setting up of "Mulankur" BioEnablers including Biofoundries, Biomanufacturing Hubs and Bio-Artificial Intelligence Hubs.

The programmes to be implemented under the BioE3 Policy are aligned with India's vision of Green Growth (announced in the Interim Union Budget 2023-24) and also with the clarion call of the Hon'ble Prime Minister on '*Lifestyle for Environment (LiFE)*' that envisions collective approach towards sustainability. The Policy also aligns with the Hon'ble Prime Ministers vision of 'Net-Zero' carbon economy of the country. In order to establish Centre-State Partnerships under BioE3 Policy, a Centre-State Partnership Conclave on the BioE3 Policy was organized, during which the State Governments including Rajasthan participated and were urged to set up BioE3 Cells in order to align national objectives with state priorities and resources. Stakeholder Meetings are being held with several states to formulate a State BioE3 Action Plan and set up BioE3 Cells.

The Department of Biotechnology and BIRAC have supported research, development and demonstration projects to generate the new bio-based avenues for employment generation and environmental sustainability through technological innovations. Under the BioE3 Policy, DBT-BIRAC are setting up "मूलांकुर BioEnablers – Biofoundries and Biomanufacturing Hubs", in Public-Private Partnerships (PPPs) across the country. These BioEnablers will supports startups and industry to scale up their bio-based products and thus support development of bio-based enterprise across the country, including rural regions. Further, DBT has supported 4 projects on environmental sustainability in Rajasthan, in the area of (i) integrated remediation technology for degradation of microplastics (ii) low water demanding algal cultivation systems, (iii) Micro-Nano Plastics (MNPs) Fingerprinting in Cruciferous Truck Crops, and (iv) Bioprocess development for cost effective lignocellulosic bioethanol production. BIRAC through its various PPP schemes promote technological innovation, employment generation and environmental

sustainability in the biotechnology sector across the country including Rajasthan. In the state of Rajasthan, the Biotechnology Ignition Grant (BIG) grant scheme has supported 15 early-stage start-ups and individual entrepreneurs, the Equity Funding Schemes such as SEED and LEAP schemes have funded 2 projects to startups and the BIRAC Amrit Grand Challenge (AGC) – जल CARE has supported 3 innovations from Rajasthan for providing digital health solutions in rural areas. Under the Small Business Innovation Research Initiative (SBIRI), Biotechnology Industry Partnership Programme (BIPP) and the Promoting Academic Research Conversion to Enterprise (PACE- AIR and CRS) PACE programmes, 7 projects under various thematic areas of biotechnology have been supported to companies/startups/academia located in Rajasthan. Further, three Incubation and pre-incubation centres have been set up by BIRAC in Rajasthan. All these initiatives have the potential to generate employable skilled manpower.

The Department of Biotechnology through its various schemes and programmes has been placing emphasises on the building skilled manpower in cutting edge biotechnologies. This skilling will be taken to a more advanced level, under the aegis of the BioE3 Policy, that places skilling at its core, aiming to create a highly trained workforce equipped for emerging areas such as biomanufacturing, genomics, synthetic biology, AI-enabled biotechnology, and circular bioeconomy solutions.

The BioE3 skilling initiative, DESIGN for BioE3 Challenge themed "Empowering Youth to Solve Critical Issues of their TIMES", promotes an innovative mindset in the youth, by encouraging creative problem-solving, entrepreneurship, and innovation-led R&D. This is a year-long challenge, that will open on the 1st of every month. In the 1st month of the challenge i.e. November 2025, 1079 proposals were received.

DBT is also leveraging digital platform for mass training through its "Webinar Series on Biofoundry and Biomanufacturing initiatives". This series dwells upon challenges and opportunities in various thematic area of Biomanufacturing through talks by eminent experts in the field of biomanufacturing. Over 5000 participants including students, researchers and entrepreneurs have benefited from these Webinars.

One of the key components under the Policy is setting up of a network of Biofoundries that houses shared infrastructure for scaling-up of bio-based products. DBT has currently setup a "National Network of 6 Biofoundries". Further, as DBT expands India's biofoundry ecosystem, training modules in design-build-test-learn cycles for biomanufacturing will be made accessible to a large number of researchers and entrepreneurs, aiming to scale-up their technologies. The Biomanufacturing Research Centre at iBRIC-NCCS, Pune is also being established with a major focus on skilling workforce for Biomanufacturing.

Apart from this a "High-Performance Biomanufacturing Platform" of 15 Biomanufacturing Hubs with shared facilities for pilot and precommercial scale Biomanufacturing, has also been established in the country. These Biomanufacturing Hubs will lead to the generation of both direct jobs within the Hubs, as well as indirect jobs, in the co-located industries that will benefit from the technological and upscaling support on target bio-based products. Setting up of more such Biomanufacturing Hubs is in pipeline.

Further, as per the approved BioE3 Policy, a large number of projects would be supported for research, development and scale up in the 6 different verticals of the Biomanufacturing Programme which will require a diverse set of inter-disciplinary, cross-functional skilled manpower. This is likely to boost employment in this field.

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