

Executive Summary of MIT-Engine Workshop Report—Building America’s Bioeconomy: A Triple-Helix Innovation Framework

The United States stands at a pivotal moment in the global bioeconomy. While U.S. universities, startups, and national laboratories continue to produce world-leading discoveries in biology and biotechnology, the nation struggles to translate these advances into domestic manufacturing capacity, resilient supply chains, and sustained economic value. This translation gap threatens U.S. competitiveness, climate objectives, public health preparedness, and national security. On **October 31, 2025**, an MIT faculty bioeconomy working group convened with The Engine a cross-sector workshop bringing together leaders from academia, government, national laboratories, industry, venture capital, policy, and workforce development. The workshop examined the bioeconomy across two complementary dimensions:

1. **Innovation Organization** (basic R&D, workforce, manufacturing, policy/regulation, and investment capital), and
2. **Societal Impact** (supply chain resilience, climate and sustainability, economic revitalization, and national security).

Central Finding: The primary barrier to U.S. bioeconomy leadership is **institutional fragmentation**. Academia, government, and industry operate in largely separate spheres with misaligned incentives, fragmented infrastructure, discontinuous funding, and weak pathways from discovery to scale. Incremental reforms within existing silos are insufficient.

Core Conclusion: A **coordinated triple-helix innovation model**—institutionally integrating **academia, government, and industry (including venture capital and startups)**—is essential to unlock the bioeconomy’s full potential. Effective integration requires shared infrastructure, aligned incentives, seamless knowledge flow, and continuity from early discovery through commercialization and manufacturing.

Key Insights Across the Innovation Pipeline:

- **Basic R&D:** Future bioeconomy leadership depends on high-throughput, AI-enabled engineering biology, standardized and “AI-ready” biological data, and shared cloud-laboratory infrastructure. Biology must become reproducible, predictive, and scalable, analogous to mature engineering disciplines.
- **Education & Workforce:** Workforce development is the hardest and slowest challenge. The U.S. lacks clear pipelines connecting education to emerging bioeconomy jobs, particularly outside major metro hubs. New models are needed to align universities, community colleges, industry, and government around long-term regional workforce needs.
- **Manufacturing & Distribution:** The largest bottleneck is scaling—from lab to pilot to commercial production. The U.S. lacks affordable, flexible, shared biomanufacturing infrastructure and standardized process platforms, driving offshoring and supply-chain vulnerability.
- **Policy & Regulation:** Regulatory frameworks were designed for chemicals and agriculture, not platform biotechnologies. Fragmented agency oversight and regulatory uncertainty slow innovation and deter investment.
- **Investment Capital:** Venture capital timelines (3–7 years) are misaligned with bioeconomy development cycles (10–20 years). Patient, mission-aligned capital and public–private co-investment mechanisms are required.

Societal Impact on the USA: Workshop participants highlighted compelling examples where biological manufacturing can **re-shore critical supply chains**, reduce dependence on foreign sources for essential materials and medicines, enable climate-positive production systems, revitalize regional economies, and strengthen national security. These examples demonstrate feasibility—but also underscore the need for coordinated institutional support to scale nationally.

Design Principles for a Triple-Helix Model: Successful bioeconomy institutions must embody:

- **Shared physical infrastructure** (research, pilot-scale, GMP, AI/automation)
- **Aligned incentives** across sectors (including academic promotion reform)
- **Integrated funding mechanisms** spanning TRL 1–9
- **Seamless knowledge flow** via standardized IP, data, and collaboration frameworks
- **End-to-end continuity**, eliminating handoff failures between discovery and deployment .

Urgency and Next Steps: Global competitors are moving quickly with coordinated national strategies. Participants emphasized that “the timeline for action is yesterday.” This report provides a shared diagnosis and guiding principles. Detailed implementation models—such as regional bioeconomy institutes, enhanced national lab roles, and pre-competitive consortia—are addressed in a companion report.

America’s leadership in the bioeconomy is not inevitable. It must be deliberately constructed through new institutional models that align discovery, translation, and deployment at national scale.