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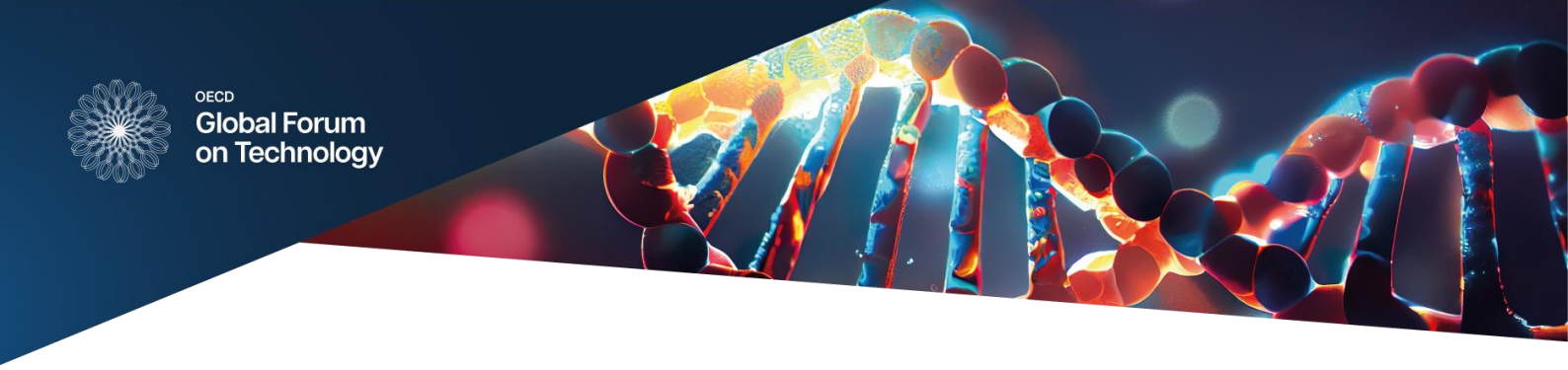

Synthetic Biology Briefing Document

3 April 2024 | Global Forum on Technology (GFTech)

Understanding synthetic biology

Synthetic biology is a multidisciplinary area of biotechnology that seeks to harness living systems in research and product development. The last two decades have witnessed the development of the first synthetic cell, a millionfold drop in the cost of sequencing DNA, a thousand-fold drop in the cost of synthesising DNA, and the development of CRISPR genome editing.

Building on these advances, synthetic biology is already providing breakthrough innovations in current and future global challenges. Among others, these include treating or eradicating infectious and genetic diseases (e.g. gene editing of insects to eradicate malaria), preventing food shortages (e.g. enabling alternative protein sources such as plant-based and other synthetic meats), enabling sustainable and distributed manufacturing (e.g. using renewable bio feedstocks instead of fossil fuels), and mitigating the impacts of climate change (e.g. scaled production of microorganisms for carbon dioxide removal).

Countries around the world are rapidly ramping up their biotechnology capabilities. Synthetic biology, combined with product scaling processes such as biomanufacturing, promises a revolution across many sectors and offers solutions to global and local societal challenges. However, serious policy challenges remain: balancing open science with biosecurity, building resilient value chains, scaling synthetic biology innovations and bridging synthetic biology and biotechnology divides across the globe.

The case for anticipatory governance and policy

The rapid development of synthetic biology in diverse sectors, coupled with the potential risks posed by nefarious users and the prevalence of non-traditional innovation communities, makes effective governance critical to building safe and long-lasting progress in this field. Many countries already have dedicated biotechnology regulations, which some argue are fit-for-purpose and that additional regulatory oversight could stifle innovation and reduce national competitiveness. However, critics say that current regulatory frameworks are insufficient to cope with the rapidly evolving complexities of synthetic biology innovations and do not consider building and maintaining trust in the regulation of engineered organisms. Anticipating future technological developments and their potential consequences is critical to forecasting issues and embedding responsible, value-led innovation in synthetic biology.

Focus group on synthetic biology

Established in November 2023, the focus group brings together over 60 experts from research, governments, academia, industry and non-governmental organisations from 31 countries to collect insights and provide evidence on the technical, social and policy issues facing synthetic biology. The group aims to inform policymakers of key areas where action is needed to foster a strong bioeconomy whilst mitigating potential risks.

The focus group has scoped the below sets of challenges and opportunities posed by synthetic biology.

Opportunities and benefits to be unlocked	
Convergence with AI and digital technology	Transition to net zero with circular production and new carbon capture and storage technologies
Increasing decentralised and distributed manufacturing for resilient societies and empowered local communities	Ensuring food security for resilience against climate change
New healthcare applications in therapeutics and diagnostics	Nurturing and enhancing biodiversity through nature-synergistic synthetic biology

Challenges and risks to anticipate and manage	
Fostering responsible and values-driven innovation	Building a culture of responsibility to mitigate dual-use, biosafety, and biosecurity risks
Avoid divides by ensuring equity and access to innovations across the world	Avoid a workforce deficit by developing skills that empower the development of local economies
Building resilient innovation ecosystems to foster scaling and availability of SynBio solutions	Build trust between civil society and synthetic biology researchers and innovators

Planned GFTech activities

1. Having identified key case studies for the application of synthetic biology and the main cross-cutting issues, the focus group will deep-dive into each to flesh out the opportunities and challenges, with a view to identifying key areas of interest and concern for policy.
2. Engage frontline researchers and private sector innovators in mapping technological futures and their transformative potential for society, breaking down the policy steps required to fulfil these blue-sky visions.
3. Incorporate diverse perspectives by inviting constructive industry and civil society partners to ad-hoc meetings, aiming to raise new issues and build trust in the group's conclusions.
4. The focus group's discussions have informed the agenda and content of the GFTech "Building our Bio Future" event on the margins of the CSTP Ministerial on 22 April. Several focus group members have been invited as speakers, and all have been invited to attend. Panels in the event are based directly on insights from the focus group meetings and the outcome of the panels will feed back to the work of the focus group.

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- GFTech Webpage
- About us video: What is the OECD Global Forum on Technology?
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