

Unlocking the potential of engineering biology: The time is now

Engineering biology¹ has applications in virtually every industry

Impact and commercialization timelines for engineering biology use cases – by industry **Commercialization timeline** Potential impact of (in years)* use case Timeframe within which the Based on % of executives that use case is likely to become rate the use case as high impact commercially viable Inner zone: 0-2 years Low (<30%) Middle zone: 2–5 years **Chemicals and materials** Agriculture Outer zone: 5–10+ years Medium (30–50%) High (>50%) Life sciences Food and beverages Personalized Bio-based synthetic rubberDisease and medicine Bio-solvents, Bioplastics Biosensors and ubricants and ubricants climate resilient Regenerative medicine and сгорз Fortified foods and monitoring tissue **Biofertilizers** additives **Biocatalysts** engineering **Diagnostics and** Cultured meat/labdetection grown meat Cell and gene therapy Nutritionally **Flavors and** Personal Environmental fragrances enriched Drug discovery and Personalized and use cases vaccine development сгорз skincare Animal-Bioremediation household (common Sustainable products free dairy Environmental sensing cosmetics and proteins саге across fragrances products industries) Carbon capture Plant-based meat Waste management high-performance cleaning Sustainable materials and packaging skincare ingredients **Bio-based** Sustainable Bioleather automotive fabricated alternatives materials textiles (fabrics and paints and coatings) Sustainable dyes and pigments Fashion Automotive Precision fermentation for sustainable biofuel production **Bio-cybersecurity** Biomethane Algal biofuels **Biological defense** Microbial biohydrogen Bioengineering for oil refining Biological solar cells Biosolutions for space zexploration Water treatment and valorization **Biomining/bioleaching** Energy Aerospace

and defence

Mining

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*Commercialization timelines are based on the assessment of surveyed executives and Capgemini experts. Source: Capgemini Research Institute analysis; Capgemini Research Institute, Engineering biology survey, April–May 2024, N=1,100 corporate organizations.

¹Engineering biology (also known as synthetic biology) involves the application of principles from biology and engineering, in conjunction with AI and data-driven computational techniques, to create new or redesigned biological systems for valuable purposes. Products, materials, or processes driven by engineering biology are referred to as **biosolutions** in this report.

Organizations view engineering biology as transformative

Almost every corporate executive agreed that biosolutions will significantly disrupt their industry – around half of respondents expect to see this disruption within **5 years**, and the rest in **5–10 years** or more.



In your opinion, will biosolutions create a major disruption in your industry?

Source: Capgemini Research Institute, Engineering biology survey, April–May 2024, N=1,100 corporate organizations.

Organizations are preparing for disruption



40% are at an exploratory stage

56% are engaging more

actively in experimentation, pilots, or scaled deployments

Source: Capgemini Research Institute, Engineering biology survey, April–May 2024, N=1,100 corporate organizations

Biosolutions offer significant sustainability benefits, but only if correctly harnessed

Sustainability is a major driver of corporate interest in biosolutions



of corporate executives believe that biosolutions can significantly accelerate progress toward sustainability goals

However, unlocking their true potential for sustainability requires deliberate action, such as measuring the environmental and social impacts across the product lifecycle, and designing the lifecycle to avoid any unintended consequences.

Source: Capgemini Research Institute, Engineering biology survey, April–May 2024, N=1,100 corporate organizations.

Barriers to the accelerated adoption of biosolutions



Source: Capgemini Research Institute, Engineering biology survey, April–May 2024, N=1,100 corporate organizations and N=500 engineering biology startups.

Digital and engineering technologies will be instrumental in developing and deploying engineering biology

These are viewed as key drivers for reducing costs, optimizing bioprocesses, shortening time-to-market for biosolutions, and helping mitigate environmental and societal risks.



of corporate executives believe that digital and engineering technologies such as AI, digital twins, robotics and sensors will be crucial to accelerating the development and scale-up of biosolutions

98% are using or planning to use AI to accelerate the adoption of biosolutions

Source: Capgemini Research Institute, Engineering biology survey, April–May 2024, N=1,100 corporate organizations.



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