# Synthetic Biology and Biological Diversity

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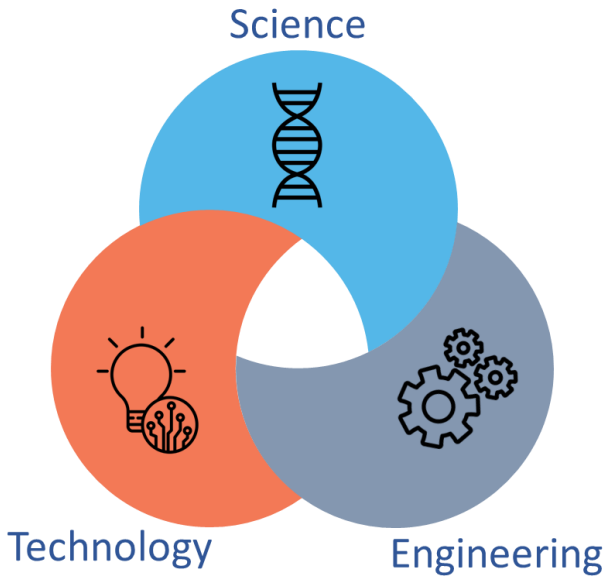
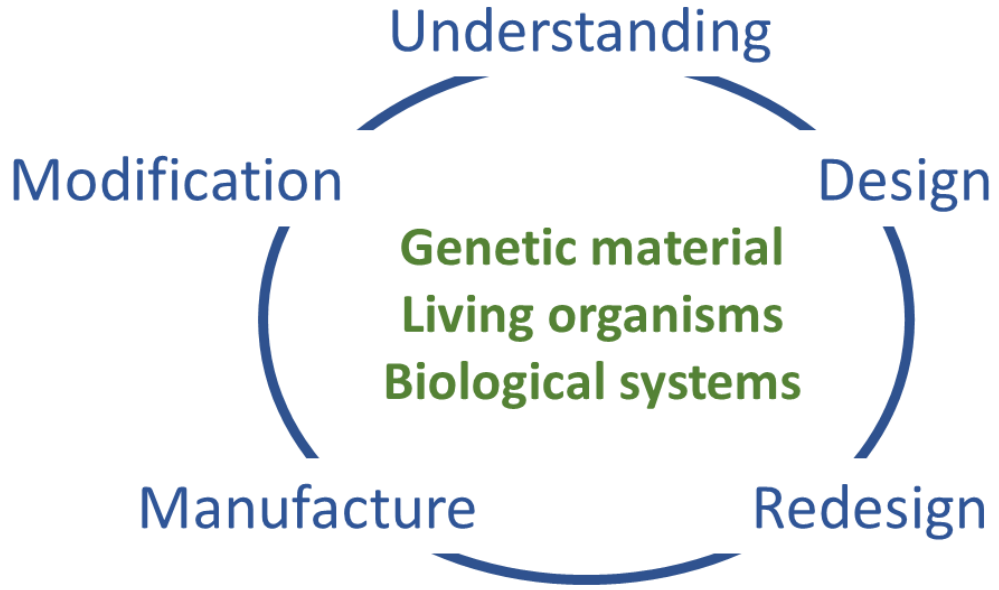
# What is Synthetic Biology?

*"…. a further development and new dimension of modern biotechnology that combines science, technology and engineering to facilitate and accelerate the understanding, design, redesign, manufacture and/or modification of genetic materials, living organisms and biological systems"*



# Synthetic Biology: Supporting Technologies and Areas of Research

## Supporting technologies

DNA synthesis

Directed evolution

Genome editing

Engineered gene drives

RNA interference

Artificial Intelligence

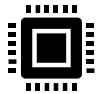
Machine Learning

BioBricks

Biofoundries

Plant and animal engineering

## Areas of research



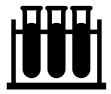
Genetic circuits

Engineering of

- proteins
- metabolisms
- genomes

Protocells

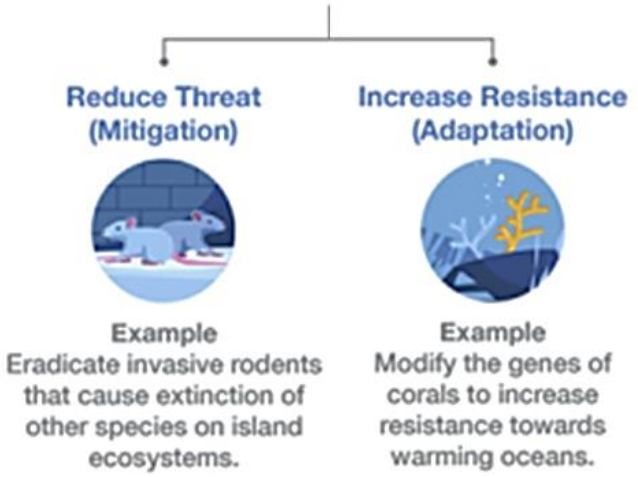
Xenobiology



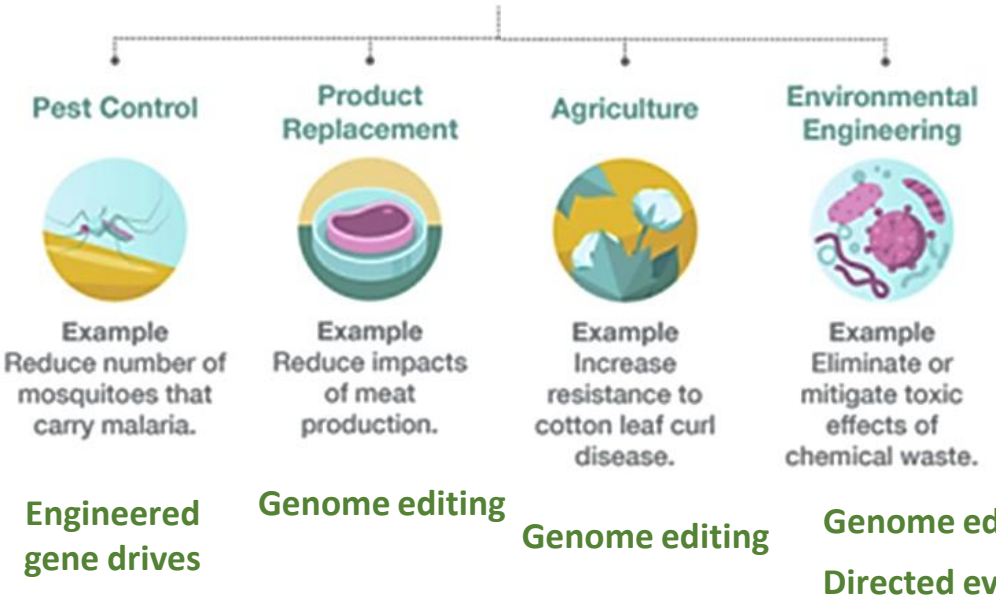
Cell-free systems

# Synthetic Biology Applications

## Applications intended for conservation benefits




## Applications <u>not</u> intended for conservation benefits




Modified from Macfarlane et al., (2022)

# Synthetic Biology: Governance Considerations

**Diverse Impacts**:

- Generalizations across applications not correct
- Each application demands case-by-case consideration

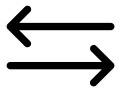
**Regulatory Framework**:

- International treaties and laws attempt regulation
- Fragmented framework poses risks of regulatory gaps and overlaps

**Science-Based Risk Assessment**:

- Cornerstone of current governance
- Recognized as one element in a broader decision-making process

# Balancing Innovation and Responsibility



**Shift in Governance**:
- Beyond traditional biosafety considerations
- Encompass social impacts, ethical principles, and social justice

**Incorporating Social Sciences**:
- Understanding broader implications for society
- Essential for responsible advancement

**Equitable Distribution**:
- Benefits and risks distributed fairly
- Avoiding undue burdens on vulnerable populations

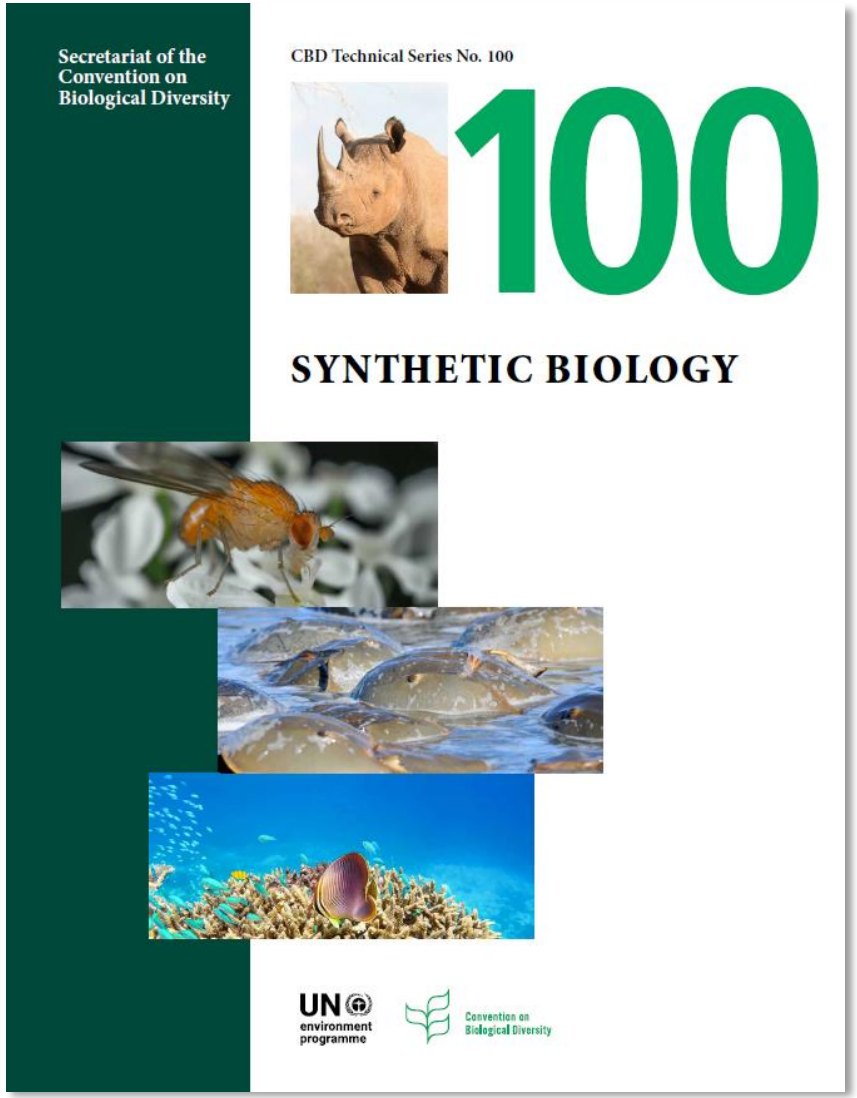
**Inclusive Decision-Making**:
- Active involvement of diverse stakeholders
- Collaboration among scientists, policymakers, ethicists, and communities

**Adaptive Governance**:
- Agility and responsiveness to the evolving landscape
- Balancing innovation with legal, ethical, and societal values

# Balancing Innovation and Responsibility in Synthetic Biology

Updated version covers:

- Supporting technologies and tools
- Areas of synthetic biology research
- Applications and products of synthetic biology
- Potential impacts on the conservation and sustainable use of biodiversity
- Social, economic and cultural concerns
- General biosafety concerns
- Governance and regulation
- Potential implications of the CBD
- Other relevant international rules
- Challenges, gaps and overlaps




25 YEARS Convention on Biological Diversity
SAFEGUARDING LIFE ON EARTH

# ICGEB

## An International Organisation in the United Nations System


80+ Signatory States, 60+ Member States, 3 Components:
Trieste (Italy) - New Delhi (India) - CapeTown (South Africa)
and a network of 40+ Affiliated Centres

Developing knowledge