

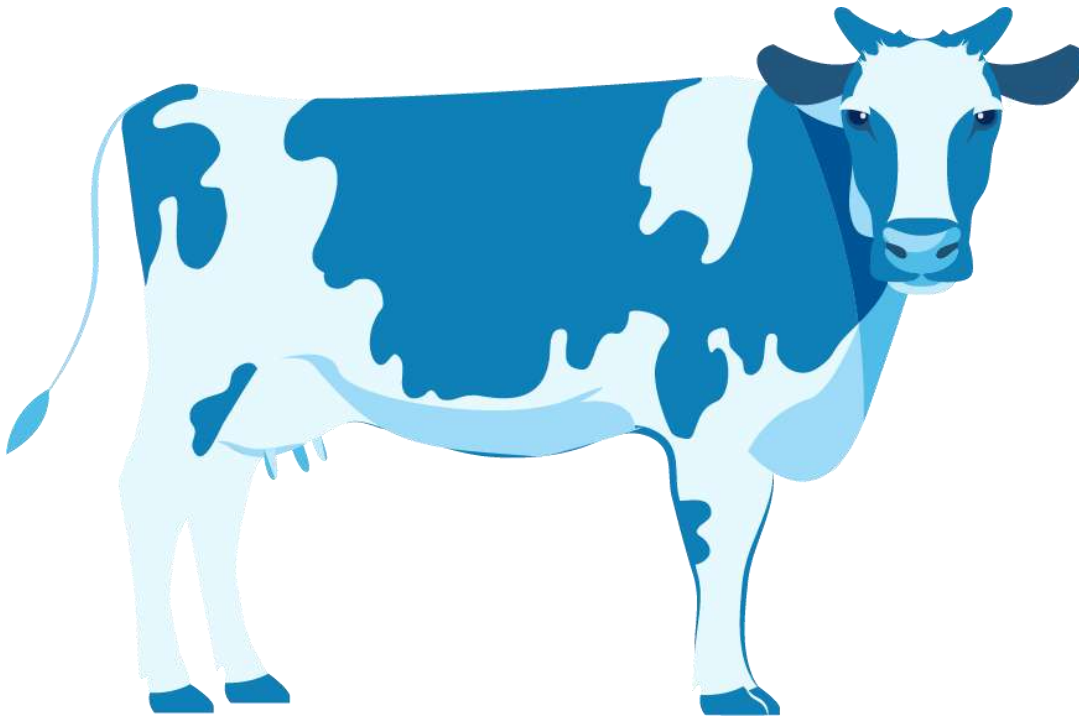


Genetic Frontiers in Conservation

An Assessment of Synthetic Biology and Biodiversity Conservation

IUCN Task Force on Synthetic Biology and Biodiversity Conservation

When we think of cows



We think of
products from
cows:

- Leather
- Meat
- Milk

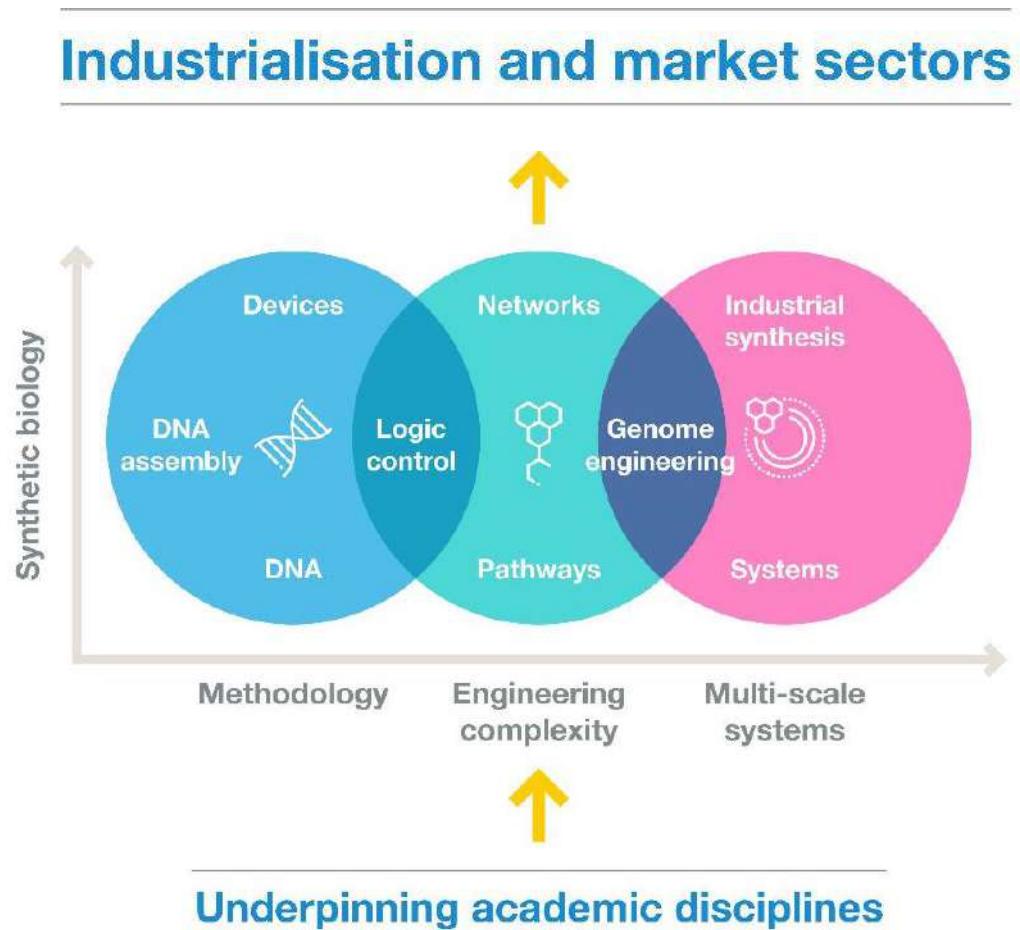
What if we could get 'cow products'.....without the cows?

Products from cow genes inserted into algae – with the application of the tools of synthetic biology:



What is synthetic biology?

“Synthetic biology is 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.” - CBD



Synthetic biology and Agriculture



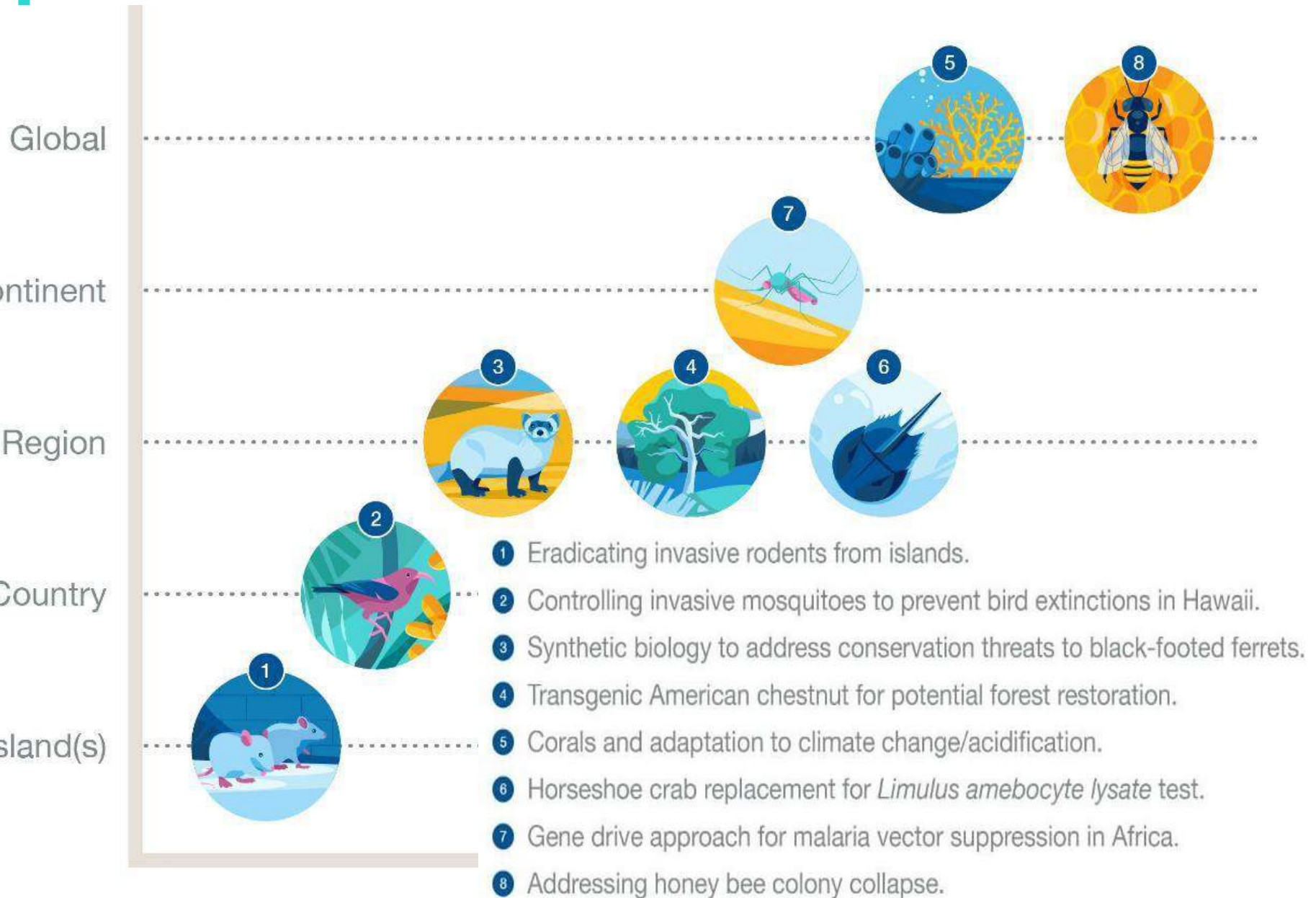
1. Transform rice from inefficient C3 photosynthesis to C4 photosynthesis (as in corn, sugarcane, and sorghum)
2. Increase micronutrients in existing crops
3. Create new domestic crops
4. Increase drought tolerance
5. Increase disease resistance
6. Add nitrogen-fixing capacity to crops
7. Improve animal production

Synthetic biology changes in human health



1. Reduce malaria burden
2. Develop new/improved drugs
3. Improve drug effectiveness
4. Improve disease monitoring
5. Improved nutrition

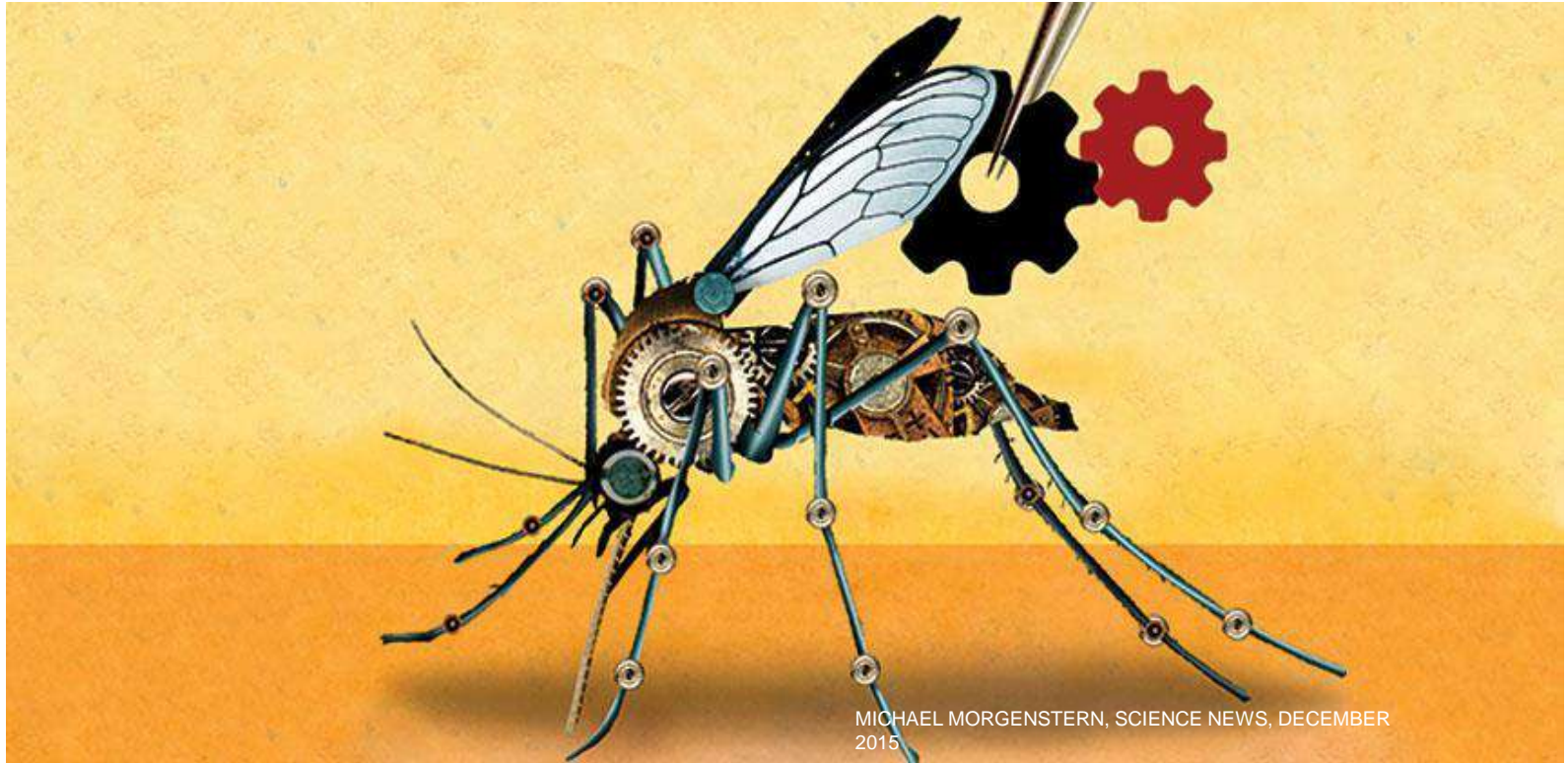
Synthetic biology and conservation



Resolution 086 – “Development of IUCN policy in biodiversity conservation and synthetic biology”

- to *undertake an assessment*...
- to *examine* the organisms, components and products resulting from synthetic biology techniques and the impacts of their production and use, which may be beneficial or detrimental to the conservation and sustainable use of biological diversity and associated social, economic, cultural and ethical considerations; and
- to *assess the implications* of gene drive and related techniques and their potential impacts on the conservation and sustainable use of biological diversity as well as equitable sharing of benefits arising from genetic resources

Gene Drive



Task Force

- ❖ IUCN Commission members and Secretariat
- ❖ Natural, social sciences
- ❖ Governments, NGOs, Academia, Business
- ❖ Indigenous Peoples
- ❖ Africa, North America, Latin America, Europe, Asia, Australasia



Technical Subgroup

Lead authors of Assessment

- ❖ IUCN Commission, Secretariat & Specialist Group members
- ❖ Natural, social sciences
- ❖ Governments, NGOs, Academia, Business
- ❖ Indigenous Peoples
- ❖ Africa, North America, Latin America, Europe, Asia, Australasia



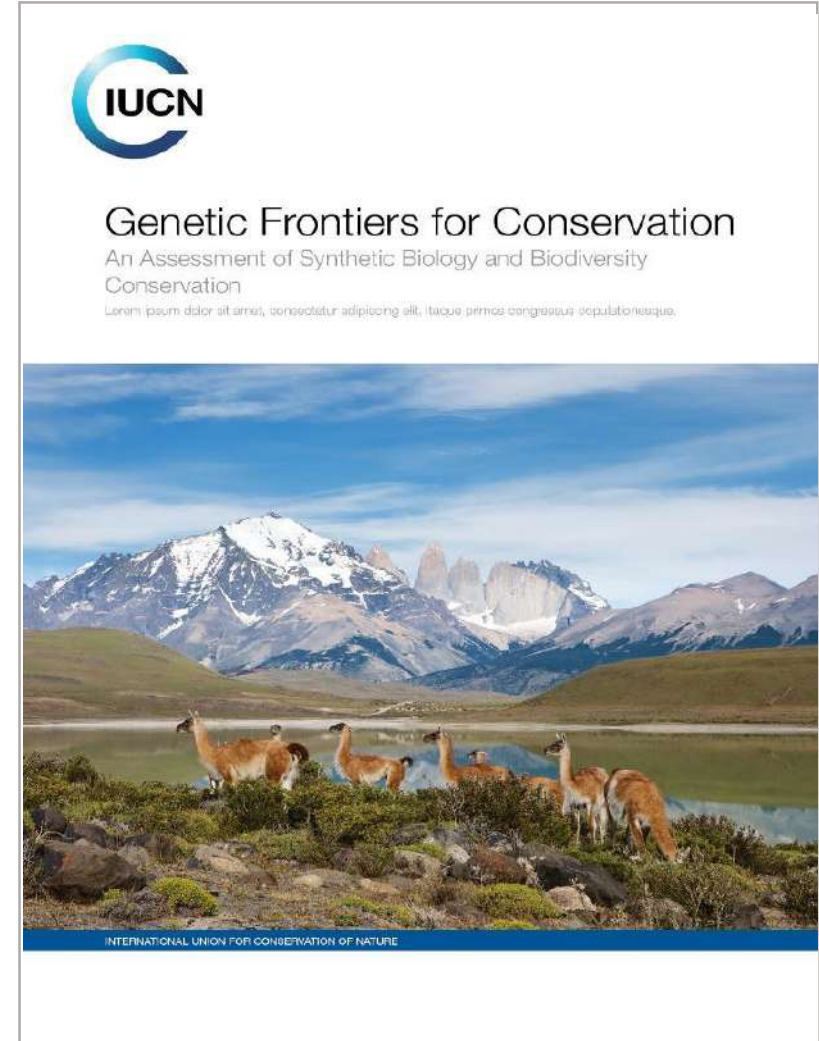
Technical Assessment

Genetics Frontiers for Conservation:

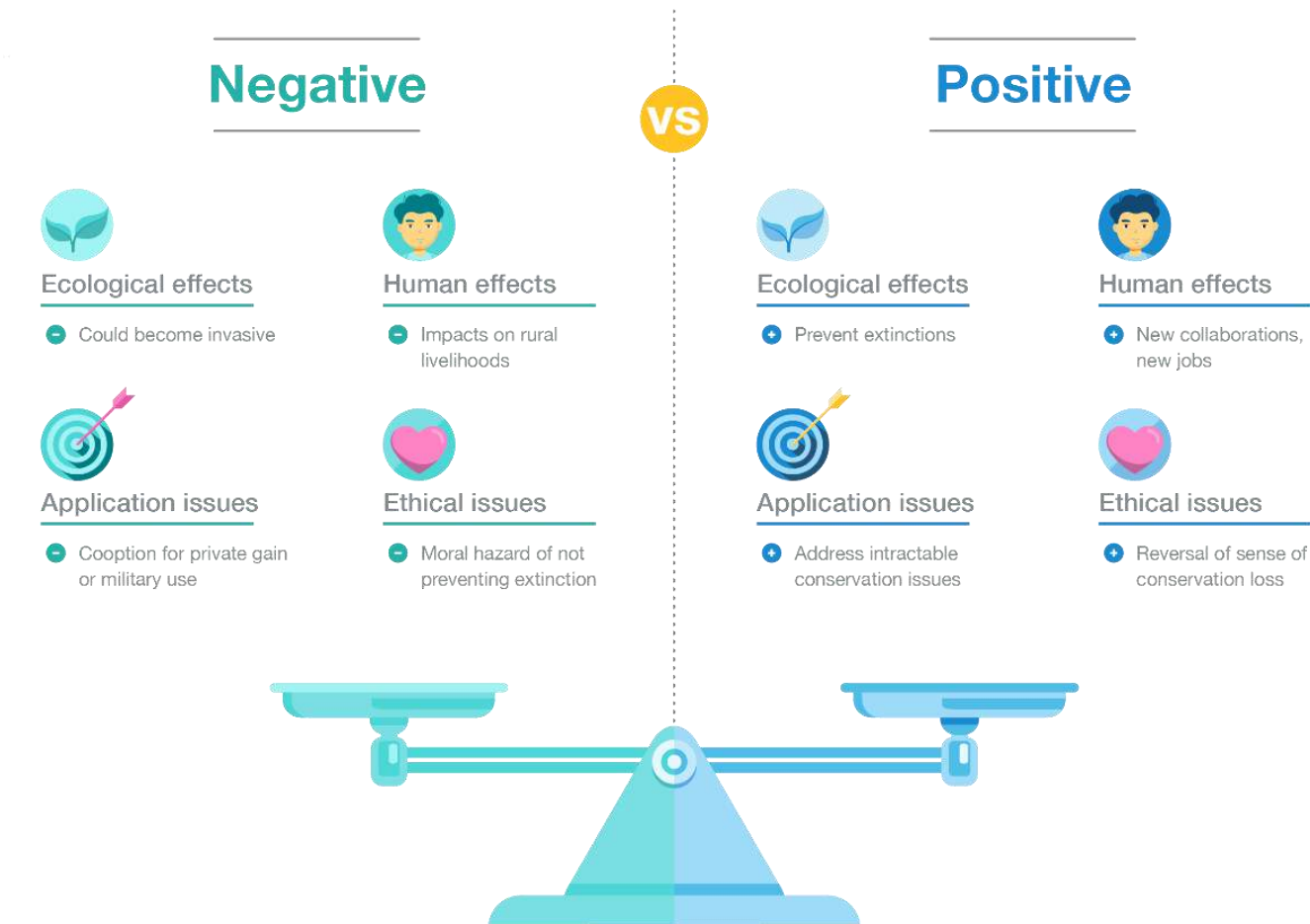
An Assessment of Synthetic Biology and Biodiversity Conservation

EVIDENCE-BASED

220+ pages text
English, Spanish, French
Online appendices

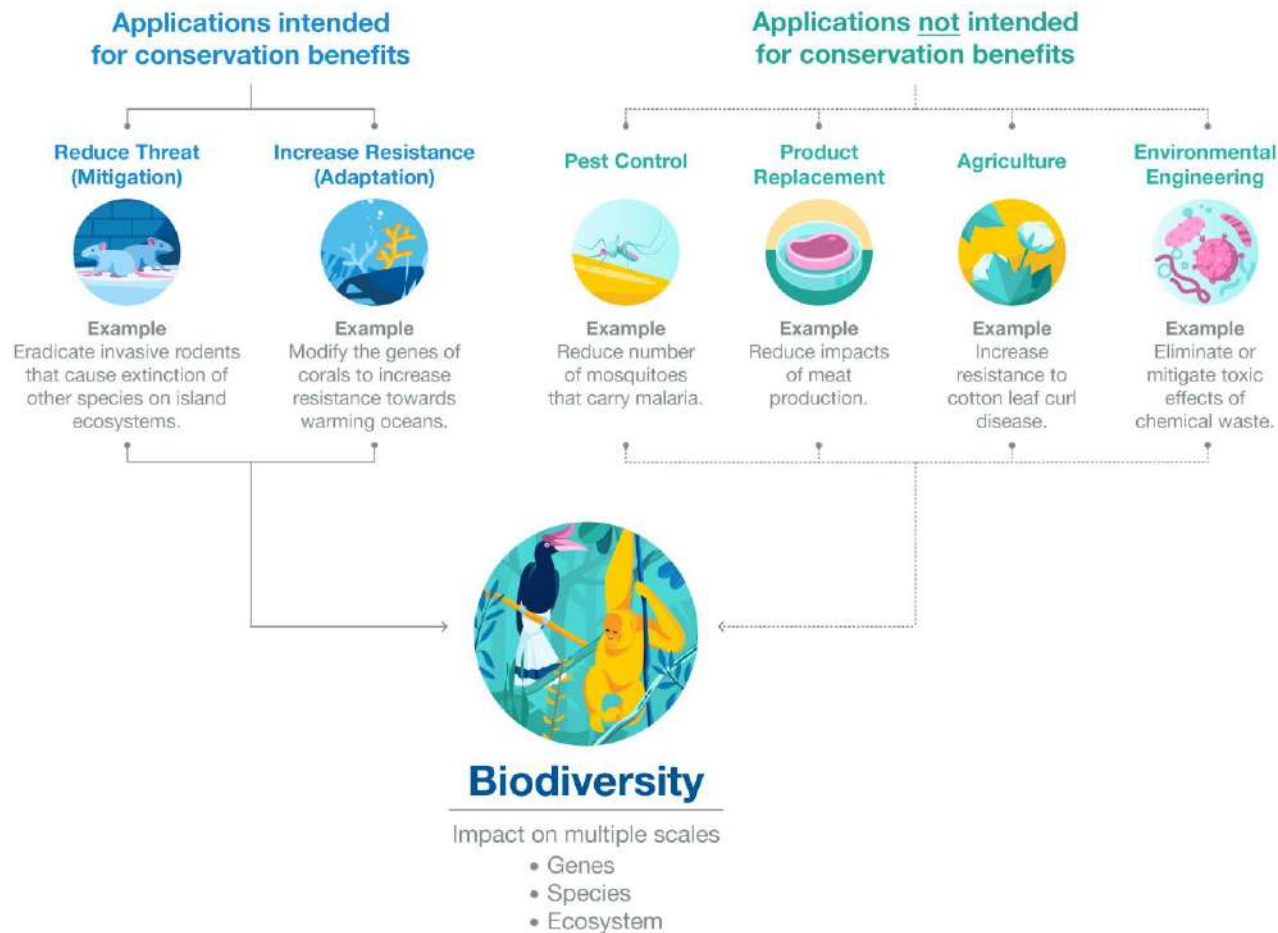


Strengthening our analysis of both positive and negative anticipated effects of synthetic biology



Ways that synthetic biology can affect conservation

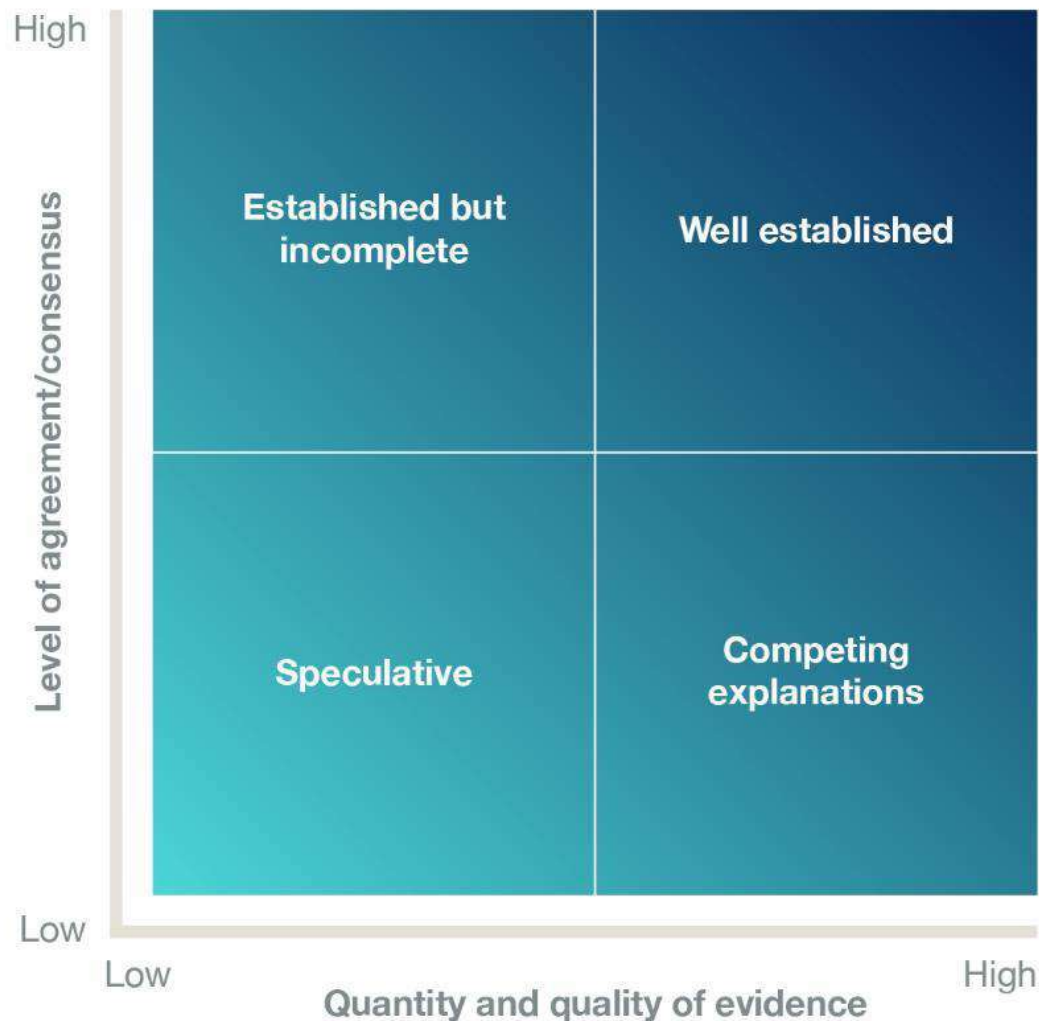
Ways that synthetic biology can affect conservation



Key Messages

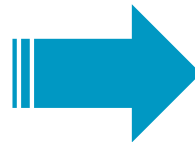
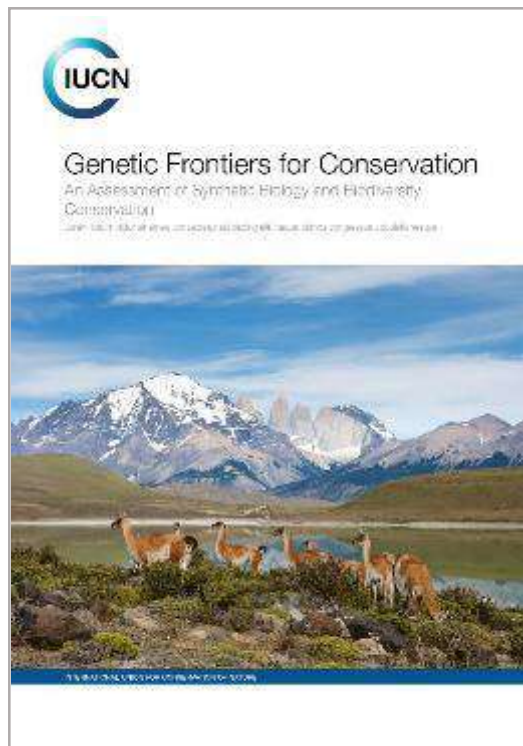
- 1 Conservation implications: *Important implications*
- 2 New tools: *conservation needs them*
- 3 Rapid growth: *of synbio globally – 5x increase*
- 4 Engineered gene drive: *unproven, great potential plus & minus*
- 5 Beneficial conservation impacts: *possible but untested*
- 6 Detrimental conservation impacts: *possible but untested*
- 7 Values and worldview: *influence development and assessment*
- 8 Indigenous and local communities: *key actors in research and decisions*
- 9 Governance: *existing structures may be challenged*
- 10 Risk assessment: *not what Assessment is - for technology or cases*

Assessing the Evidence – Qualitative uncertainty terms

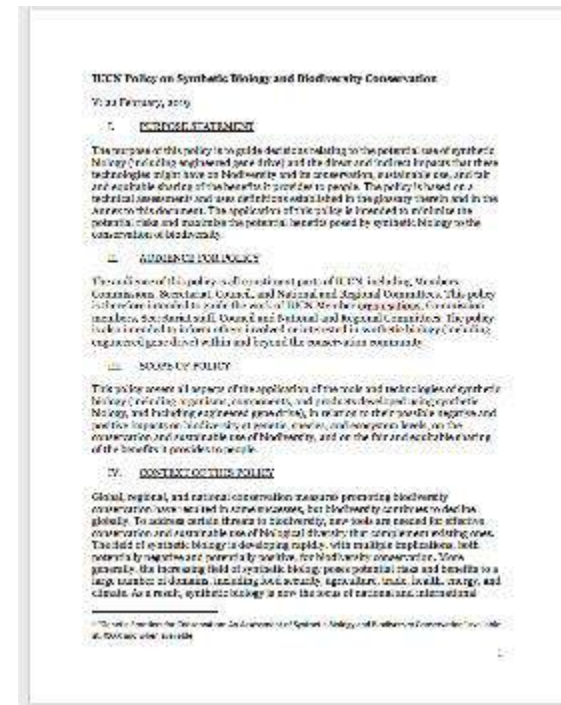


DRAFT IUCN Principles on the Intersection of Biodiversity Conservation and Synthetic Biology

Technical Assessment



Principles



Draft IUCN Principles on the Intersection of Biodiversity Conservation and Synthetic Biology

III. Principles

1. Biodiversity conservation imperative
2. Intergenerational Equity and Sustainable Development
3. Respect for rights, beliefs and cultures
4. Stakeholder and rightsholder participation
5. Free, prior, and informed consent
6. Evidence
7. Multidisciplinary dialogue between conservationists and synthetic biologists
8. Ethics

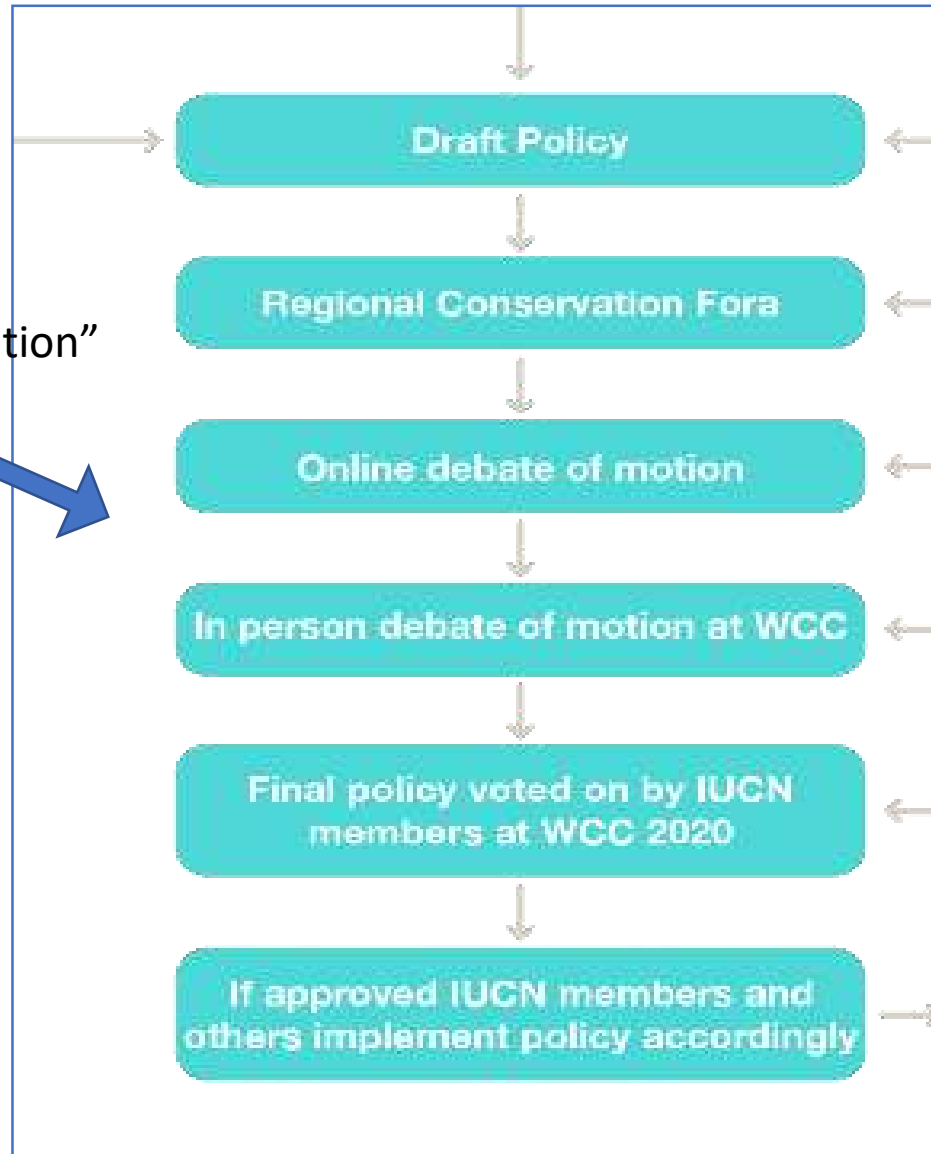
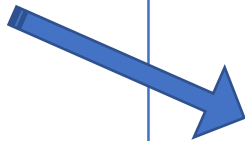
Draft IUCN Principles on the Intersection of Biodiversity Conservation and Synthetic Biology

IV. Key Considerations for applications

- Case-by-case decision-making;
- For applications of synthetic biology intended for conservation goals, evaluation of existing alternatives;
- For applications of synthetic biology intended for purposes other than conservation, steps to ensure that such applications do not threaten biodiversity and its sustainable use;
- Staged assessment of risks and benefits;
- Governance;
- Knowledge gaps and research needs;
- Knowledge transfer and capacity building;
- Potential introduction of moratoria.

Where are we now in the process?

In a “holding position”



To develop a coronavirus vaccine, synthetic biologists try to outdo nature

By SHARON BEGLEY @sxbegle / MARCH 9, 2020

