The concept of a Circular Economy and some key agenda for biological materials

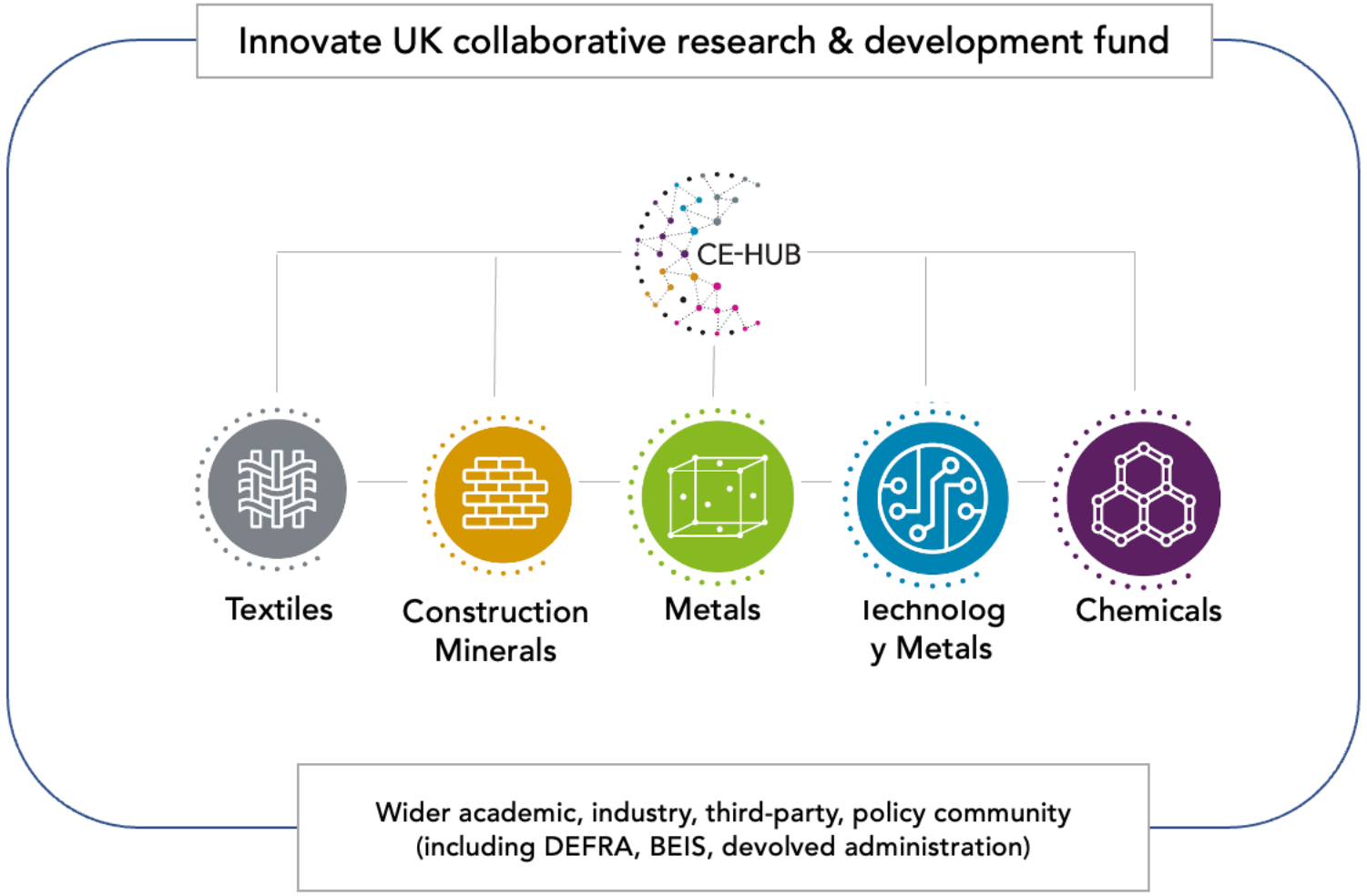
OECD-UNECE SEEA-Seminar, Geneva – 18-19th of March 2024

Prof. Peter Hopkinson, Co-Director Exeter Centre for Circular Economy
and UK CE-hub

NICER PROGRAMME

UK Research and Innovation

University of Exeter is leading National £30M research programme co-ordinating 5 material-based centers



4 year programme (2020-2024 to accelerate a UK circular economy

Sponsored by Uk Government

UK focal point for UN Circular STEP

UN Centre of Excellence for Circular Economy (Materials)

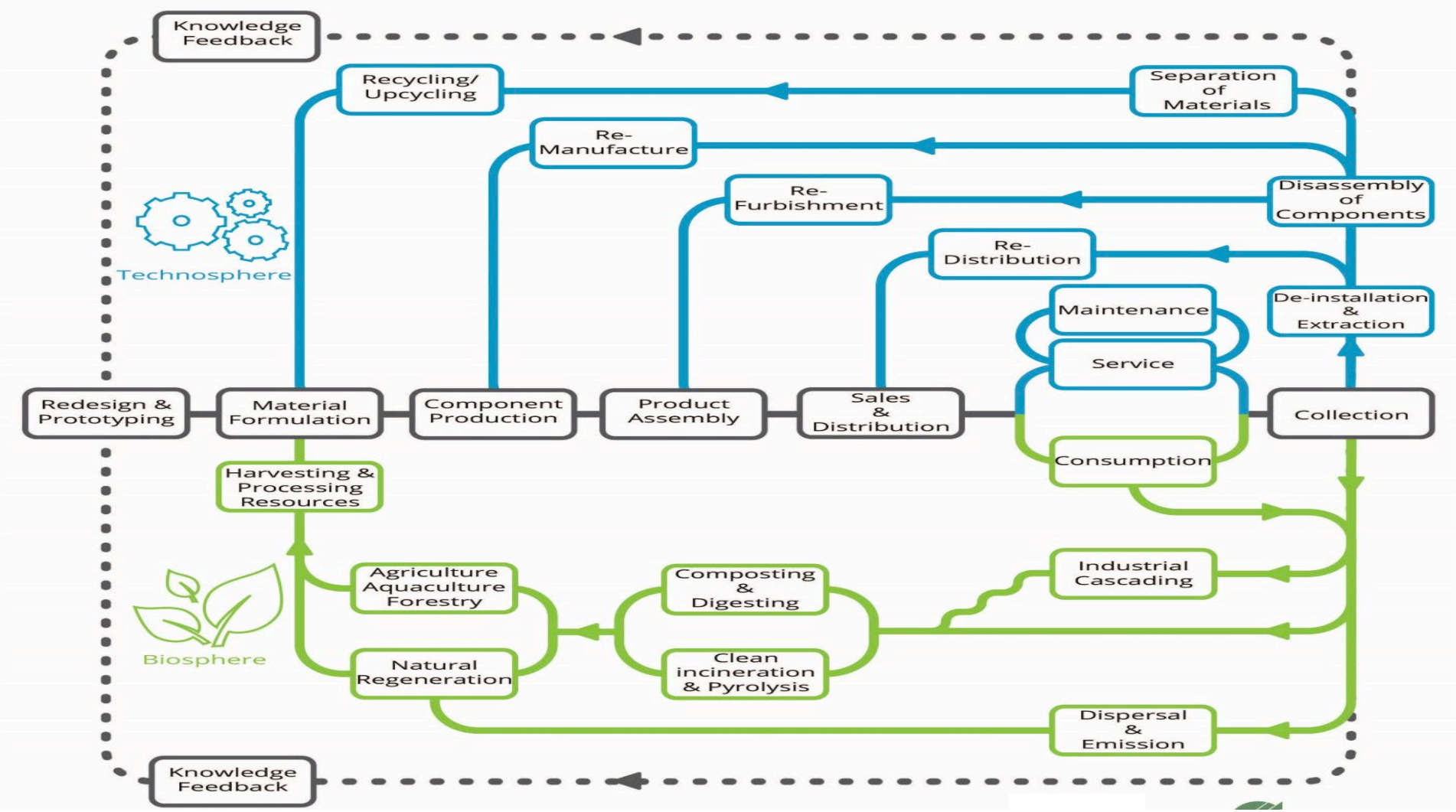
Agenda

The CE perspective on the biosphere

Overview of typical CE debates for the biosphere

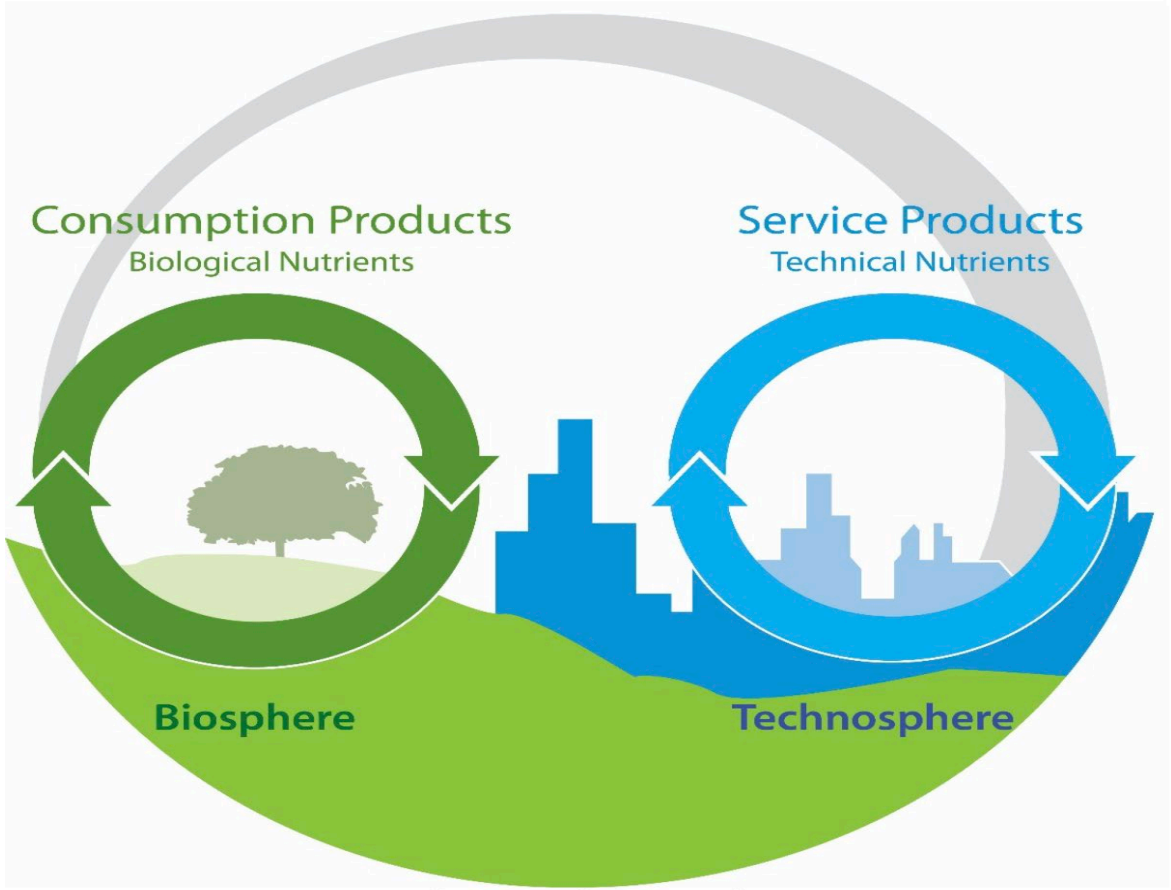
Summary of key requirements for CE in the biosphere

Everything is a resource for something else



Source: EPEA

Products of consumption and products of service - a key distinction and why they matter ?



Material quality and health – a system design challenge

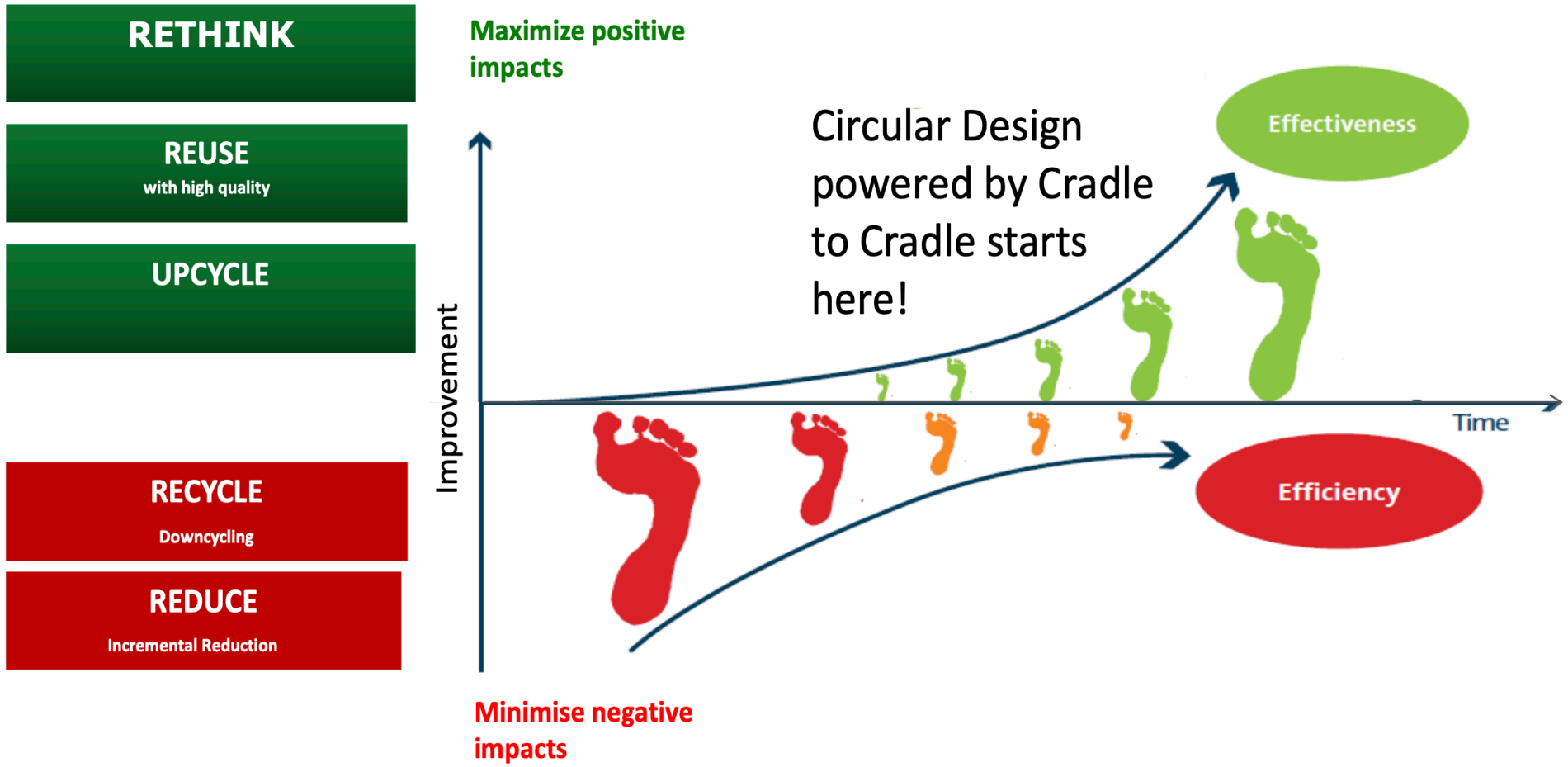
Recycling starts with **waste**

PAST

Upcycling starts with designing products
so all materials are **resources for something new**

Clean Resources for future use

Esp. within the biosphere there is an opportunity for increasing the impact footprint



Source: Katja Hansen

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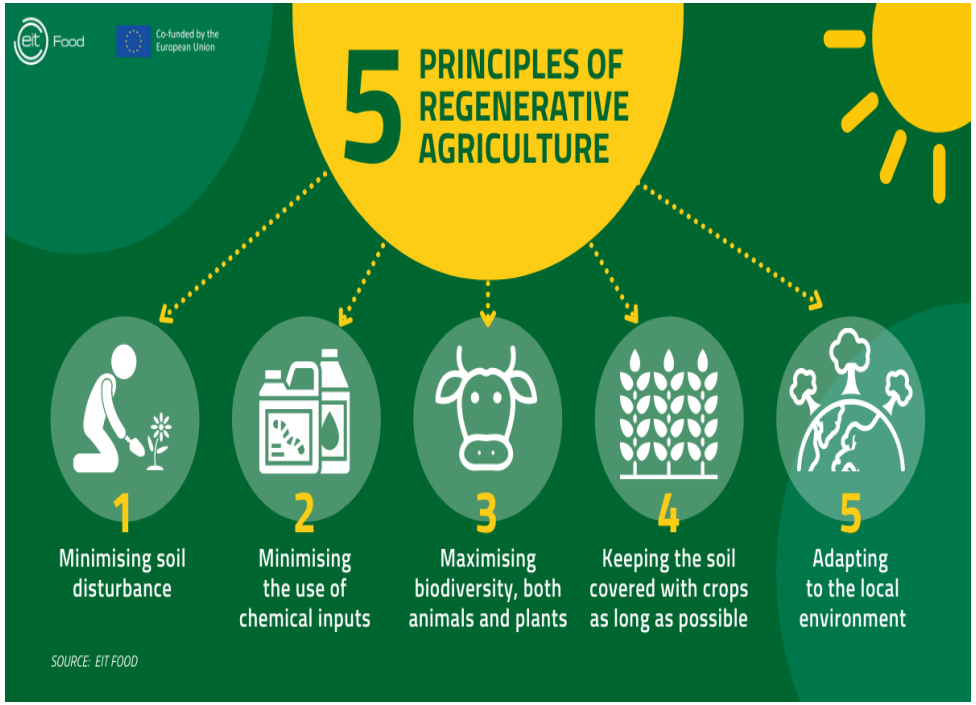
Agenda 1: **Products of consumption**: enabling continuous flows of nutrients



Soil health, eliminating toxicity and regenerating ecosystem services

Many claims for composting and Biodegradability are misleading

Agenda 2: Biological materials as **Products of Service**

Demand for bioeconomy materials risk reproducing the same mistakes of the linear economy

Many bio-based feedstocks are locked into complex mixed-products which are difficult to recover or return to the biosphere

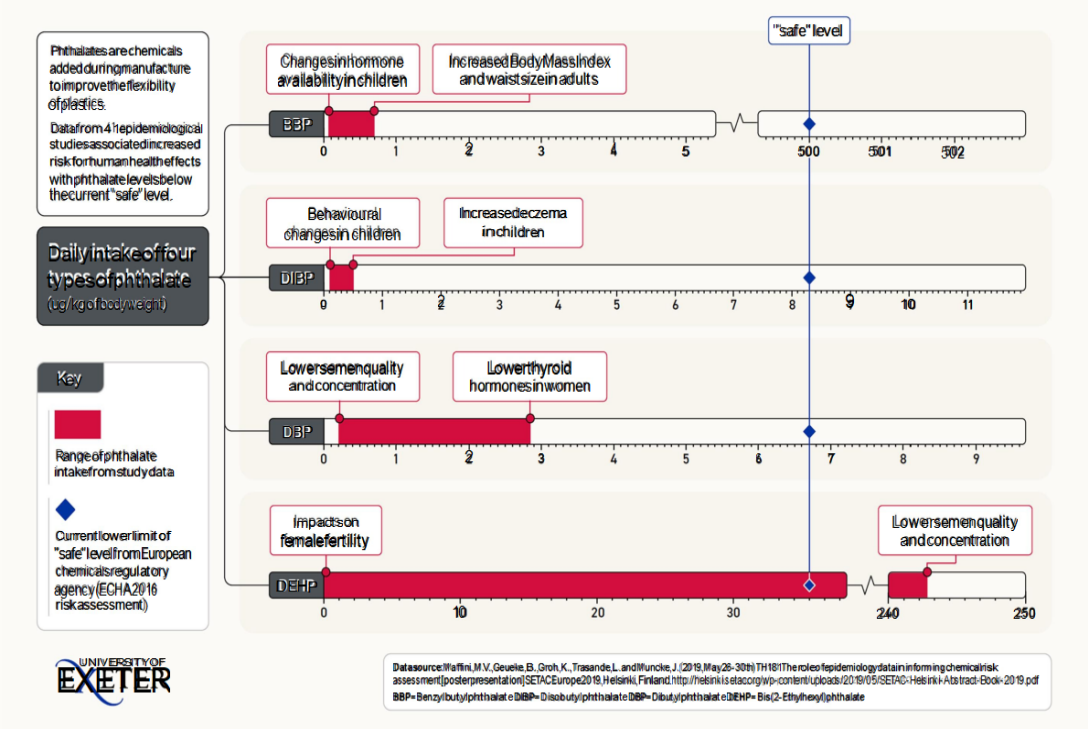
Image: https://www.tyreandrubberrecycling.com/articles/news/china-moves-on-waste-tyres/

Image https://blogs.lse.ac.uk/businessreview/2023/09/12/brazils-comparative-advantage-in-soybean-production-triggered-deforestation/

Agenda 3: **Products of Consumption** and **Products of Service** leaking into the biosphere

Significant post-use leakage of consumption and products of service degrading natural feedstocks

https://www.newscientist.com/article/2243731-we-may-have-missed-half-the-microplastics-in-the-ocean/



Levels of harm to environment and human species increasingly better understood but not risk recycling toxicity and need to be fully taken into account for CE systems design

J. Eales, A. Bethel, T. Galloway, P. Hopkinson, K. Morrissey, R.E. Short, R. Garside,Human health impacts of exposure to phthalate plasticizers: An overview of reviews,Environment International,Volume 158, 2022,106903, https://doi.org/10.1016/j.envint.2021.106903.

Agenda 4: Biological carbon **sources and sinks**

CLIMATE CHANGE AND ENERGY

The University of California has all but dropped carbon offsets—and thinks you should, too

It uncovered systemic problems with offset markets and recommended that the public university system focus on cutting its direct emissions instead.

By James Temple

November 30, 2023

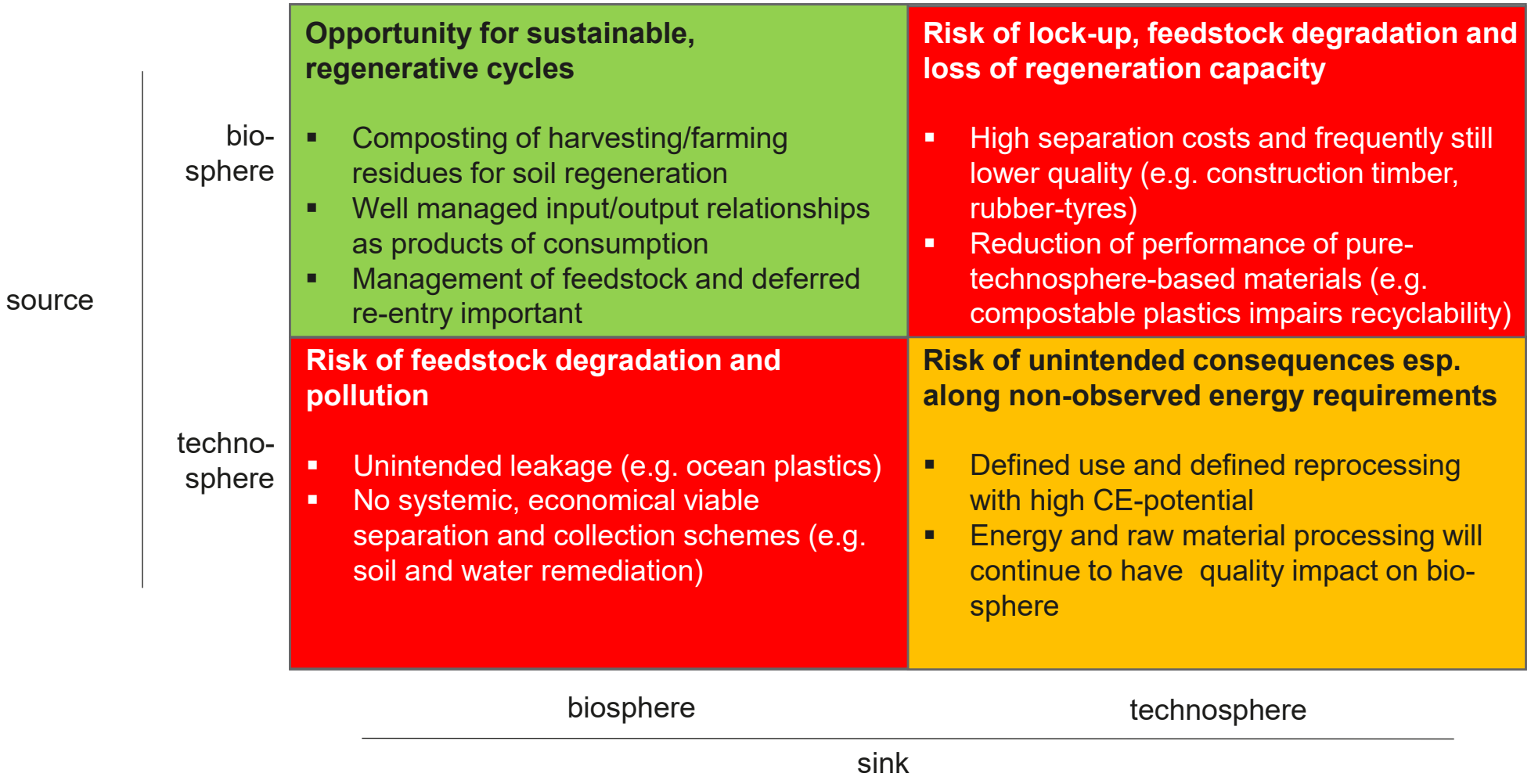
Carbon offsets provide a limited measure of offsetting, but don't avoid increasing emissions into the biosphere

Creation of "green" and "sustainable" energy solutions are rarely low carbon and often have high impact on bio-based feedstocks

https://www.technologyreview.com/2023/11/30/1084104/the-university-of-california-has-all-but-dropped-carbon-offsets-and-thinks-you-should-too/

UK power station cuts down primary forest in Canada
https://www.bbc.co.uk/news/science-environment-63089348

Interaction between the bio- and technosphere in CE face a number of tough sink and source challenges



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In summary:

1. The biosphere and technosphere in a circular economy are distinct but also highly connected, and have different implications for system design, business models, actions and responses

2. CE needs as much focus on stocks of material (and human) health and quality as circulatory flows and quantities

3. As much effort and measurement towards increased upcycling and biological cascades as to waste and recycling

4. Great confusion, inconsistency and lack of understanding of key terms, increasing the potential to do the wrong thing

5. Substituting fossil fuel feedstock with biological feedstocks is not in itself a circular economy, and runs the risk of creating future linear bio economy

6. The Joint OECD/UN, SEEA Guidance is an essential step in ensuring these agenda and debates are reflected in measurement systems to shape effective future CE ‘bioeconomy’