

Towards a framework to assess functionalities of the EU bioeconomy in a social-ecological transformation

Liesbeth de Schutter, Martin Bruckner, Stefan Giljum, Asjad Naqvi, Ines Omann
Vienna University of Economics & Business

SOCIETAL CHALLENGE AND RESEARCH QUESTIONS

Aiming at low carbon pathways, renewable resources and resource use efficiency, the EU has embarked on a bioeconomy strategy to replace building blocks in the fossil economy by renewable resources (EC, 2012). In doing so, the bioeconomy expands its role from merely food supplier towards multiple functions in the foundation of the EU society, such as bio-based construction materials for housing, bio-chemicals, bioenergy and carbon sequestration. BIOWAY explores the expanding role of a bioeconomy with the following research questions:

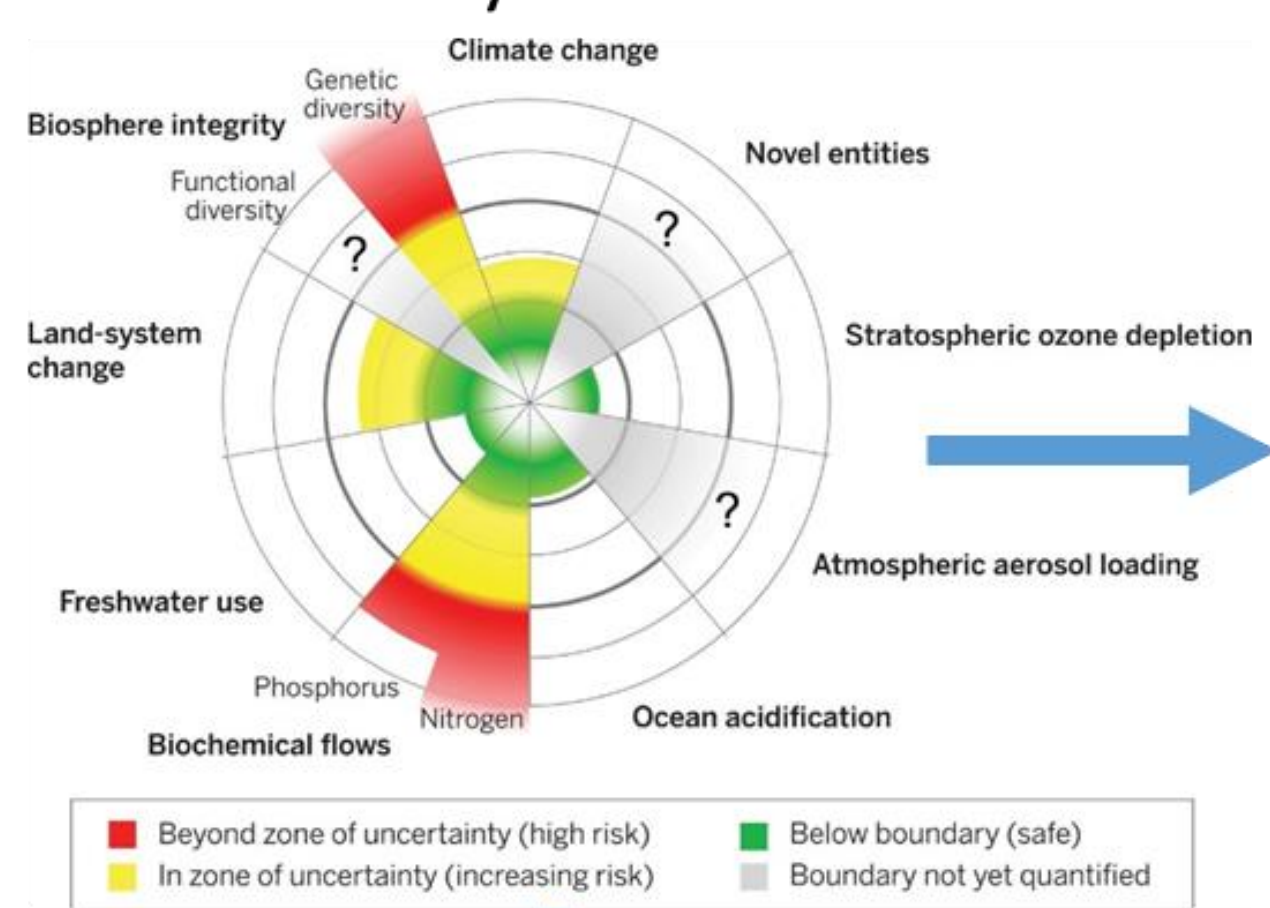
1. Is a bioeconomy capable of replacing a substantial share of materials and energy in the larger economy within safe environmental boundaries?
2. Does society benefit from a growing role of a bioeconomy in terms of wellbeing?
3. Are actors in the bioeconomy, i.e. workers, consumers and citizens, aware of this social-ecological transformation and of the impact of their strategies in the coupled social-ecological system?

AIM: developing a holistic assessment framework to empirically assess social-ecological impacts of the bioeconomy from a complex systems perspective.

ONTOLOGY: THE BIOECONOMY IN A COMPLEX SYSTEMS PERSPECTIVE

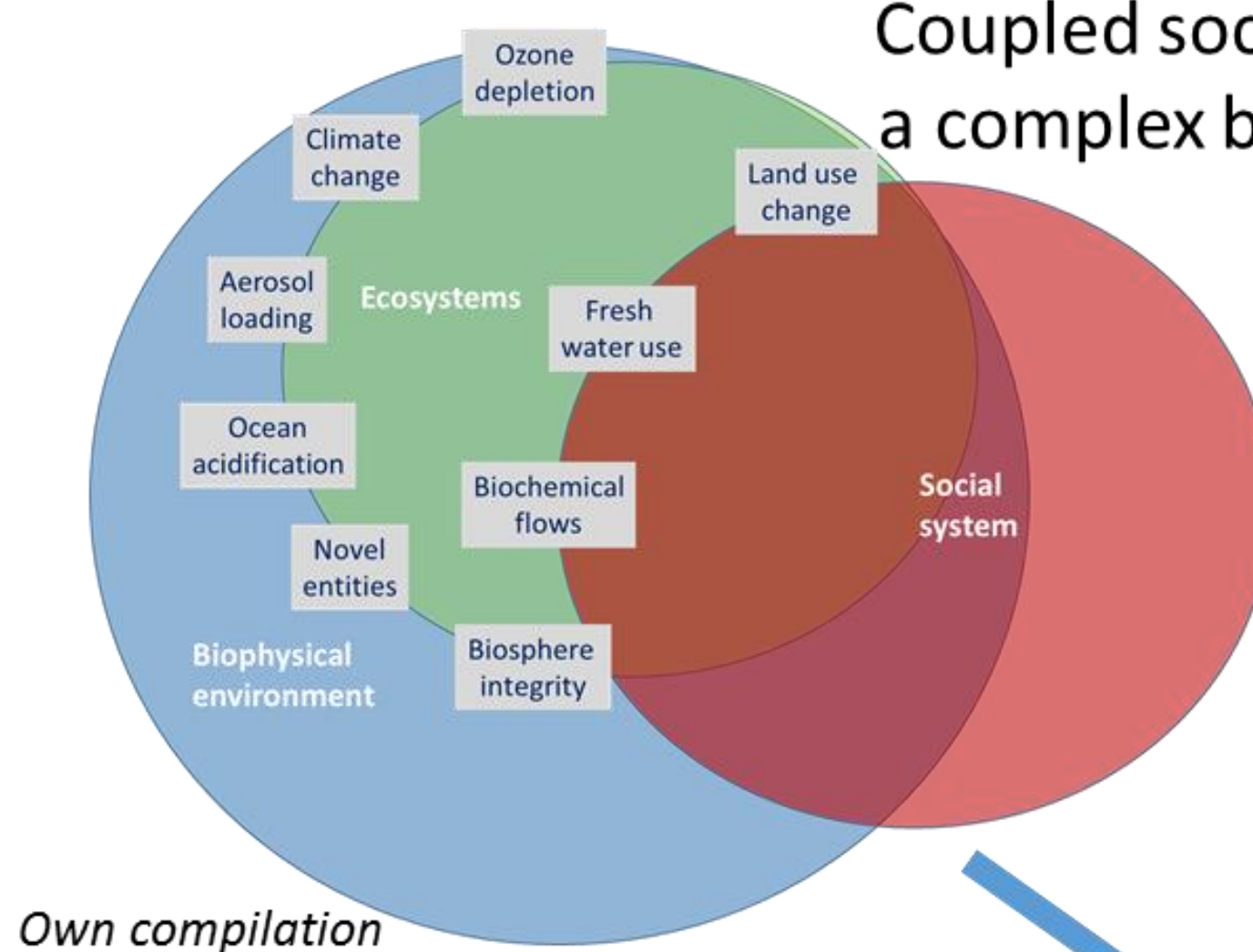
- The provisioning systems in the bioeconomy link ecosystem services to society in a **coupled, interdependent social-ecological system** (Folke, 2006); the scale and functions of a bioeconomy are subject to carrying capacities, feedback loops and risks from dynamic ecosystems.
- A society developing on a bioeconomy requires a shift from linearity to a risk and resilience paradigm subject to **planetary boundaries** beyond which biophysical systems may become hostile to humanity (Rockström et al. 2009).
- Raworth et al. (2012) insist on **human flourishing within planetary boundaries**, although linkages between the social, the economic and the ecological systems remain unclear.
- BIOWAY adopts these (related) concepts into one theoretical model of human flourishing, including the fulfilment of **fundamental human needs** (Max-Neef 1991), in a coupled social-ecological system with internal (local) and external (planetary) environmental boundaries (set and safeguarded in the social-political context, i.e. a societal contract).

Planetary boundaries



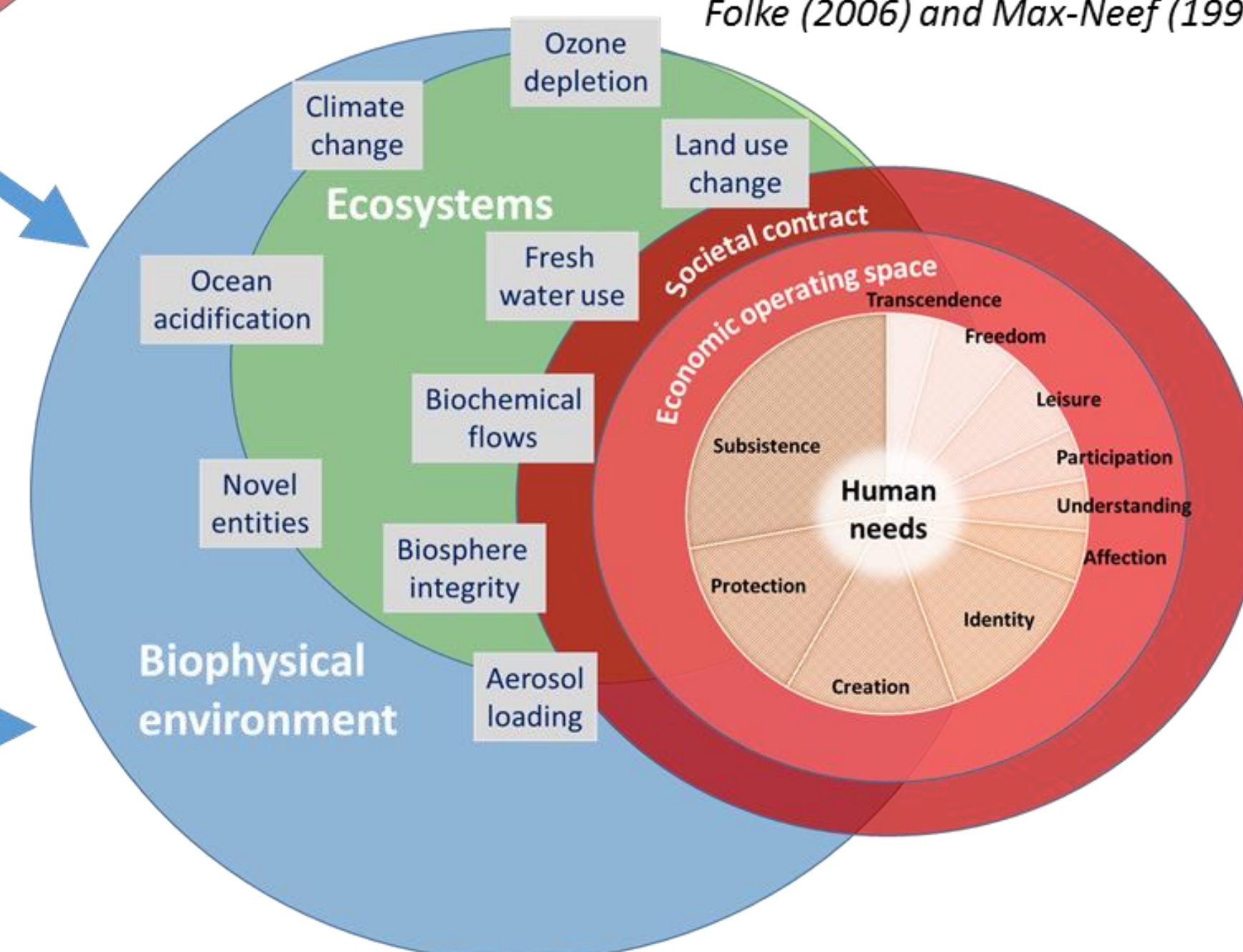
Rockström et al. 2009

Coupled social-ecological system in a complex biophysical environment

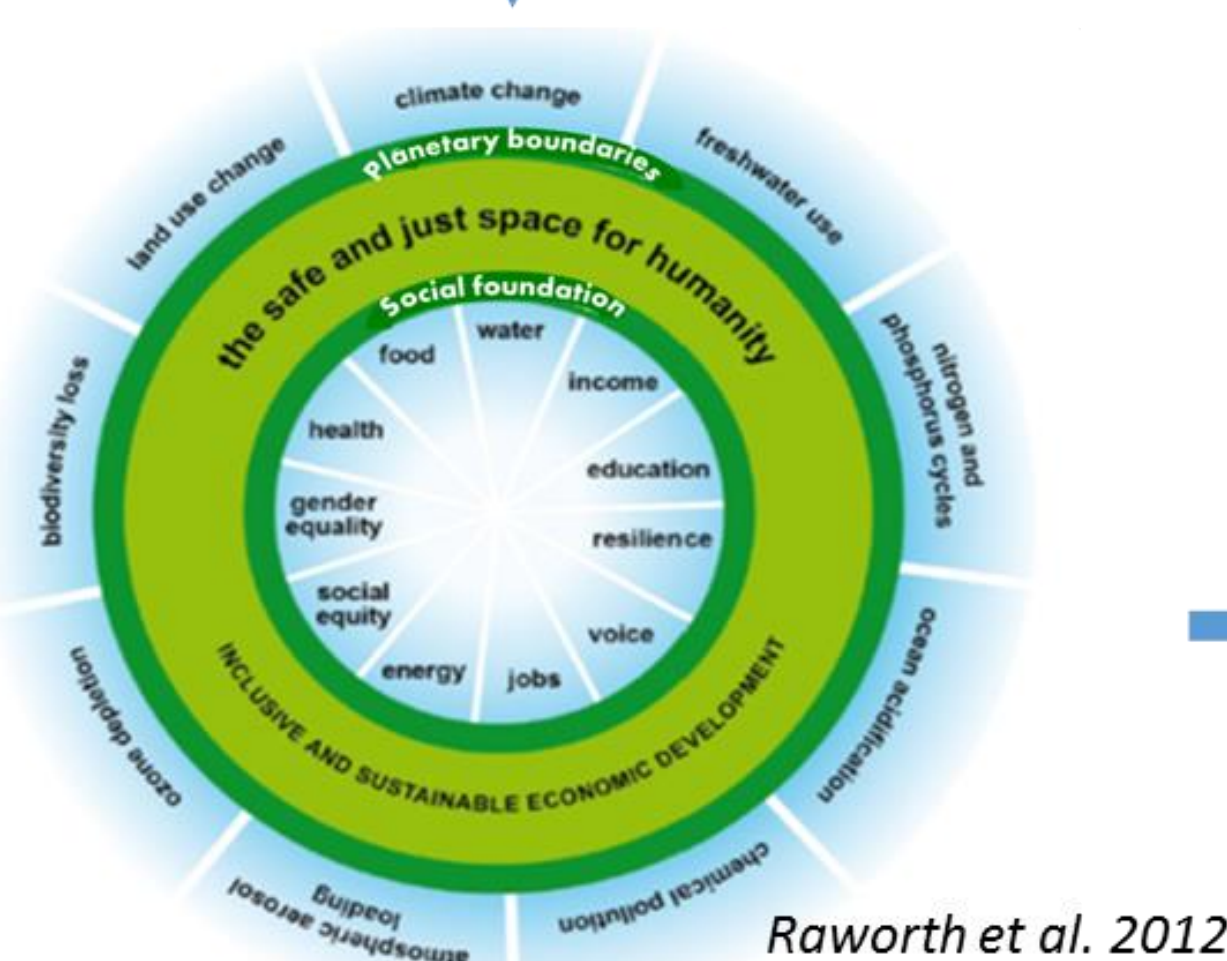


Own compilation based on Folke, 2006

Own compilation based on Folke (2006) and Max-Neef (1991)



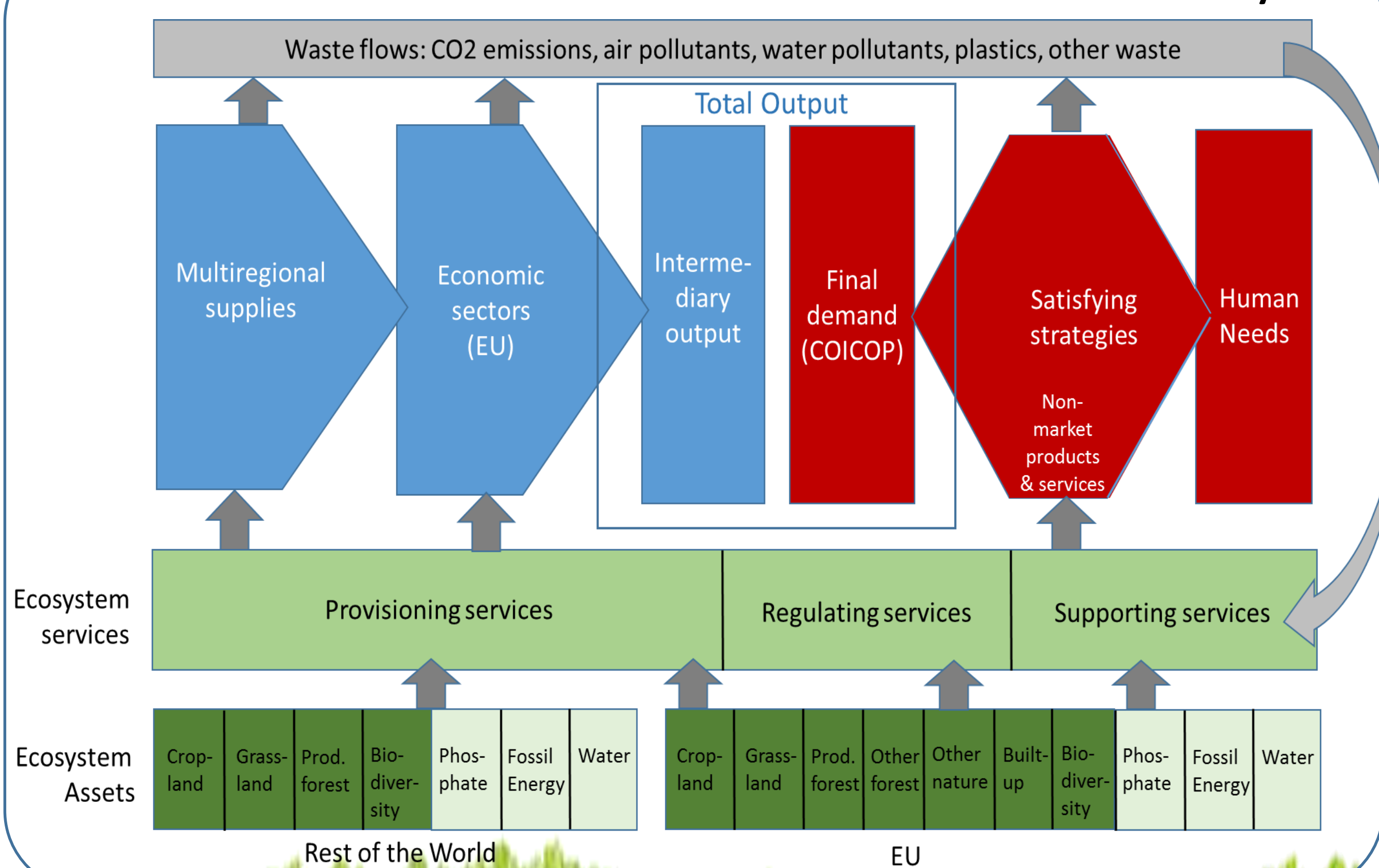
Human flourishing in a coupled social-ecological system within planetary boundaries



Raworth et al. 2012

Human flourishing within planetary boundaries

BIOWAY FRAMEWORK to assess functionalities of the Bioeconomy



OBJECTIVES & METHOD

The BIOWAY framework will be used for a holistic assessment of:

1. **Scale, share and temporal development (1995-2015) of the bioeconomy in the EU economy (production perspective);** analysing the EU economic structure in an environmentally extended input-output framework showing the forward linkages between ecosystem services and economic sectors in terms of monetary, physical, energy and waste flows.
2. **Functional contribution of bioeconomy provisioning systems to society (end-user perspective);** linking output of provisioning systems to functional categories (food, housing, clothing, mobility) in terms of material (land, phosphate, energy, water use), social (jobs, income) and ecological impacts (GHGs, N/P-pollution, water depletion).
3. **Efficiency analysis of bioeconomy provisioning systems;** applying a non-parametrical method to assess social-ecological efficiencies in terms of desired and undesired outputs.
4. **Strategies in the bioeconomy supporting human flourishing in the coupled social-ecological system;** Human Scale Development workshops (Max-Neef) to assess the material and immaterial role and efficiency of strategies employed by workers, consumers and citizens.