Introduction to the Circular Economy

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HENVI Science Day

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“Towards Circular Economy – Designing a sustainable food cycle”.

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Content of the introduction

- The sustainability challenge (the background)
- The circular economy challenge (the aim)
- The policy challenge (speeding up and directing the transition)
- The knowledge challenge (the need for and the nature of the knowledge required)

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The starting point:
The world is not sustainable

nature

Vol 461|24 September 2009

FEATURE

A safe operating space for humanity

Identifying and quantifying planetary boundaries that must not be transgressed could help prevent human activities from causing unacceptable environmental change, argue **Johan Rockström** and colleagues.

SUMMARY

- New approach proposed for defining preconditions for human development
- Crossing certain biophysical thresholds could have disastrous consequences for humanity
- Three of nine interlinked planetary boundaries have already been overstepped

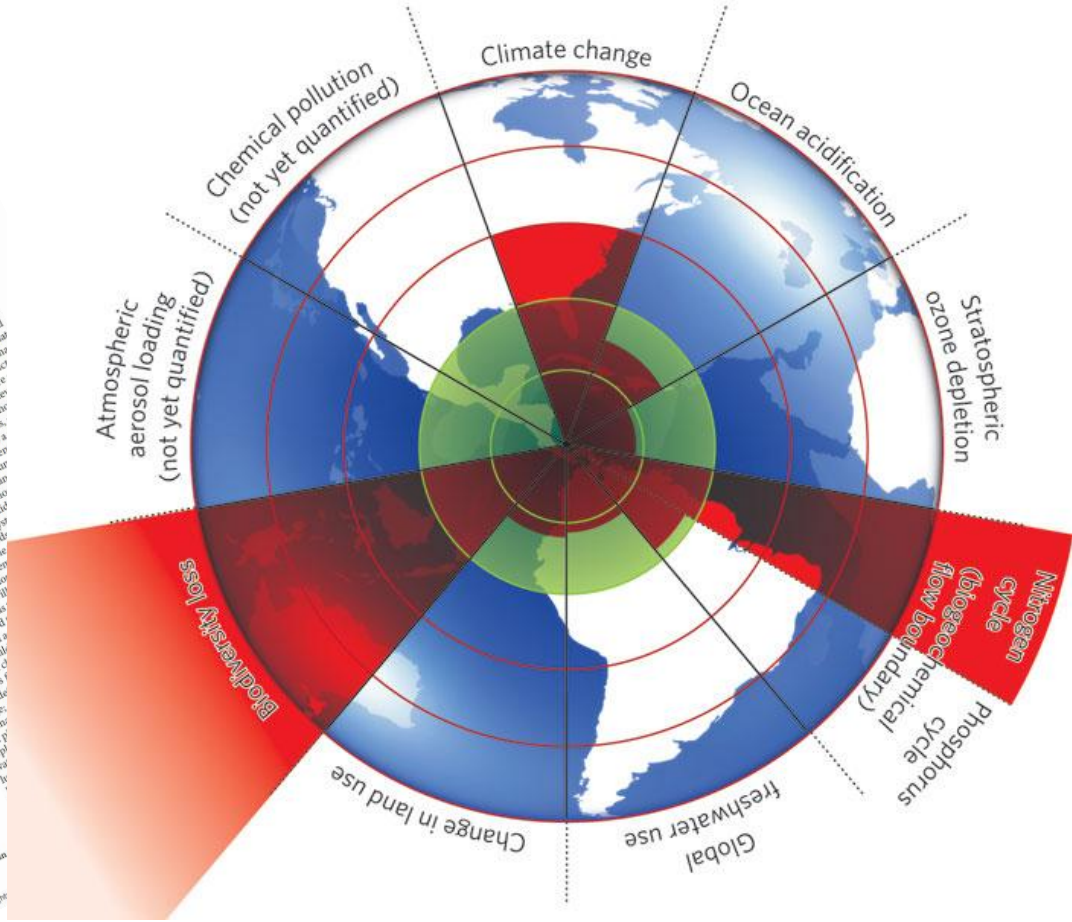
Although Earth has undergone many periods of significant environmental change, the planet's environment has been unusually stable for the past 10,000 years[1,2]. This period of stability — known to geologists as the Holocene — has seen human civilizations arise, develop and thrive. Such stability may now be under threat. Since the Industrial Revolution, a new era has arisen, the Anthropocene[3], in which human actions have become the main driver of global environmental change[4]. This could see human activities push the Earth system outside the stable environmental state of the Holocene, with consequences that are detrimental or even catastrophic for large parts of the world.

During the Holocene, environmental change occurred naturally and Earth's regulatory capacity maintained the conditions that enabled human development. Regular temperatures, freshwater availability and biogeochemical flows all stayed within a relatively narrow range. Now, largely because of a rapidly growing reliance on fossil fuels and industrialized forms of agriculture, human activities have reached a level that could damage the systems that keep Earth in the desirable Holocene state. The result could be irreversible and, in some cases, abrupt environmental change, leading to a state less conducive to human development[5]. Without pressure from humans, the Holocene is expected to continue for at least several thousands of years[6].

Planetary boundaries

To meet the challenge of maintaining the Holocene state, we propose a framework based on 'planetary boundaries'. These boundaries define the safe operating space for humanity with respect to the Earth system and are associated with the planet's biophysical subsystems or processes. Although Earth's complex systems sometimes respond smoothly to changing pressures, it seems that this will prove to be the exception rather than the rule. Many subsystems of Earth react in a nonlinear, often abrupt, way, and are particularly sensitive around thresholds. If these thresholds are crossed, then important subsystems, such as certain key variables, could shift into a new state. If the monsoon system, could shift into a new state, then often with deleterious or potentially disastrous consequences for humanity. Most of these thresholds can be expressed as a critical value for one or more variables, such as carbon dioxide concentration. Not all processes or subsystems have well-defined thresholds, but human actions that undermine the resilience of processes or subsystems, such as land and water degradation, may mean that thresholds will be crossed. We have tried to identify processes and subsystems that, if crossed, could have disastrous environmental consequences. Three processes fulfil the necessary to define planetary boundaries: climate change and human interference with the nitrogen cycle.

Figure 1 | Beyond the boundary. The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable. The boundaries in three systems (rate of biodiversity loss, climate change and human interference with the nitrogen cycle), have already been exceeded.



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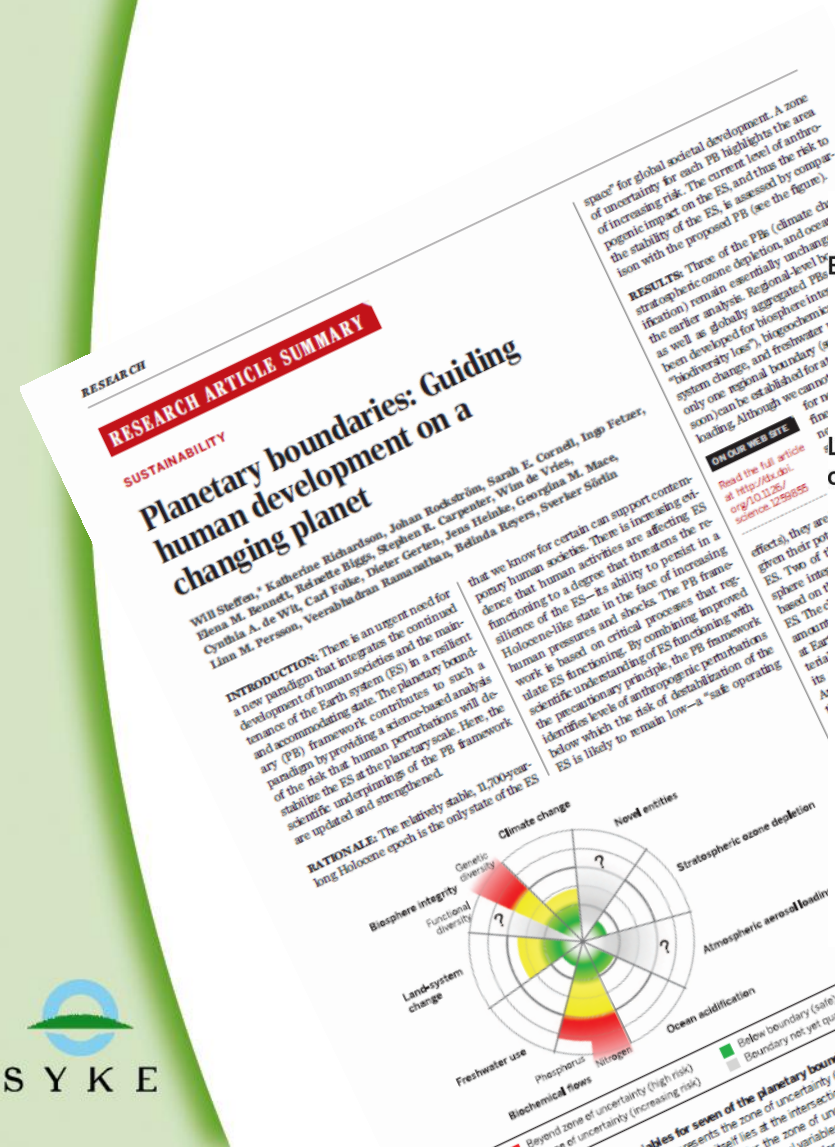
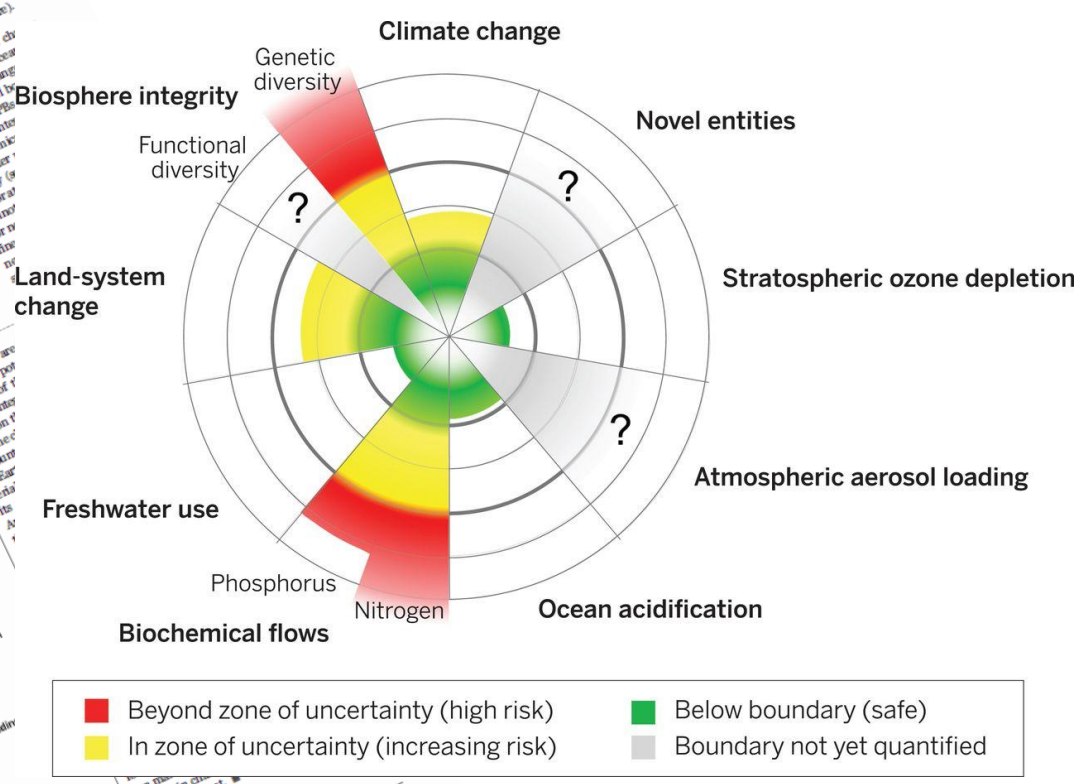
The starting point:
The world is not sustainable PB 2.0


RESEARCH

RESEARCH ARTICLE SUMMARY

SUSTAINABILITY

Planetary boundaries: Guiding human development on a changing planet



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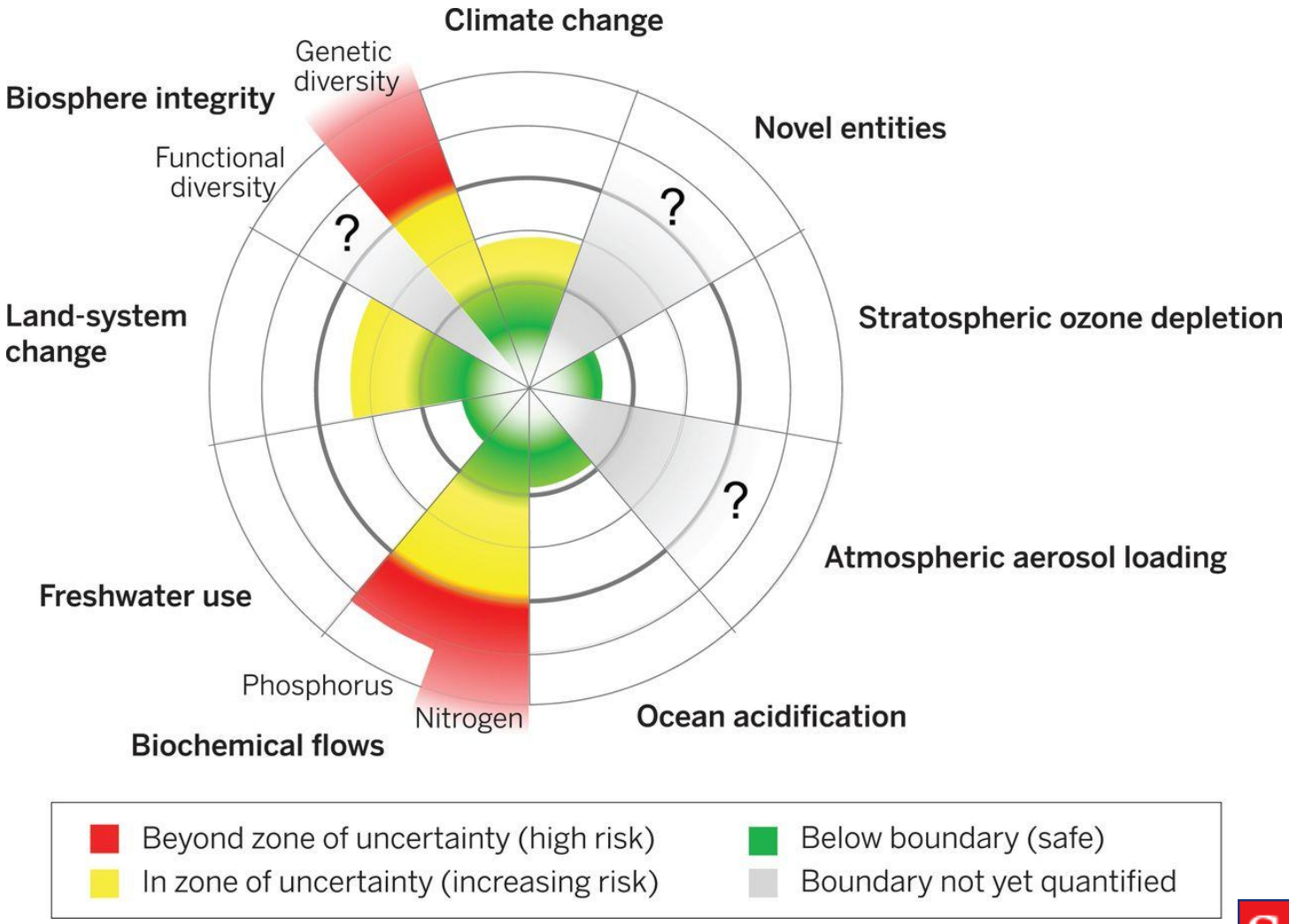
Current status of the control variables for seven of the planetary boundaries. The green zone is the safe operating space, the yellow represents the zone of uncertainty (increasing risk), and the red is a high-risk zone.



Will Steffen et al. Science 2015;347:1259855

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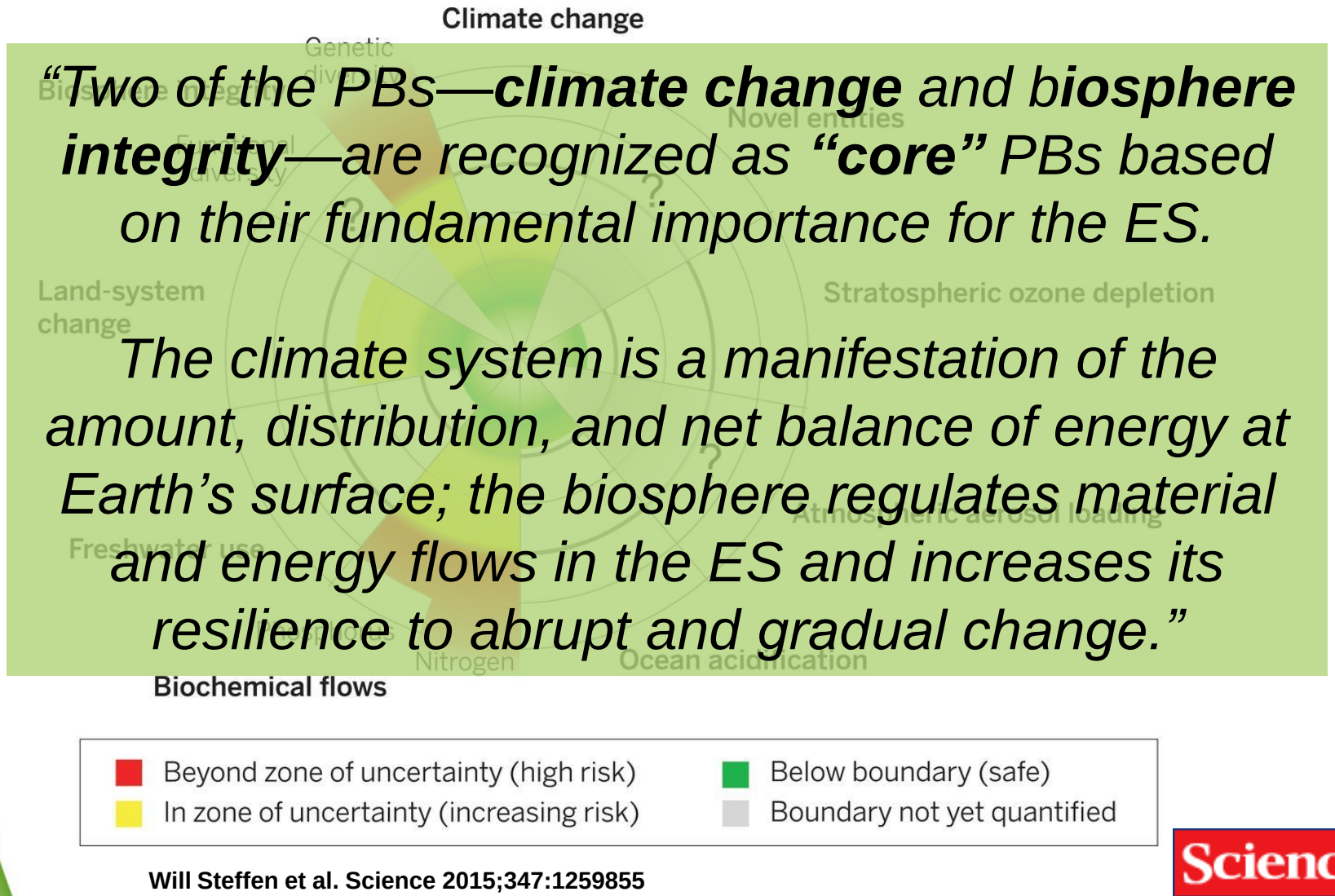

*"Two of the PBs—**climate change** and **biosphere integrity**—are recognized as **"core"** PBs based on their fundamental importance for the ES.*

The climate system is a manifestation of the amount, distribution, and net balance of energy at Earth's surface; the biosphere regulates material and energy flows in the ES and increases its resilience to abrupt and gradual change."

Will Steffen et al. Science 2015;347:1259855

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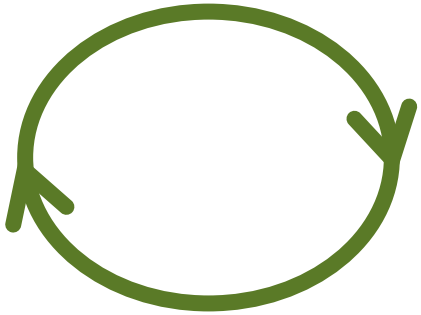
The aim

Greenhouse gas emissions are increasing

The use of natural resources is increasing → The amount of waste and emissions are increasing



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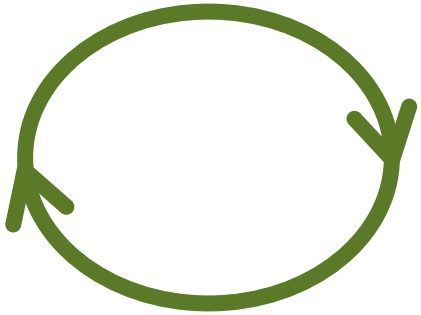
The aim



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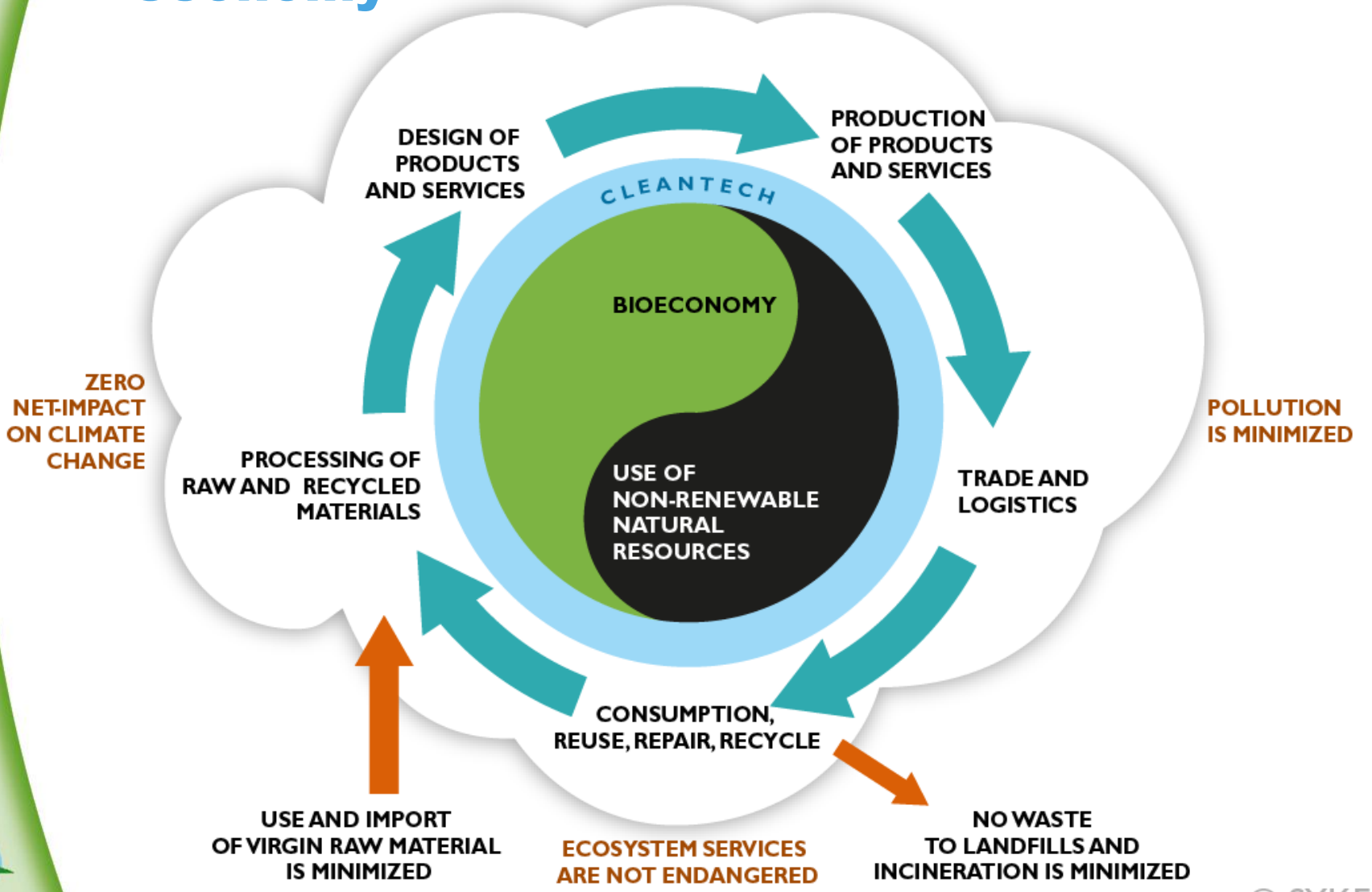
The aim: A carbon neutral circular economy



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"The way and the rate we are using up natural resources today risk undermining our well-being along with nature's ability to provide for us. <u>We need to fundamentally transform the way we produce, consume and live</u>. We need to green our economy and the transition needs to start today."

Hans Bruyninckx
Executive Director
The European Environment Agency (EEA)

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Euroopan ympäristökeskuksen (EEA) State of the Environment report 2015

- The policies in place are delivering results, many of the 2020 targets will be achieved
- The long-term aim *"to ensure that 'Living well, within the limits of our planet'"* will not be achieved with just current policies

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Systems change: policy to speed up and direct the transition

1. Landscape pressure
2. Destabilization of dominant system
3. Variation, maturing niches & selection

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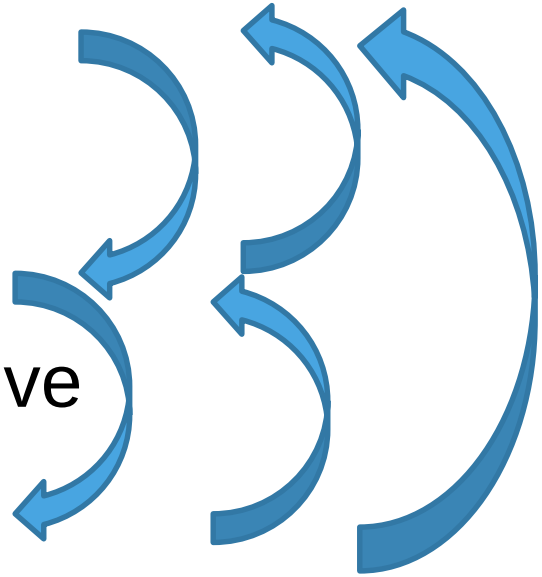
The aim to promote transitions has consequences,

- Normative perspective
- Ontological & epistemological perspective
- Methodological approach



"All researchers should be cognizant of the philosophical assumptions that guide their work."

Donna Mertens (2007)

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The aim to promote transitions has consequences

- Natural scientists often pay too little attention to the framing they contribute to – lack of constructivism

- Social scientists often too little attention to environmental challenges – lack of realism
  - *"If global change is seen as primarily a social construction rather than an objective (albeit imperfectly understood) condition, then it poses little threat to the future of our species."* (Dunlap and Catton 1994)

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The aim to promote transitions has consequences and we will have to focus more on these in the future

- Natural scientists often pay too little attention to the framing they contribute to – lack of constructivism

- Social scientists often too little attention to environmental challenges – lack of realism
  - *"If global change is seen as primarily a social construction rather than an objective (albeit imperfectly understood) condition, then it poses little threat to the future of our species."* (Dunlap and Catton 1994)

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To which degree can research approaches and methods developed for marginal change be used to produce knowledge for radical transformations?

"Evaluation is part of an ongoing ***incremental*** *[emphasis in the original text] process of improvements and adjustments of a policy or an activity."* (Furubo 2013)

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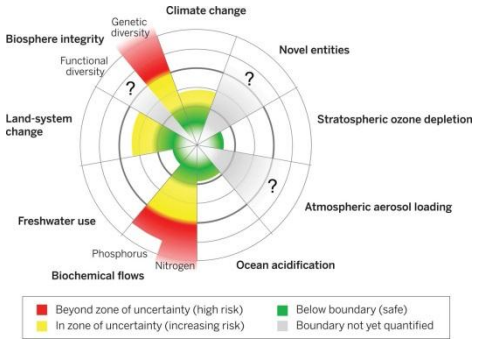
4 challenges of the circular economy

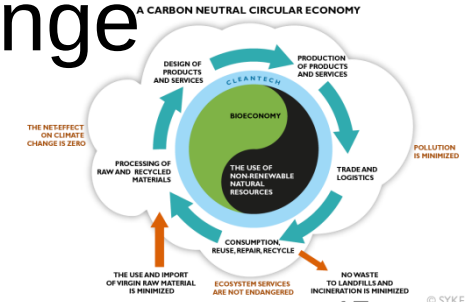
- The sustainability challenge



- The policy challenge

- The knowledge challenge

- The circular economy challenge



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