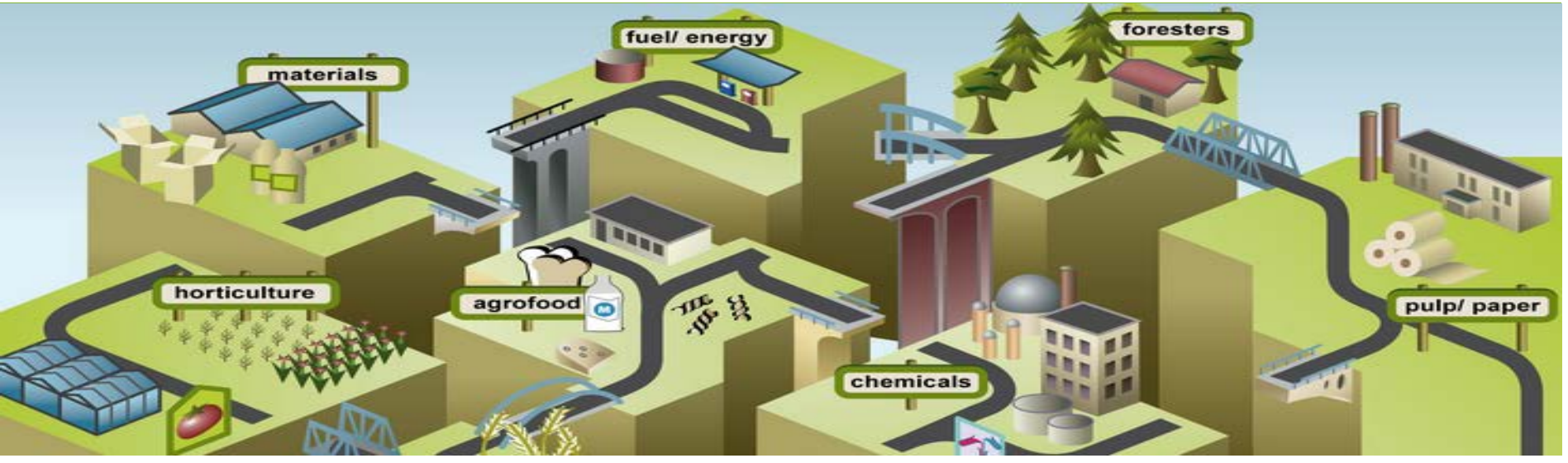

Monitoring the EU bioeconomy from a global perspective

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Vienna University of Economics & Business
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25.05.2018

Outline

- Introduction: what is bioeconomy?
- A systems perspective on bioeconomy
- Monitoring the bioeconomy
- Methods to assess global biomass flows and the related land footprint
- Empirical results
- Conclusions

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Introduction

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Bioeconomy

- Food and non-food activities based on biobased input
- Involves production and consumption activities, all people
- A transition process from fossil to biogenic carbon in the economy
- In a bioeconomy transition, economic systems become more directly dependent on functioning ecosystems
- A transformation process in society where people take responsibility for their vulnerable relationship with life supporting ecosystems

Benefits and risks of bioeconomy

Benefits	Risks
Low (net) emissions	Competition w. food security
'Green Growth'	Competition with public goods/ecosystem services
High skilled jobs	Biodiversity loss
Rural development	Infinite demand non-food materials and energy
Networks	Environmental pressures
More circular economy/ environmental awareness	

→ Need to monitor the bioeconomy

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Systems perspective

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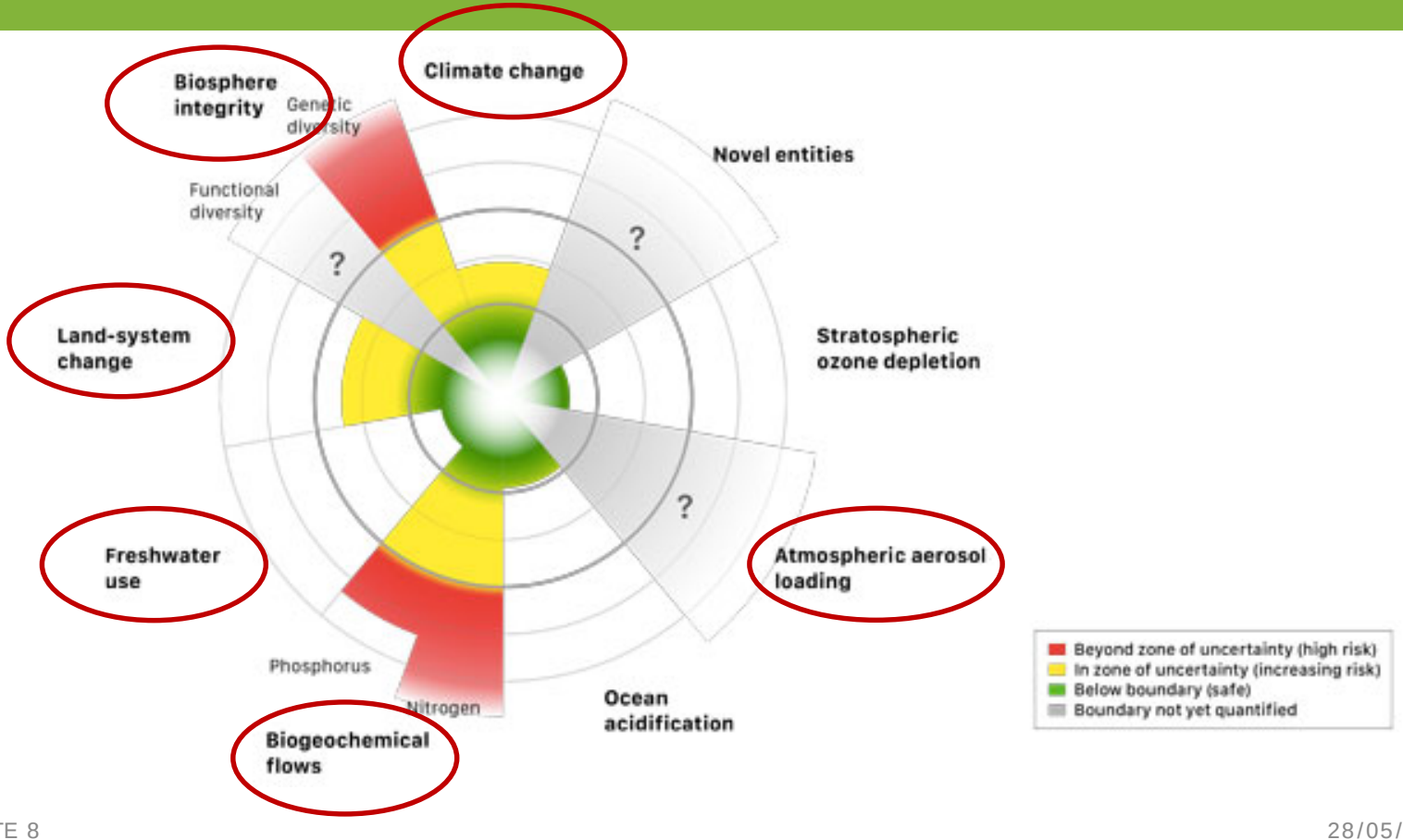
A systems perspective on bioeconomy

- Economy embedded in society, society embedded in nature (ecological economics)
- People are dependent on functioning ecosystems and, through value systems in society, the health of ecosystems is dependent on society
- ‘humans can make conscious choices as individuals or as members of collaborative groups, and these individual and collective choices can, at least potentially, make a significant difference in environmental outcomes’ (McGinnis and Ostrom, 2014)
- Interrelated social-ecological system

Systemic environmental pressures, in particular related to **bioeconomy**



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Monitoring the bioeconomy

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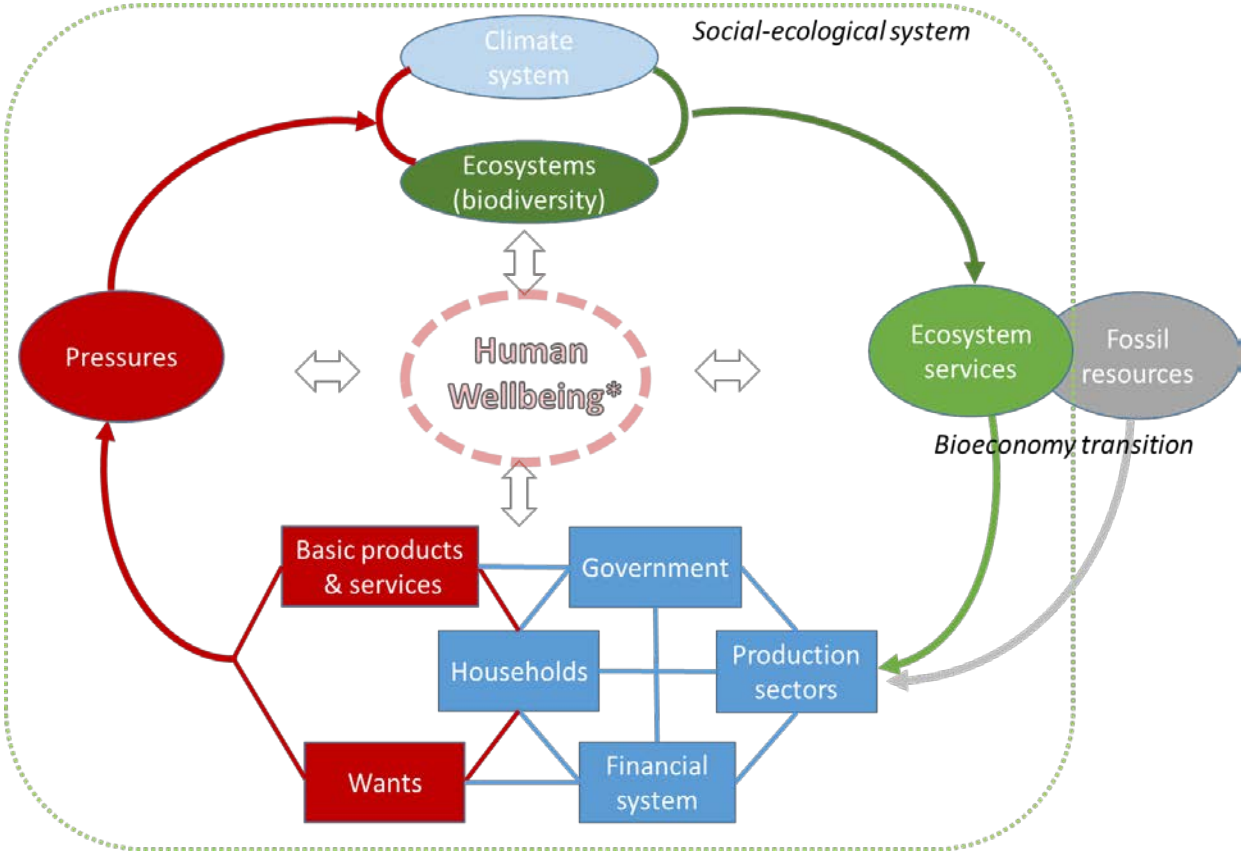
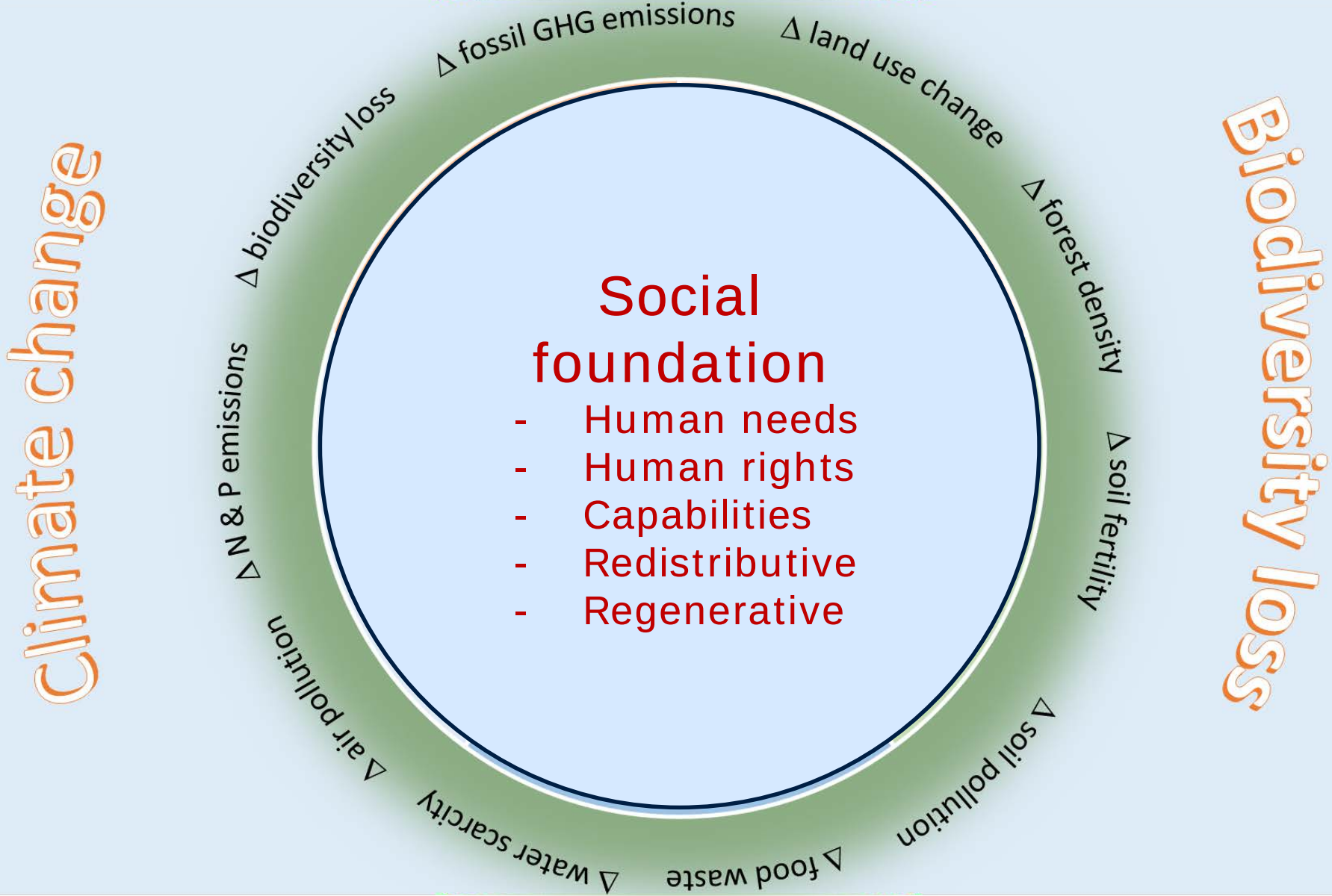
Monitoring the bioeconomy from a systems perspective




Climate change
Biodiversity loss
Δ fossil GHG emissions
Δ land use change
Δ biodiversity loss
Δ forest density
Δ N & P emissions
Δ soil fertility
Δ air pollution
Δ soil pollution
Δ water scarcity
Δ food waste
Social foundation
- Human needs
- Human rights
- Capabilities
- Redistributive
- Regenerative

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Methods

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Global Resource Flows

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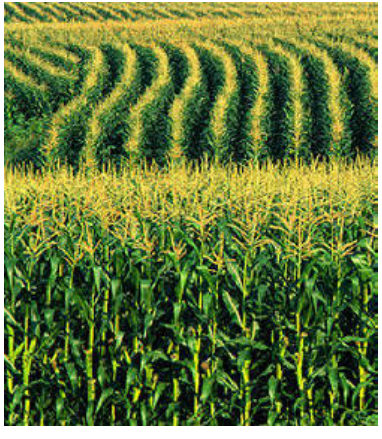
Primary production → Supply chains → Trade flows → Consumption



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Life Cycle Analysis (LCA)

INPUT: Water, Materials, Land, etc.

OUTPUT: Emissions, Waste, etc.

Footprinting Methods

	Life Cycle Analysis (LCA)	Input-Output Analysis (IOA)
Focus	Single products or processes	Countries or economic sectors
Pros	Very detailed and accurate	
Cons	Data and time intense	

Input-Output Table Z = production recipes

Outputs from \ Inputs to	Agriculture z_{i1}	Industry z_{i2}	Services z_{i3}	Final demand y_i	Total output x_i
Agriculture z_{1j}	5	15	2	68	90
Industry z_{2j}	10	20	10	40	80
Services z_{3j}	5	15	10	0	30

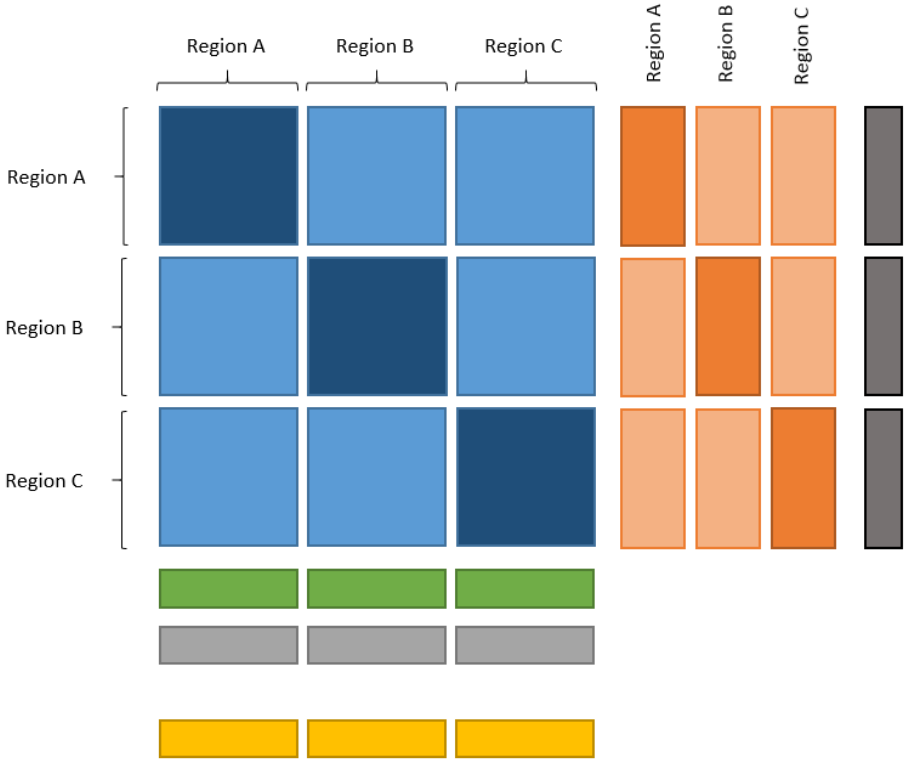
j columns: Input requirements of a sector

$j=1$ → Inputs to agriculture: z11 + z21 + z31 (+ capital + labor)

i rows: Sales of a sector's products

$i=1$ → Outputs from agriculture: z11 + z12 + z13 + y1 = x1

Multi-Regional Input-Output (MRIO) table



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Results

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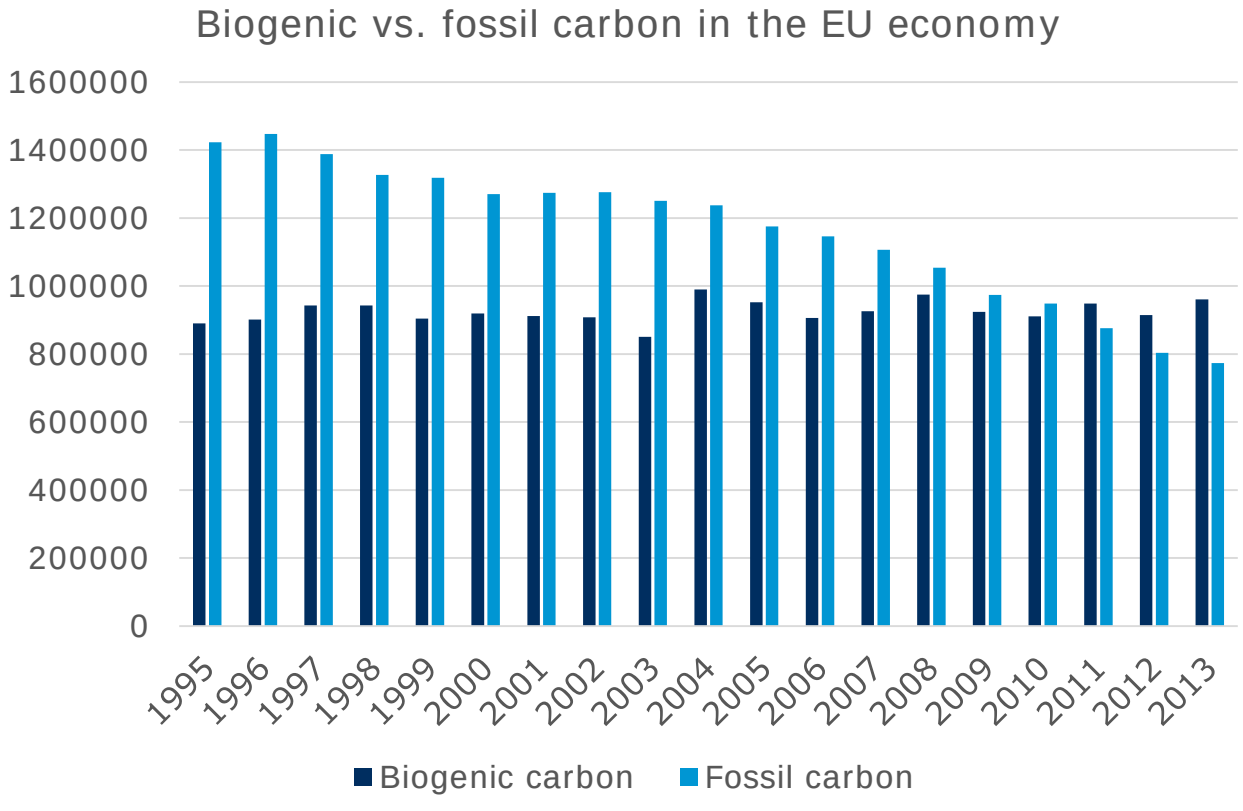
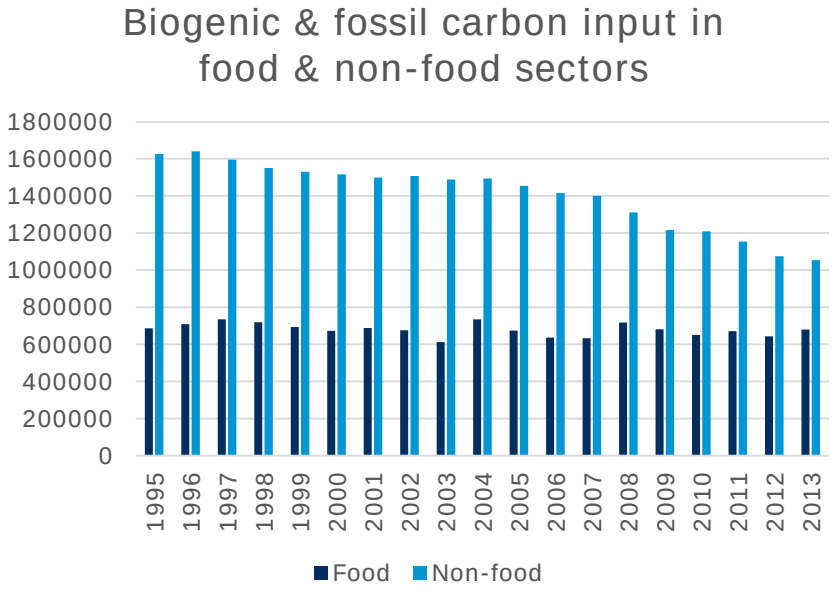
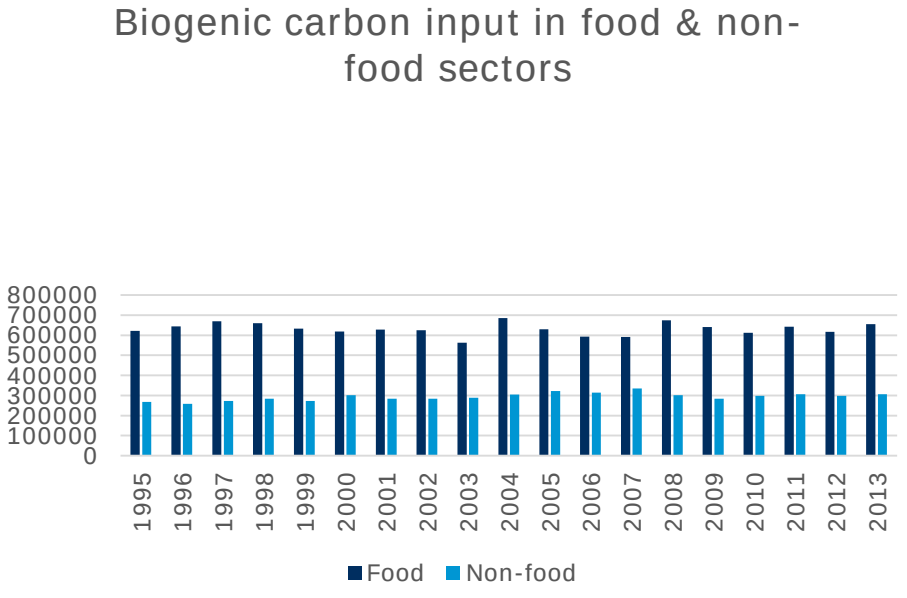
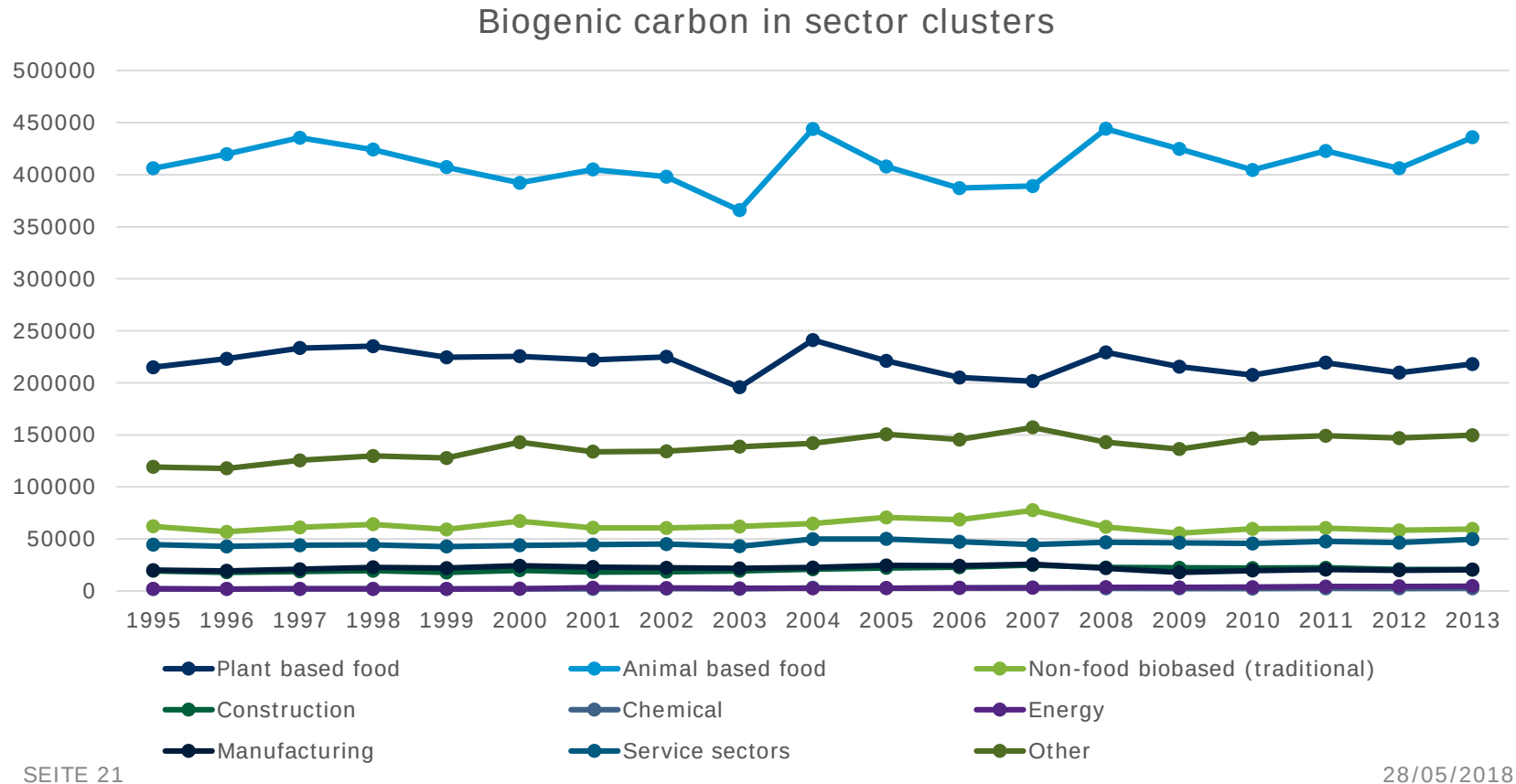
Carbon transition in the EU (I)?



Carbon transition in the EU (II)?

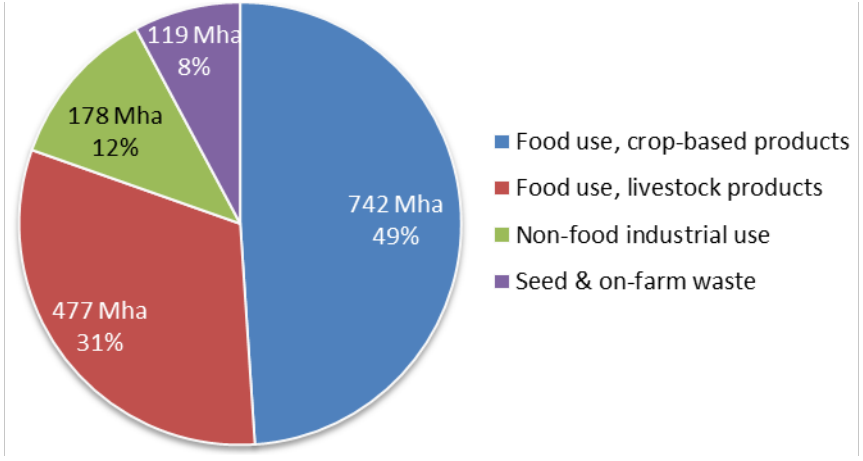




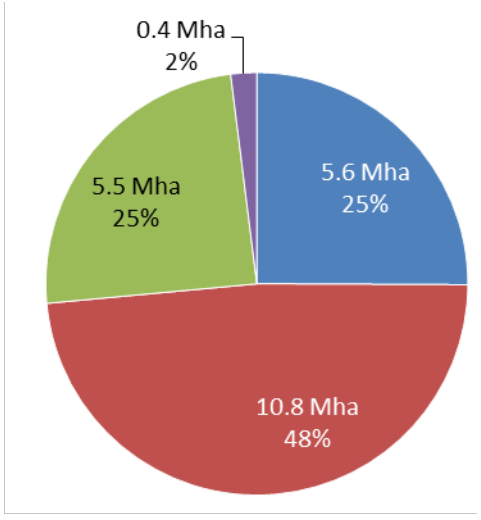


Composition of the cropland footprint in 2010

Global



Germany



Composition of the cropland footprint of Germany in 2010

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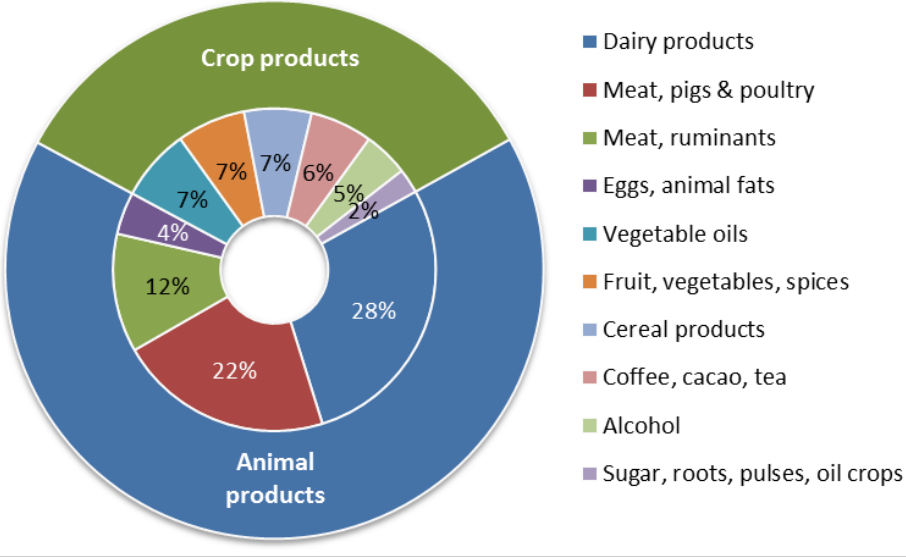
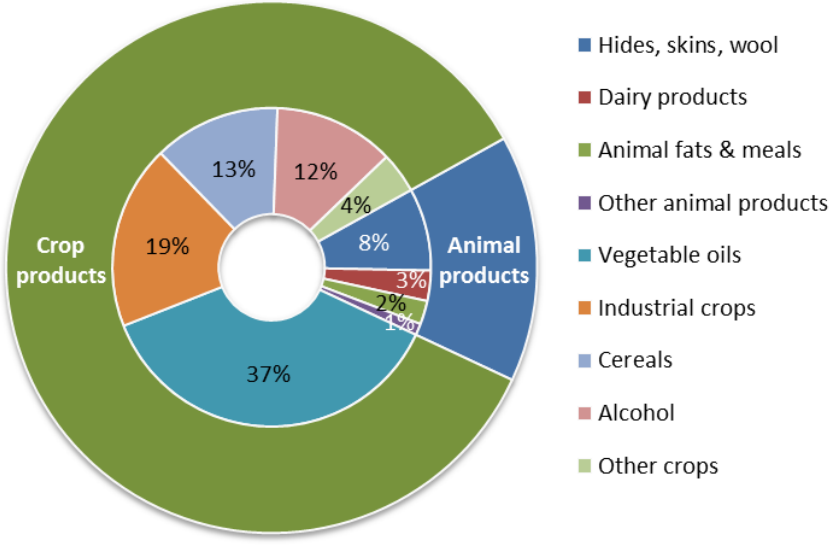
Food



Non-Food



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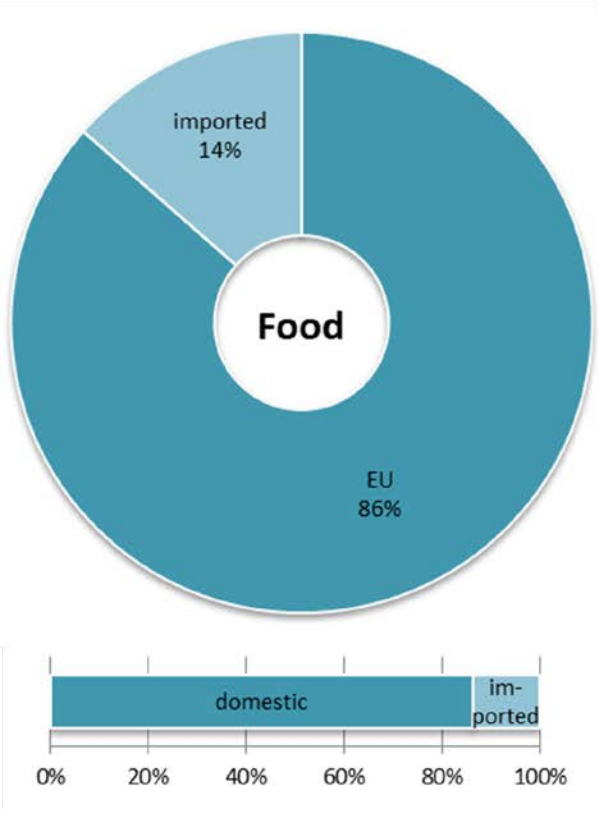
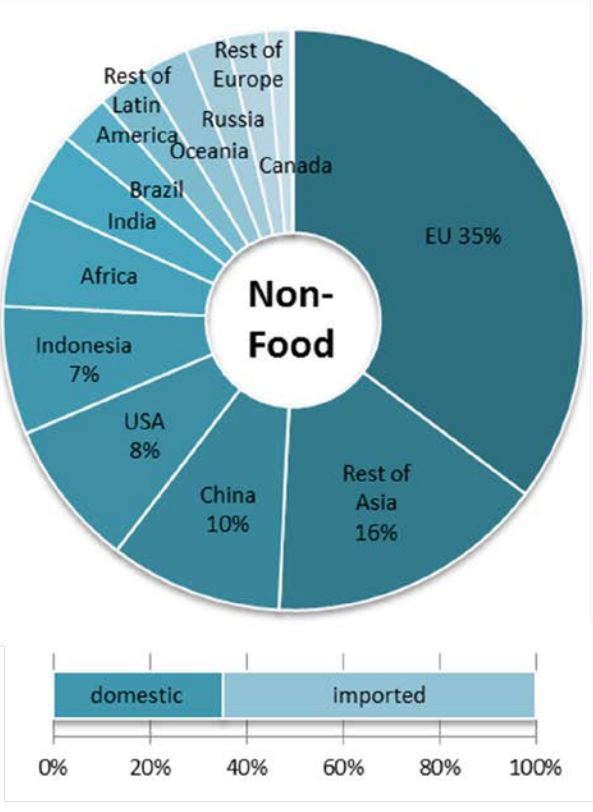
Origin of Food and Non-Food Cropland Footprint of the EU in 2010





Environmental Footprints

Environmental impacts vary between locations and crops

- Deforestation hotspots
- Biodivers

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Conclusions

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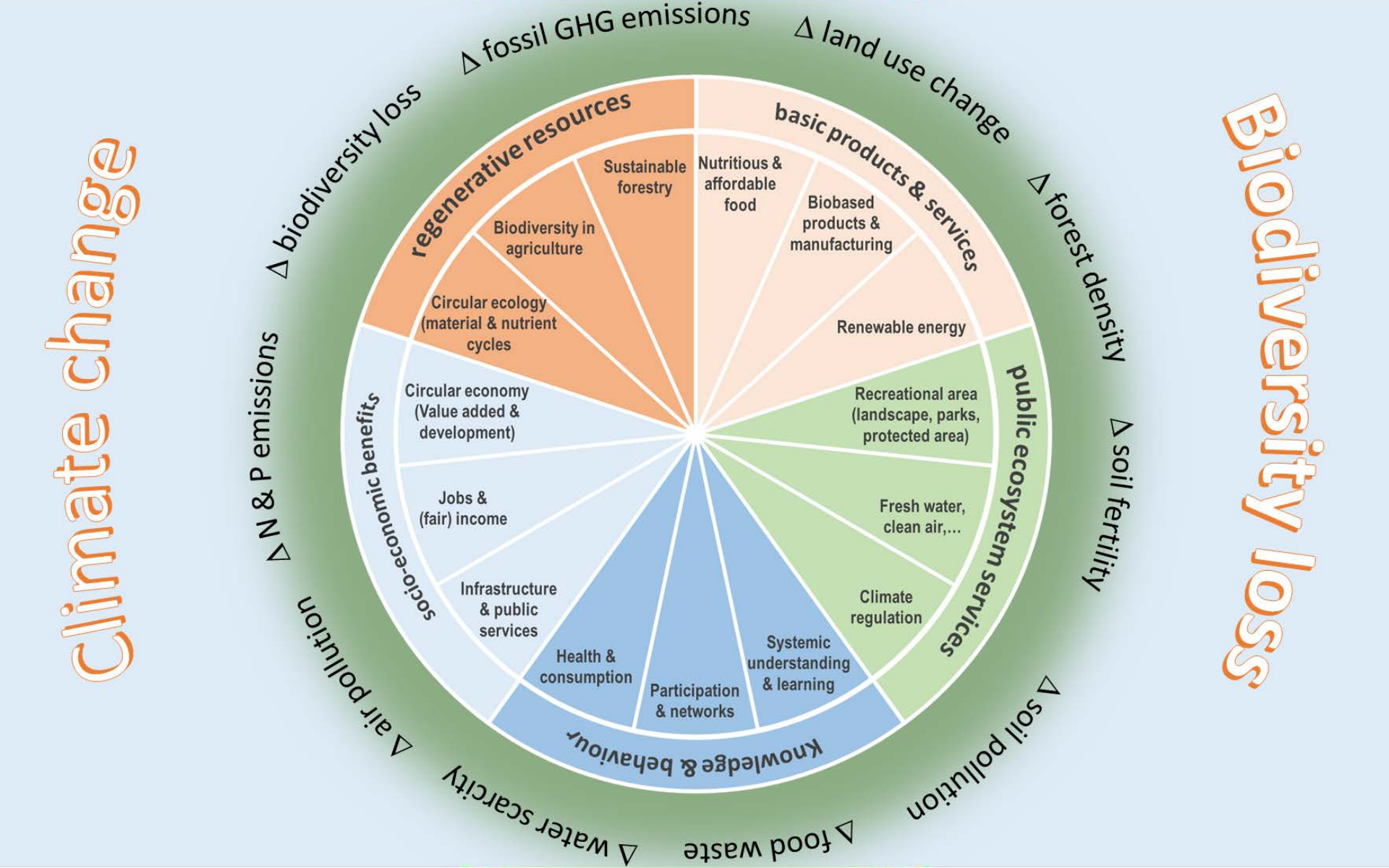
Conclusions

- Increasing globalisation and international trade → need to move from national (territory-oriented) indicators to supply-chain wide (footprint-type) indicators
- There is a need to monitor the bioeconomy from a global perspective (footprint approach)
- Proper assessment of the impacts requires spatially explicit information and participatory approaches
- A monitoring framework needs to support three interrelated conditions: (1) respecting ecological boundaries, (2) contributing to social outcomes and (3) theories and capacities that allow stakeholders to act responsibly with respect to (1) and (2).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Δ water scarcity
Δ food waste
regenerative resources
Sustainable forestry
Biodiversity in agriculture
Circular ecology (material & nutrient cycles
basic products & services
Nutritious & affordable food
Biobased products & manufacturing
Renewable energy
public ecosystem services
Recreational area (landscape, parks, protected area)
Fresh water, clean air,...
Climate regulation
Systemic understanding & learning
Participation & networks
Health & consumption
knowledge & behaviour
socio-economic benefits
Circular economy (Value added & development)
Jobs & (fair) income
Infrastructure & public services

Thank you!

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