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Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

The role of the bioeconomy in energy and climate policy – area of conflict or promised land?

BioFuture25 Annual Seminar

Dr. Hannes Böttcher, Oeko-Institut e.V:, Berlin

Lahti, April 16 2019

SYM BIO
Systemisches Monitoring und Modellierung der Bioökonomie

Expectations from bioeconomy in Germany

BMEL National Policy Strategy on Bioeconomy (2014), foreword by Minister of Agriculture:

"*Major challenges characterize the 21st century. These include providing enough and healthy food for a growing global population, climate change, and the loss of soil fertility and biodiversity. […] The "bio-based economy", offers the opportunity, both, to make an* ***important contribution to mastering*** *these* ***challenges*** *and,* ***simultaneously****, to advance the* ***transition from an economy mainly using fossil-based raw materials to an economy based on renewable resources*** *[…].*"

www.bmel.de, www.bioökonomie.de

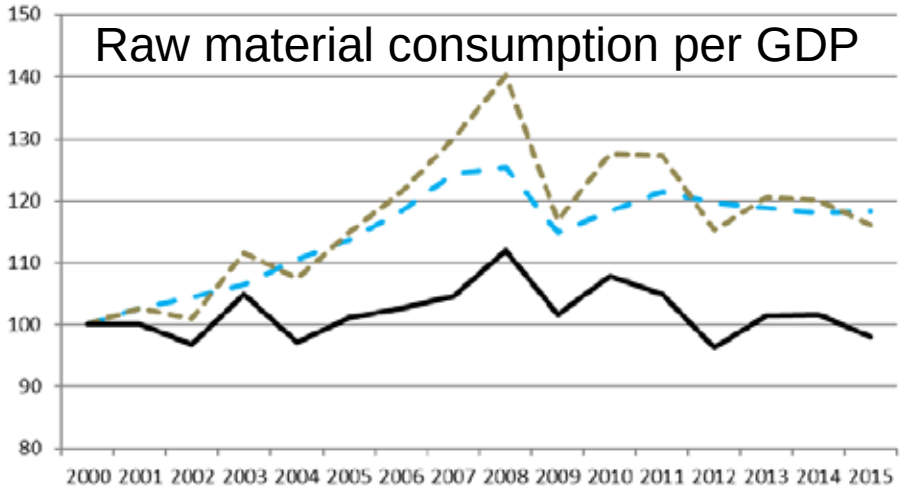
Expectations from bioeconomy in Finland

The Finnish Bioeconomy Strategy (2014):

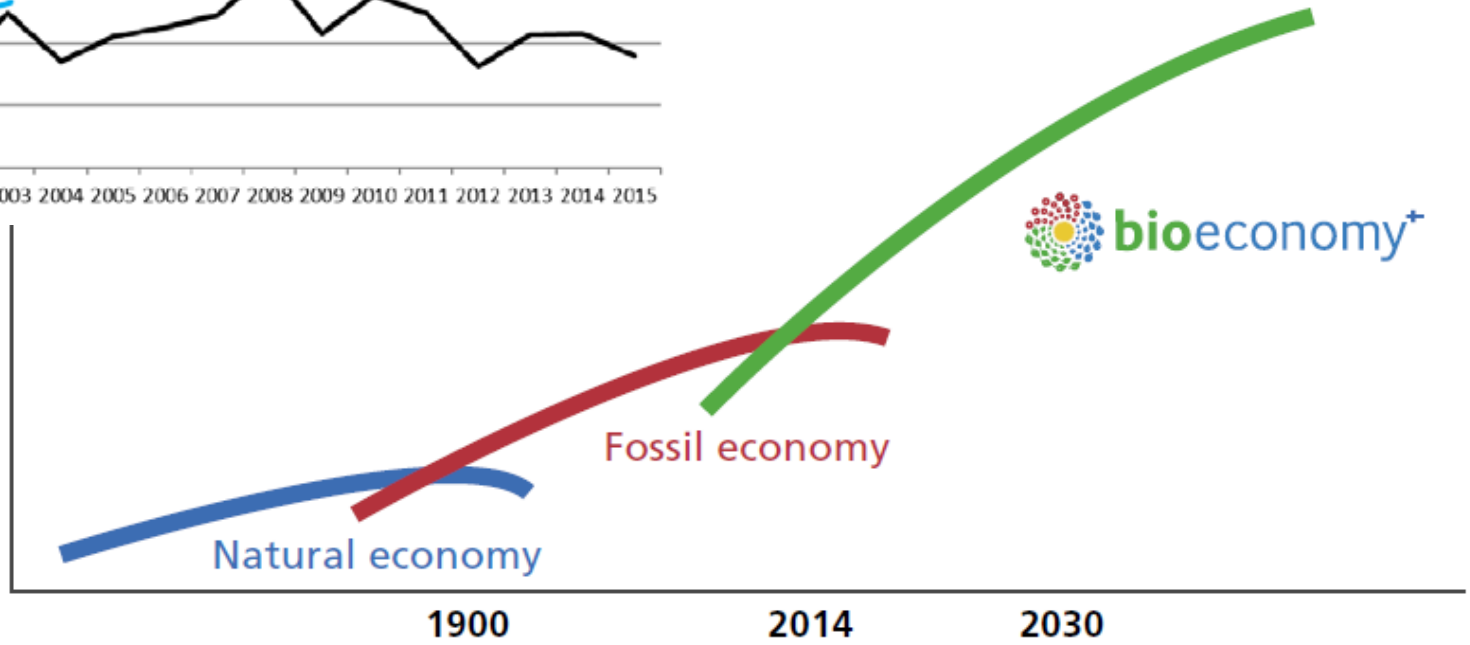
"*The leading idea of the strategy is that competitive and sustainable bioeconomy solutions for global problems will be created in Finland, and that new business will be generated both in the Finnish and international market, thus* ***boosting the welfare of the whole of Finland***."

www.bioeconomy.fi

Bioeconomy as „game changer“ for economic development?



Mäenpää et al. 2017



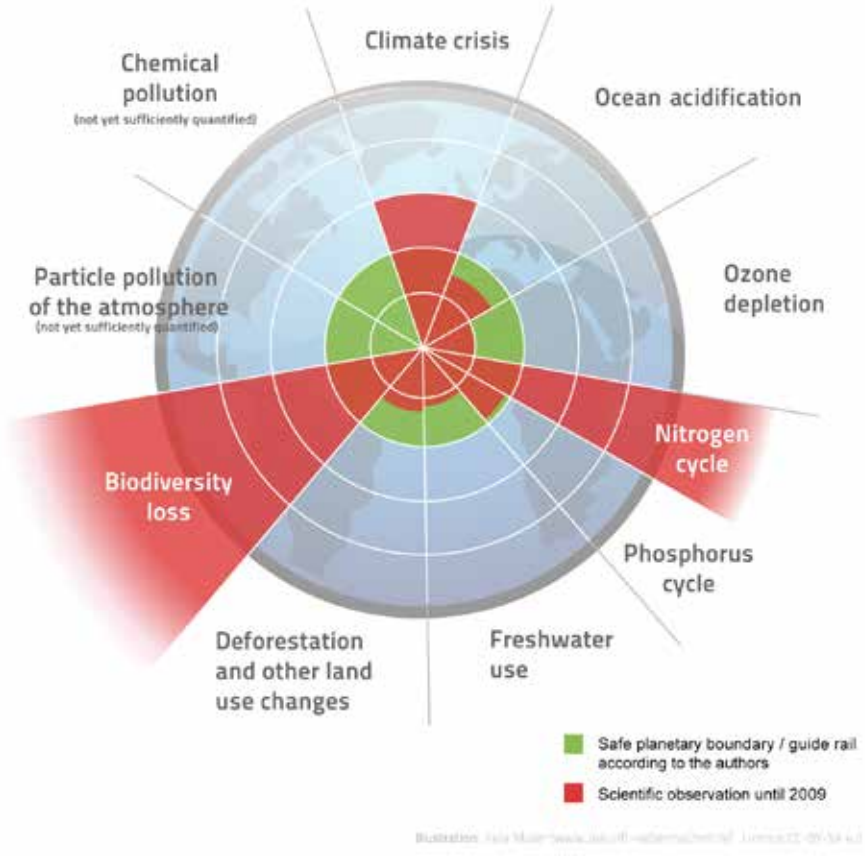
www.bioeconomy.fi

Planetary boundaries and the bioeconomy

Status of quantifiable planetary boundaries

- **Biodiversity loss**
- **Nitrogen cycle**
- **Climate crisis**
- Land use
- Freshwater use
- Phosphorus cycle

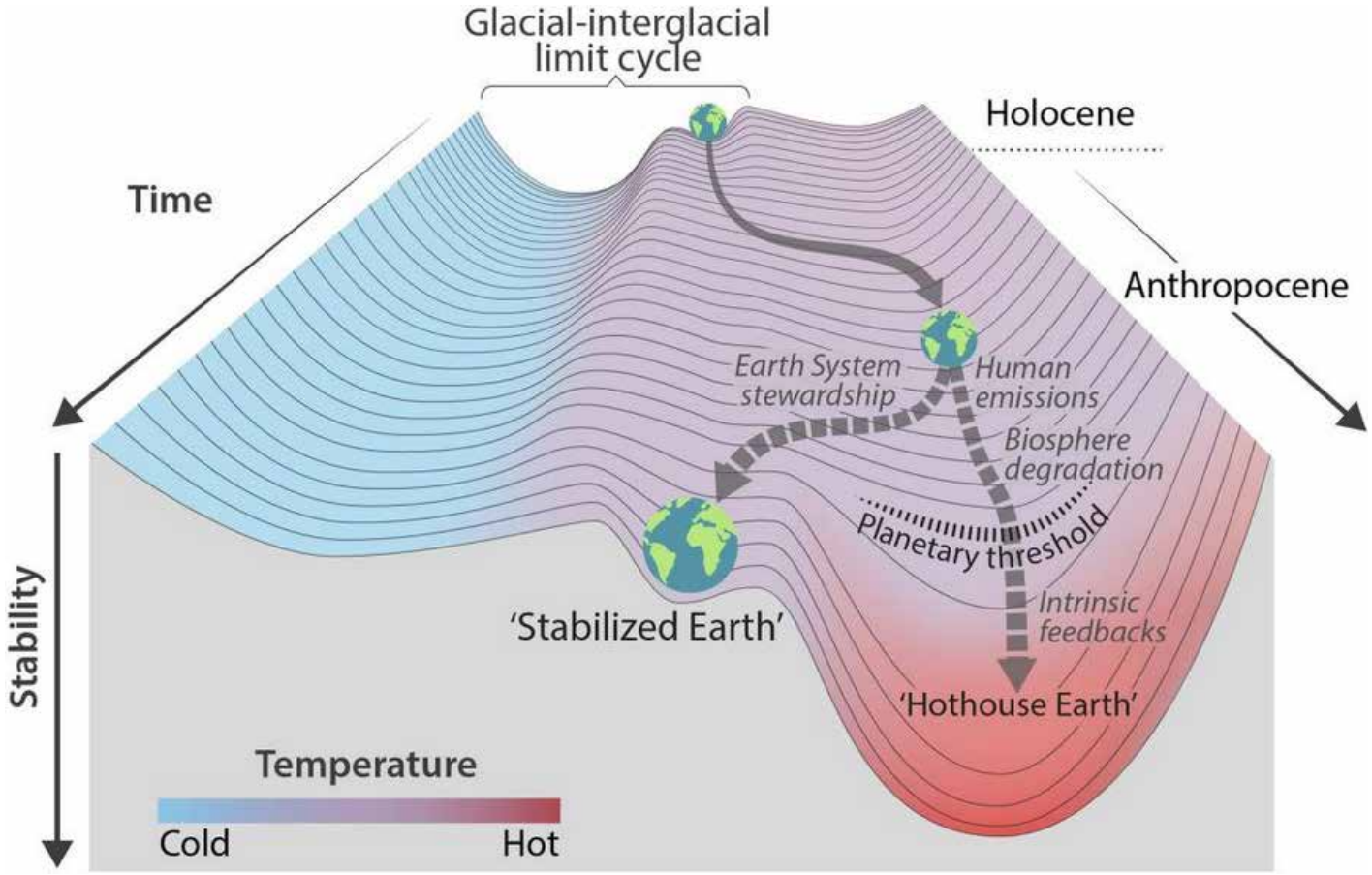
Direct link to biomass production



Rockström et al. 2009 Nature

„Orienteering“ through the Anthropocene

Where is the bioeconomy?



Steffen et al. 2018 PNAS

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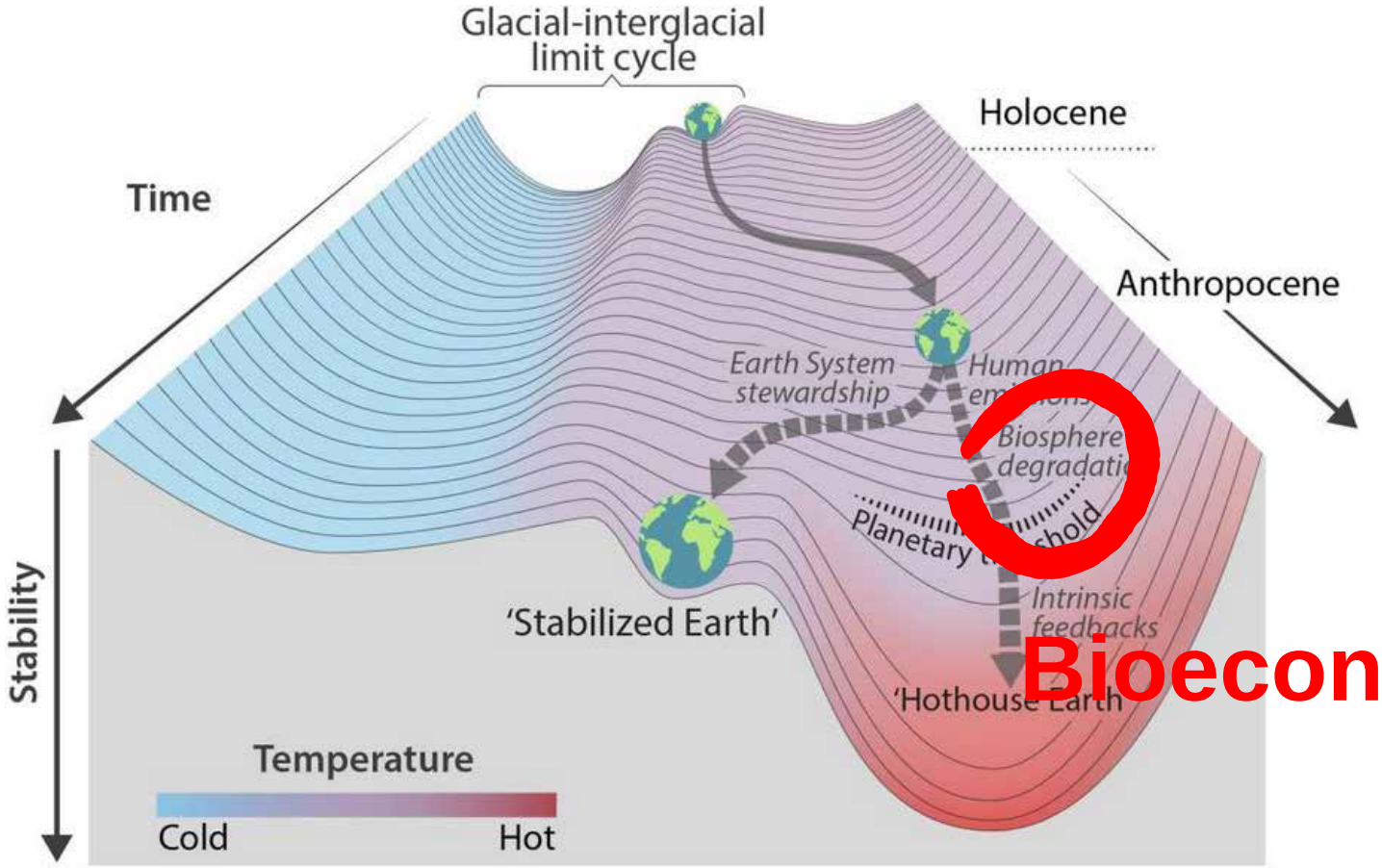

Bioeconomy?

Steffen et al. 2018 PNAS

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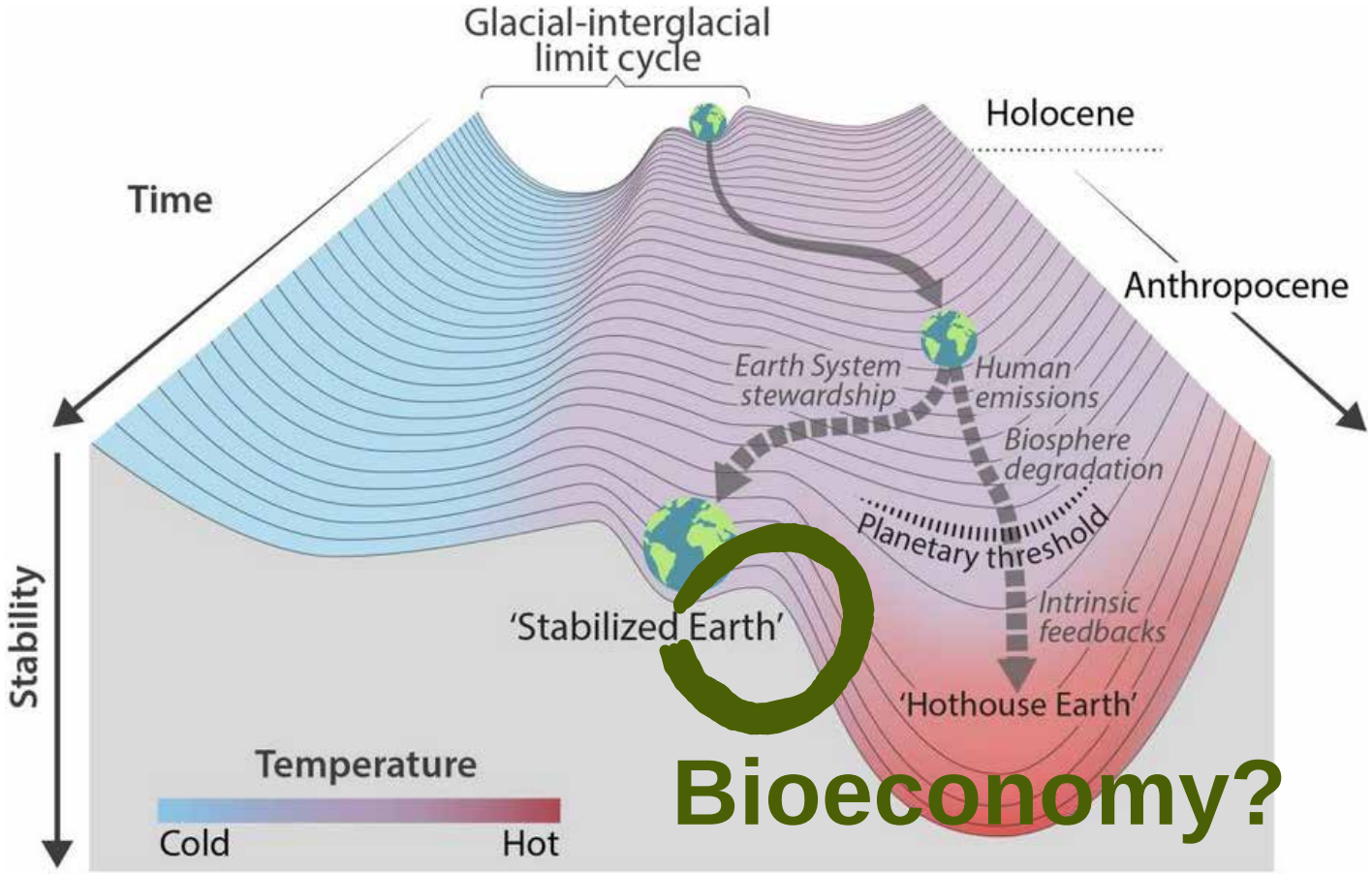
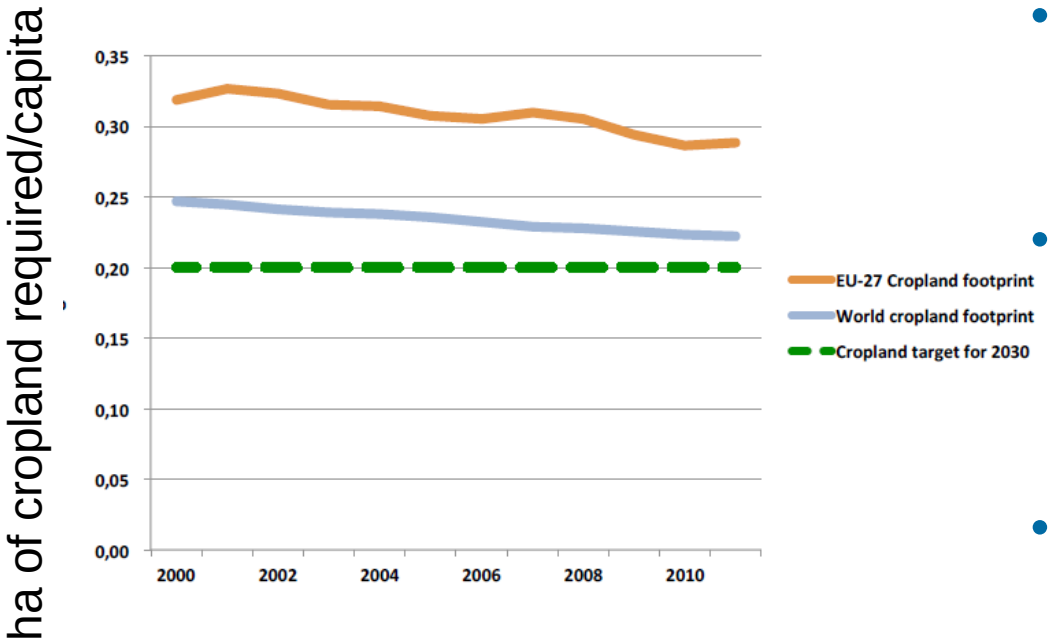


Steffen et al. 2018 PNAS

The land footprint of the EU bioeconomy



- Between 2000 and 2011, cropland area within the EU-27 decreased (-6.6%)
- EU-27 required 20–27% more cropland than domestically available to meet demand
- Cropland requirements associated with imports and exports **increased** (2.9%, 10%)

O'Brian et al. 2015 Land Use Policy

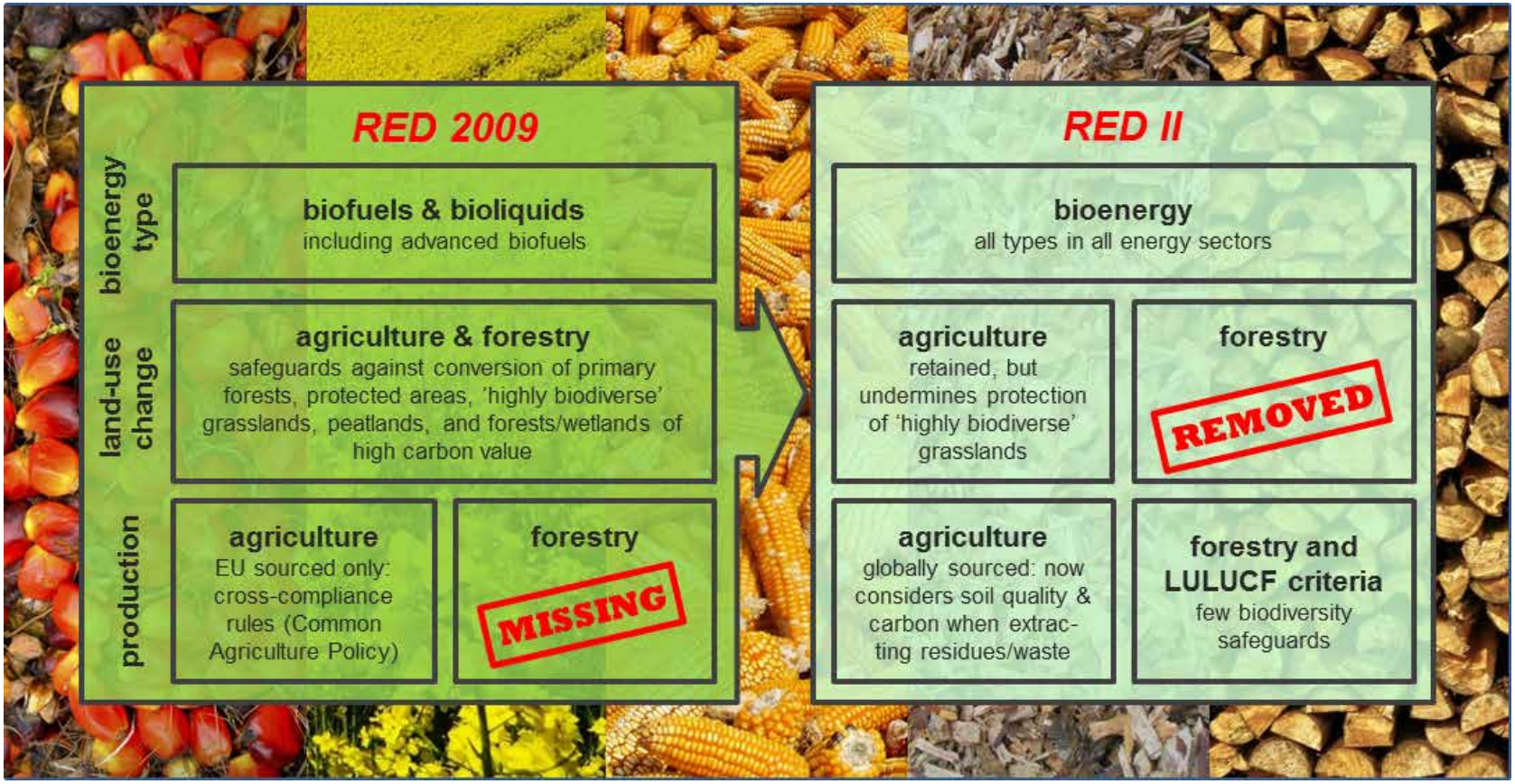
Hypotheses for a sustainable bioeconomy

Requirements and preconditions

- Requirements
  - More effective **Policy and Governance** that filters unsustainable products and processes

Policy and Governance

Example of the EU Renewable Energy Directive – Sustainability criteria

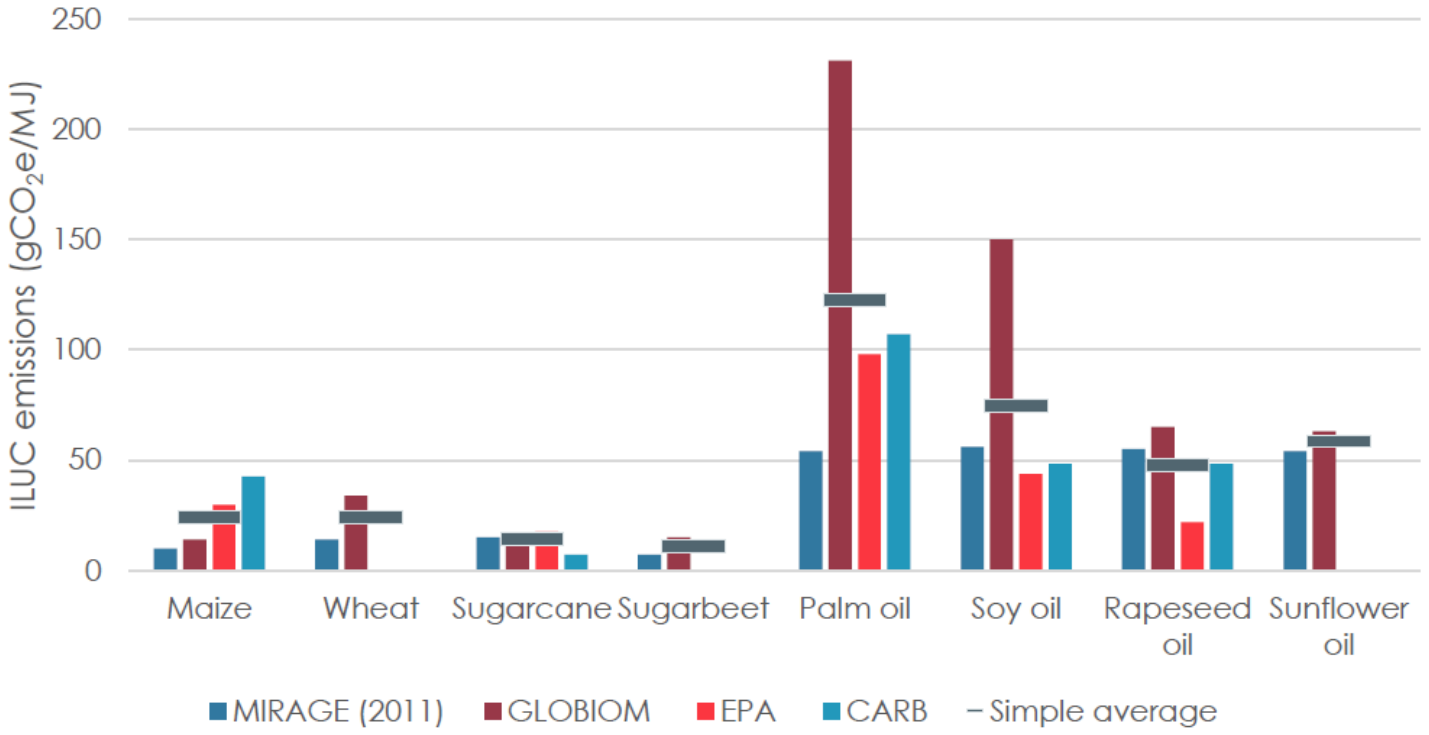


Hennenberg et al. 2018 NEE

Policy and Governance

Example of the EU Renewable Energy Directive – Avoiding indirect effects

Biofuel debate: more biomass production leads to shifts in land use and indirect emissions from land use change elsewhere (ILUC)



Malins et al. 2019 Cerulogy

Policy and Governance

Example of the EU Renewable Energy Directive – Avoiding indirect effects

Biofuel debate: more biomass production leads to shifts in land use and indirect emissions from land use change elsewhere (ILUC)

Solution: Additionality! Can we produce more biomass without causing indirect effects (low-ILUC)?

Additionality, as defined by RED ILUC rules:

- Production on “unused land” – definition? Risks for social sustainability
- Produced through yield increase – intensification might have more negative impacts on environment, multi-cropping less
- Produced from waste and residues – but what about “IRUC” (indirect residue use change)?

Hypotheses for a sustainable bioeconomy

Requirements and preconditions

- Requirements
  - More effective **Policy and Governance** that filters unsustainable products and processes
  - More comprehensive **Monitoring and Certification** covering full supply chains and all biomass uses

Monitoring and Certification

SYMOBIO Project : Towards a monitoring system of the bioeconomy

- Development of a multi-scale system for modelling and assessment (using systems dynamics)
- Analysis of the key drivers for the bioeconomy transformation
- Modelling of recent trends and their impact on environment and socio-economy
- Indicators and data generated by certification and life cycle assessment (LCA)
- Development of a pilot monitoring system for the German bioeconomy

SYMBIO Systemisches Monitoring und Modellierung der Bioökonomie https://symobio.de/

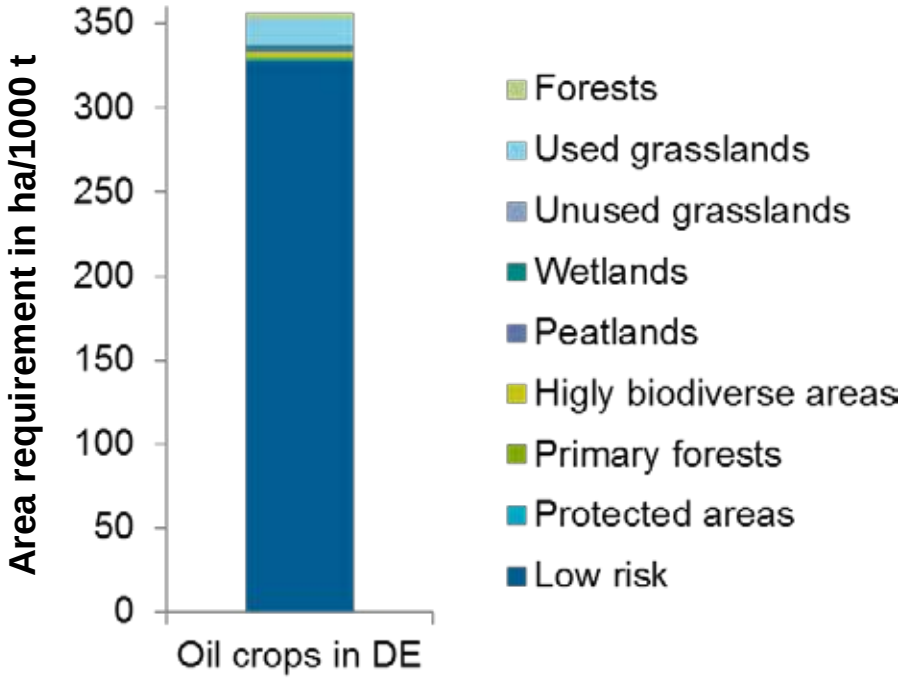
Monitoring and Certification

Preliminary exemplary results on land footprint

- Approach combines different methods and tools:
  - Material-flow models/software (e.g. Umberto)
  - Input-Output-databases and econometric models (e.g. EXIOBASE)
  - Land- and water use models (e.g. LandShift)
- Footprints of land, forest, water use and greenhouse gas emissions

Hennenberg, per.s comm.

Land foot print of oil crop production for DE



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Hypotheses for a sustainable bioeconomy

Requirements and preconditions

- Requirements
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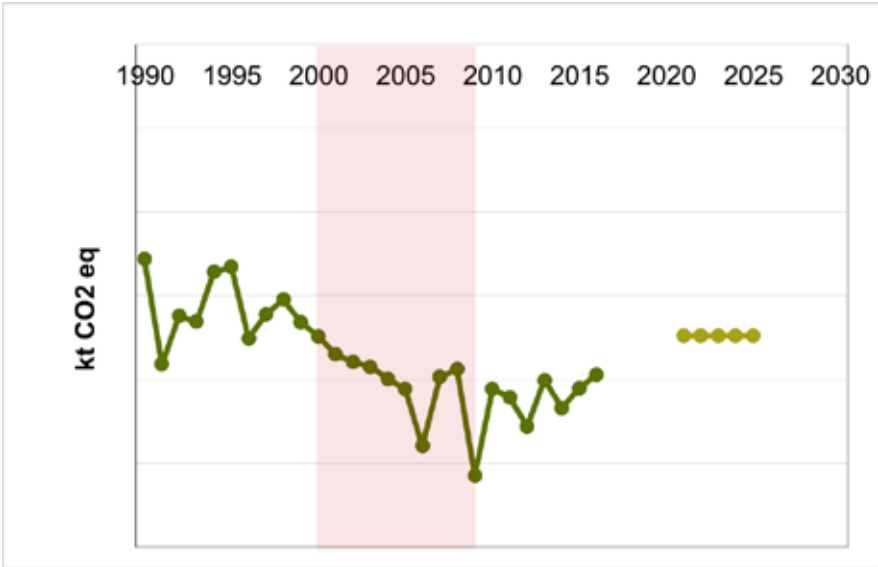
  - More comprehensive **Monitoring and Certification** covering full supply chains and all biomass uses
  - Ambitious **Targets and Accounting** rules

Targets and Accounting

Example of the EU LULUCF Regulation – treatment of forests

EU LULUCF Regulation introduced a target for the land use sector, the „no debit rule“

- Forests: accounting only of human-induced changes in emissions
- Need to anticipate natural dynamics (age-class structure effects)
- Forest Reference Levels to be proposed based on harvest intensity observed 2000-2009
- Challenge of credible baseline: no policy changes to be included, e.g. constant ratio between energy and material use of wood



Hypotheses for a sustainable bioeconomy

Requirements and preconditions

- Requirements
  - More effective **Policy and Governance** that filters unsustainable products and processes
  - More comprehensive **Monitoring and Certification** covering full supply chains and all biomass uses
  - Ambitious **Targets and Accounting** rules
- Preconditions
  - High level of **Transparency and Accuracy** by maintaining practicality of monitoring approaches
  - Increased **Accountability and Responsibility** by producers
  - Improve the level of **Participation and Education**

Participation and Education

„The Global Field“ initiative

- A public garden in Berlin represents land requirements of global agriculture
- 2000 m² that are on average available per person
- More than half of the field is cultivated for just four crops: wheat, corn, rice and soybeans
- Online tool: what is the land footprint of different dishes?

https://www.2000m2.eu/

Questions for the discussion I

- Policy and Governance
  - What would be potential impacts of a CO_2 price on the bioeconomy and specific products/processes?
  - To what degree is the bioeconomy steered by subsidies setting incentives for unsustainable developments?
- Monitoring and Certification
  - Including land use emissions in LCA, what are the challenges and barriers, e.g. regarding official standards?
- Targets and Accounting
  - How will targets for the land use sector be set after 2030 to incorporate the requirements of the Paris Agreement: “balance of sinks and sources”?
  - How would accounting rules have to change to set the right incentives?

Questions for the discussion II

- Transparency and Accuracy
  - What are the most challenging data gaps for an effective and transparent monitoring of the bioeconomy? E.g. issues with confidentiality of forestry data in Germany
- Accountability and Responsibility
  - How can full supply chain monitoring be improved to increase accountability of producers?

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Thank you for your attention!

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Literature

Hennenberg, Klaus Josef; Böttcher, Hannes; Bradshaw, Corey J. A. (2018): Revised European Union renewable-energy policies erode nature protection. In: Nature ecology & evolution 2 (10), S. 1519–1520. DOI: 10.1038/s41559-018-0659-3.

Mäenpää, I.; Heikkinen, M. Piñero, P.; Mattila, T. Koskela, S. Kivinen, M. (2017) MFAfin – Finnish material flow accounts. Main results. http://www.oulu.fi/sites/default/files/content/MFAfin%20-%20Main%20results.pdf

Malins, C. (2019) Risk management. Identifying high and low ILUC-risk biofuels under the recast Renewable Energy Directive. Cerulogy. https://www.trans

O'Brien, Meghan; Schütz, Helmut; Bringezu, Stefan (2015): The land footprint of the EU bioeconomy. Monitoring tools, gaps and needs. In: Land Use Policy 47, S. 235–246. DOI: 10.1016/j.landusepol.2015.04.012.

portenvironment.org/sites/te/files/2019_01_Cerulogy_Risk_management_study.pdf

Rockström, J.; Steffen, W.; Noone, K.; Persson, Ã…; Chapin, F. S.; Lambin, E. F. et al. (2009): A safe operating space for humanity. In: *Nature* 461 (7263), S. 472–475. Online verfügbar unter http://www.scopus.com/inward/record.url?eid=2-s2.0-70349451894&partnerID=40&md5=5db9dbf18fe00b3899ae7b60c2f60f82.

Steffen, Will; Rockström, Johan; Richardson, Katherine; Lenton, Timothy M.; Folke, Carl; Liverman, Diana et al. (2018): Trajectories of the Earth System in the Anthropocene. In: Proceedings of the National Academy of Sciences of the United States of America 115 (33), S. 8252–8259. DOI: 10.1073/pnas.1810141115.

Abstract

Over the last decade the bioeconomy has become a generic recipe for addressing multiple challenges in many countries. The promise: green production based on a renewable source to meet the increasing demand for food, energy and other consumables while mitigating climate change and halting the loss of soil fertility and biodiversity. In fact, currently biomass production, extraction and consumption are among the largest stress factors to the planet. What is rather needed, is action to reduce the stress on biomass resources through sustainability transformations in the fields of energy, mobility, housing, food and agriculture, forestry and consumption. The presentation discusses preconditions for a sustainable, knowledge-based bioeconomy that contributes its share to fulfilling the promise.