Towards an inclusive and sustainable bioeconomy
Macroeconomic impacts

Hans van Meijl

1. Introduction

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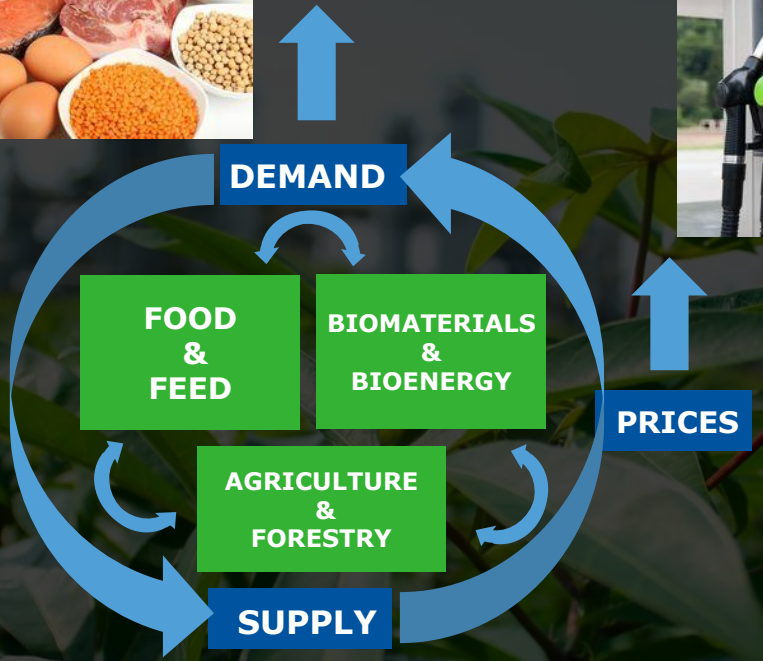

SOCIETAL CHALLENGES

- Employment and value added
- Dependency on non-renewables
- Greenhouse gas emissions
- Food security
- Biodiversity

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Sustainable Development Goals (2015)

"This presentation contributes to an inclusive and sustainable bioeconomy by designing and implementing a system analysis framework, from a macro-economic perspective, that supports coherent policies that address the societal grand challenges"

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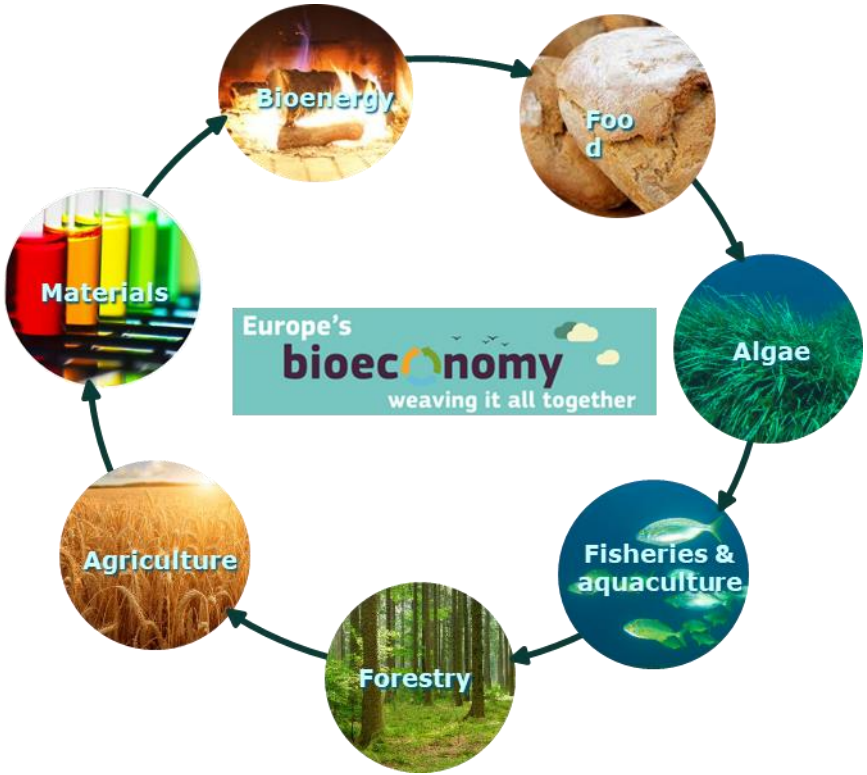
EU Bioeconomy

Bioeconomy covers all sectors & systems that rely on biological resources, their functions and principles. It includes:

- Ecosystems on land and sea
- Primary production sectors (agriculture, forestry, aquaculture/fisheries, waste/side streams)
- Economic sectors and industries based on biological resources and processes to produce food, feed, bio-based products, energy and services

COM/2018/673: A sustainable Bioeconomy for Europe: Strengthening the connection between economy, society and the environment



Europe: Strengthening the connection between economy, society and the environment

Bioeconomy strategy and its 5 objectives

1. Ensuring food security

"transformation towards sustainable, healthy, nutrition-sensitive, resource-efficient, resilient, circular and inclusive food and farming systems"

2. Managing natural resources sustainably

"preservation and productivity of healthy **ecosystems** in seas, oceans, forests and soils depends on biodiversity"

3. Reducing dependence on non-renewable resources

4. Mitigating and adapting to climate change

5. Creating jobs and maintaining European competitiveness

Sustainable and inclusive

1. Ensuring food security

2. Managing natural resources sustainably

3. Reducing dependence on non-renewable resources

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POLICY and STRATEGY

DRIVERS

DEMAND

Food Feed

(Bio) material & energy

Agri & Forestry

SUPPLY

Leeuwen et al. 2013
Meijl et al. 2015, 2017

SOCIETAL CHALLENGES

LAND

Water

CONSTRAINTS

Non renewables

LABOUR


"This presentaiton contributes to an inclusive and sustainable bioeconomy by designing and implementing a system analysis framework, from a macro-economic perspective, that supports coherent policies that address the societal grand challenges"

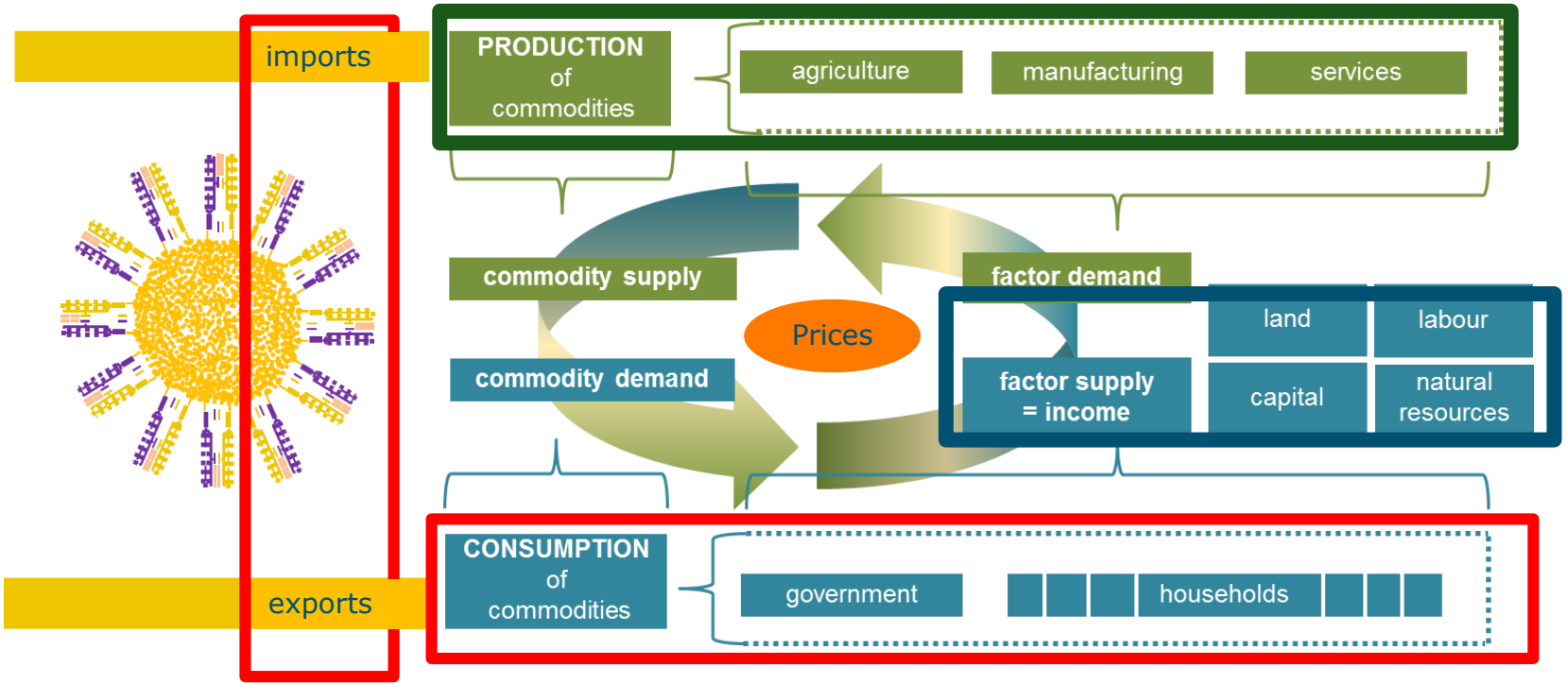
“from a macro-economic perspective”

- External effects (cost\benefit for somebody who did not chose it. Calculate cost and benefits of different options to solve problem)
- Substitution effects (substitute fossil based product for green product)
- Indirect effects (price effect penetrates other markets, rebound effect)

“from a macro-economic perspective”

- Macro-economics: Need for new engine of growth
  - Capital to be accumulated and dimishing returns, marginal product should not fall for stable growth
  - Tech change keeps marginal returns from falling
  - Mostly labour saving =>higher income per capita
  - To employ all people we need growth driven by higher consumption induces by higher incomes
  - Growth requires more inputs such as land, materials, energy
  - Decouple growth from input use, but as long there is growth we get a scale effect. Efficiency effect needs also to outrun scale effect. => need a new engine of growth or slow or degrowth?

MAGNET – an economic model of nations in the global economy



GDP = C+ I + G + X - M

Opportunities offered by MAGNET

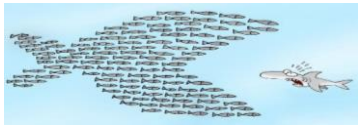
Closed economic system - no "manna from heaven" solutions

Address **multiple objectives** in a single consistent framework

Behaviour is key - producer & consumer choices drive results

Opportunity to **experiment** with different incentives and drivers

Join forces with other approaches and disciplines



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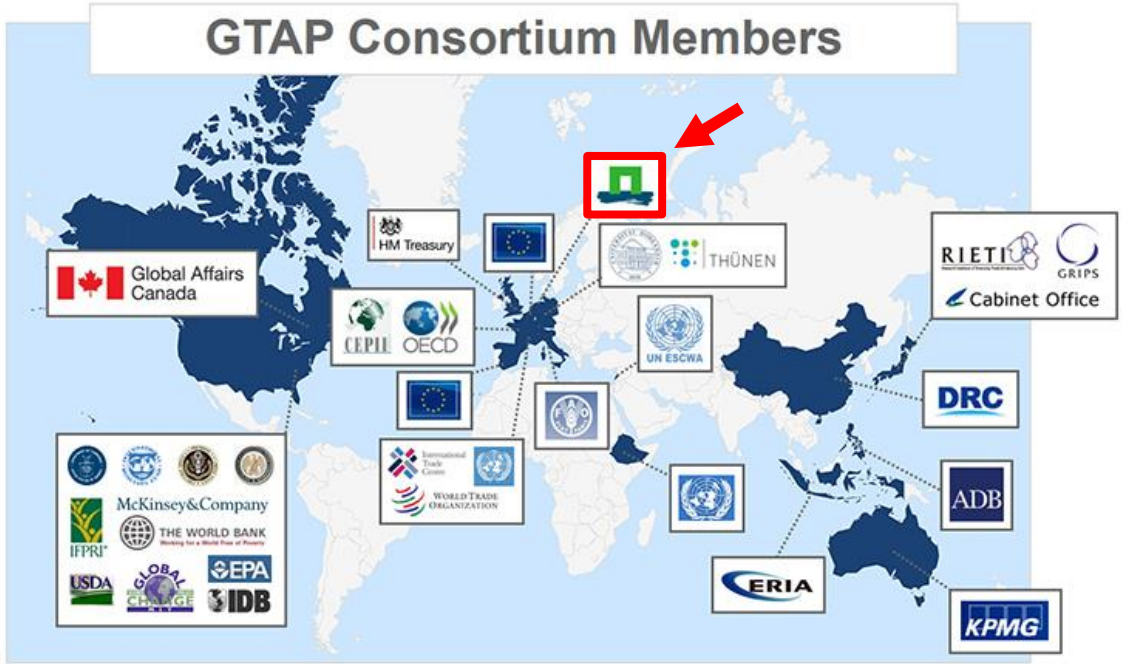
GTAP - Global Trade Analyses Project

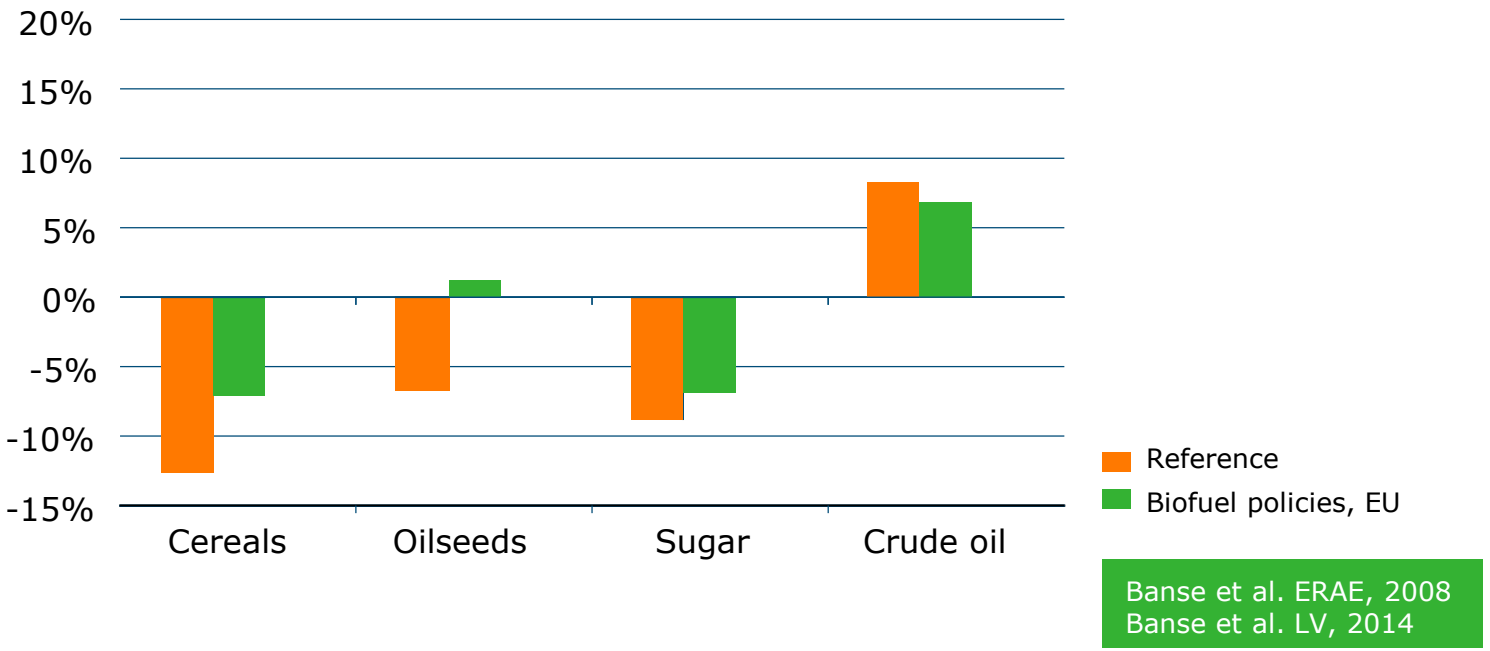


Members:
OECD, FAO, EC, World bank, IFPRI, WEcR, TI, USDA .....
& also McKinsey, KPMG

GTAP

Hertel (1997) Global Trade Analysis: Modeling and Applications

Impact of EU Biofuel Directives on World Prices (% ’01- ’20)



Banse et al. ERAE, 2008
Banse et al. LV, 2014

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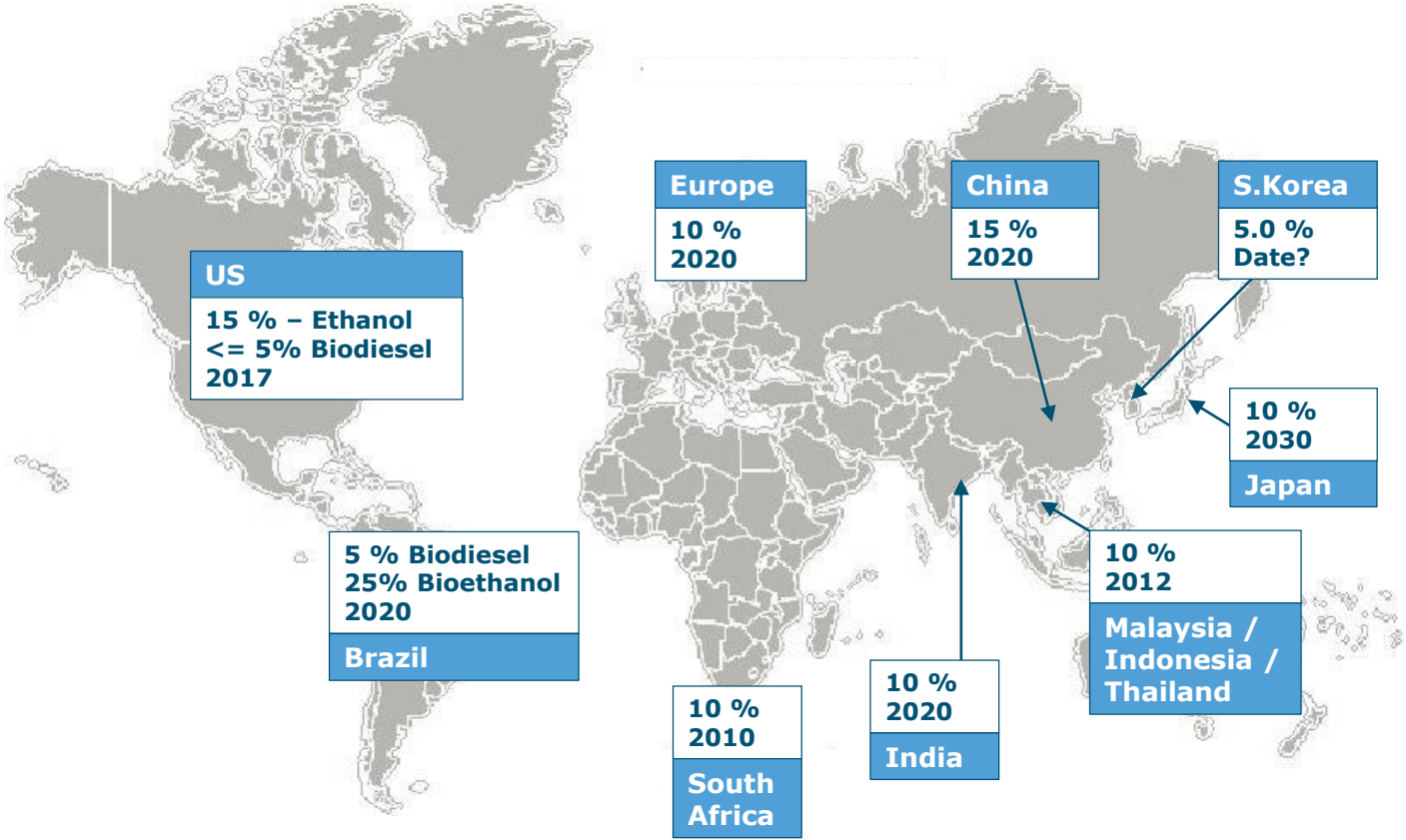
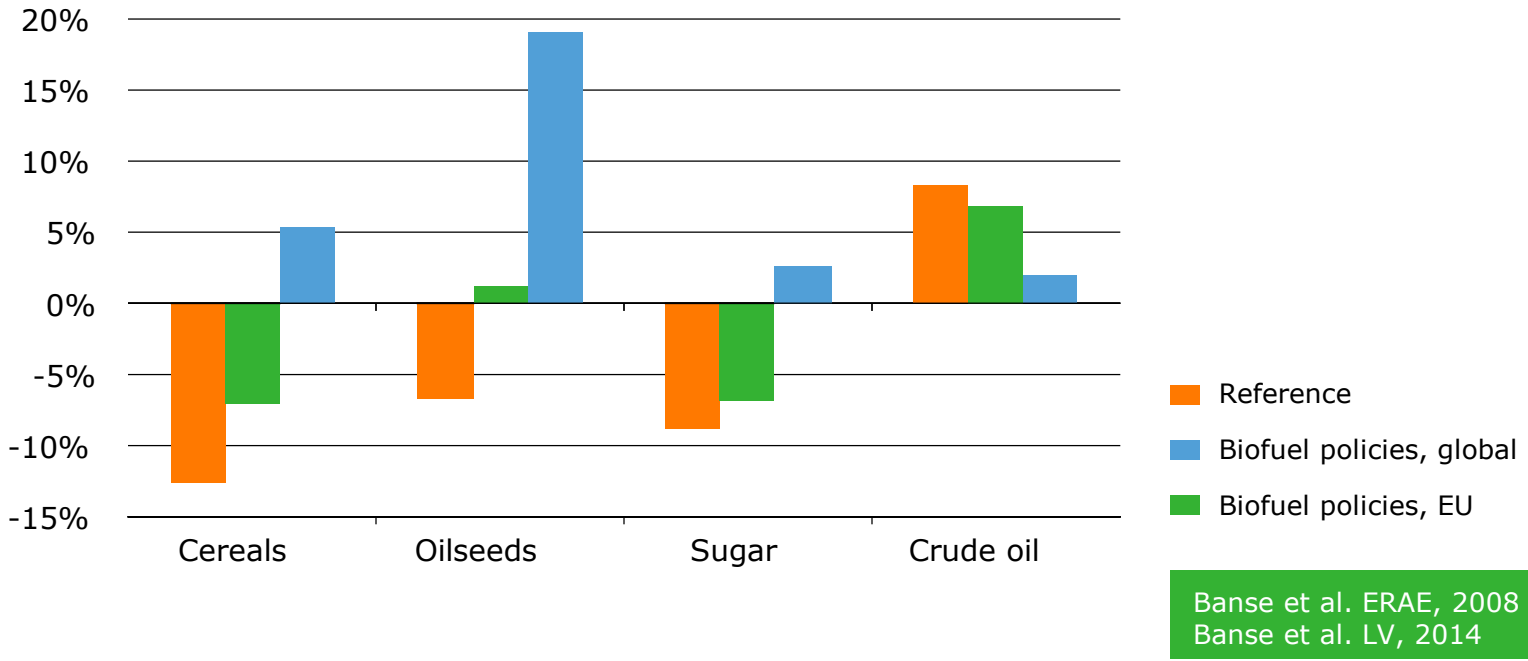
Targets for Bio-fuels Worldwide



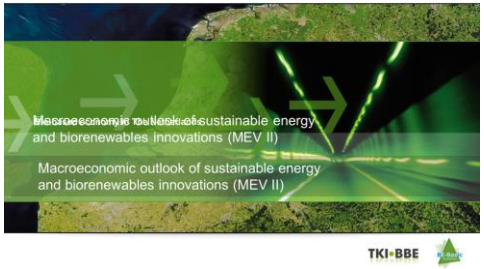
Sources: IEA Task 39 report May 2007, Governments of countries, Frost & Sullivan Consulting

Impact of Biofuel policies on World Prices (% '01 - '20)

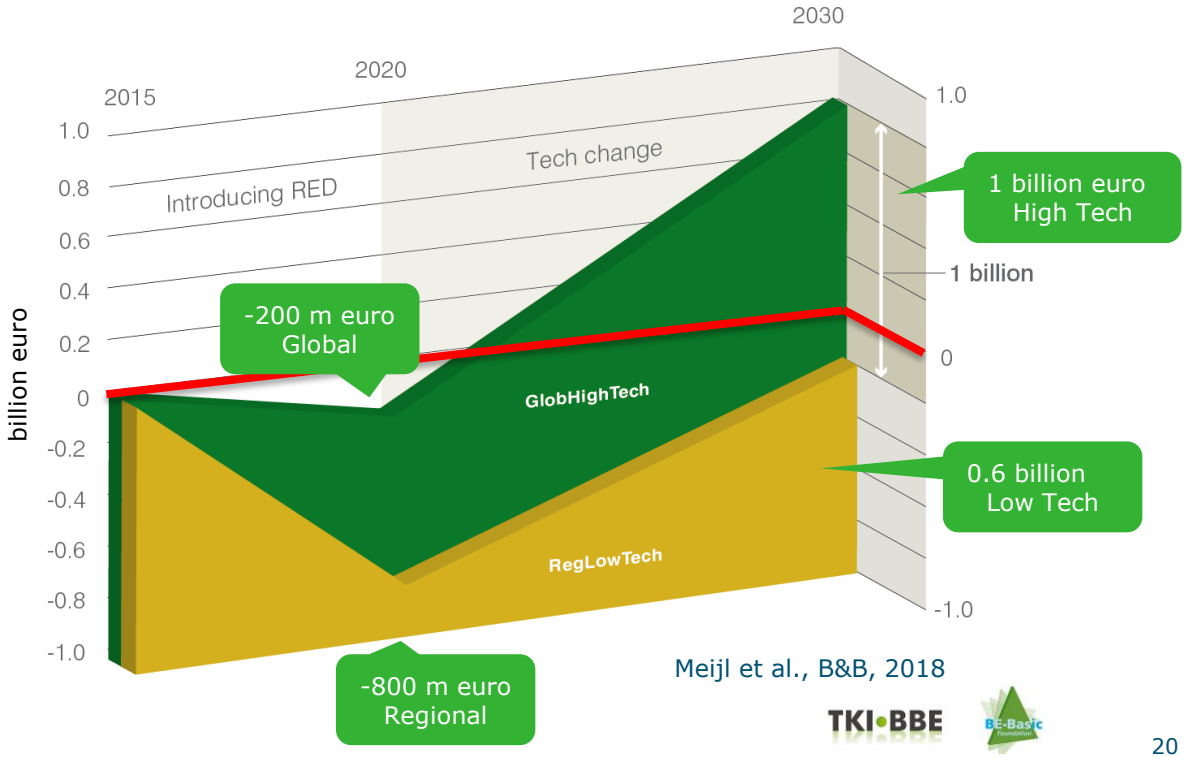


Banse et al. ERAE, 2008
Banse et al. LV, 2014

MEV- BBE: Annual GDP effect of a bio-based economy on GDP in billion euros compared to non-bio-based



Macroeconomic outlook of sustainable energy and biorenewables innovations for The Netherlands (MEV II)



Meijl et al., B&B, 2018

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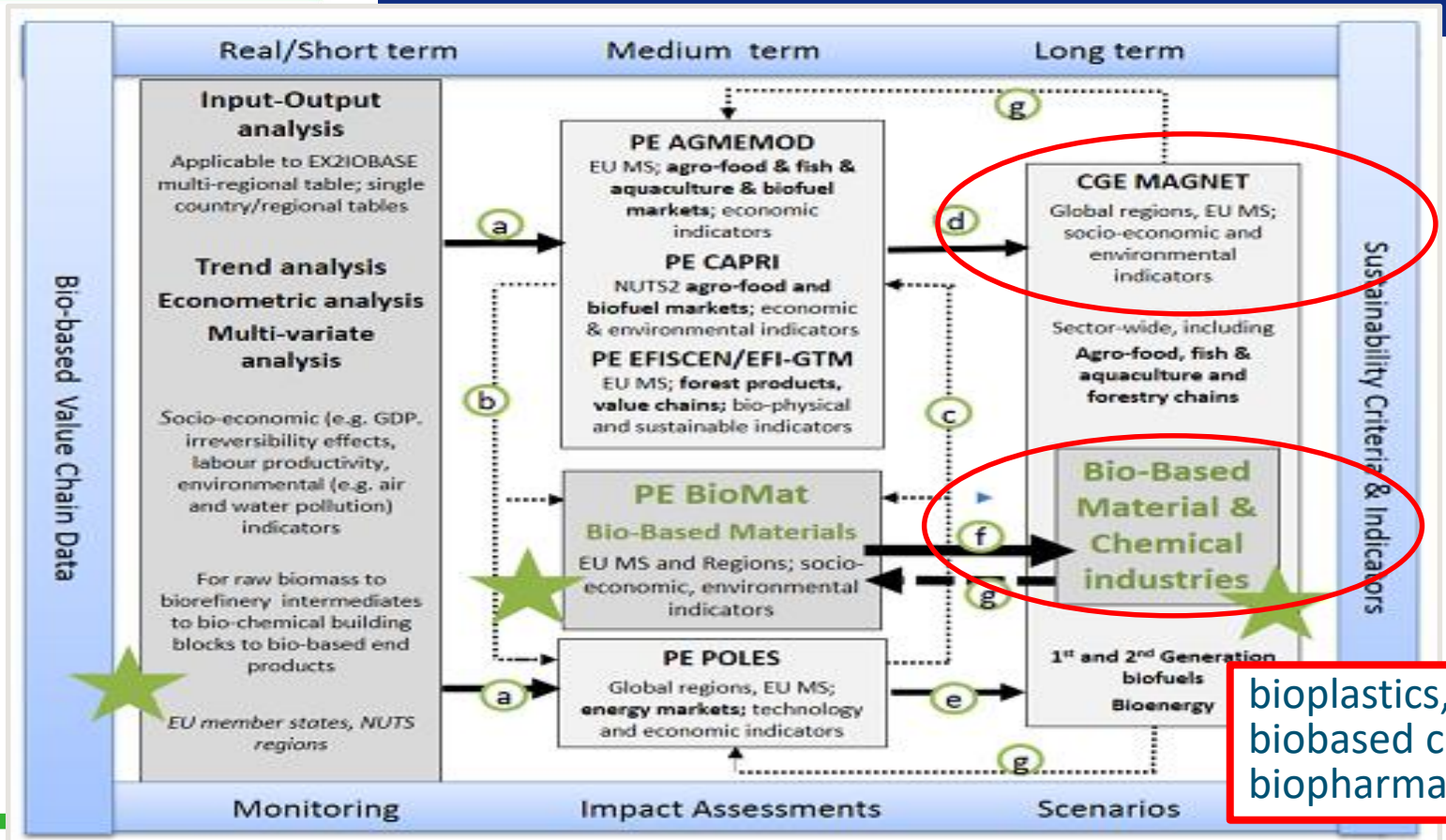
TKI•BBE

Extending bioeconomy representation (e.g. biochemicals)



bioplastics,
biobased chemicals,
biopharmaceuticals)

MAGNET waste module for a circular economy

WEcR: Heleen Bartelings\
Monica Verma

WUR: Alessandro Gatto (PhD)

“Alternative futures of a circular bio-based society:
the economic consequences of adopting circularity at different spatial scales”

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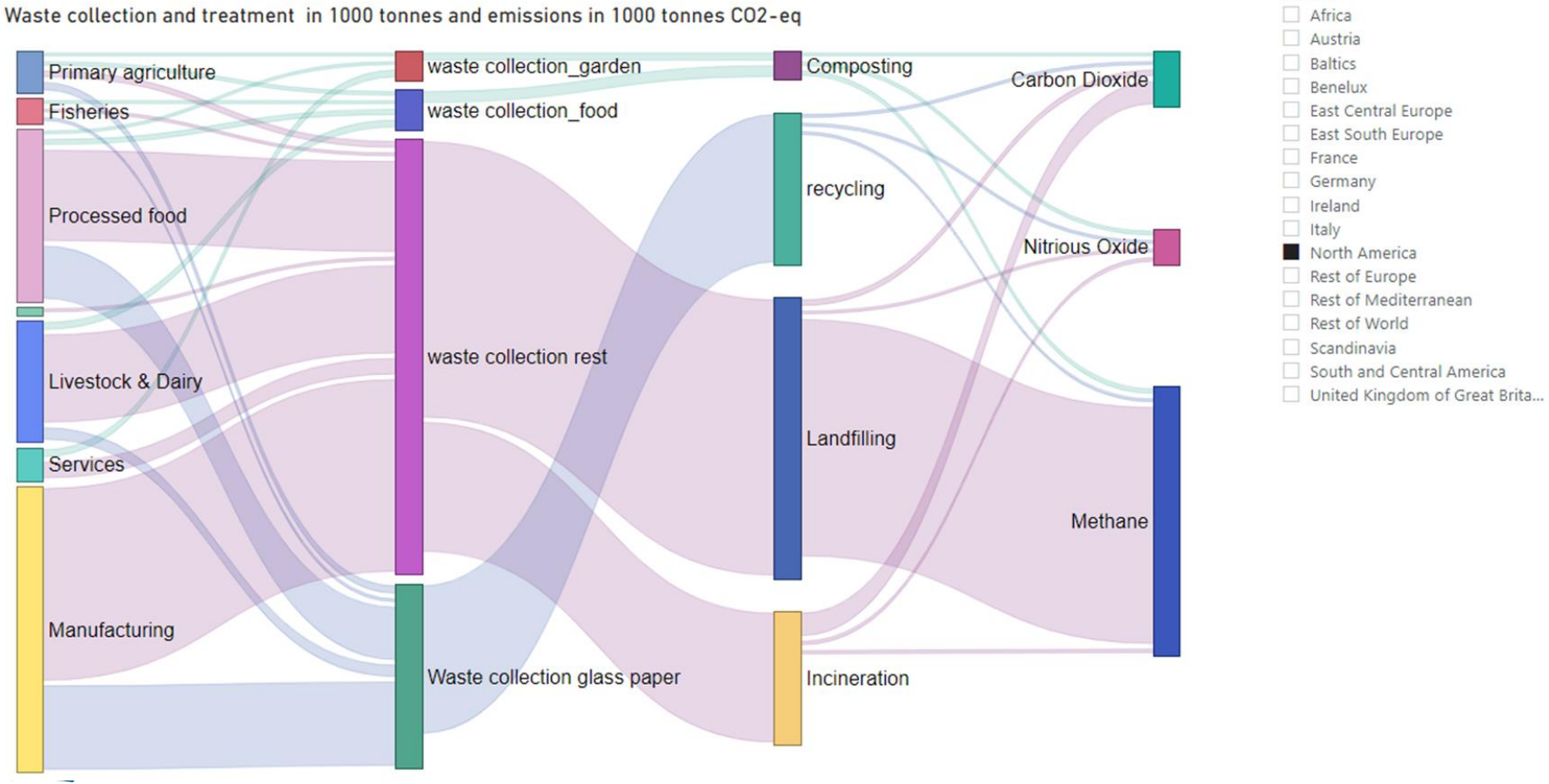
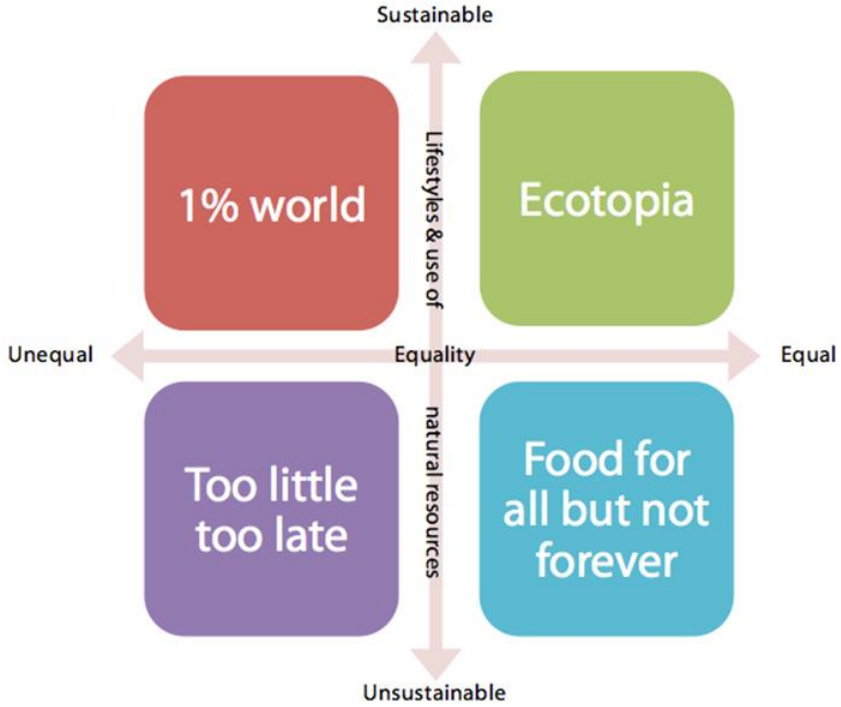
2014 | 2020 | **2030** | 2040 | 2050

Waste collection and treatment and emissions

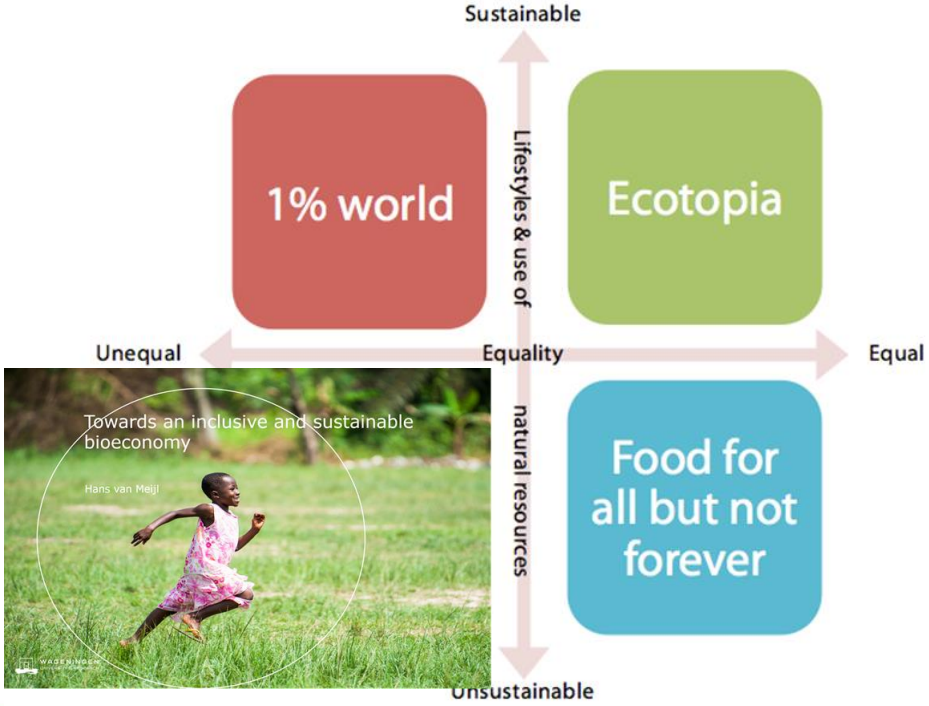


FOODSECURE scenario storylines

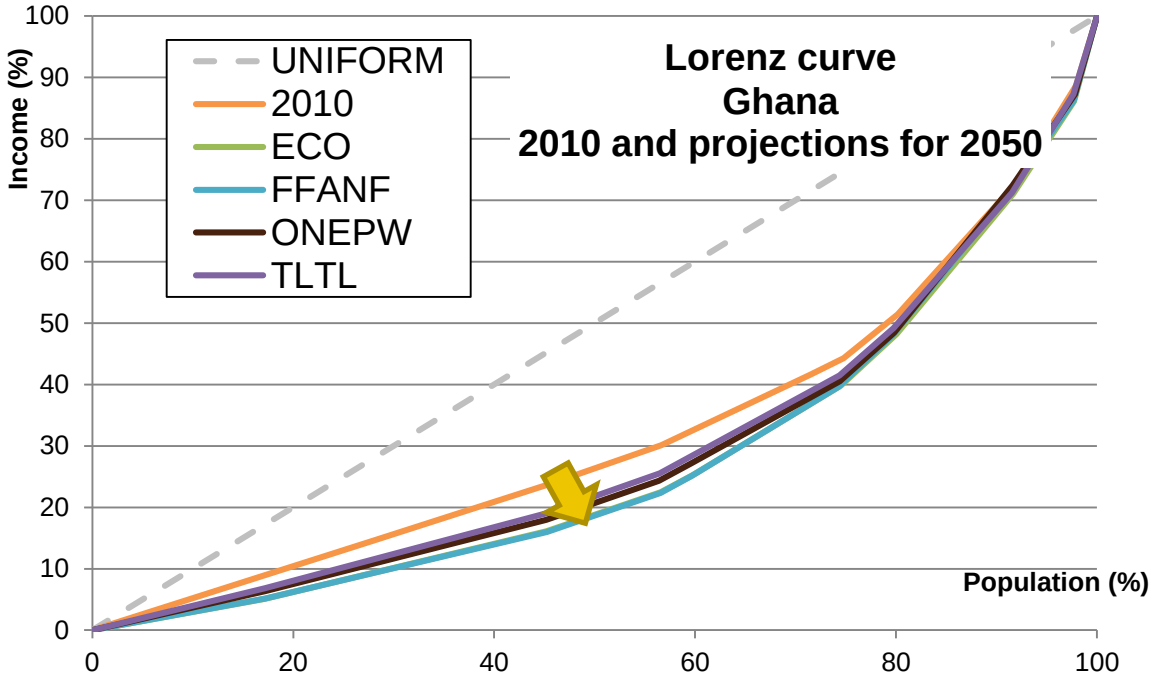


Dijk, et al. (forthcoming)

FOODSECURE scenario storylines

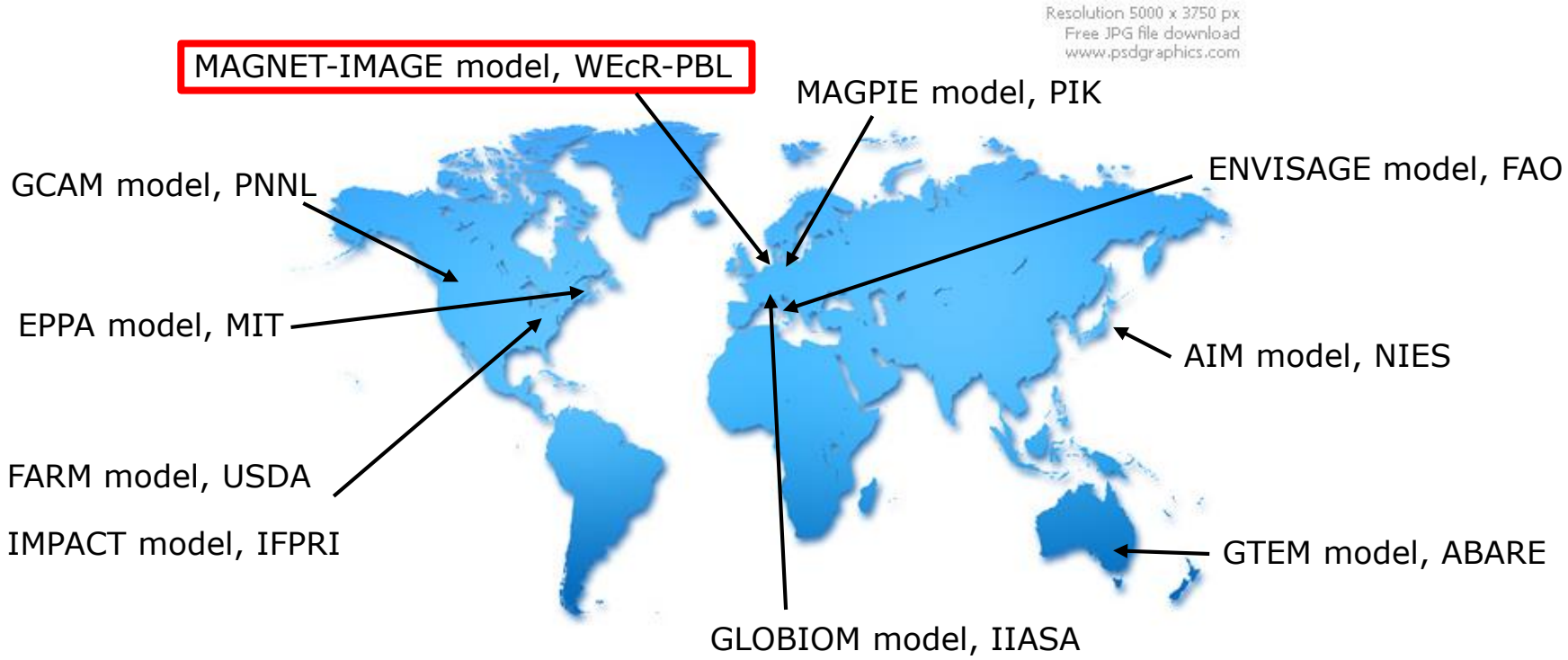


Inequality axis: Future growth not pro-poor, rationale for redistributive policy



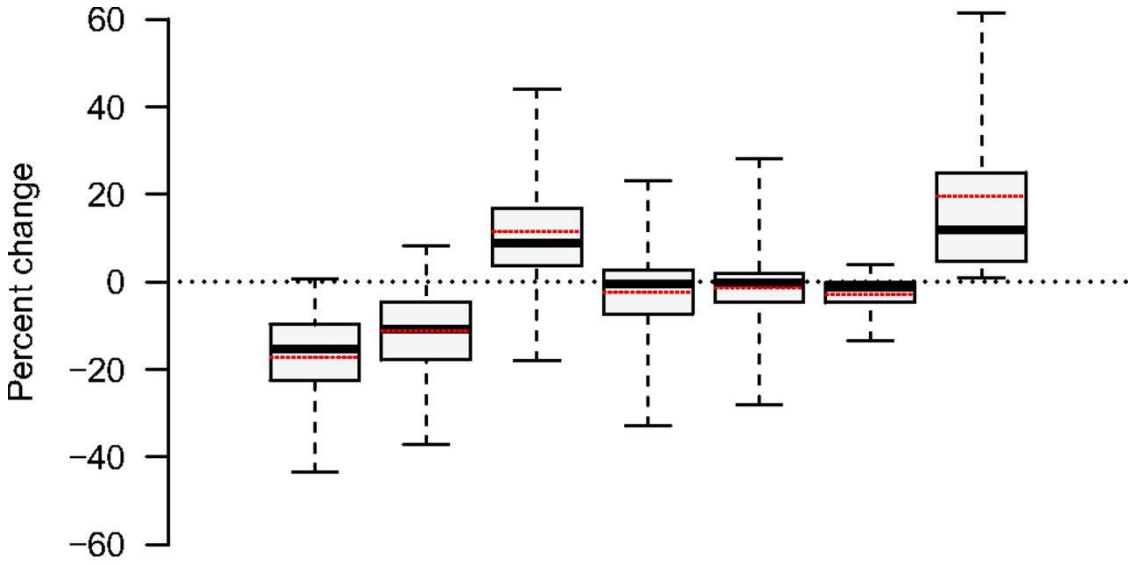
Kuiper, et al. (forthcoming)

AgMIP: Ten global economics modelling groups;



Plus several crop modeling groups!!!

Impacts Climate Change in 2050 (8.5 W/m^2)

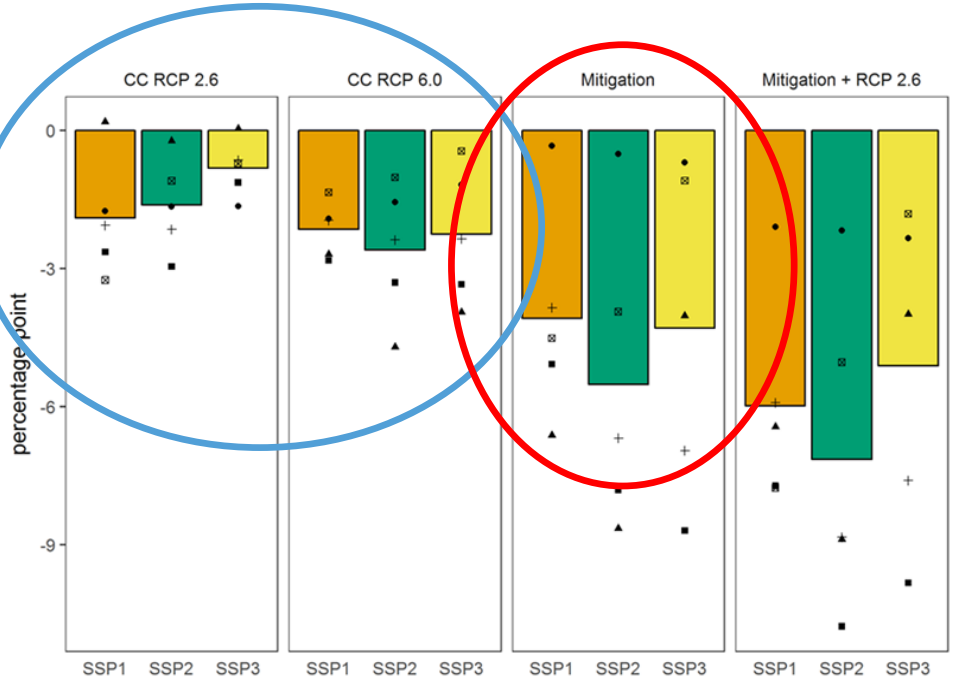


	YEXO	YTOT	AREA	PROD	TRSH	CONS	PRICE
n	2891	2891	2891	2891	2891	2891	2891
Mean	−0.17	−0.11	0.11	−0.02	−0.01	−0.03	0.2
SD	(0.13)	(0.17)	(0.25)	(0.25)	(0.26)	(0.06)	(0.24)

PNAS

Nelson et al. 2014

Climate change and mitigation impacts on total global agricultural production by 2050



ERL

Meijl et al. 2018

Towards a new engine of growth

- Externalities, substitution effects and indirect effects are important to take into account. Focus multi objectives (trade-off, synergies)
- Circularity implies to include waste and reuse of materials (material flow balances are key)
- Decoupling of growth and resource use might not be enough.
    - Change in lifestyle (less is more, common home, future generations), producer behaviour, governance
    - Rebalancing work and leisure
    - Short run to long term investments
    - From labour saving to tech change directed at grand challenges

The end