



**Realizing the Bio-Based Economy:
Bioenergy in context**

Dr. Martin Junginger

E&R Seminar series

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The E&R Bioenergy cluster

Cluster leader: Dr. Martin Junginger

Senior scientists: Dr. Birka Wicke, Dr. Floor van der Hilst and Dr. Ric Hoefnagels



15 PhD students and junior researchers:

Chun Sheng Goh, Gert-Jan Jonker, Judith Verstegen, Sarah Gerssen-Gondelach, Vassilis Daioglou, Marnix Brinkman, Anna Duden, Sierk de Jong, Ingeborg Kluts, Thuy Mai-Moulin, Jorge Moncada, Yudistira Wachyar, Yannis Tsiropoulos, Giannis Dafnomillis, Kostis Tzanetis

..and strong links to clusters of Dr. Andrea Ramirez (Biobased Materials) and Dr. Pita Verweij (Land Use and Biodiversity)



Our research areas:

Feedstock supply: a broad set of issues surrounding biomass production (both residues and dedicated crops) requires increasing attention, including land-use, biodiversity, water, soil, carbon stocks, and various socio-economic factors.





Our research areas:

Logistics: To secure significant volumes of biomass, scaling-up and design of (international) supply chains provide new challenges, including optimization of harvest, pre-treatment, transport, storage, etc.





Our research areas:

Conversion side: we model conversion processes and understanding the impacts of novel technologies and opportunities to sustainably (co-) produce of value-added products and energy.





Our approach:

- Need for integrated, holistic and multi-disciplinary assessments, including interlinkages with other fields
- Large variety of methods and tools used, e.g. geographically explicit land-use change modelling, techno-economic technology assessment, Life-Cycle Assessment, optimisation of logistic chains etc.
- Strong collaboration with partners in the department, the GeoScience faculty, the Netherlands, EU and top research institutes world-wide (especially Brazil, USA, but also many others)

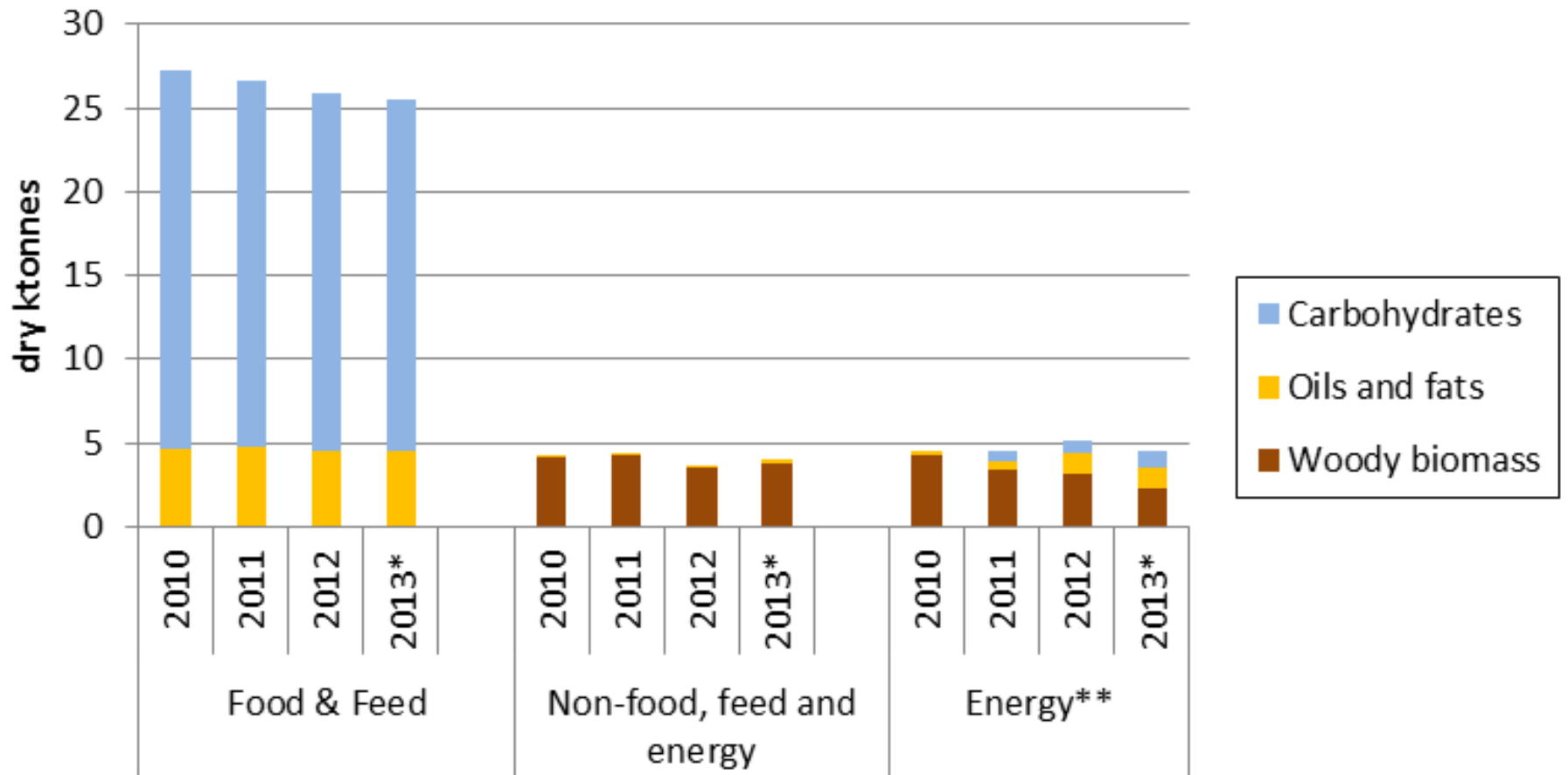


What is the Biobased economy?

- encompasses all activities related to biomass production and subsequent conversion to **energy and materials**.
- aims at reducing the carbon footprint of **energy and material supply**, and the dependence on finite and increasingly costly fossil fuels

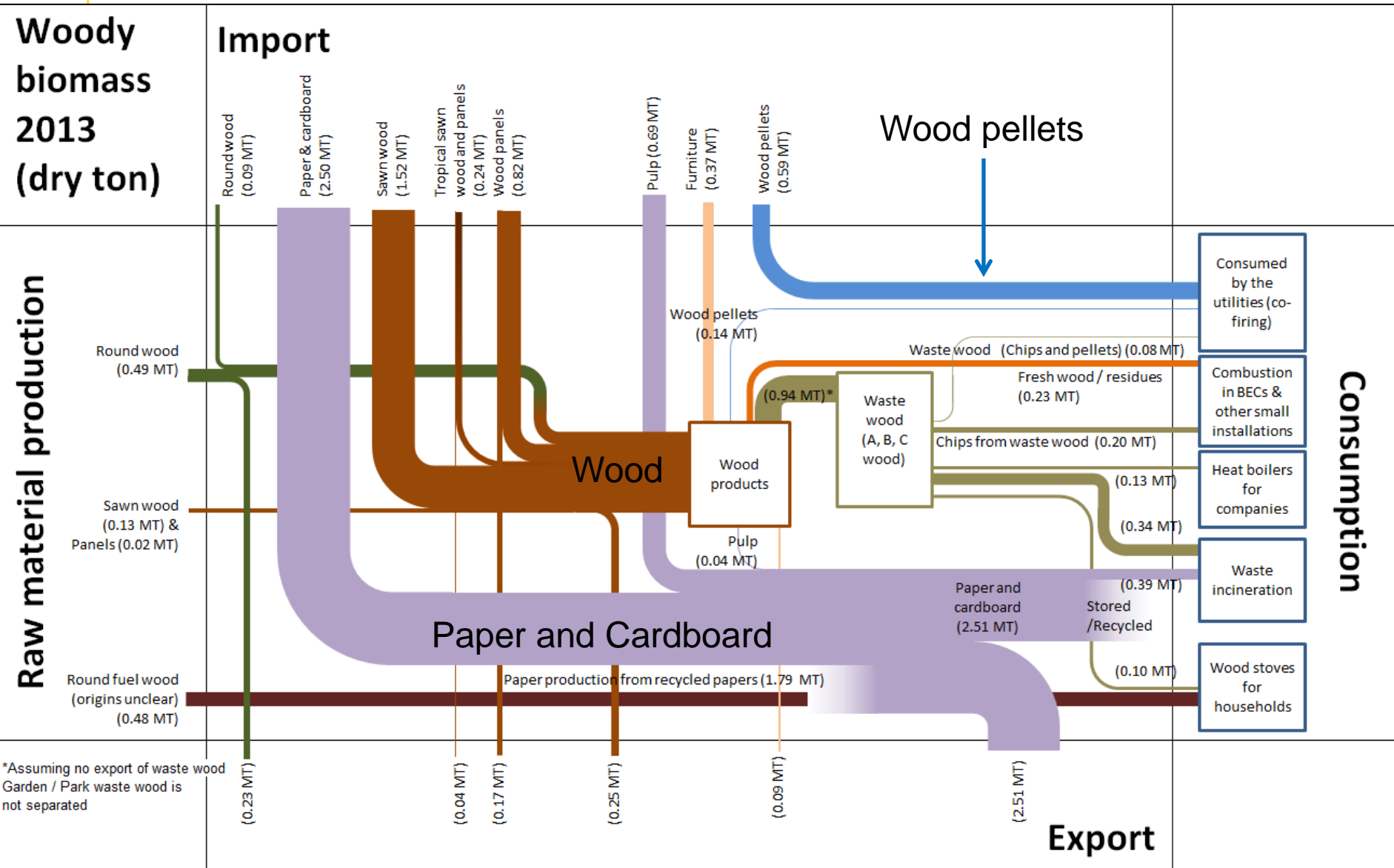


The Dutch bio(based) economy





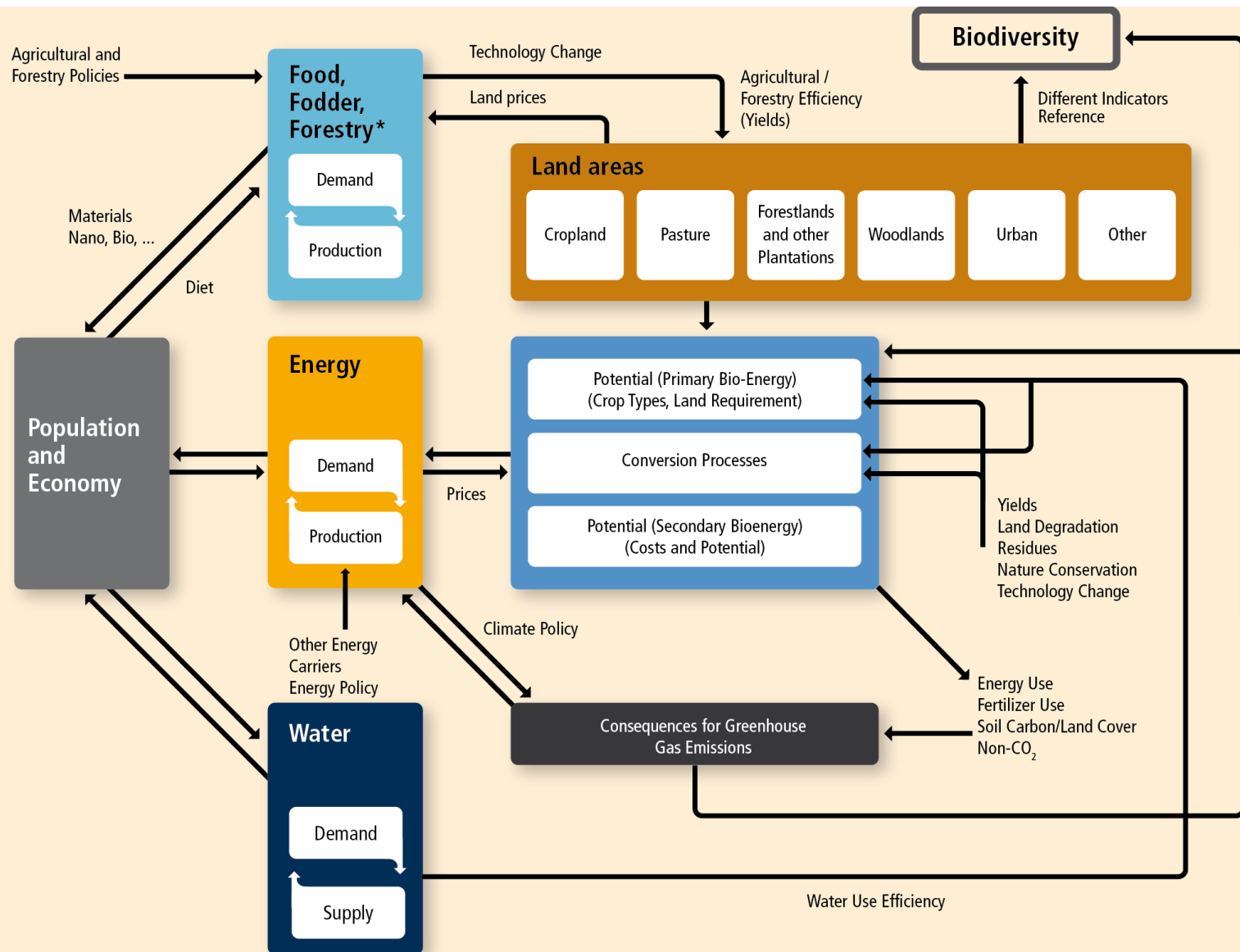
The Dutch biobased economy



*Assuming no export of waste wood Garden / Park waste wood is not separated

Understanding biomass resource potentials requires integration of many science arena's

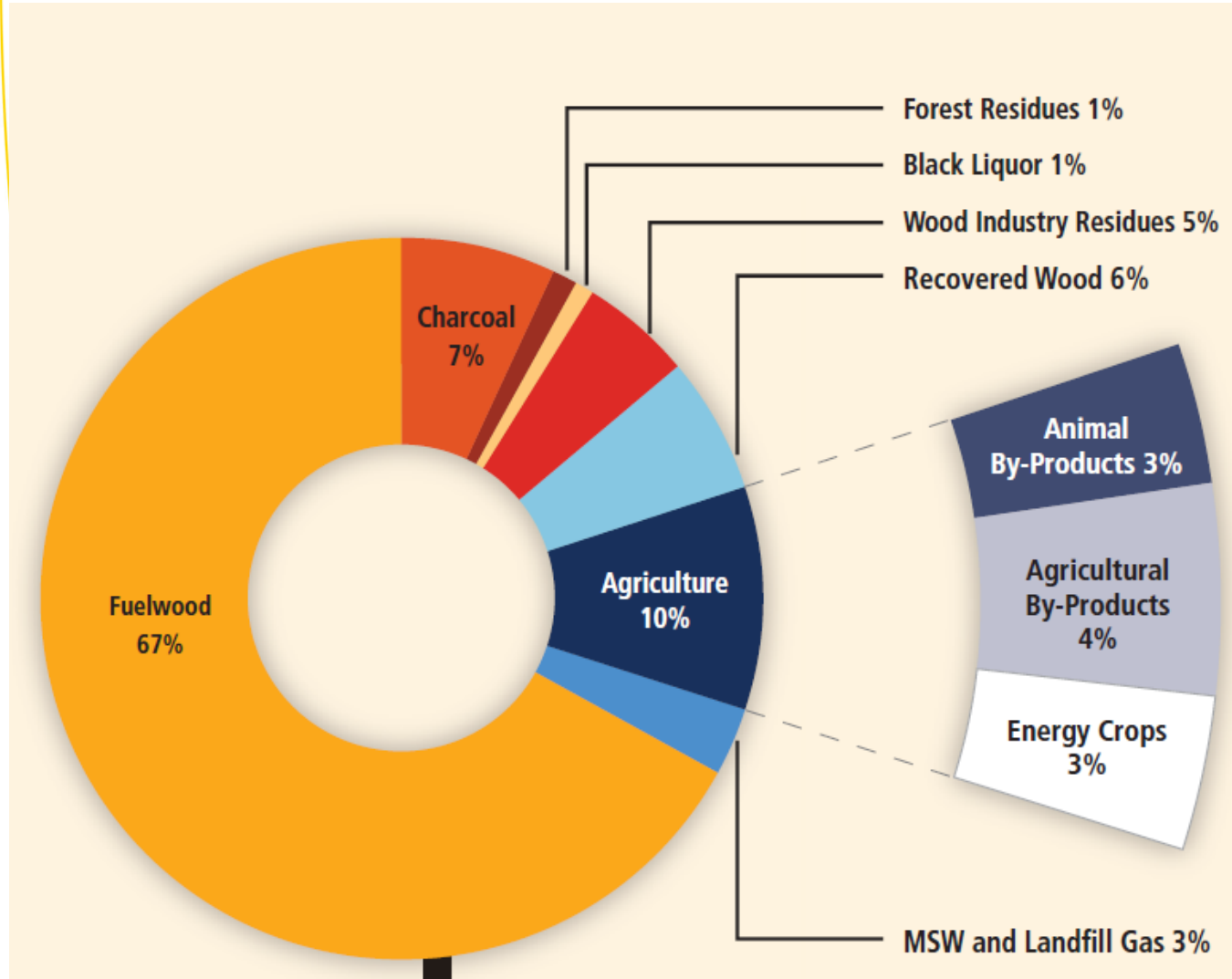
[IPCC -SRRES & Dornburg et al., Energy & Environmental Science, 2010]



* Includes Short Rotation Forestry and Products

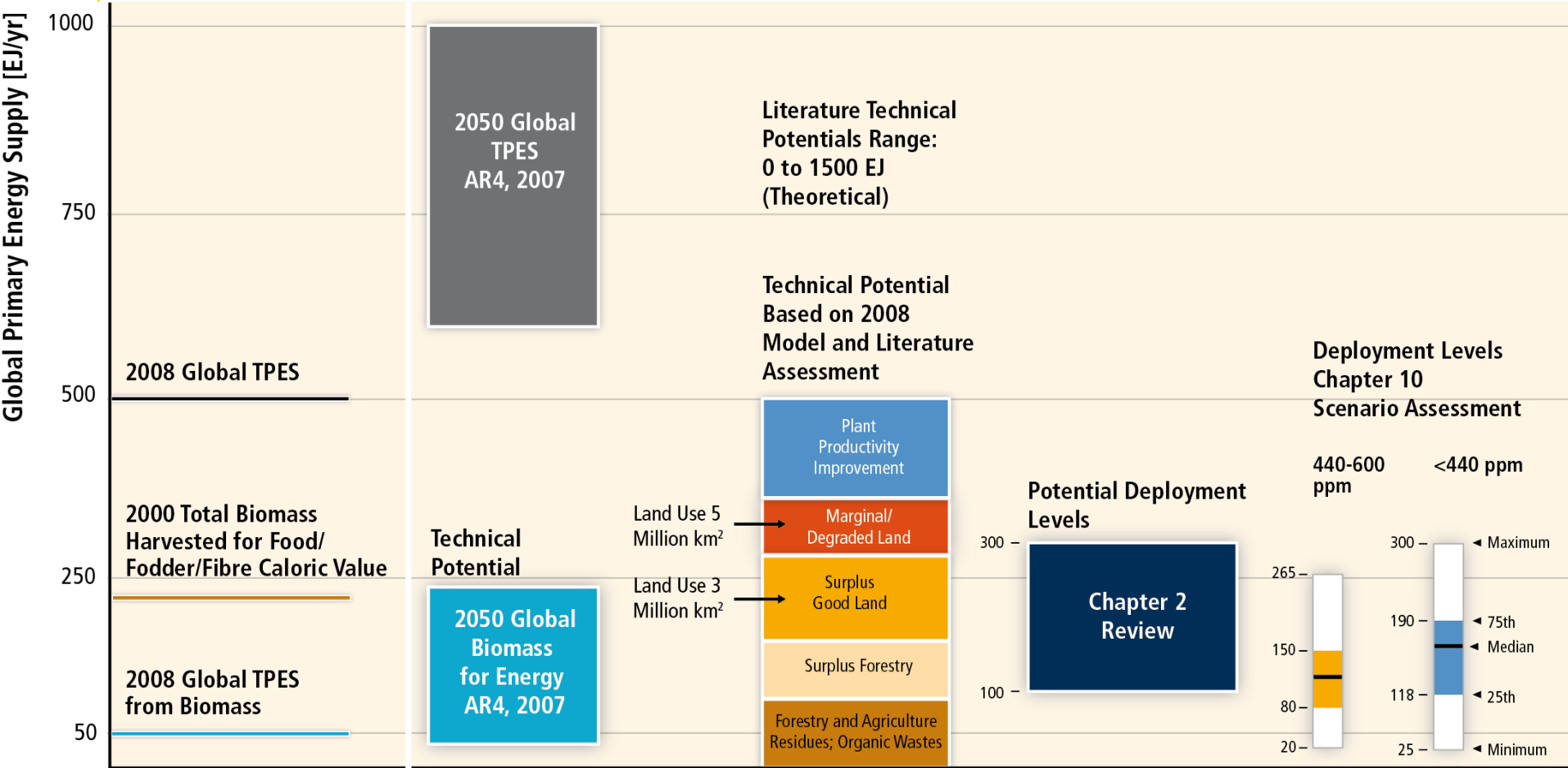


Current global bioenergy feedstock use





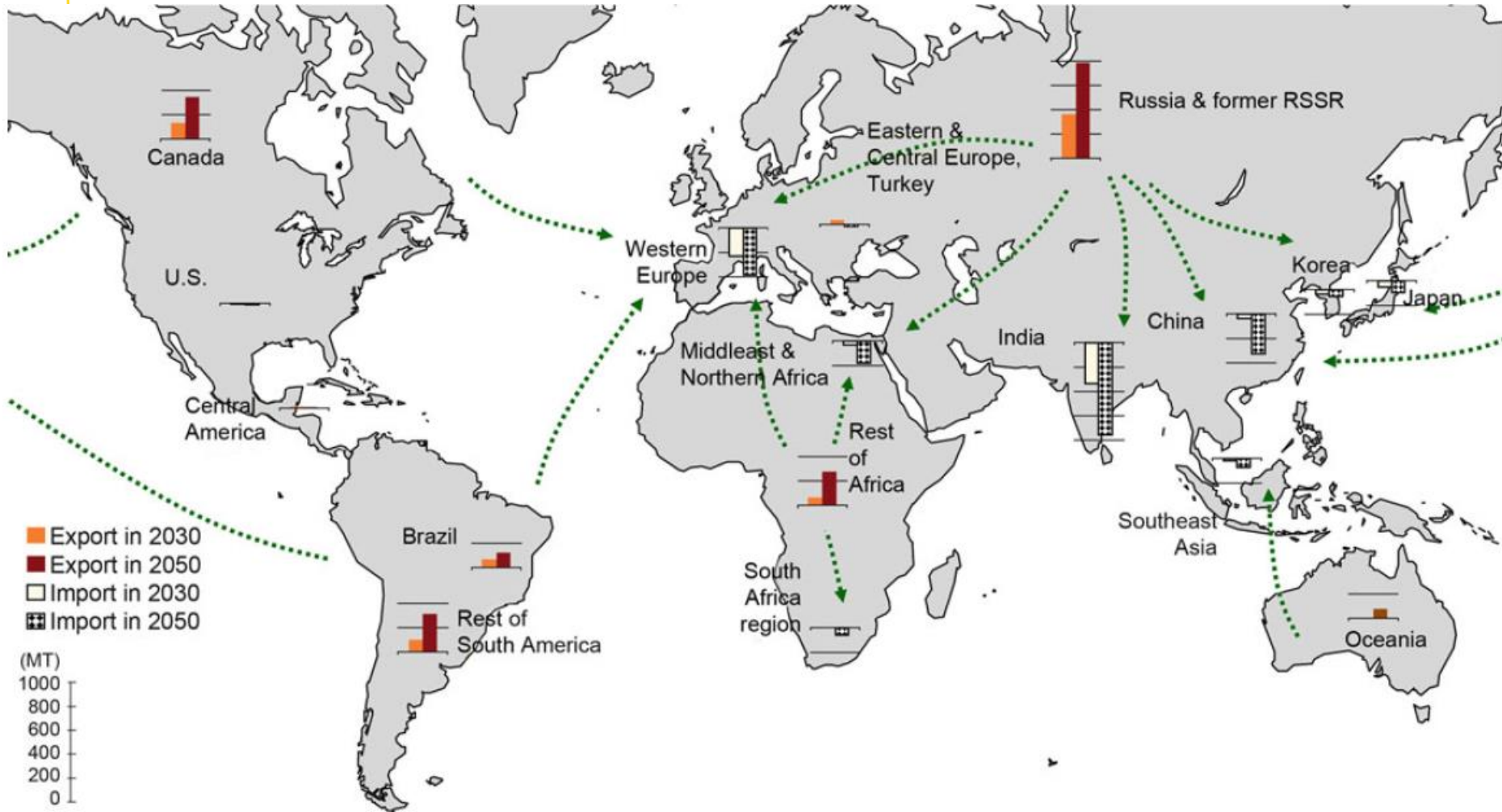
2050 Bioenergy Potentials & Deployment Levels



2050 Projections



Global solid trade by 2030/2050?





Key uncertainties biomass potentials

Issue/effect

Importance

Supply potential of biomass

Improvement agricultural management

Choice of crops

Food demands and human diet

Use of degraded land

Competition for water

Use of agricultural/forestry by-products

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Protected area expansion

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Water use efficiency

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Climate change

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Alternative protein chains

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Demand for biomaterials

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GHG balances of biomass supply chains

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Demand potential of biomass

Bio-energy demand versus supply

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Cost of biomass supply

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Learning in energy conversion

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Market mechanism food-feed-fuel

**



What are (some of) the main issues for bioenergy and the biobased economy at large

- Direct environmental impacts of dedicated (energy) crops and using biomass residues
- Indirect effects – food security and indirect land-use change
- Efficient logistics: need for pretreatment technologies and optimized logistic chains to minimize cost and GHG emissions



Thank you for your attention!

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References

- Dornburg, V., Van Vuuren, D., et al. Bioenergy revisited: Key factors in global potentials of bioenergy. *Energy and Environmental Science* 3 (3), pp. 258-267
- Faaij, A., Moreira, J.R., Chum, H., (Convening Lead Authors), Junginger, M. (Contributing Author) et al. (2011), Chapter 2: Bioenergy. In: IPCC Special Report on Renewable Energy Sources (SRRES).
- Goh, CS, Junginger, H.M. Sustainable biomass and bioenergy in the Netherlands: Report 2014. Commissioned by RVO. Forthcoming, February 2015.
- Junginger, M., Goh, C. S., & Faaij, A. (Eds.). (2014). *International Bioenergy Trade: History, status & outlook on securing sustainable bioenergy supply, demand and markets*. Springer.



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1) Questions and comments on the presentations?

2) Invitation for further cooperation: what are new & further possibilities to work together in the department of IMEW and GeoScience faculty at large?



Statements for discussion

- Can use of wood pellets for electricity production help to mobilize sustainable forestry resources and achieve short-term GHG emission reductions?
- Should biomass feedstock production for the biobased economy be maximized in the EU before relying on imports?
- Is it wishful thinking that indirect effects of feedstock production can be avoided or mitigated?



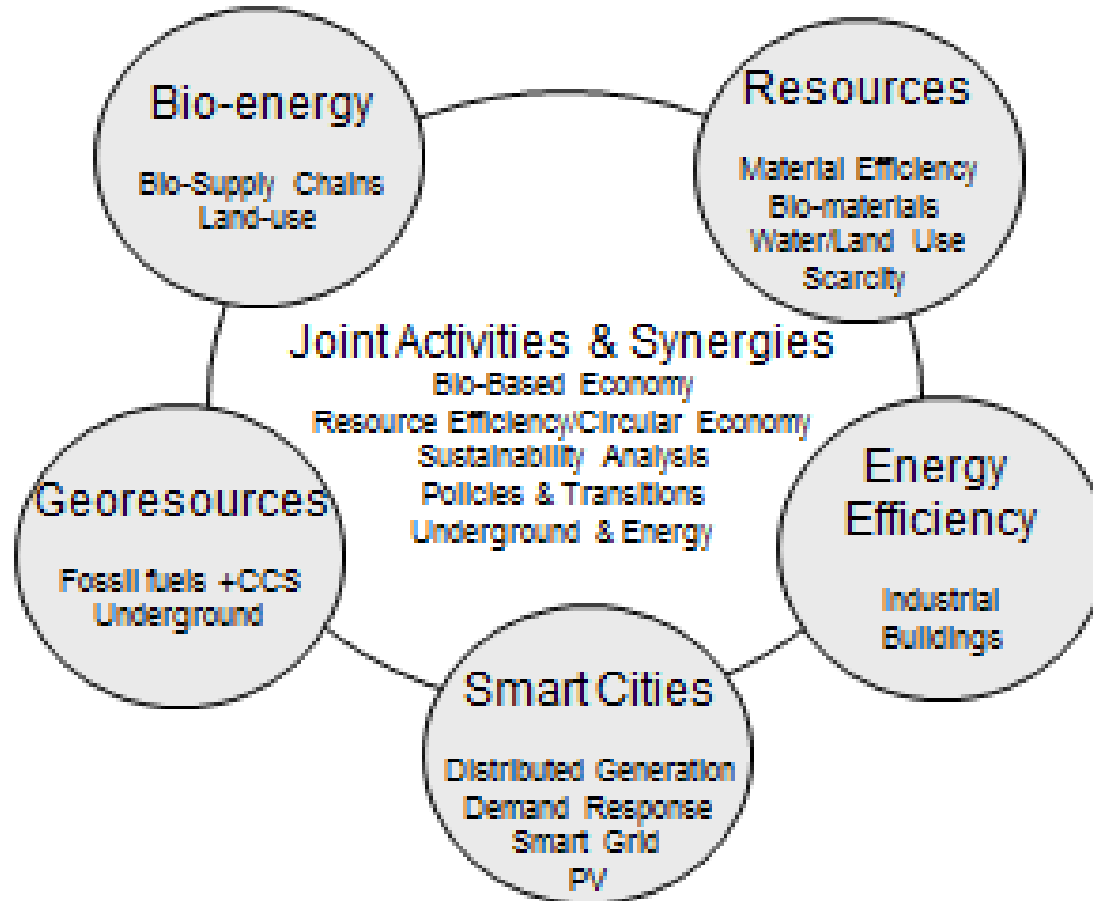
Statements KNAW for discussion

- Meestook van hout leidt niet tot innovatie en de bijdrage aan de vermindering van CO₂-uitstoot is onzeker. Het is geen effectieve manier om de uitstoot van broeikasgas te verlagen.
- Biobrandstof concurreert met voedsel. Vanwege gebrek aan grond wordt ongerepte grond ontgonnen zodat daar het voedsel kan worden geteeld dat door biobrandstof is verdrongen ('Indirect Land Use Change' ofwel ILUC).



Energy & Resources

Research Focus of Energy & Resources





Bioenergy: Driving forces, dimensions, scales...

