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Background to ILUC and other mechanisms influencing use of bioenergy to replace fossil energy

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Overview

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- **ILUC:** concept, data on ILUC-related GHG emissions of biofuels; considerations for future iLUC policies
- "**C debt**" for bioenergy from forests; risk matrix approach
- **Bioeconomy** with broader system boundaries to avoid "cherry picking" and burden shifting; sustainability requirements for all biomass
- Potential longer-term (2050) view, role of **BECCS**
- SDGs and acceptable "**bioenergy corridor**" until 2030

Indirect LUC

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- ILUC occurs outside system boundaries - for **all** incremental use
- iLUC of bioenergy = direct LUC of agriculture
- non-local character (modeling instead of monitoring); **real** world: only **direct** LUC
- **Views:** analytical (science) vs. regulatory (policy)
- **iLUC factor = proxy for regulation**

Selected Results on ILUC (1)

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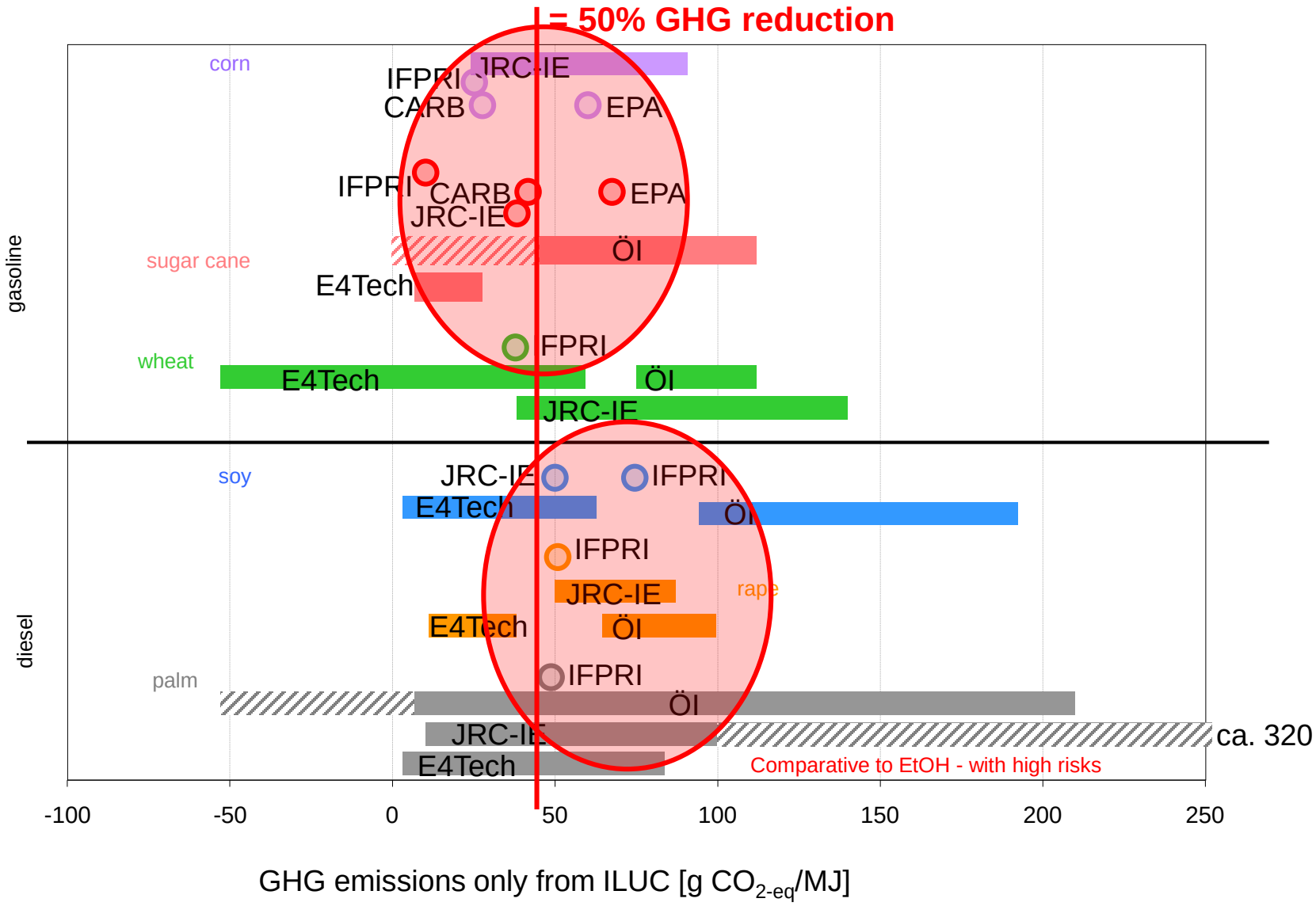

Selected Results on ILUC (2)

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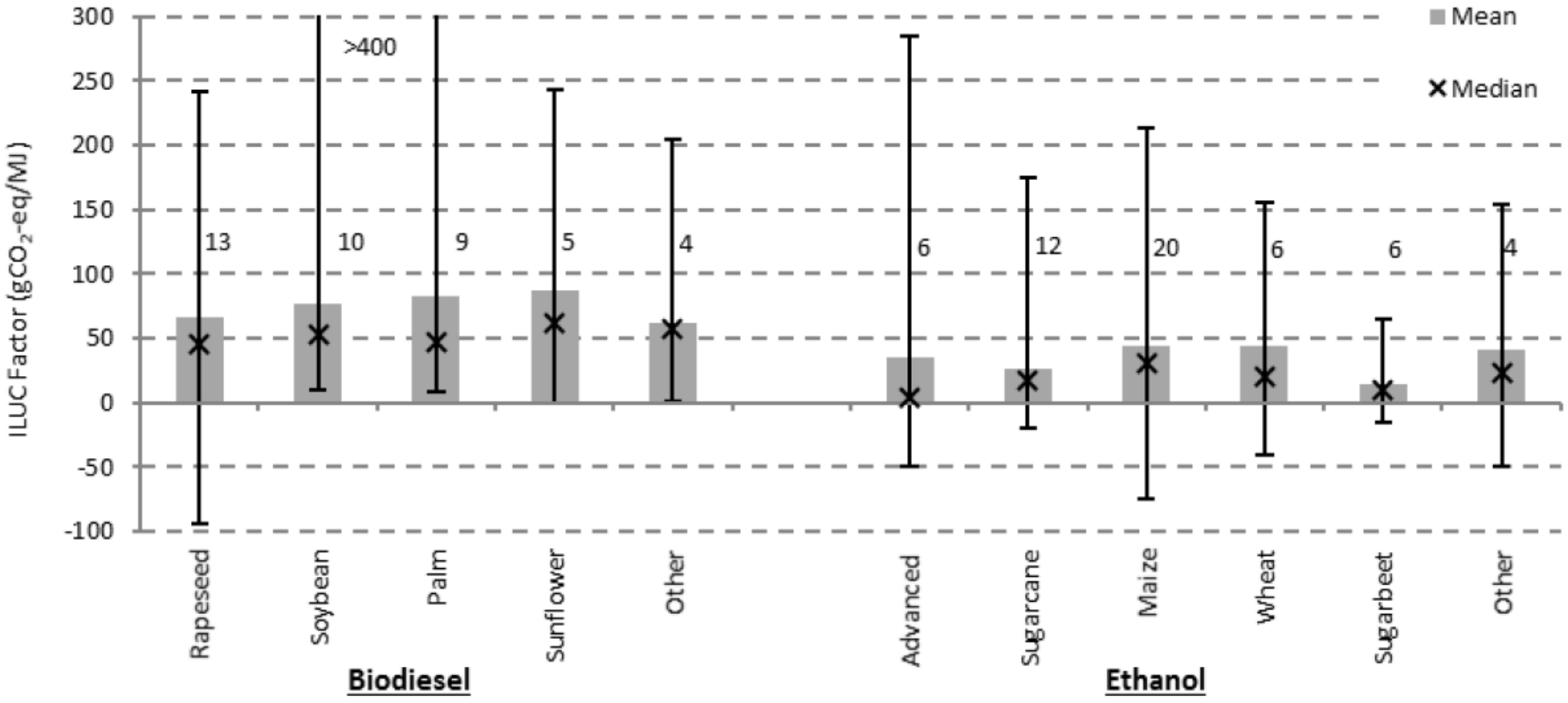

Source: Woltjer et al. (2017) Analysis of the latest available scientific research and evidence on indirect land use change (ILUC) greenhouse gas emissions associated with production of biofuels and bioliquids. Study Report on Reporting Requirements on Biofuels and Bioliquids Stemming from the Directive (EU) 2015/1513. Brussels https://ec.europa.eu/energy/sites/ener/files/documents/20170816_iluc_finalstudyreport.pdf

Dynamic View on ILUC

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- Future iLUC **can** become low
  - **Dampening** ILUC through REDD (if adequately **financed**)
  - **Intensifying** agricultural land use (**baseline**, tradeoffs!)
  - Better **governing** LUC in key countries (AR, BR, ID…)
- **Prioritizing** low-iLUC feedstocks
  - residues & wastes (2nd generation)
  - **unused + degraded** land (+ biodiversity/social safeguards)
- **iLUC is no "fate"**

C Balance of Forest Bioenergy

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- Models give 10-20 years of payback time for **forest residues** = **nearly carbon neutral**
- Forest baseline (what happens if no bioenergy?) and fossil reference: influence of **counterfactual**
- **Differentiation**:
  - Type of forest biome (boreal, temperate, (sub)tropic)
  - Type of forest product (residues, thinnings, low- or high quality stemwood)

“C Debt“ from Forest Bioenergy?

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Woody biomass source for energy use	Time horizon for CO_2 emission reduction					
	short (10 years)		medium (50 years)		long (centuries)	
	Coal	gas	coal	gas	coal	gas
Boreal forest, stems final harvest	---	---	-	- -	+	+
Temperate forest, stems final harvest	---	---	+/-	-	++	+
Harvest residues, thinnings, landscape care & salvage wood*	+/-	+/-	+	+	++	++
SRC on marginal agricultural land	+++	+++	+++	+++	+++	+++
SRC replacing forest	-	-	++	+	+++	+++
industrial residues, wastes	+++	+++	+++	+++	+++	+++

*-; --; ---: **bioenergy system emits more** CO_2eq than reference fossil system **in given time frame***
*+/-: GHG emissions of **bioenergy and fossil are comparable** **in given time frame***
*+; ++; +++: **bioenergy system emits less** CO_2eq than reference fossil system **in given time frame***
** For harvest/thinning residues & salvage wood, balance depends on alternative use (burning) and decay rates*

Source: own compilation based on JRC (2013)

Biomass: Cascading!?

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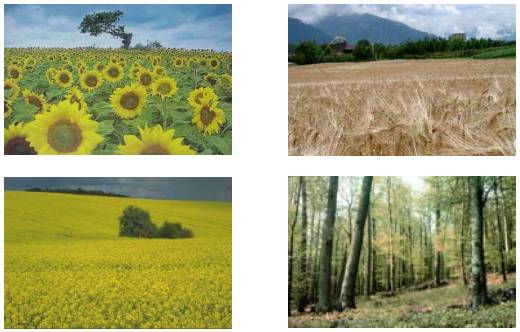
Biomass crops



1st priority: food & (high-value) materials

Residues/wastes

End of cascade: energy use

Consistent with EU **circular economy** concept – but not as a criterion for certification, see
IEA Bio (2016) Cascading of woody biomass: definitions, policies and effects on international trade
http://task40.ieabioenergy.com/wp-content/uploads/2013/09/t40-cascading-2016.pdf

A Matter of Scale: Biomass and Energy

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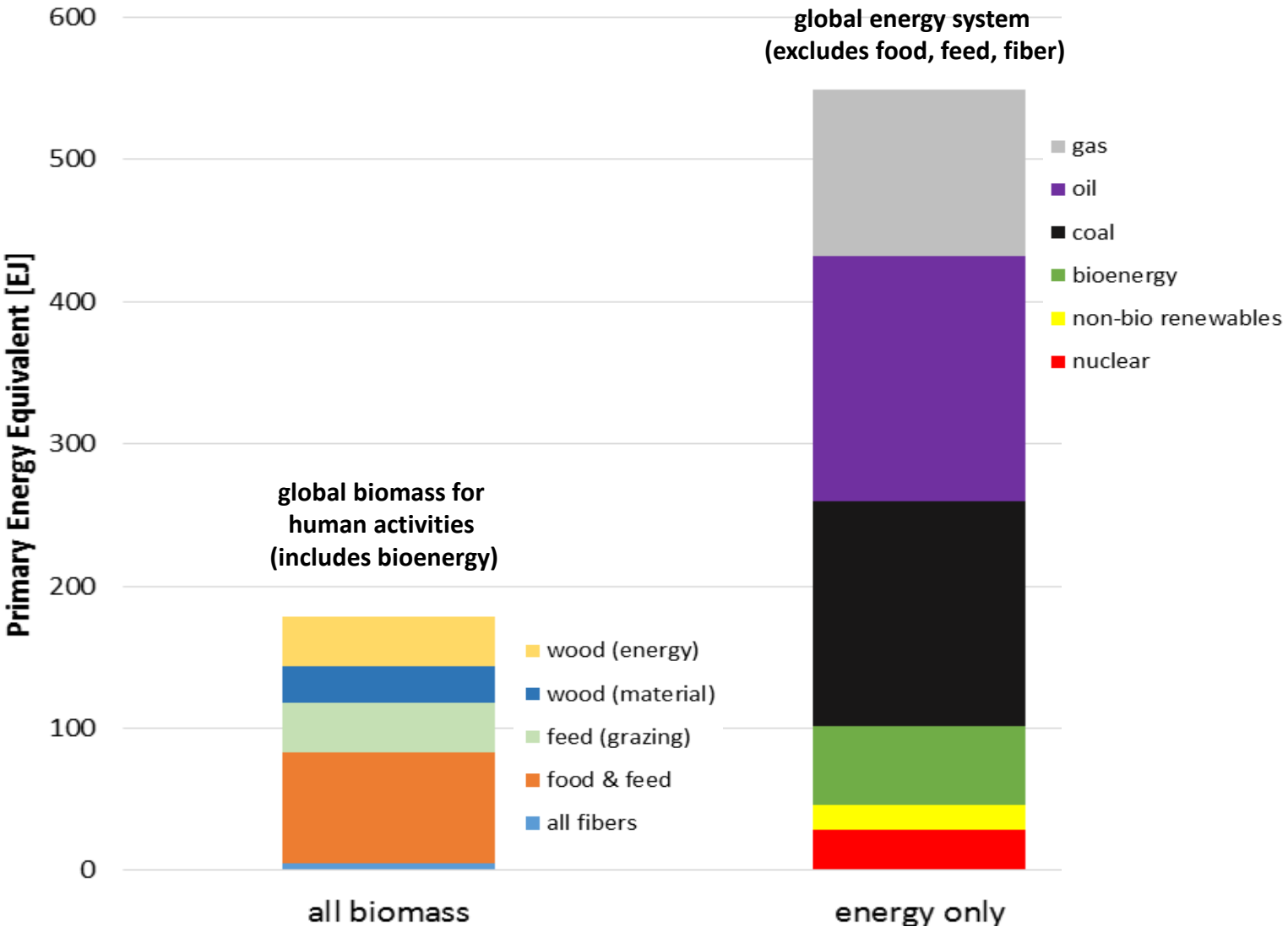

Source: IINAS calculation for 2010 based on data from IEA and nova

Long-term Perspective

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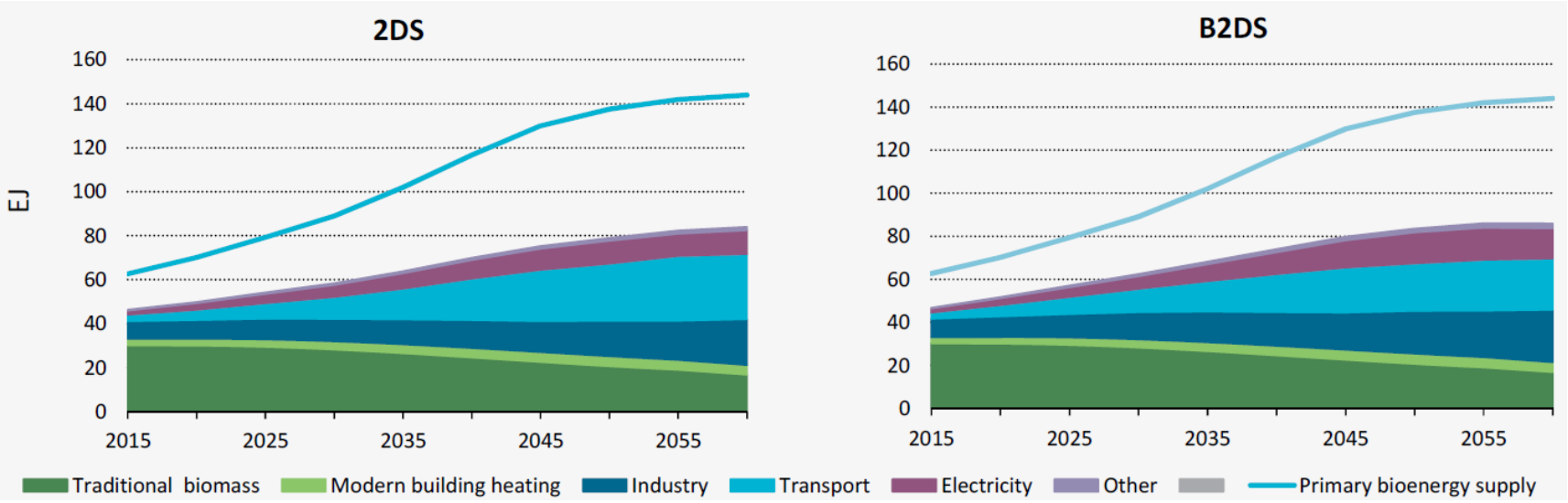
IEA Roadmap: Delivering **Sustainable** Bioenergy



- More climate change mitigation (**2 → 1.5 °C**), **more bioenergy** (esp. BECCS)
- More activities to ensure sustainability of the **bioeconomy**, incl. food and materials
- **Governance** of a sustainable bioeconomy: SDGs

SDGs: The normative framework

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from: https://sustainabledevelopment.un.org/sdgs

Medium-term Bioenergy Corridor?

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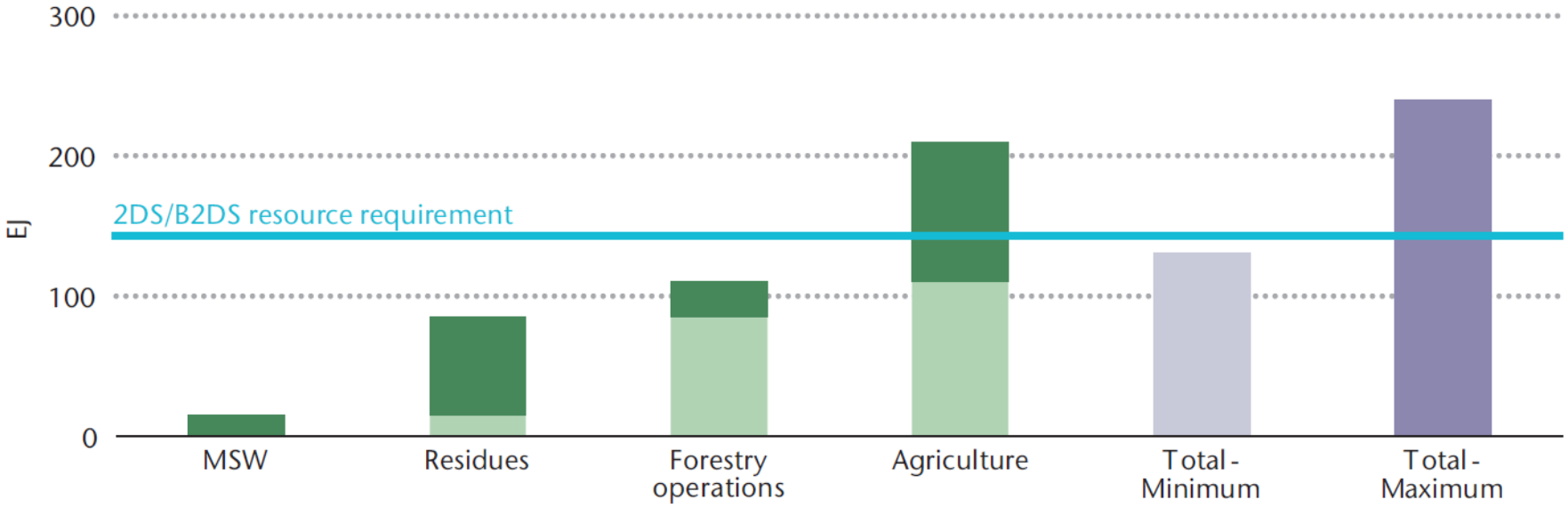
IEA Roadmap: Delivering **Sustainable** Bioenergy



- Sustainable global bioenergy potential enough for IEA scenarios, but **role of BECCS remains disputed**
- To reduce risk of negative tradeoffs between SDGs, consider an "**agreeable corridor" of sustainable global bioenergy use until 2030**, e.g. 70 – 90 EJ (excluding BECCS)

Sustainable Bioeconomy: a Vision

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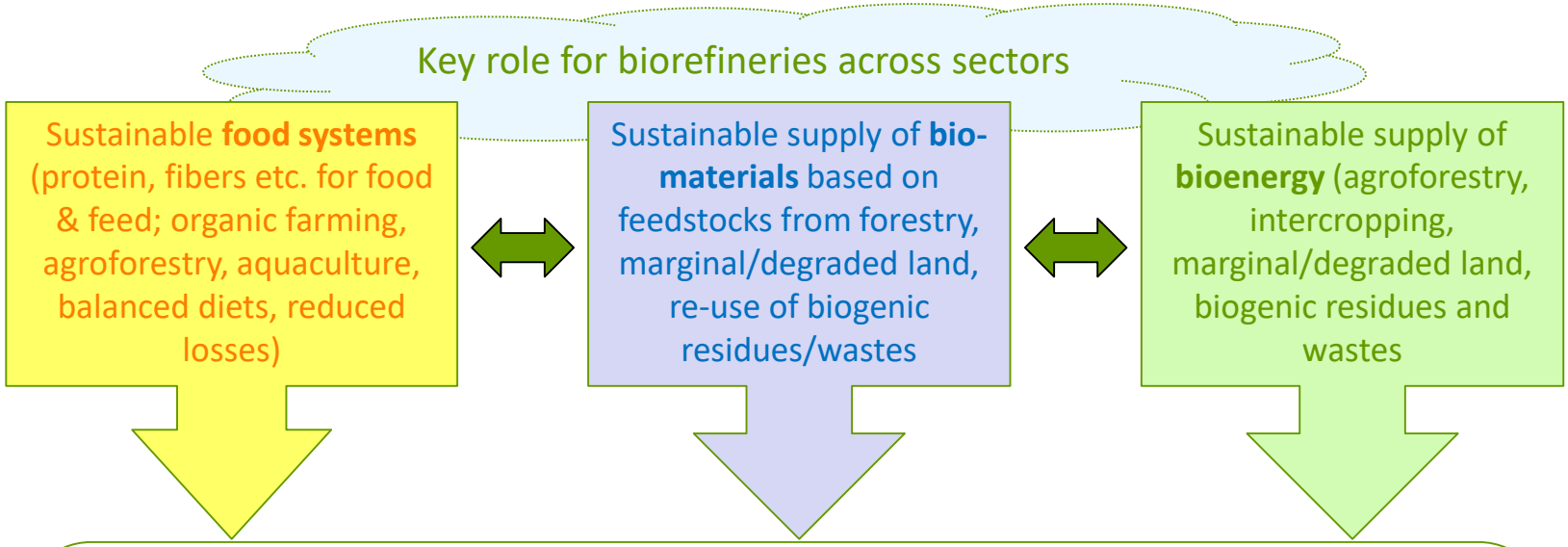

- Global food security, secure land tenure
- Regional/local employment and value added (rural development)
- Sustainable production in agriculture, fishery and forestry
- Reduction of food losses, recycling of wastes (circularity)
- Conservation of ecosystem services (biodiversity, C sequestration, recreation, soil fertility, water…)

More Information

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IEA Bioenergy **Inter-task project "Measuring, governing and gaining support for sustainable bioenergy supply chains"** http://itp-sustainable.ieabioenergy.com

GBEP
Global Bioenergy Partnership

www.globalbioenergy.org

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