

# Future perspectives of international bioenergy trade

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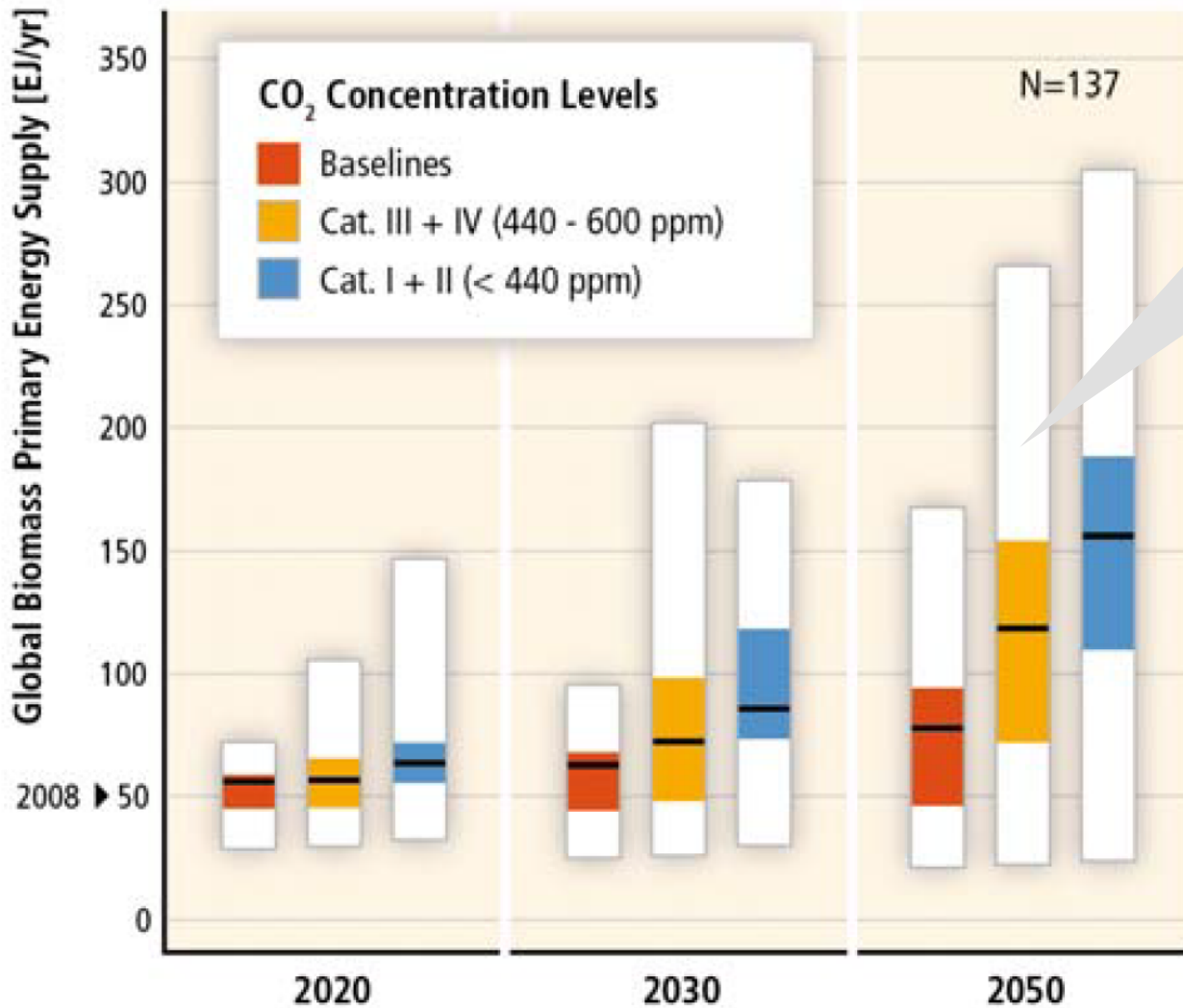
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# Global bioenergy scenarios



Implication of scenarios on future international bioenergy trade?

Source: IPCC SRREN, 2011

# Objective

Provide insight into “possible futures” of bioenergy trade and discuss drivers, implications and challenges

## Methodological approach

- Investigate to which extent various global energy models and scenarios take into account bioenergy trade
- Identify the drivers and implications of different global bioenergy scenarios on bioenergy trade
- Summarize the range of results into a set of storylines of future international bioenergy trade
- Derive conclusions

# Comparison of models and scenarios

- ✓ **Screening of existing models and studies**
  - 28 models have been screened in total
  - Preselection of models
  - Request (small questionnaire) to selected modeling groups
  
- ✓ **Selection of models for further investigation: GFPM, IMAGE/TIMER**
  
- ✓ **Three biomass fractions to be covered:**
  - **solid biomass**
    - based on residues and waste
    - based on primary energy products
  - **liquid biomass** distinction of three fractions
  
- ✓ **Regional aggregation level: 20 world regions**

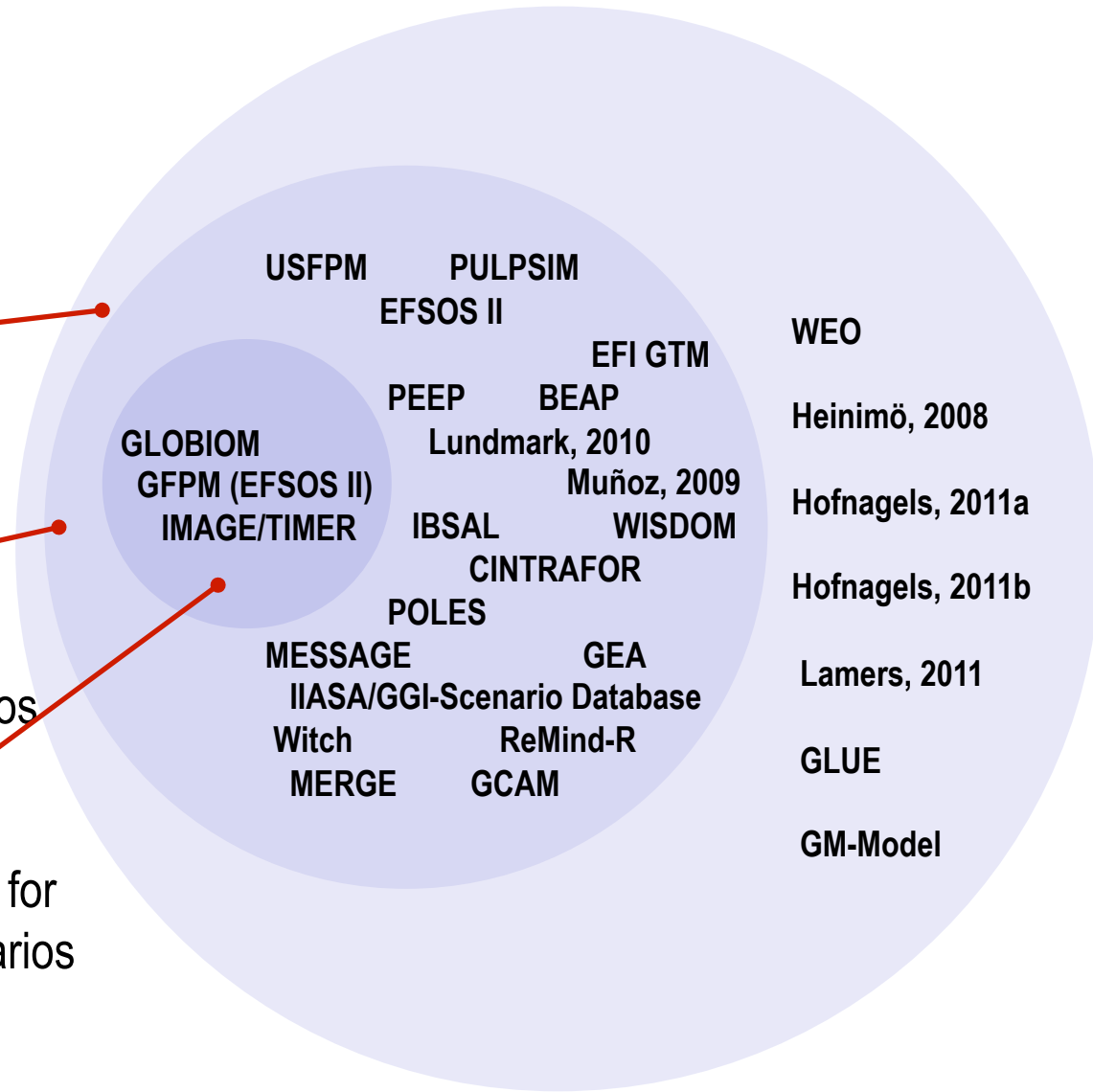


# Model selection

**Whole range**  
All investigated models  
(studies)

**Long List**  
Models dealing with  
bioenergy trade scenarios

**Short list**  
Models highly relevant for  
analysis of trade scenarios



# Models I – GFPM (EFSOS II)

**Short Description:** Partial Equilibrium Model

**Coverage Biomass Trade:** Global - Trade between country and world market rather than between individual countries

**Assumptions regarding trade:**

- equilibrium calculation determine the direction of change of trade flow
- Institutional and other constraints limit the adjustment that can take place in any given year.
- Effect of tariffs change the cost of transportation.

**Sectoral Coverage:** Limited to the forest and forest biomass sectors

- covers 14 principal categories of forest products

**Regional Aggregation:** 180 countries,

- 50 from Africa, 35 from North Central and South America, 50 from Asia and Oceania, and 45 from Europe and former USSR

**Scenario Time Frame** Up to 2060

# Models II – IMAGE/TIMER

**Short Description:** Systems dynamic Integrated assessment model

**Coverage Biomass Trade:** Yes

**Assumptions regarding trade:** Bilateral trade available

- n regions, n markets. Each region imports from wherever offers the lowest price

- Imports have transport costs, plus a factor determining how "open" they are to that region (i.e. indicating OECD countries or closed economies)

**Sectoral Coverage:** Traditional biomass (no trade), modern solid biofuel, liquid biofuel

**Regional Aggregation** global 26 regions

**Scenario Time Frame:** up to 2100

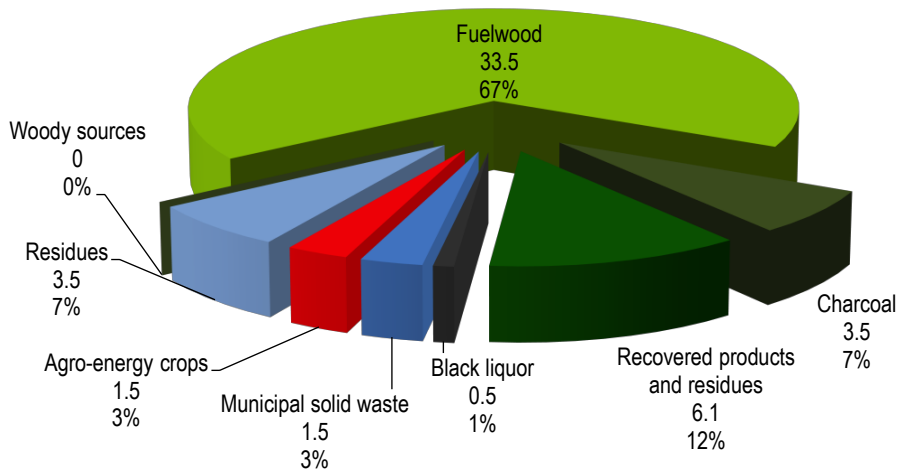


# Selected drivers

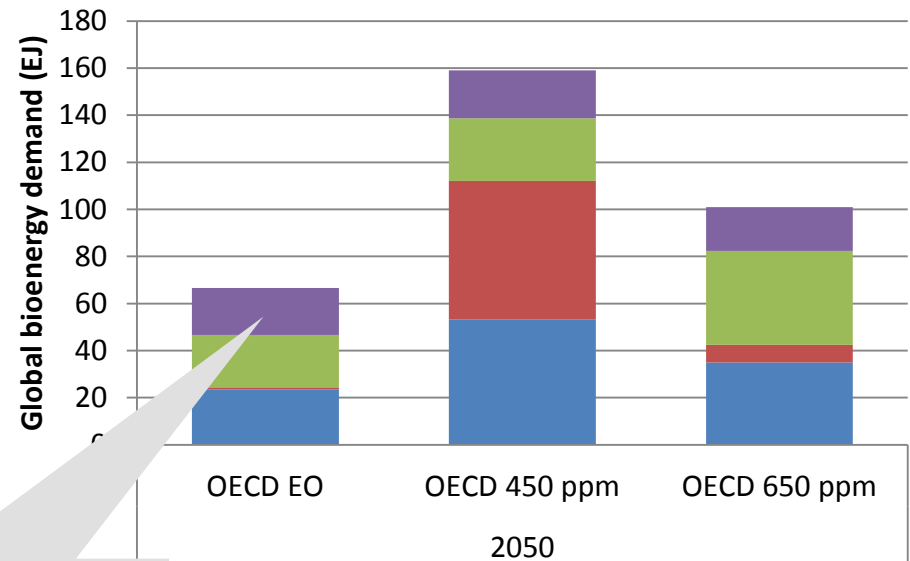
- **Regional balancing of supply and demand**
  - Barriers and drivers of bioenergy demand (in current supply and demand regions): oil price, policies, technological learning, ...
  - Barriers and drivers of bioenergy supply
  - Regional development of bio-based industry
  
- **Barriers and drivers of bioenergy trade**
  - Logistics
  - Trade policies
  - Sustainability requirements
  - ...
  
- **Technological change**
  - Traditional biomass => modern biomass
  - Change in resource base

# Shift from traditional to modern biomass

Global structure of bioenergy use, 2009



Global structure of bioenergy use according to selected scenario results Image/Timer, 2050



Share of traditional biomass in 2050:  
13%-18%

- Solid biomass, traditional biomass
- Liquid Biomass
- Solid biomass primary energy products
- Solid biomass residues and waste

Source: estimation according to FAO 2010

# Conclusions (1)

- **Quantities of produced biomass are rising in all investigated scenarios.**
- **All investigated scenarios show a strong increase in total internationally traded biomass (in a range of 20-90 fold increase from 2010 to 2050).**
- **The scenarios indicate a considerable dependency of global bioenergy use on international trade. Bioenergy use decreases significantly with higher trade barriers.**
- **The development of international bioenergy trade will be driven strongly by**
  - Climate policies
  - Regional differences of policies
  - Technological change and thus shift in the biomass resource base
  - Overall global energy demand, GDP, population, ...

## Conclusions (2)

- Only a few number of global energy models explicitly simulate international bioenergy trade.
- Nevertheless, all global energy scenarios need to make an assumption on the future development of bioenergy trade. Mostly, this is only implicitly the case and is not clearly documented.
- A further investigation and integration of international bioenergy trade, barriers and drivers into existing modeling frameworks is highly needed.