International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

science for global insight

REDD-PAC Kick-off meeting
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REDD pac

# Experience with GLOBIOM for Climate Change Policies

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# REDD-PAC & Climate change policies

A lot in common but not fully similar:

- Importance of :

1. Consistency with wider climate policy approaches
   - IPCC scenarios
   - RCPs climate impacts

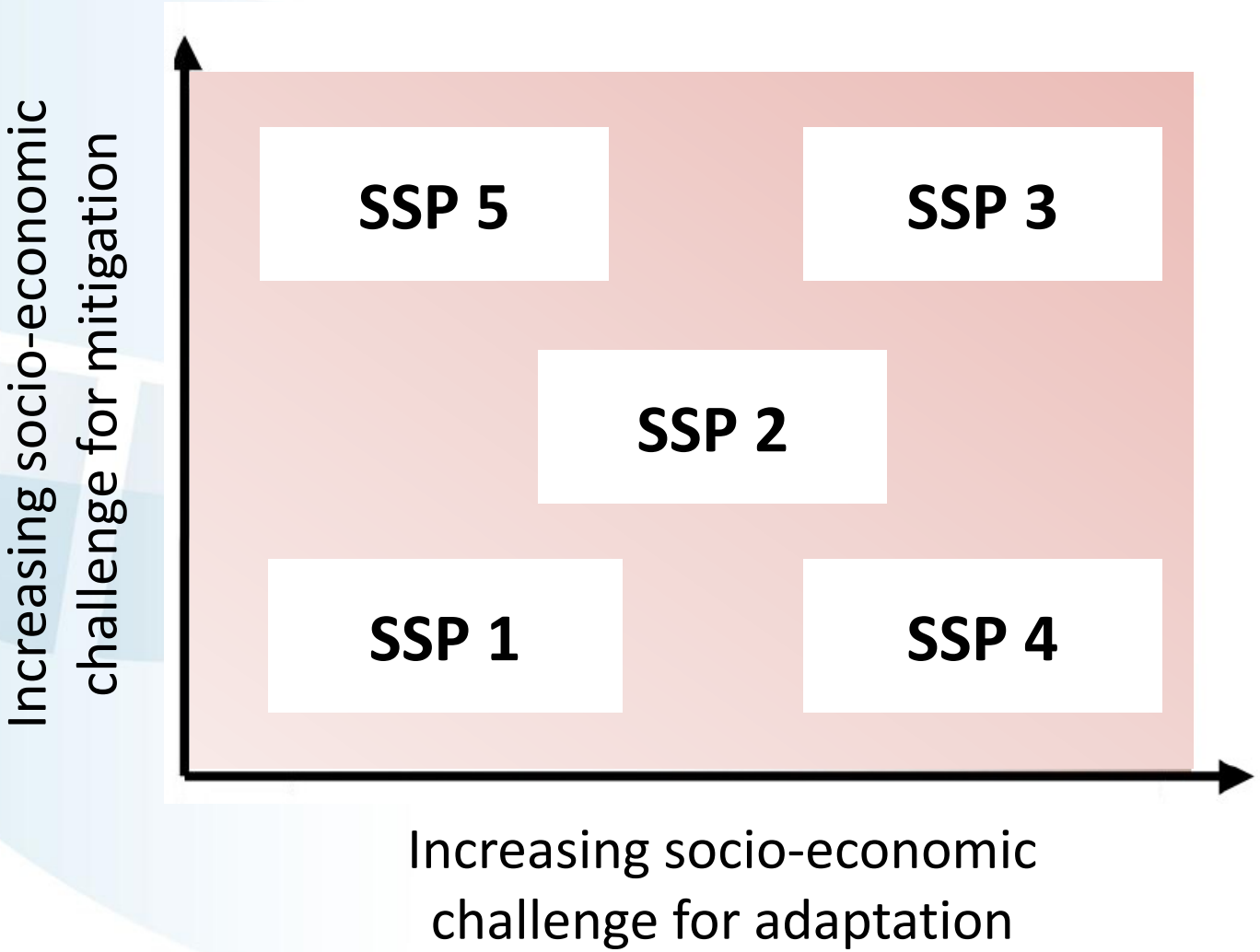
   Prerequisite for scientific outreach
2. Developing tools informative for efficient policy design
   - Interaction with other mitigation policies
   - Leakage across land use activities
   - International reallocation effects

- Significant experience already acquired through GLOBIOM modelling
- Collaboration through a wide IIASA ESM network

# GLOBIOM: Typical applications

- **Agricultural prospective**
  - Schneider et al. (2011) **Impacts of population growth, economic development, and technical change on global food production and consumption.** *Agricultural Systems*
  - Smith et al. (2010) **Competition for land,** *Philosophical transactions*
  - **Applied scenarios such as Eastern Africa with CCAFS**
- **Deforestation**
  - Mosnier et al. (2010) **Modeling impacts of development trajectories on forest cover in the Congo Basin**
  - **Living Forest Report** – WWF (2011)
- **Climate change mitigation**
  - Valin et al. (2010) **Climate change mitigation and food consumption patterns**
- **Biofuels**
  - Fuss et al. (2011) **A stochastic analysis of biofuel policies**
  - Havlik et al. (2010) **Global land-use implications of first and second generation biofuel targets**. *Energy Policy*
  - Mosnier et al. (2010) **Direct and indirect trade effects of EU biofuel targets on global GHG emissions**
- **And several others…**

# REDD baseline in the IPCC scenario space?



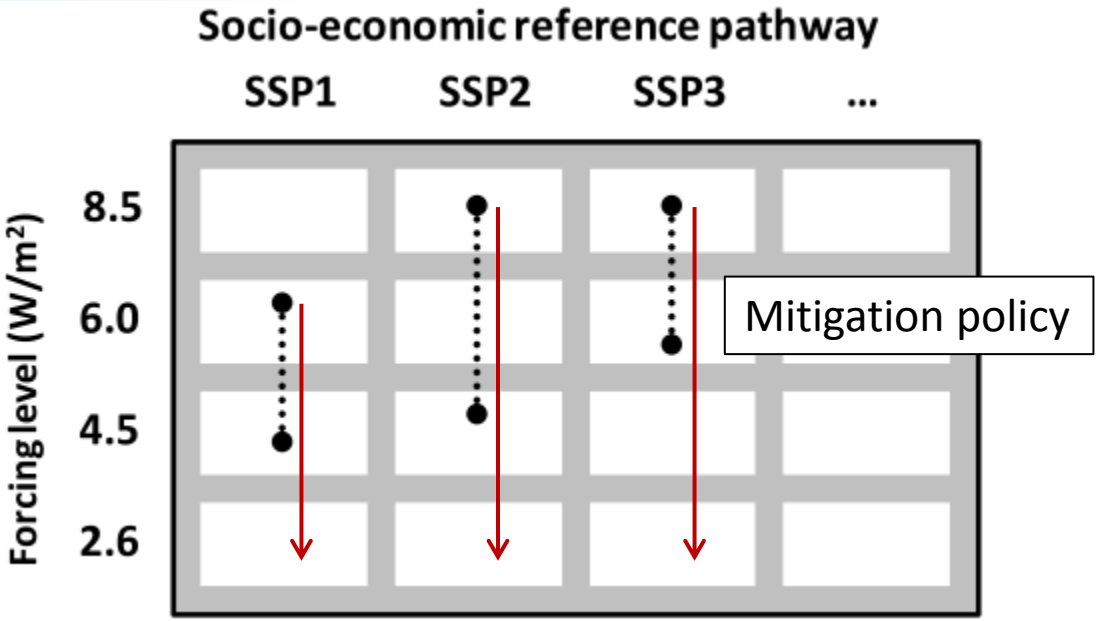

Source: O'Neill presentation. Den Haag meeting, 14-16 May 2012, SSP Working group.

# SSPs: Beyond quantitative scenario drivers

| | SSP x | | | SSP y | | | SSP z | | |
|---|---|---|---|---|---|---|---|---|---|
| | Country Income Groupings | | | | | | | | |
| SSP Element | Low | Med | High | Low | Med | High | Low | Med | High |
| Land use change regulation, e.g. forest protection (cconsistent with Env. Policy?) | | strong | | | weak | | weak | medium | strong |
| Agriculture | | | | | | | | | |
| Crop yield increase | | rapid | | | medium | | slow | medium | rapid |
| Total calories per capita (incl. food waste?) | | low | | | medium | | | high | |
| Animal share | | low | | | medium | | low | medium | high |
| Trade liberalisation (cf. Trade, globalisation) | | rapid | | | medium | | | slow | |
| Livestock systems change (e.g. increase in feed conversion rates)? | | rapid | | | medium | | slow | medium | rapid |
| Water use efficiency? | | high | | | medium | | | low | |
| Baseline bioenergy demand? | | high | | | medium | | | low | |

# GLOBIOM modelling, SSPs, RCPs

- Pop & GDP are exogenous drivers of demand structure in GLOBIOM
- Other RAPs characteristic likely to be taken into account in a systematic approach (work on productivity projections)
- Connexion to mitigation policies through a matrix approach



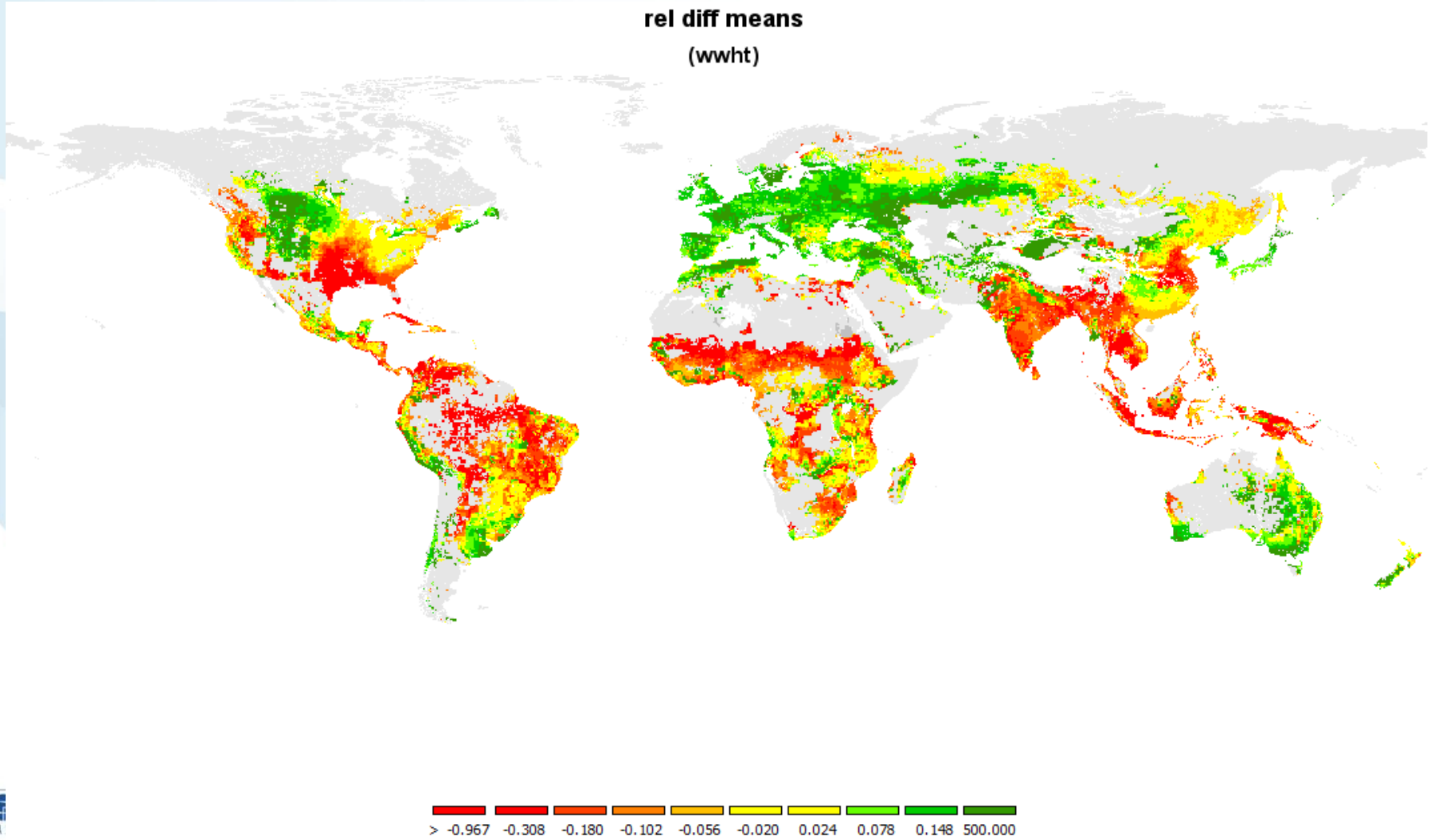

Source: Matrix from Arnell et al., 2011

# Experience from IIASA ESM

- Impact, Adaptation, Vulnerability (Working Group II)
  - AgMIP (Agricultural Models Intercomparison and Improvement Project)
    - Focus on food production and food security
    - More cross-model direction
  - ISI-MIP (Intersectoral Impact Model Intercomparison Project)
    - Focus on all impacts (GLOBIOM mostly food security and land use)
    - More cross-scenario direction
  - Asia vulnerability to climate change with GLOBIOM+EPIC
- Integrated Assessment Community (Working Group III)
  - Collaboration with MESSAGE model to provide RCPs baseline and mitigation pathways with biomass potential contribution

# Impact of Climate Change (WG II)

Relative Difference in Means (2050/2100) in Wheat Yields
[Data: Tyndall, Afi Scenario, simulation model: EPIC]



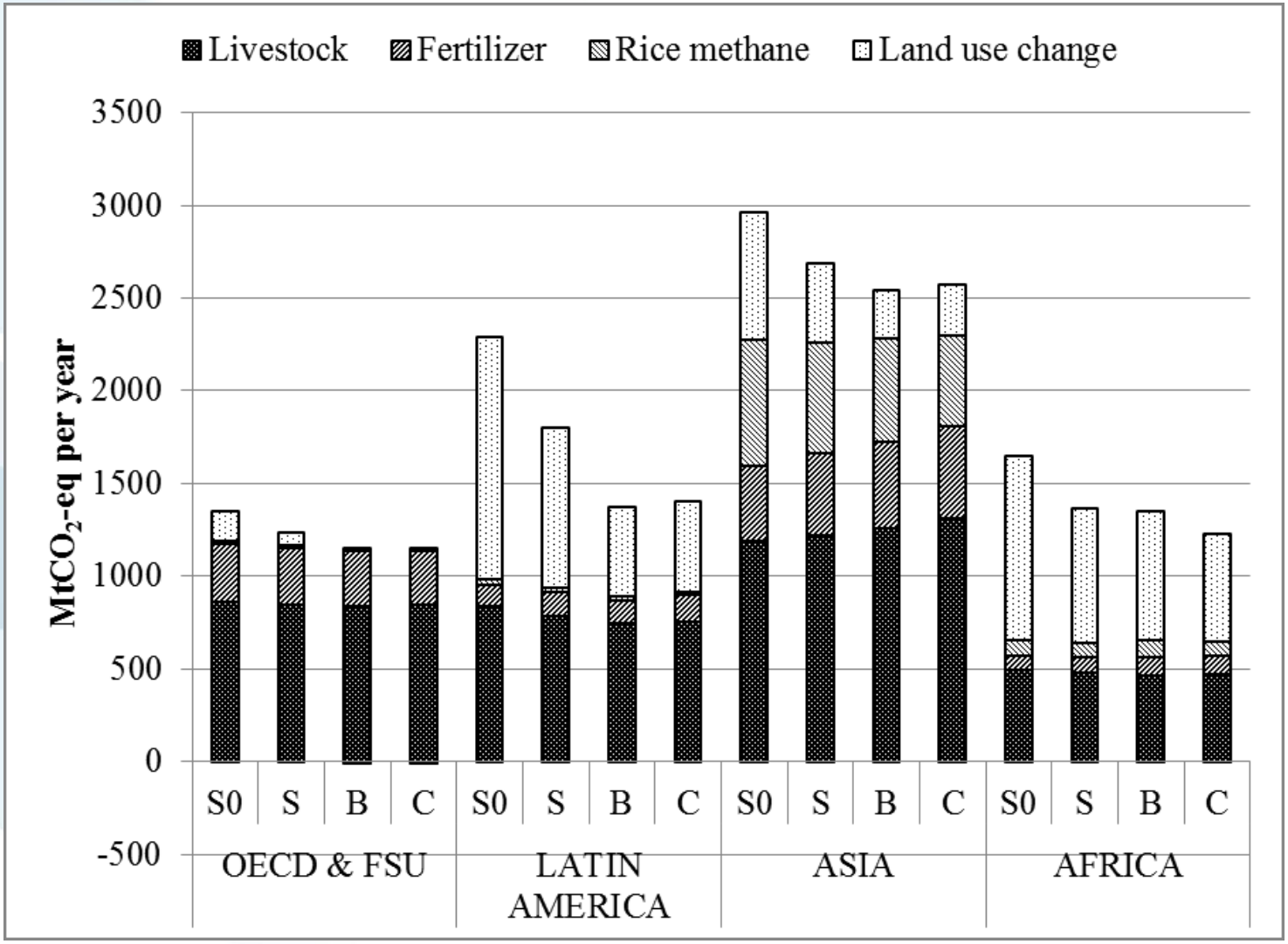
# Mitigation policies (WG III)

- Investigation of different mitigation strategies
  - Abatement possible through system shifts
    - Crops (subsistence, low input, high input, irrigated)
    - Livestock (grass fed, mixed extensive, mixed intensive)
    - Different biofuel policies (1st / 2nd generation, high yield crops/plantations)
  - Add-on technologies
  - Role of reallocation and trade policies
  - Increased productivity pathways

# GHG sources consistent with IPCC rules

| Sector | Source | GHG | Reference | Tier |
|---|---|---|---|---|
| Forest | Above and below ground biomass | $CO_2$ | IIASA G4M Model (Kindermann et al., 2008)<br>Tier 3: Austria | 2 / 3 |
| Other vegetation | Above and below ground biomass | $CO_2$ | Ruesch and Gibbs (2008) | 1 / 2 |
| Crops | Fertilizers | $N_2O$ | EPIC runs output/IFA + IPCC EF<br>Tier 3: EU | 2 / 3 |
| Crops | Rice methane | $CH_4$ | Average value per ha from EPA | 1 |
| Livestock | Enteric fermentation | $CH_4$ | RUMINANT (ILRI) + Livestock systems | 2 |
| Livestock | Manure management | $N_2O$, $CH_4$ | RUMINANT (ILRI) + Livestock systems | 2 |
| Livestock | Manure grassland | $N_2O$ | RUMINANT (ILRI) + Livestock systems | 2 |
| **UNDER PROGRESS** | | | | |
| Crop | Soil organic carbon | $CO_2$ | Not at global level.<br>Good information available for EU through EPIC | 2 / 3 |

# Emission response to productivity




Havlik et al., forthcoming

Thank you for your attention

Questions…

- www.globiom.org