Land Use in the SSPs

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Overall Process

- Five Shared Socio-economic Pathways were designed to explore a range of future societal circumstances that exhibit a wide range of
  - Challenges to adaptation, and
  - Challenges to mitigation.

SSP1: Sustainability

SSP2: Middle of the Road

SSP3: Regional Rivalry

SSP4: Inequality

SSP5: Fossil-Fueled Development
Overall Process

SSPs (Basic Drivers)

Narratives

O’Neill et al

GDP

Dellink, Crespo, Leimbach et al.

POP

KC & Lutz

Urbanization

Jiang & O’Neill

Technology, Demand, Lifestyle, Productivity

Energy

Land-use

GHG Emissions

Aerosol/Pollutant Emissions

IAM Models

AIM/CGE, IMAGE, GCAM, MESSAGE, REMIND, MAGPIE, WITCH, GLOBIOM

Overall Process
Combining SSPs and RCPs

Shared Socioeconomic Pathways

- SSP1: Sustainability
- SSP2: Middle of the Road
- SSP3: Regional Rivalry
- SSP4: Inequality
- SSP5: Fossil-fueled Development

Climate (RCPs) vs. 2100 forcing level (W/m²)

- ~7
- ~3.7
- ~1.9

Range of IAM baseline scenarios
Global Forest Cover in all SSP-RCP-IAM combinations
### Shared Socioeconomic Pathways

**ScenarioMIP Design: Specific Scenarios**

<table>
<thead>
<tr>
<th>SSP1</th>
<th>SSP2</th>
<th>SSP3</th>
<th>SSP4</th>
<th>SSP5</th>
<th>Tier 3 simulations (RCPs)</th>
</tr>
</thead>
<tbody>
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<td>SSP1</td>
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<td>SSP3</td>
<td>SSP4</td>
<td>SSP5</td>
<td>SRES A2, B1, B2</td>
</tr>
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#### Climate (RCPs)
- 2100 forcing level (W/m²)
  - ~7
  - ~3.7
  - ~1.9

#### SSPs
- **SSP1**: Sustainability
- **SSP2**: Middle of the Road
- **SSP3**: Regional Rivalry
- **SSP4**: Inequality
- **SSP5**: Fossil-fueled Development

**Range of IAM baseline scenarios**

**Tier 1**

**Tier 2**

**Tier 3**
Global Forest Cover in ScenarioMIP Scenarios
Spatial Forest Area

- SSP1 - 26
- SSP4 - 34
- SSP2 - 45
- SSP5 - 85

Pac

GCAM-ssp460 forest
- SSP4 - 60

AIM-ssp370 forest
- SSP3 - 70

MESSAGE-ssp245 forest

MAGPIE-ssp585 forest
- SSP5 - 85

2100 forest
Translating land use

Gridded land use, land cover, land management

Harmonisation Anomaly method Attribute changes in IAM data to LUH2 grid finding nearest available cell

Gridded land use, land cover, land management

Slide from D. van Vuuren
So what could possibly go wrong?

- IAM -> LUH2
  - LUH2 represents cropland, pasture, urbanization as well it can… but not perfect (>~80%)

- LUH2 -> ESM
  - A bit more dangerous – as it is mostly out-of-sight, and with less attention.
  - To be discussed this week.

- Not translated
  - LUH2 uses an underlying natural area map
  - LUH2 will not pick-up deliberate reforestation

- Other possible mismatches
  - Adding new assumptions
  - Very different carbon pools
  - Albedo

Slide from D. van Vuuren
Global Forest

primf + secdf
Added Tree Cover

area fraction

Data Min = 0.0, Max = 6.2, Mean = 0.0
Acknowledgments

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• **GCAM:** Kate Calvin, Jae Edmonds, Stephanie Waldhoff, Steve Smith, …

• **IMAGE:** Detlef van Vuuren, Elke Stehfest, David Gernaart …

• **MESSAGE-GLOBIOM:** Keywan Riahi, Volker Krey, Oliver Fricko, Petr Havlik, Shilpa Rao, Nils Johnson, Zig Klimont…

• **ReMIND-MAGPIE:** Elmar Kriegler, Nico Bauer, Alexander Popp, Florian Humpenöder, Jessica Strefler, Marian Leimbach, …

• **WITCH-GLOBIOM:** Massimo Tavoni, Johannes Emmerling, …
Thank you