MiniCAM Results: Agriculture, Land Use, Climate Stabilization with Incomplete International Participation

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EMF22 International Transition Scenarios

Two Accession Regimes:
- Immediate: Everyone joins in 2012
- Delay:

<table>
<thead>
<tr>
<th>Group</th>
<th>Regions</th>
<th>Years of Accession</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Annex I (less Russia)</td>
<td>2012</td>
</tr>
<tr>
<td>Group 2</td>
<td>Brazil, Russia, India, China</td>
<td>2031 to 2050</td>
</tr>
<tr>
<td>Group 3</td>
<td>Rest of the World</td>
<td>2051 to 2070</td>
</tr>
</tbody>
</table>

Five climate targets
- 4.5 W/m² (650 CO₂-e): Not-to-Exceed
- 3.7 W/m² (550 CO₂-e): Not-to-Exceed and Overshoot
- **2.6 W/m² (450 CO₂-e): Not-to-Exceed and Overshoot**
Limiting Radiative Forcing to 2.6 W/m²

- This presentation is meant to illustrate the challenges associated with limiting radiative forcing from Kyoto gases to 2.6 W/m².

- We do not assess the possibility or probability of the futures described. This analysis simply identifies potentially feasible pathways that limit radiative forcing to 2.6 W/m².
Emissions Mitigation: 2.6 W/m²

GLOBAL

GROUP 1

GROUP 2

GROUP 3

Immediate-NTE: -70% by 2020

Overshoots induce NEGATIVE emissions

This is not a prediction. It is intended to illustrate potentially feasible pathways that limit radiative forcing to 2.6 W/m² Kyoto.
Electricity Generation: 2.6 W/m² Not-to-Exceed

This is not a prediction. It is intended to illustrate potentially feasible pathways that limit radiative forcing to 2.6 W/m² Kyoto.
Emissions Mitigation by Region

Not-to-Exceed, Immediate

Overshoot, Immediate

Not-to-Exceed, Delay

Overshoot, Delay

NOT ATTAINABLE
CO₂ Emissions: With and Without a Terrestrial Policy

VALUING CARBON

• Decreases land use change emissions
• Increases allowable fossil & industrial emissions

Land Use Change Emissions

Fossil & Industrial CO2 Emissions

Immediate Accession, 2.6 W/m², Overshoot
Land Allocation: 2.6 W/m² Overshoot

GROUP 1

Immediate Accession

Delayed Accession

Proudly Operated by Battelle Since 1965
Land Allocation: 2.6 W/m² Overshoot

GROUP 2

Immediate Accession

Delayed Accession

Tundra
UrbanLand
Desert
Forest
Pasture
Grass/Shrub
Biomass
Corn
FiberCrop
FodderCrop
MiscCrop
OilCrop
OtherGrain
Rice
SugarCrop
Wheat


Proudly Operated by Battelle Since 1965
Land Allocation: 2.6 W/m² Overshoot

GROUP 3

Immediate Accession

Delayed Accession

Proudly Operated by Battelle Since 1965
Land-Use Change Emissions: 2.6 W/m² Overshoot

DELAYED ACCESSION

• Shifts crop and bioenergy production to non-participating regions
• Increases land use change emissions

GROUP 1

GROUP 2

GROUP 3

Reference
S1_2p6_OS
S1_2p6_S
S2_2p6_OS

2005 2020 2035 2050 2065 2080 2095

2005 2020 2035 2050 2065 2080 2095

2005 2020 2035 2050 2065 2080 2095

GROUP 1

GROUP 2

GROUP 3

Proudly Operated by Battelle Since 1965
## Getting to 2.6 W/m²

<table>
<thead>
<tr>
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<th>Not-to-Exceed</th>
<th>Overshoot</th>
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<tbody>
<tr>
<td></td>
<td>1) Includes immediate participation by all regions</td>
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<tr>
<td></td>
<td>2) Includes dramatic emissions reductions, 70% by 2020</td>
<td>1) Includes the construction of 126 new nuclear reactors and the capture of nearly a billion tons of CO₂ in 2020</td>
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<tr>
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<td>3) Includes substantial transformation of the energy system by 2020, including the construction of 500 new nuclear reactors and the capture of 20 billion tons of CO₂</td>
<td>3) Includes negative global emissions by the end of the century, and thus requires broad deployment of bioCCS technologies</td>
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<td>4) Results in significant land-use leakage, where crop production is outsourced to non-participating regions resulting in a substantial increase in land-use change emissions in these regions</td>
<td>5) Possible without a tax on land-use emissions, but would result in a tripling of carbon taxes and a substantial increase in the cost of meeting the target.</td>
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<td>5) Includes a tax on land-use emissions beginning in 2020</td>
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<td>6) Includes advanced technologies</td>
<td></td>
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<tr>
<td>Delayed Accession</td>
<td>Not attainable given the assumptions in MiniCAM</td>
<td>1) Includes dramatic emissions reductions for Groups 2 and 3 at the time of their accession.</td>
</tr>
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### MiniCAM Assumptions
- Carbon prices begin at $50/tCO₂ and rise to $2000/tCO₂.
- Results in significant land-use leakage, where crop production is outsourced to non-participating regions resulting in a substantial increase in land-use change emissions in these regions.