Offsets in GCAM

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GTSP Technical Workshop
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Offsets in GCAM

- For this analysis, we are focusing on CO₂ in land use and forestry offsets only.

- GCAM is well-suited to analyze land use offsets because:
  - It is global in scope
  - The agriculture and land-use component is fully integrated with the energy system

- As a result, GCAM can determine how much land can be converted to forests and how much land can be used for bioenergy production while still ensuring that people eat.
For offsets to effectively reduce global land use change emissions, a significant portion of global land must be covered by the offset program.
Our Approach to Modeling Offsets in GCAM

- Scenario Design:
  - Annex 1 must reduce fossil fuel & industrial CO₂ emissions
  - Five cases:
    - No offsets are allowed
    - Only domestic offsets are allowed
    - Domestic offsets and offsets from Latin America are allowed
    - Domestic offsets and offsets from tropical regions are allowed
    - Offsets can be purchased from any country or region

- Caveats:
  - We are not addressing compliance or additivity. If a region sells offsets, then we assume the net carbon stock in that region increases. We do not look at intra-regional leakage.
  - The emissions cap and choice of offset suppliers is stylized (roughly 50% Annex 1 reduction in 2050). It was chosen to illustrate a point and not represent a particular policy.
Annex 1 CO₂ Emissions Reductions

Cumulative CO₂ Reductions (2005 to 2050)

- No Offsets
- Domestic Offsets
- Domestic + Latin America Offsets
- Domestic + Tropical Offsets
- Domestic + Global Offsets

INTERNATIONAL OFFSETS
DOMESTIC OFFSETS
DOMESTIC REDUCTIONS
Did you get what you paid for?

Purchased Offsets
(Change in Annex 1 FF&I Emissions)

<table>
<thead>
<tr>
<th>Change in Global Land Use Change</th>
<th>Cumulative 2005 to 2050 (GtCO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Offsets</td>
<td>-120</td>
</tr>
<tr>
<td>Domestic Offsets</td>
<td>-100</td>
</tr>
<tr>
<td>Domestic + Latin America Offsets</td>
<td>80</td>
</tr>
<tr>
<td>Domestic + Tropical Offsets</td>
<td>100</td>
</tr>
<tr>
<td>Domestic + Global Offsets</td>
<td>120</td>
</tr>
</tbody>
</table>

Note: Negative indicates an increase in LUC emissions relative to the reference.
Did you get what you paid for?

![Chart showing emissions and offsets in GtCO2]
Did you get what you paid for?

**Purchased Offsets**
(Change in Annex 1 FF&I Emissions)

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</table>

**Change in Global Land Use Change Emissions from Reference**

- **Domestic Offsets**
- **Domestic + Latin America Offsets**
- **Domestic + Tropical Offsets**
- **Domestic + Global Offsets**

Note: Negative indicates a decrease in LUC emissions relative to the reference.
Did you get what you paid for?

[Bar chart showing actual emissions reductions compared to different offset scenarios.]

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What is the impact on the climate?

![Graph showing the impact of different offset scenarios on the climate. The graph plots ppmv against years from 2005 to 2050, comparing No Offsets, Domestic Offsets, Domestic + Latin America Offsets, Domestic + Tropical Offsets, and Domestic + Global Offsets.]