Quantifying the relative importance of natural and anthropogenic land cover changes in the Representative Concentration Pathways

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Vegetation dynamics
- JULES in the coupled model, HadGEM2-ES
- RCP (representative concentration pathways) used in IPCC AR5.

Anthropogenic Land Cover Change (land use change forced) vs. ‘Natural’ Land Cover Change (climate forced)
About the Representative Concentration Pathways (RCPs)

<table>
<thead>
<tr>
<th>Radiative forcing</th>
<th>Temp. increase</th>
<th>Anthropogenic Land cover change</th>
<th>Climate forced Land cover change</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP8.5</td>
<td>high</td>
<td>![Tree to Wheat][1]</td>
<td>?</td>
</tr>
<tr>
<td>RCP6.0</td>
<td>low</td>
<td>![Wheat to Tree][2]</td>
<td>?</td>
</tr>
<tr>
<td>RCP4.5</td>
<td>low</td>
<td>![Wheat to Tree][2]</td>
<td>?</td>
</tr>
<tr>
<td>RCP2.6</td>
<td>low</td>
<td>![Tree to Wheat][1]</td>
<td>?</td>
</tr>
</tbody>
</table>

[1]: Tree to Wheat
[2]: Wheat to Tree
## Land cover change (as % of total land surface area)

<table>
<thead>
<tr>
<th></th>
<th>RCP2.6</th>
<th>RCP4.5</th>
<th>RCP8.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropogenic LCC (in model)</td>
<td>2.2%</td>
<td>4.7%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Agricultural LCC change (imposed)</td>
<td>2.9%</td>
<td>5.1%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Natural LCC</td>
<td>3.2%</td>
<td>5.6%</td>
<td>8.6%</td>
</tr>
</tbody>
</table>

T Davies Barnard, *Natural and anthropogenic land cover in the RCPs.* t.davies-barnard@bristol.ac.uk
Anthropogenic Land Cover Change (land use change forced)

Agricultural

Forest
'Natural' Land Cover Change (climate forced)
Natural' Land Cover Change (climate forced)
Forest Change

2100

- Forest change Global (%)
  - Anthropogenic
  - Natural
  - Net

2050

- Forest change Global (%)
  - Anthropogenic
  - Natural
  - Net

- Forest change Boreal (%)
  - Anthropogenic
  - Natural
  - Net

- Forest change Tropical (%)
  - Anthropogenic
  - Natural
  - Net

Legend:
- RCP 2.6
- RCP 4.5
- RCP 8.5

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Land carbon changes

![Bar charts showing land carbon changes in different categories: Anthropogenic, Natural, and Net.](image)
Conclusions

• Total land area changed is larger from climate change than from anthropogenic land use change.
• Climate forced changes in trees offsets 90% of anthropogenic deforestation in RCP8.5, but only 3% in RCP2.6.
• The carbon emissions from natural land cover change are bigger than those from anthropogenic land cover change in the deforestation scenarios.
• Bigger land cover change contributions tend to originate from anthropogenic land cover change in the shorter term or lower radiative forcing scenarios, and from climate changes in the longer term and higher radiative forcing scenarios.
• To what extent natural land cover change can mitigate anthropogenic land cover change raises difficult questions regarding global forest and biodiversity offsetting, especially at different timescales.