

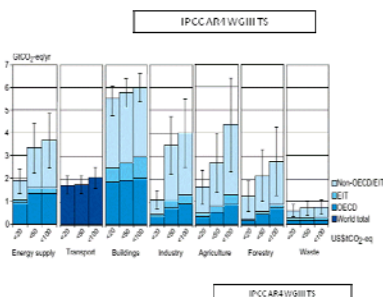
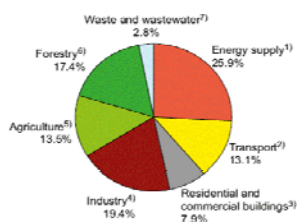
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Revisiting the Managed Land Proxy: Background and Scope

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AFOLU needed to achieve $\Delta T_{\text{anth.}} < \approx 2\text{C}$

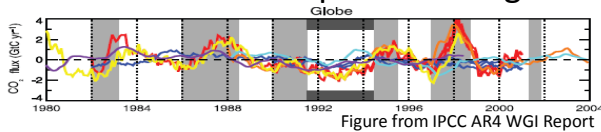
- AR4 suggests ~ 30% anthropogenic emissions and available mitigation potential from LULUCF + Agriculture
- Efficient response requires estimation of *anthropogenic* emissions
- Is the managed land proxy the best way to estimate anthropogenic GHG emissions?



Issues surrounding *anthropogenic*

UNFCCC requires estimation of *anthropogenic* emissions and removals. For LULUCF there is:

- 1) a background (or *residual*) uptake of greater magnitude (≈ 2.6 GtC/yr) and opposite sign to anthropogenic emissions from LULUCF (≈ 2.3 GtC/yr)
- 2) Interannual variability of order ± 2 GtC, sometimes more, related to fires and climatic processes e.g. El Niño:



As a consequence uncertainties associated with 1) and 2) UNFCCC made requests of IPCC...

COP Decision 11/CP.7 requests & IPCC response

- Task 1 – develop estimation methods (led to GPG and 2006 Guidelines; highly successful)
- [Task 2 – develop definitions for forest degradation and deforestation (identified need for symmetrical accounting)]
- Task 3 – how to separate ('factor out') direct human induced effects from indirect effects, including RU. Possible causes of indirect effects: age class structure, CO₂ fertilisation, N fertilisation, productivity leading ecosystem respiration. Indirect effects more recently generalised to include natural *or force majeure* disturbances

Task 3 – *Factoring out*

- 1st meeting - Geneva 2002 - developed a work-plan for a possible IPCC report to provide a framework for factoring out, but questioned feasibility of providing “...a definite methodology complete with facts and figures.”
- 2nd meeting - Geneva 2003 - concluded that “The scientific community cannot currently provide a practicable methodology [to] factor out direct human-induced effects from indirect human-induced and natural effects for any broad range of LULUCF activities and circumstances”

GPG/2006 GL Solution

Use LULUCF emissions on managed land as a proxy for anthropogenic

Justification:

- 1)Commonsense: anthropogenic signal preponderate on managed land
- 2)Mathematical: Disturbance signals average to zero and the average response of a linear system to a zero average forcing is zero – so disturbances average out leaving the anthropogenic effect.

Use LULUCF emissions on managed land as a proxy for anthropogenic

GPG/2006 Guidelines provide methodologies for estimating GHG emissions and removals associated with LULUCF. Possible issues to consider:

- 1) The treatment of the residual uptake in this system
- 2) Knock-on anthropogenic effects on unmanaged land
- 3) Time taken for interannual variability and disturbances to average out.

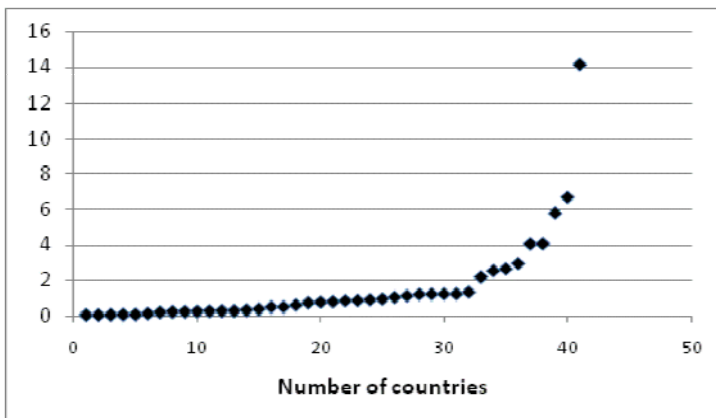
Treatment of the residual uptake (RU)

- RU \approx 2.6 GtC/yr (AR4). Large compared with Kyoto commitments (\approx 0.5 GtC/yr) & significant compared with reductions to be on track for 2C (\approx 2 to 4.5 GtC/yr in 2020)
- AR4 suggests more equally distributed between tropical, and temperate and boreal forests. RU may be diminishing and could reverse.
- RU may have direct management components (e.g. due to age-class structure).
- Do time-invariant estimation parameters remove the RU, at least until recalibration? Can conservative assumptions help? Inventory stratification?
- If anthropogenic contribution to meeting Art 2 is the differential effect relative to a base year or reference condition, would not the RU become a 2nd order effect?

Knock-on effects on unmanaged land

- Anthropogenic fire could spread to unmanaged forest
- Estimating effect would require separation between anthropogenic and non-anthropogenic fires – is this possible?
- GPG 2003 suggests that emissions from disturbances need not be accounted if subsequent removals are not. Can this principle be applied?
- Any land use change following a fire would convert unmanaged to managed land, and the fire emissions would presumably then be reported.

Time taken to average out: Forest management fluctuations averaged over 5 years as % *total* national emissions



Time taken for fluctuations to average out

- 5 year averaging of interannual variability in national inventories can leave LULUCF fluctuations up to about 15% of national emissions. This is big, and may only diminish as $\sqrt{\text{no. of years averaged}}$.
- Can one identify (e.g. statistically) unusual events – either natural or *force majeure*? Do we need to identify separately?
- Could use of Tier 2 models with country specific but time average parameters help?
- How would GPG/2006GL be used to identify the emissions/removals associated with the disturbance in case special provision were to be made for them?

Summary

- UNFCCC is about anthropogenic emissions and removals
- The anthropogenic signal is combined with a background trend (the RU) and interannual variability of similar magnitude : this sort of signal identification should be no more difficult than many problems familiar in physical and biological sciences and economics
- The GPG/2006GL provide the methods to identify the data. The managed land proxy is the first approximation to identifying the anthropogenic signal
- There may be additional advice we can provide in how to use the GPG/2006GL estimates to identify the emissions and removals estimates needed – some suggestions provided and there may be others but approach needs to be on how to use the GPG/2006GL; not reinvention