Is the Forest Sector in Danger of Losing Credibility?

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The Forest Sector Started with a Credibility Issue

- Forest stores are not permanent
  - No carbon stores on Earth permanent
  - All are controlled by inputs vs outputs
- The forest system is too complex
  - Technology is also complex
  - Leakage occurs in all sectors
Photosynthesis

Live Plants

Mortality

Dead Plants

Soil formation

Soil

Timber harvest

Wood Products

Respiration, combustion, leaching, erosion

Outside forest system
Inputs with Losses

Inputs No Losses

Only in the case of inputs with no losses is there a steady, non-ending accumulation.
Classic theory is wrong

Older forests do not saturate with C

Forests have constant net C gain

Cited 338 times in 4 years
after Luyssaert et al. 2008
Possible explanations

- Methodological biases
- Does not account for all the loss terms
- Did not observe forests long enough time to see long-term trend
- There are recent changes that have increased input compared to losses
Product Substitution

Three key assumptions

• The substitution is permanent
• There is no relationship to the use of wood products
• The input remains constant over time

• DO THESE MAKE SENSE?
Carbon costs are changing

![Graph showing changes in carbon costs over time. The graph includes lines for constant C cost, 200 years to decrease C cost 50%, and 20 years to decrease C cost 50%.]
Thought Experiment

- We have a fixed area of land that supplies housing
- We can only take wood from that area
- The speed at which the land can produce wood is fixed
- What happens if?
  - Housing lost before regrowth?
  - Housing lasts beyond regrowth?
The fact buildings don’t last forever has real consequences.
Fossil carbon is subject to leakage (someone else uses it)

![Graph showing the products substitution over time for different scenarios: fossil C use 25 years, fossil C use in 50 years, fossil using in 100 years, and no fossil C use.](image-url)
Combined effects

![Graph showing the combined effects of ecosystem and product stores, maximum substitution assumptions, and realistic substitution assumptions on carbon storage over time.](image)
Other starting conditions

Starting with an existing production forest will lead to 0 gain

Starting with an older forest might lead to a net loss
What are Those Outside the Forest Sector to Conclude?

- Both right ➔ Forest sector irrelevant
- Both wrong ➔ Forest sector science weak and untrustworthy
- One wrong ➔ Forest sector science largely a PR exercise
Conclusions

- 1. The forest sector has a potential role to play in greenhouse gas mitigation
- 2. To play this role the science and the suggested policy must be credible
- 3. The track record of the forest sector is checkered and this needs to change ASAP
The Math of Leaky Buckets

$C_{ss} = \frac{l}{k}$

$C_{ss} =$ steady-state store
$l =$ input rate
$O =$ output rate
$k =$ proportional rate of losses