Forest Research

Tier 3 forest model development and application in UK GHG inventories

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Motivation

- First meeting of the IPCC held in November 1988
  - Before this, World Conference on Changing Atmosphere (June 1988)
- UK recognized early the important role of forests:

"How much carbon are the UK's forests storing?"…

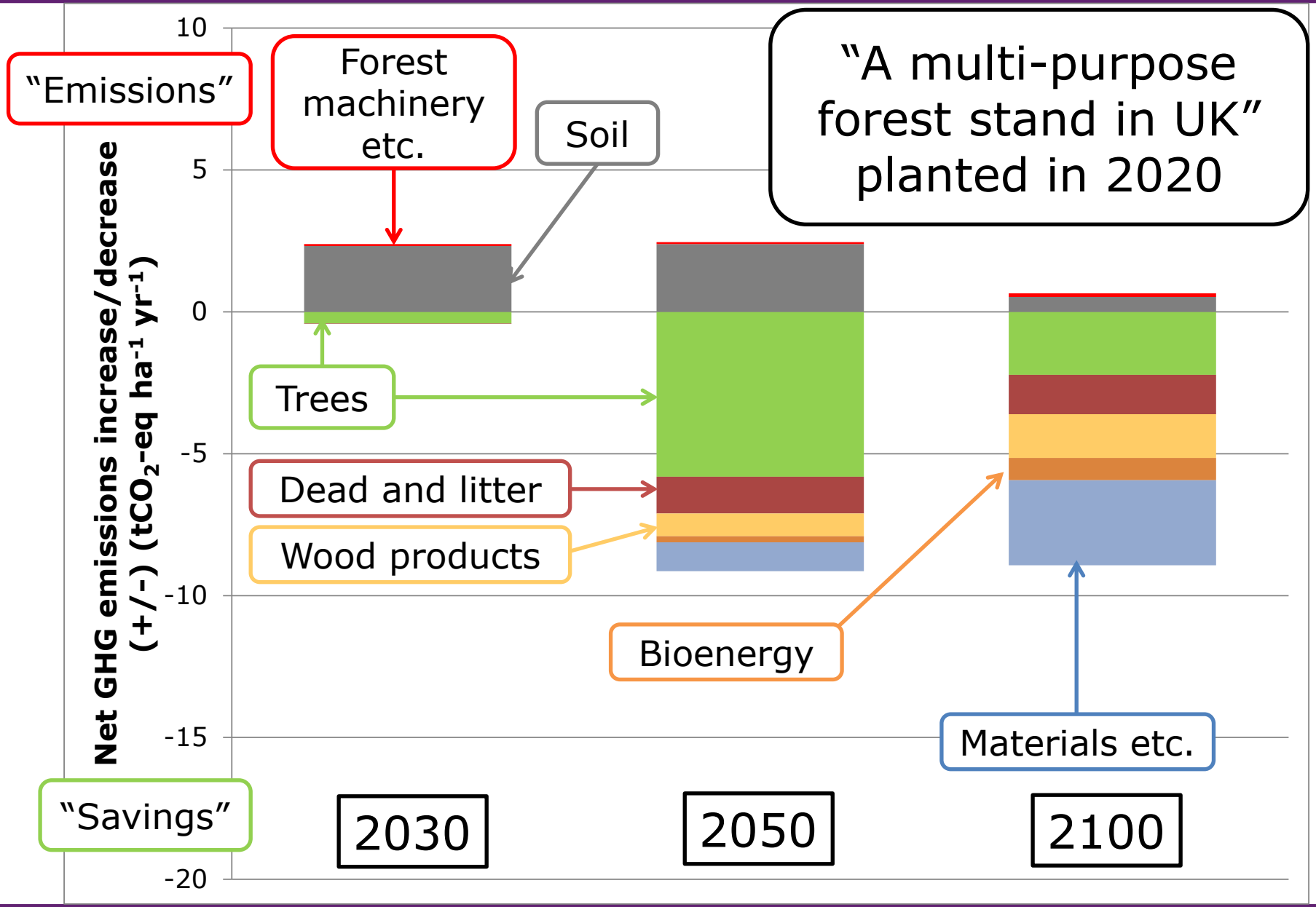
Model development

- Analytical model of carbon sequestration and losses in forests
  - Not the only model, probably the first (1988)
  - First UK Information Note published in Spring 1989
- Other similar models followed in UK (CFLOW) and abroad
- Forest Research model eventually named "CARBINE"
- "Basics" of ECOSSE soil carbon model now added into CARBINE.

GHG inventories

- CFLOW applied in GHG inventories until 2012 (simpler to apply)
- CARBINE used since then – push to better represent detailed forest composition and management, soil carbon …

Example: Impacts of afforestation



Main assumptions

- Carbon stock changes can be estimated using tables of volume production, biomass expansion factors and turnover rates
- Reliance on forest yield tables/models dating back to 1960s
- (Currently) growth not influenced by changing CO_2 or climate.

Advantages

- Framework for systematically integrating and reconciling different country-specific data sources at different scales (e.g. tree allometry, turnover rates, forest areas, age classes, management, wood production)
- Easy to update parameters and activity data when available
- Projections for policy/scenario assessment are relatively easy
  - Projections consistent with GHG inventories
- Wider applications (e.g. LCA of wood supply chains, economics).

Be aware

- No turning back!

Verification of model outputs and GHGI results

- Growth models/yield tables calibrated/verified against long-term data from permanent research sample plots (not NFI)
- Litter and soil parameters derived from literature reviews
- Smaller network of intensive forest monitoring sites provide data for verification of litter and soil
  - Basic checks against Tier 1 values
- High level in inventories: managed forest area consistent with wood production given forest production potentials (yield models)
- Forest areas consistent with National Forest Inventory.

Transparency of assumptions and calculations

- Documentation needs to be systematic, thorough and understandable to those using model results – can be challenging
- Example calculations (simple and complex) to help explain how inputs relate to relate to results
- Tier 2 calculations are simpler – easier to check, but still complex to estimate activity data and does not match well UK forests.

- Elements consistent with UK QA processes, with some extensions
- Where to find IPCC elements:

Basis and type of model	NIR/CARBINE documentation
Application and adaptation of model	NIR/QA documentation
Main equations and processes	NIR/CARBINE documentation
Key assumptions	QA documentation
Domain of application	QA documentation
Estimation of model parameters	CARBINE documentation Other reports (e.g. growth models)
Key inputs and outputs	NIR/CARBINE documentation Separate "RECONCILE" report
Model calibration and evaluation	CARBINE report
Uncertainty and sensitivity analysis	Separate report (in progress)
QA/QC procedures	Internal Forest Research procedures
References to literature	CARBINE documentation

- Has needed sustained effort (development, documentation, data).

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Thank you

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