Emissions trading: Opportunities and Issues for Forestry

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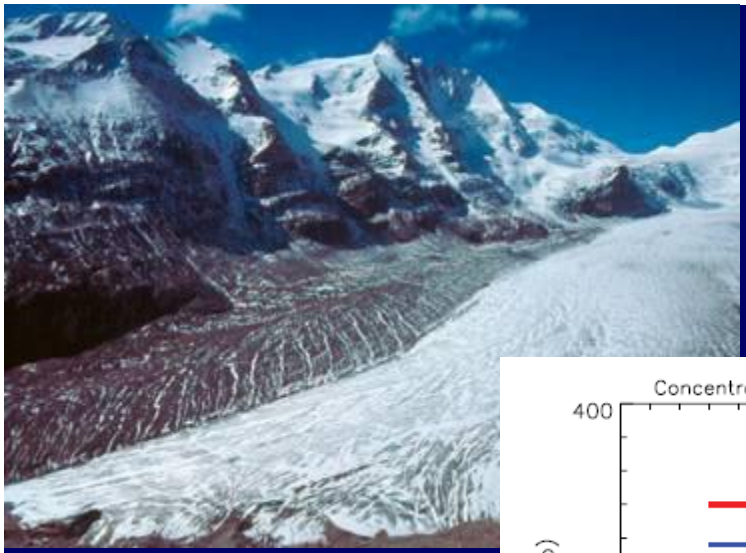
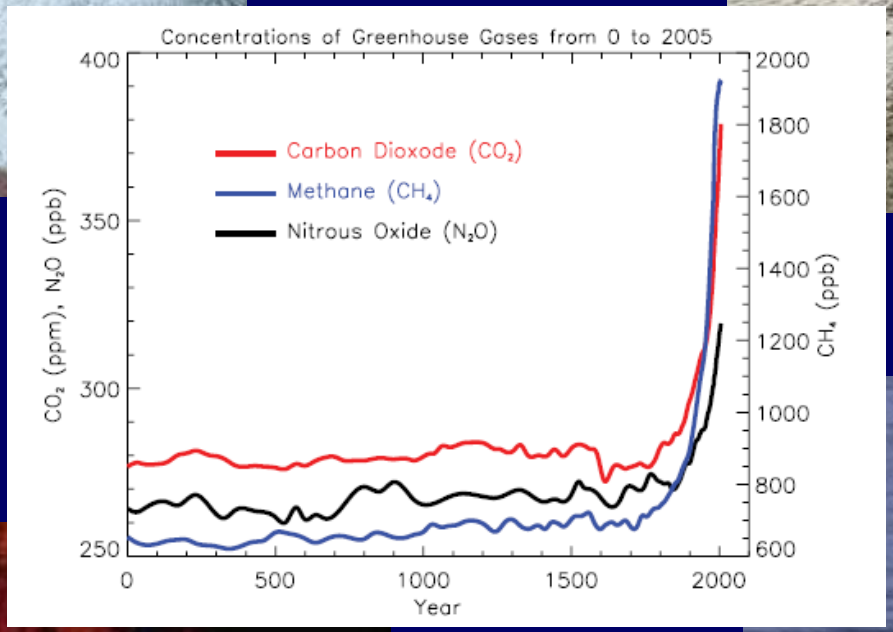
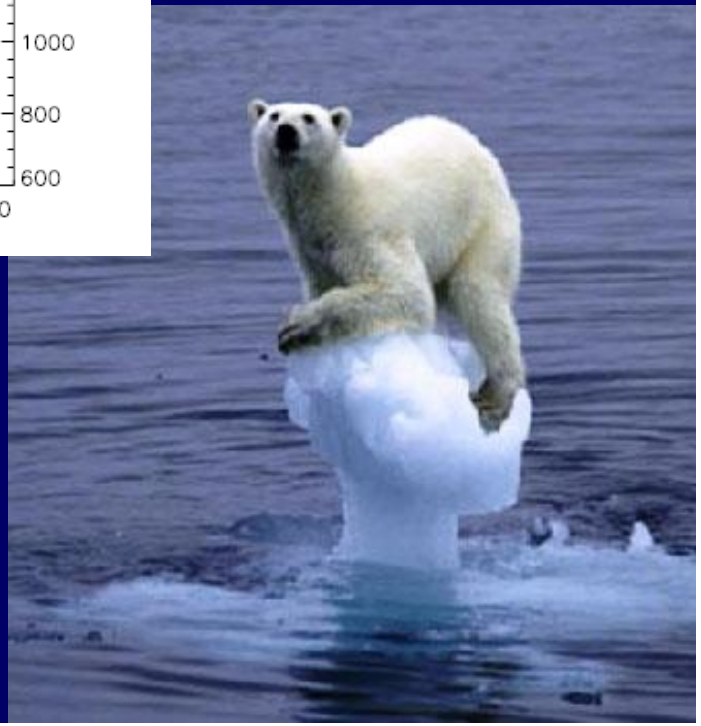
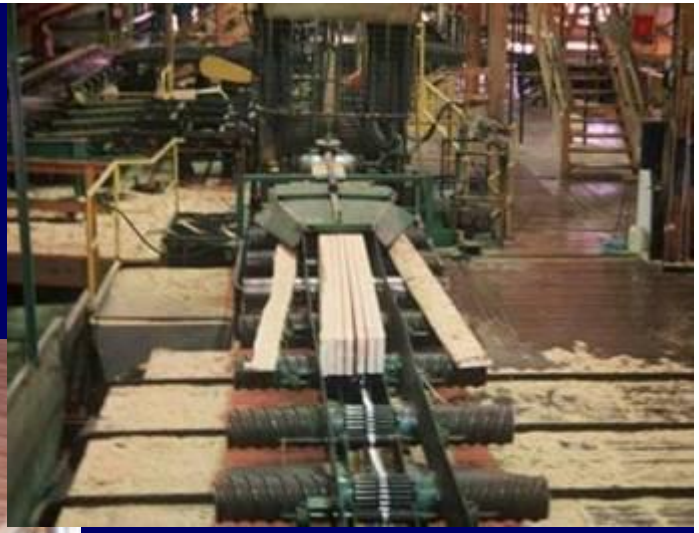
NSW Department of Primary Industries




Concentrations of Greenhouse Gases from 0 to 2005
Carbon Dioxode (CO_2)
Methane (CH_4)
Nitrous Oxide (N_2O)
CO_2 (ppm), N_2O (ppb)
CH_4 (ppb)
400
350
300
250
2000
1800
1600
1400
1200
1000
800
600
0
500
1000
1500
2000
Year




9016
UEG 146




NO. 15
CONVEYOR

Sequestration potential: reforestation

Sequestration rate tCO_2-e/ha/year

Annual rainfall mm		
400-600	600-800	>800
4-10	6-12	10-25

Montagu et al Carbon Sequestration Predictor

Sequestration potential: reforestation

	No carbon return	$15/t CO2	$30/tCO2
Plantation area '000 ha	160-425	585-750	900 -1000
Carbon Sequestration Mt CO_2e	35-95	130-160	200-220

ABARE/BRS 2001

Opportunities: Sequestration

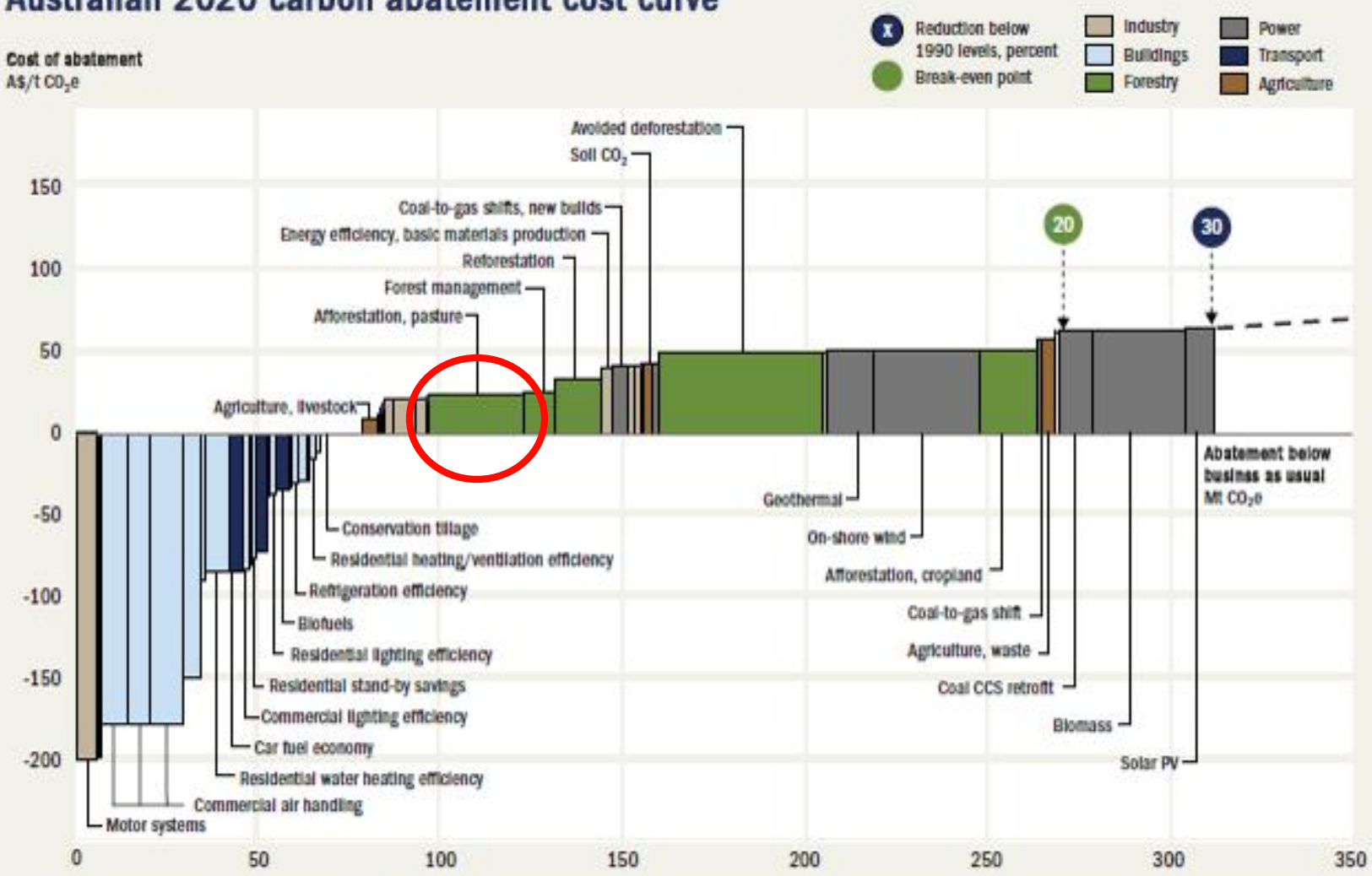
Potential biosequestration

Potential sequestration through reforestation in Australia estimated at

- 657 mt CO_2e from 2.25m ha, over 40 years
- cf annual emissions 560 mt CO_2e

Hatfield-Dodds et al, 2007

Australian 2020 carbon abatement cost curve



Note: Abatement opportunities are not additive to those of previous years

Source: McKinsey Australia Climate Change Initiative

Challenges for inclusion of forestry

- Real abatement
- New abatement (additional)
- (non-)Permanence
- Quantifiable, verifiable

NSW GGAS – carbon sequestration

- Eligibility criteria
  - Forests that are “Kyoto-consistent” (Planted since 1990 on cleared land)
  - Carbon Sequestration Rights registered on the title
  - Carbon stocks maintained for 100 years
- Coverage: CO_2 only
- Baseline: prior land use
- Additionality: environmental

New South Wales GGAS

- Permanence: “100 year rule”
  Can only trade carbon that will remain sequestered for 100 years
- Uncertainty: “70% rule”
  Can only trade quantity for which 70% probability that actual sequestration exceeds traded C

New South Wales GGAS

Conservative calculation methods
Strict rules for accreditation, accounting, monitoring, audit
“Restriction on Use”

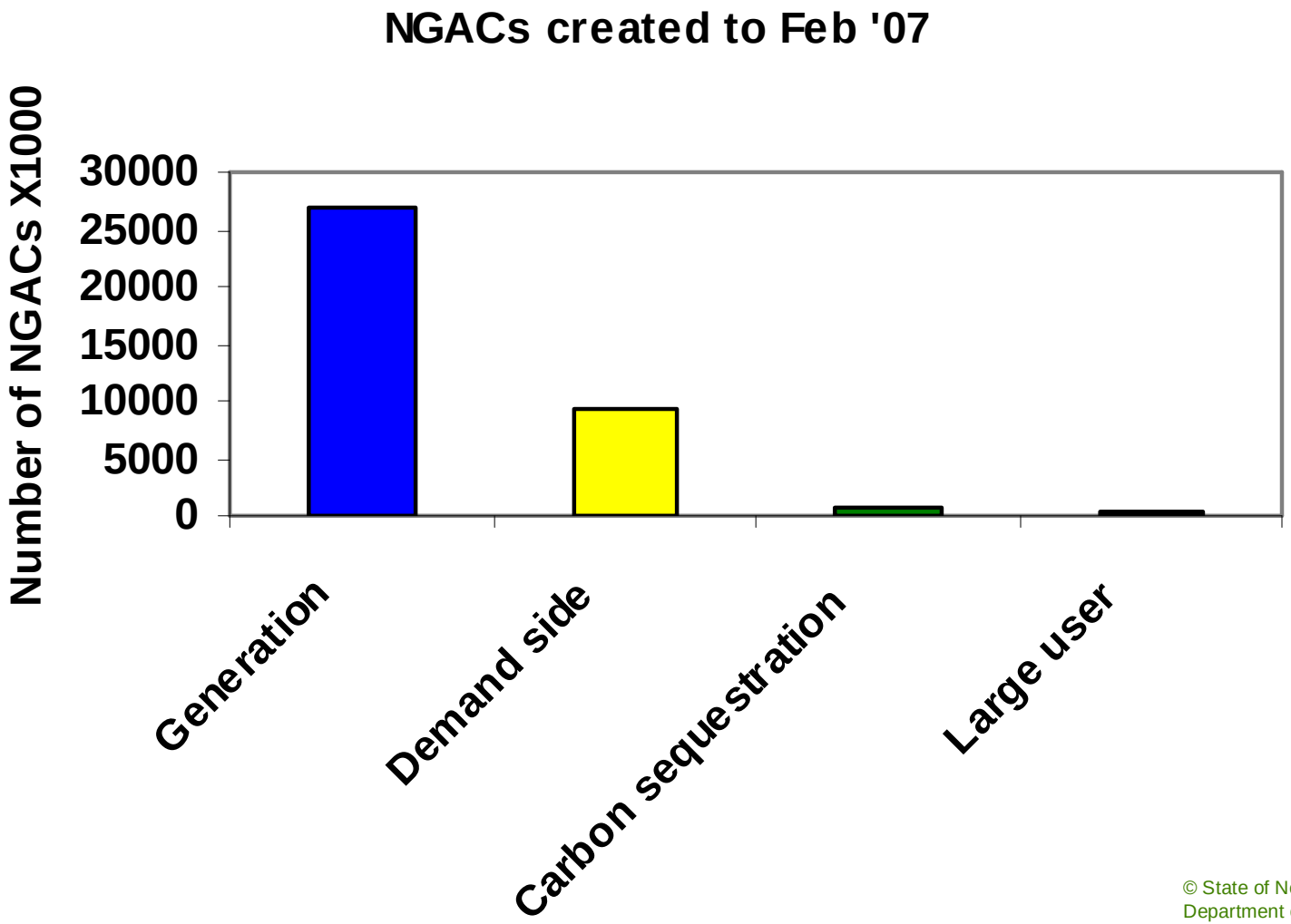
= Confidence in the market-place

But

= High transaction costs,

= Barrier to participation

NSW Greenhouse Gas Abatement Scheme



Australian Emissions Trading Scheme

- Carbon Pollution Reduction Scheme
- Cap and trade
- Sector-based
- Coverage: six GHGs
- Inclusion of forestry
  - reforestation optional
  - forest management X
  - avoided deforestation X
- Accounting: annual stock change

Proposed inclusion of Forestry in CPRS

1. Covered sector or offsets provider?
2. Additionality requirement?
3. Baselines?
4. Permanence?

Maximise participation

- Minimise barriers
- Accreditation costs
- Participation costs
  - Cost-effective carbon accounting
  - Monitoring and verification
- Marketing costs
  - Pooling mechanism

Maintain integrity

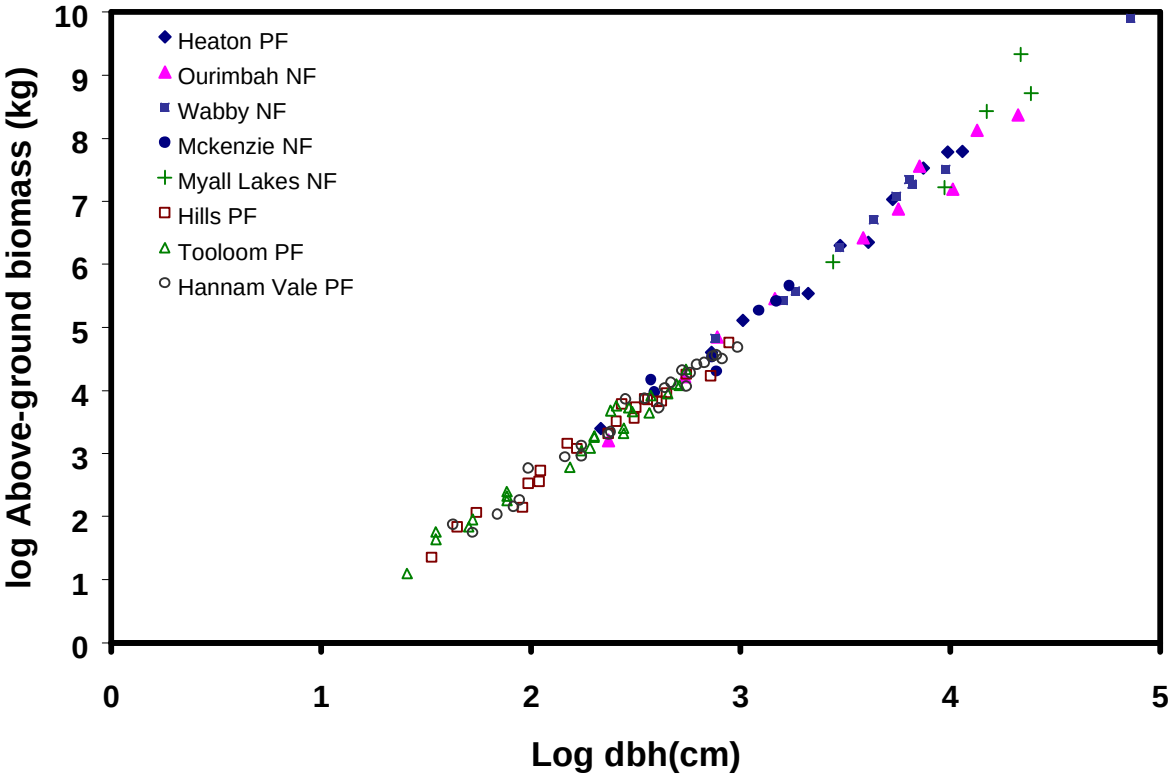
- Sufficiently accurate accounting
- Avoid unbalanced participation
- Full coverage preferable

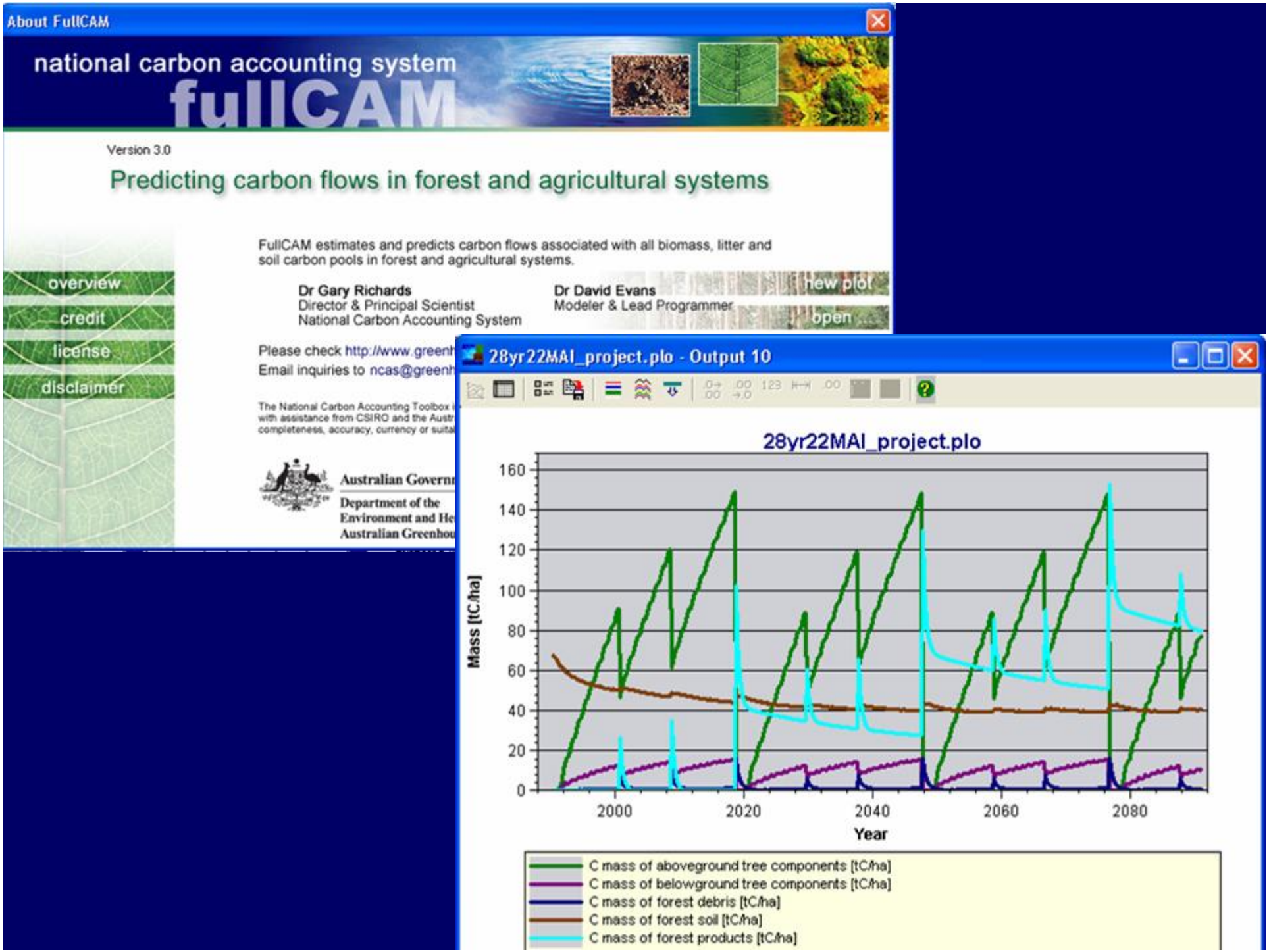
Counting Carbon in plantations - easy!

- Carbon makes up 50% of tree biomass
- Predict carbon from growth models, inventory
- Focus on stock change, not absolutes

Allometric approach for estimating carbon in trees

from inventory data




About FullCAM
national carbon accounting system
fullCAM
Version 3.0
Predicting carbon flows in forest and agricultural systems
FullCAM estimates and predicts carbon flows associated with all biomass, litter and soil carbon pools in forest and agricultural systems.
Dr Gary Richards
Director & Principal Scientist
National Carbon Accounting System
Dr David Evans
Modeler & Lead Programmer
new plot
open ...
overview
credit
license
disclaimer
Please check http://www.greenh
Email inquiries to ncas@greenh
The National Carbon Accounting Toolbox
with assistance from CSIRO and the Austr
completeness, accuracy, currency or suita
Australian Governm
Department of the Environment and He
Australian Greenhou
28yr22MAI_project.plo - Output 10
28yr22MAI_project.plo
Mass [tC/ha]
0
20
40
60
80
100
120
140
160
2000
2020
2040
2060
2080
Year
C mass of aboveground tree components [tC/ha]
C mass of belowground tree components [tC/ha]
C mass of forest debris [tC/ha]
C mass of forest soil [tC/ha]
C mass of forest products [tC/ha]

Knowledge gaps

1. **Low rainfall forestry, environmental plantings**
2. **Non-CO_2 GHGs**

- Nitrous oxide
- Methane

Knowledge gaps

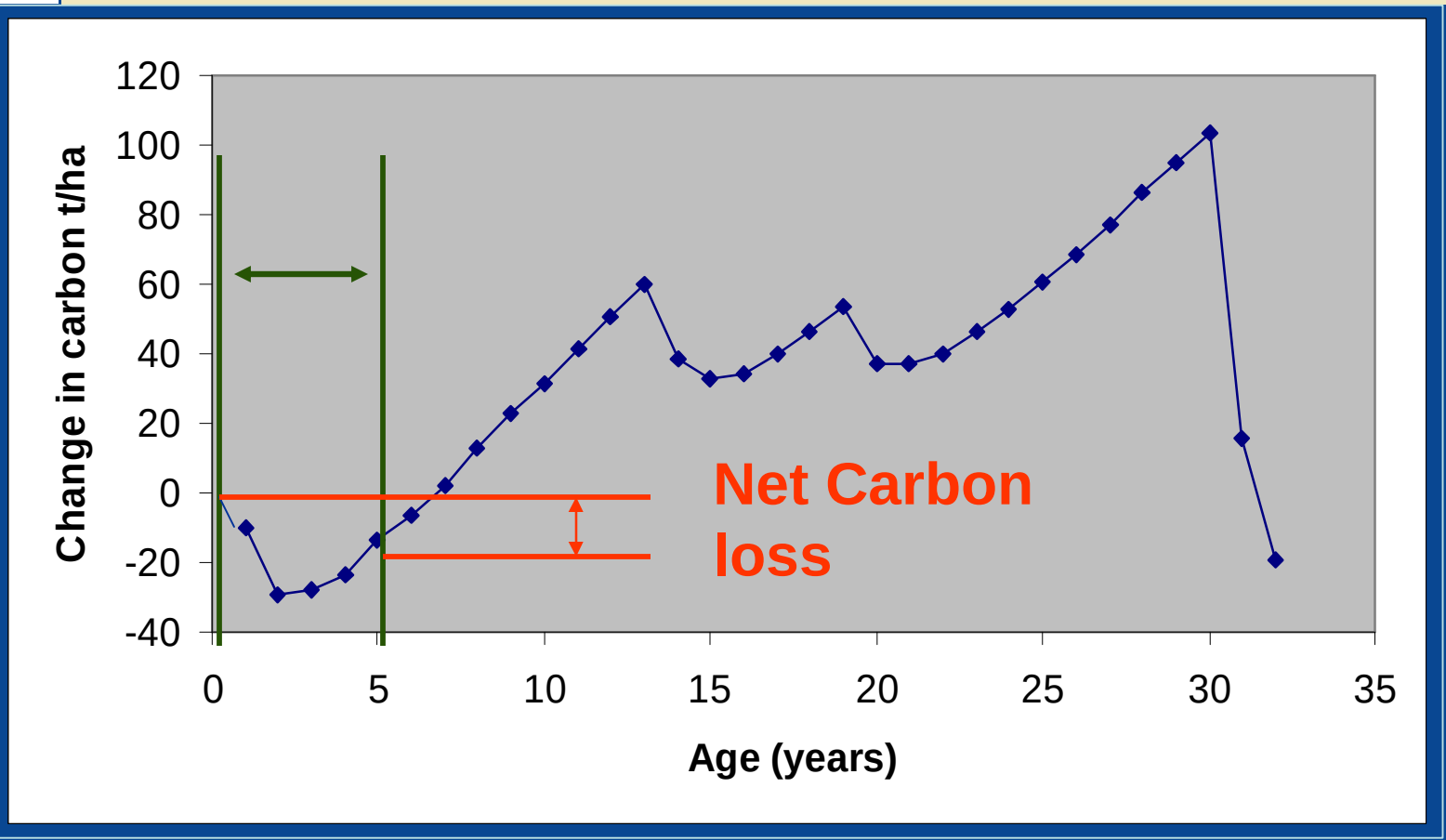
3. Soil carbon dynamics in forests

- Loss during establishment?
- Long term impacts –
  - Over rotation
  - Across rotations
- How to document?
  - measurement, monitoring?
  - Modelling

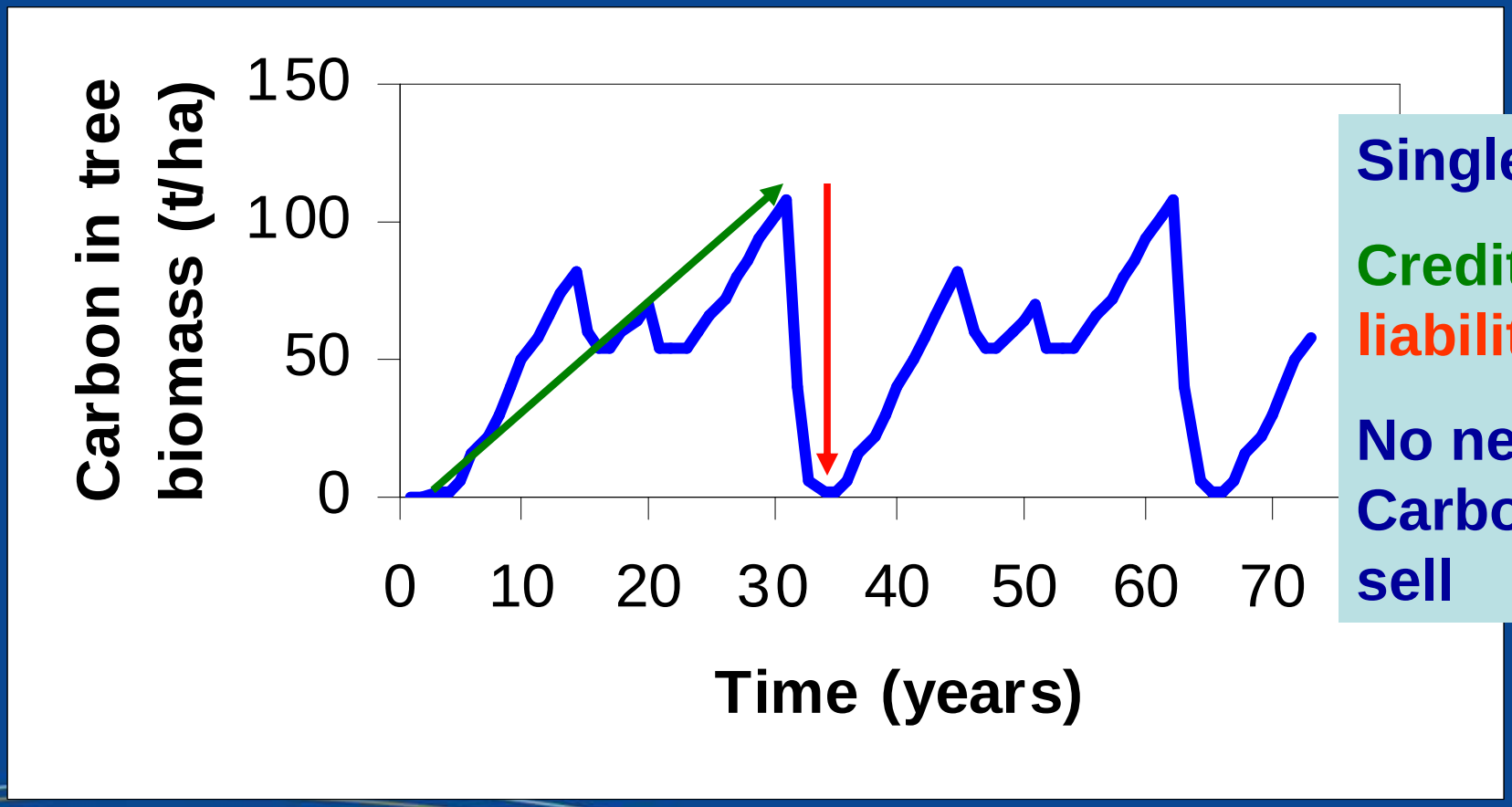
High risk of soil carbon loss

- High initial soil carbon
- Large proportion decomposable
- Climate that favours decomposition: warm, wet but not waterlogged
- Soil type that minimises OM protection (low clay, low Al)
- Short rotation
- Studies suggest long term decline in radiata pine

Soil carbon problem



Stock change accounting

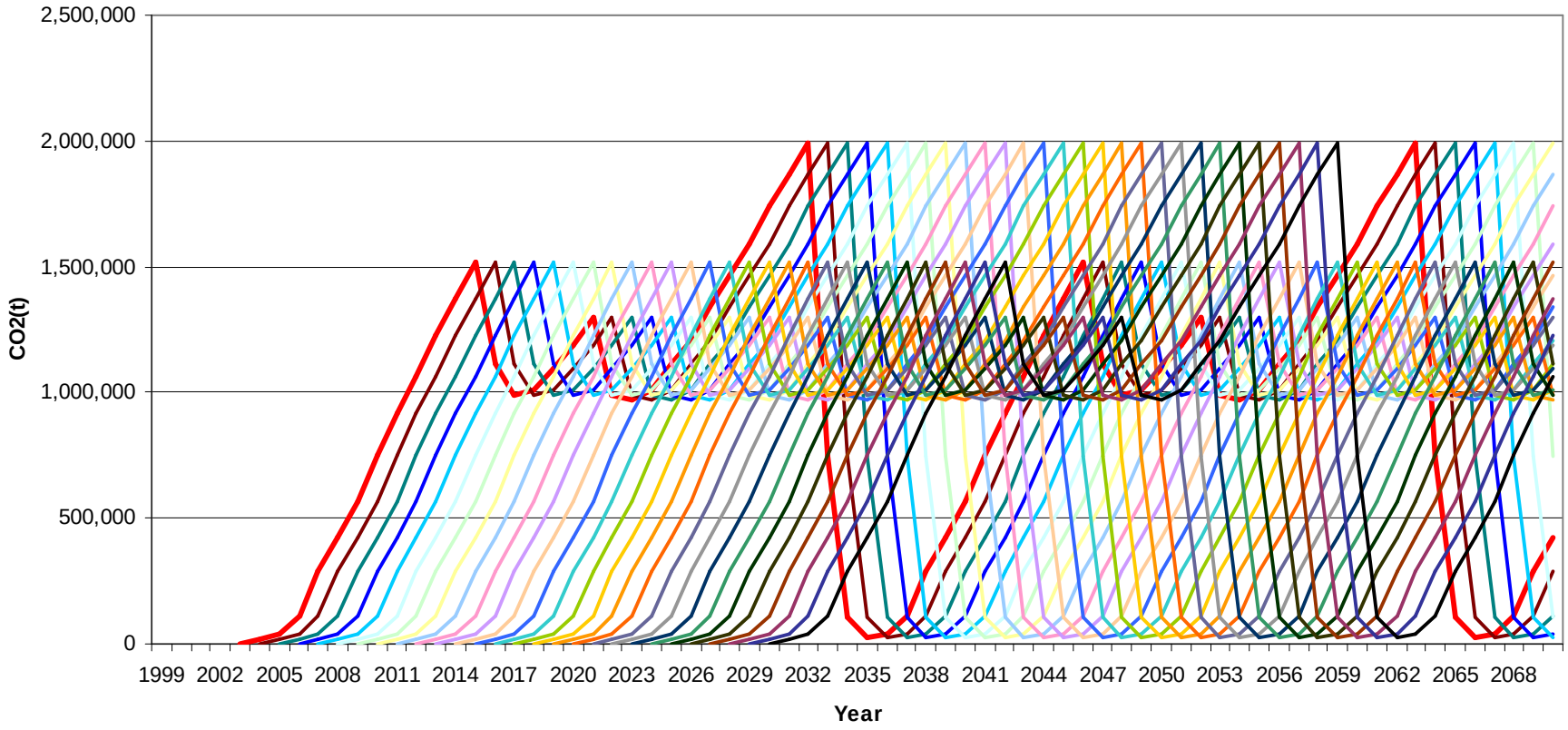


Single stand

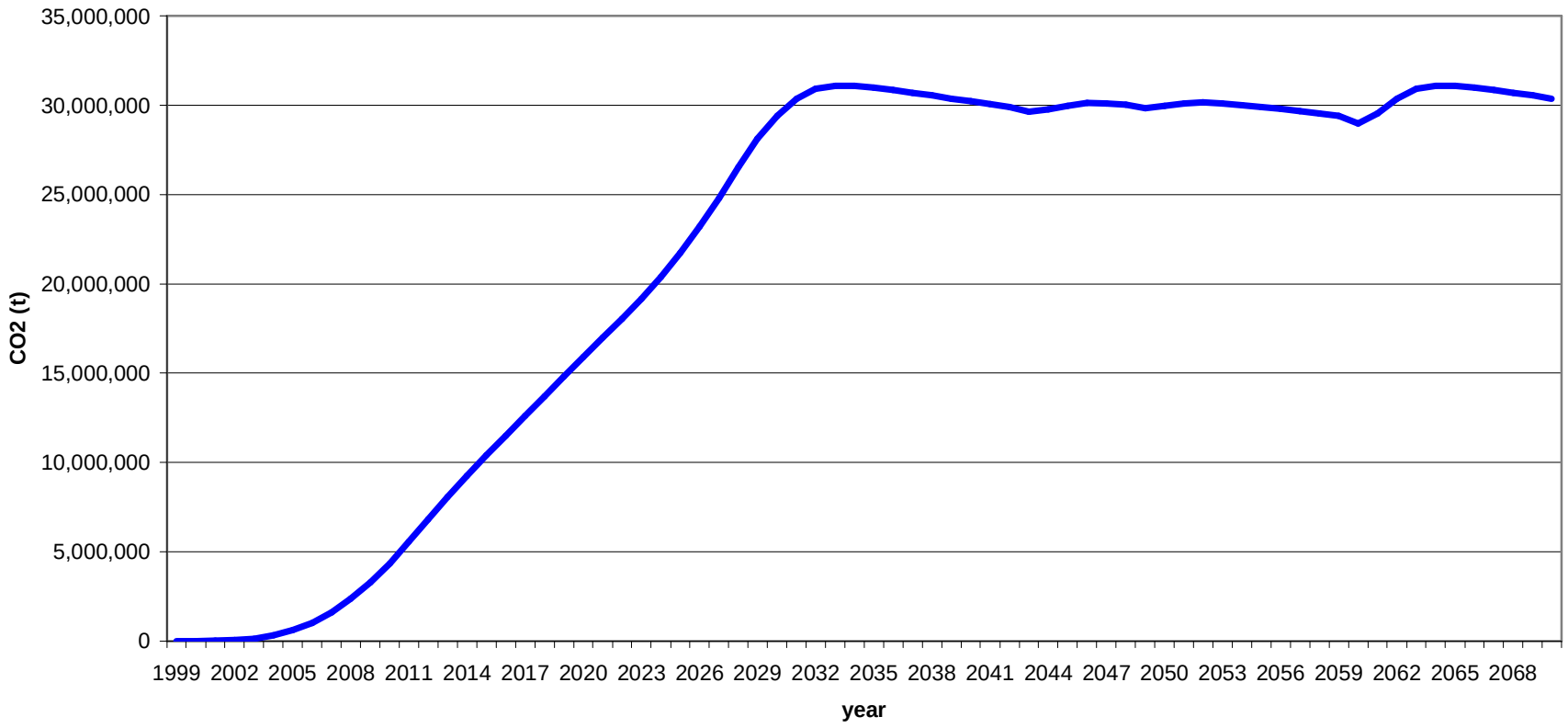
Credit = liability

No net Carbon to sell

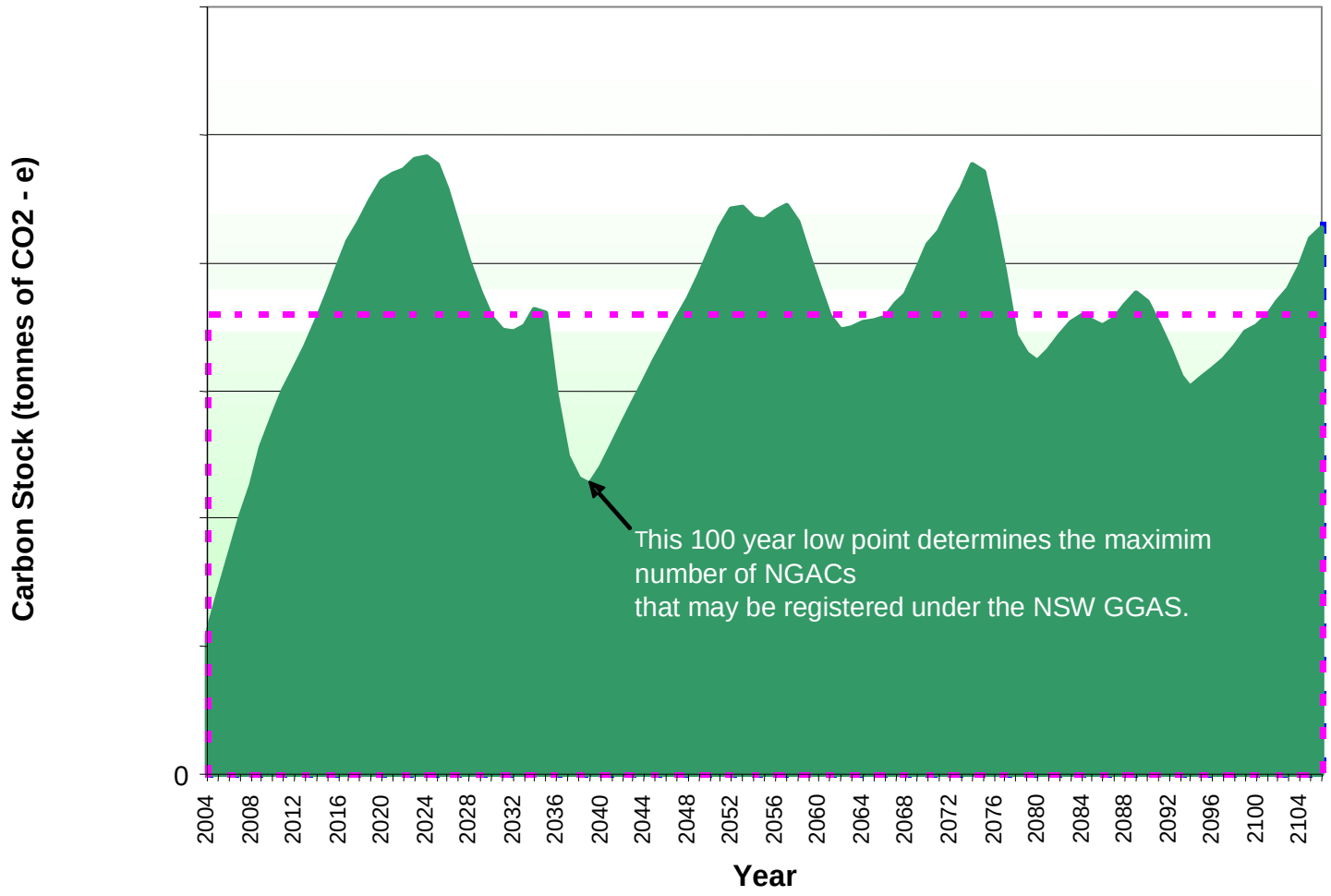
Forest estate



Forest estate

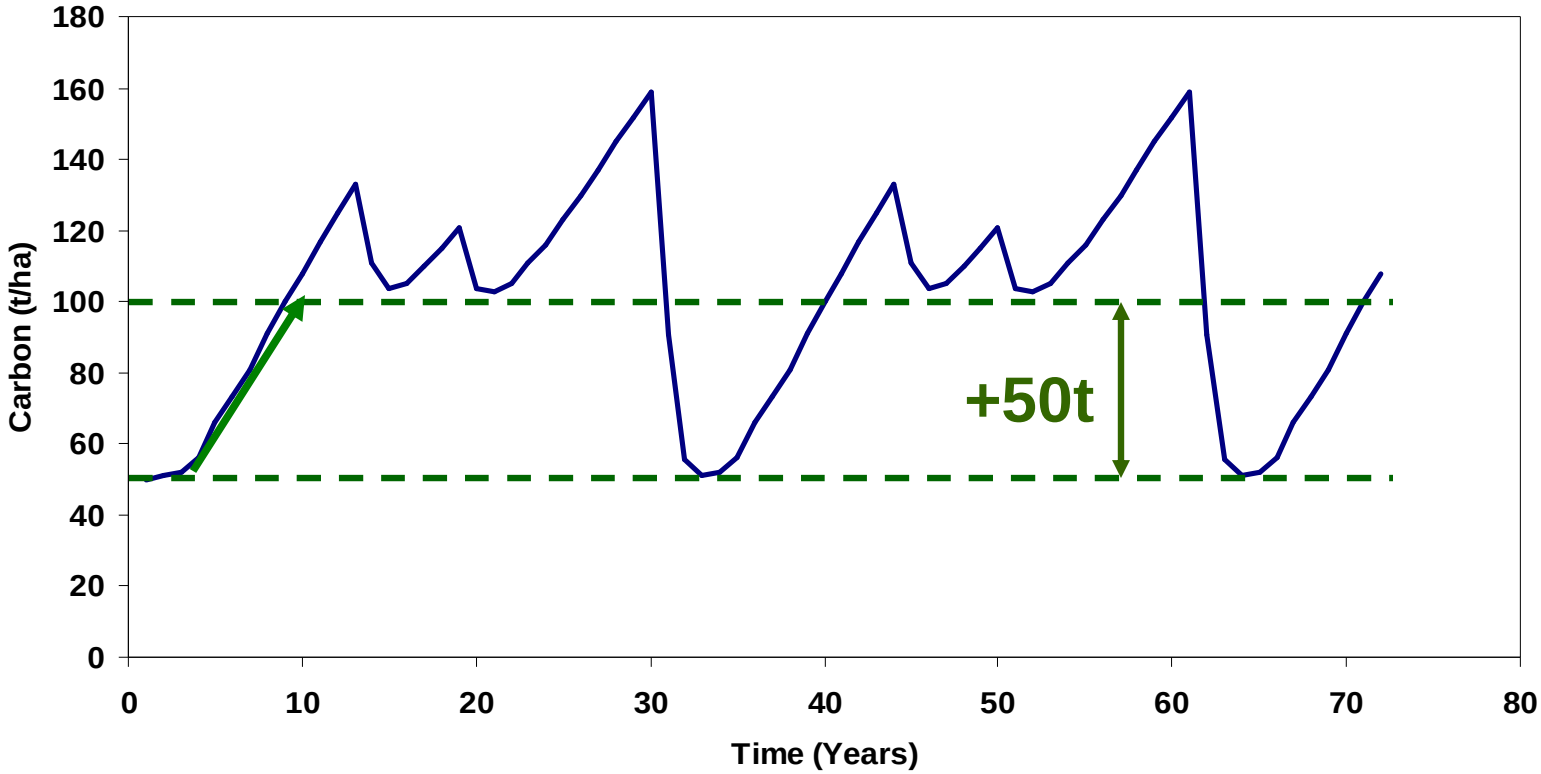


Forests NSW's 100 year Carbon Stock profile



Potential accounting simplification: Average Carbon Stocks Approach

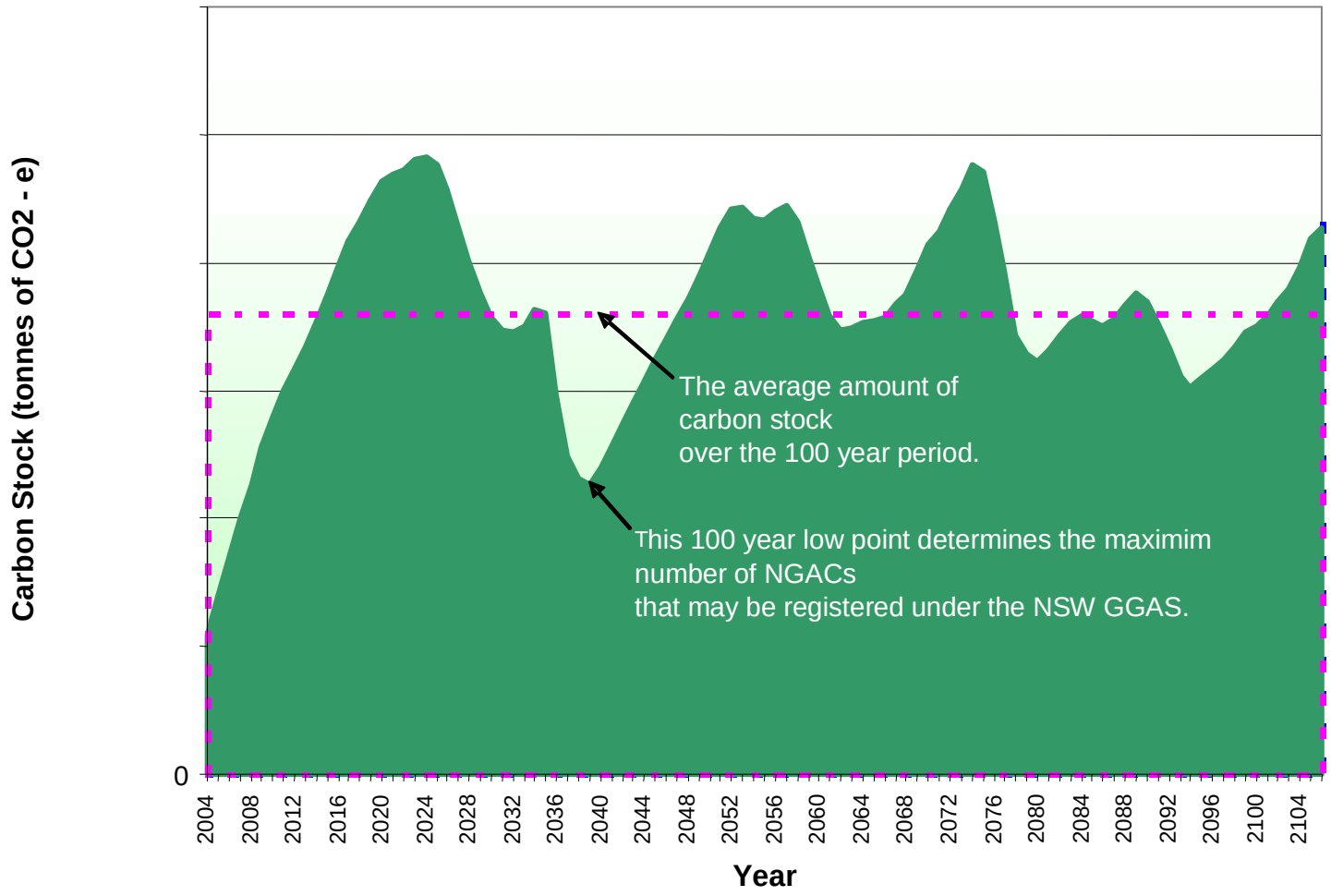
Credit increase in long term average carbon stock

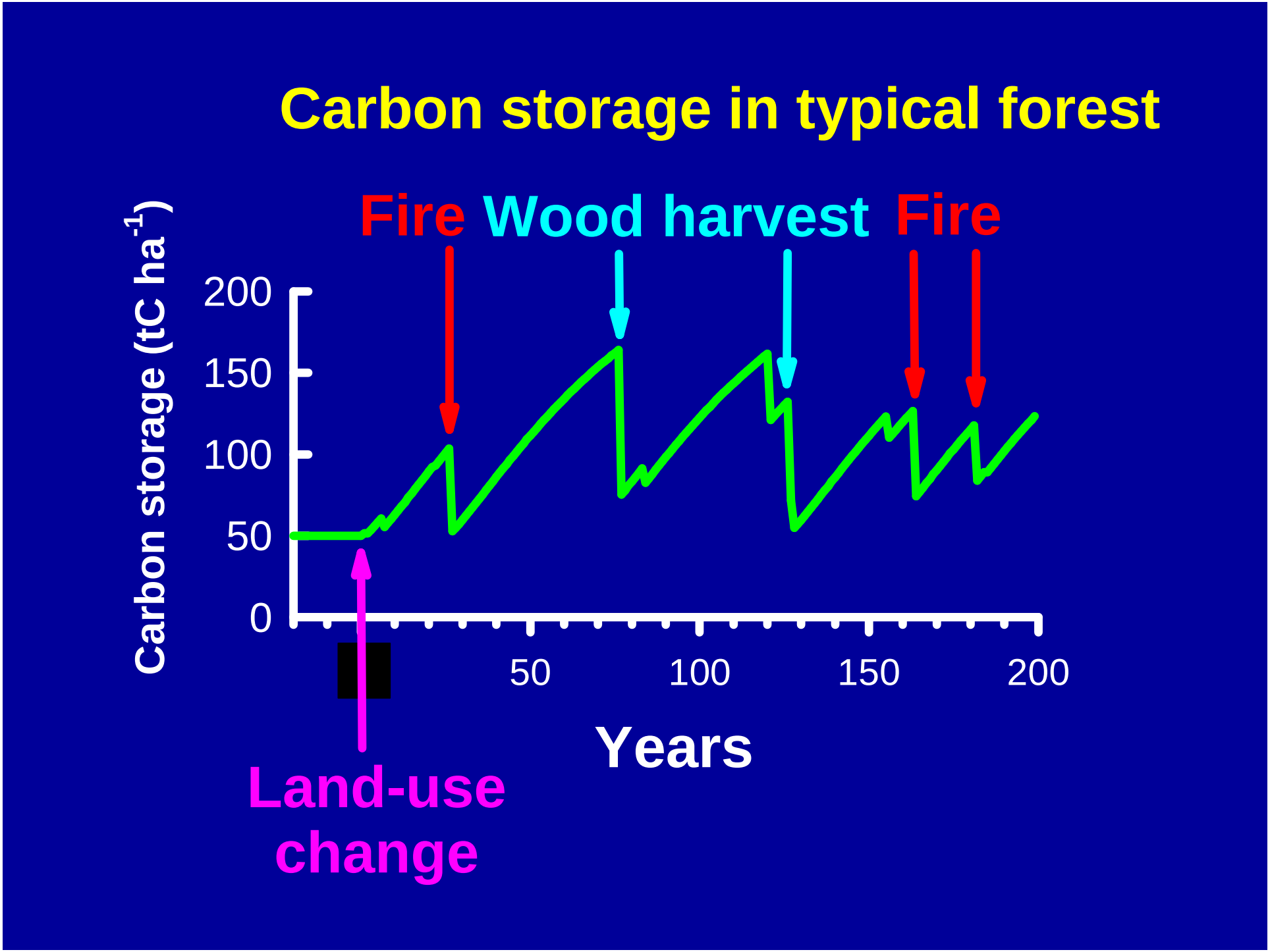


The proposal:

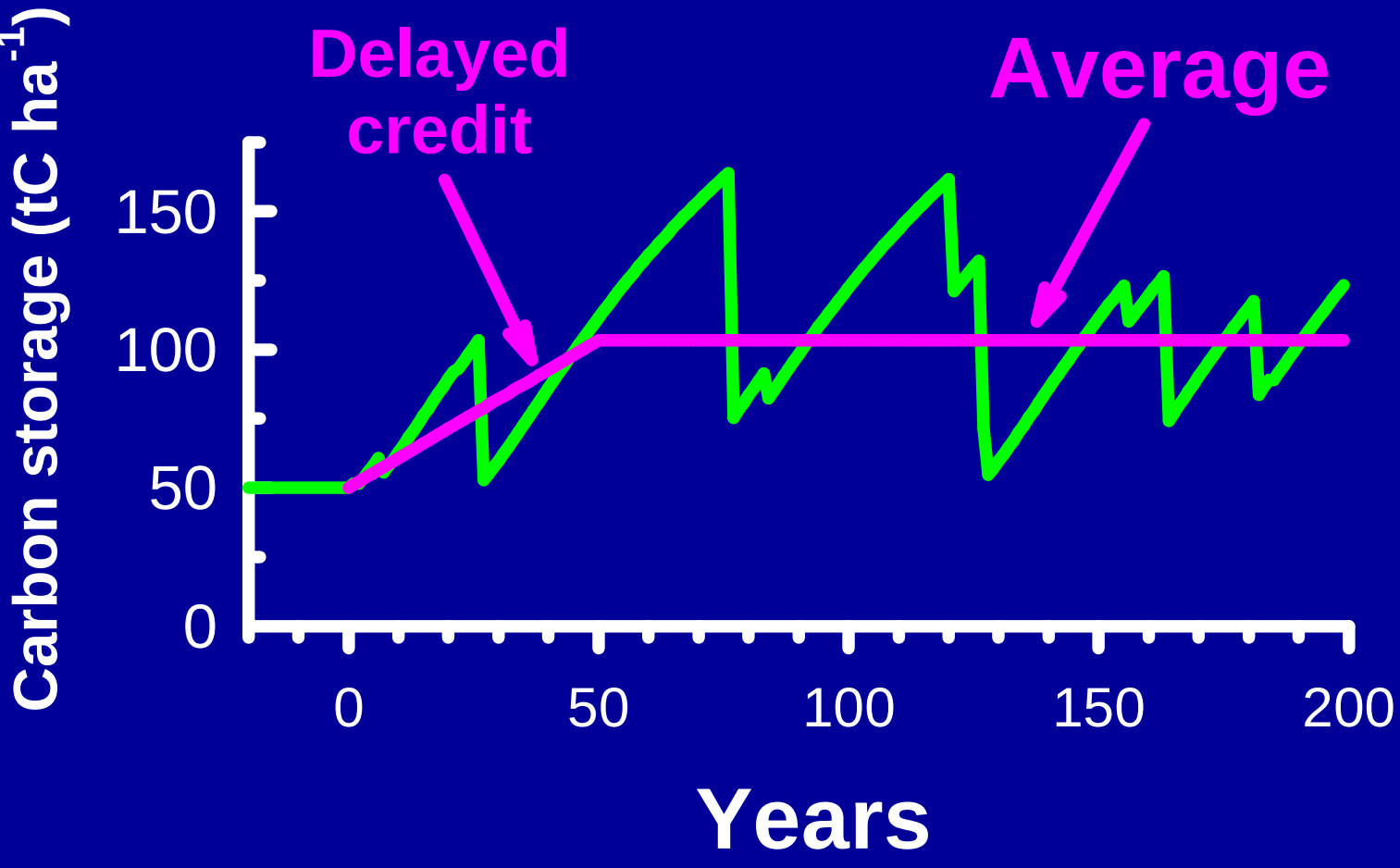
- Sub-divide land area into different land-use types.
- Establish characteristic carbon storage potential for each land-use type.
- Give credits/ debits for conversion between land-use types with different carbon storage potential.
- Give credits/ debits for human-induced change of carbon storage within land-use types.

Forests NSW's 100 year Carbon Stock profile




Carbon storage in typical forest
Fire
Wood harvest
Fire
Carbon storage (tC ha-1)
200
150
100
50
0
50
100
150
200
Years
Land-use change

Carbon storage in typical forest



Verification: Data requirements

Area estimates

- remote sensing
- planning information
- spot checks

Potential average carbon density

- stratified sampling
- general scientific understanding , models
- statistics
- spot checks

Average Carbon Stock Approach

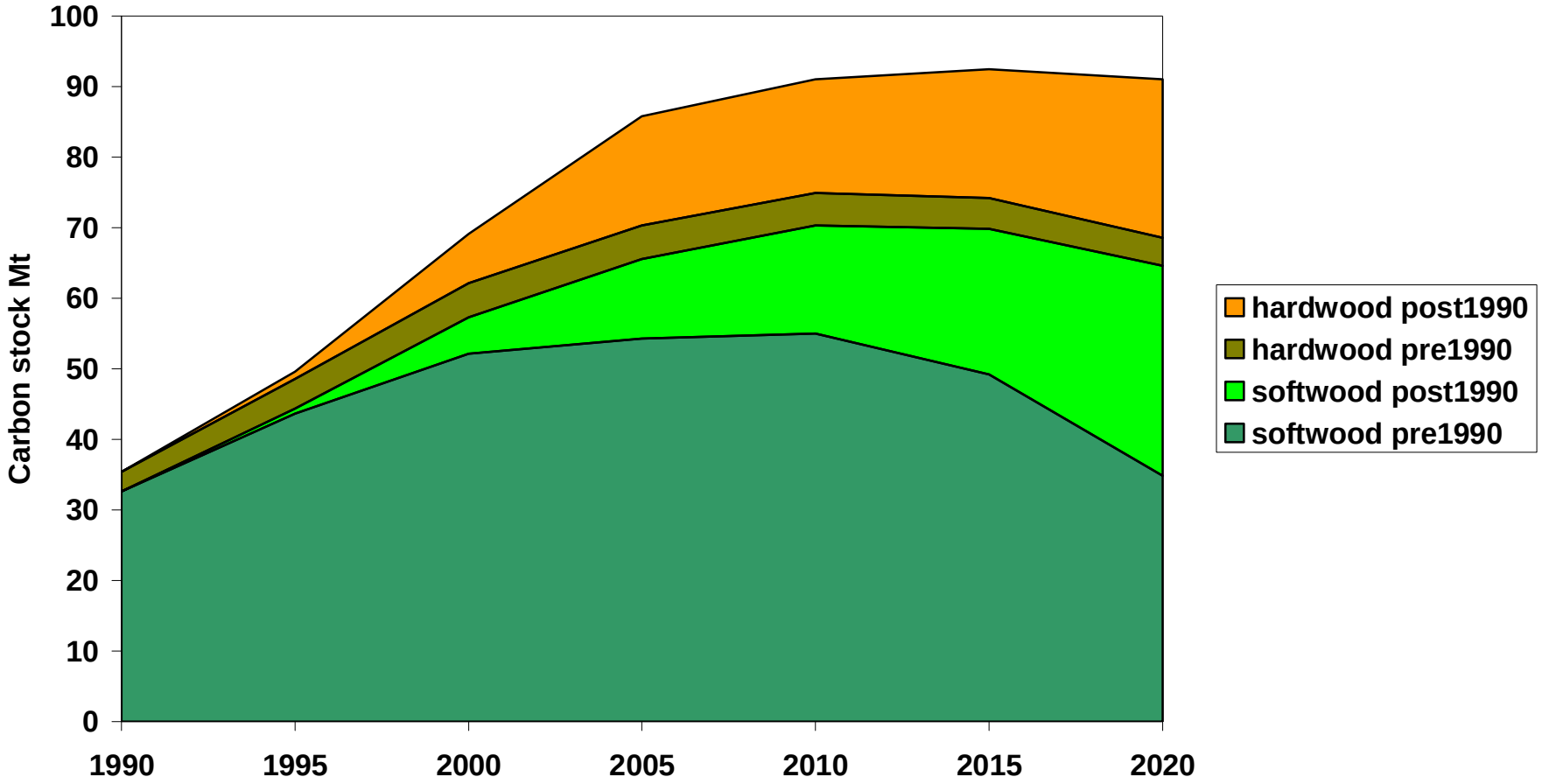
- gives credit only for long term benefits
- simplifies carbon accounting
- reduces monitoring requirements, costs
- gives credit for direct human-induced impacts

‘Factoring-Out’

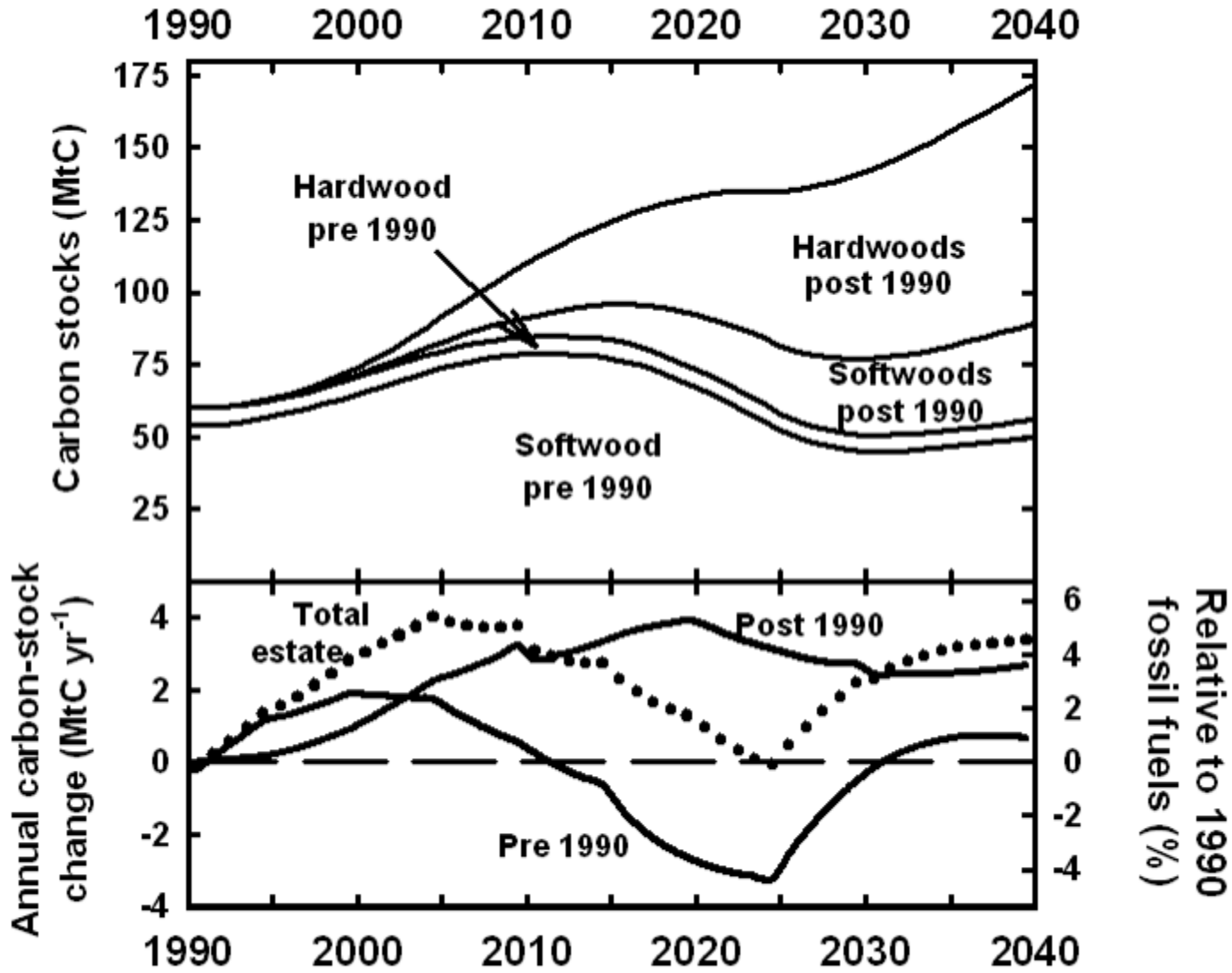
COP 7 Marrakesh Accord:

- *….accounting excludes removals resulting from (i) elevated carbon dioxide concentrations above their pre-industrial level; (ii) indirect nitrogen deposition; and (iii) the dynamic effects of age structure resulting from activities and practices before the reference year*

- IPCC invited to develop methods for “factoring-out” direct human-induced changes from changes due to indirect human-induced and natural effects, and effects due to past practices in forests

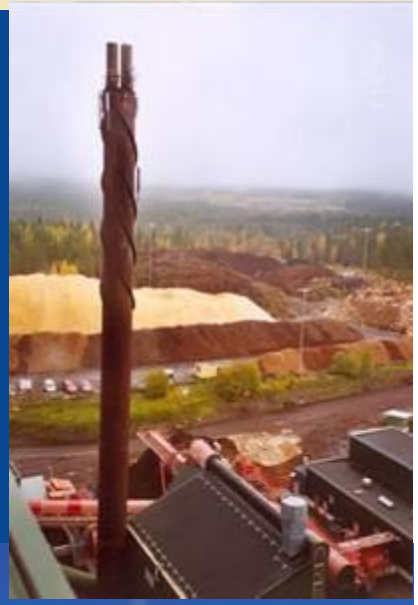


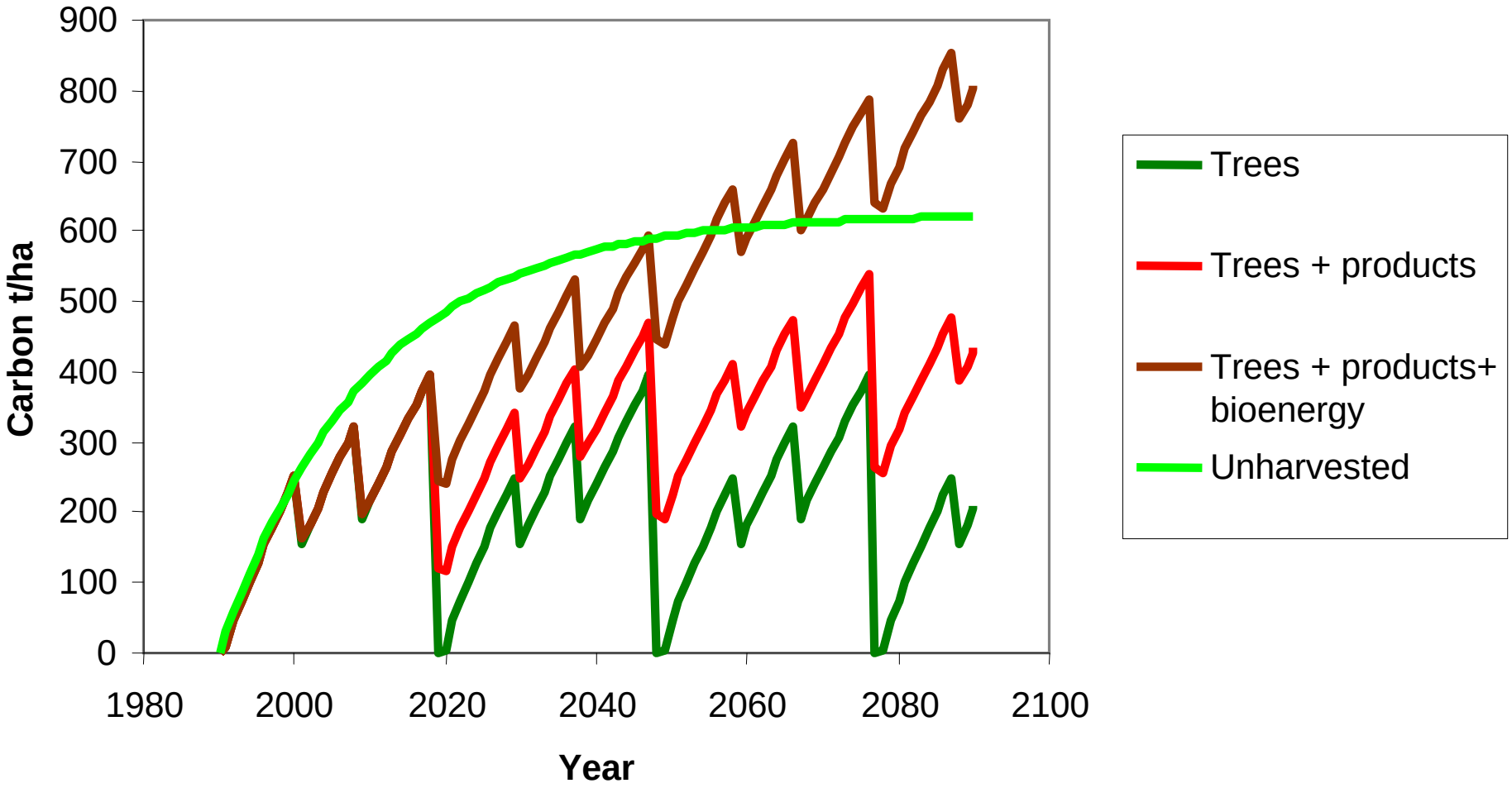
Kirschbaum and Cowie



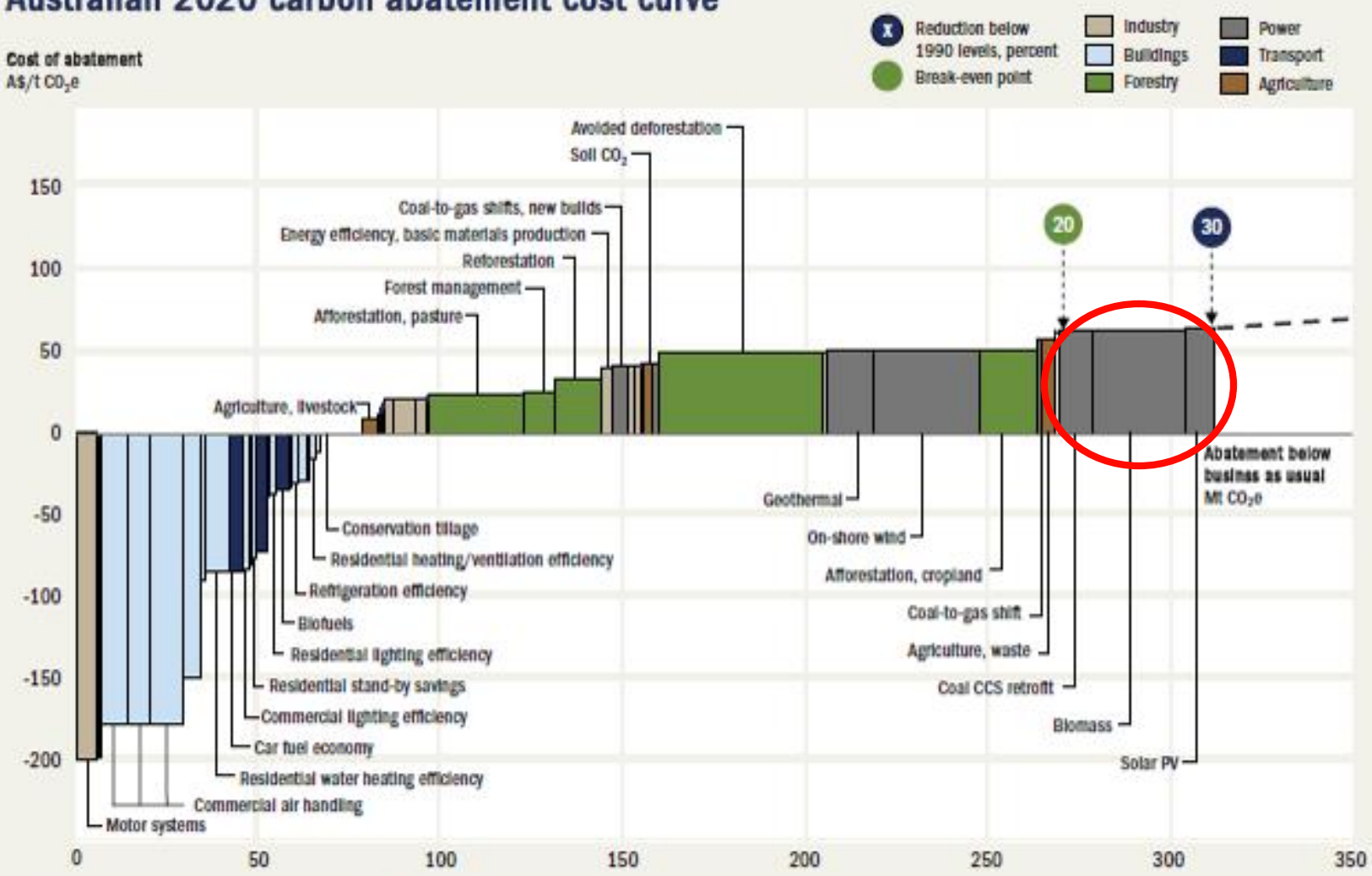
Kirschbaum and Cowie 2004 Climatic Change 67: 417–436.

Opportunities: Bioenergy




900
800
700
600
500
400
300
200
100
0
Carbon t/ha
1980
2000
2020
2040
2060
2080
2100
Year
Trees
Trees + products
Trees + products+ bioenergy
Unharvested

Australian 2020 carbon abatement cost curve

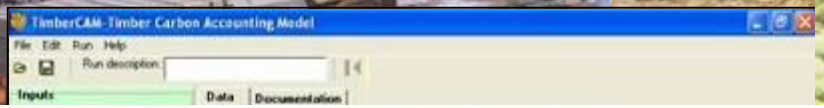


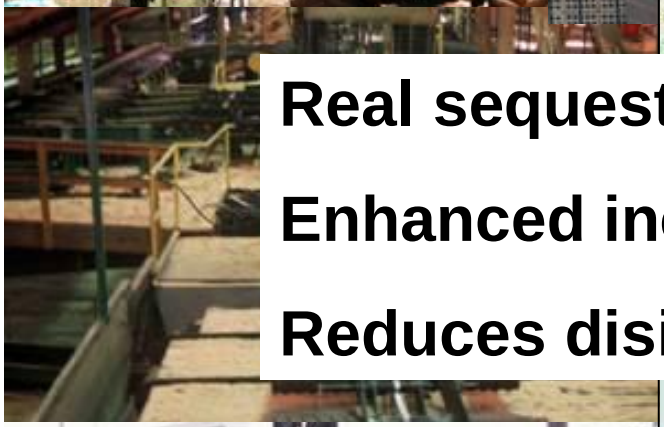
Note: Abatement opportunities are not additive to those of previous years

Source: McKinsey Australia Climate Change Initiative

Opportunities: Wood products

Accounting for wood products?

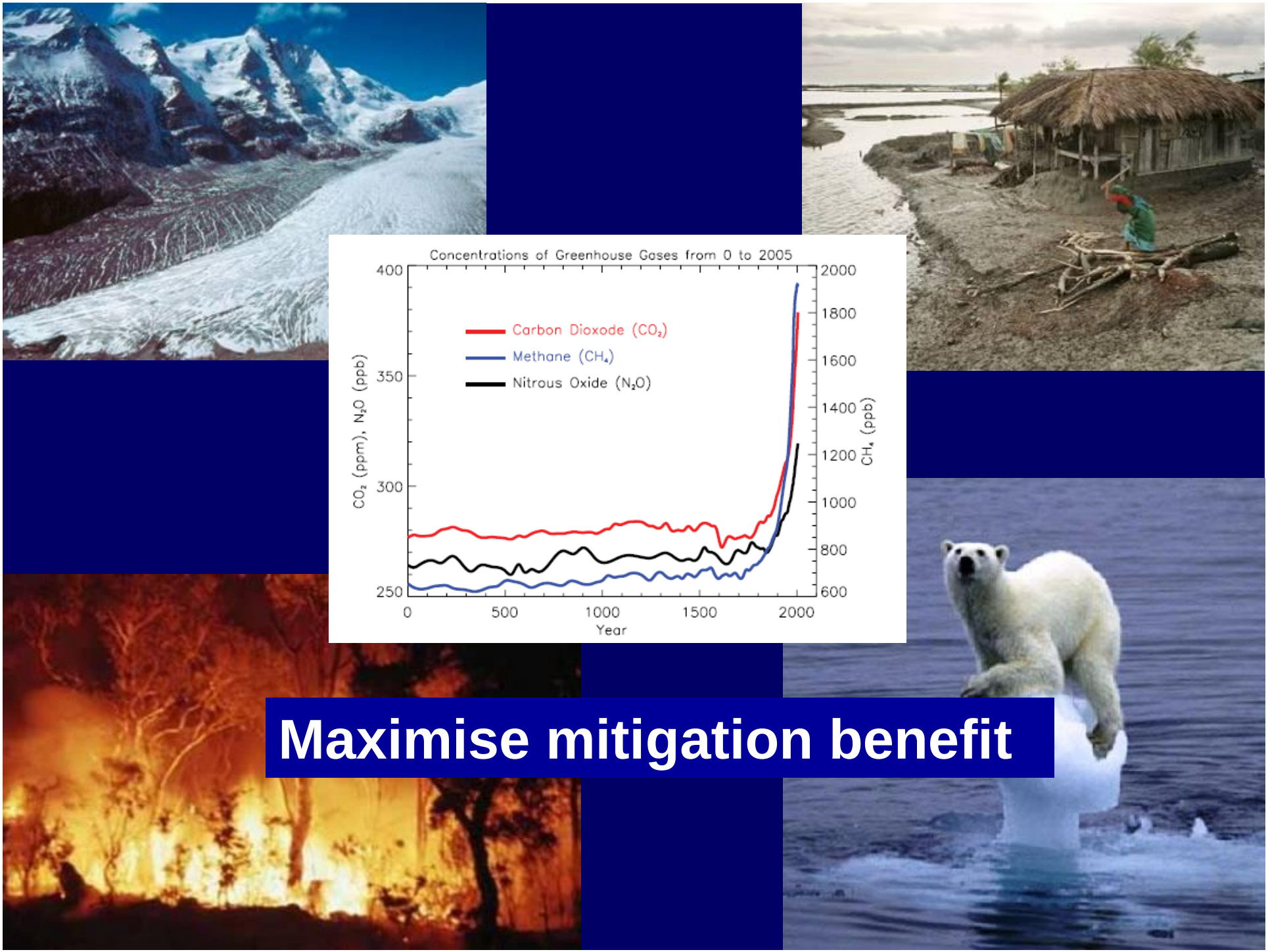




- **Real sequestration**
- **Enhanced incentive to use wood products**
- **Reduces disincentive to harvest**

Issues for Forestry in CPRS

- Opt-in – limited participation, cherry-picking
- Environmentally, full coverage is preferable
- GHG accounting gaps
  - Models for low rainfall
  - Soil carbon dynamics
  - Estimating non-CO_2 GHGs
- Approach - Average carbon stocks
- Coverage
  - Inclusion of wood products
- No need to be constrained by CP1 rules
- Minimise barriers, maximise incentive



Maximise mitigation benefit