

# Climate change mitigation through forestry measures: potentials, options, practice

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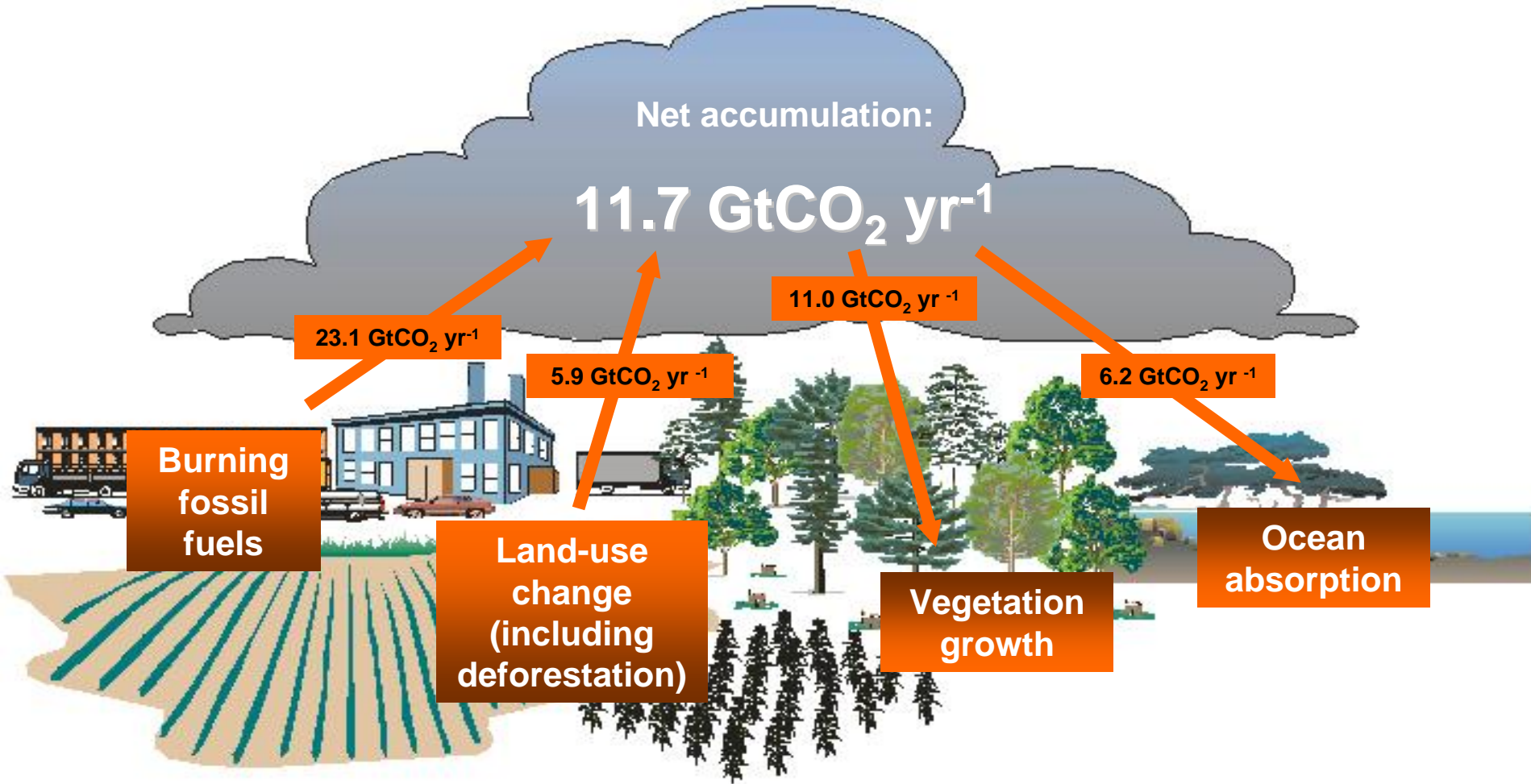
## What I will cover

- Inherent properties of GHG balances in forestry systems (1 slide)
- The current GHG balance and potentials at different scales (5 slides)
- Modelling forest GHG balances and impacts of measures (2 slides)
- Understanding the potentials and issues surrounding specific forestry measures (14 slides)
- Estimating potential of forestry measures in Wales (6 slides)
- What does it all mean for practice? (1 slide)
- What is the FC doing? – Woodland carbon code and assessment protocols (3 slides)
- Conclusions (2 slides).

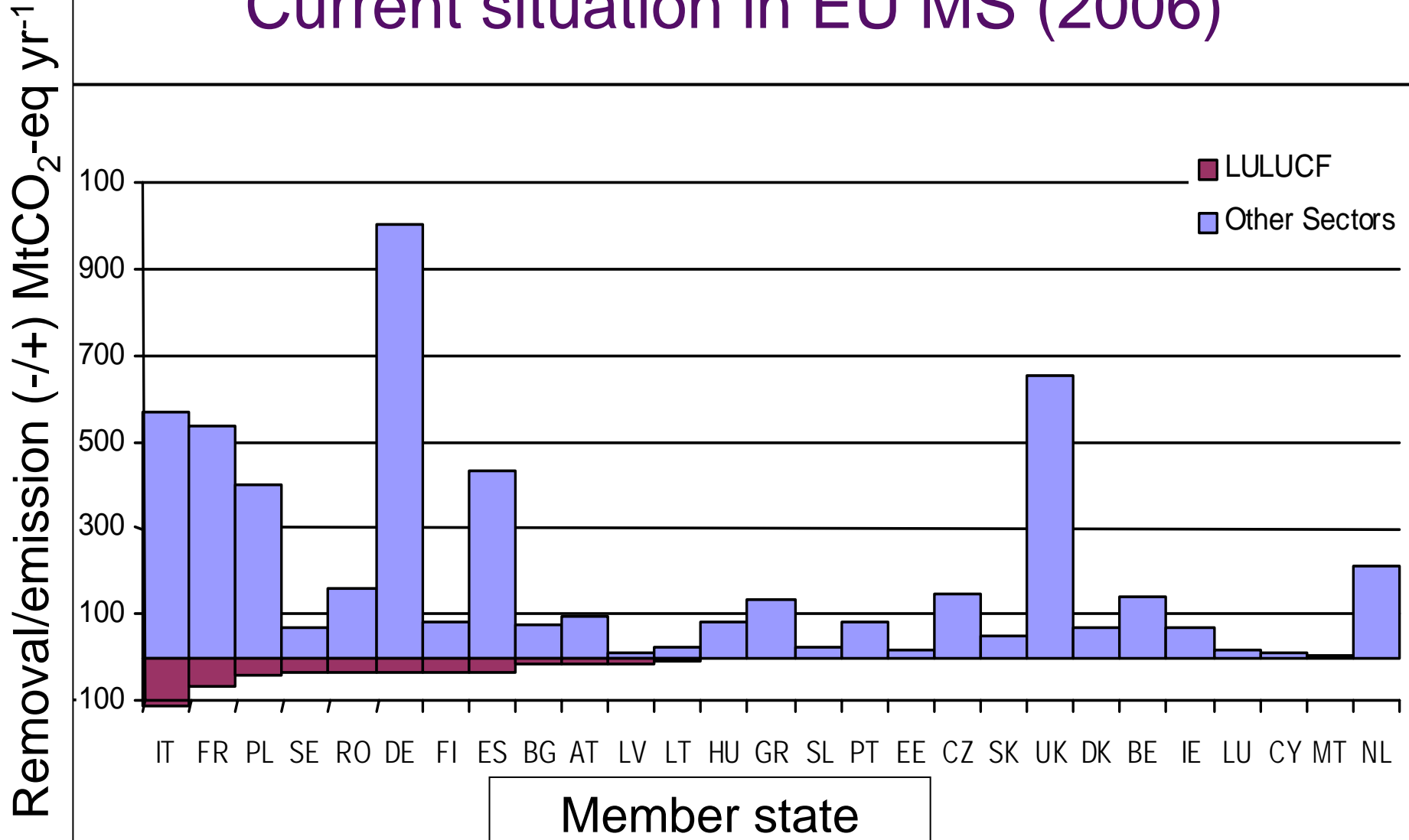
## GHG dynamics in forest systems

- Emissions, removals, saturation, reversibility
- Complex, time-dependent responses
- Human and natural impacts
  - (When evaluating and monitoring measures, natural impacts need to be ‘factored out’ as part of dealing with additionality)
- **Risks**
  - Outcomes are not always reliable or certain
  - A large number of diverse actors are involved
  - Indirect Land Use Change (ILUC)
- **Also to bear in mind**
  - Wider impacts/co-benefits in forestry
  - Harvested wood products (HWP)
  - Contributions of biomass/HWP in Energy and Industrial sectors.

# Global carbon balance c. 2000

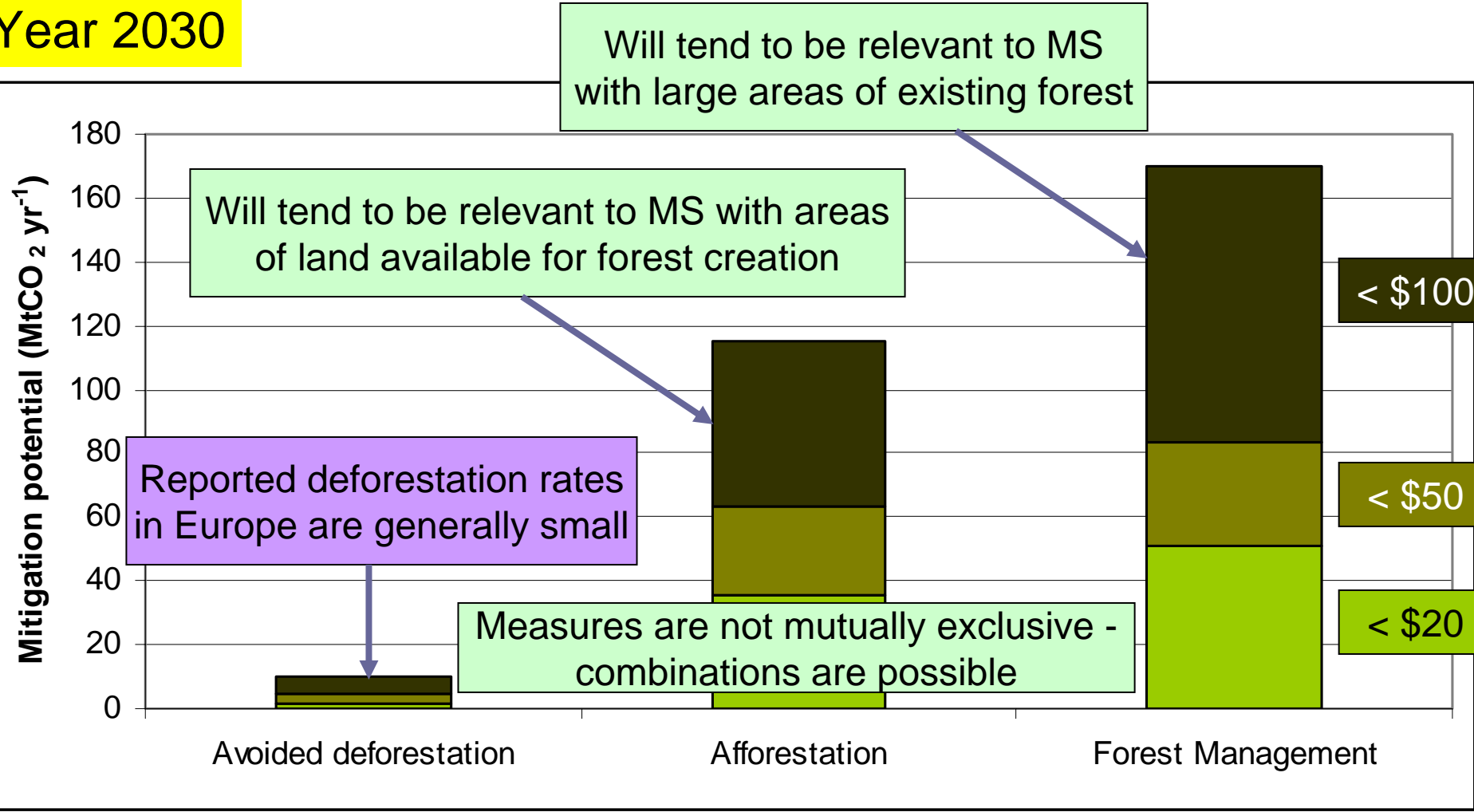


# Current situation in EU MS (2006)



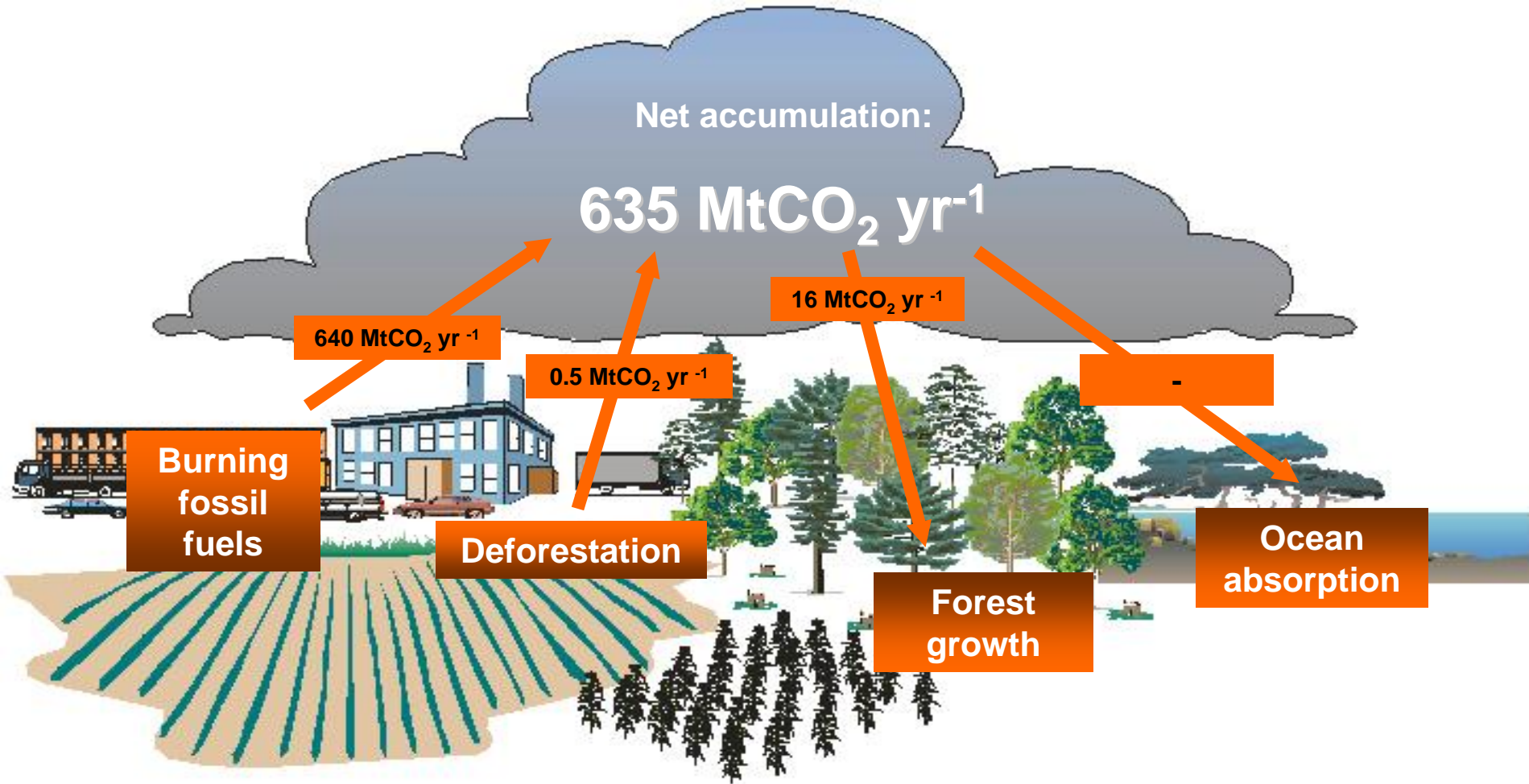
# Estimated mitigation potential (Europe)

Year 2030



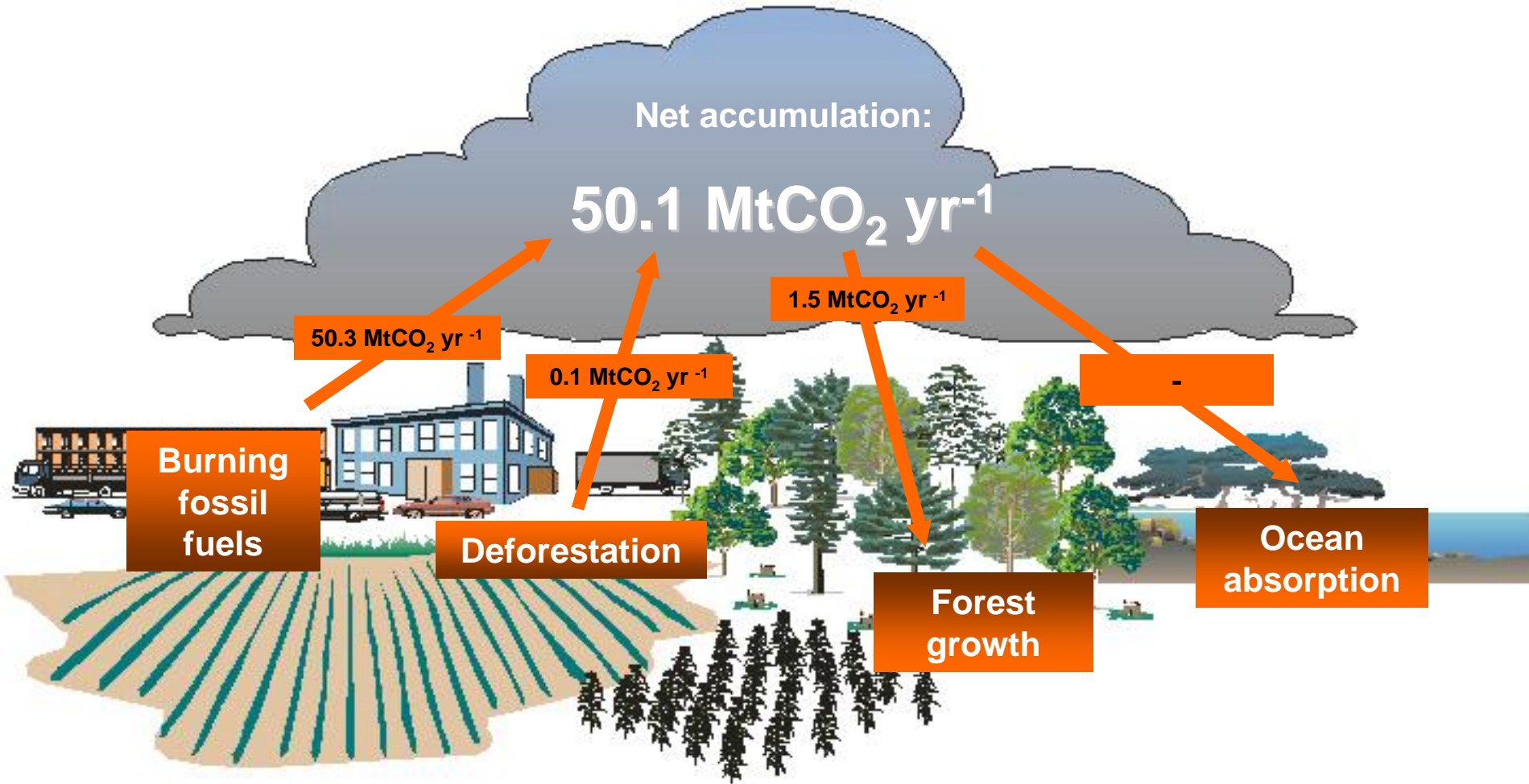
(From IPCC Fourth Assessment Report, Chapter 9)

# UK carbon balance\* 2005



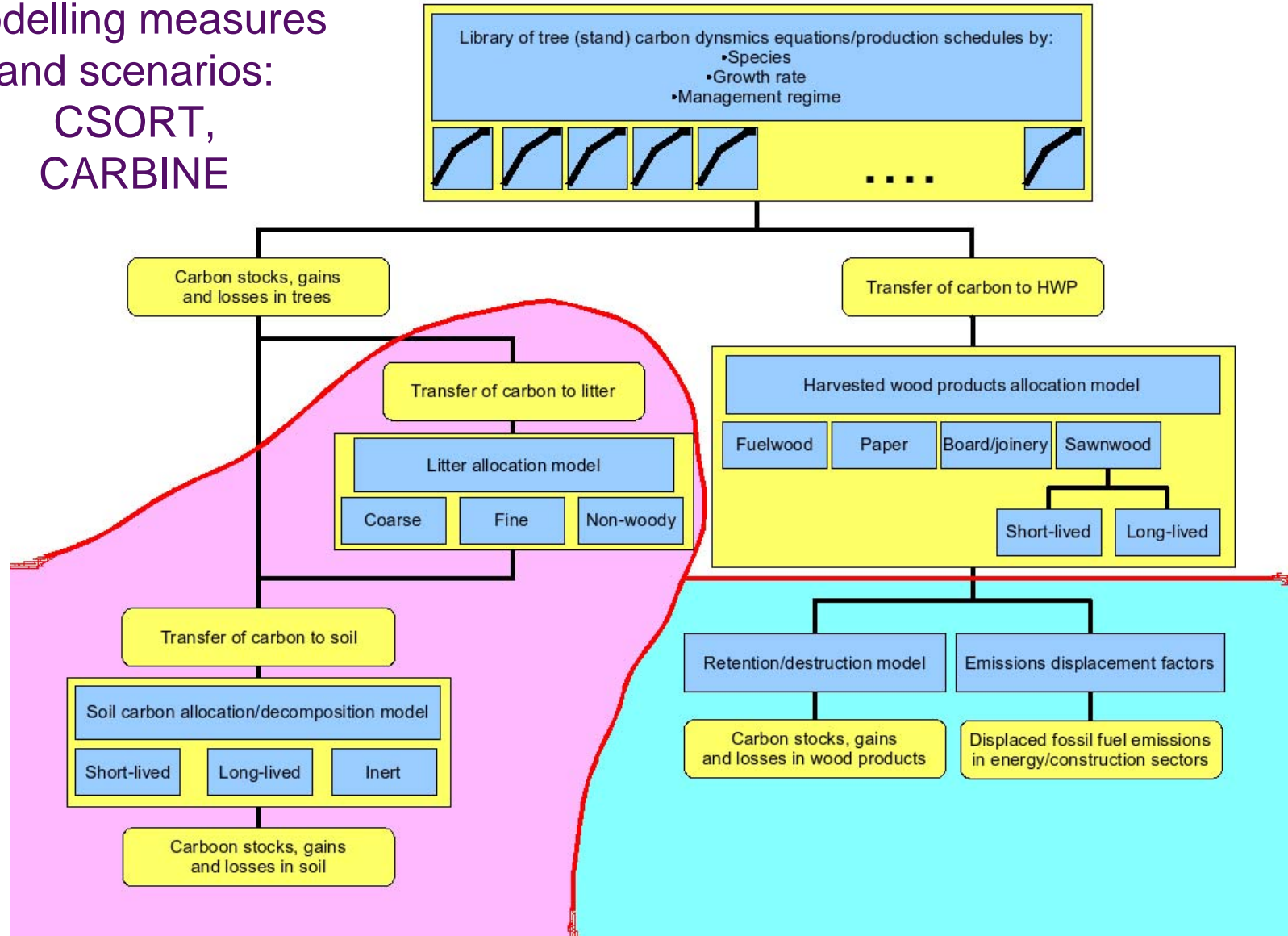
\*Non-forest land types not shown but included in net result

# Wales carbon balance\* 2005

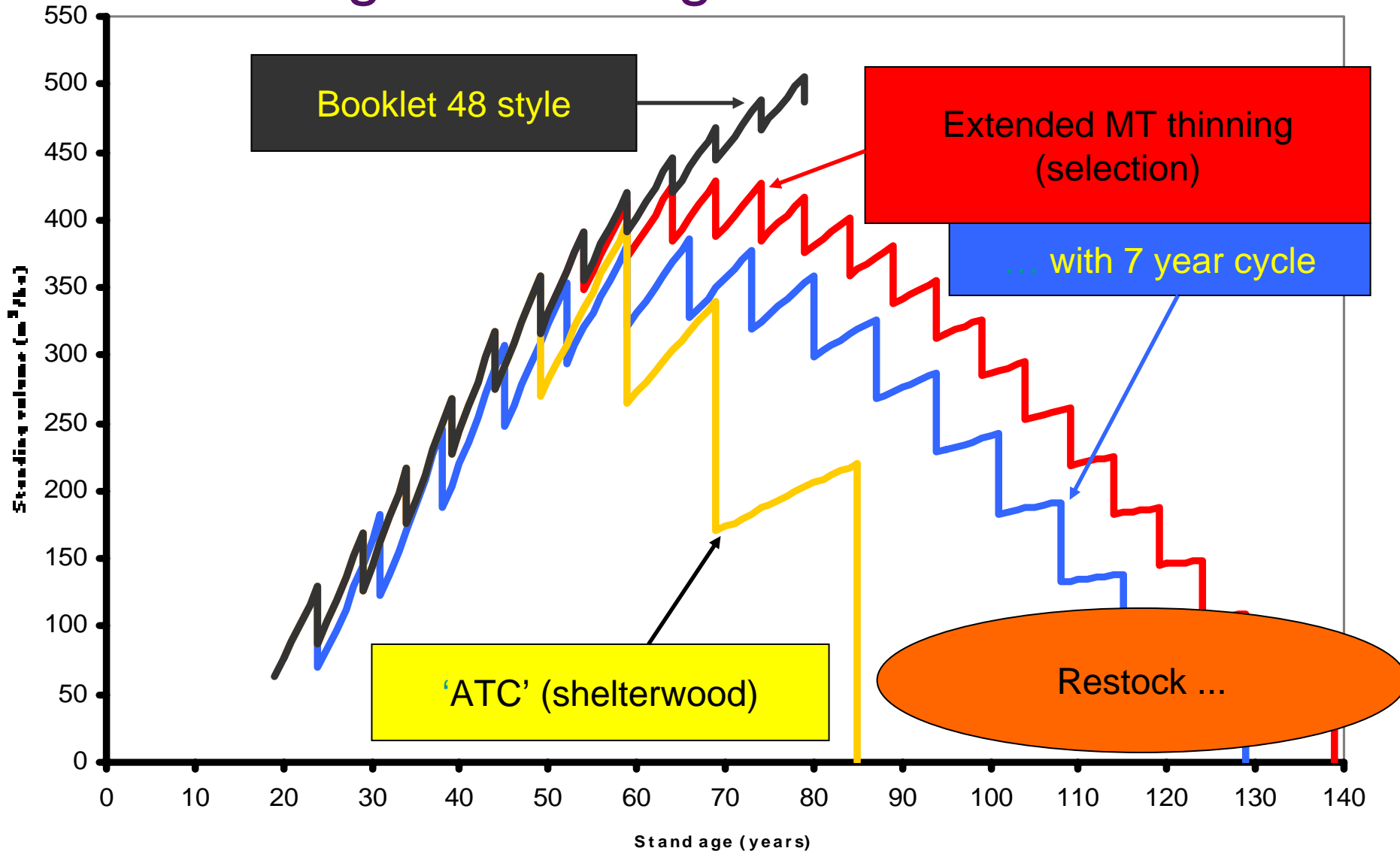


\*Non-forest land types not shown but included in net result

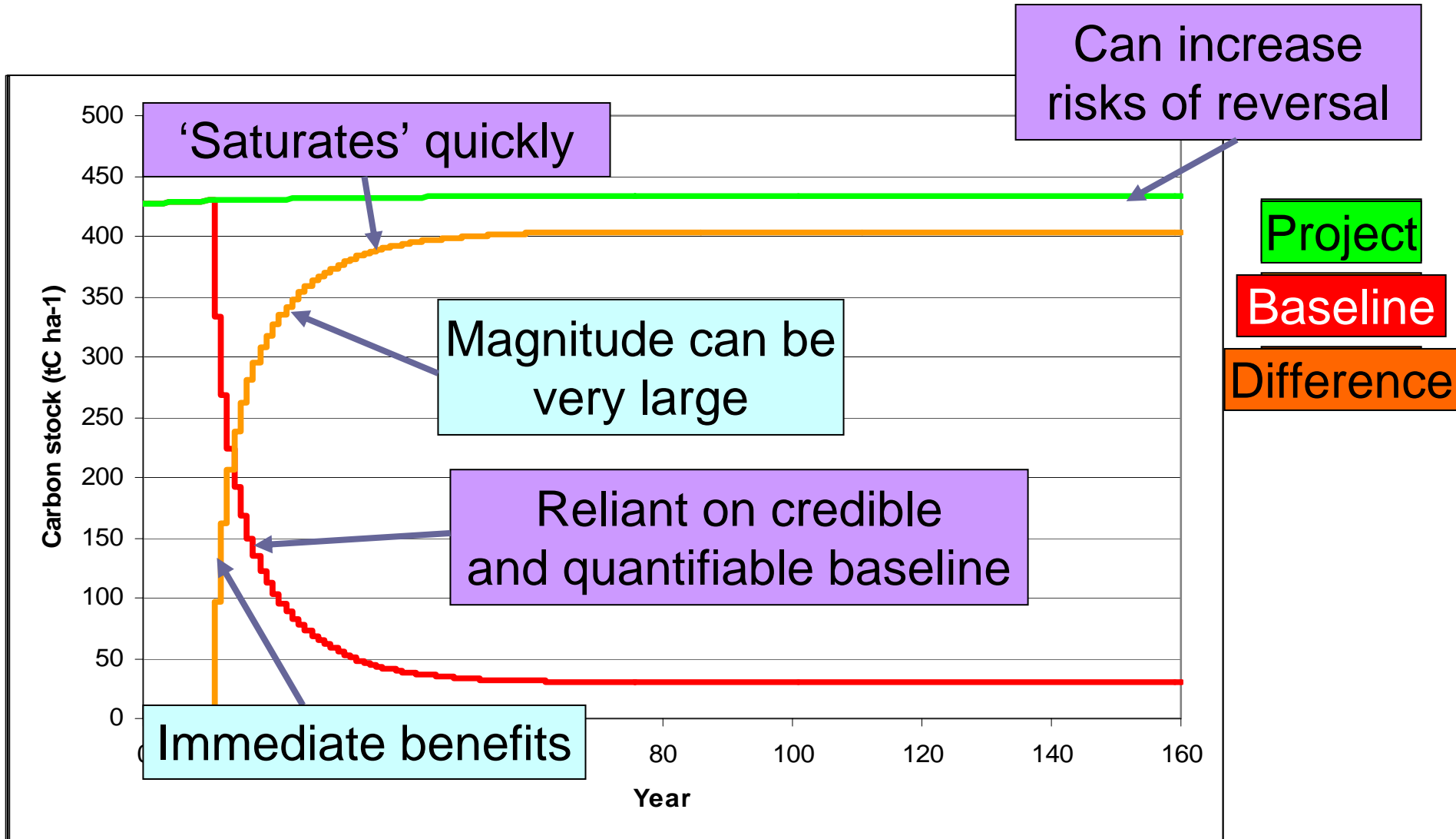
## Modelling measures and scenarios: CSORT, CARBINE



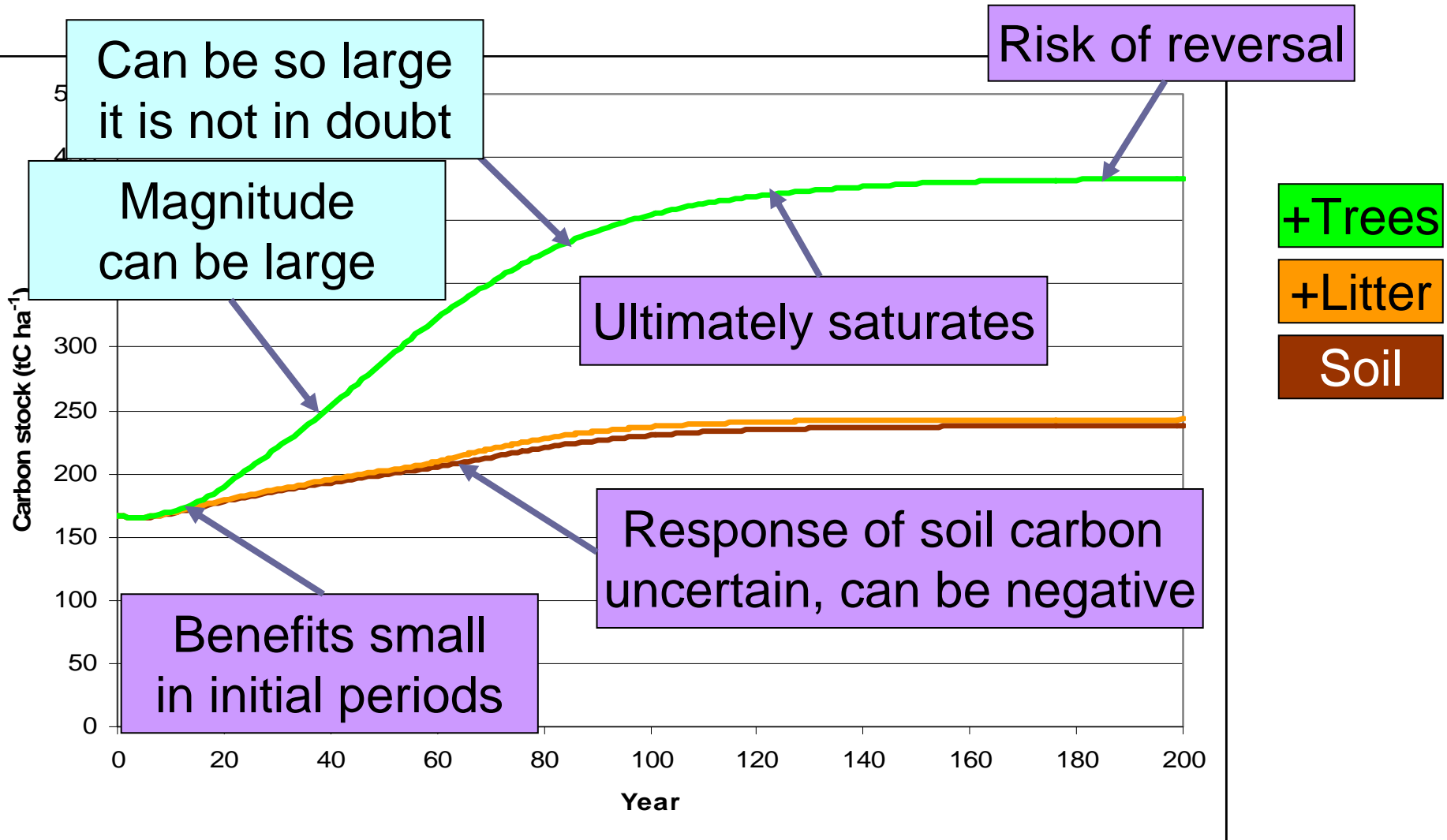
# Linking models together M1-CSORT



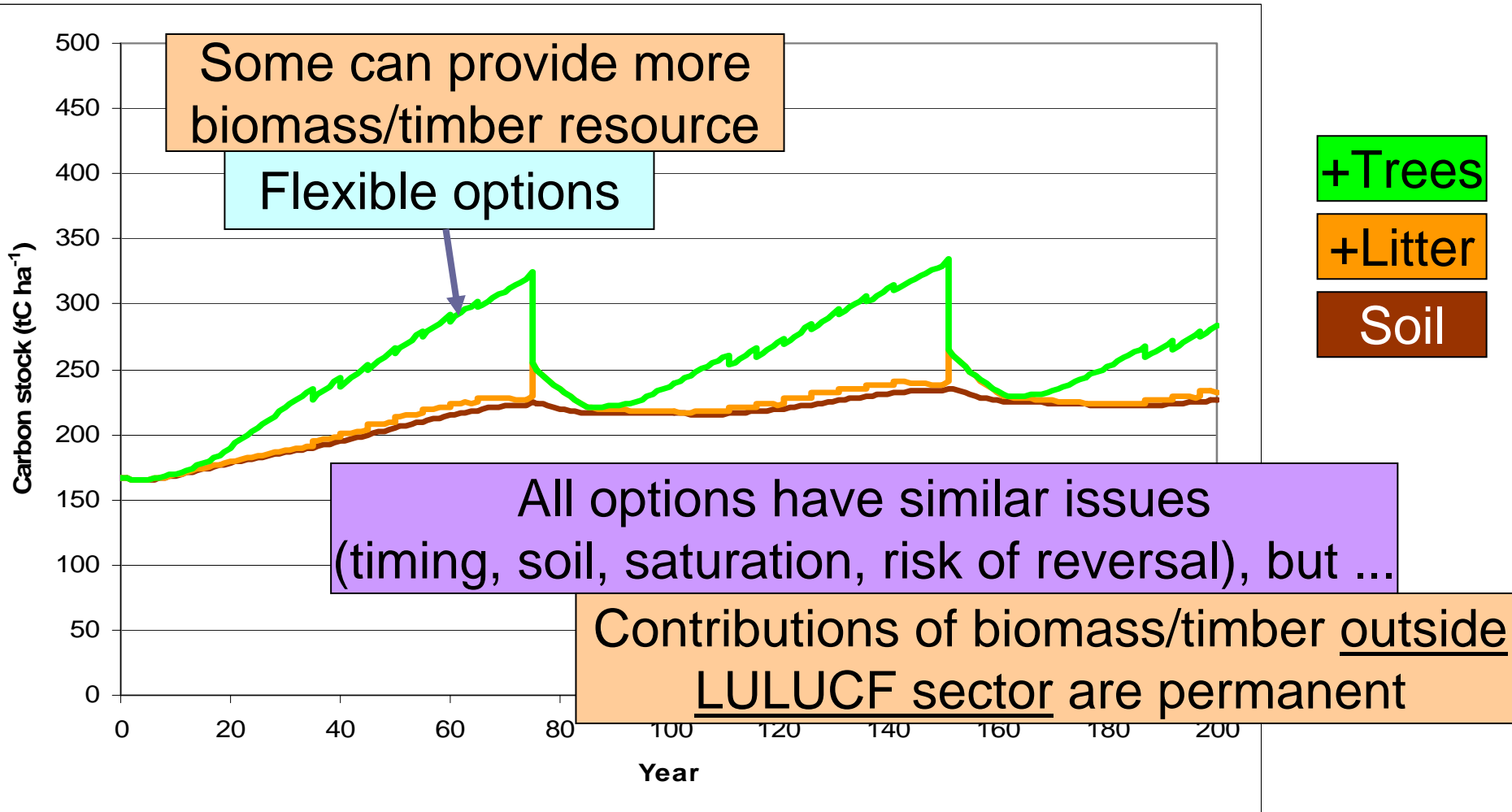
# Possible measures: avoided deforestation



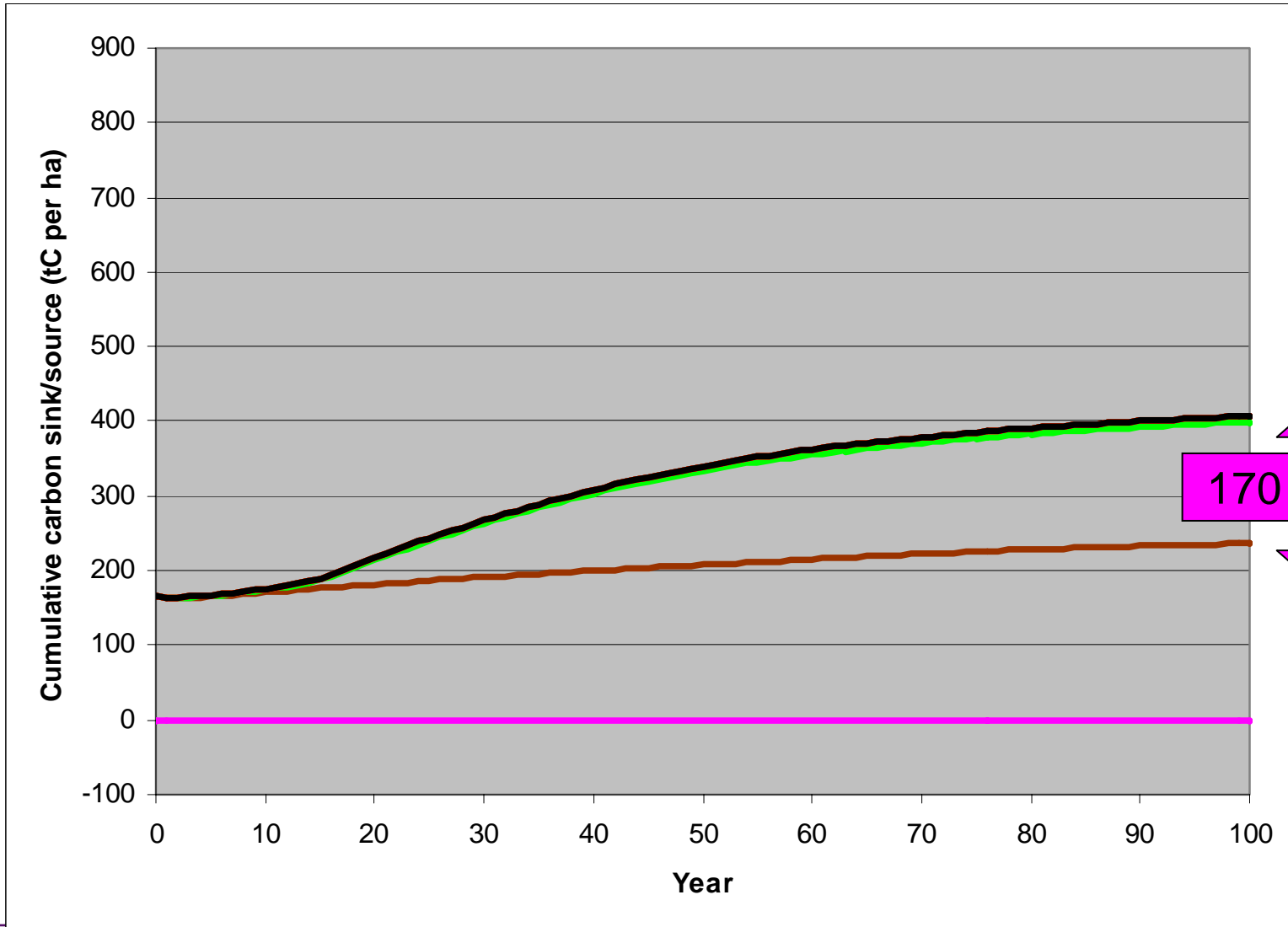
# Possible measures: afforestation (1)



# Possible measures: afforestation (2)

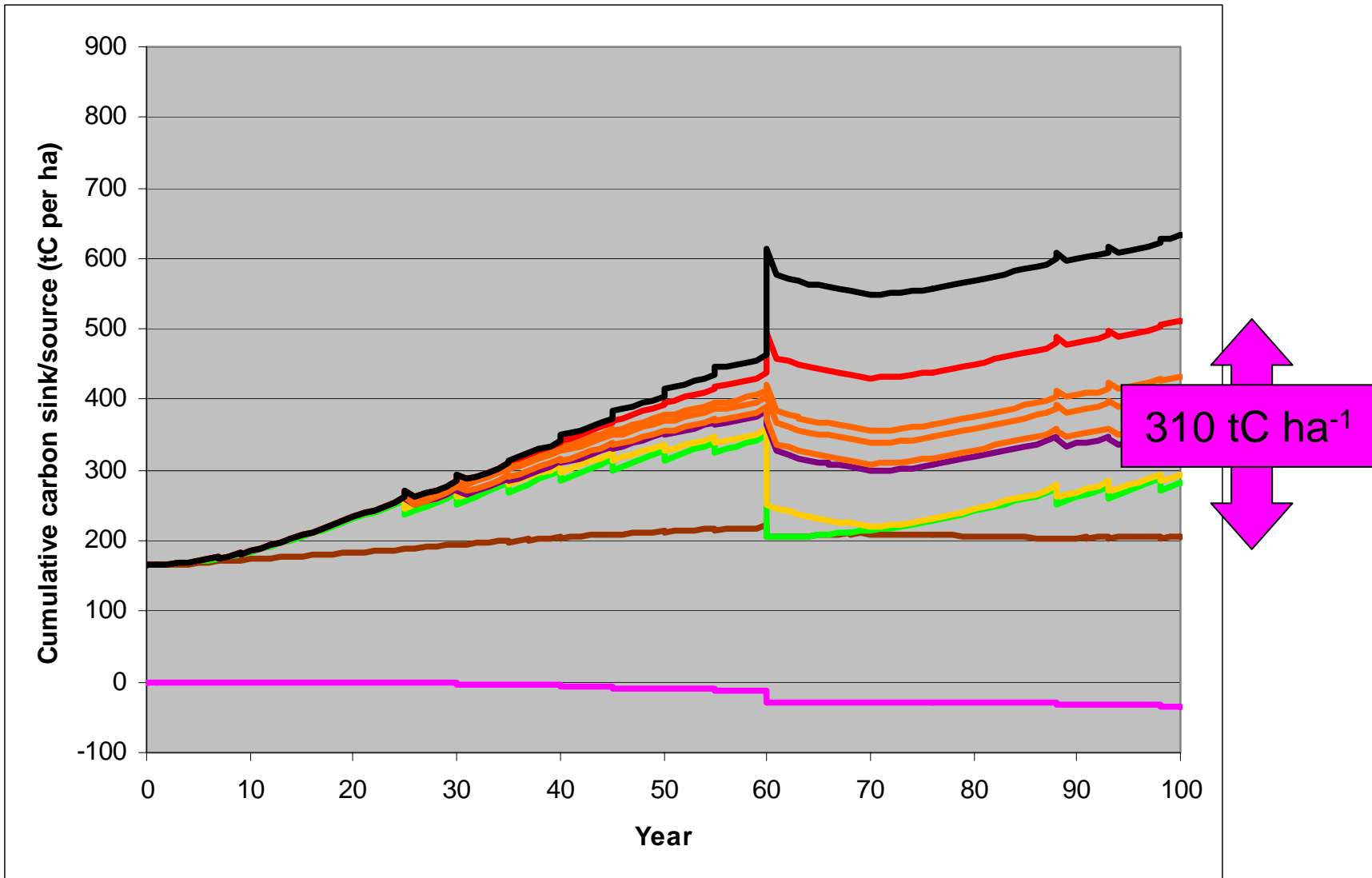


# Sycamore, ash, birch, YC 4, no thin, no fell

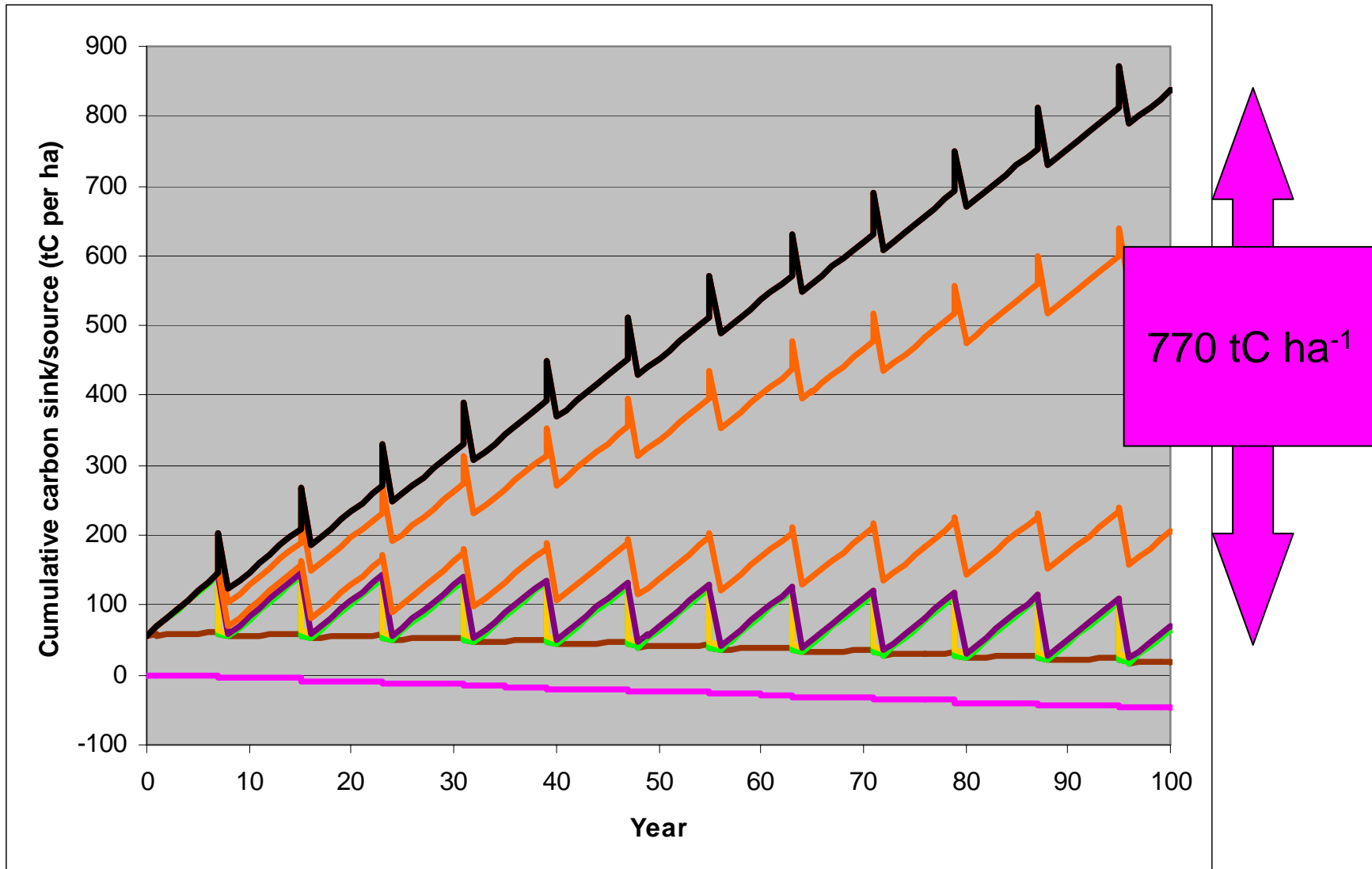


170 tC ha<sup>-1</sup>

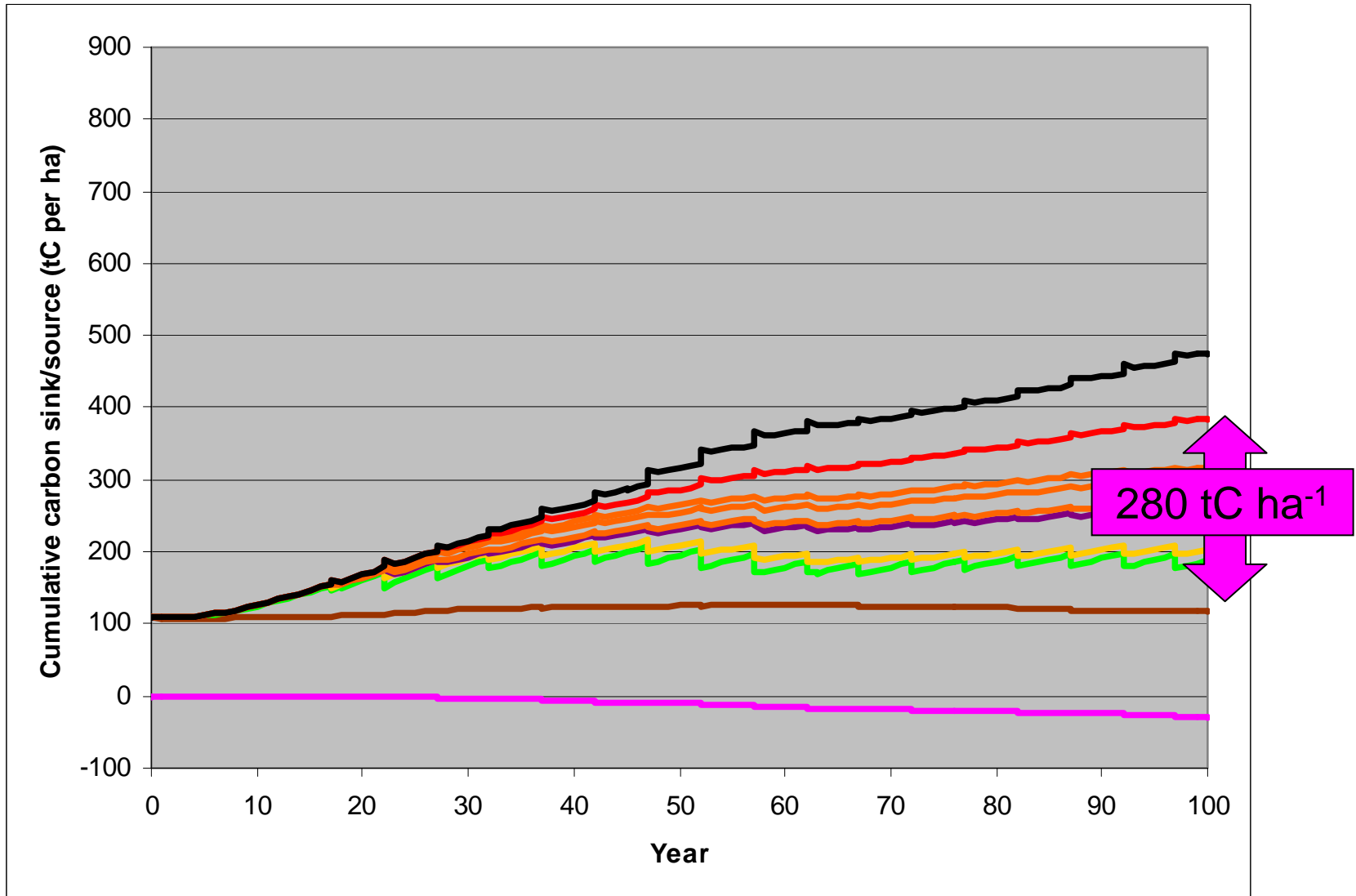
Sitka spruce/Douglas fir mix, YC 12, thinned, 60 year rotation



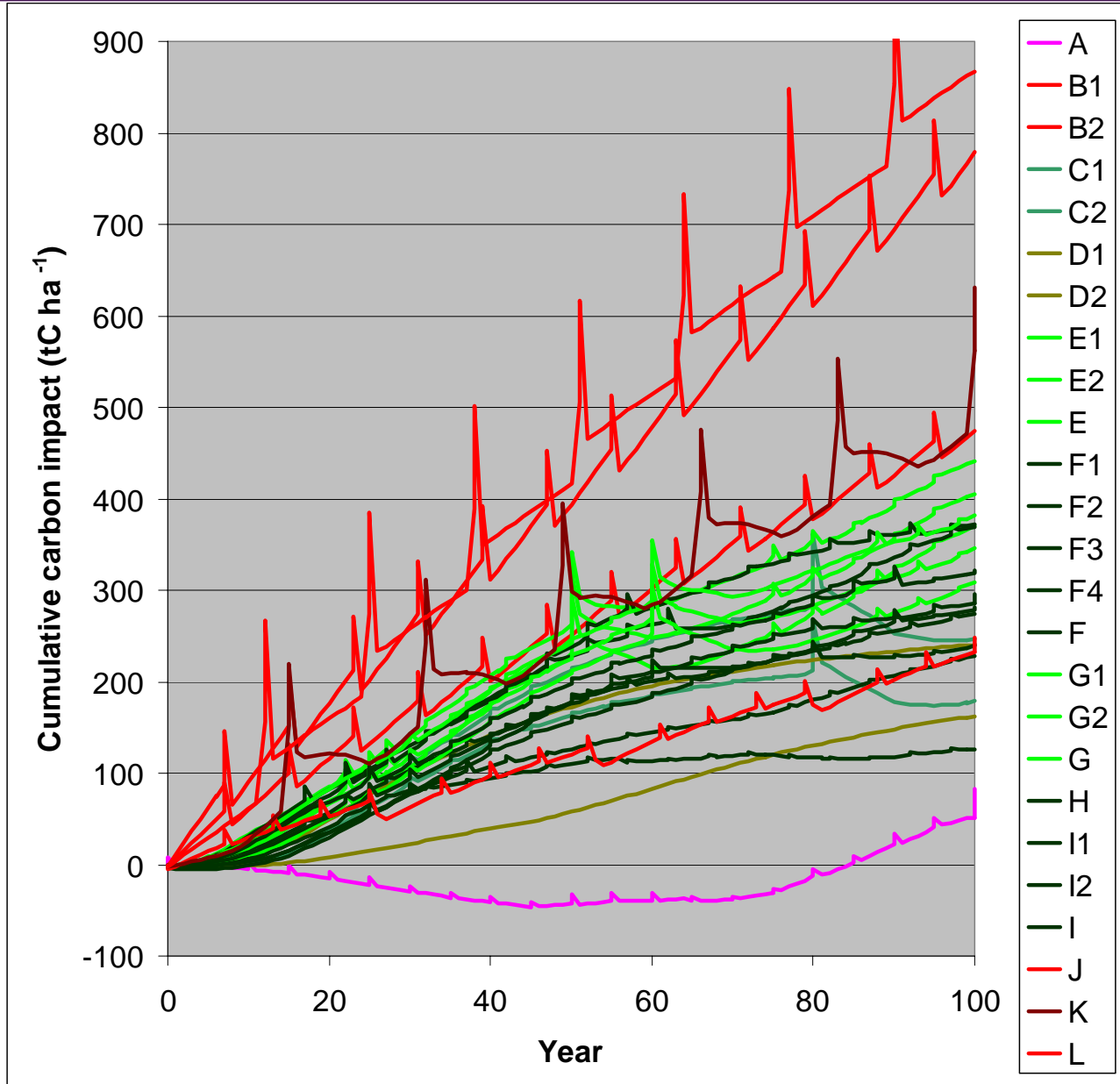
# Eucalyptus, YC 36 (!?), 7 year rotation



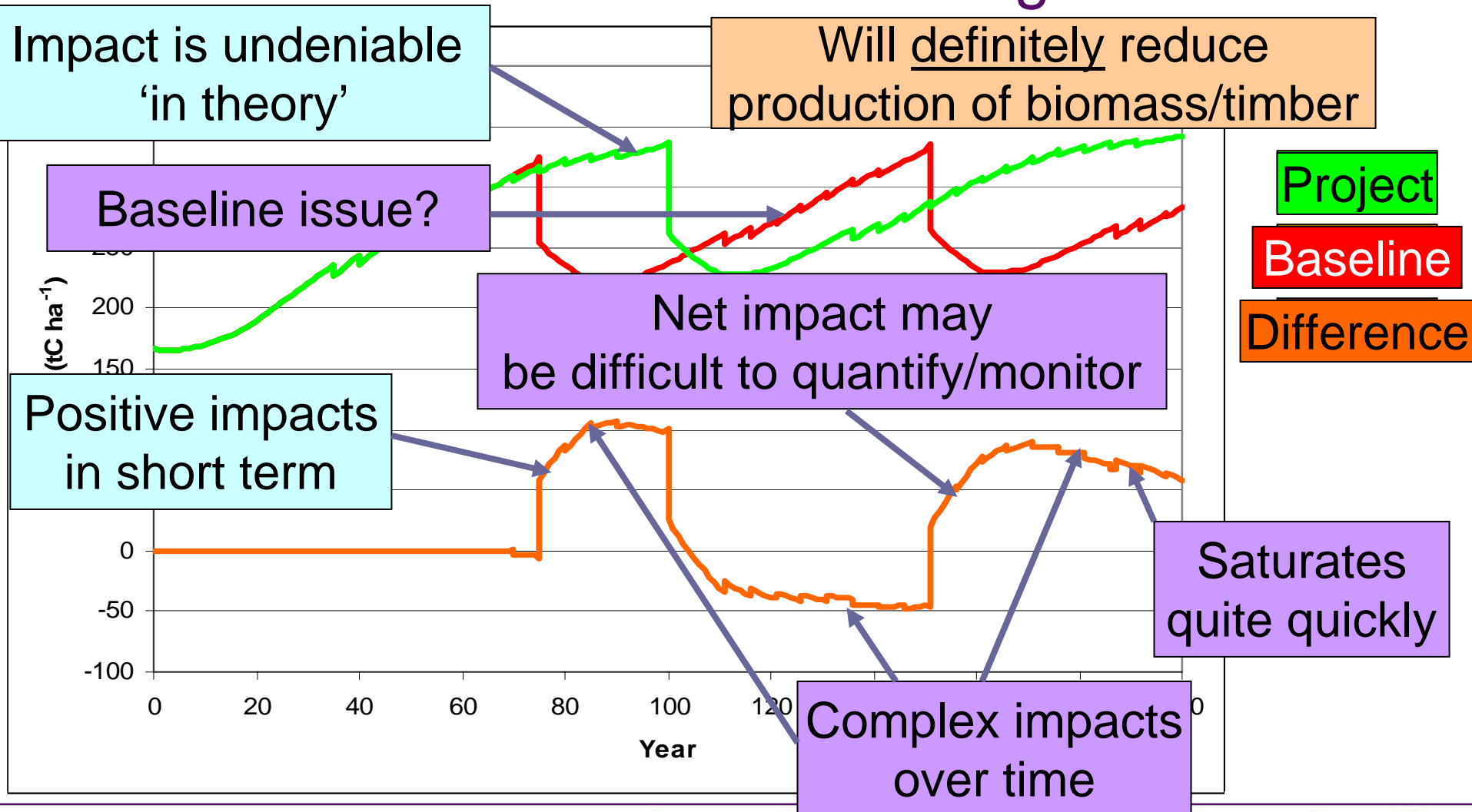
# Conifer/broadleaf mixture, various YC, LISS



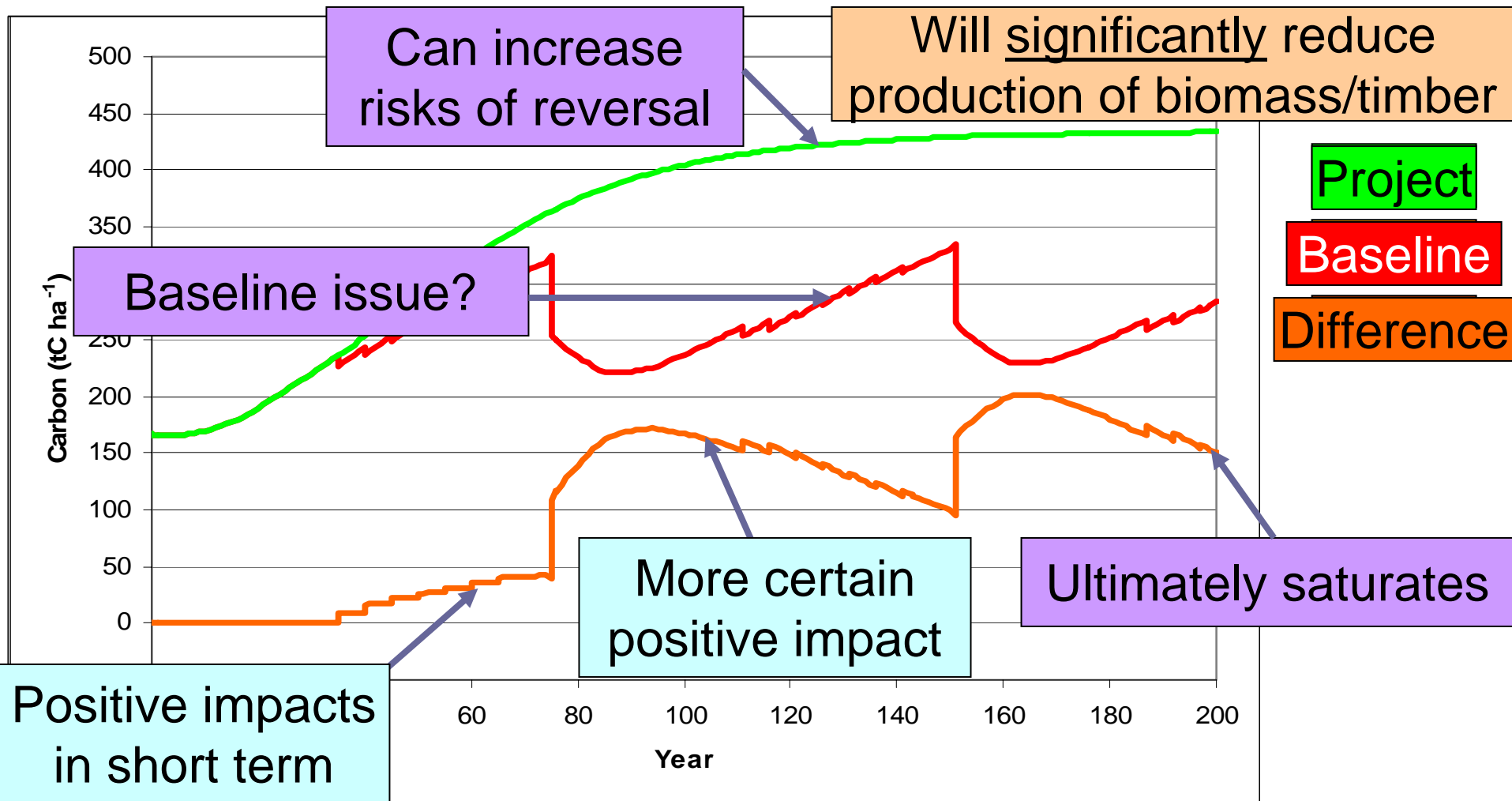
## A range of examples



# Possible measures: Extended rotations in existing forests



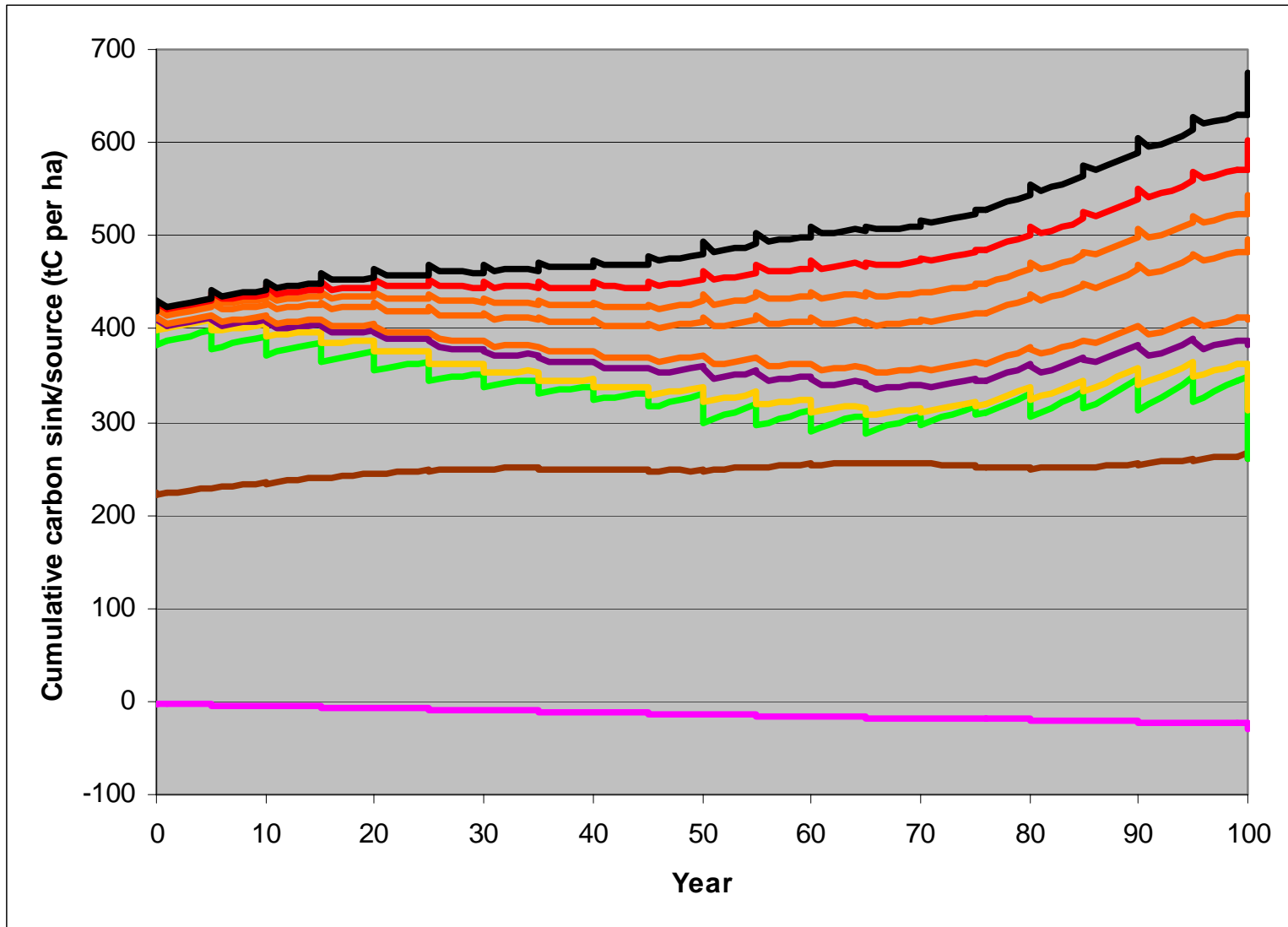
# Possible measures: Stopping harvesting in existing forests



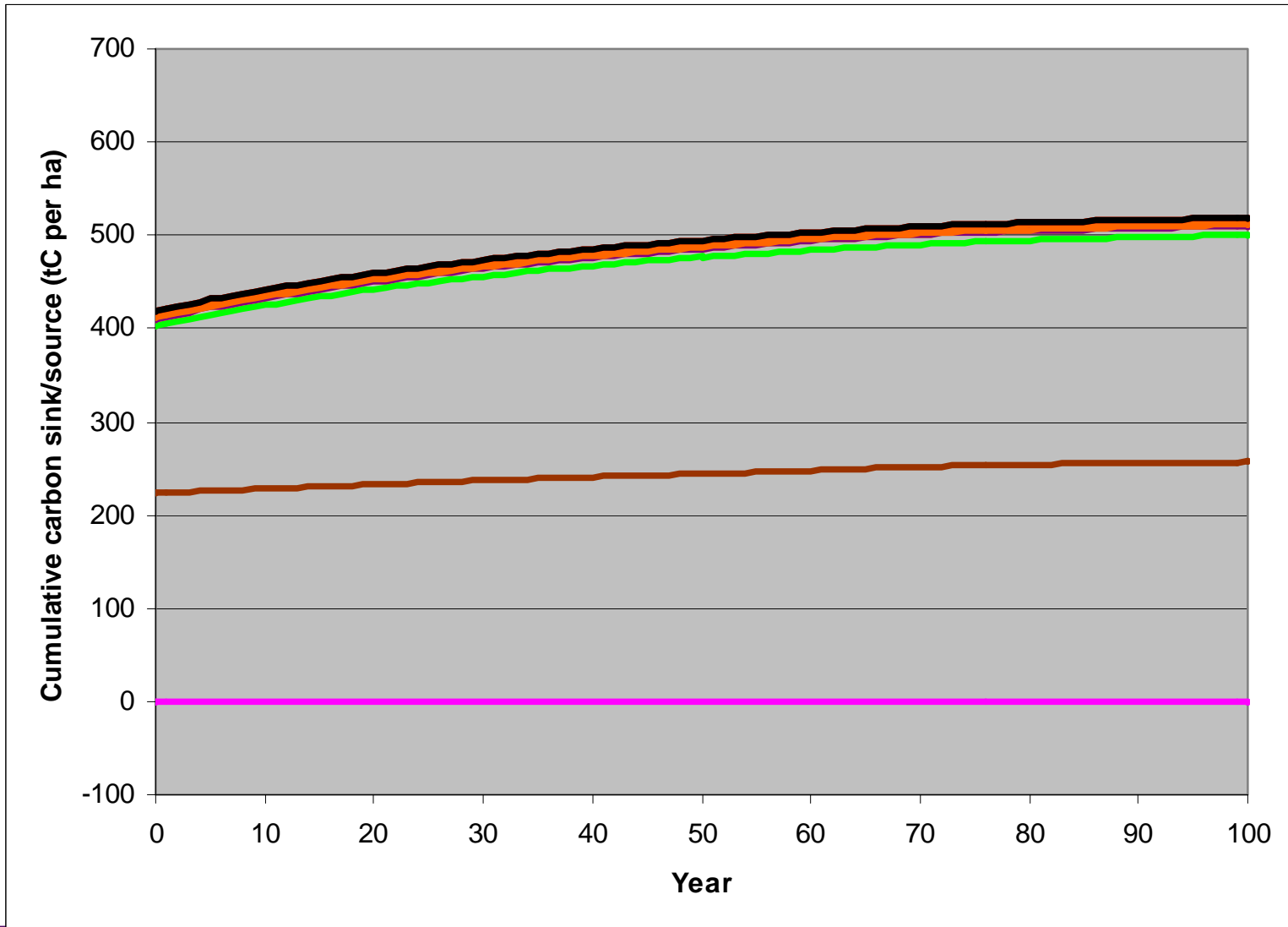
## Measures to achieve cross-sectoral benefits

- Afforestation (specifically with biomass and fibre production).
- This is an 'inevitable' co-product of afforestation measures involving production.
- Increasing production from existing forests.
  - Migration towards optimum rotations.
  - Restoring management in 'overstocked' woodlands.
- These options have the inverse impact of those aimed at enhancing carbon in existing forests, i.e.
  - Potential supply of biomass and timber to the energy and construction sectors may be increased
  - But forest carbon stocks may be reduced.

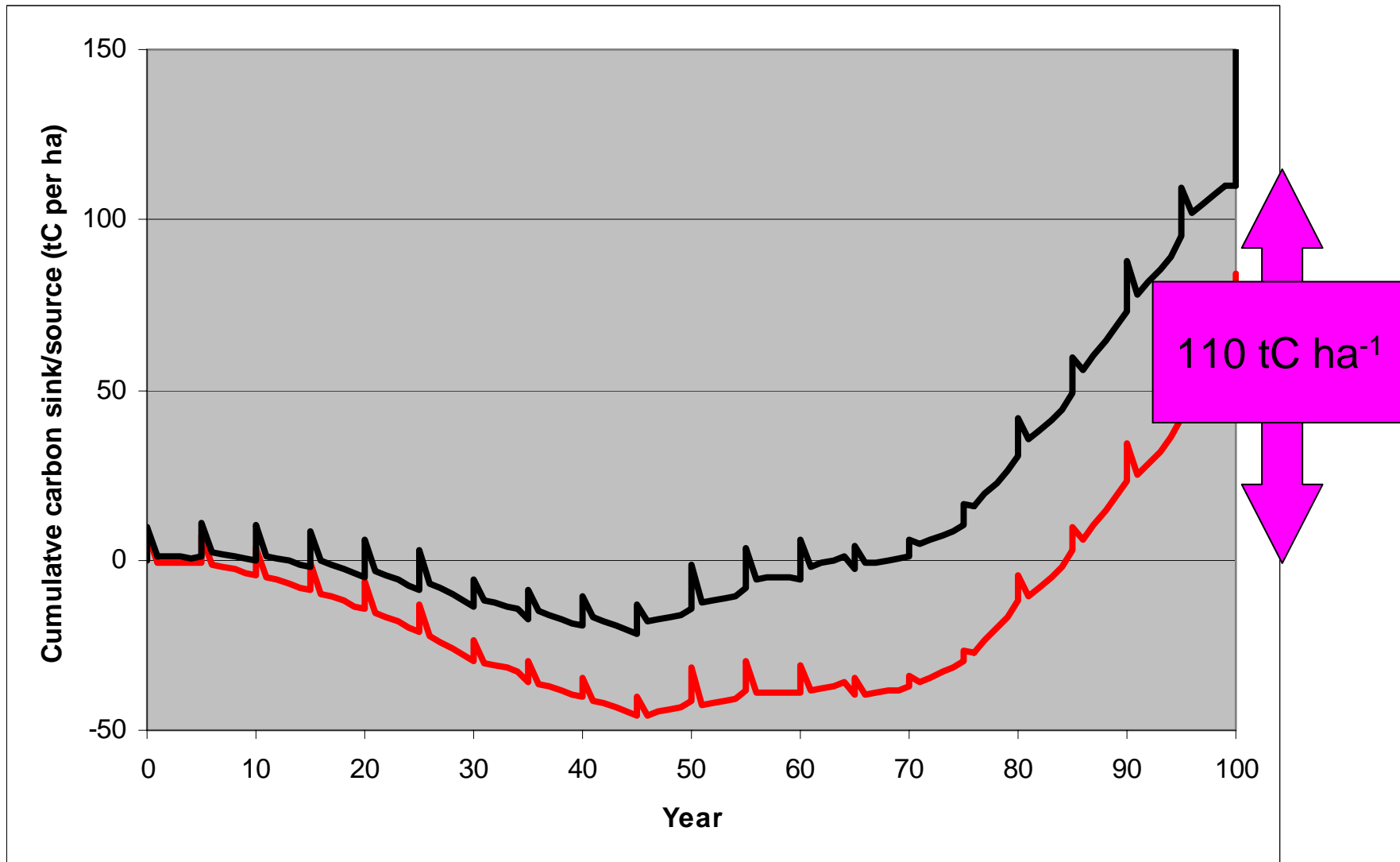
## Restoring management: SAB, YC 4, previously neglected



# Restoring management, SAB, YC 4, left neglected



# Restoring management: restoration vs. baseline



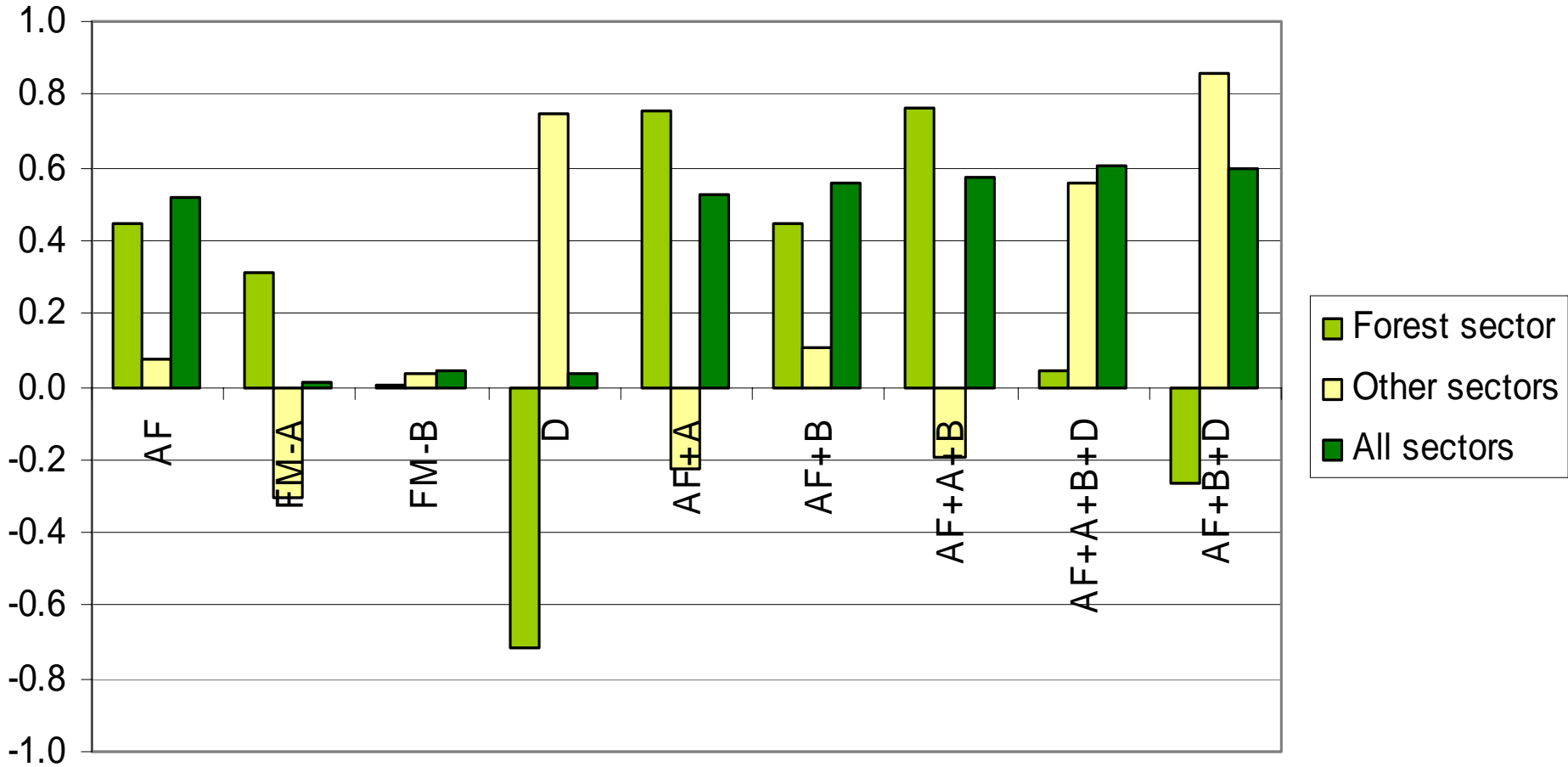
## Estimating potentials in Wales: scenarios

- AF: afforestation (enhanced but including current levels)
  - 2500 ha per year for 30 years
  - Mixed broadleaf amenity woodlands (20%)
  - Mixed broadleaf woodlands with production (40%)
  - Mixed conifer woodlands with production (40%).
- FM-A: ‘carbon conservation’ measures
  - One half of the existing production-forest estate.
  - 10% withdrawn from production
  - 40% deferred on rotations.
- FM-B: ‘enhanced production’ measures
  - One half of the existing production-forest estate area
  - Rotations migrated towards maximum yield.
- FM-D: restoration of management in overstocked areas
  - One half of forest areas currently not in production.

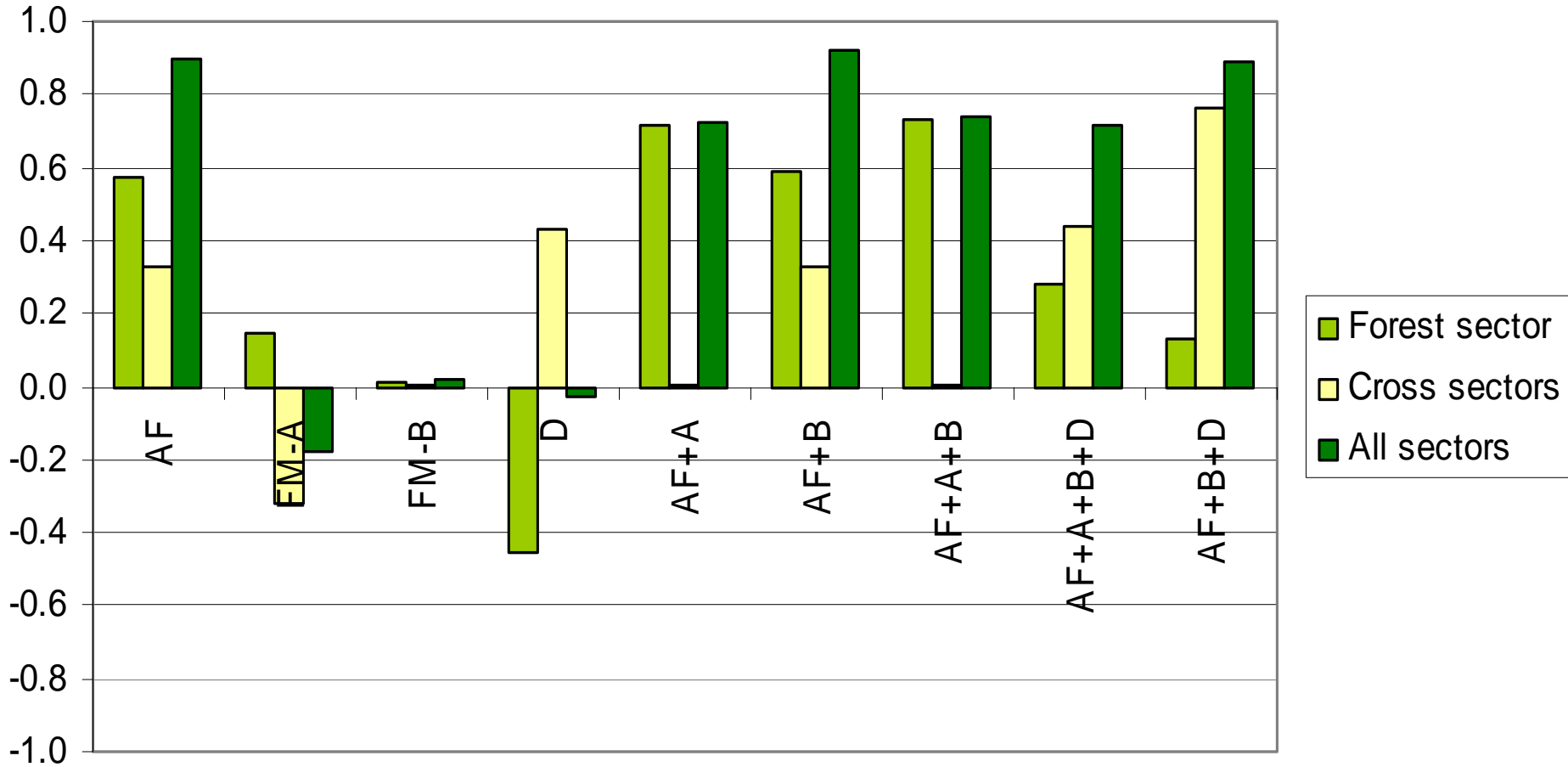
## Modelling approach

- Construct a business as usual projection from 2010 into the future.
- Re-run, changing the management of forests according to the scenario.
- Compare one to the other.

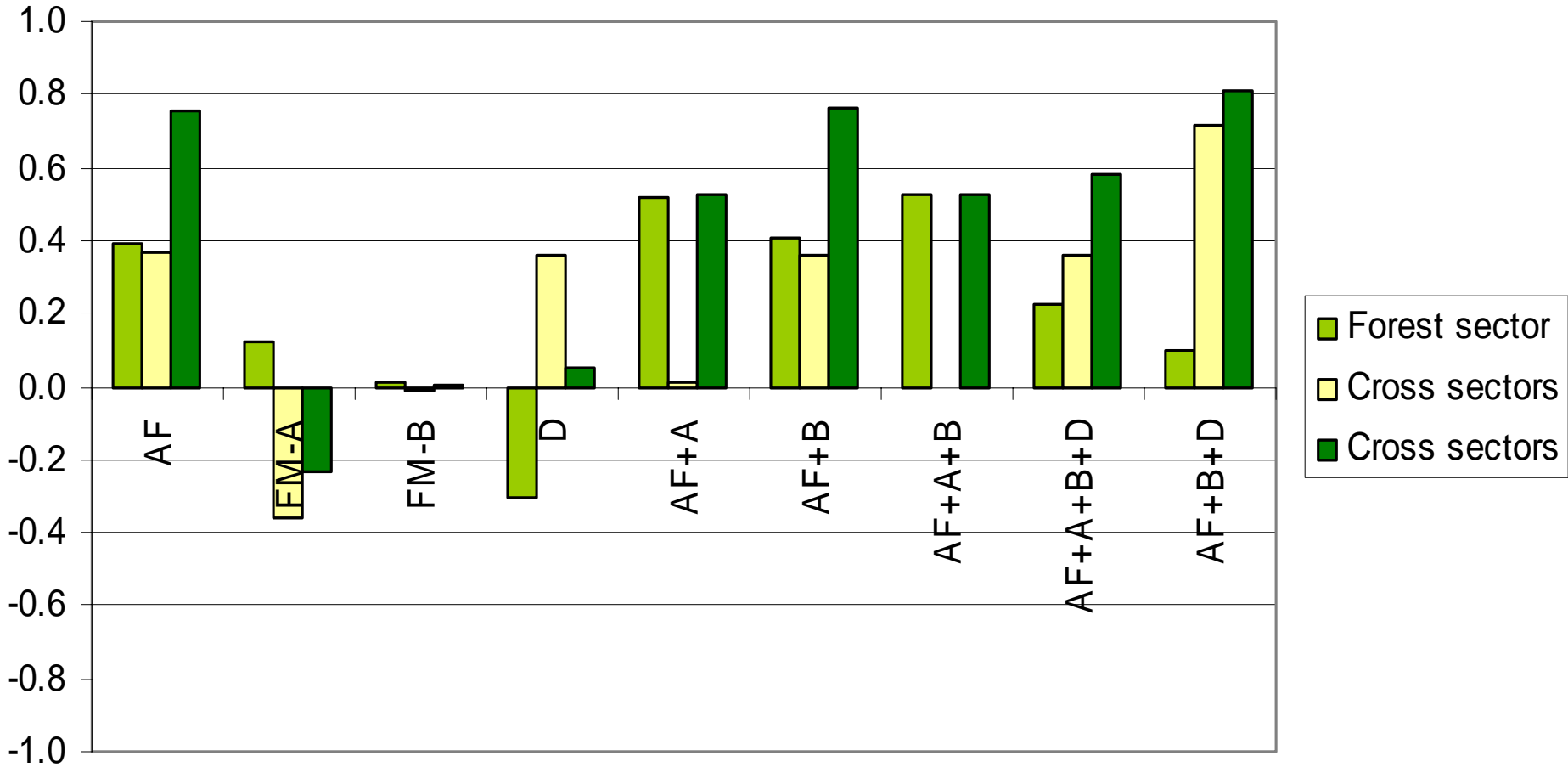
# Estimating potentials in Wales: period 2010-2050



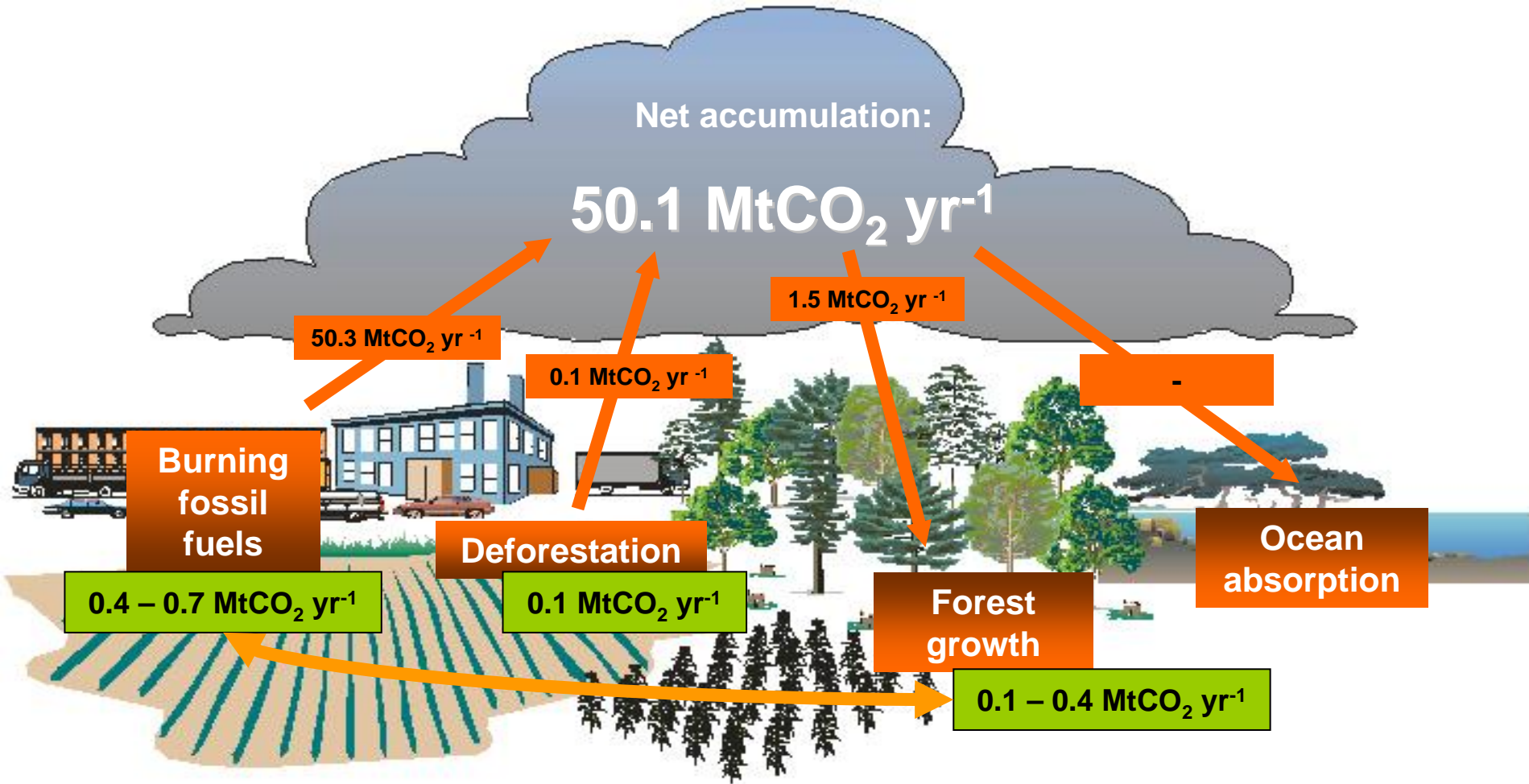
# Estimating potentials in Wales: period 2010-2100



# Estimating potentials in Wales: period 2010-2150

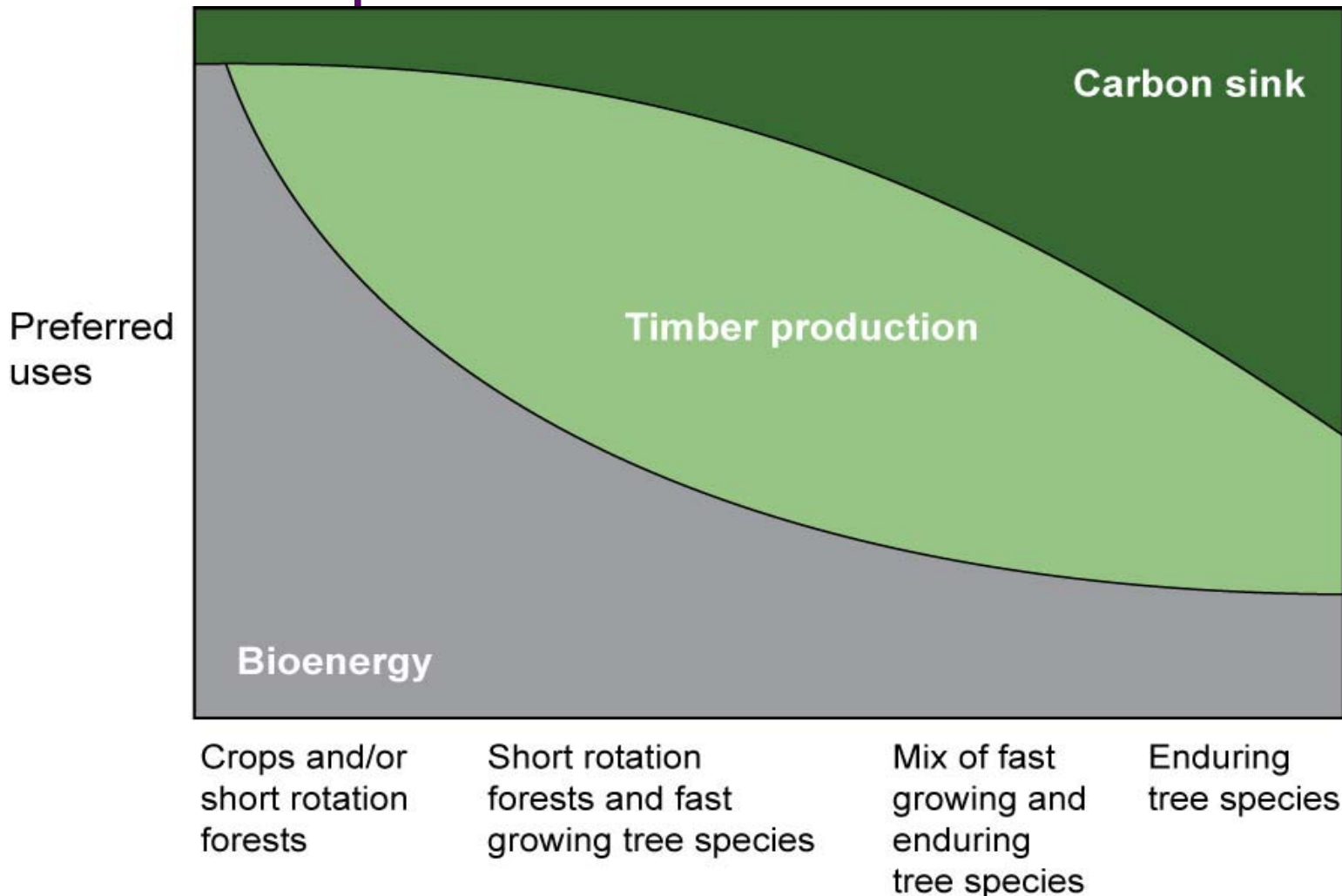


# Wales carbon balance\* 2005



\*Non-forest land types not shown but included in net result

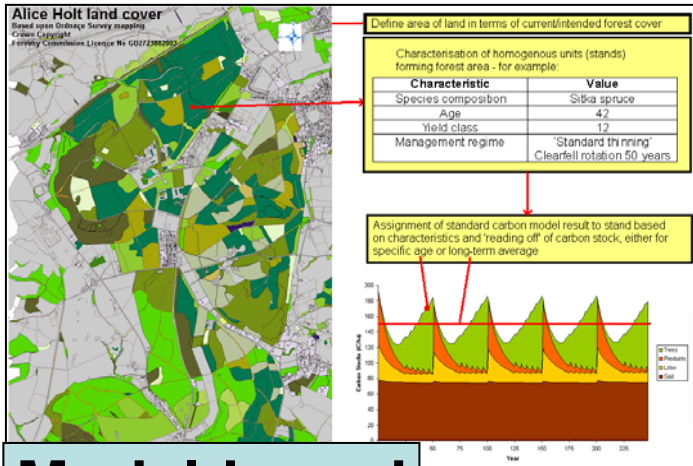
# What does all this mean for practice? Depends - 'horses for courses'



## What is the FC doing?

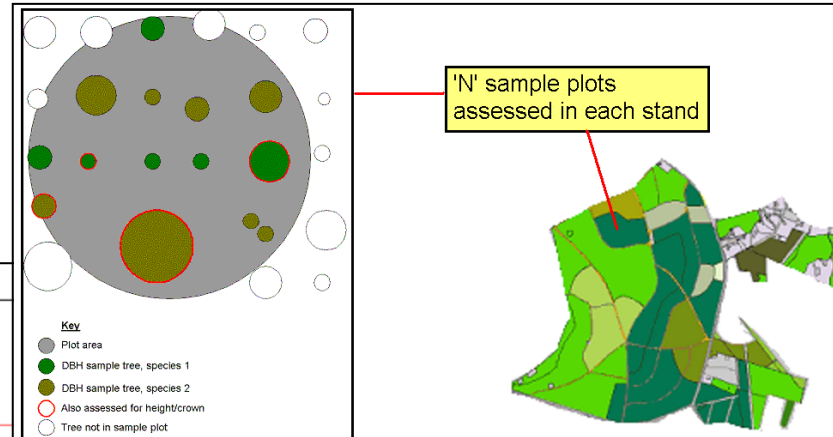
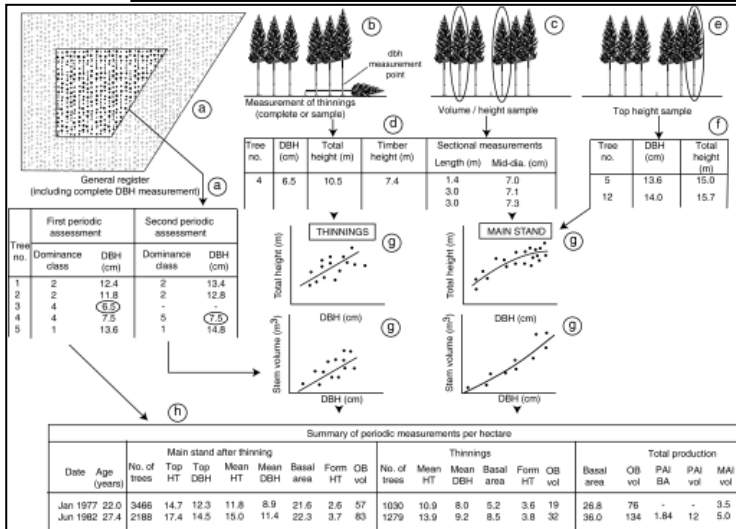
- Has recognised issues surrounding woodland carbon offset and management schemes
- Is trying to clarify the situation and support good practice where it exists
- Is developing climate change guidelines
- Is developing code of good practice for woodland carbon management schemes - initially covering new planting.
- Carbon assessment protocols being developed in support of code of best practice.

## Forest carbon monitoring framework



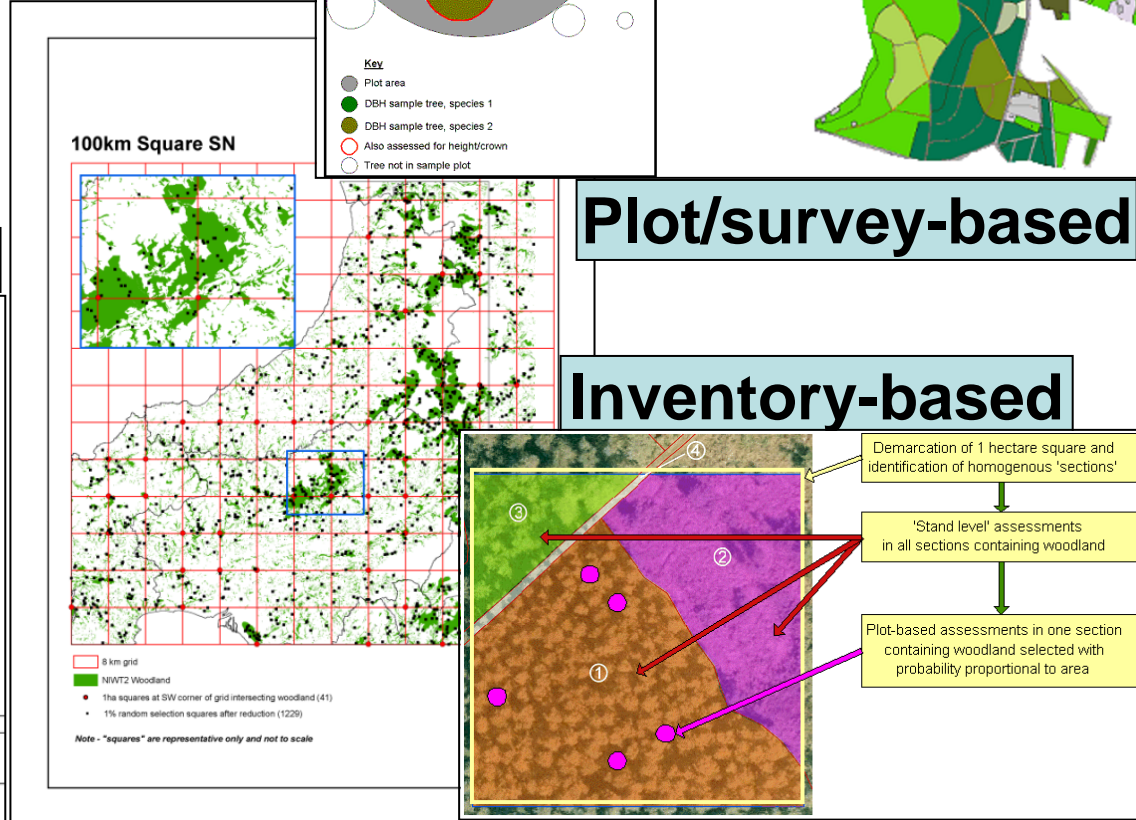
**Model-based**

**Enumeration-based**



**Plot/survey-based**

**Inventory-based**



# Forest carbon default values

Species	Forest/management type			Growth period (years)	Carbon sequestration (tC ha <sup>-1</sup> y <sup>-1</sup> )	Cap for rotation (tC ha <sup>-1</sup> )				
	Soil	Yield class	Thinning			50	60	70	80	No fell
Birch	Gley	4	None			128	196	206	210	215
				1-5	0.19					
				6-10	1.8					
				11-15	2.9					
				16-20	5.1					
				21-25	5.9					
				26-30	5.5					
				31-35	4.7					
				36-40	4.2					
				41-45	3.6					
				46-50	3.3					
				51-55	2.7					
				56-60	2.1					
				61-65	1.8					
				66-70	1.5					
				71-75	1.4					
				76-80	1.2					
				81-85	1.0					
				86-90	0.92					
				91-95	0.81					
				96-100	0.71					
				101-105	0.66					
				106-110	0.54					
				111-115	0.48					

## Conclusions (global)

- Globally, forests play an important part in the carbon balance.
- Forests are also a renewable resource.
- Options for mitigating climate change are:
  - Afforestation
  - Reforestation
  - Adjustments to forest management
  - Avoided deforestation
  - Targeted timber utilisation.

## Conclusions (Wales)

- Forests in Wales can make a small but useful contribution.
- Carbon sequestration can be risky (obligation to maintain stocks).
- Emissions saved through (home grown or imported) wood are 'banked'.
- Focus on use of wood at least as much as forest management.
- Could woodland creation provide initial incentives to develop a wood resource?