

# Implementing IPCC methodology in model CASMOFOR to estimate the forest carbon sink

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*IPCC Expert Meeting: Application of 2006 IPCC Guidelines to Other Areas  
1-3 July 2014, Sofia, Bulgaria*

# WGIII Report of AR5:

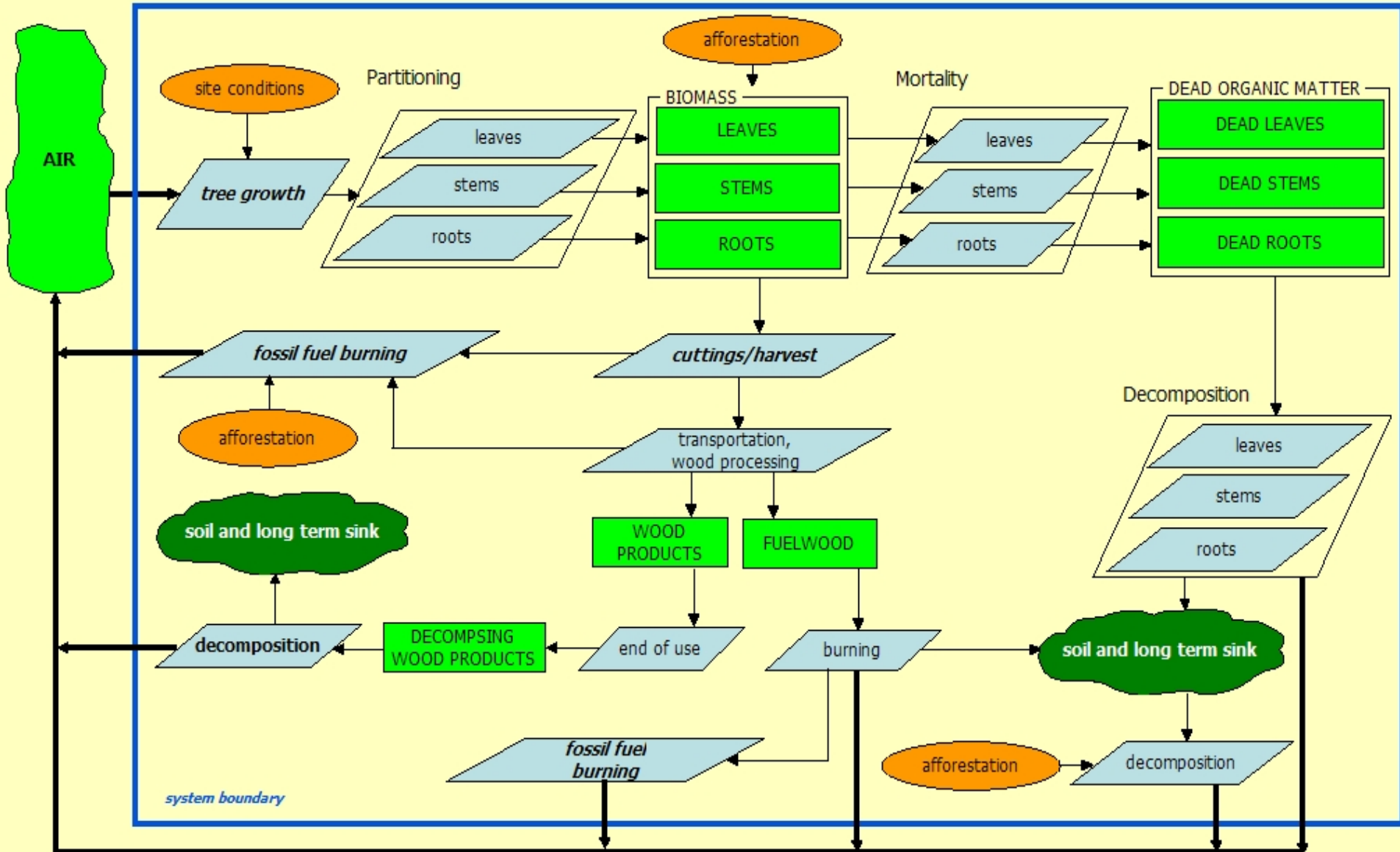
*„energy use reductions ... will not be sufficient by themselves to constrain GHG emissions”*

- *„mitigation scenarios indicate a **potentially critical role** for land-related mitigation measures”*
- *„the potential of afforestation is **limited**”*
- *„there is a **wide uncertainty** in the role of afforestation and reforestation in mitigation”*

# Some mitigation options in forestry

Measure	Relative importance	
	globally	<i>in Hungary</i>
<b>Preserving current forests (=preventing deforestation and degradation)</b>	●●●●●	●
<b>Increasing forest area</b>	●●●	●●●●●
<b>Increasing the C-density of the current forests</b>	●	●●
<b>Increasing the amount of carbon in wood products</b>	●	●

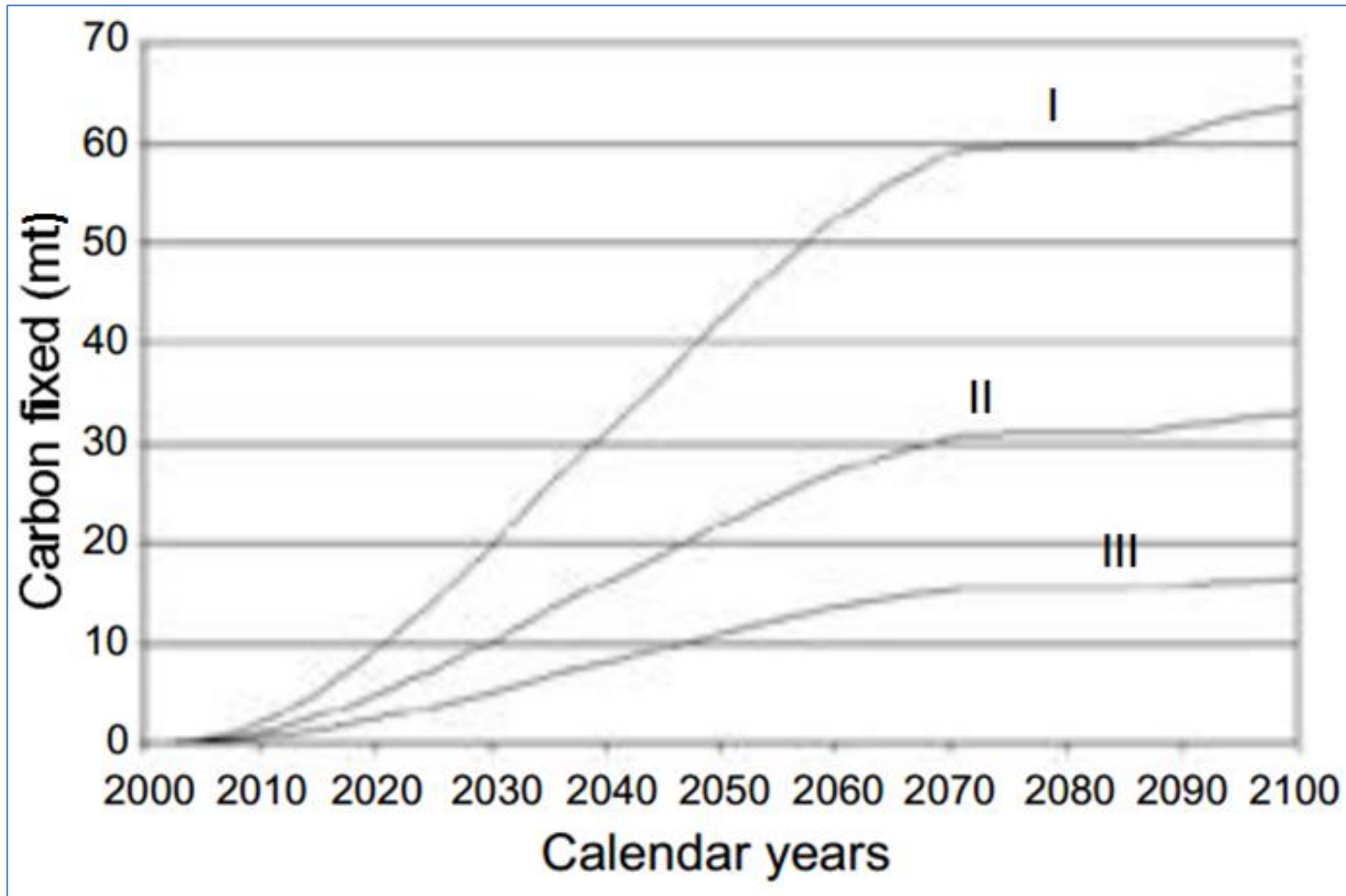
# A potentially useful, IPCC-compatible tool to model forest carbon dynamics: [www.scientia.hu/casmofor](http://www.scientia.hu/casmofor)



# Issues addressed by using CASMOFOR so far:

What is the potential of AR projects?

Are methodologies good enough to persuade stakeholders?



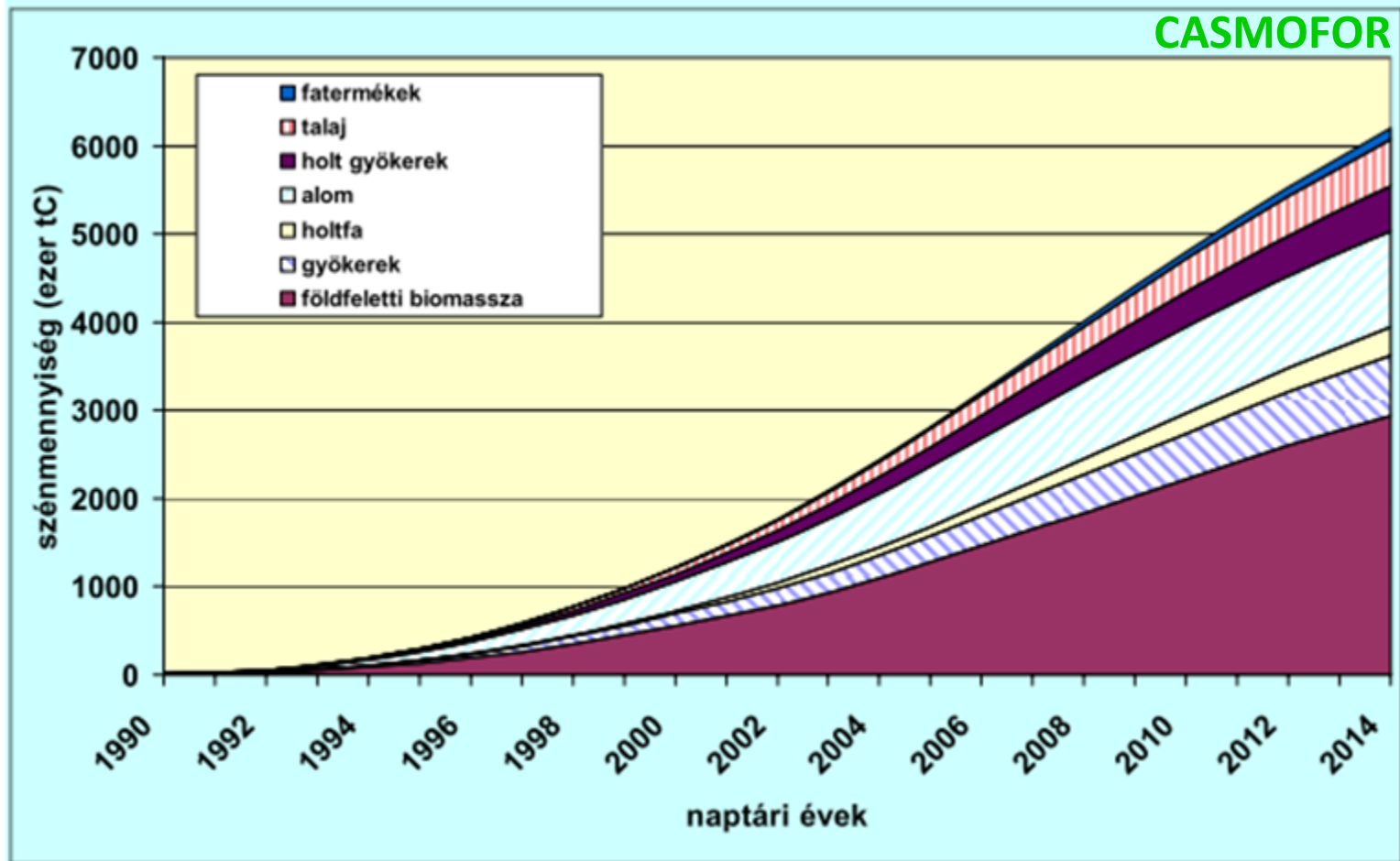
# How much is the projected sink of the AR category? Informing the Initial Report of Hungary

- *results affected domestic policy choices for the 1st CP*
- *compatibility with inventory estimates* was essential
- projections depend both on the assumptions for future afforestations with respect to species, site and evolution of total area over time, but also *on models applied*
- *guidance for projections was (and is still) missing*

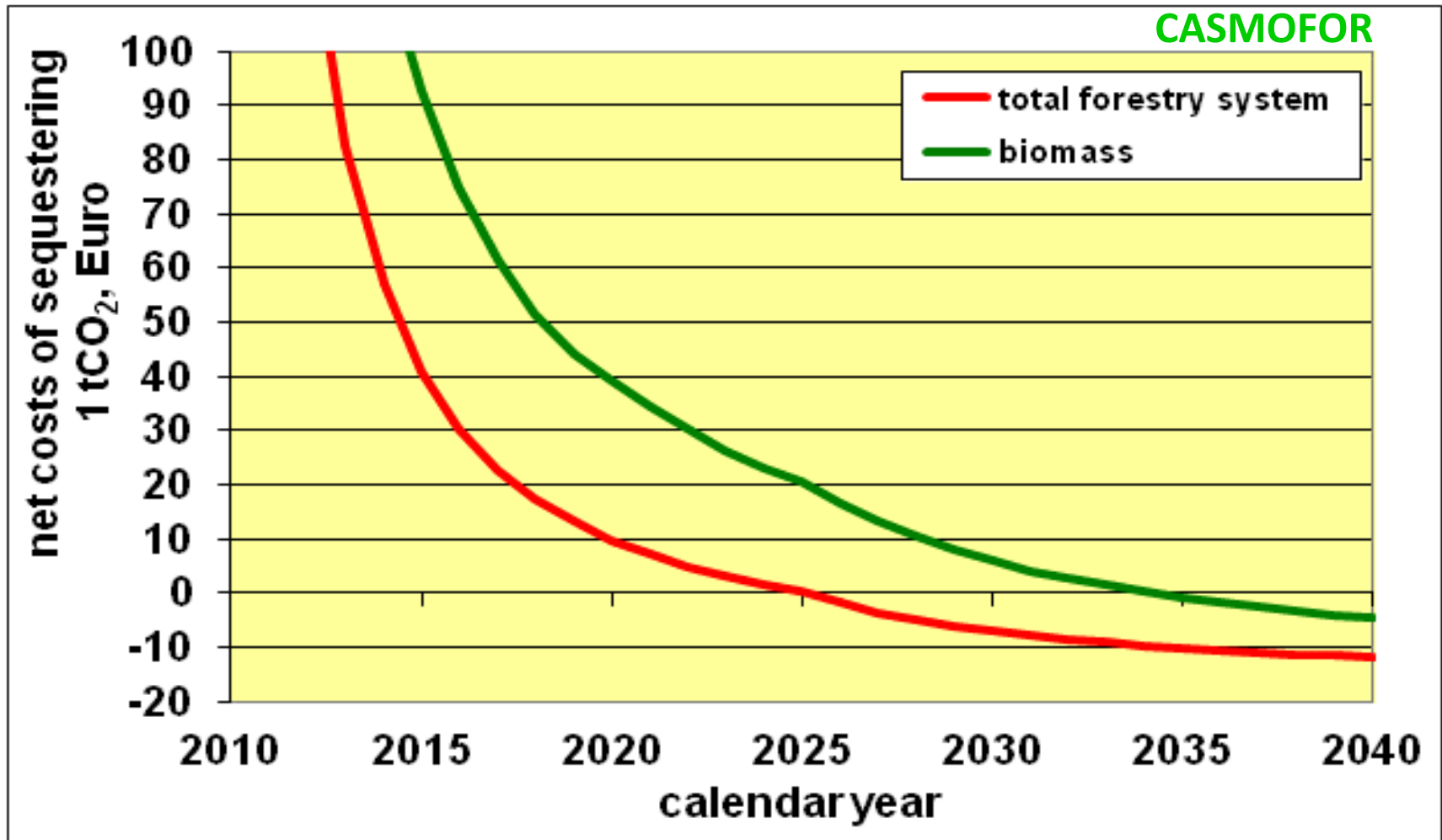
# Estimates of average annual sink in CP1 (MtCO<sub>2</sub>yr<sup>-1</sup>):

CASMOFOR (2005): **1.1**

GHG inventory (2014): **1.22**

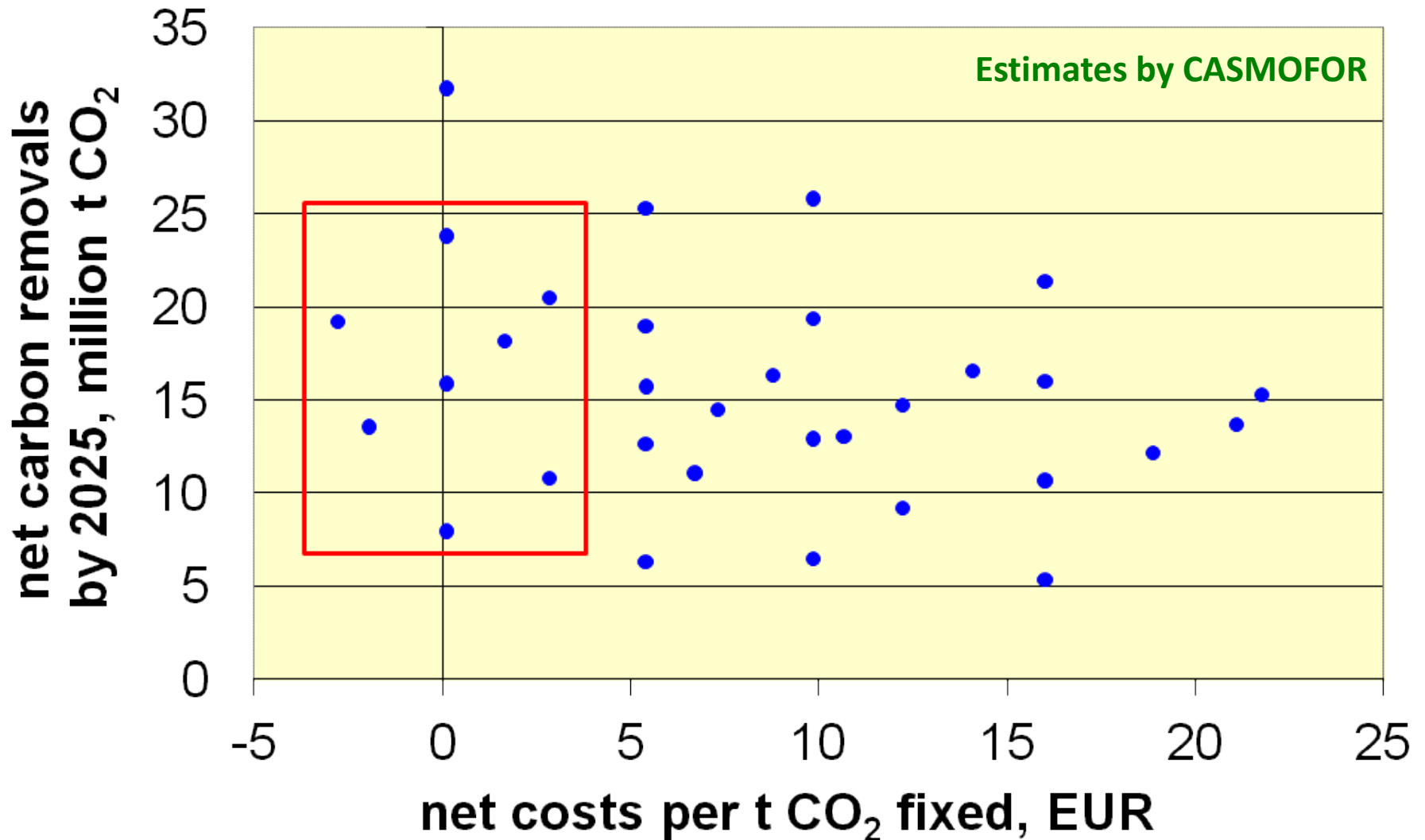


# Net cost of AR: model estimates for the scenario of 10,000 hayr<sup>-1</sup>, fast growing species on good site

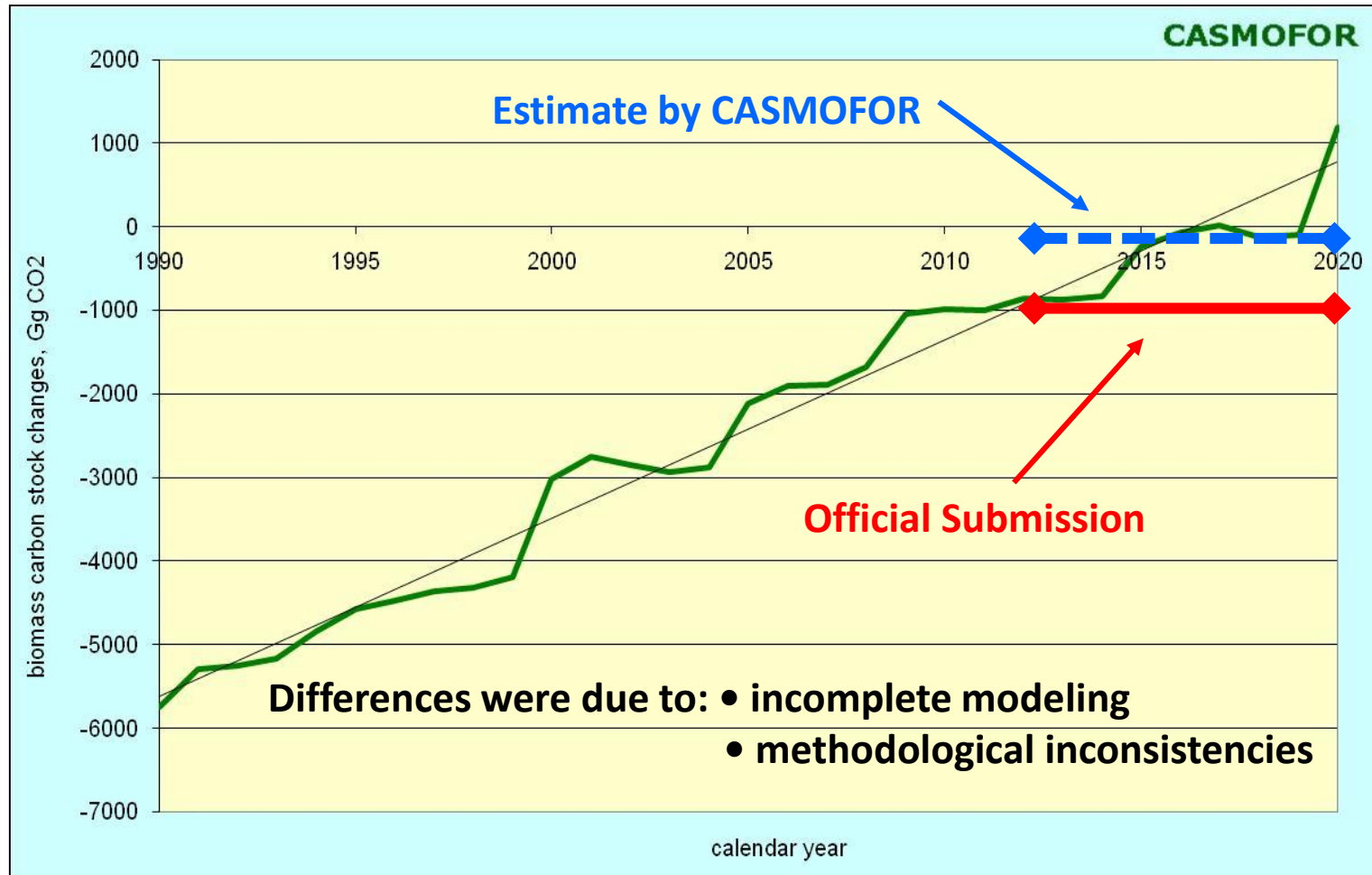




## Compararing 32 afforestation scenarios

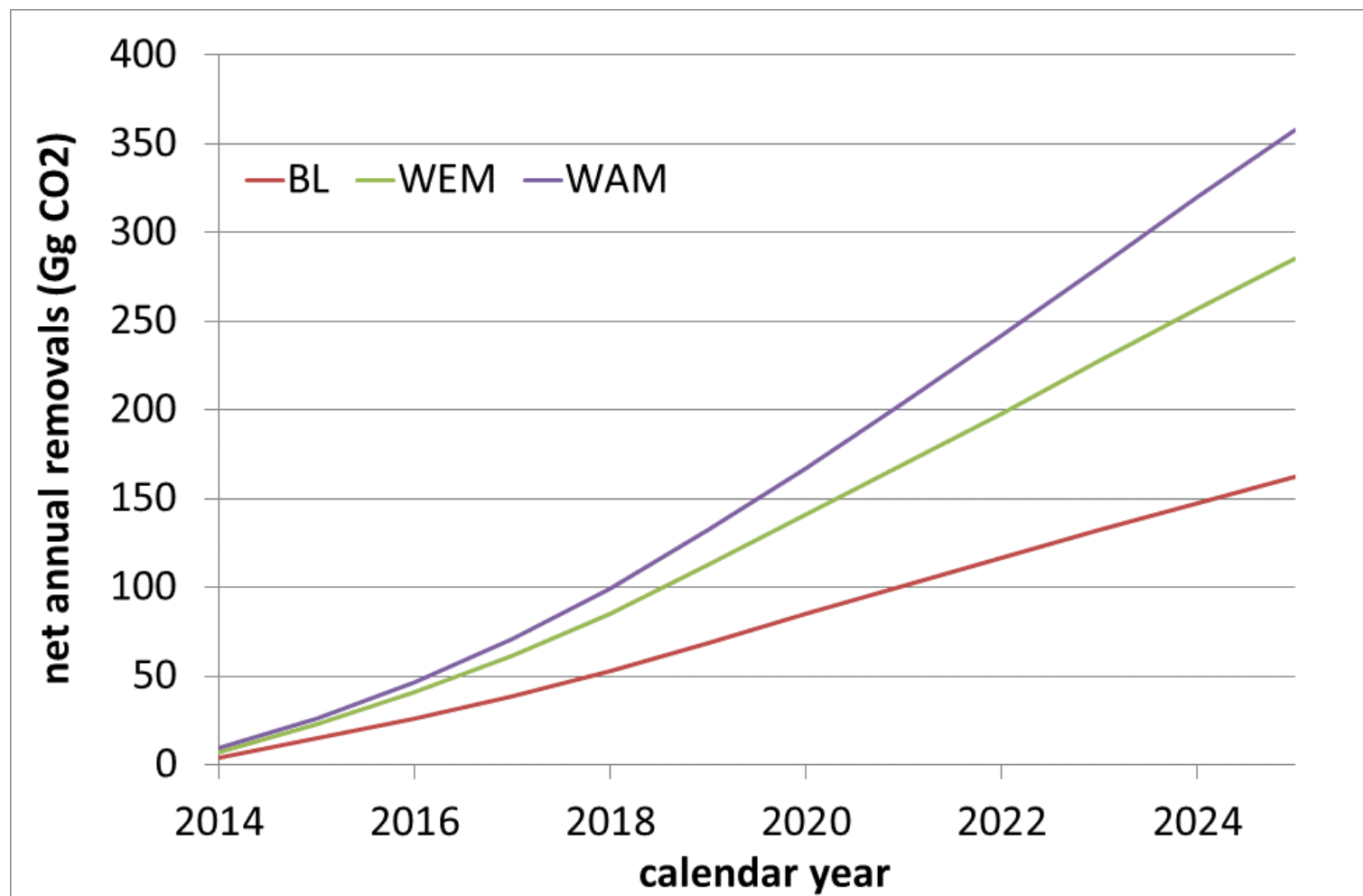


# How can FMRL estimate be validated?

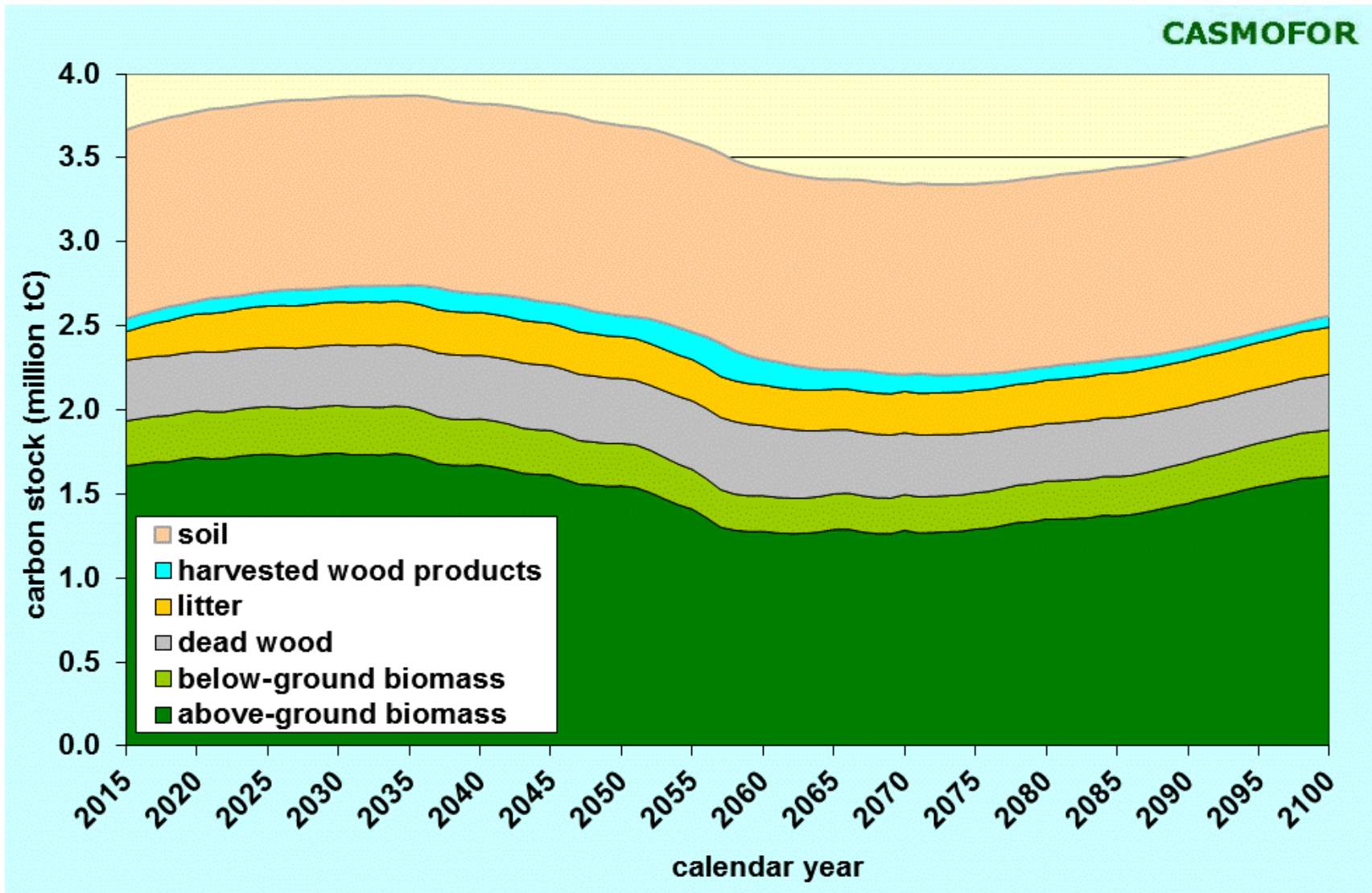


# Projections for the mitigation sections of National Communications (1997-2013)

Estimates by CASMOFOR



# Research on how climate change may affect the carbon balance of forests



*(graph shows baseline scenario, i.e. assuming no climate change, for beech forests in Zala country, Hungary; Somogyi Z. 2014, ongoing research)*

# Possible additional questions by decision makers that could be answered by CASMOFOR

- how much **C** can be fixed on a given area?
- how much **area** is needed to fix a given amount of C?
- how **quickly**?
- for how much **money**?

# Possible additional questions by decision makers that could be answered by CASMOFOR

- which **species** is worth using from a sequestration point of view?
- what are the effects of **site** and **other factors**?
- how **permanent** is C sequestration?

# Methodologically, mitigation projects, projections and NGHGs are different

- NGHGs: historical data; projections: scenarios; projects: both

*how to develop projections of activity data? how to deal with changing EF/RF?*

- methodologies can be different

*under what conditions can NGHGI methods or already existing project methodologies (e.g. under the CDM) be applied?*

- NGHGI models are partly covered by IPCC report of 2010 „Use of Models ... in Greenhouse Gas Inventories”

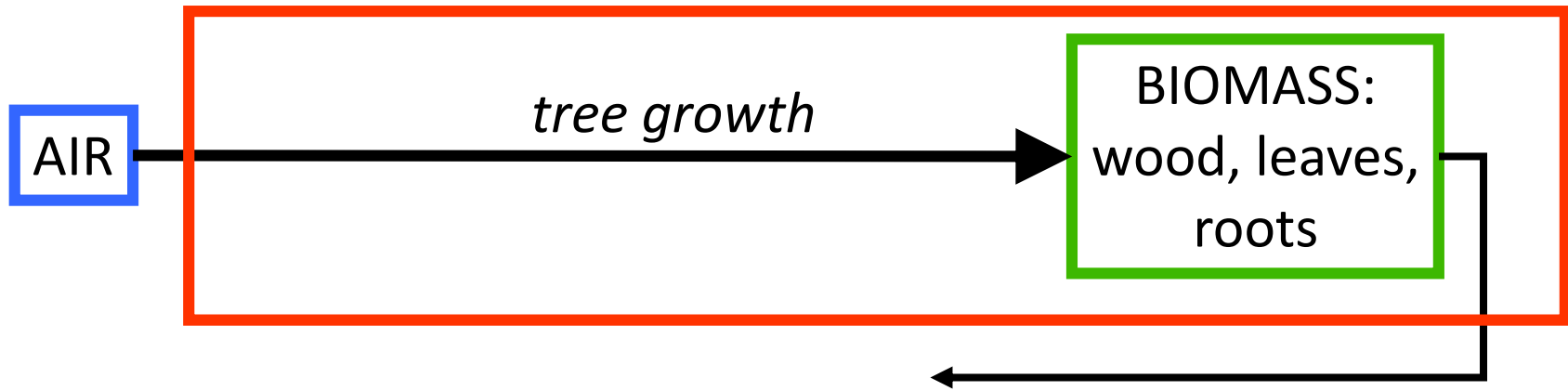
*what criteria should projections meet?*

# CASMOFOR: an IPCC-compatible model

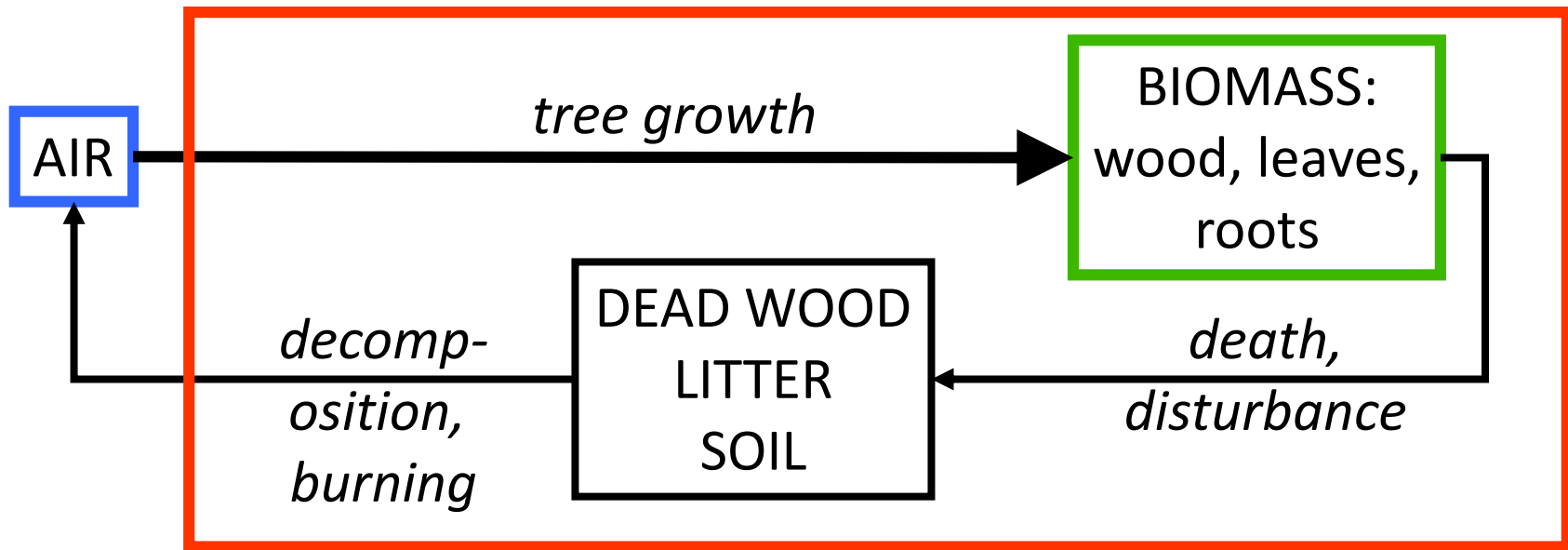
- based on **IPCC 2006 Guidelines** (Tier 2-3-1)
- *cohorts* by species/varieties and site of appropriate data (can be changed in regenerations)
- ~40 equations of dynamics of *all carbon pools* plus forestry and carbon economics (all in website)
- calculations in *annual steps*



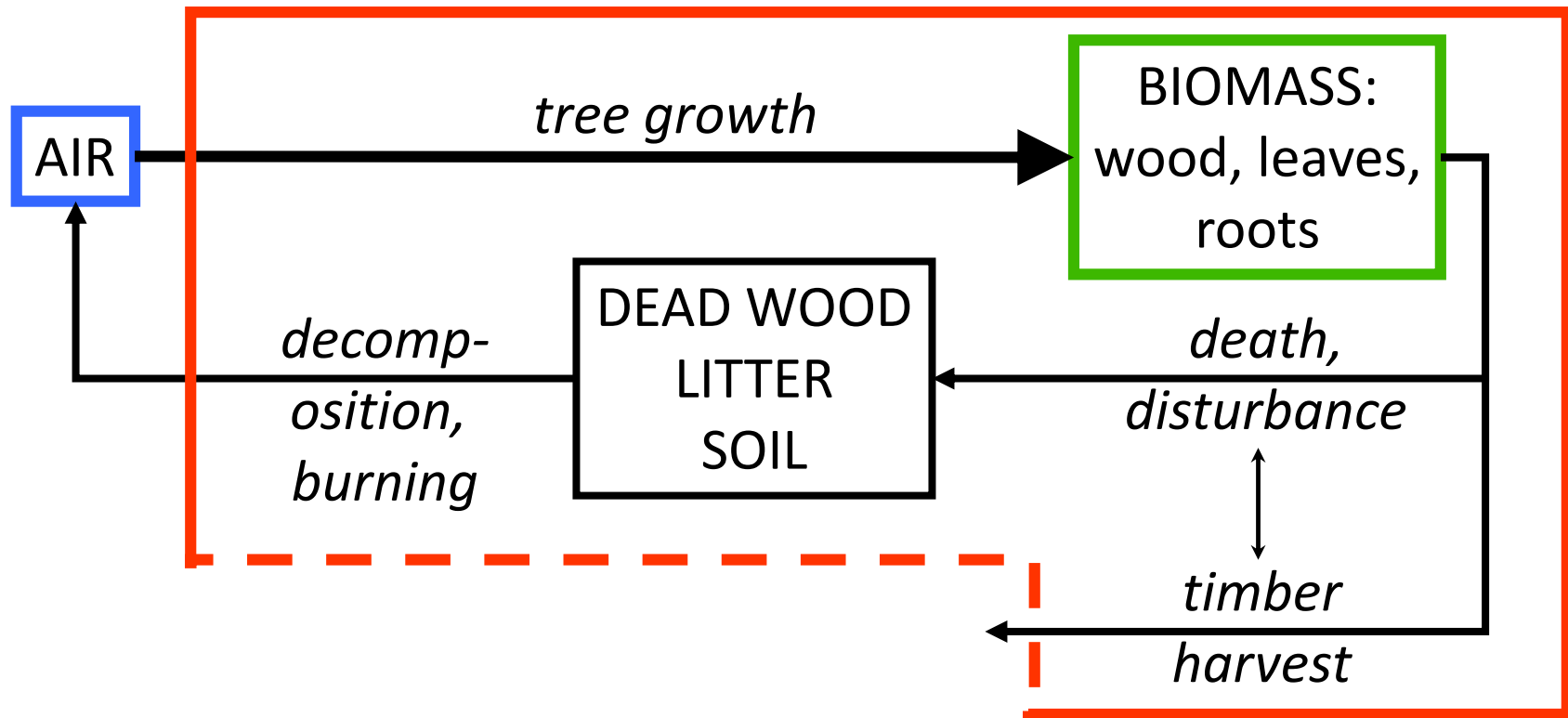
# CASMOFOR models balanced processes



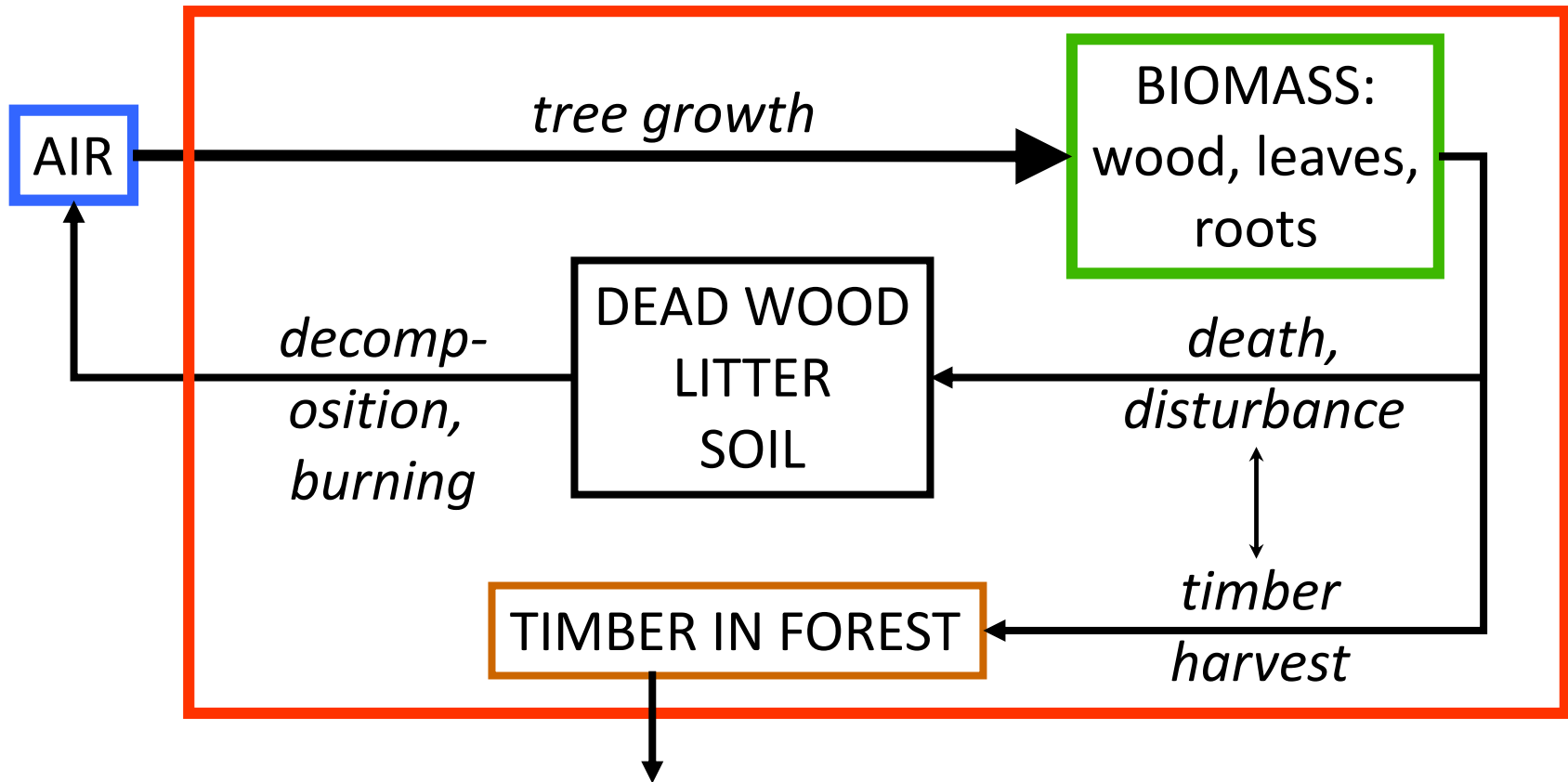
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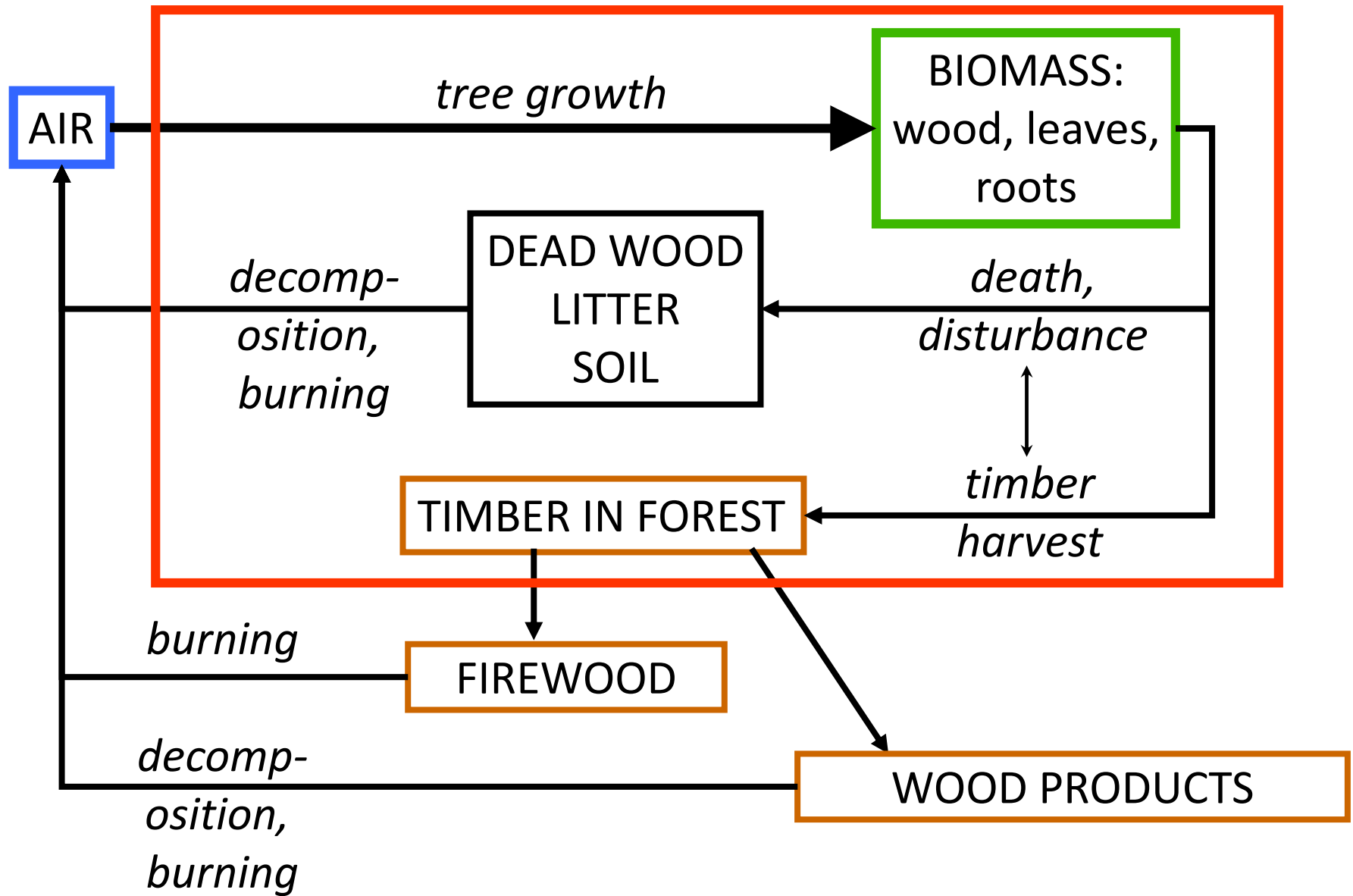
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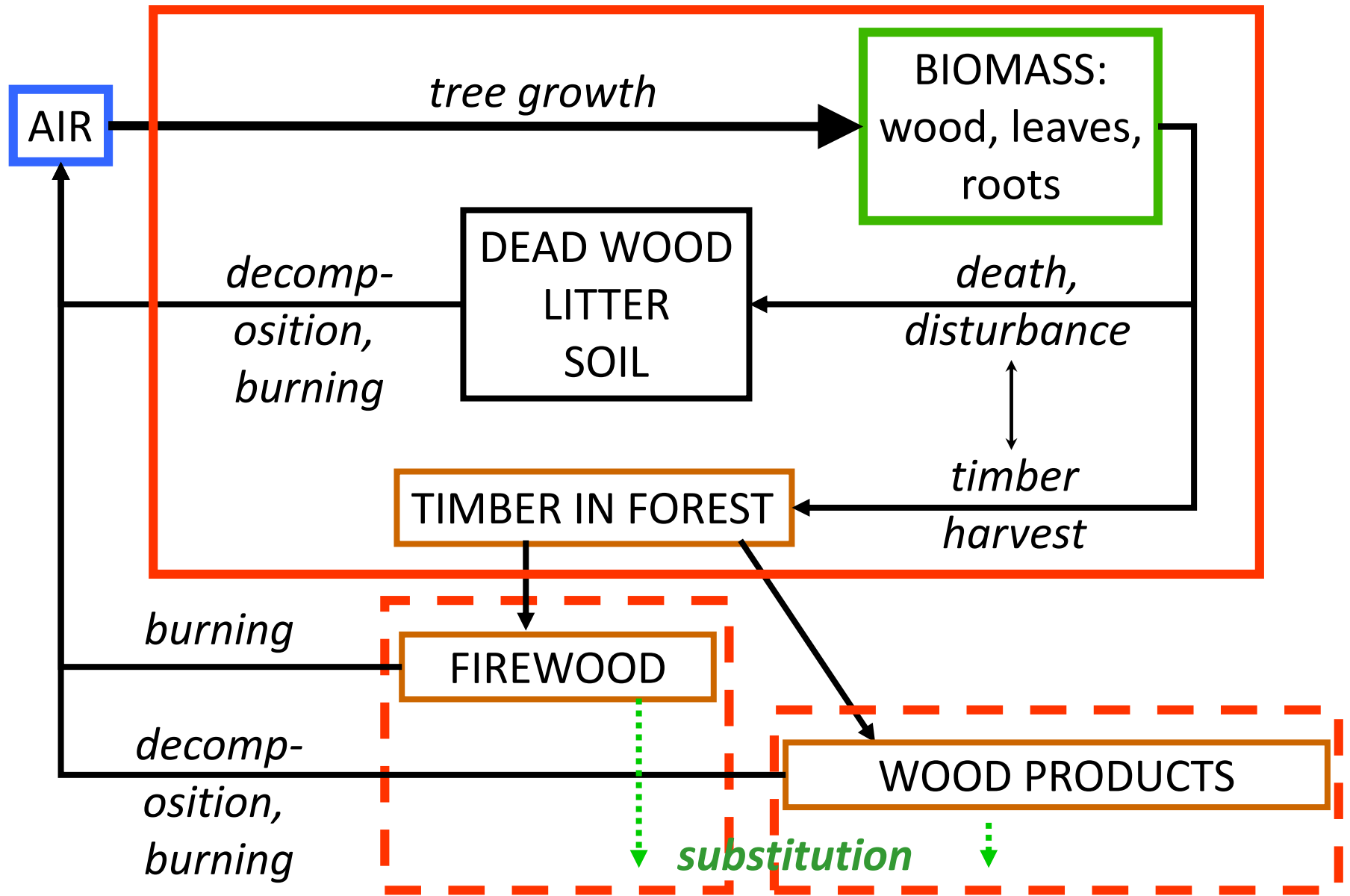
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# Methodological issues of using models

- what *project boundaries* to apply?
- are project and national level methods *consistent*?  
(=could projected sink be regarded as potential additions to AR?)
- consistency between *gain-loss method* and *stock change method*?

# CASMOFOR: a forestry data warehouse for Hungary

- yield tables
- silvicultural models
- 22 factors of carbon dynamics
- economic model of costs and revenues  
(including carbon credits)

for 18 species/species group, and often by 6 yield groups



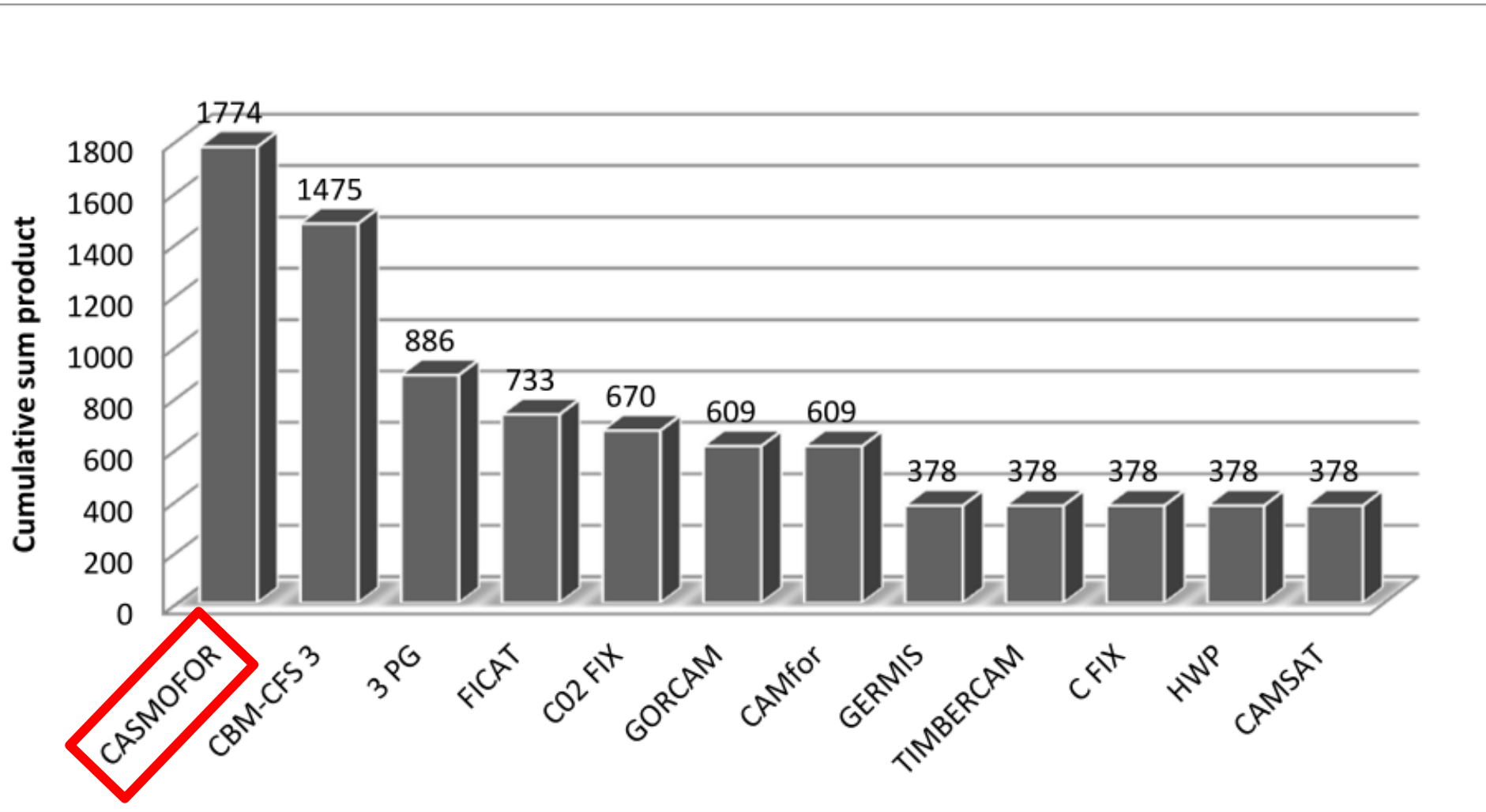
# CASMOFOR: an adaptable and transparent framework

- fully customizable database: both *local* („country-specific”) or *IPCC default data* could be used  
*which IPCC default data / under what conditions?*
- the application of data can be checked during simulations
- the model was successfully adapted in South Africa

# CASMOFOR: implementation

- growth rate + silvicultural regime + disturbance regime must be known / simulated / assumed
- changing parameter values over time is possible  
*guidance on the methodology to estimate growth rate, disturbance and other parameters under changing climate?*



# CASMOFOR in a model comparison



# CASMOFOR: *a simple, accurate, user-friendly framework*

„CASMOFOR predicted with higher accuracy the carbon ... than [other] ... models.... This is largely because the model meets all five of the characteristics of modifiability, reliability, efficiency, integrity and usability (McCall et al., 1977 cited by Ortega& Rojas, 2003) which are important in the success of any software or model.”

# CASMOFOR: an *accurate, transparent, simple* framework

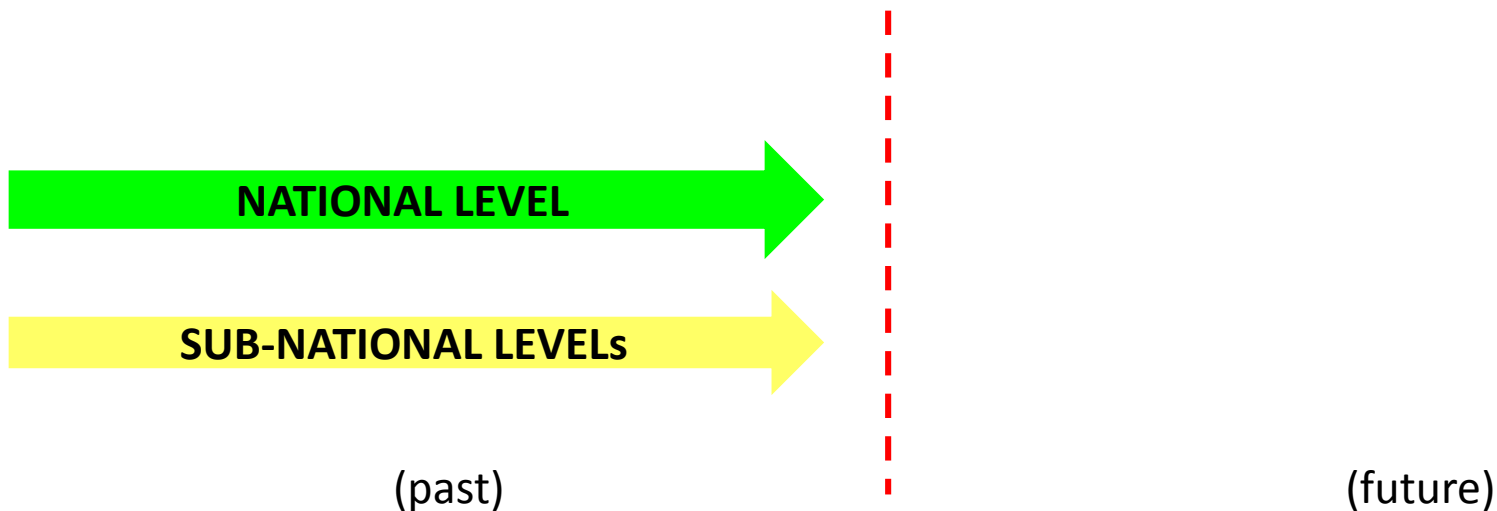
- calculations compatible with the *Law of the Conservation of Mass and Energy*
- *Uncertainty analysis* is possible using the built-in *Monte Carlo* module
- extended *help* both in  and 
- system in MS Excel + its VBA to keep everything *simple*

# Should IPCC work on methodological issues of (AFOLU) mitigation?

Managing climate change requires:

**A**ssessment – **M**itigation – **A**daptation

**so a TF GGP might not only need to include:**



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