

# Forest transitions: from regional dynamics to global exchanges

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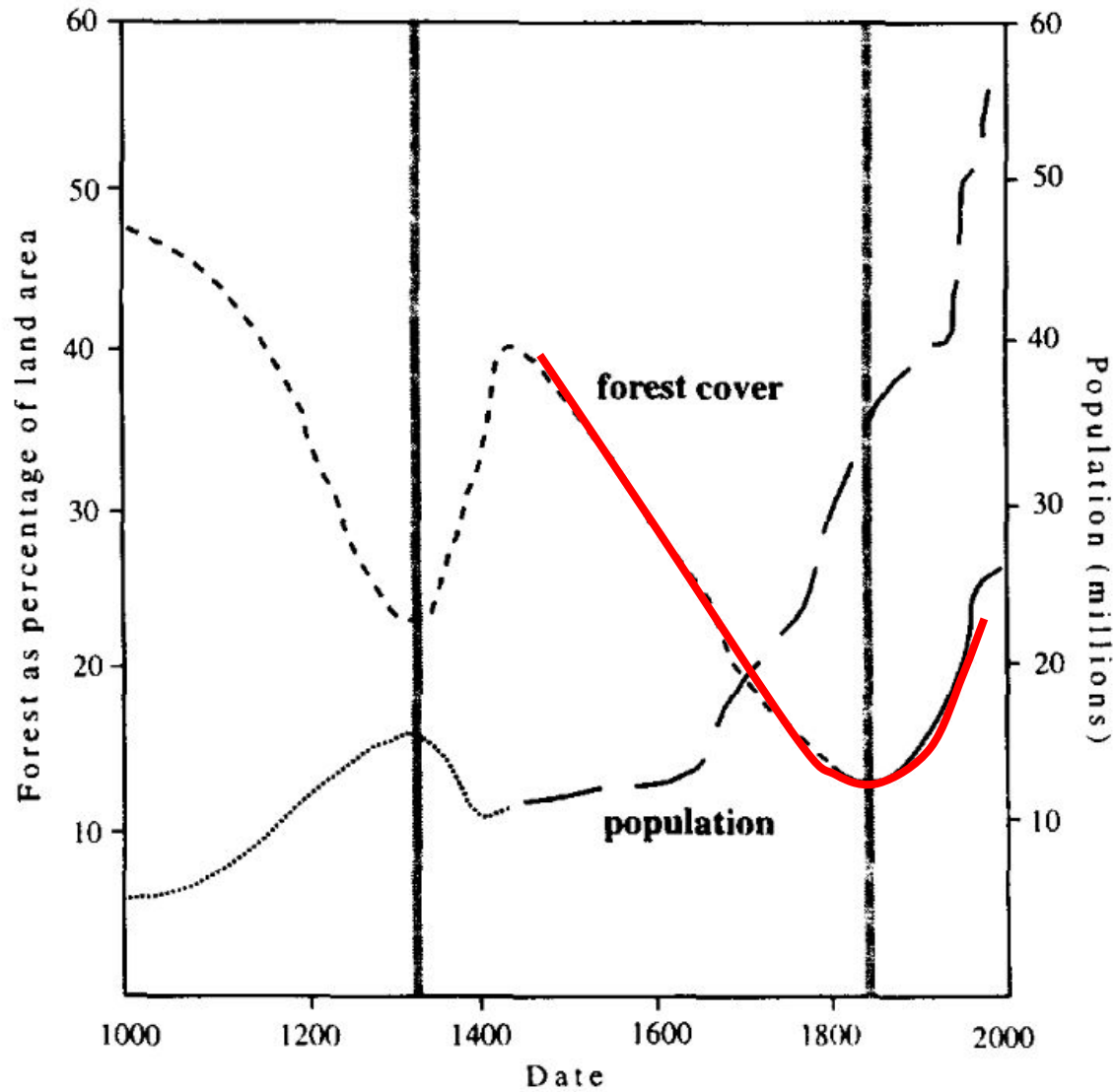
# Forest transitions?

“Forests in Transitions” - “Forest Transitions” ?

How does “forest transition” help to think about “forests in transitions”?



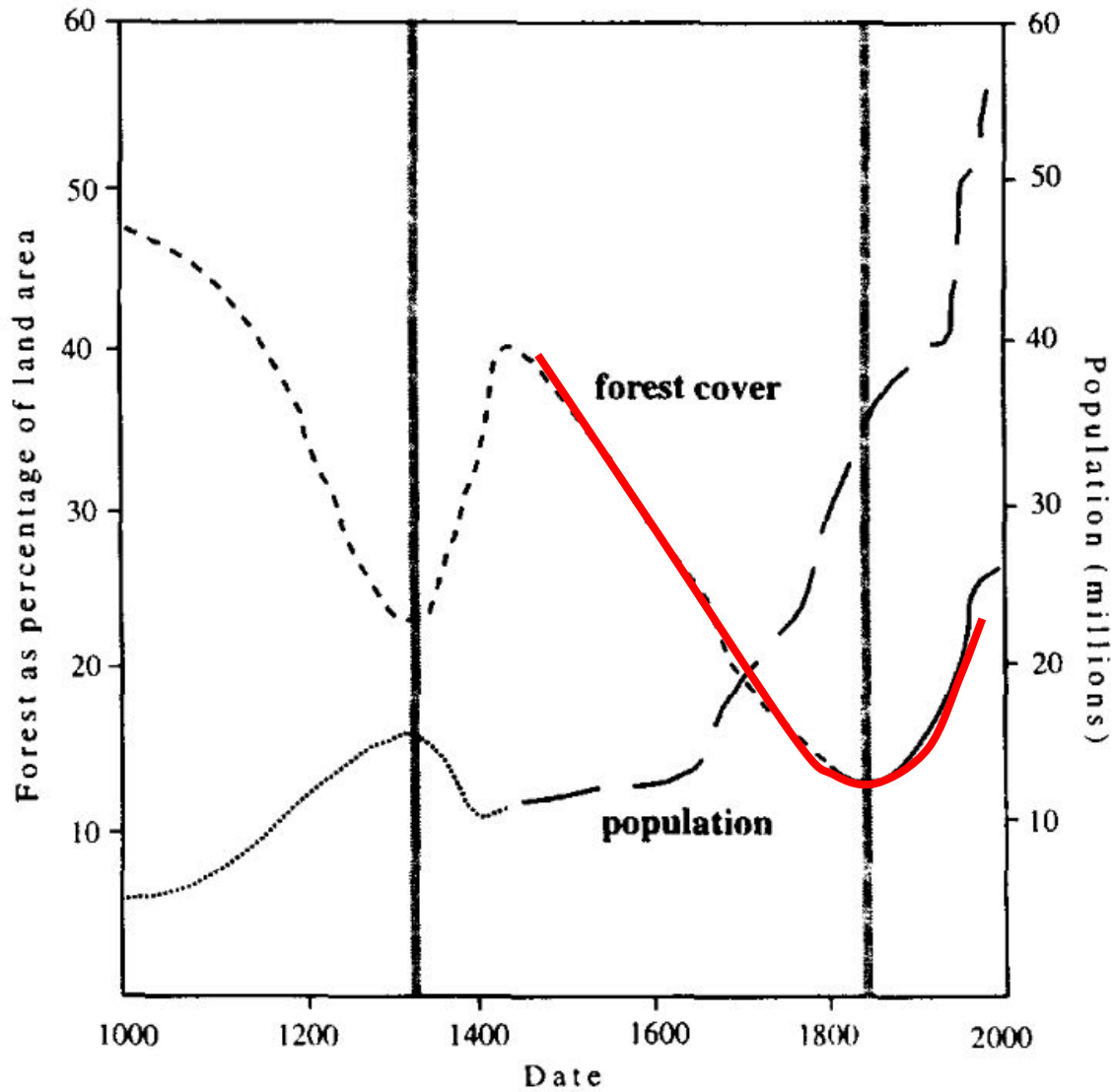
# Forest transition in France



Mather et al., 1999

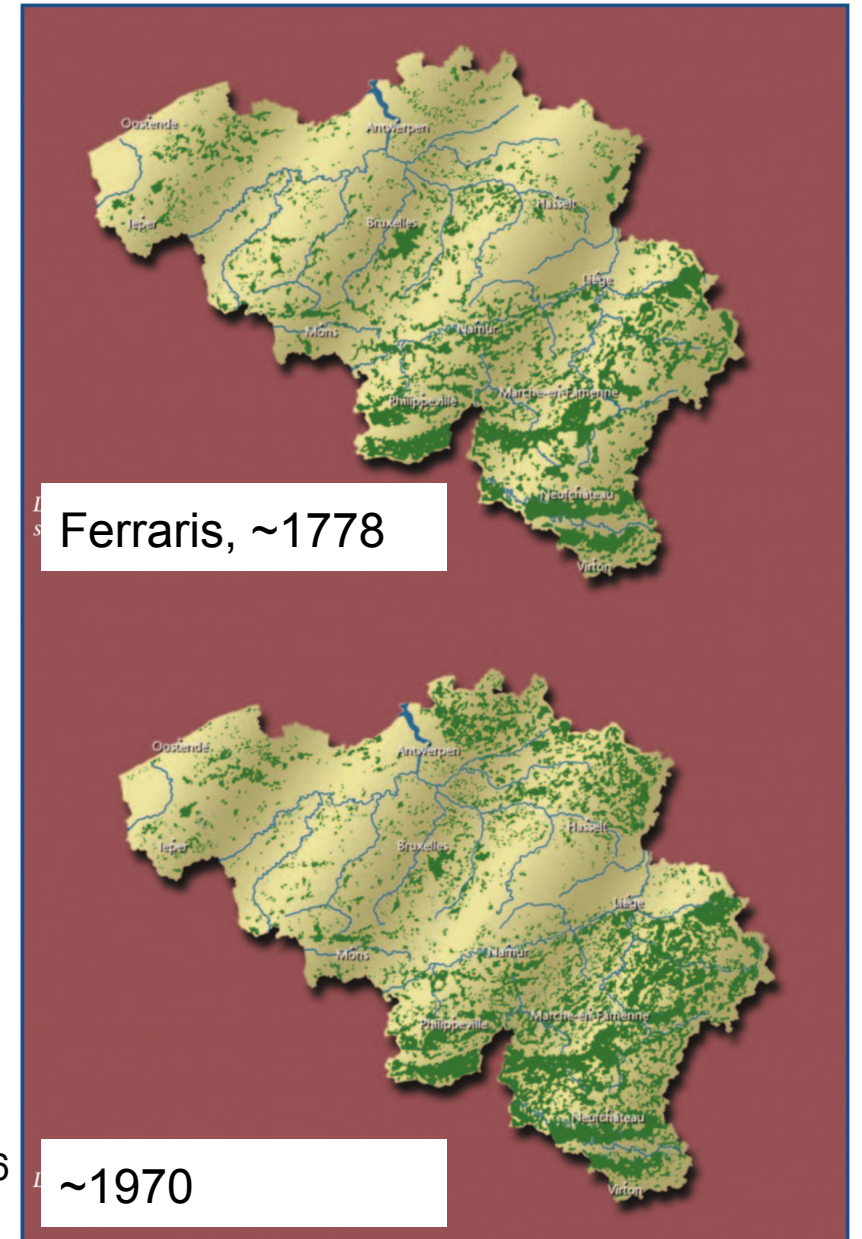


# Forest transition in France, and Belgium



Mather et al., 1999

Tallier 2004  
Lowest point ~1866  
(Clicheroux 1956)



# Forest transitions - What it is

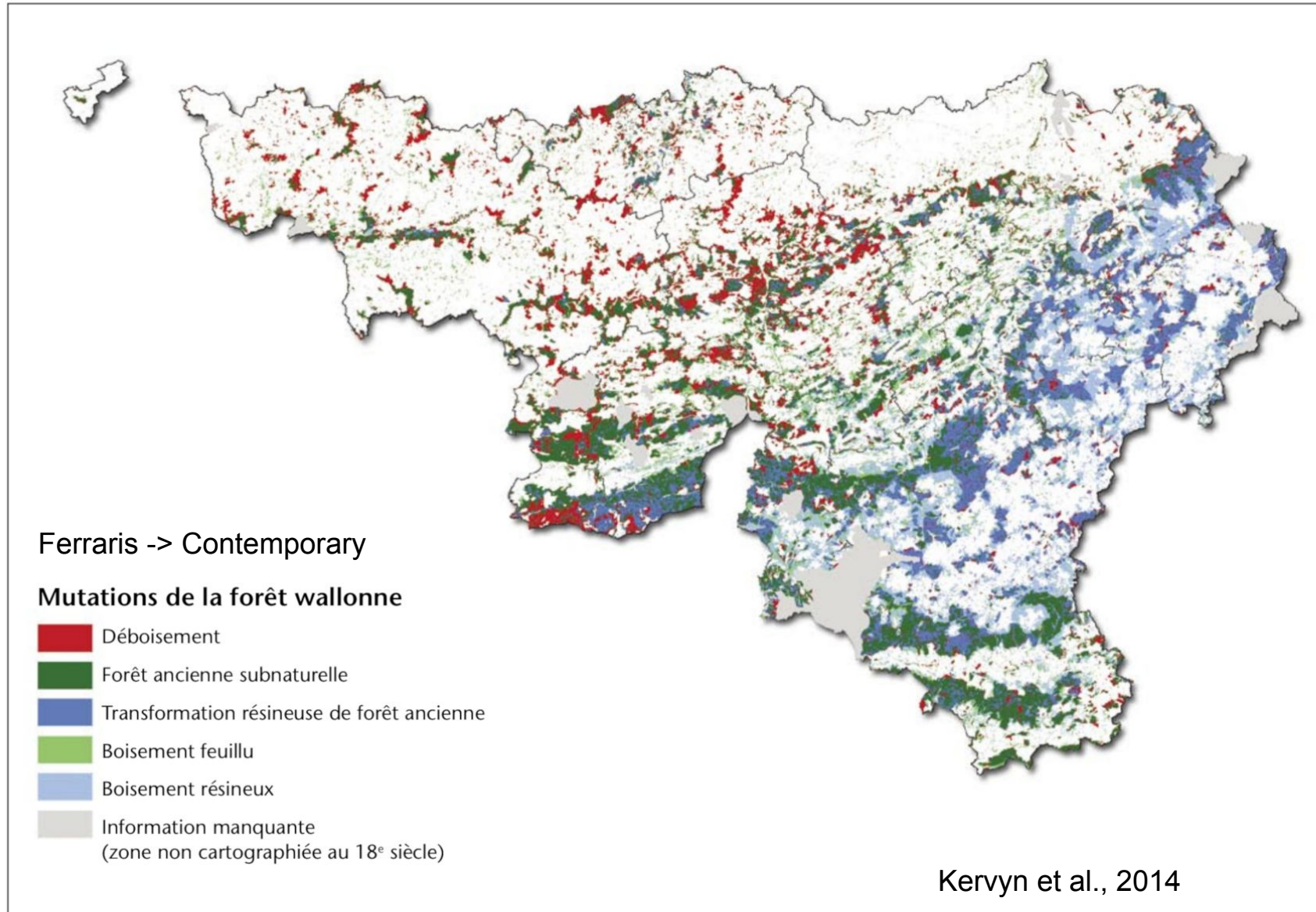
- Reversal from forest area decline (deforestation) to forest area recovery (reforestation)
- Over a somewhat large geographic extent (not a fallow plot), over a certain time period, reflecting a structural change (land use transition)
- Always associated with changes other than area itself
- Contingent empirical regularity, associated with certain drivers, but no deterministic or teleological trend

Mather's many works  
Rudel et al. 2005  
Lambin and Meyfroidt 2010  
Meyfroidt and Lambin 2011  
Meyfroidt et al. 2018  
Meyfroidt et al. 2022 *PNAS*  
*many others*



# Spatial reorganisation and transformation of forests in Walloon Region

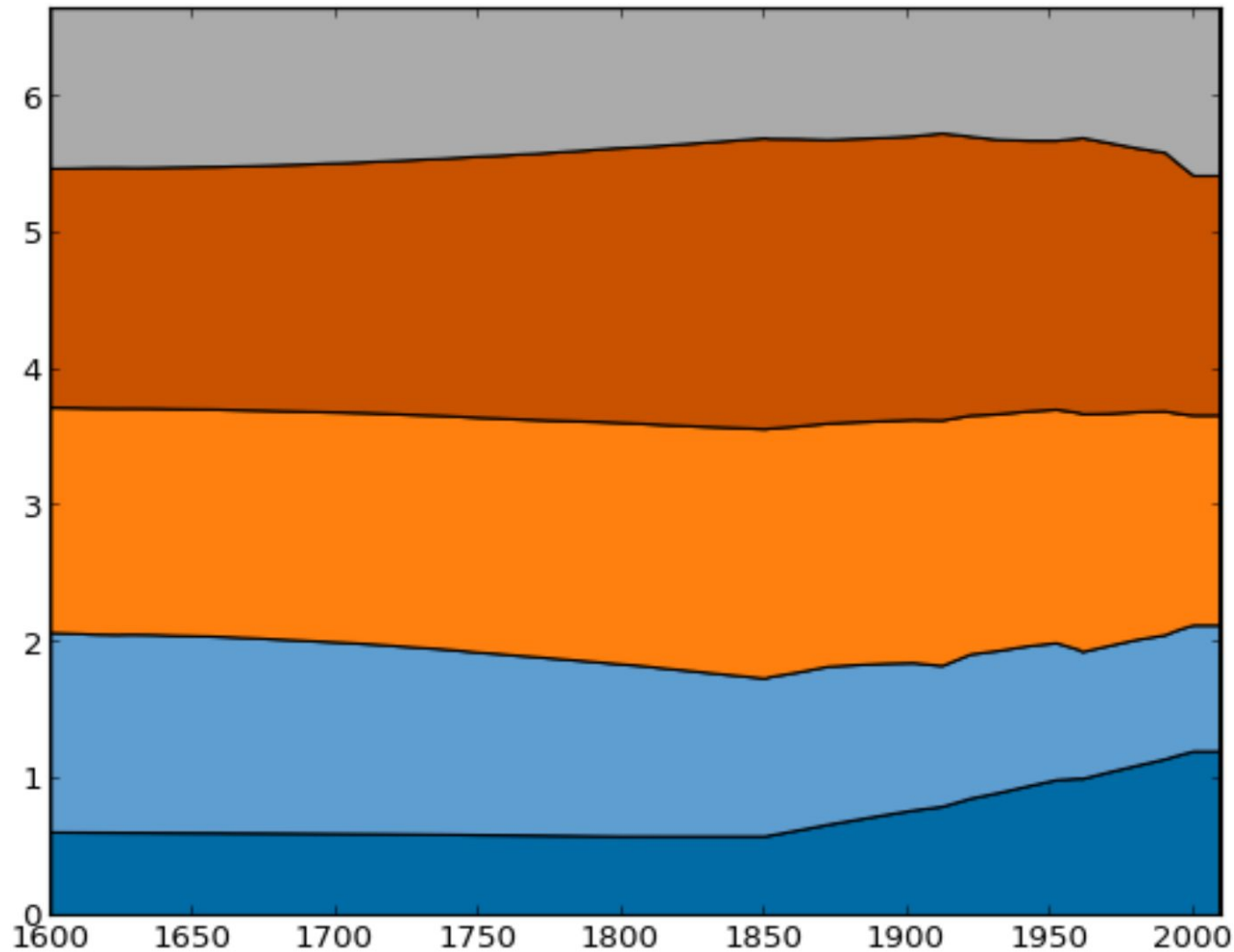
See theoretical model in Mather and Needle 1998



Kervyn et al., 2014



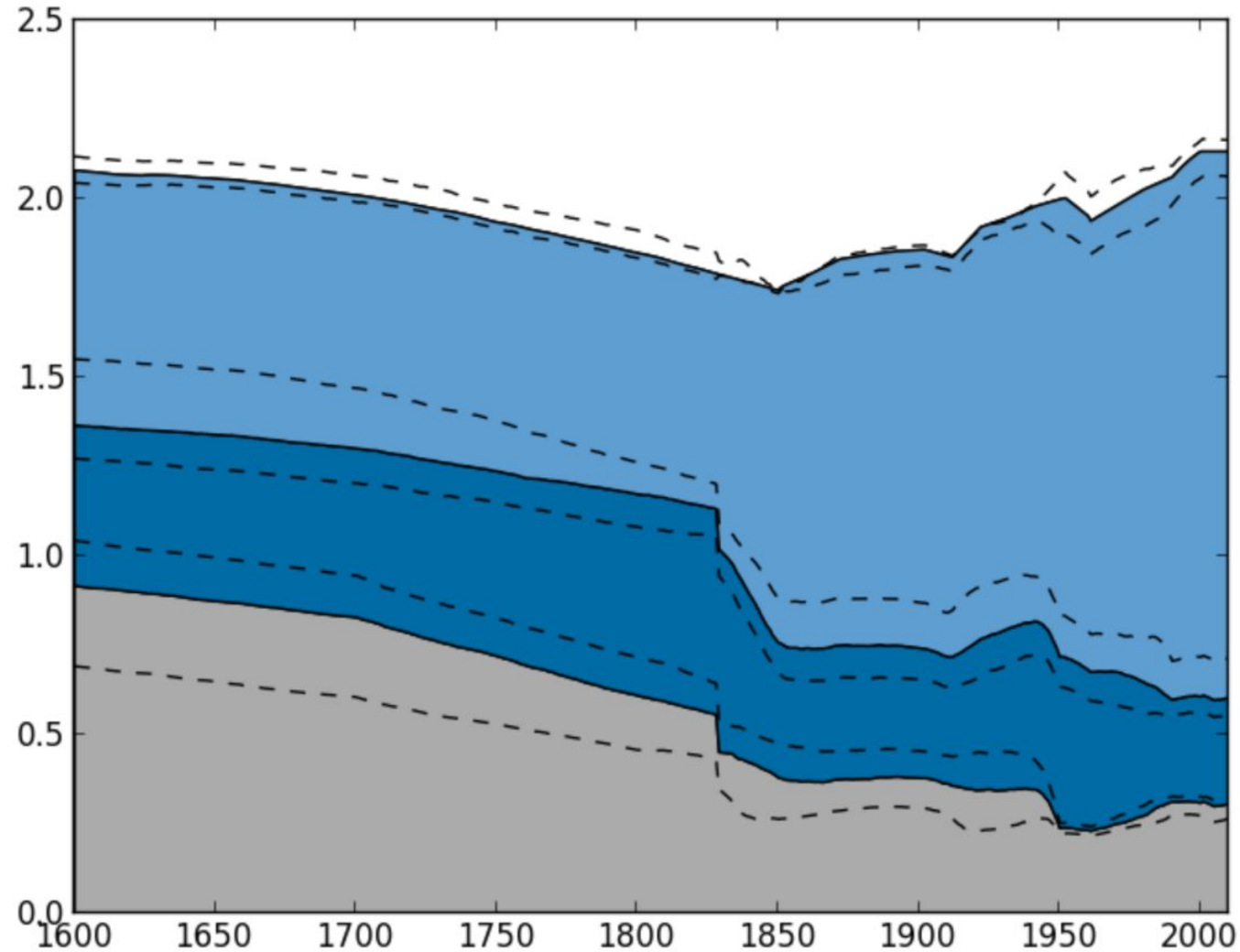
# Forest transition at European scale - Tree species



**Figure 3.** Land surface area in  $10^6$  km<sup>2</sup> covered by forest (blue), grassland (orange), cropland (brown) and bare soil (grey) between 1600 and 2010. The forest area is further separated in coniferous (dark blue) and deciduous (light blue).



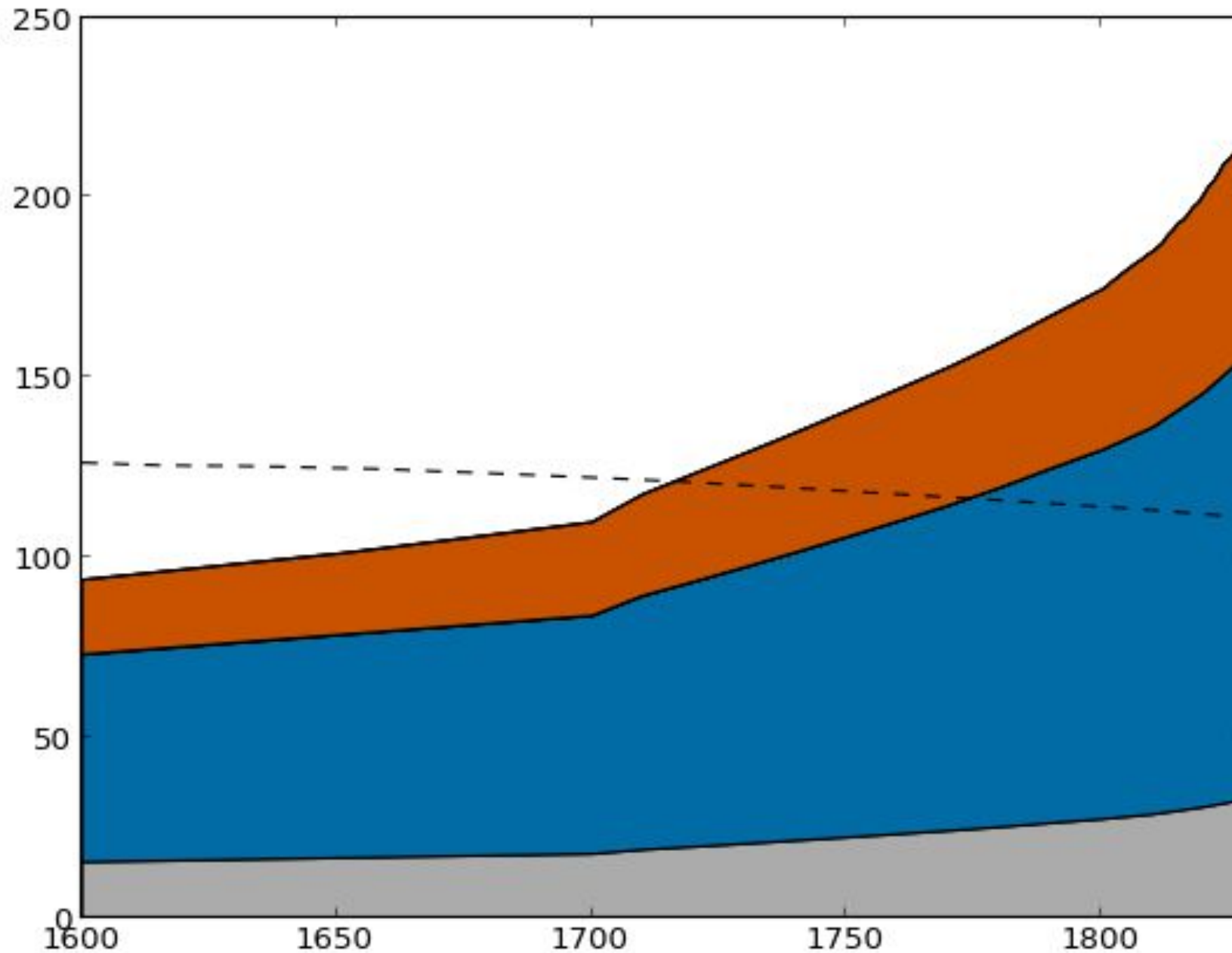
# Forest transition at European scale - Management



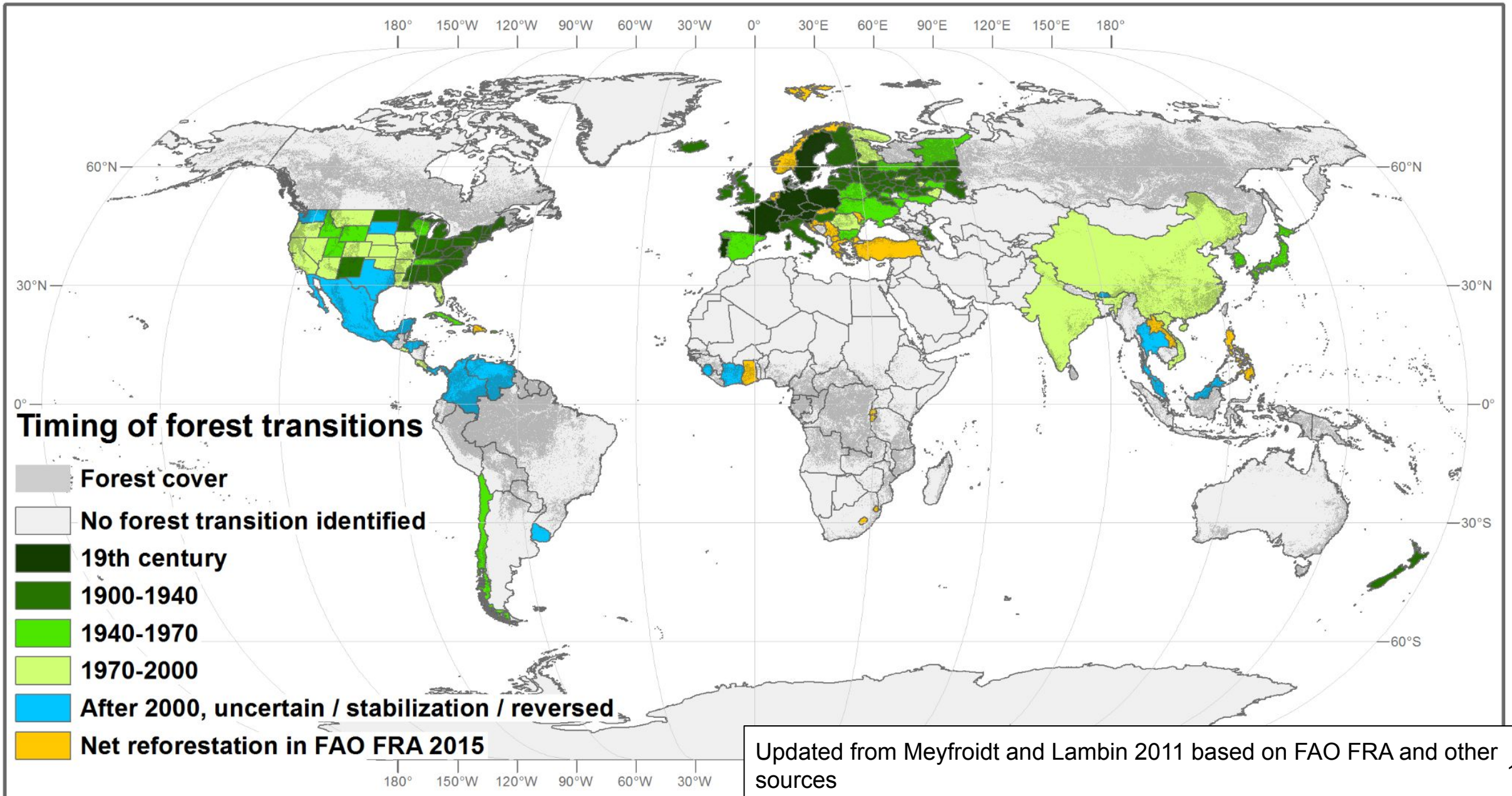
**Figure 5.** Total area ( $10^{12}$  km<sup>2</sup>) of unmanaged (gray), high stand (light blue) and coppice (dark blue) forests between 1600 and 2010. The full lines show the best available estimates whereas the dashed lines show the sensitivity of the management reconstruction to the “minimal importance” threshold (see Sect. 2.4.6).



# Forest transition at European scale - Demand

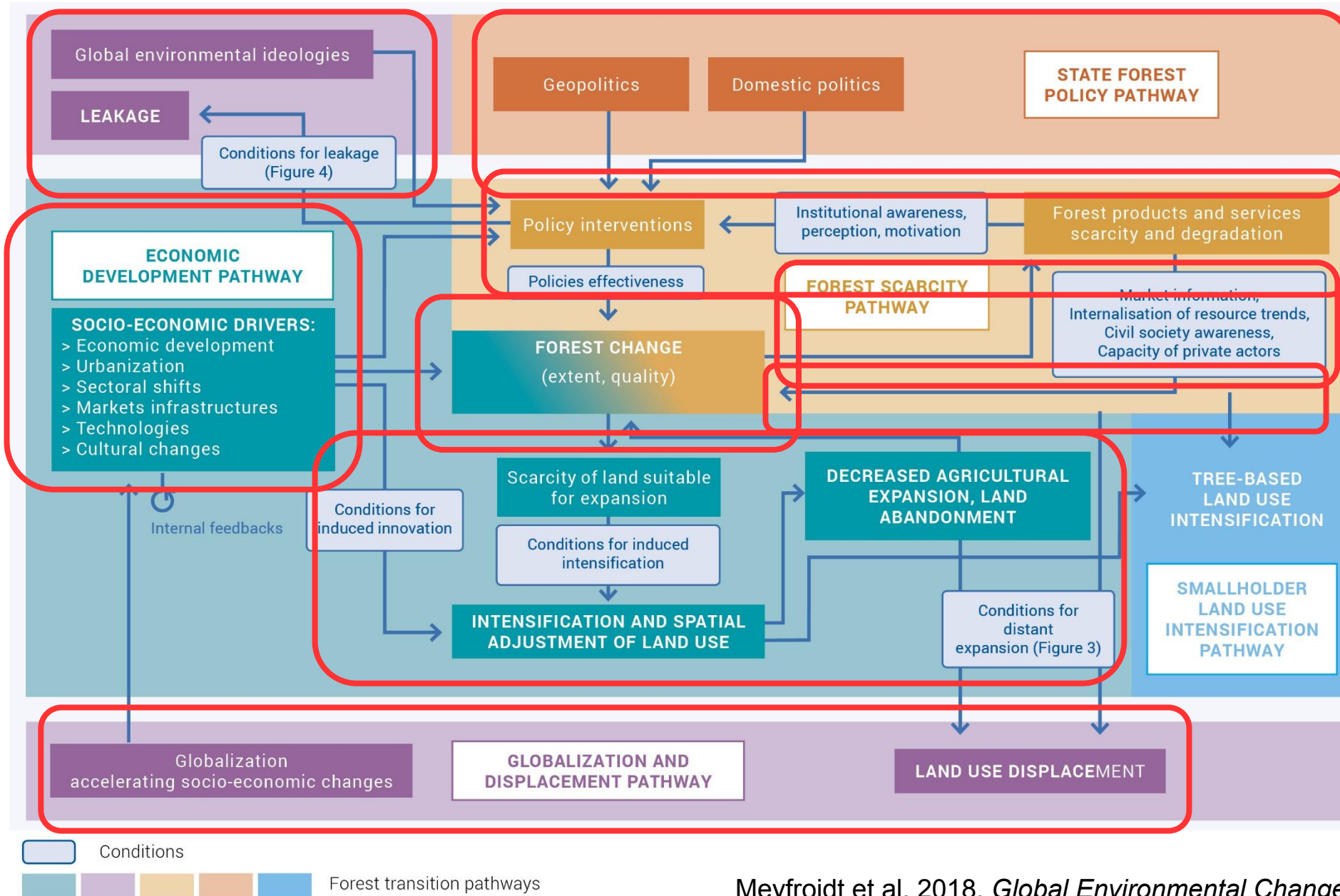


# Evidence across contexts



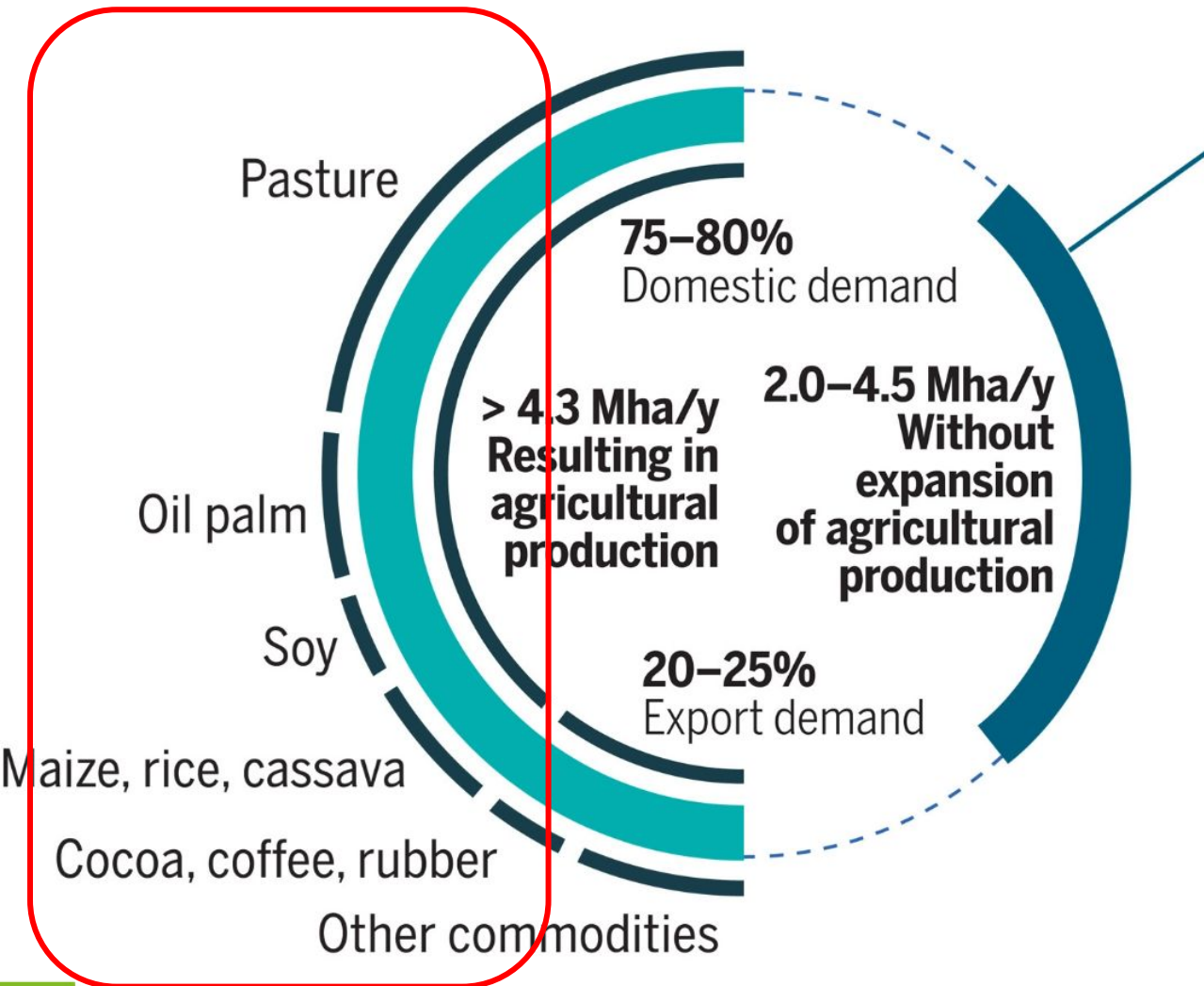
# Middle-range theories of Forest Transitions

FIGURE 5 | Theories of forest transition



# Displacement

## Agriculture-driven deforestation



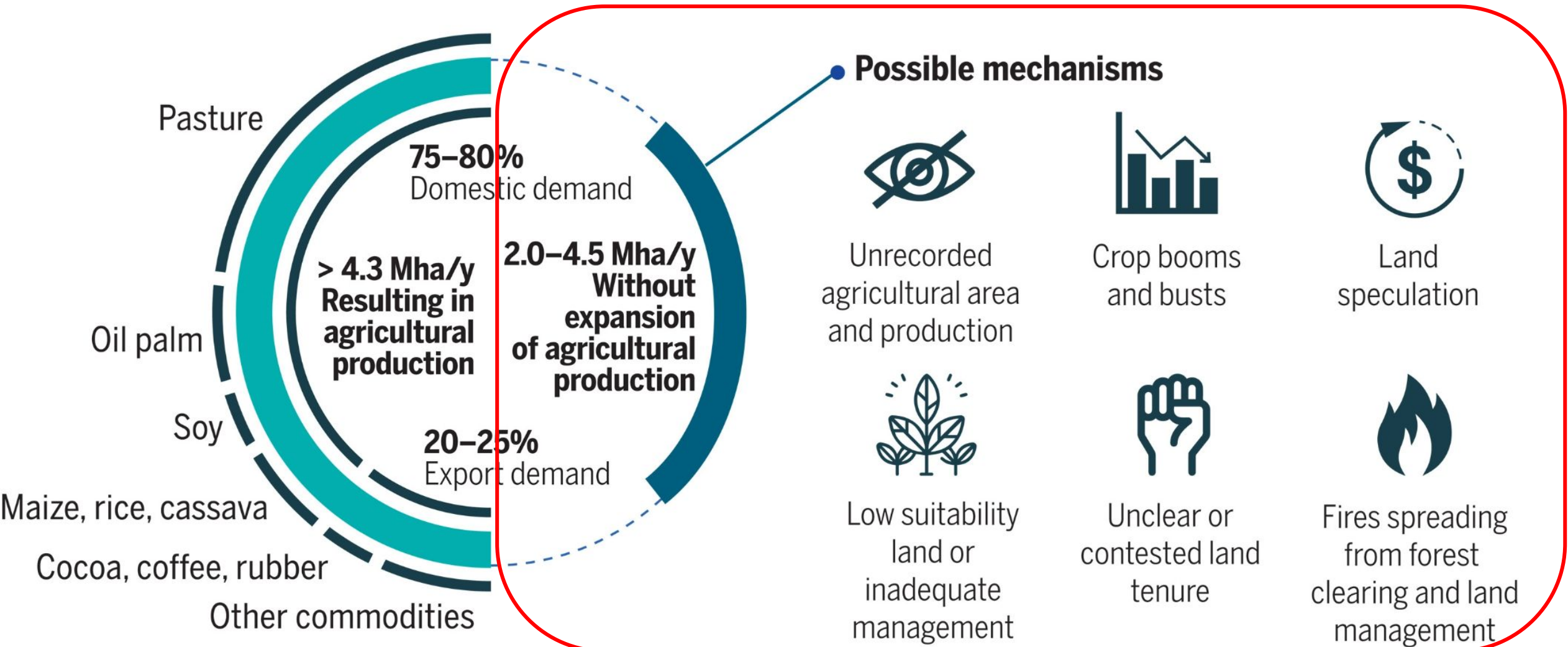
- 6.4-8.8 Mha/y
- 20-25% in international trade
- 87% to late/post forest transition countries (Pendrill et al. 2019 *ERL*)

Pendrill et al., *Science* 2022



# Displacement ... and complexities

## Agriculture-driven deforestation



Pendrill et al., *Science* 2022



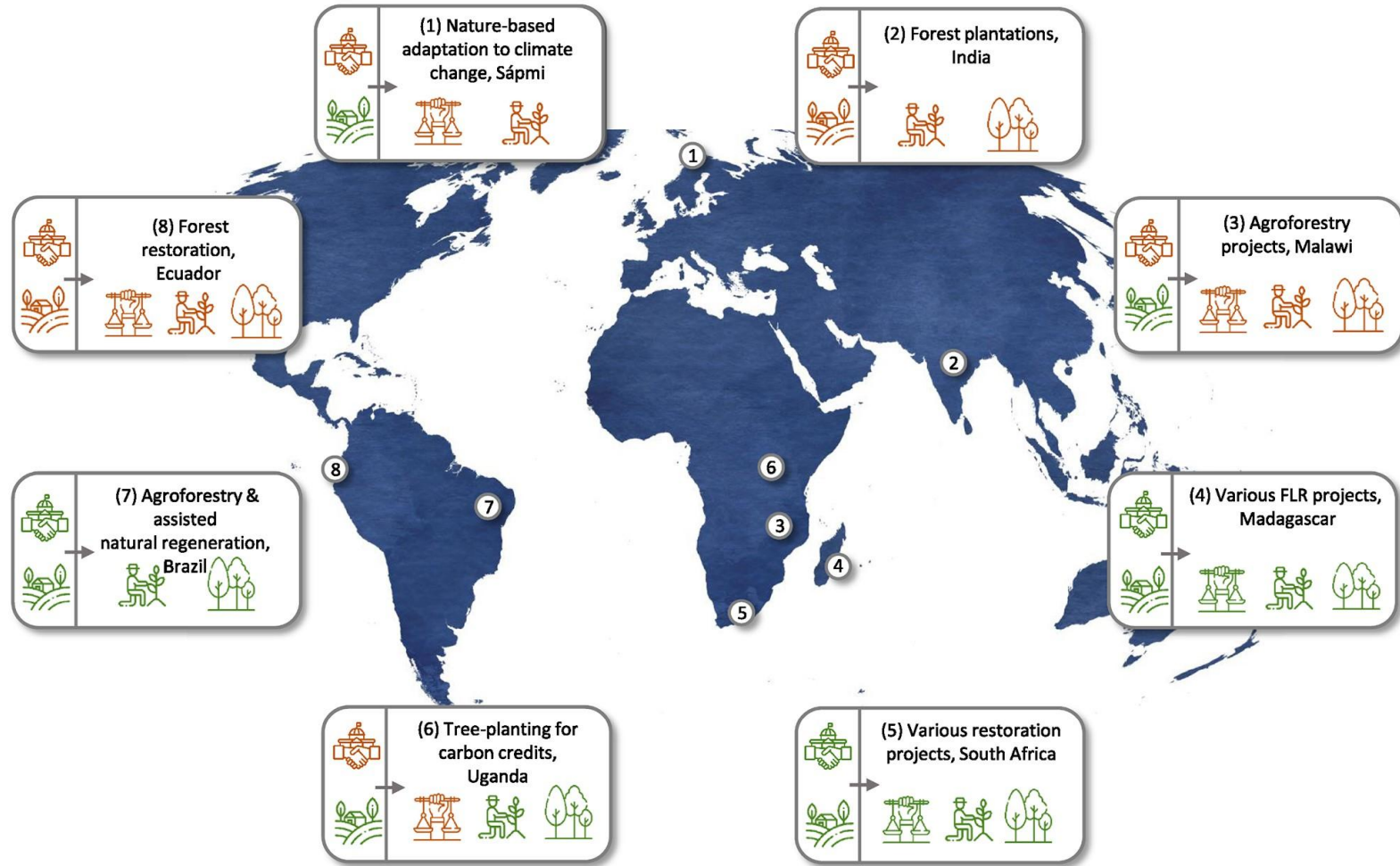
# Contestation and Conflicts



Horace Vernet, 1803



# Equity and Effectiveness of restoration can go hand in hand



Social considerations in project planning and/or implementation		Outcomes	
Equity was incorporated	Insufficient incorporation of equity	Improved equity	Harmful or insufficient equity outcomes
Explicit focus on improving livelihoods	Insufficient focus on local realities	Livelihood benefits	Harmful or insufficient effects on livelihoods
		Improved ecological/environmental outcomes	Harmful or insufficient ecological/environmental outcomes



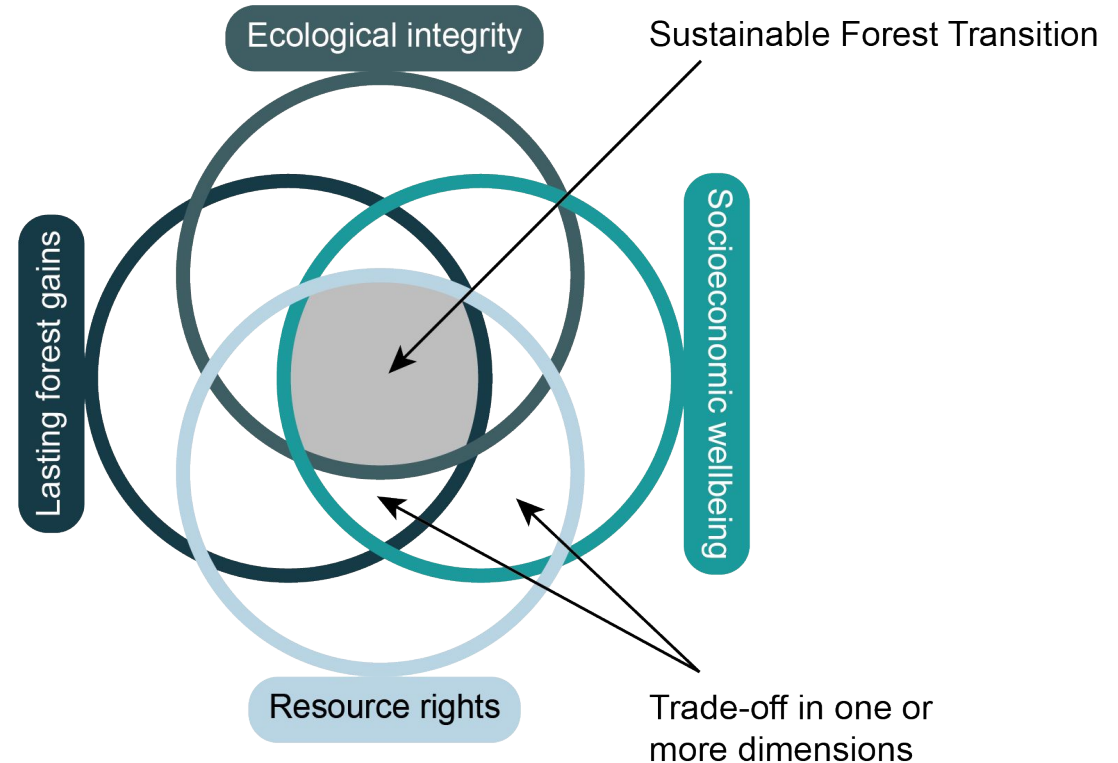
# Lessons learned & limits

- Evidence & theory
- Regularities and contingency
- Transformations and spatial reorganisation
- Conflicts but not only, equity, environmental justice
- Displacement

## >> Sustainable forest transition theory?

a rediscussion of land system complexities here:  
Meyfroidt et al. 2022 *PNAS*

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Oldekop J. et al. *in preparation*