

Forests are supposed to help stop climate change – these forests didn't

Sebastiaan Luyssaert
Matthew McGrath
Guillaume Marie
Yi-Ying Chen
James Ryder
Aude Valade
Juliane Otto
Kim Naudts



VRJIE
UNIVERSITEIT
AMSTERDAM



Agence de l'Environnement
et de la Maîtrise de l'Énergie



Article 2

Article 5

Article 7

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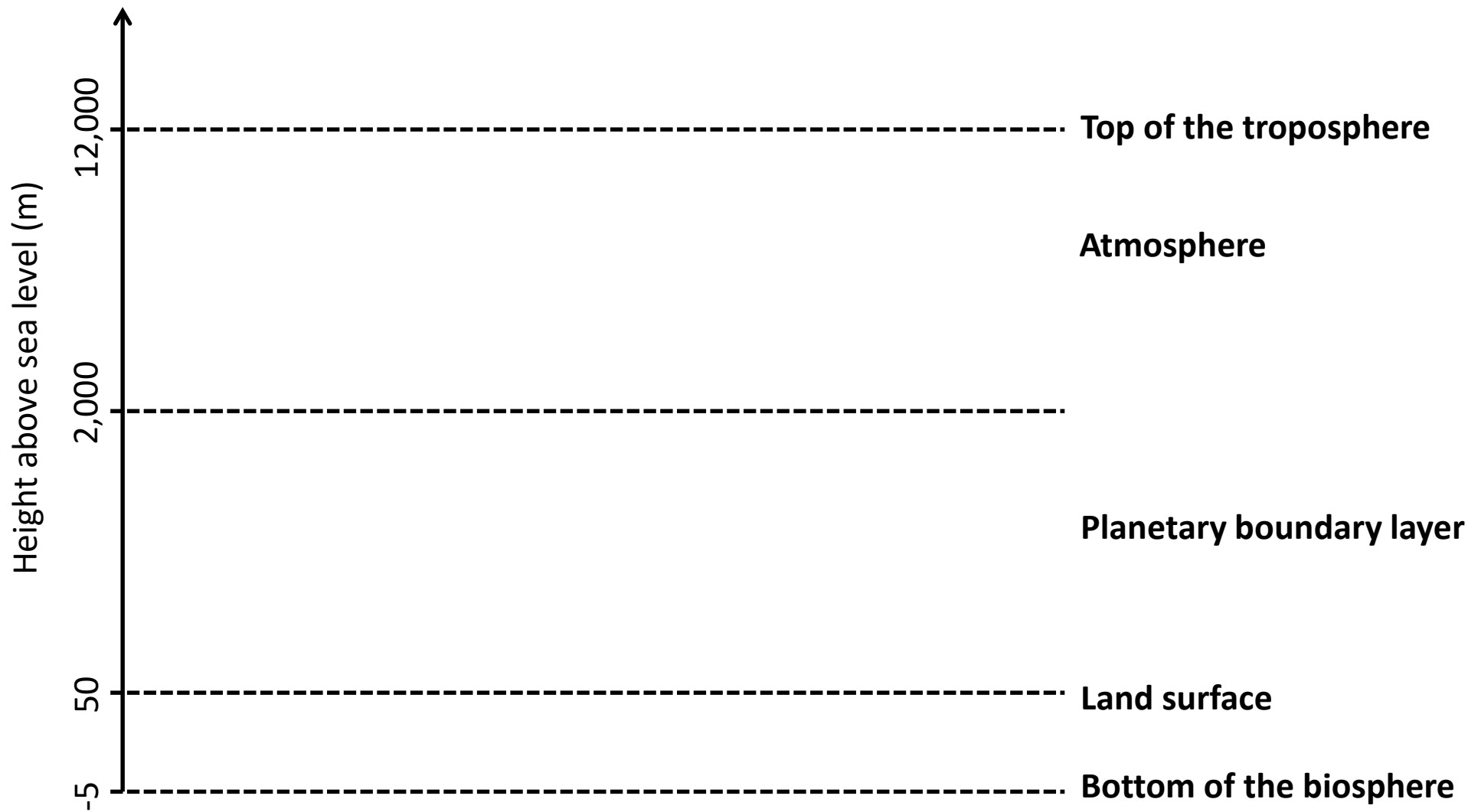
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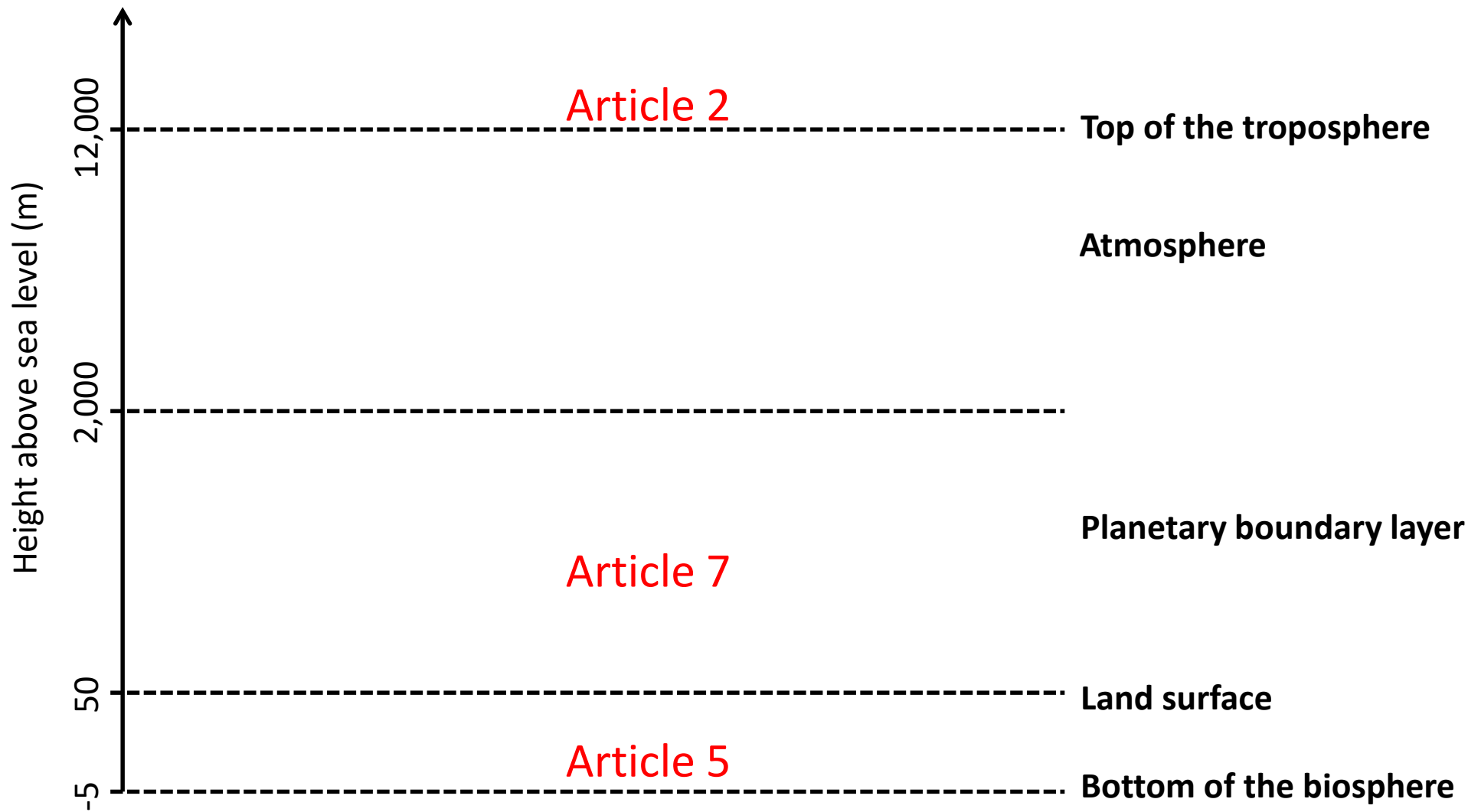
Article 7

[...] makes a contribution to the long-term global response to climate change to protect people, livelihoods and ecosystems. [...] greater levels of mitigation can **reduce the need for additional adaptation efforts**.

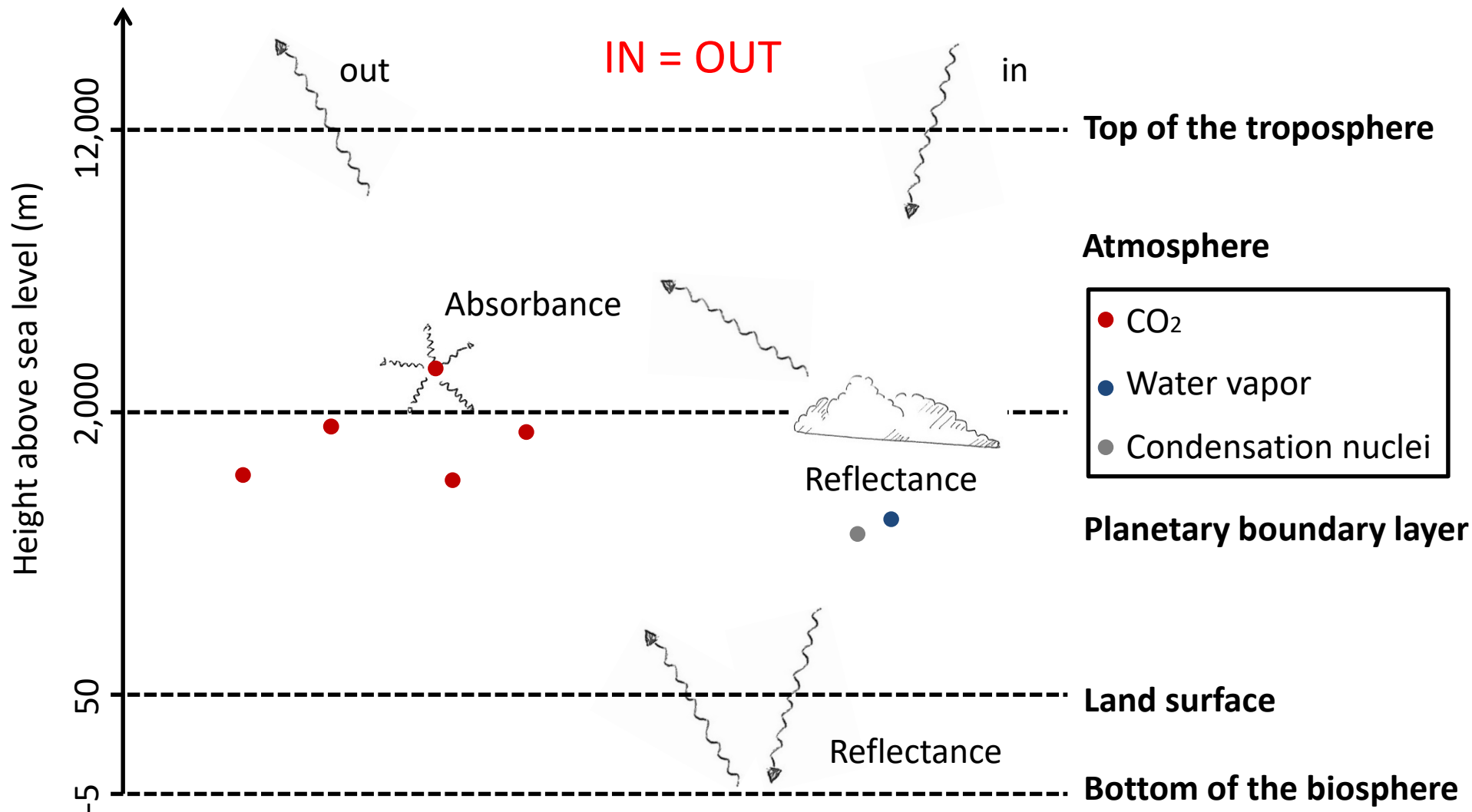
From Paris to the Earth system



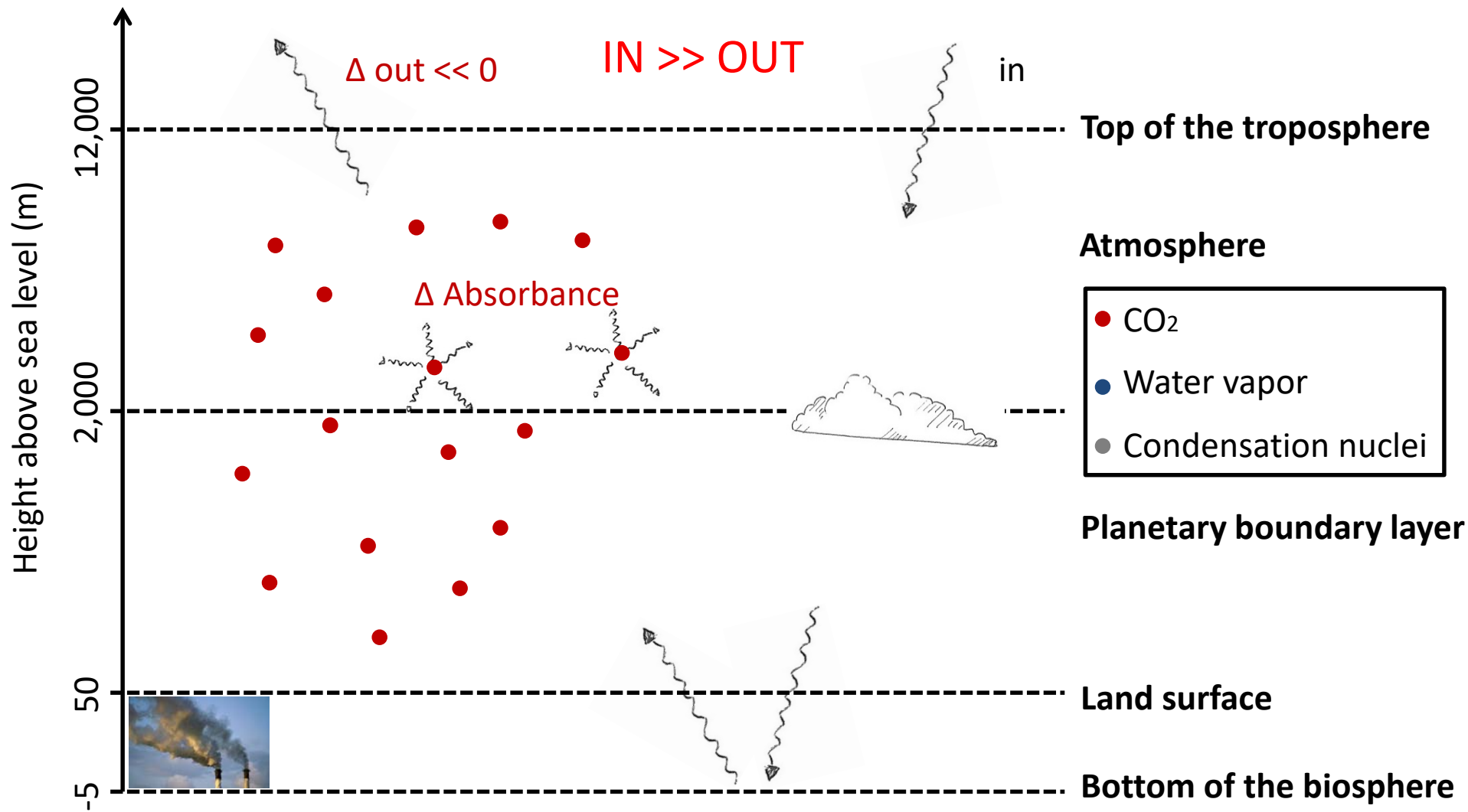
From Paris to the Earth system



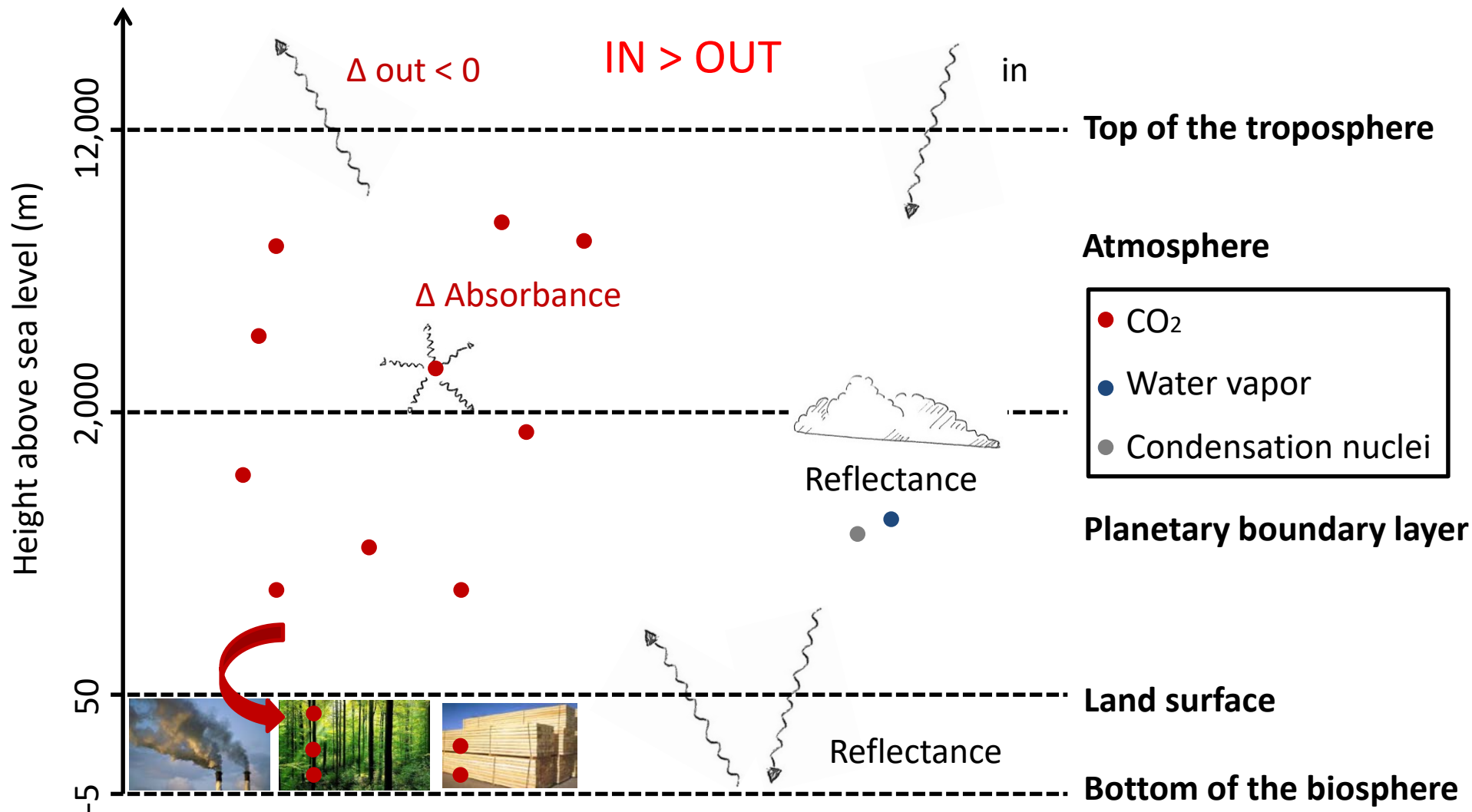
The basics of the radiative balance



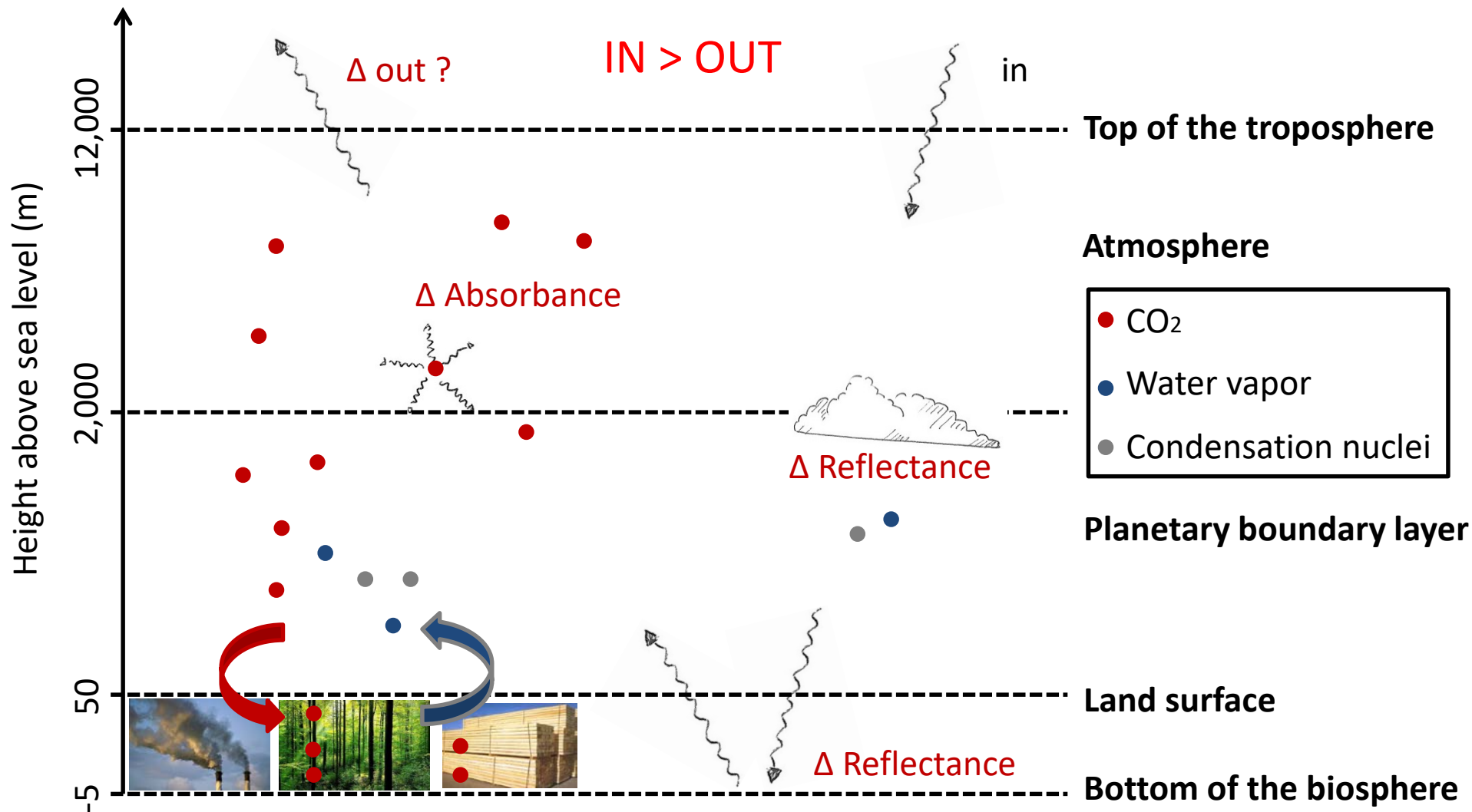
The basics of climate change



Article 5 – A carbon perspective



Article 2, 5 & 7 – An Earth system perspective



Assessing the net climate effect

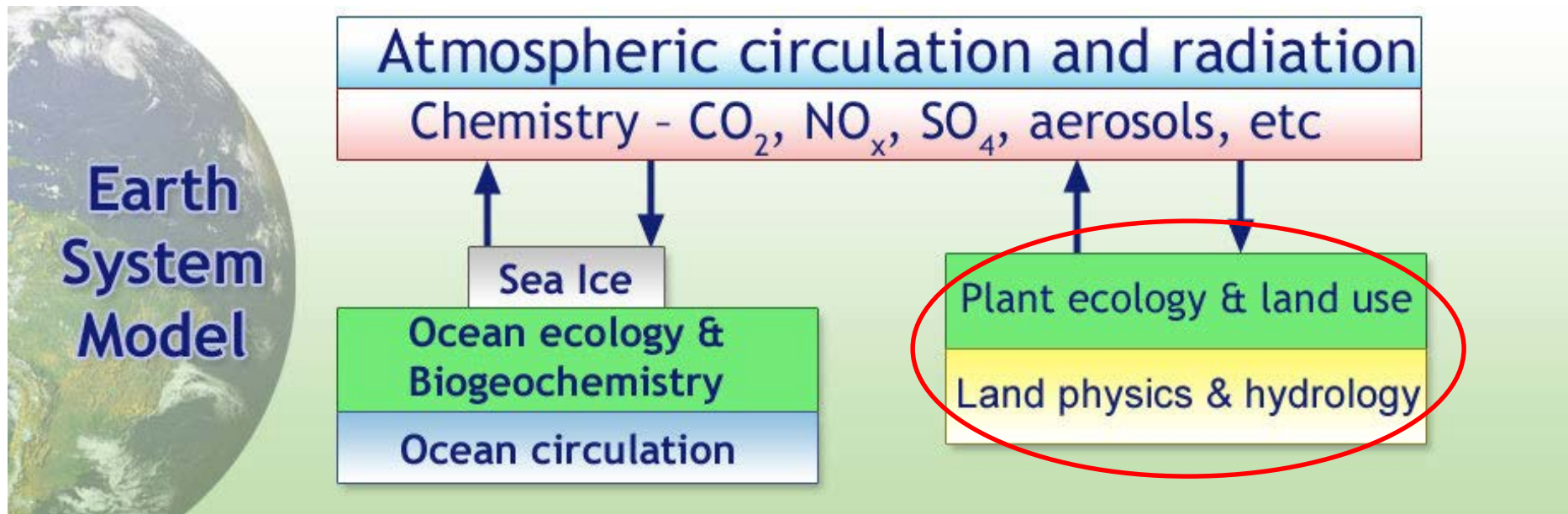
Net Climate effect (includes feedbacks)		
Biogeochemical forcing No feedbacks!		Biophysical forcing No feedbacks!
<p>GHG sink</p> <p>Soil: CO₂, CH₄, N₂O Litter: CO₂ Biomass: CO₂ Land-use: CO₂, CH₄, N₂O Land-cover: CO₂ Disturbances: CO₂, CO, CH₄, N₂O</p>	<p>GHG accounting</p> <p>Management: CO₂ Transport: CO₂ Transformations: CO₂ Wood products: CO₂ Landfilling: CO₂, CH₄ Avoided emissions: CO₂, CO, CH₄, N₂O</p>	<p>(Non) radiative</p> <p>Albedo Emissivity Evapotranspiration BVOCs Sensible heat Roughness Evapotranspiration</p>

Top of the troposphere
Planetary boundary layer

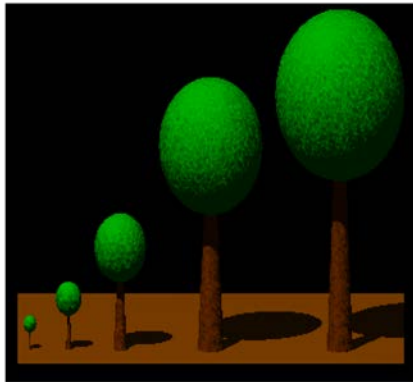
Land surface

Bottom of the biosphere

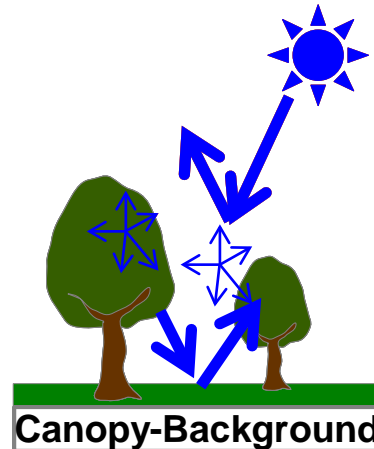
Earth system models



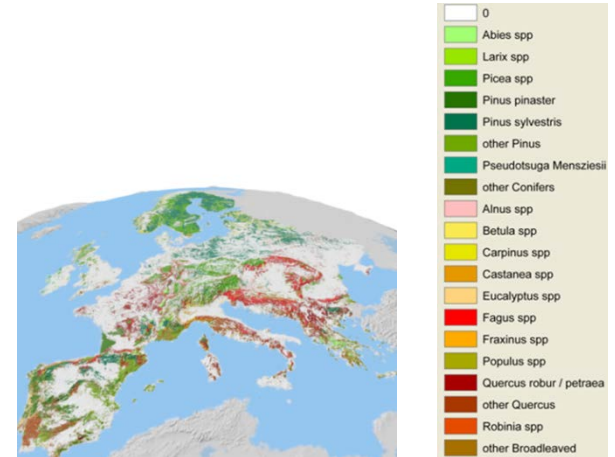
Enhanced modelling capabilities



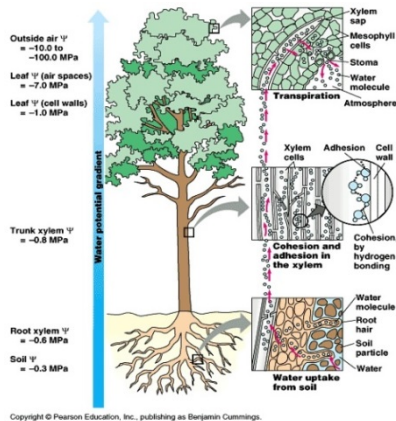
C-allocation



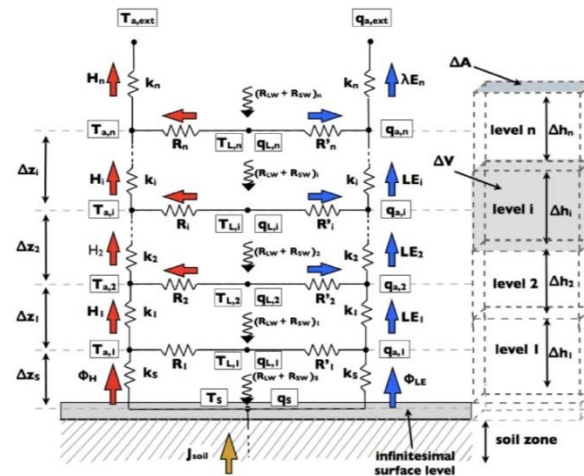
Canopy radiation transfer



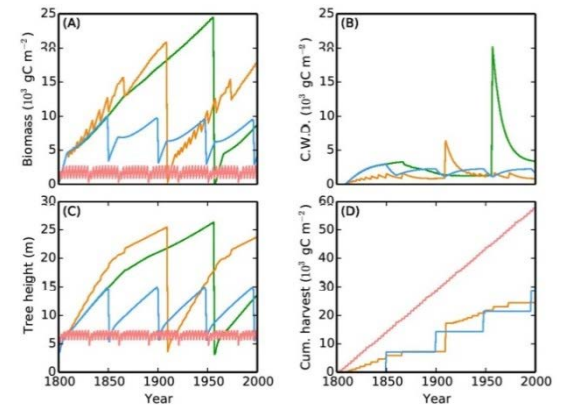
Tree species parameters



Hydraulic architecture



Multi-layer energybudget

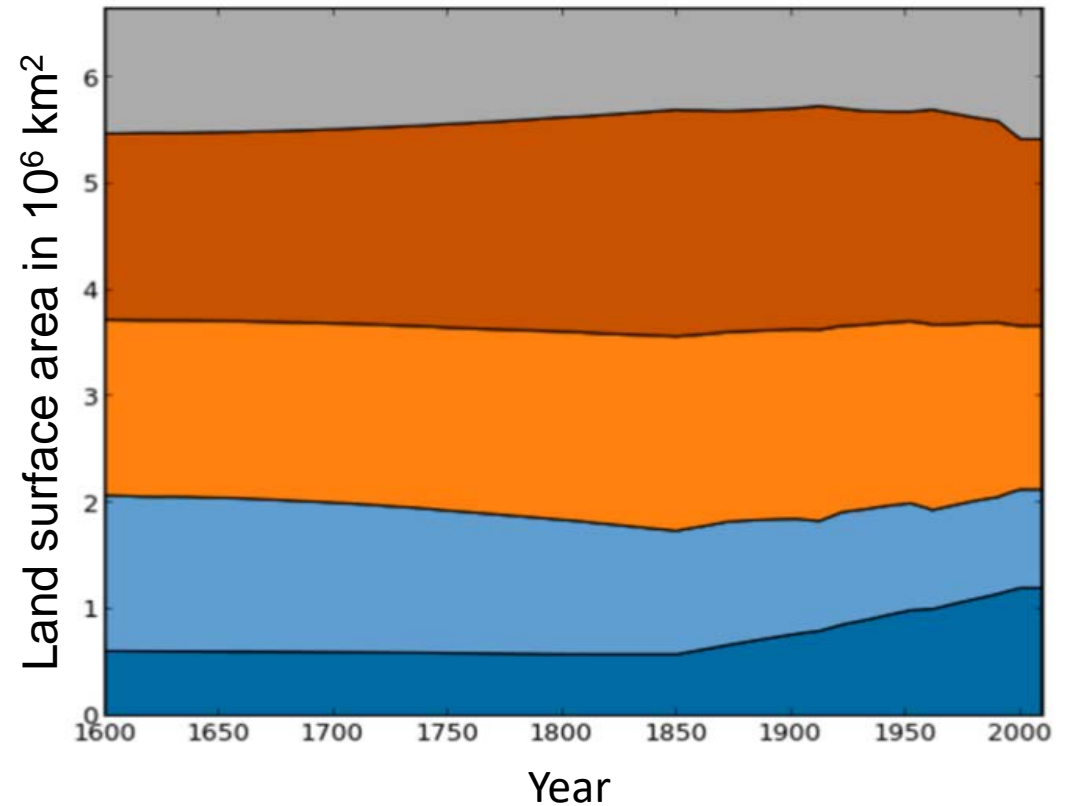
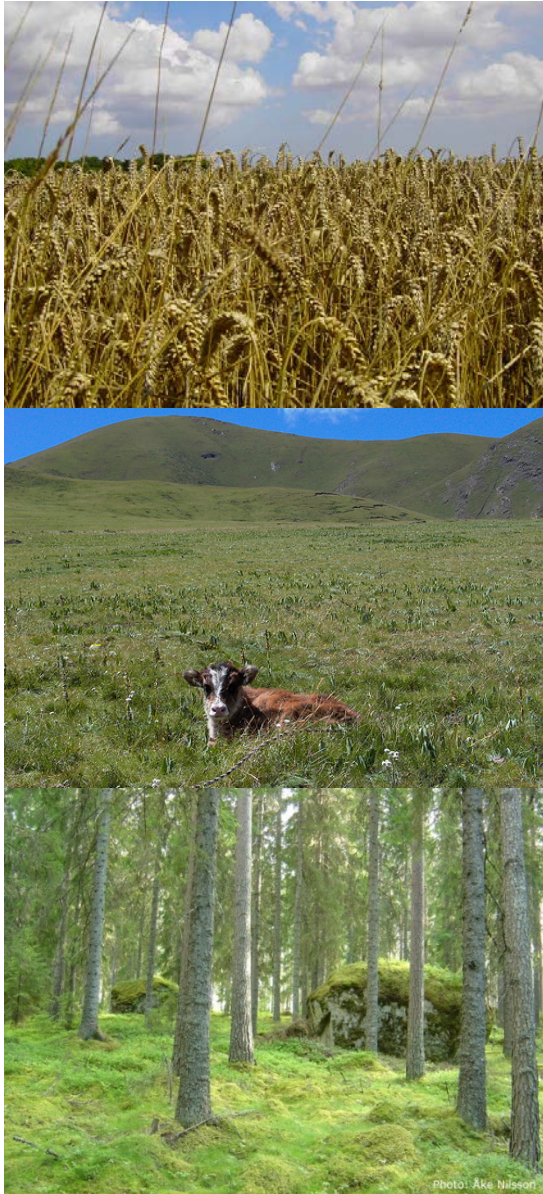


Forest management

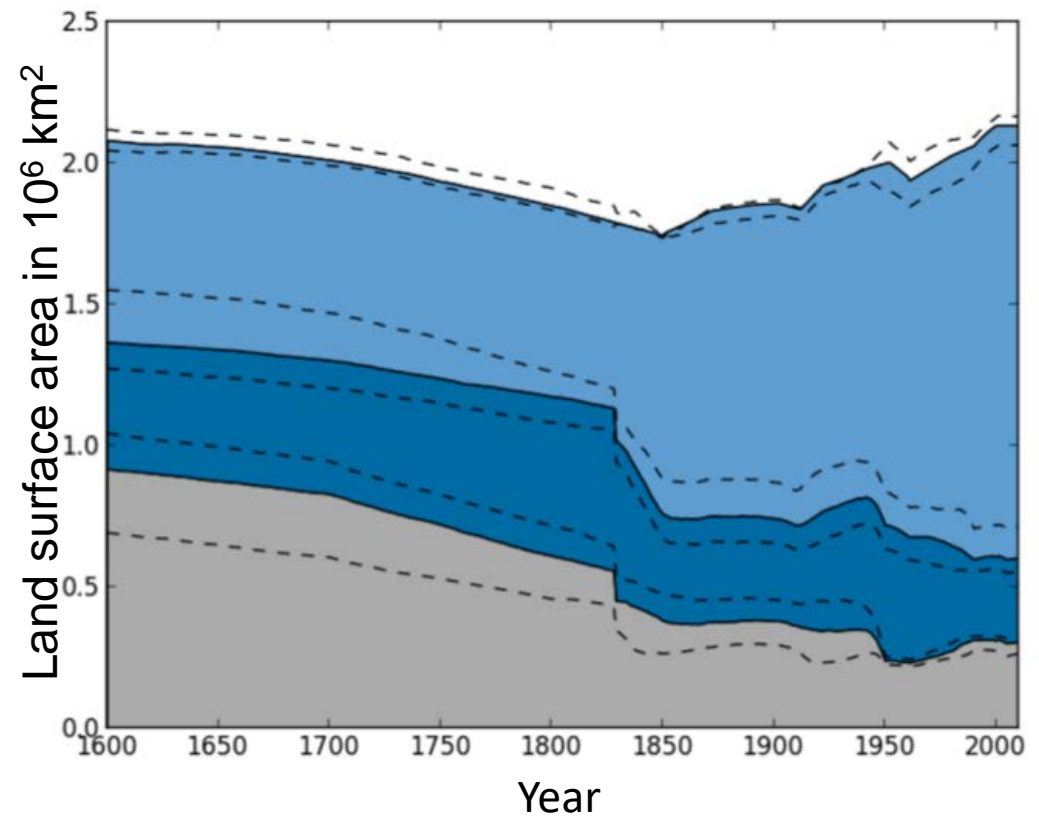
Climate effects of 250-years of forest management



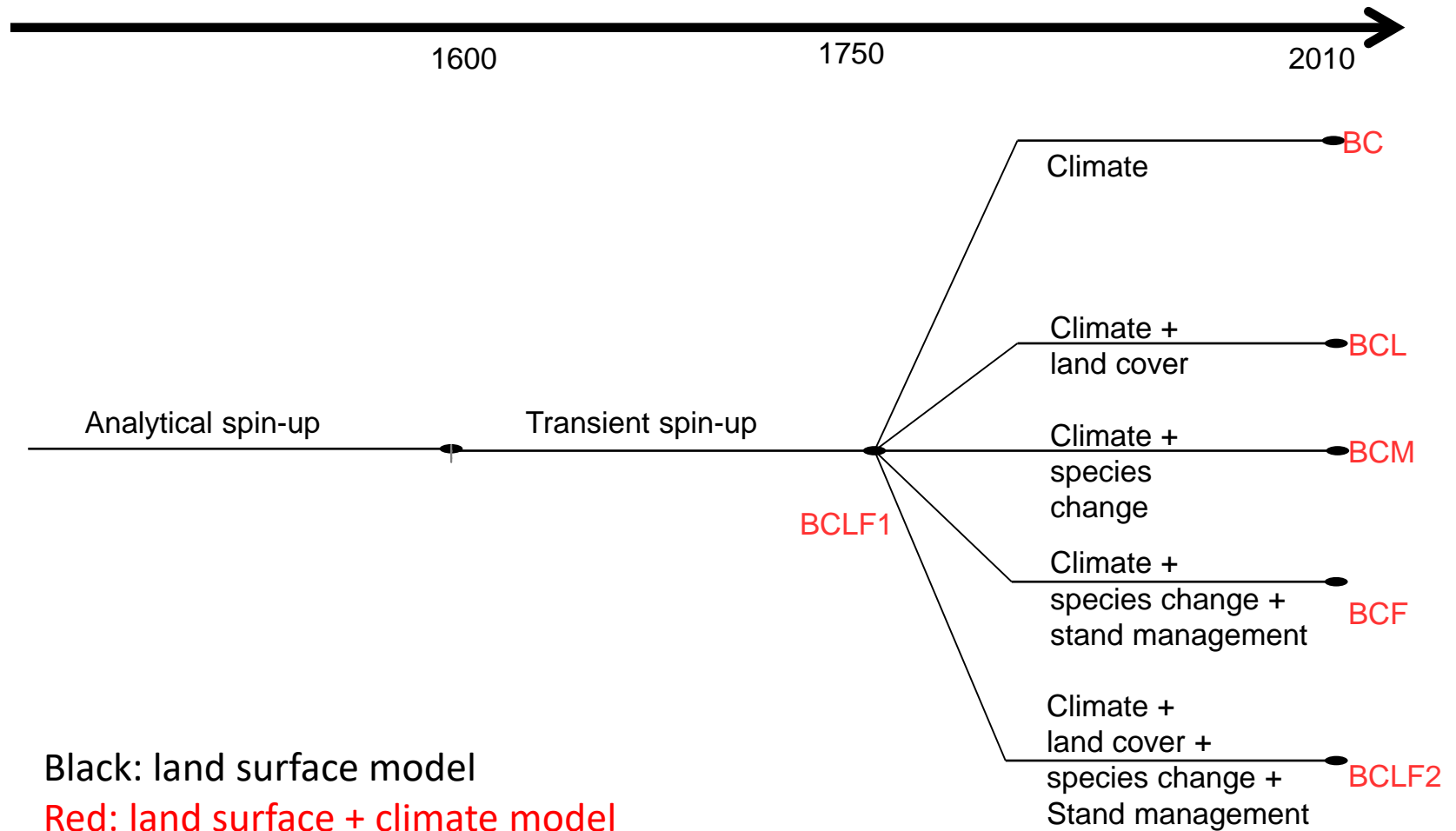
Land cover reconstruction



Forest management reconstruction



Climate effects of 250-years of forest management



Climate effects of 250-years of forest management

	ΔRF due to GHGs ($W\ m^{-2}$)	ΔRF due to surface change ($W\ m^{-2}$)	ΔT_a , summer (K)	Δ Precipitation, summer (mm per season)	Δ Atmospheric carbon (Pg C) [†]
Global					
Greenhouse gas emissions	2.98*‡	0.00	1.71*‡	–6	247§
European					
Land-use change	0.01*	0.11*¶	0.12*#	–3	3.1
Land-cover change	–0.01	0.12*¶	0.02*¶	0	–0.7**
Forest management	0.02	–0.01	0.10*#	–3*††	1.9
Species conversion	–0.01	0.00	0.08*#	–4*††	–0.6‡‡
Wood extraction	0.03	–0.01	0.02*	1	2.7

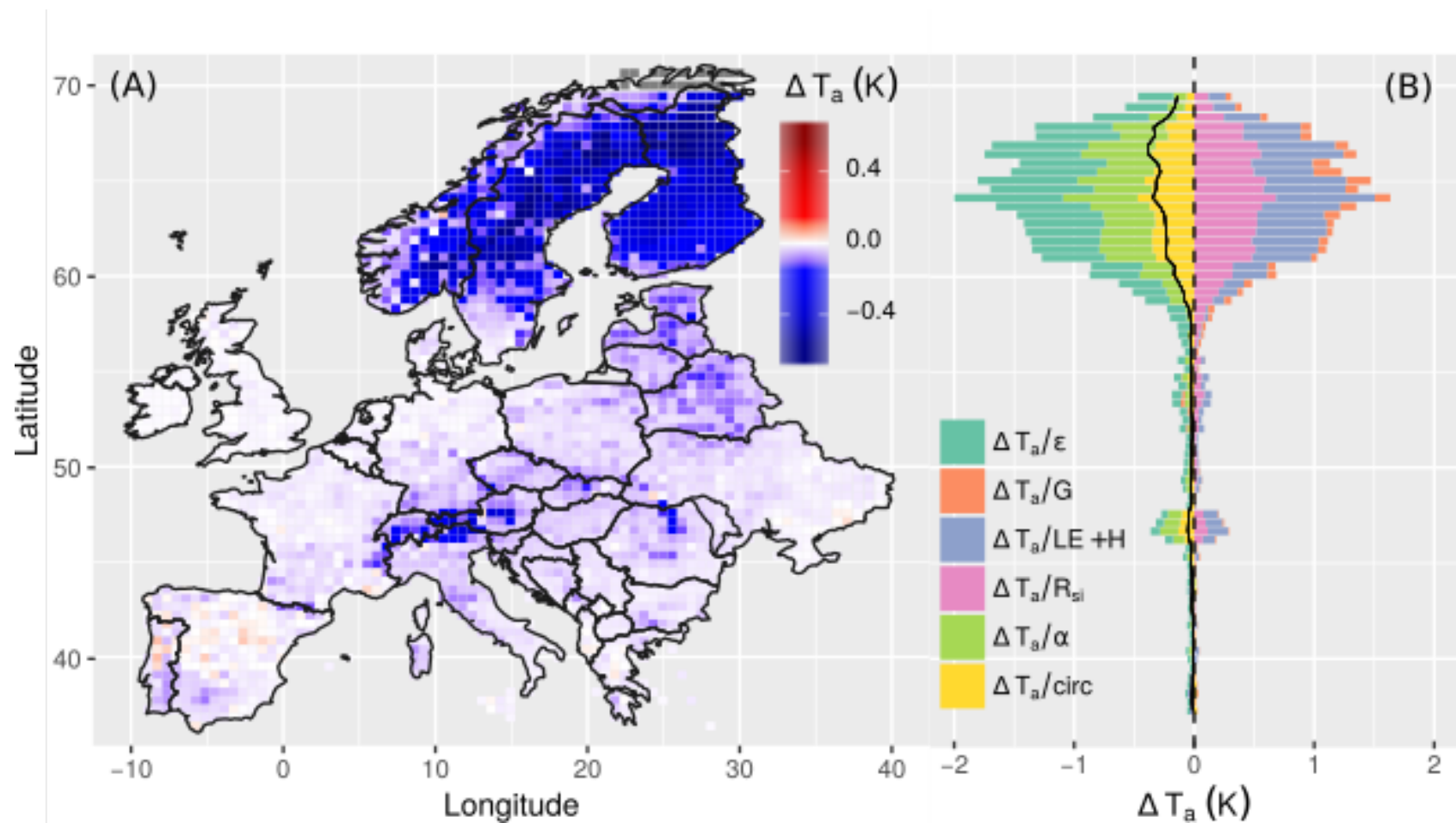
How to achieve the Paris agreement?



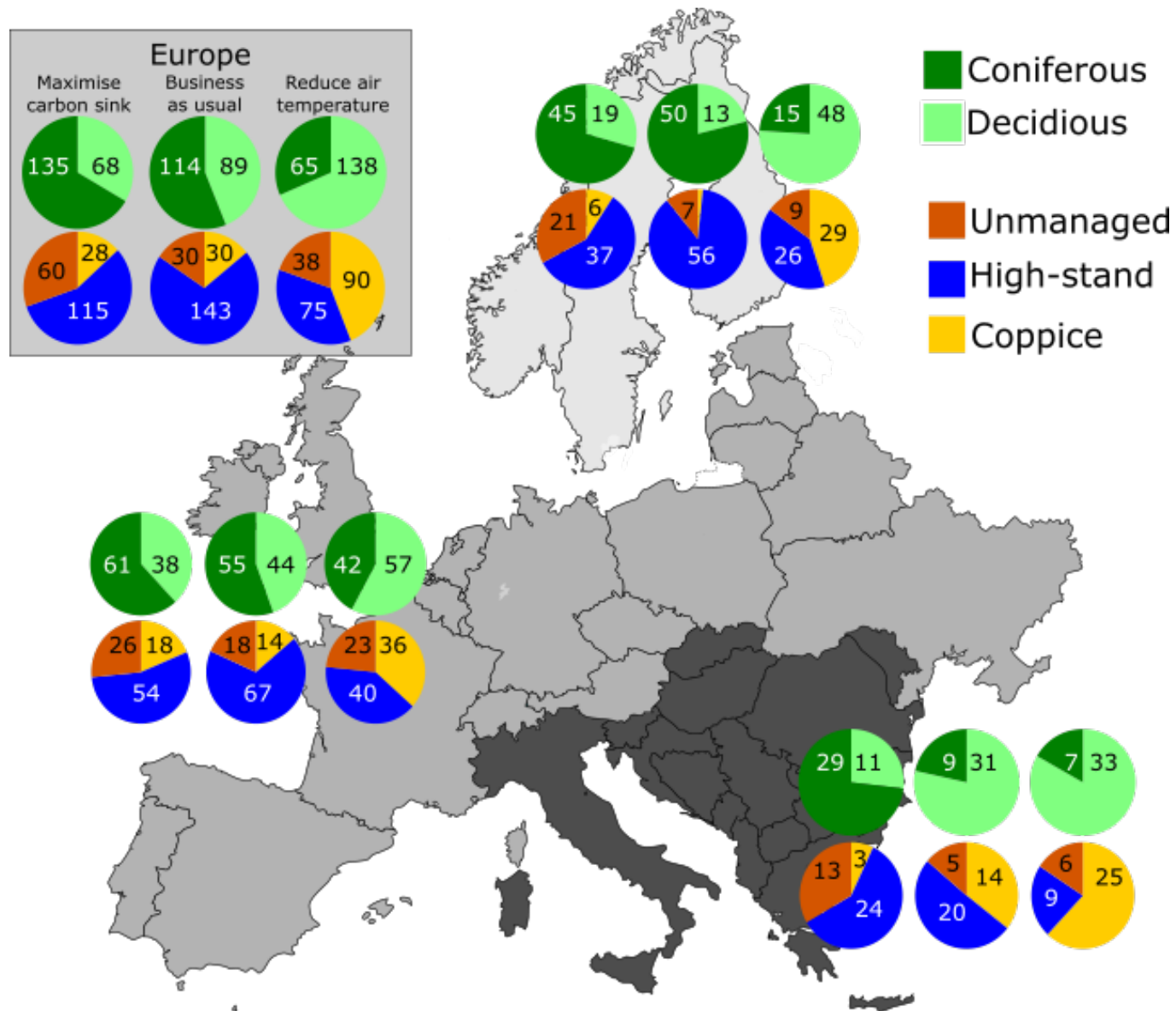
How to achieve the Paris agreement?

	Art. 2 (TOA)	Art. 5 (Carbon sinks)	Art. 7 (Adaptation T)	Art. 7 (Adaptation P)
Strongest sink	No effect	Succeed	No effect	Fail
Weakest sink	No effect	Fail	Fail	Fail
Brightest surface	No effect	No effect	Succeed	Fail
Darkest surface	No effect	Succeed	Fail	Fail
Lowest temperature	No effect	Succeed	Succeed	Fail

How to achieve the Paris agreement?



How to achieve the Paris agreement?



- When managing the carbon balance of a forest, unintended but unavoidable changes in surface properties and behavior occur. These should be accounted for when assessing the climate impact of forest management.
- Carbon-management and climate-management should not be used interchangeable

Existential crises or opportunity?

Before 1997



Existential crises or opportunity?

After 1997



After reality checks

