



MOTIVE

Models for Adaptive Forest Management under Climate Change

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European Climate Change Conference, Hamburg 19th March 2013

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Structure

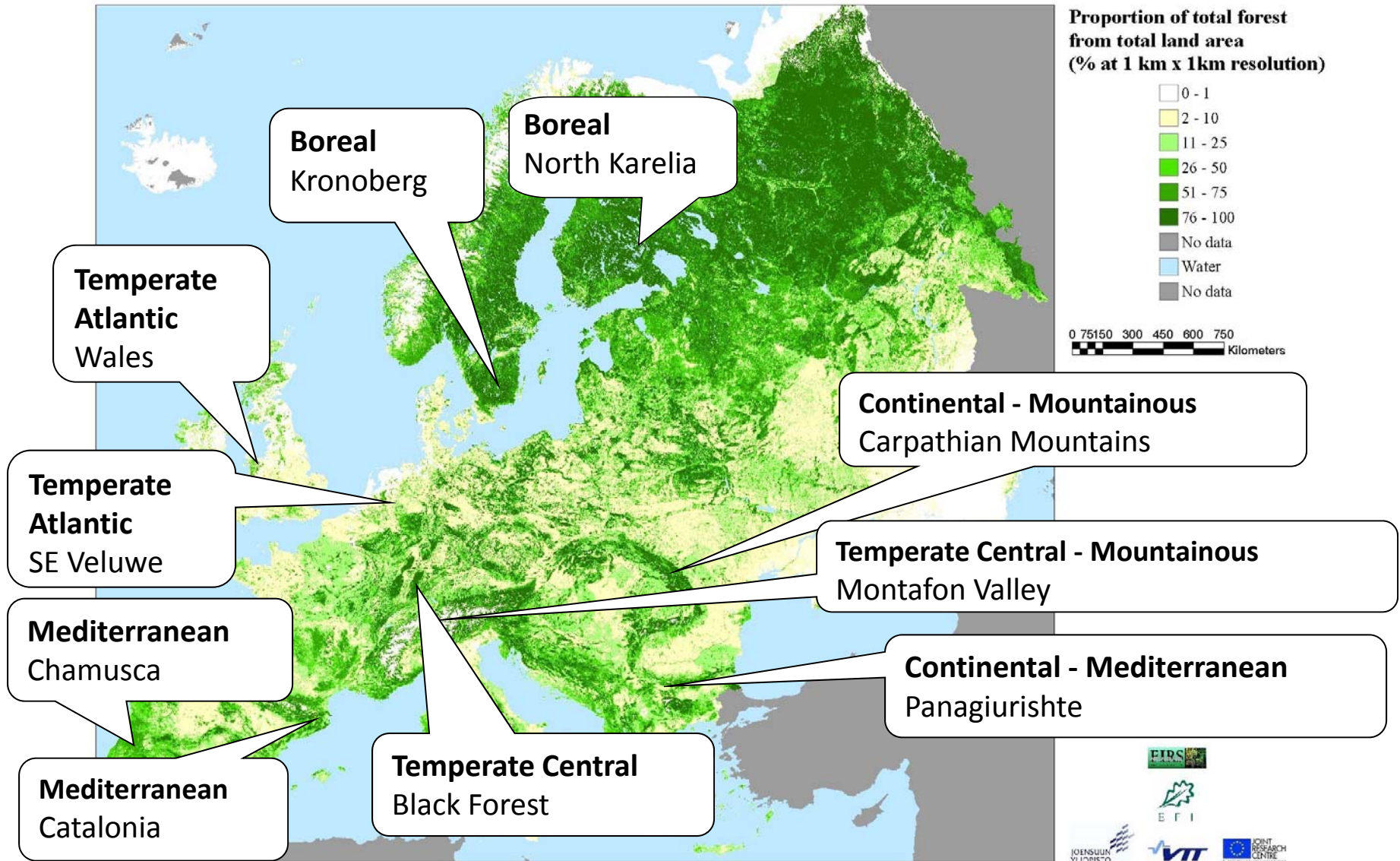
- **MOTIVE: Models for Adaptive Forest Management**
- **Climate Change and European forests - Trends**
- **Economic impacts of biome shifts – The European level**
- **Effects of CC on Ecosystem Services – case-study results**
- **Assessment of perception of CC in Europe**
- **Conclusions**



MOTIVE Objectives

To provide insights, data and tools to improve policymaking and adaptive forest resource management under climate change

- **Integrated assessment** of forest management strategies
- A comparative assessment across **a wide range of** climatic and socio-economic **conditions**
- Influence of **feedback loops** from socio-economy and policy making on resource management
- Translate scientific state of knowledge into **decision support** for policy makers and forest practitioners
 - European scale analyses as well as 10 landscape level cases
 - Stakeholder involvement and a tool box for adaptive management



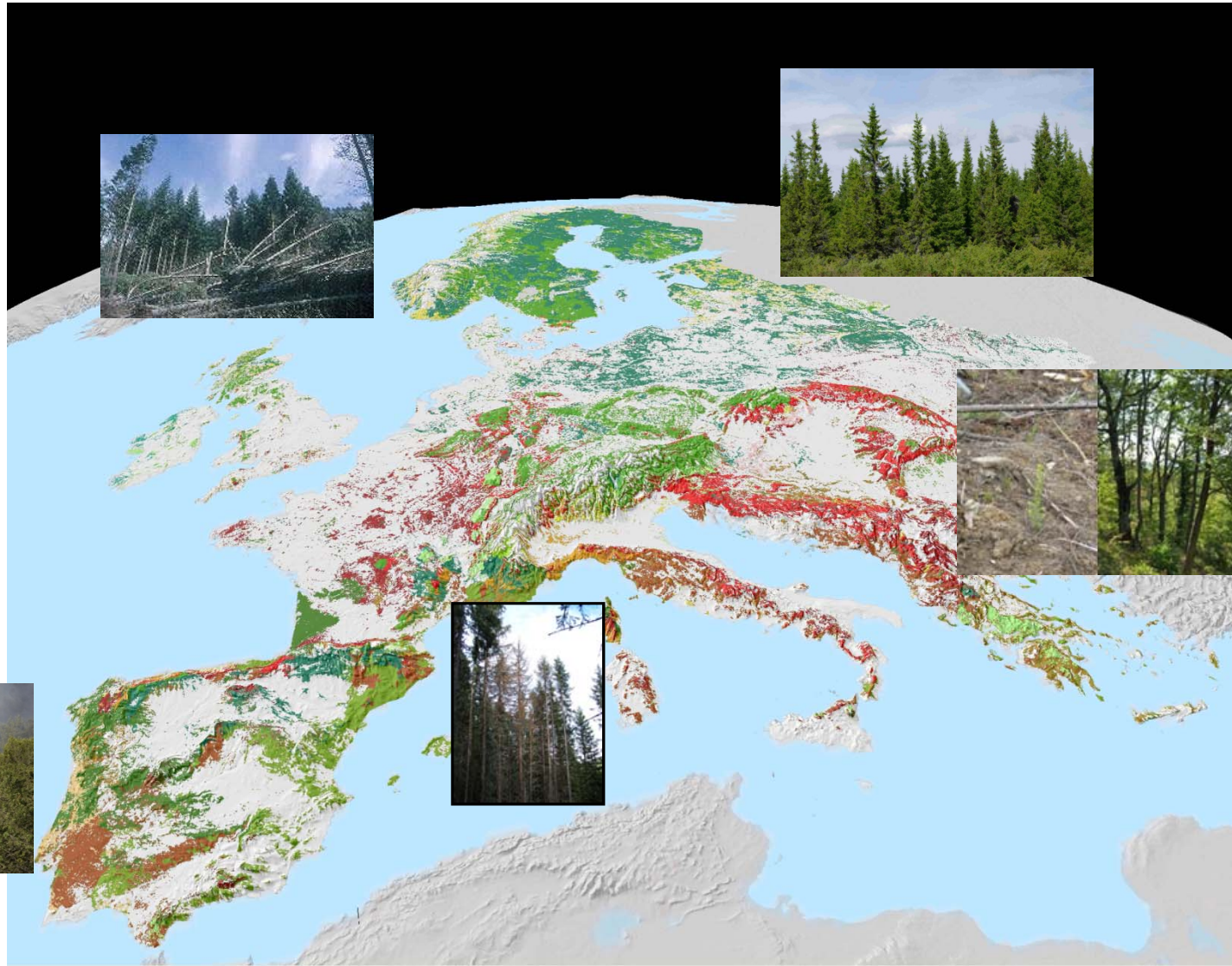
Facing Climate Change Impacts: highly diverse

EU27:

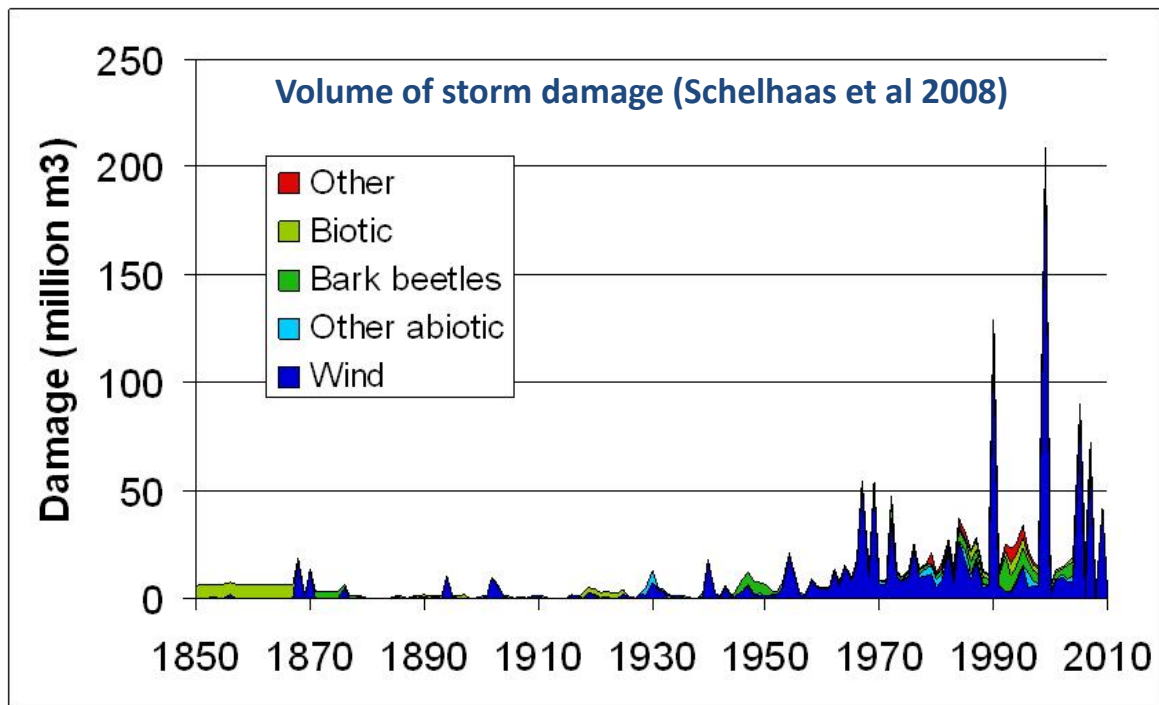
200 million ha

16 million owners

Multiple services



Increased disturbances



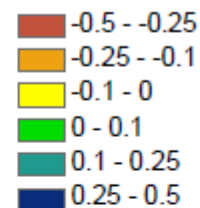
Impact: Spruce bark beetle also in mountain forests



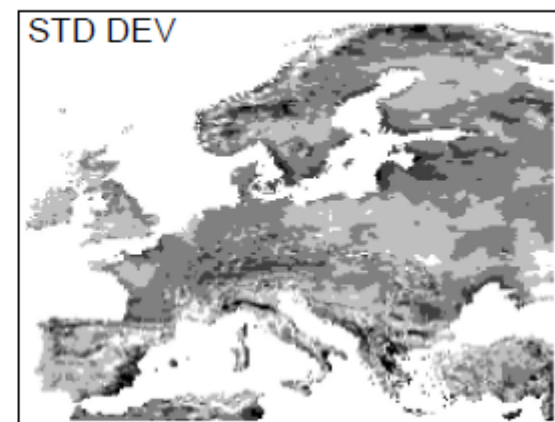
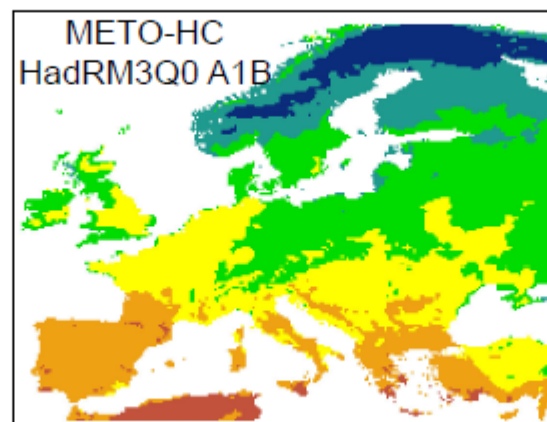
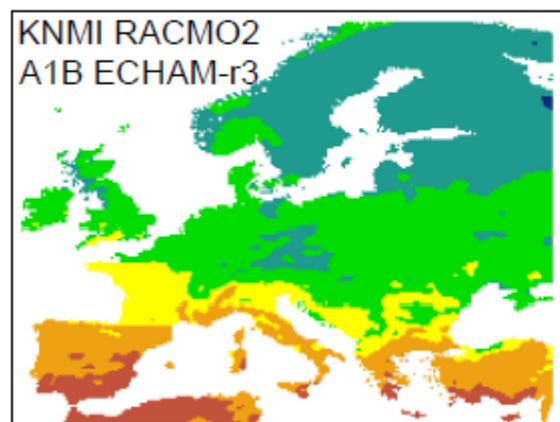
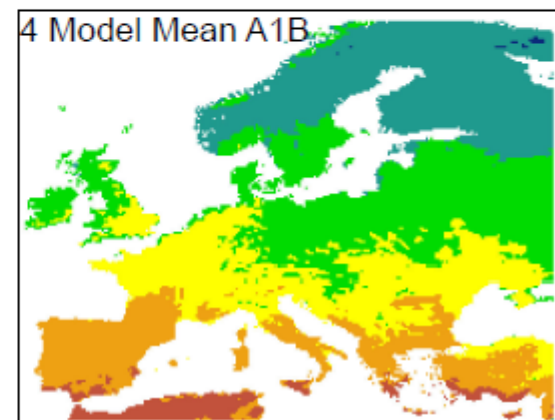
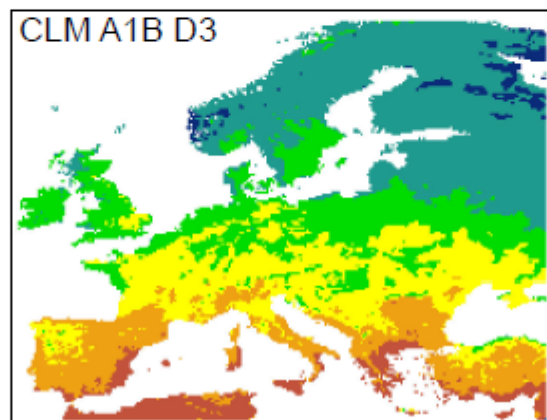
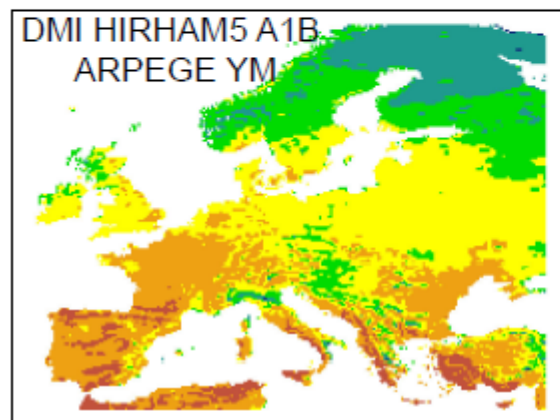
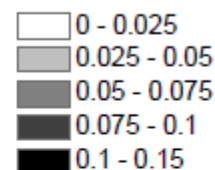


Relative Change in Precipitation

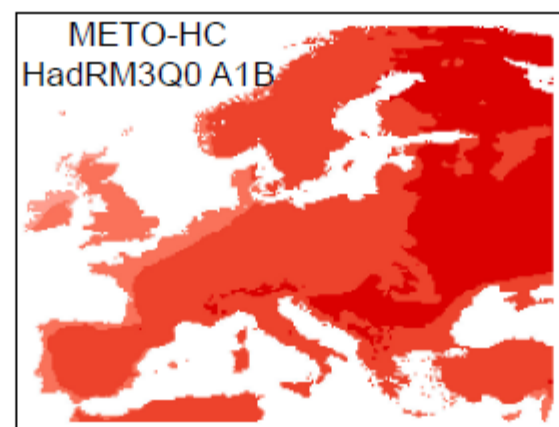
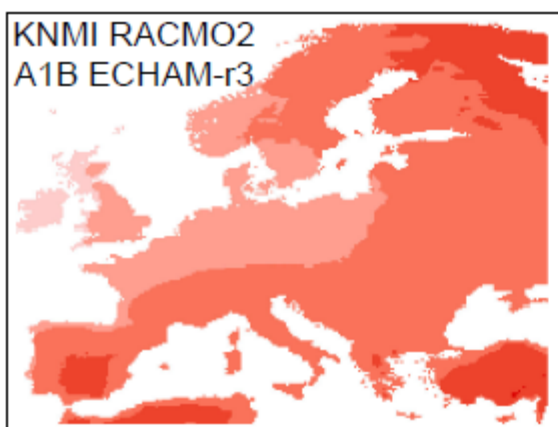
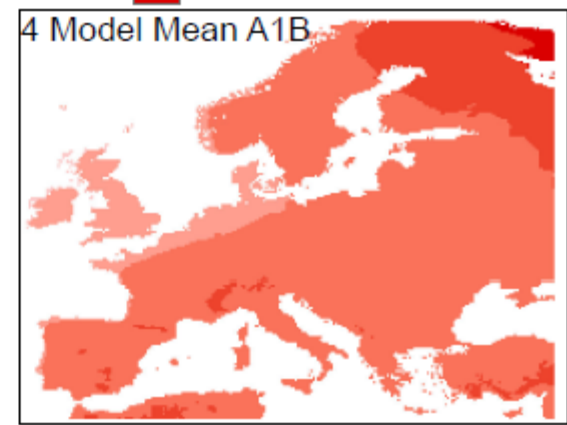
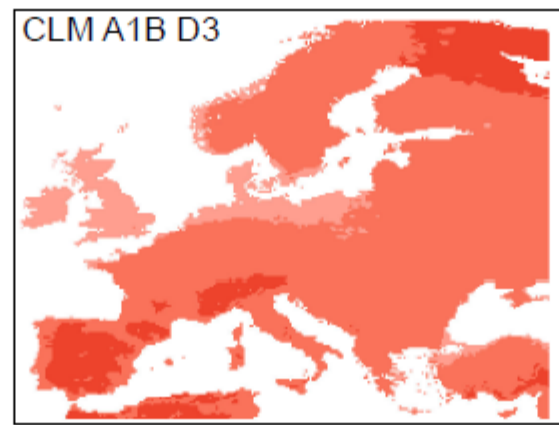
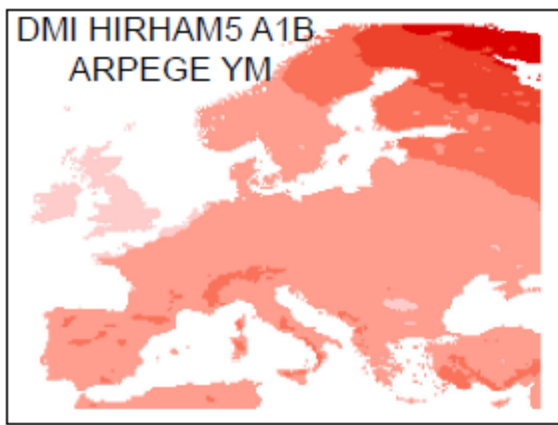
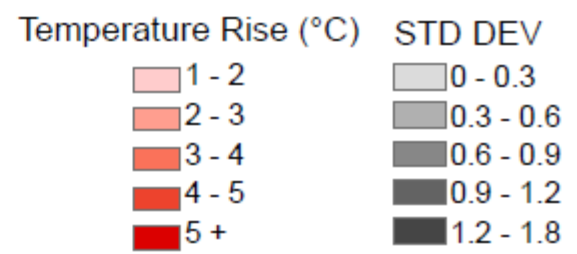
REL DIFF PRECIP



STD DEV

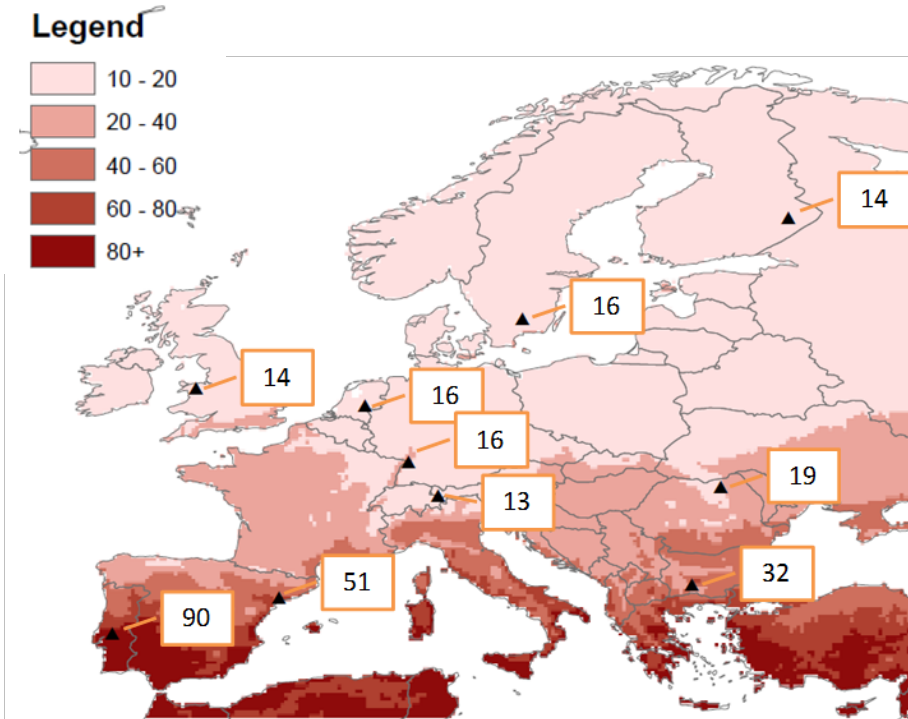


Absolute Change in Mean Annual Temperature in Degrees Celsius (av2070-99 - av1961-90)

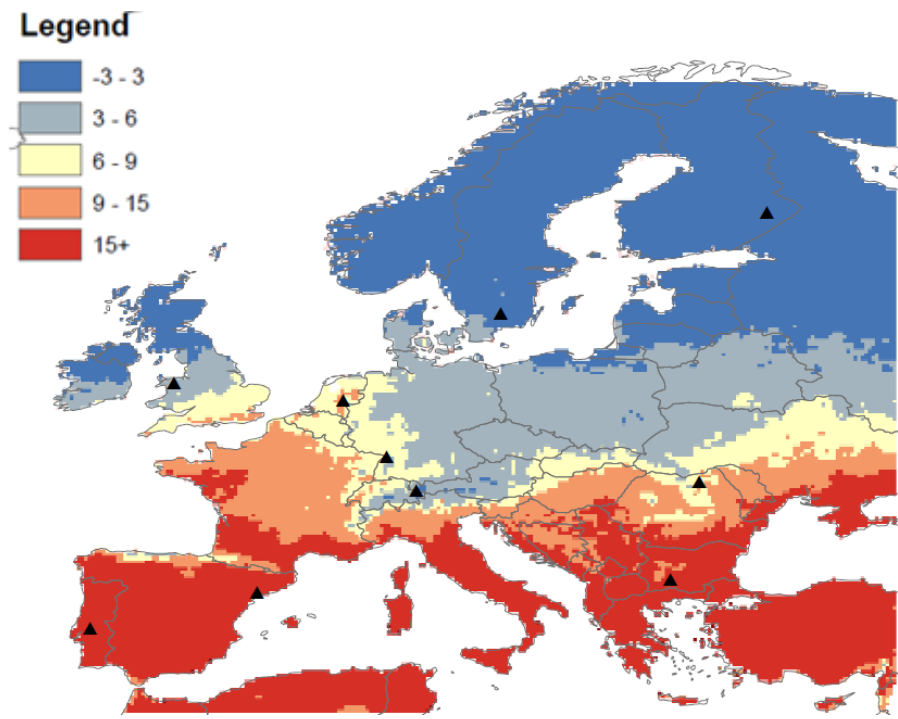


Change in Annual Maximum Number of Continuous Dry Days

Annual Maximum Number of Continuous Dry Days (Mean 1961-1990)

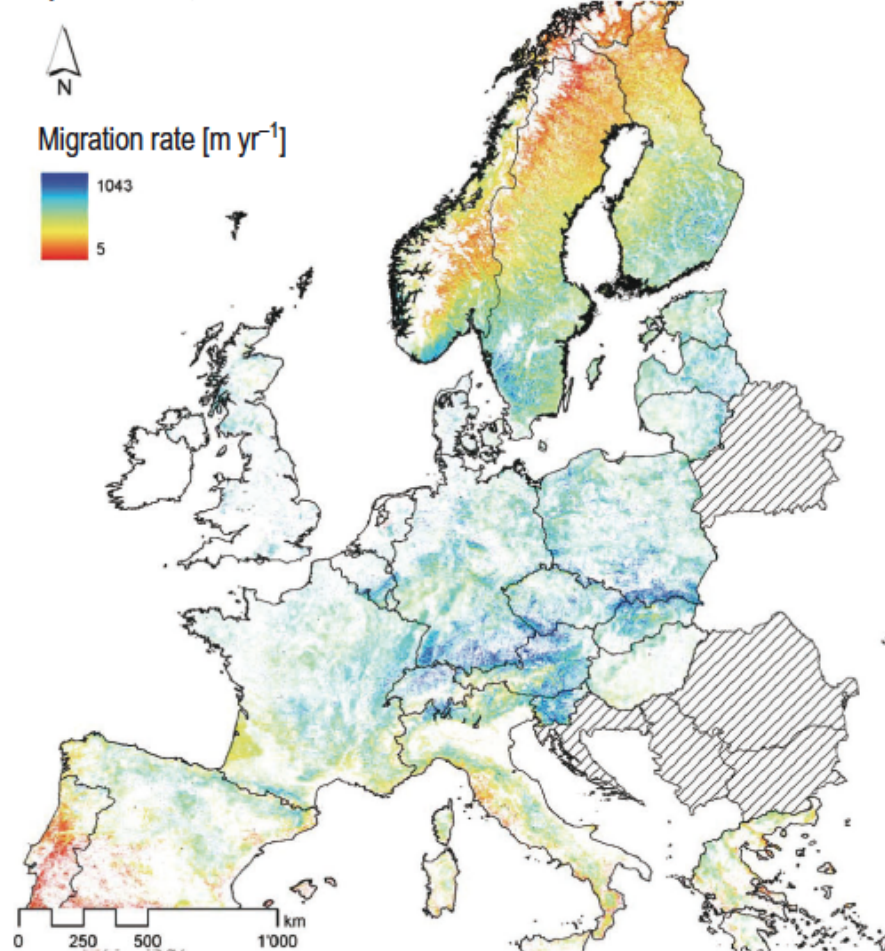


Change (2070-2099 vs. 1961-1990)

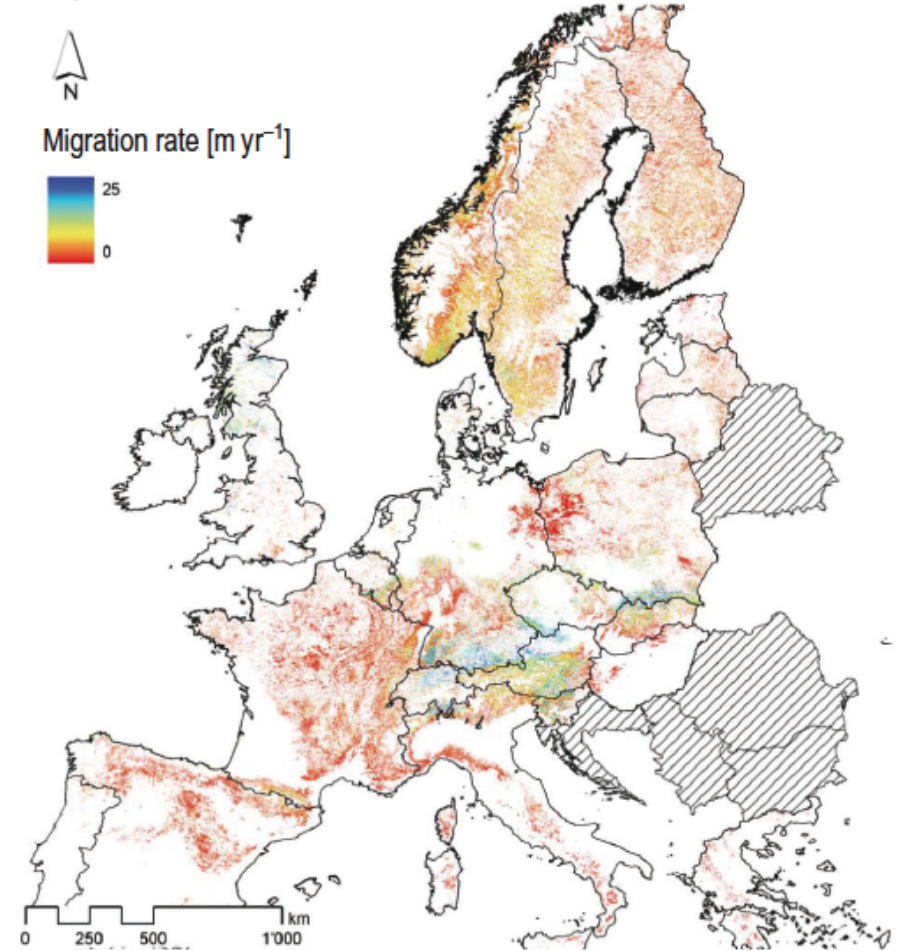


European level: annual migration rate: drastic changes

B.pendula, B1/SEDG 2000-2100



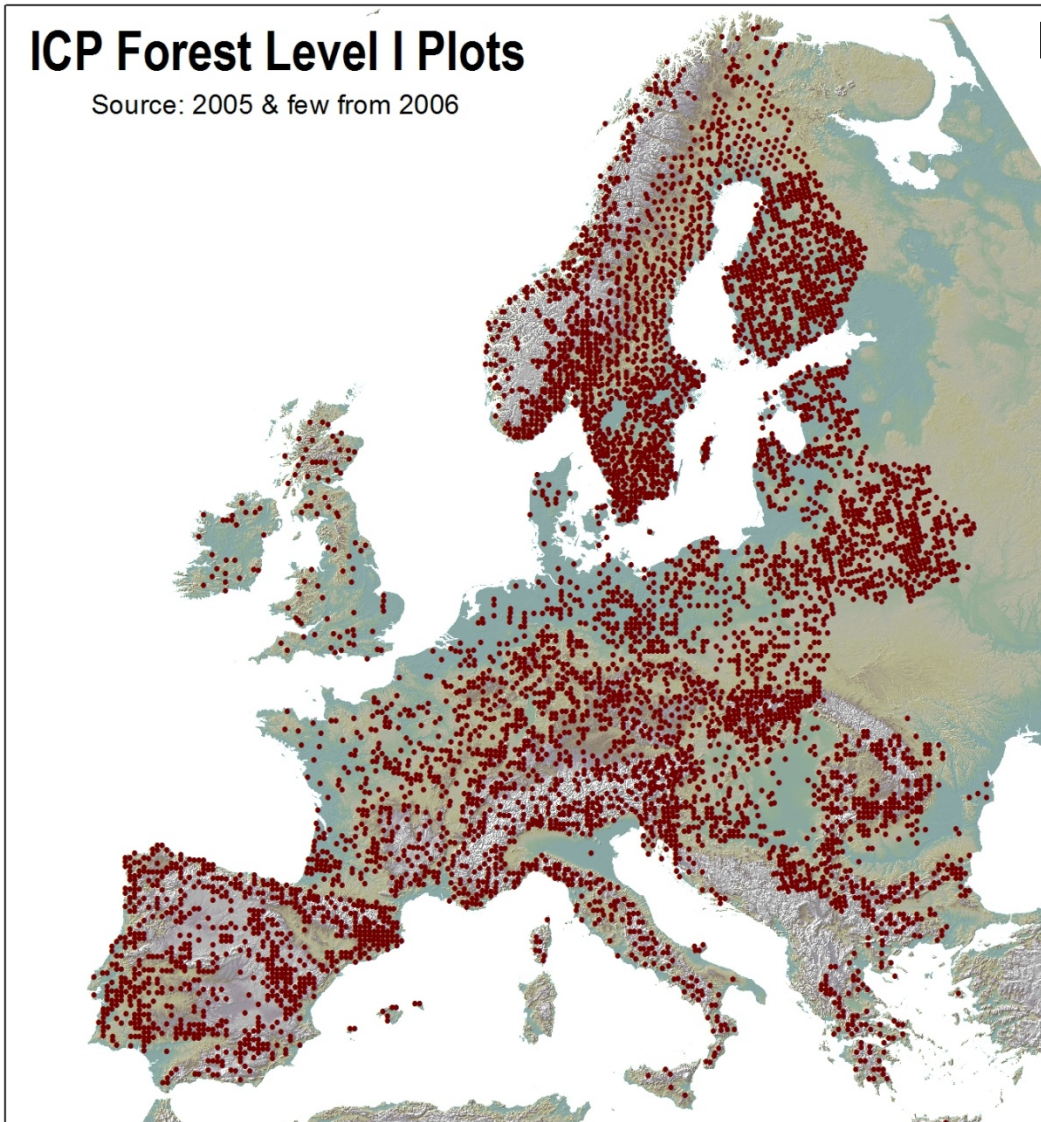
F.sylvatica, B1/SEDG 2000-2100



Economic impact of CC

ICP Forest Level I Plots

Source: 2005 & few from 2006

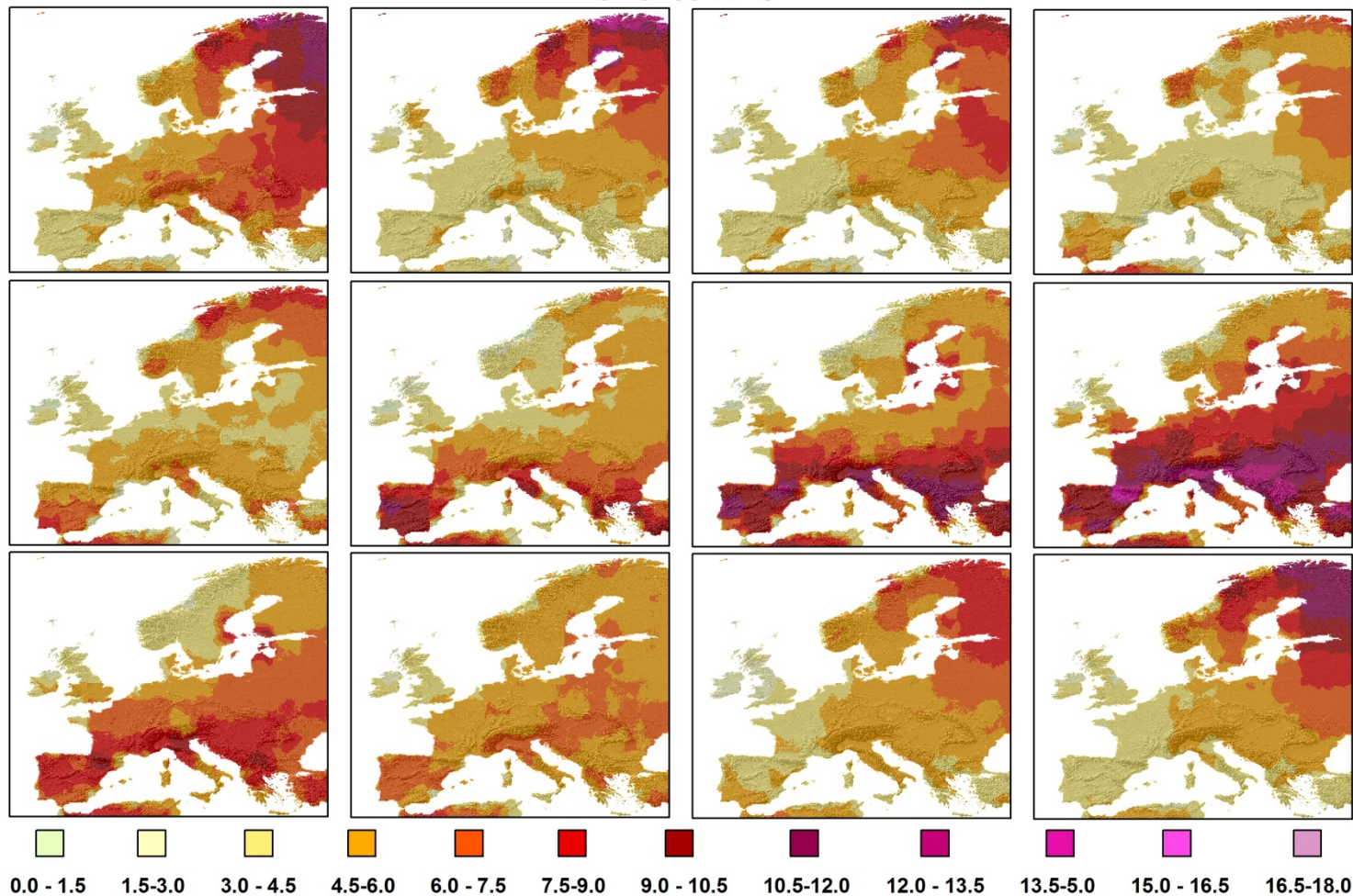


Nature of data

- 6129 plots
- ~16km grid
- 139 tree spp.

SRES A1F Anomalies for Tave - Avg. HadCM3 model output by 2071-2100

Anomalies in °C



Current: 1950-2000

Legend

-  Other spp.
-  Beech
-  Spruce
-  Oak 1
-  Pine 1
-  Birch
-  Oak 2
-  Pine 2



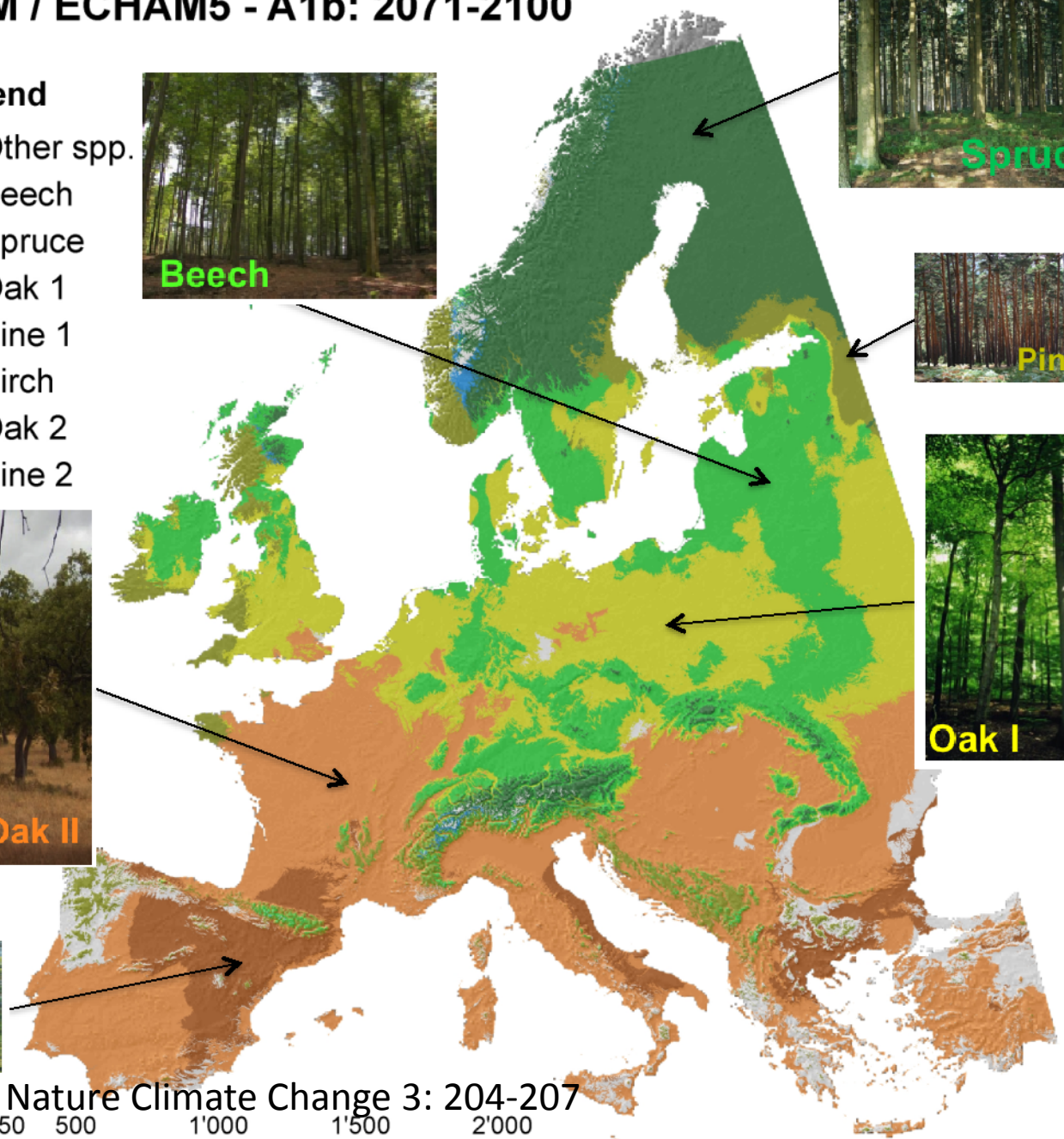
0 250 500 1'000 1'500 2'000 Kilometers

trends: biome shifts- mean

CLM / ECHAM5 - A1b: 2071-2100

Legend

- Other spp.
- Beech
- Spruce
- Oak 1
- Pine 1
- Birch
- Oak 2
- Pine 2



Hanewinkel et al. 2013. Nature Climate Change 3: 204-207



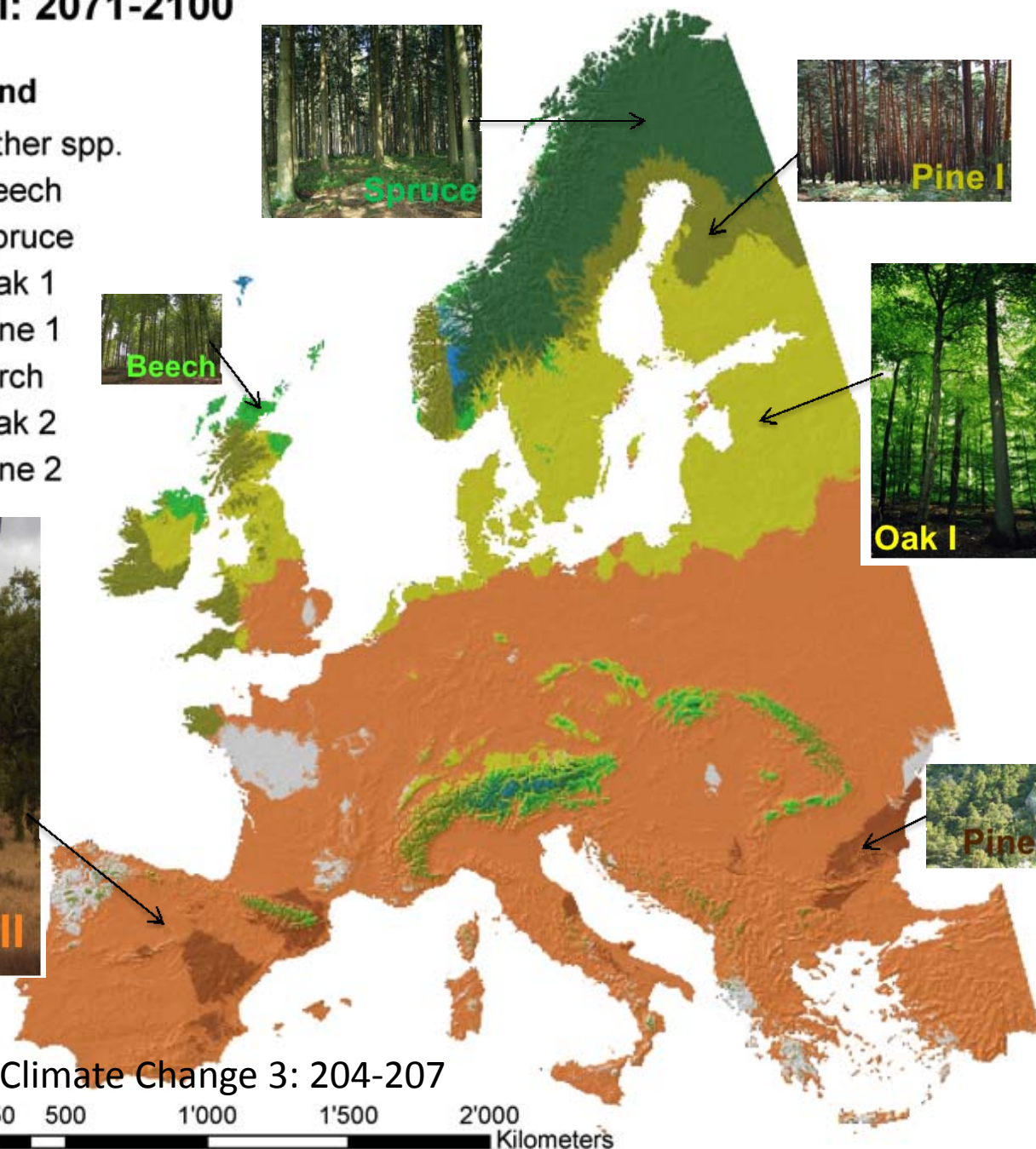


trends: biome shifts- „extremes“

A1FI: 2071-2100

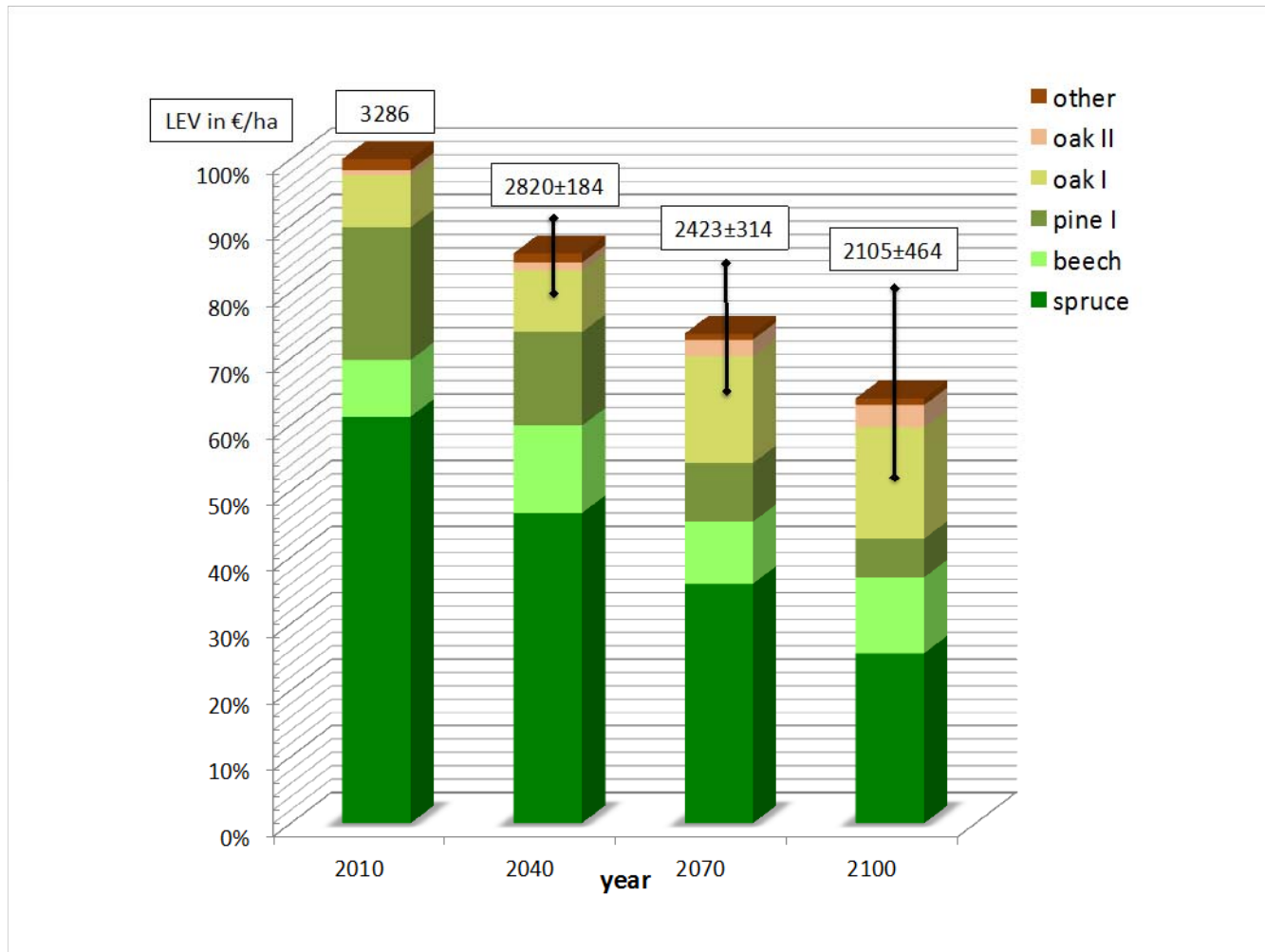
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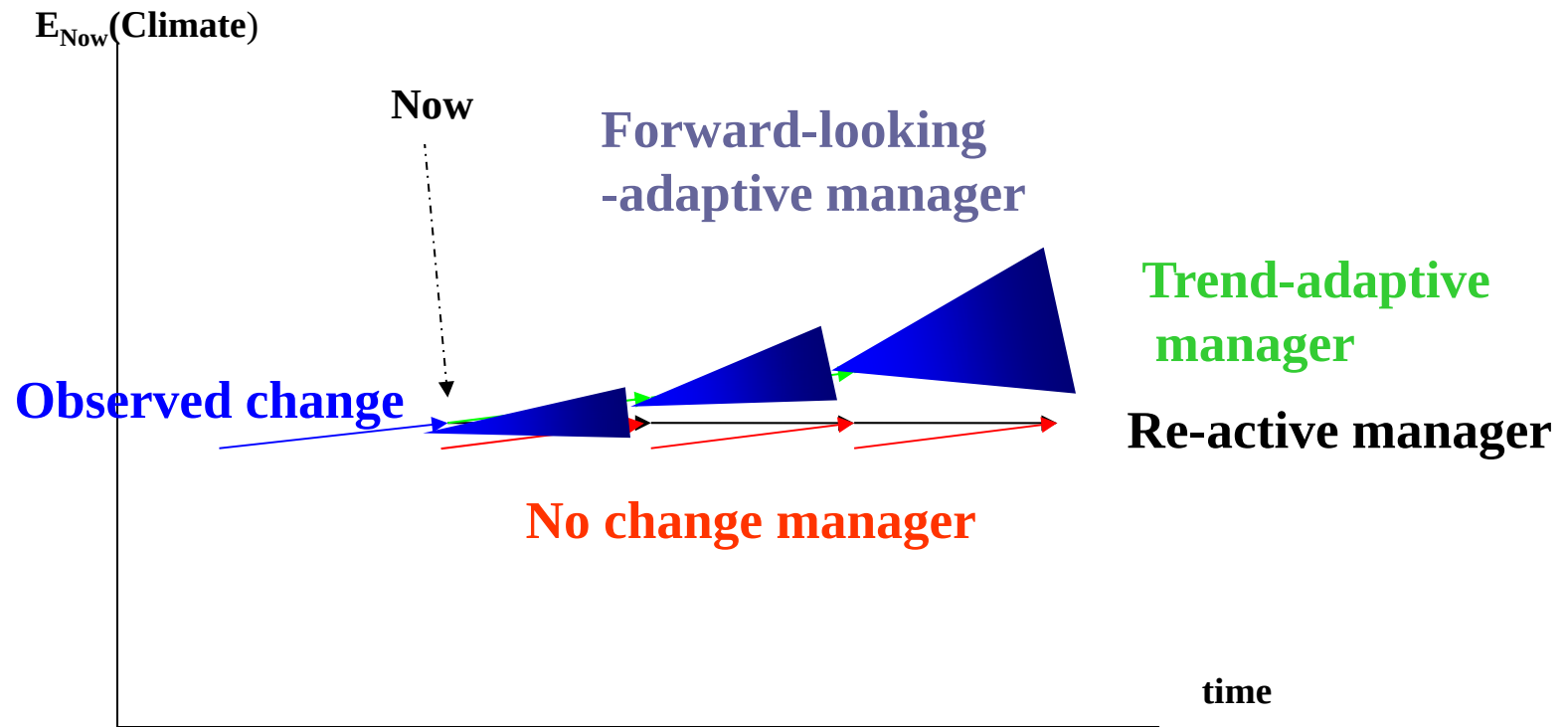
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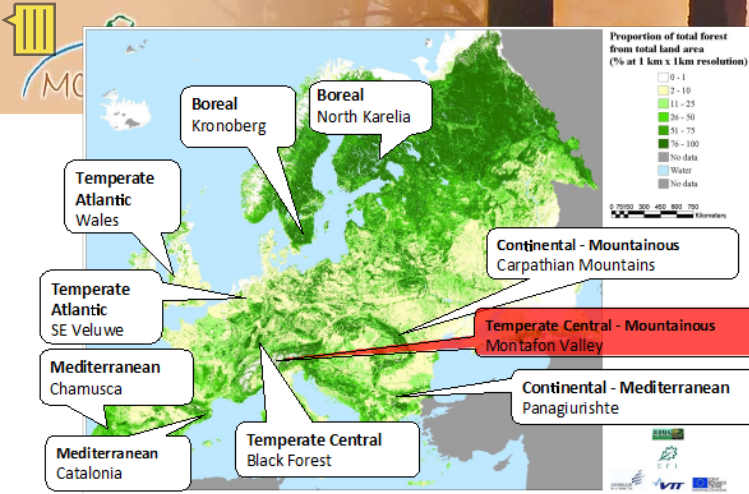
Land expectation values of European forestland in €/ha 2010 - 2100



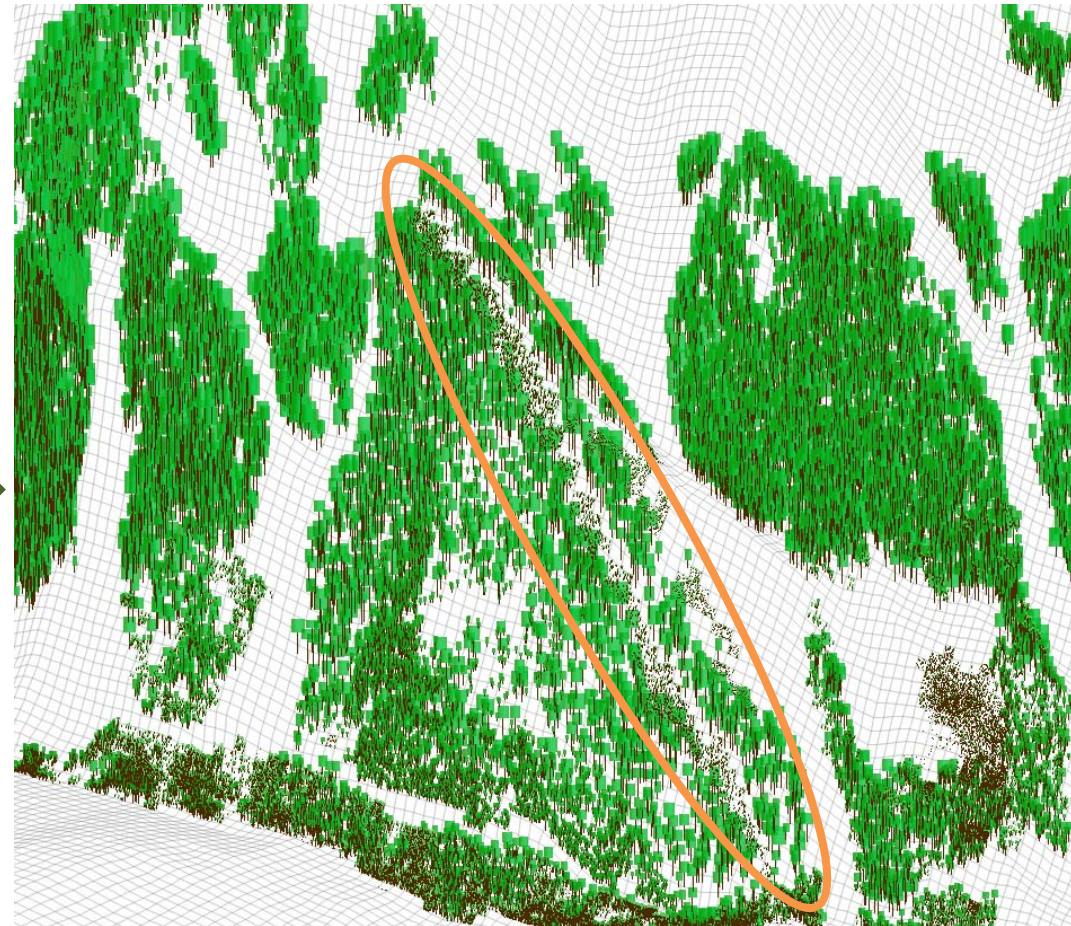
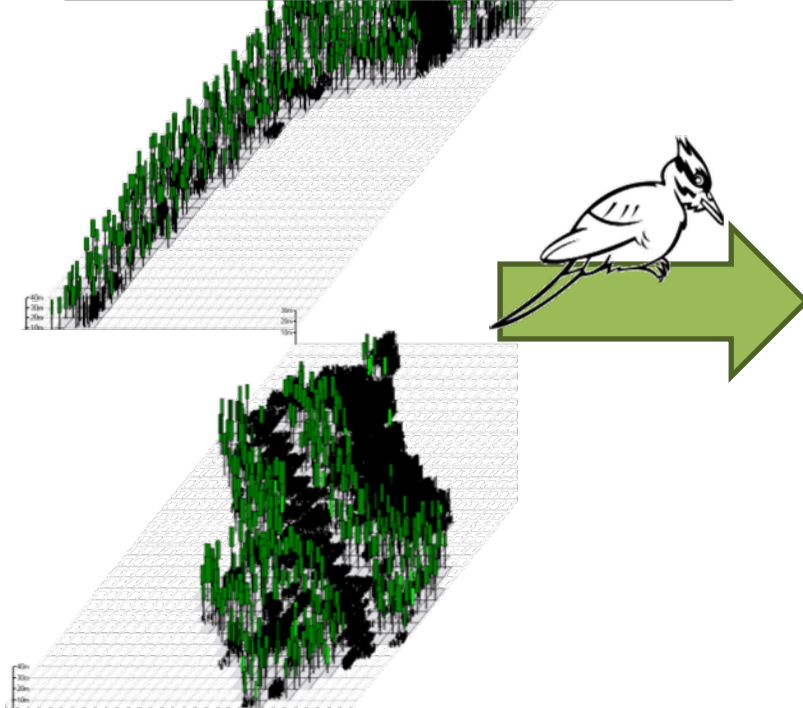
Scen. A1FI, 2010-2100 $i=0.02$, price/costs - 2005

Approach in adaptive management: Look ahead in uncertain and dynamic times



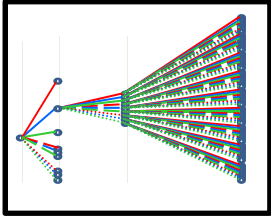


From stand to slope



from stand scale to slope scale for a spatially explicit assessment of ecosystem services

Exploring adaptive management (AM)



AM scenario:

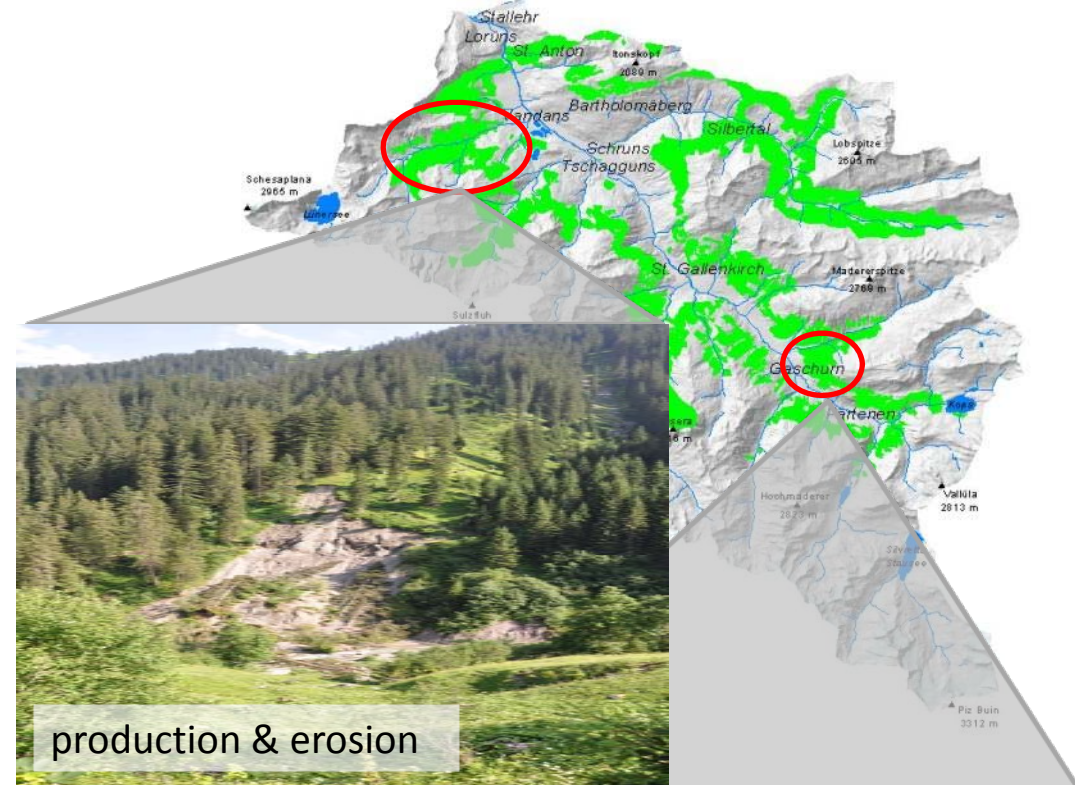
- modified skyline slits
- artificial regeneration of larch in wider parts of existing/ new slots
- artificial regeneration of maple at lower elevations

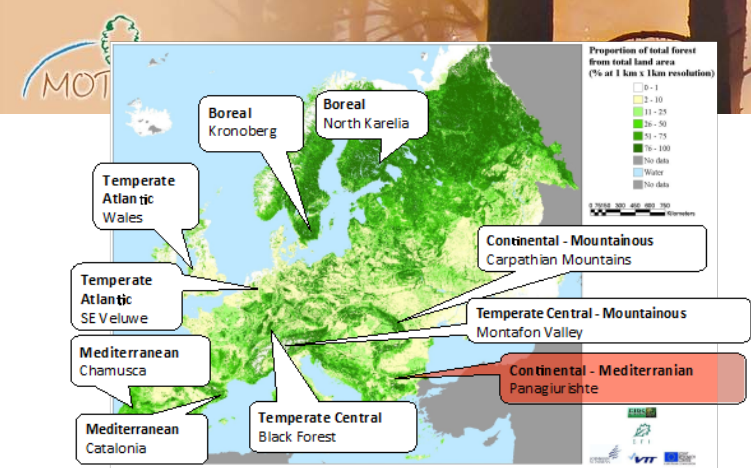




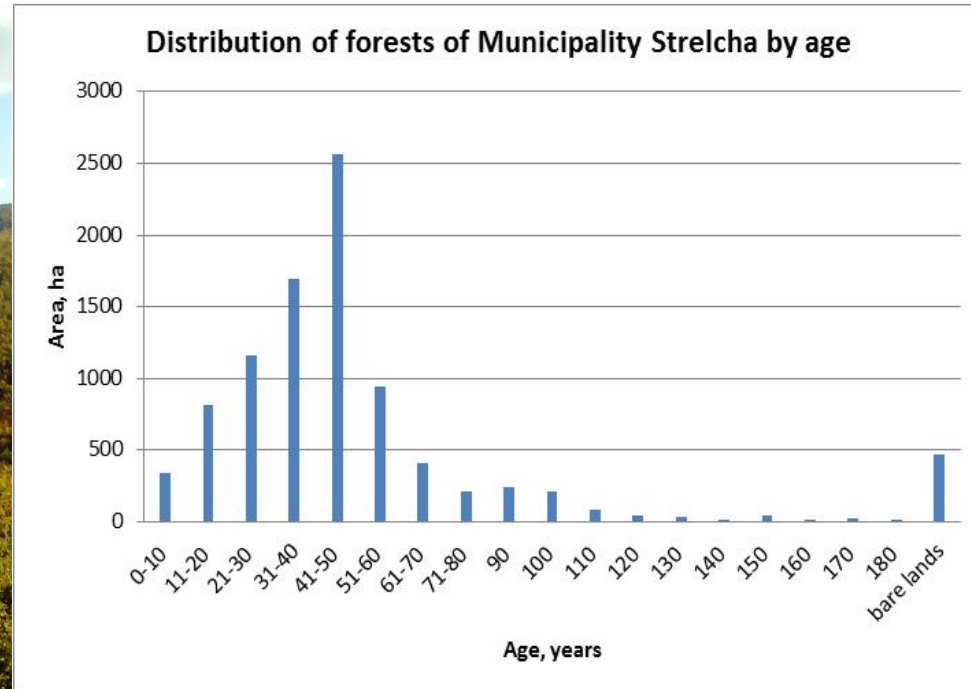
Issues addressed

- effect of climate change and disturbances on ecosystem services
- effect of adaptive management on ecosystem services
- trade-offs between ecosystem services



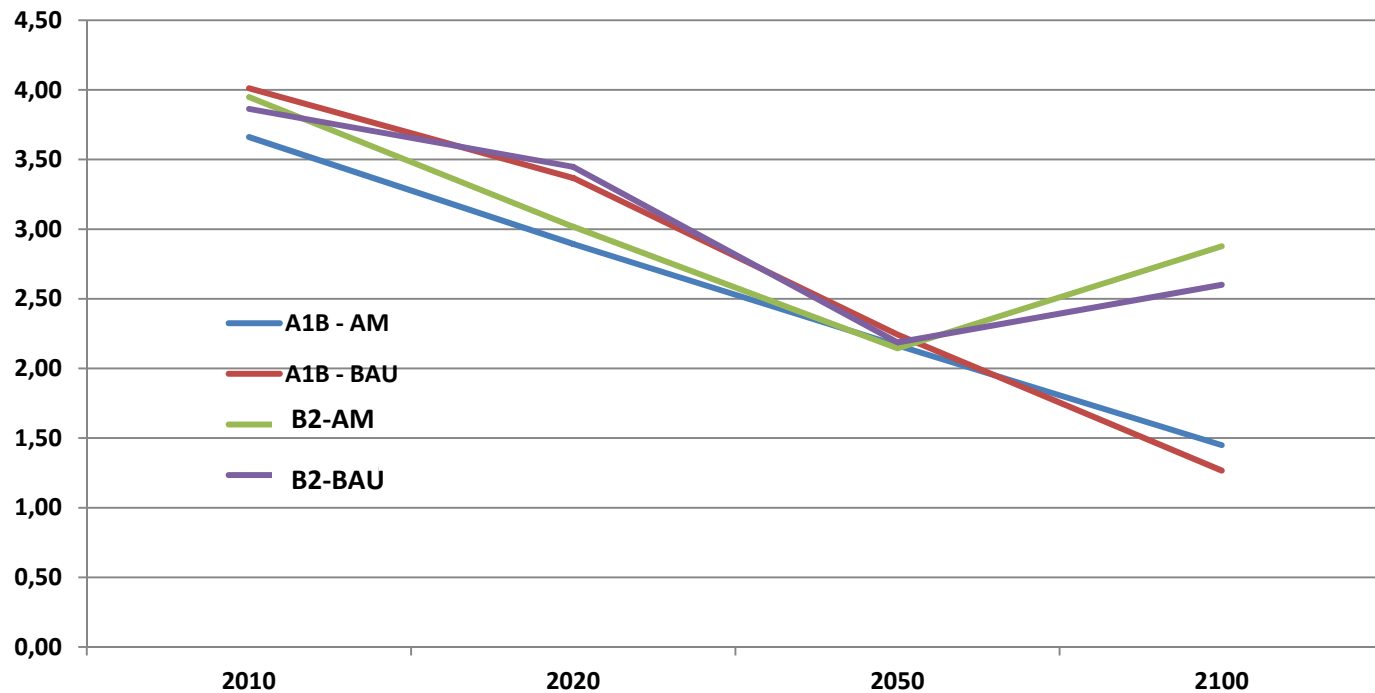


Case study Panagyuriste Bulgaria - Continental - Mediterranean



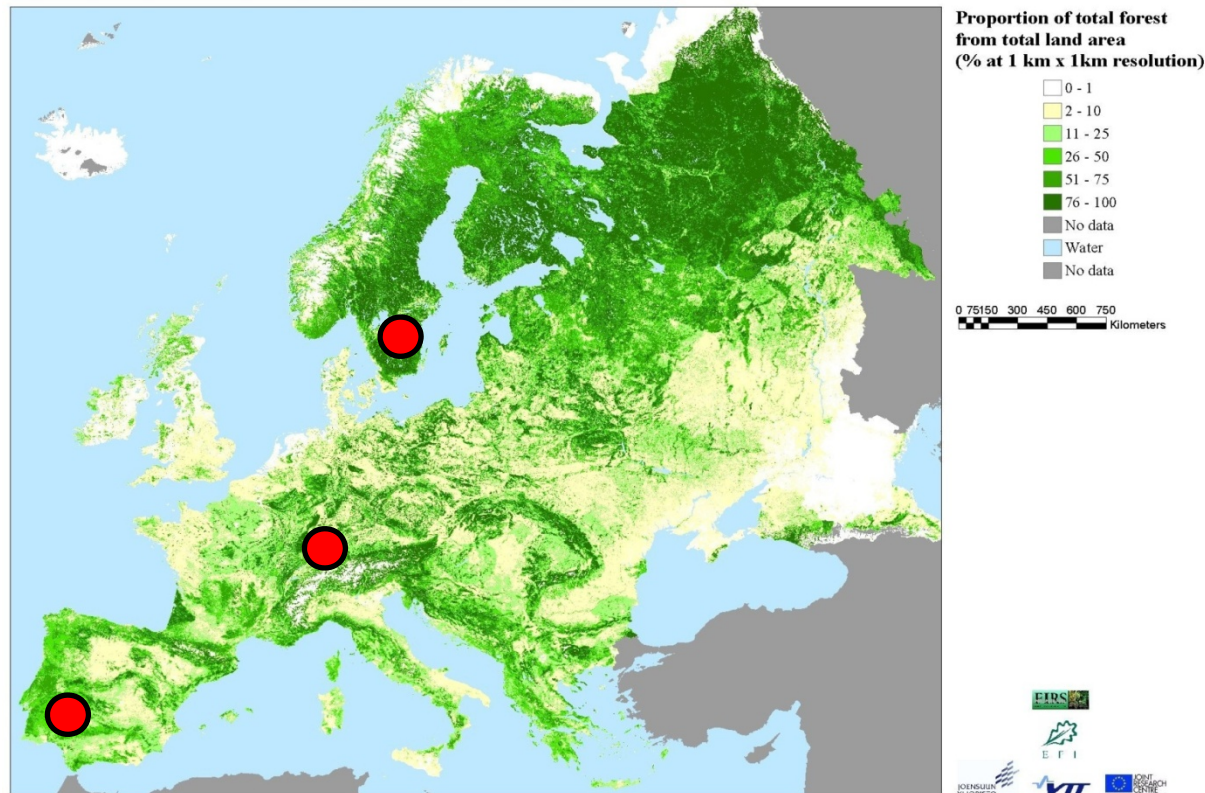
Are the tree species in the forest sensitive to climate change?

1. Growth



Average annual increment (m³/ha/year) simulation data for the forest case-study area Panagyuriste, for two climate scenarios (A1B & B2) and both BAU and AM scenarios

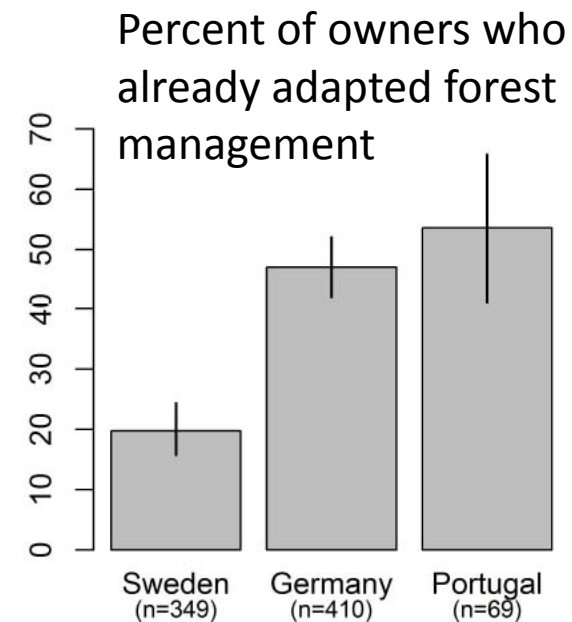
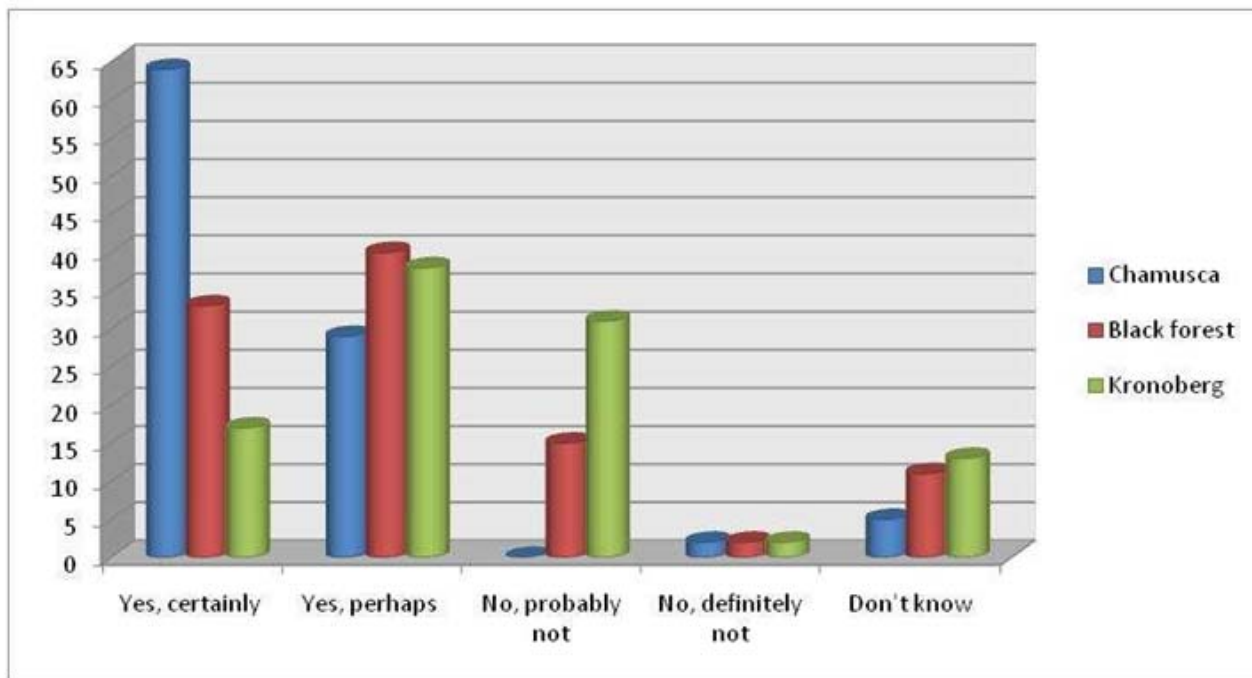
Data collection – mail surveys



Case study areas (March-April 2010)

- Sweden, Kronobergs län (3000 – 50% replies)
- Germany, Schwarzwald (650 – 65% replies)
- Portugal, Chamusca (<100 replies)

When forest owners believe in and see the effects of climate change, they are more likely to have taken adaptive measures



Conclusions

1. Severe but highly varying impacts of climate change on European forests are foreseen
2. In order for European forests to fulfill all their functions in the future, management has to be adapted
3. Major trends: increase of disturbances, biome shifts
4. Socio economic adaptive capacities vary in different regions
5. Adaptation strategies: regional/local approaches needed
6. Trade-offs and synergies between ecosystem goods and services
7. Adaptive measures depend on perceptions of stakeholders
8. Limited success of adaptation strategies under difficult growth conditions and strong scenarios



Thank you



Forstliche Versuchs-
und Forschungsanstalt
Baden-Württemberg



SKOV & LANDSKAB

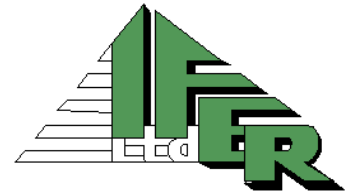
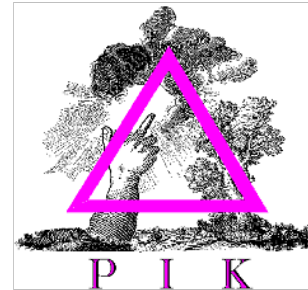


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