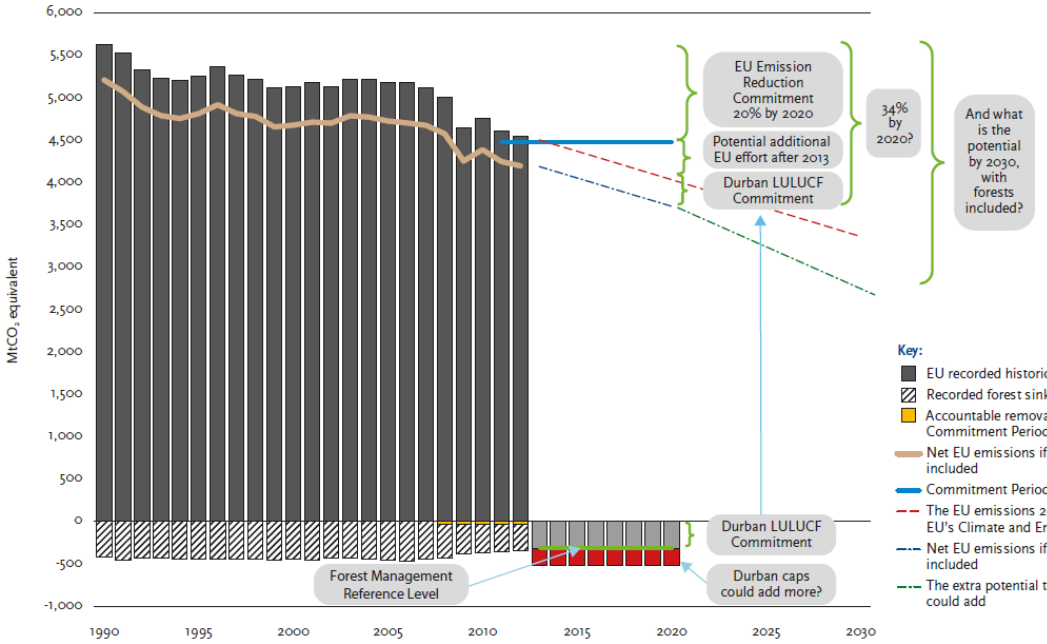

POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

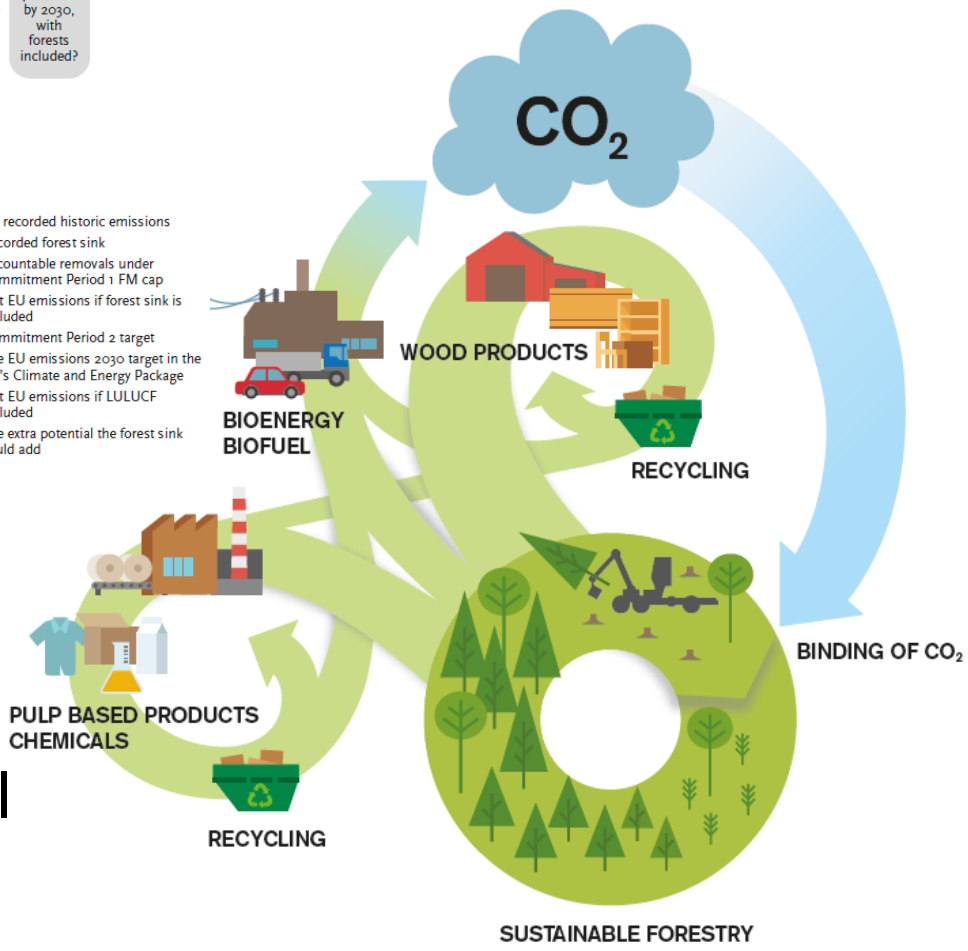
# FORest MAnagement Scenarios for Adaptation and Mitigation (FORMASAM)

C. Reyer & MJ Schelhaas, Wageningen, 12-11-2018

**EFI THEMES ADDRESSED: BIOECONOMY AND RESILIENCE**

# European forests and climate change mitigation




"The potential for EU forests to contribute to climate change mitigation and adaptation is currently not used in an optimal way…".

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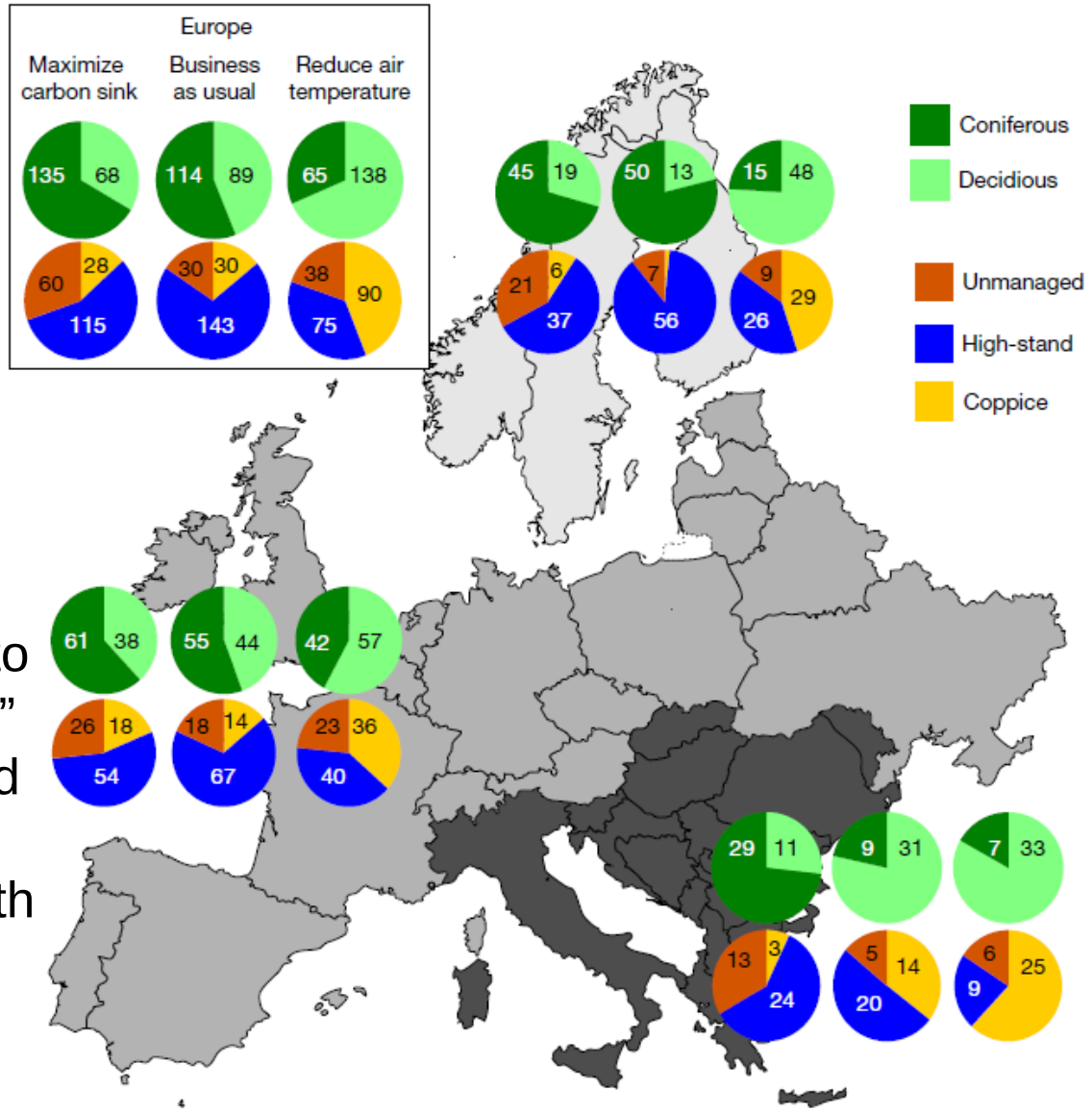
Nabuurs et al. 2015, Berndes et al. 2016

# Trade-offs are unavoidable?

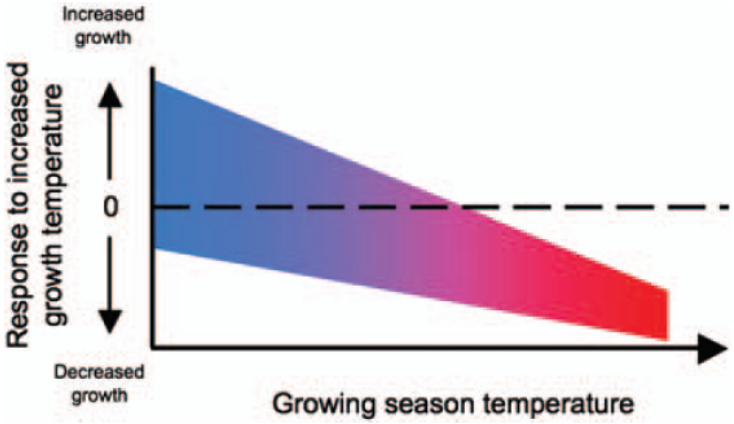



- "climate benefits from forest management are modest and local"
- "Europe should not rely on forest management to mitigate climate change"
- forests could be adapted (species composition, silvicultural systems) with neither positive nor negative climate effects

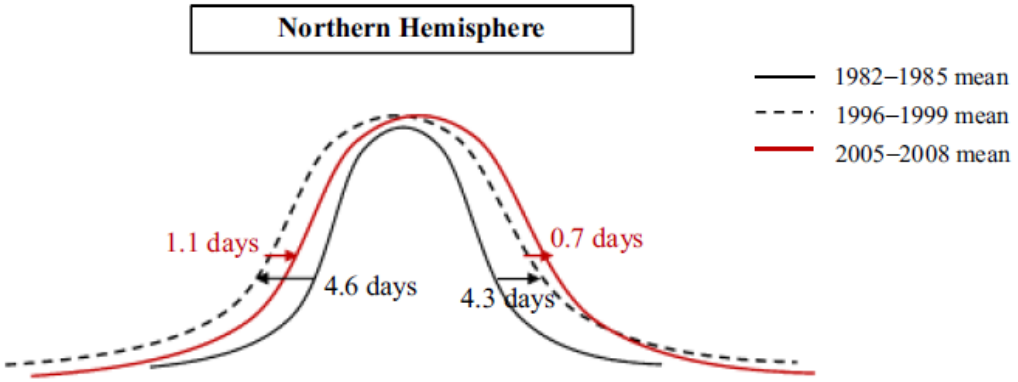
Luyssaert et al. 2018

# Adaptation to slow changes

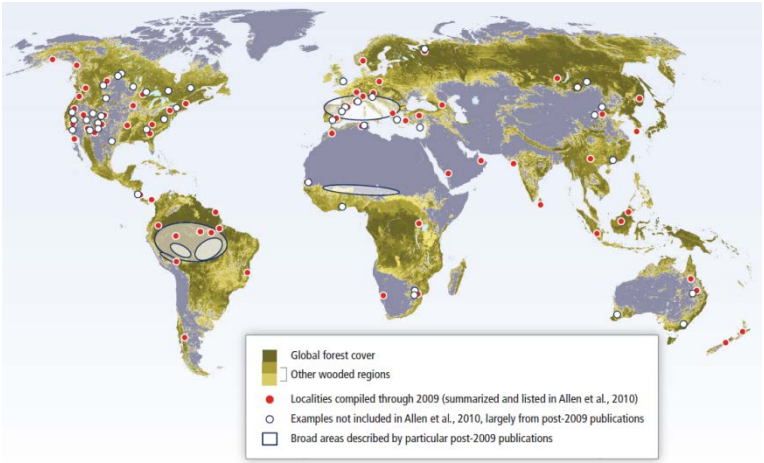
## Growing temperatures



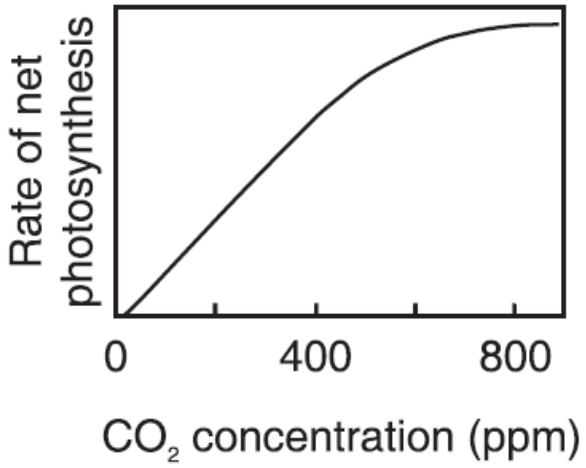

## Growing period




## Drought stress




## $CO_2$-Effects

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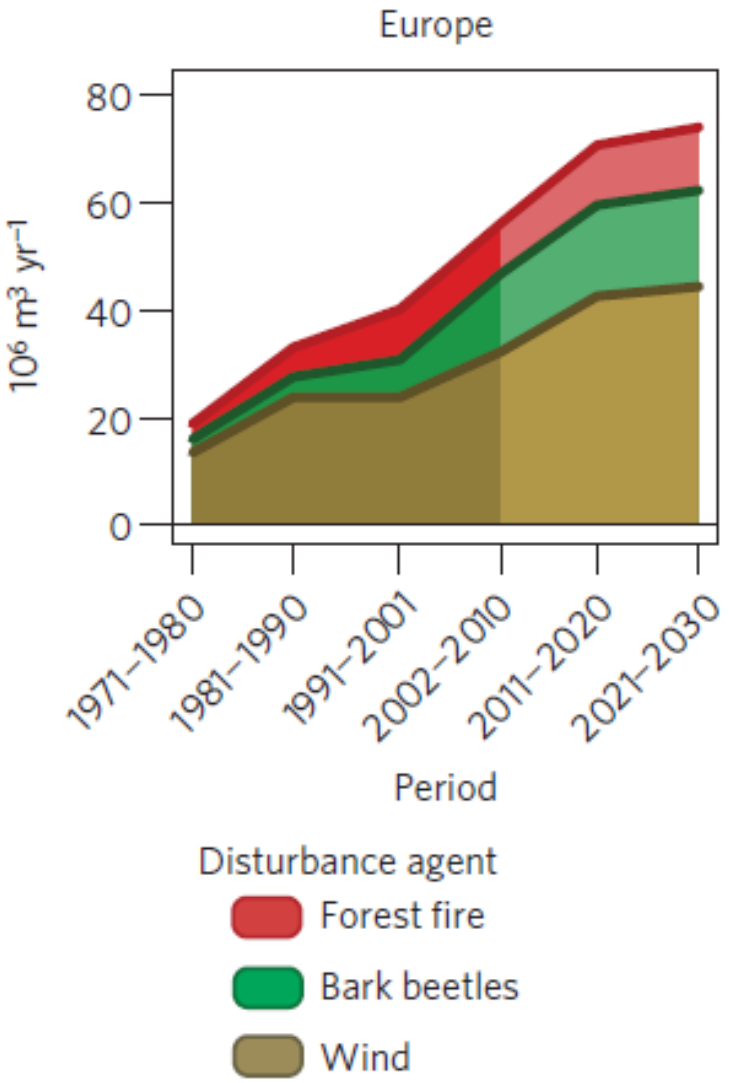
Körner 2006, Way & Oren 2010, Jeong et al. 2011, Settele et al. 2014

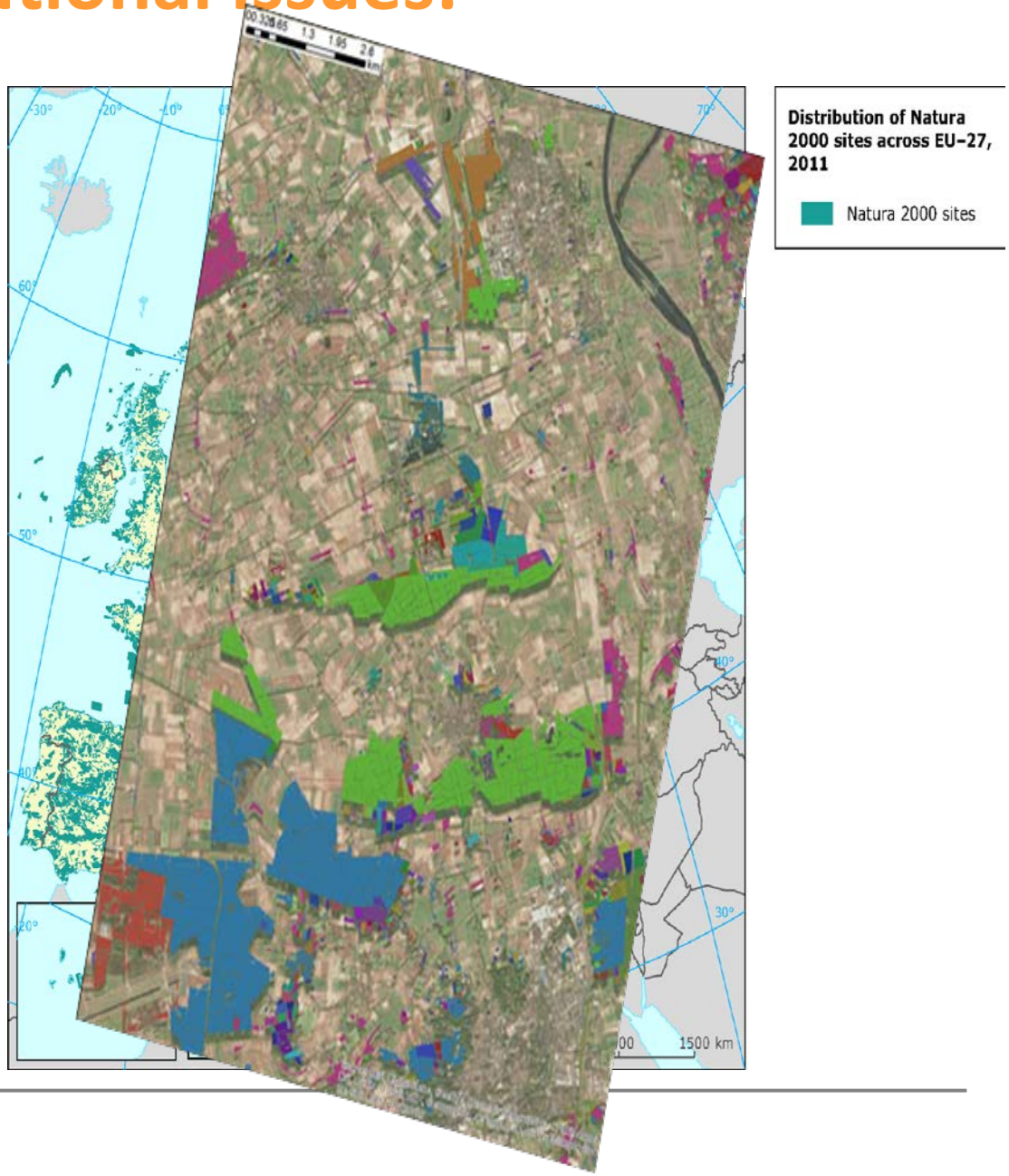
# Adaptation to fast changes




Seidl et al. 2014

# Additional issues:

- (strong) demands for nature conservation
- Conflicts between society/recreation and forest managers
- Increased demand expected for the bio-economy
- Fragmented ownership
- Many owners not dependent on forest for income

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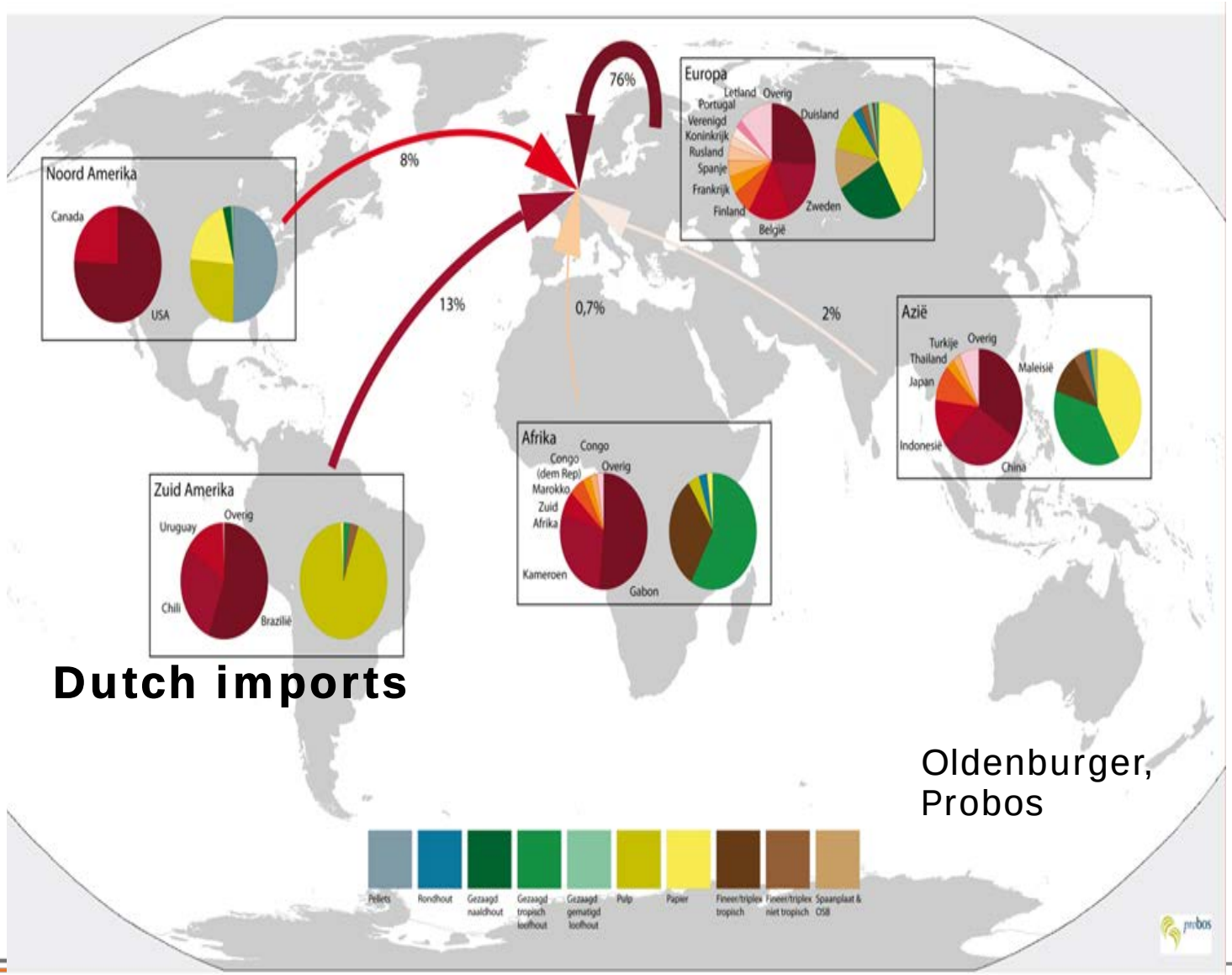
# Where will our wood come from; bio-economy will demand 250 - 500 million m3 extra.




**Dutch imports**

Oldenburger, Probos

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# Aim of FORMASAM

- to develop future forest management scenarios for adaptation and mitigation of climate change that
  - are consistent from stand ➔landscape ➔continental level,
  - allow to explore options for climate change mitigation and adaptation at the backdrop of a European bio-economy and changing climatic conditions.

# Key questions

- Which regions and forest types are suitable to focus on biomass production for bioenergy generation, on production of long-lived high-quality timber materials, on conserving carbon-rich forests or on other forest services and products?
- What are the trade-offs of these management strategies within the same climatic scenario and across different climate scenarios?
- Are there management strategies that particularly increase or decrease forest resilience and forest service and product provisioning at the stand, landscape and continental scale?

# FORMASAM Structure

**TG1: Future Forest Management Scenarios**
*(Lead MJ Schelhaas)*

**UNECE, ToS**

**Infrastructure**

ISIMIP
Inter-Sectoral Impact Model Intercomparison Project

Forest management models at:

**TG2: stand scale**
*(Lead A Mäkelä)*

**TG4: European scale**
*(Lead A Rammig)*

**TG3: landscape scale**
*(Lead R Seidl)*

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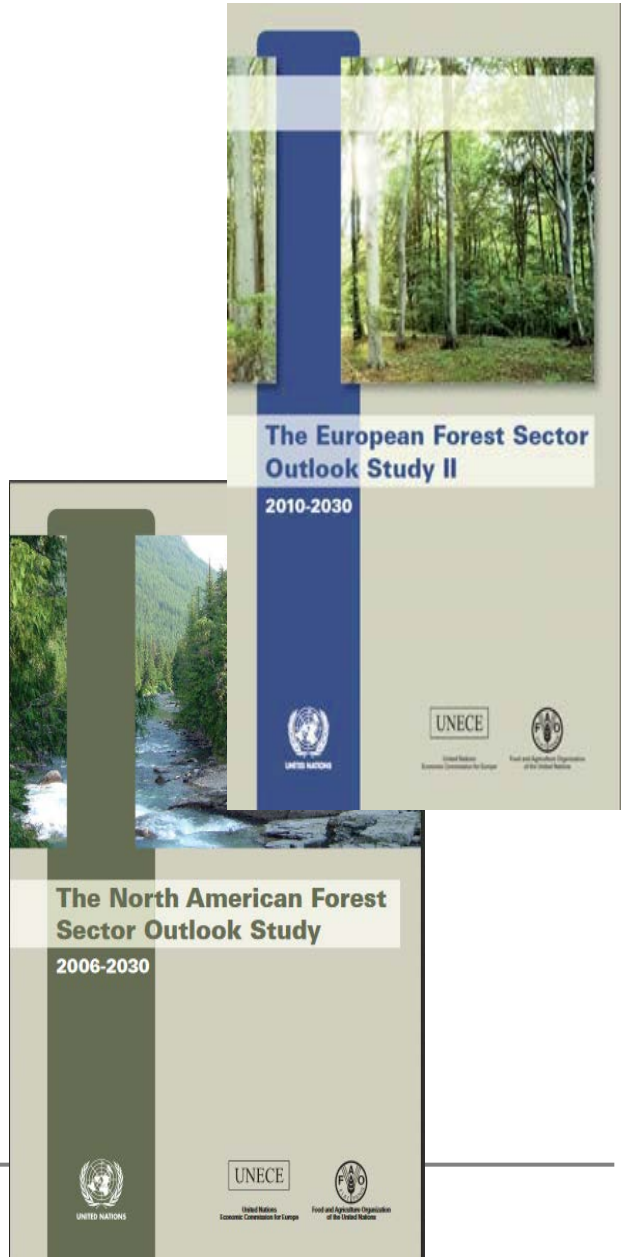
# Team of Specialists on Forest Sector Outlook Studies at the UNECE

- Every country can nominate a member
- Secretariat by UNECE
- Aim to support/guide the development of Forest Sector Outlook Studies (feedback on policy questions, scenarios, model outputs)
- In the process of developing a new Forest Sector Outlook Study
- Policy questions identified and derivation of scenarios, implementing them

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# Steering Group

MJ. Schelhaas

A. Mäkelä

R. Seidl

A. Rammig

C. Reyer

H. Verkerk

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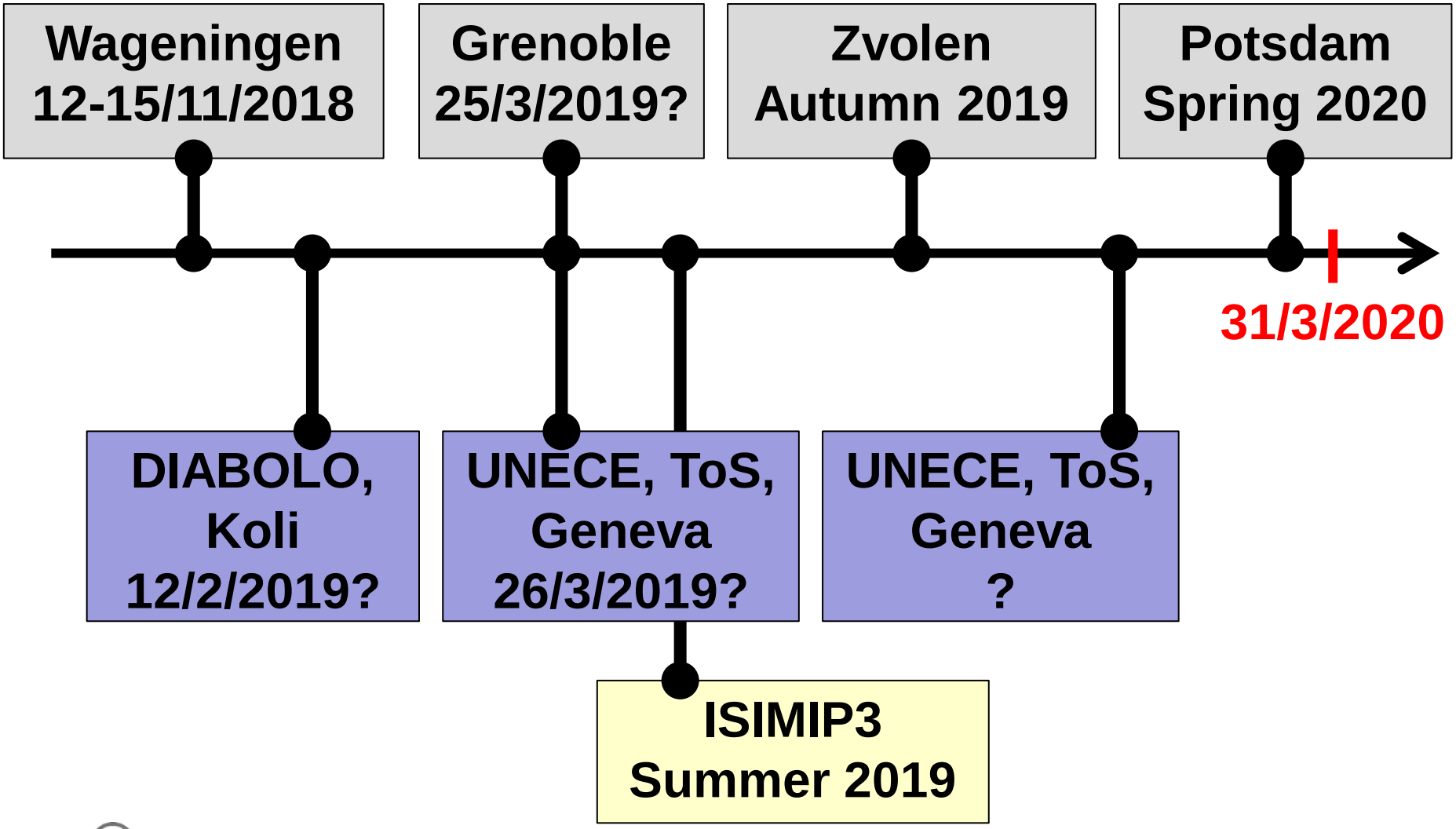
# Deliverables

- **Deliverable (D1):** Discussion notes
- **Deliverable (D2, D3):** management scenarios
- **Deliverable (D4, D6, D8):** An analysis of strengths and weaknesses of current forest stand, landscape and EU models for simulating management in Europe's forests
- **Deliverable (D5, D7, D9):** Model protocol including future forest management scenarios

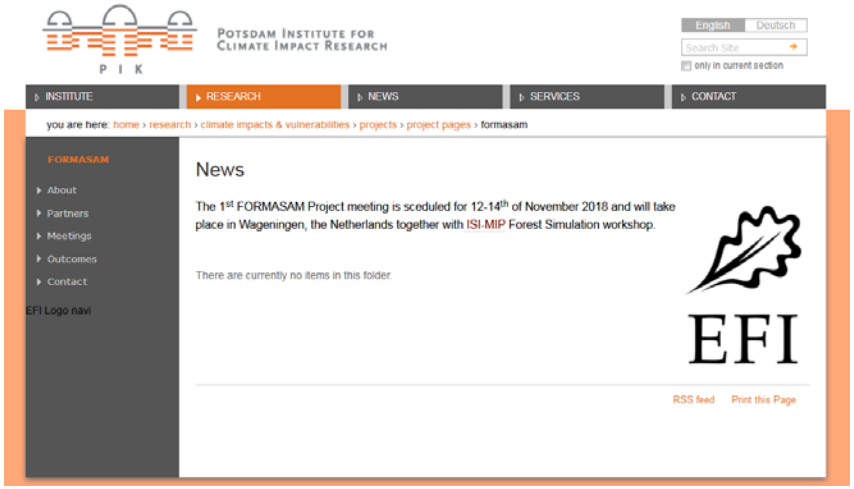
➔ First report due on 30th of April 2019

# Timeline FORMASAM and related activities



# Networking

- meetings
- short scientific exchanges
- homepage
- extended formasam mailing list



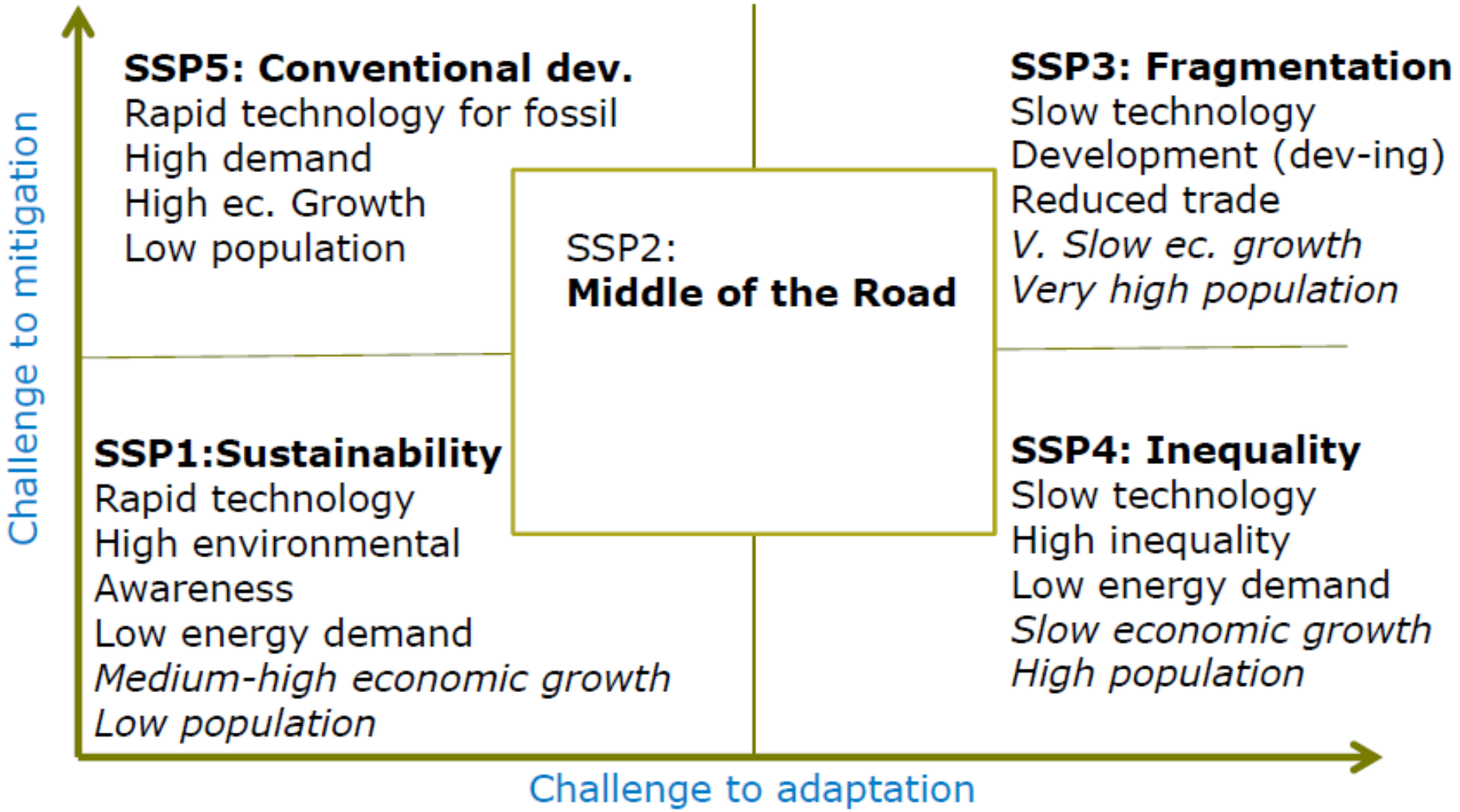

➔introduce yourself during the break-out groups

# Goal of workshop

- **Develop and agree on management scenarios / modelling protocol to simulate future forest development**
  - existing management scenarios?
  - which dimensions of management to represent?
    - Silvicultural regime (thinnings, rotation length, final cut)
    - Species choice
    - Regeneration method?
  - data and infrastructure ➔e.g. ISIMIP/PROFOUND data and protocol

# A first input

# Shared Socioeconomic Pathways (SSPs)

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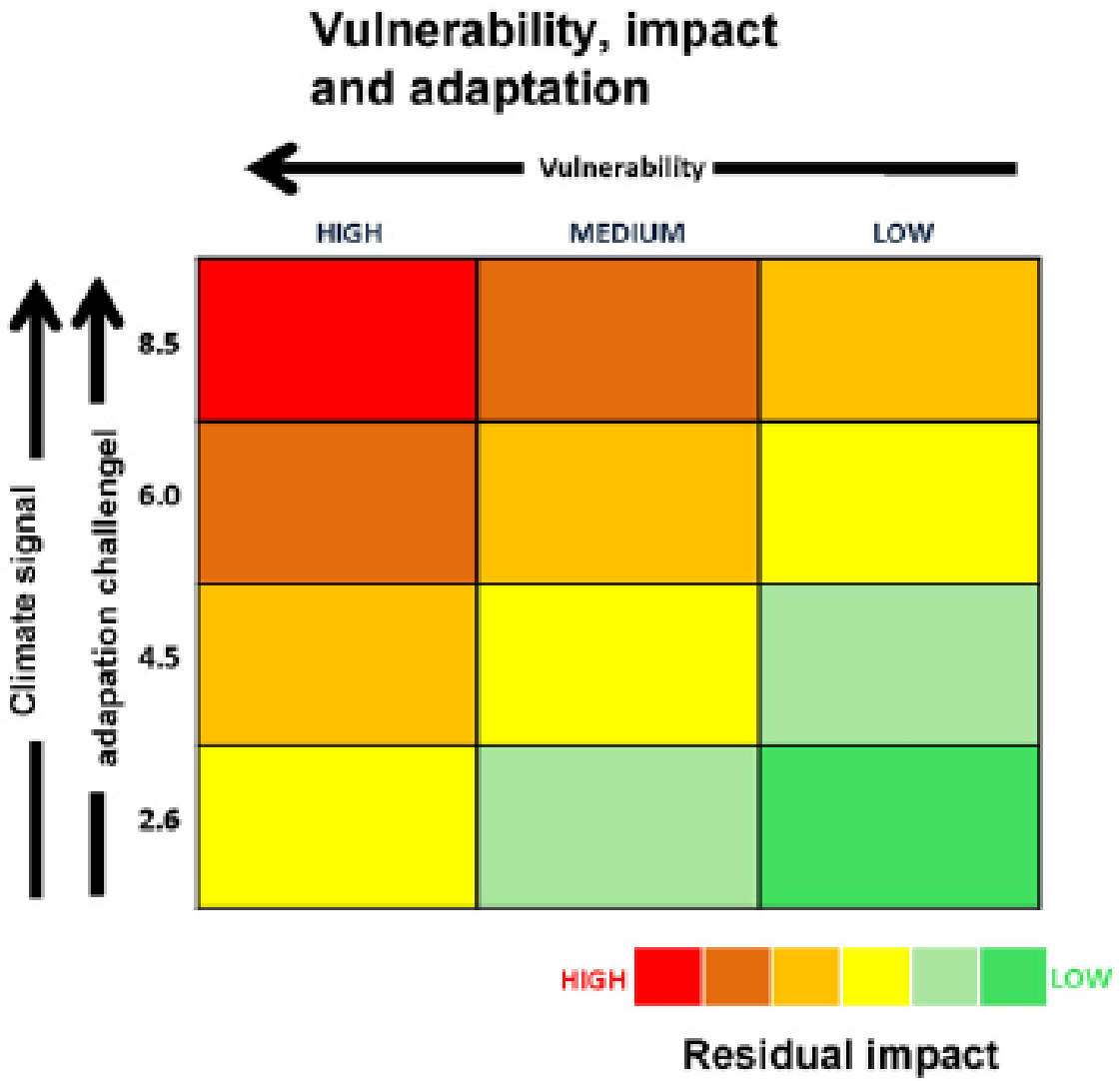
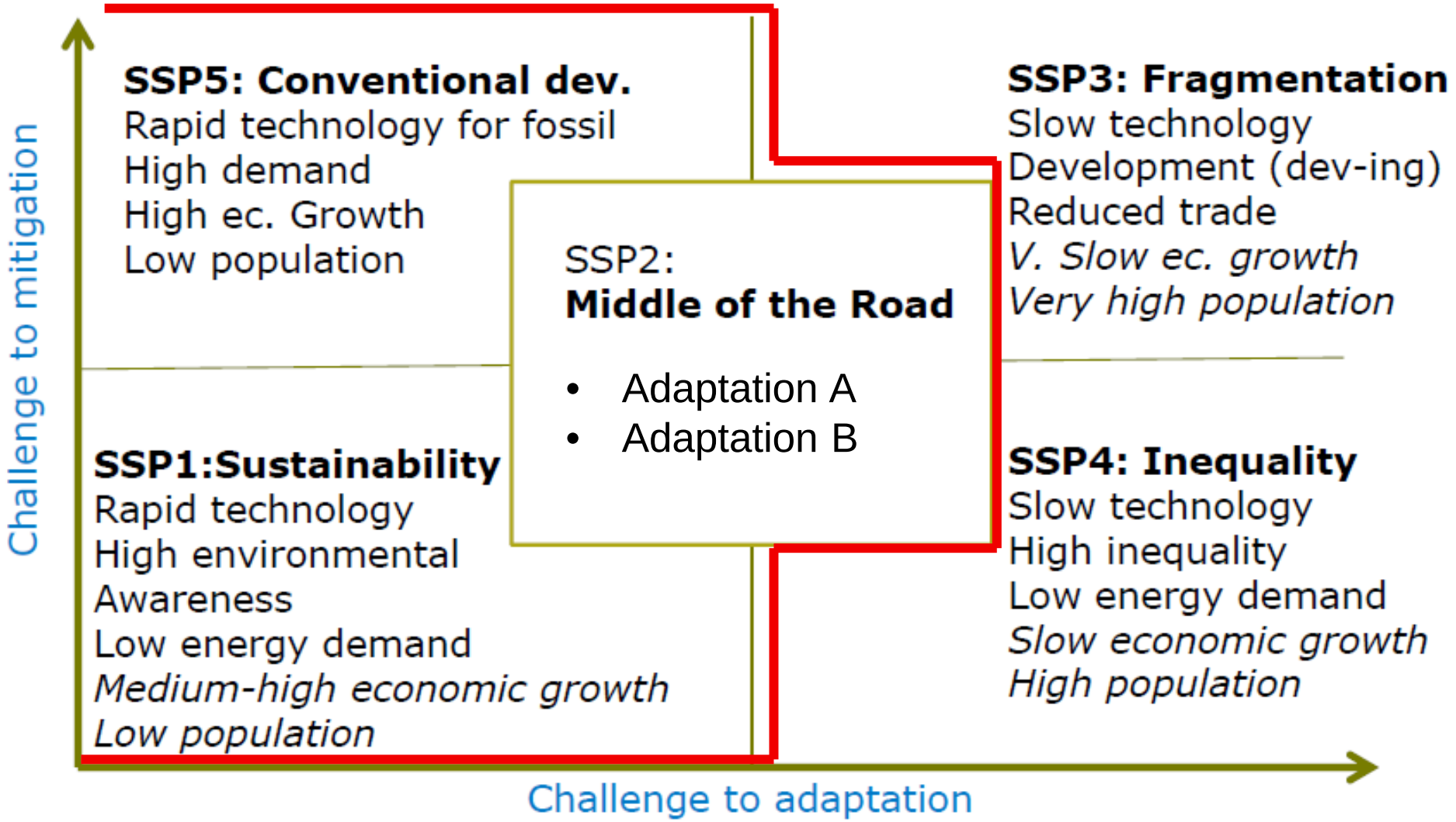
# RCP-SSP Matrix




Riahi et al. 2017

# Shared Socioeconomic Pathways (SSPs)

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# The next days

| When | What | Who |
|---|---|---|
| | **Monday 12-11-2018** | |
| 12:00 | Light Lunch (provided) | |
| 13:00 | Welcome, Introduction to FORMASAM and overview of forest management challenges in the 21st century | MJ. Schelhaas, C. Reyer |
| 13:30 | Climate Impact Analysis for Europe (how to adapt?, to what?, what are challenges for specific regions?) | M. Lindner |
| 13:50 | Perspective of Dutch State Forest Service | S. Wijdeven |
| 14:10 | UPM-Kymmene Perspective | T. Niemi |
| 14:30 | Coffee Break | |
| 15:00 | Climate Smart Forestry | H. Verkerk |
| 15:20 | FORMIT management scenarios (content and development process) and EU management types | A. Mäkelä |
| 15:50 | General discussion what is feasible in FORMASAM and in the next two days? Organization of break-out groups | All |
| 16:30 | Coffee Break | |
| 17:00 | **Break-out Group Session 1:**<br>Task Group 1: Scenario development (MJ Schelhaas)<br>Task Group 2: Stand-scale models (A Mäkelä, C. Reyer)<br>Task Group 3: Landscape models (R. Seidl)<br>Task Group 4: EU-scale models (A. Rammig) | All but in four TGs (scenarios, stand, landscape, EU) |
| 19:00 | Dinner downtown or at WICC (at own expenses) | |

| When | What | Who |
|---|---|---|
| | **Tuesday 13-11-2018** | |
| 9:00 | Overview stand-scale models and existing efforts (PROFOUND/ISIMIP) including Report from Break-out group 2 | A Mäkelä, C. Reyer |
| 9:30 | Overview landscape-scale models and existing efforts (PROFOUND/COFOLAMO) Report from Break-out group 3 | R. Seidl |
| 10:00 | Overview EU-scale models and existing efforts Report from Break-out group 4 | A. Rammig |
| 10:30 | Coffee Break | |
| 11:00 | Report from Break-out group 1 and overall scenario discussion | MJ Schelhaas |
| 12:00 | Lunch (provided) | |
| 13:00 | Excursion to marteloscope (finish at 18:00) | All |
| 19:00 | Social dinner offered by organiser | |

| Wednesday 14-11-2018 | | |
|---|---|---|
| 9:00 | Introduction to break-out groups and day 3 | All |
| 9:10 | **Break-out Group Session 2** on different regions and scales<br>Group 1, Group 2, Group 3, Group 4<br>• What are (local, regional, continental) management challenges that need to be part of scenarios?<br>• What to adapt to? How to mitigate? What are the main problems in different EU-regions? Common and differentiated problems etc.<br>• What are possible storylines for scenarios?<br>  ○ Full swing adaptation?<br>  ○ Full swing mitigation (via bioenergy, via HWP?)<br>  ○ How models can be applied at every scale but under same scenario umbrella?<br>  ○ What are wishes from stakeholders? What scenarios would they like to see?<br>• How to cope with different adaptation levels at different spatial scales? E.g.<br>  ○ Adaptation through species change requires plant new species after final cut at stand level but looking at dispersal etc. at landscape level.<br>  ○ Adaptation through species mixing requires single-tree/group mixing at stand level while at landscape level mixtures of larger, single-species stands lead to mixtures at landscape-scale<br>• Looking for complementarities across scales (spatial scale, autonomous adaptation vs. planned) | All, but in 4 groups mixing modellers across scales and from different regions (see in which group you are?) |
| 10:30 | Coffee Break | |
| 11:00 | Reports from Break-out groups | All |

| | | |
|---|---|---|
| 11:45 | **Break-out Group Session 3**<br>For TG2-4: Which of the things discussed in Break-out group session 2<br>• are particularly relevant at the respective scale of the stand (Task Group 2), landscape (Task Group 3), EU (Task Group 4)?<br>• can be implemented in the models?<br>  ○ Take models as they are now, implement some species diversification as "scenarios"?<br>  ○ Implement new processes to represent general adaptation mechanisms?<br>Task Group 1: Continue to work on scenario storylines (break-out session 1) | All but in four TGs (scenarios, stand, landscape, EU), moderation and reporting organised by TG leaders |
| 12:30 | Lunch (provided) | |
| 13:30 | **Break-out Group Session 4**<br>• Develop a clear idea of what simulation exercises we want to do at stand (Task Group 2), landscape (Task Group 3) and EU (Task Group 4) scale!<br>• Protocol/simulation set-up, data and next steps | 3 TGs (stand, landscape, EU), TG1 members are spread over TG2-4 |
| 14:30 | Summary from break-out groups and how the simulation plans (TG2-4) align with scenarios (TG1), next steps (next meeting etc.), Wrap-up | All |
| 15:30 | Official end of FORMASAM meeting | |
| 16:30 | Start of ISIMIP meeting (please come the Dorskampzaal at WICC), preparation of the next day | ISIMIP participants |
| 19:00 | Joint Dinner (own expenses) | |

| | SSP1 | | SSP2 | | SSP3 | | SSP4 | | SSP5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP2.6 | BAU | | BAU | | BAU | | BAU | | BAU | |
| | Intense | Extensive | Intense | Extensive | Intense | Extensive | Intense | Extensive | Intense | Extensive |
| RCP4.5 | BAU | | BAU | | BAU | | BAU | | BAU | |
| | Intense | Extensive | Intense | Extensive | Intense | Extensive | Intense | Extensive | Intense | Extensive |
| RCP6 | BAU | | BAU | | BAU | | BAU | | BAU | |
| | Intense | Extensive | Intense | Extensive | Intense | Extensive | Intense | Extensive | Intense | Extensive |
| RCP8.5 | | | | | | | | | BAU | |
| | | | | | | | | | Intense | Extensive |

- **Intense?: mitigation focusses on ex-situ carbon sequestration, adaptation to maintain resource flows to support this**
- **Extensive?: mitigation focusses on in-situ carbon sequestration, adaptation to avoid risks**
- **SSPs mostly provide demand for wood which has to be satisified either through intensive or extensive strategy (mostly relevant for EU scale)**

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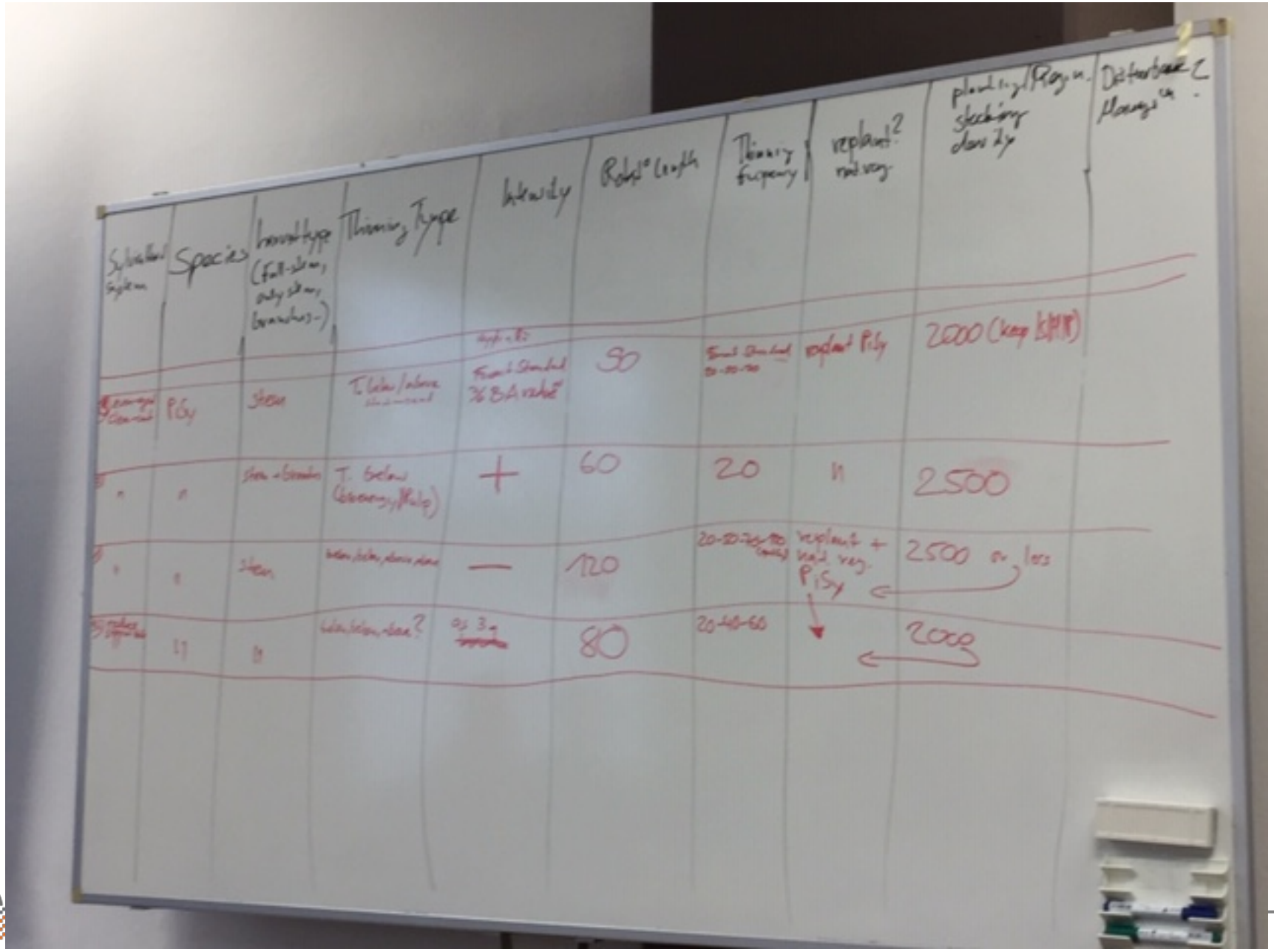
Species
PiSy
2000 (keep
90
60
20
2500
120
2500 or less
80
2000

# Break-out Group Session 1:

**Monday 12-11-2018, 17:00. 4 Groups.**

- Task Group 1: Scenario development (MJ Schelhaas), Room:
- Task Group 2: Stand-scale models (A Mäkelä, C. Reyer), Room:
- Task Group 3: Landscape models (R. Seidl), Room:
- Task Group 4: EU-scale models (A. Rammig), Room:

| TG1 (scenario): | TG2 (stand scale): | TG3 (landscape scale): | TG4 (EU scale): |
|---|---|---|---|
| Aleksi Lehtonen | Alessio Collalti | Björn Reineking | Anja Rammig |
| Annika Nordin | Annikki Mäkelä | Giorgio Vacchiano | Marie Guillaume |
| Dejan Stojanovic | Christopher P.O. Reyer | Heike Lischke | Anne Sofie Lansø |
| Esther Thürig | David Cameron | Josef Brůna | Bas Lerink |
| Hans Verkerk | Friedrich J. Bohn | Paola Mairota | Sycheva Ekaterina |
| Jean-Luc Peyron | Katarína Merganičová | Rupert Seidl | |
| Marcus Lindner | Mikko Peltoniemi | Gunnar Petter | |
| Mart-Jan Schelhaas | Santiago Sabaté | Jan Wild | |
| Rasoul Yousefpour | Thomas Rötzer | Julius Sebald | |
| Saša Orlović | Timothy Thrippleton | Elena Cantarello | |
| Susana Barreiro | Benoît Courbaud | | |
| Louis König | | | |
| Susanne Suvanto | | | |

# Break-out Group Session 2

**Wednesday 14-11-2018, 09:10. 4 Groups.**

- What to adapt to? How to mitigate? What are the main problems in <your group region>?
- What are possible storylines for scenarios wrt
  - adaptation?
  - mitigation (via bioenergy, via HWP?)
- How to cope with different adaptation levels at different spatial scales? E.g.
  - Adaptation through species change requires plant new species after final cut at stand level but looking at dispersal etc. at landscape level.
  - Adaptation through species mixing requires single-tree/group mixing at stand level while at landscape level mixtures of larger, single-species stands lead to mixtures at landscape-scale
- Looking for complementarities across scales (spatial scale, autonomous adaptation vs. planned)

# Groups:

| Eastern Central | Northern | Southern | Western Central |
|---|---|---|---|
| Christopher P.O. Reyer | Aleksi Lehtonen | Alessio Collalti | Anja Rammig |
| Dejan Stojanovic | Annika Nordin | Anne Sofie Lansø | David Cameron |
| Elena Cantarello | Annikki Mäkelä | Benoît Courbaud | Esther Thürig |
| Jan Wild | Bas Lerink | Heike Lischke | Friedrich J. Bohn |
| Josef Brůna | Björn Reineking | Julius Sebald | Gunnar Petter |
| Katarína Merganičová | Hans Verkerk | Mart-Jan Schelhaas | Jean-Luc Peyron |
| Marcus Lindner | Marie Guillaume | Paola Mairota | Louis König |
| Rupert Seidl | Mikko Peltoniemi | Santiago Sabaté | Rasoul Yousefpour |
| Saša Orlović | Susanne Suvanto | Susana Barreiro | Sycheva Ekaterina |
| | Timothy Thrippleton | | Thomas Rötzer |

Rooms?

# Break-out Group Session 3

**Wednesday 14-11-2018, 11:45. 4 Groups.**

- For TG2-4: Which of the things discussed in Break-out group session 2
- are particularly relevant at the respective scale of the stand (Task Group 2), landscape (Task Group 3), EU (Task Group 4)?
- can be implemented in the models?
- Take models as they are now, implement some species diversification as “scenarios”?
- Implement new processes to represent general adaptation mechanisms?
- Task Group 1: Continue to work on scenario storylines (break-out session 1)

# Break-out Group Session 4

**Wednesday 14-11-2018, 13:30. 3 Groups.**

- Develop a clear idea of what simulation exercises we want to do at stand (Task Group 2), landscape (Task Group 3) and EU (Task Group 4) scale!
- TG1 members are spread over TG2-4
- Protocol/simulation set-up, data and next steps

# Closing

- **Send pictures**
- **Reports / agreements**
- **Next steps?**
- **Next meeting?**
- **Next EFI**