

# Mixed species forest management Lowering risk, increasing resilience

## REFORM

*REsilience of FOrest Mixtures*

**Miren del Río**

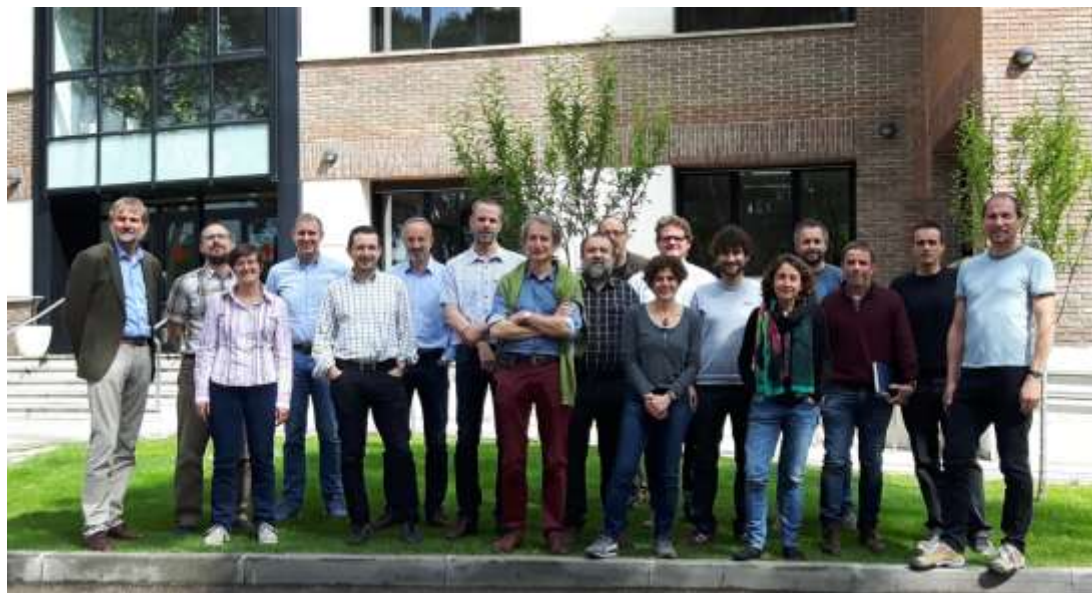


*Workshop, Vienna-Maissau 17-18 January 2019*



- Austria: BOKU A. Nothdurft
- Belgium: UCL Q. Ponette
- France: INRA H. Jactel  
CNRS X. Morin
- Germany: TUM H. Pretzsch
- Italy: UNITUS A. Barbati
- Latvia: SILAVA A. Jansons
- Lithuania: ASU G. Brazaitis
- Norway: NMBU A. Brunner
- \*Poland: AUK M. Pach
- Spain: INIA M. del Río**  
UVA F. Bravo
- Sweden: SLU M. Löf

13 Partners from 11 countries



Increasing number of studies in mixed species forests

## Stability

del Río et al 2017 *J Ecol*  
Guyot et al 2016 *Biol. Letters*  
Pretzsch et al 2013 *Plant Bio*

## Productivity

Liang et al 2016 *Science*  
Pretzsch et al 2015 *Eur J For Res*  
Paquette & Messier 2011 *Glob Ecol Biog*

## **DIVERSITY**

## Ecosystem services

Gamfeld et al 2013 *Nat Comm*  
van der Plas 2016 *Nat Comm*  
van der Plas 2016 *PNAS*

# Background and State of the Art

But there is the need of further knowledge on:

- Mixing effect on resistance and resilience to extreme drought (contrasting results)
- Thinning reactions in mixed stands as adaptive strategy
- Effect of mixed forests reactions to climate change on provision of ecosystems services (ES)
- Silvicultural guidelines and forest models for mixed stands adaption to climate change



# Aim and Objectives

**AIM:** to provide risk resilient forest management alternatives to stakeholders and policy makers

**Specific objectives, to:**

- i. Determine the role of mixing species on reducing the vulnerability
- ii. Identify Management regimes to improve the resilience
- iii. Adapt growth models to simulate mixed forest dynamics
- iv. Analyse the effect of risk resilient forest management on the provision of Ecosystem services
- v. Transfer the project results to stakeholders and policy makers

- **Triplet-transects (observational)**

*Pinus sylvestris*- *Fagus sylvatica*

*Pinus sylvestris*-*Quercus petraea*

*Pinus sylvestris*- *Picea abies*

- **NFI data (observational)**

- **Case studies (experimental) (13)**

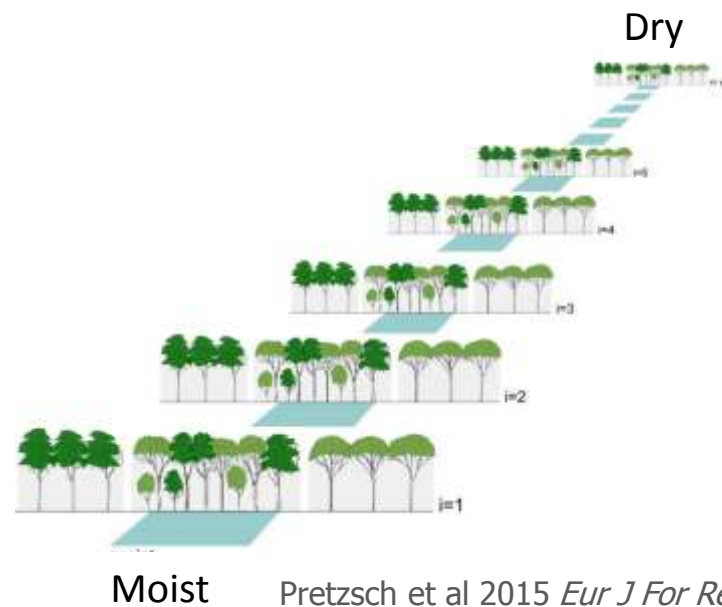
Long term plots

Thinning experiments

Intensive monitoring plots

- **Models (modelling)**

ForCEEPS, PINEA, Prognaus, SILVA, SIMANFOR



Pretzsch et al 2015 *Eur J For Res*  
Heim et al 2017 *Ann For Sci*





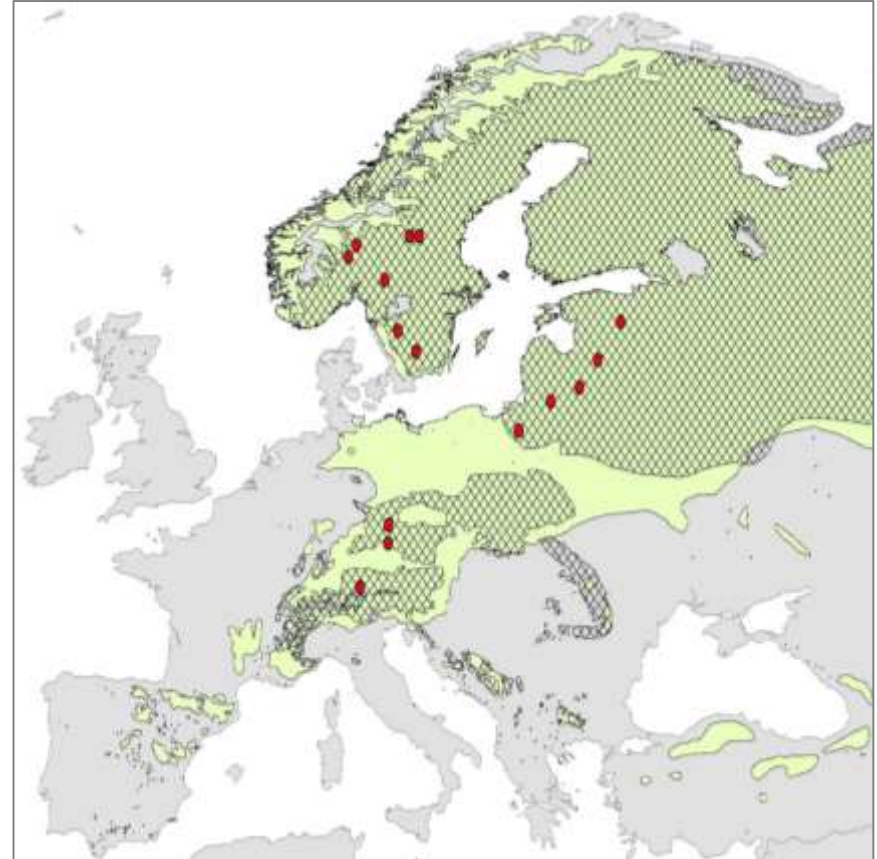
- **Triplet-transects (observational)**

Overview Spruce-pine triplets

18 triplets unthinned

8 triplets to be thinned

\* 10 countries



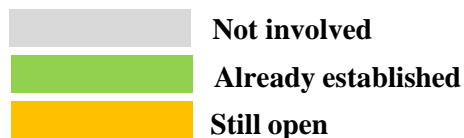
- **Triplet-transects (observational)**

Overview Oak-pine triplets

23 triplets unthinned

14 triplets to be thinned or thinned

\* 12 (16) countries





# Methods: Work Packages

## Abiotic disturbances



2000 1990 1980 1970

## Biotic disturbances



### **WP2 Resistance and resilience**

- Comparison of mixed vs monospecific stands
- Identify patterns and drivers
- Linking stand features and vulnerability

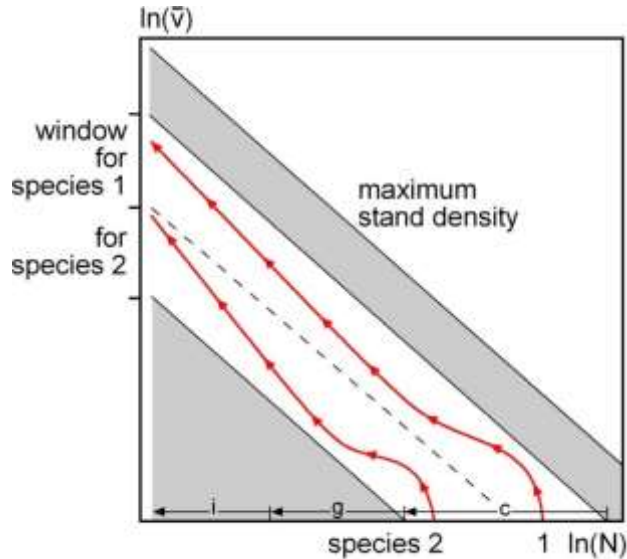
## WP3 Risk resilient forest management

- Structure and thinning effect
- Silvicultural guidelines
- Computer algorithms

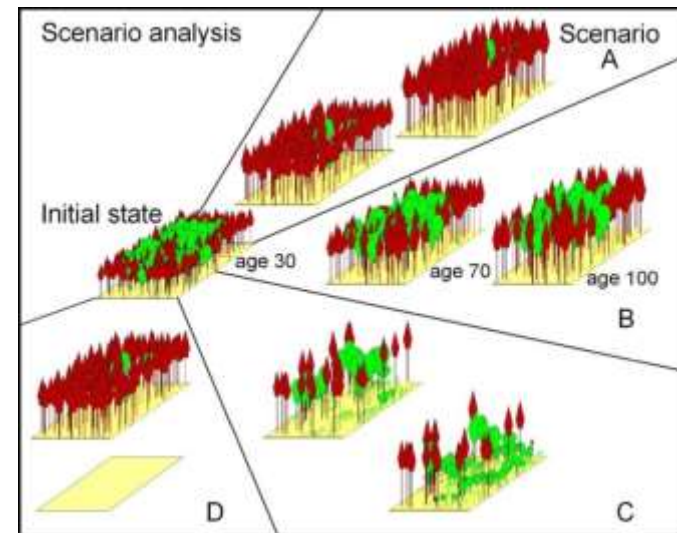


## WP4 Long term provision of ecosystem services

- ES estimation in mixed stands
- Simulation of risk resilient effect
- Stand and large scale approaches



(a)



## WP5

### Science-Policy-practice

- Open Access simulation platform
- Marteloscopes
- Policy guides



## WP6

### Communication-training

- Regional workshops
- Training guides
- Project web site
- Final conference

<http://www.reform-mixing.eu/>

## Scientific knowledge

- ✓ Scientific publications

## Science-Practice

- ✓ Stakeholders engagement (2-6 by country)
- ✓ Provision *practical tools*
- ✓ Transnational training forest networks
- ✓ Open Accesss Simulation Plataform

*bi-directionally*

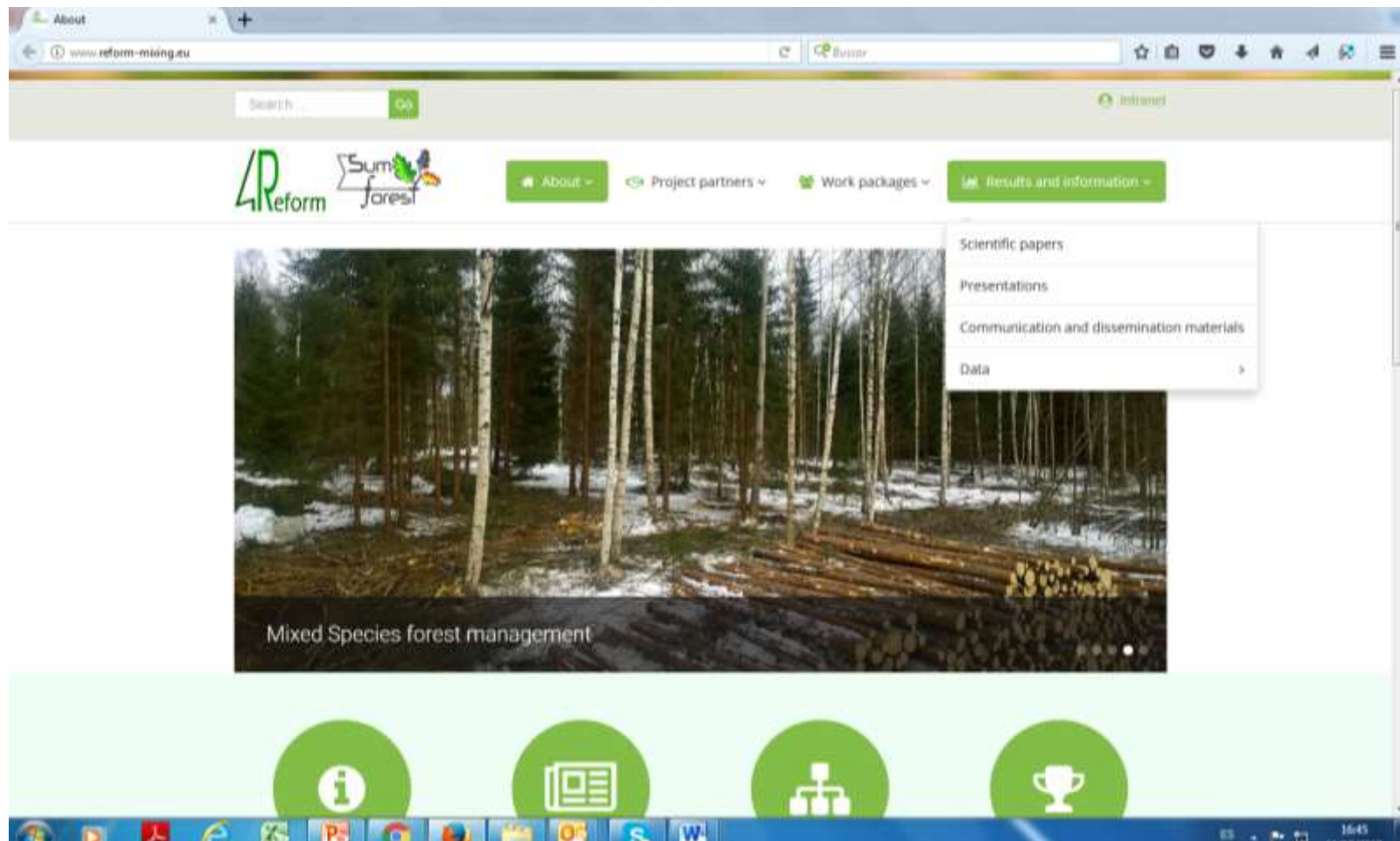
*Education and Practice*

## Science- Policy

- ✓ Recommendations to forest policy makers for the promotion of resilient mixed forestry.

# Expected results and impact

<http://www.reform-mixing.eu/>







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**Thank you very much  
for your attention!**