ALTERFOR
Information about the project and Slovak results

EFI network, 3rd FORMASAM meeting
Technical university in Zvolen, Zvolen, 18-20. September 2019.
Jan Tucek, Robert Sedmak

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 676754.

Introduction
Alterfor as Project
Slovak details
Results

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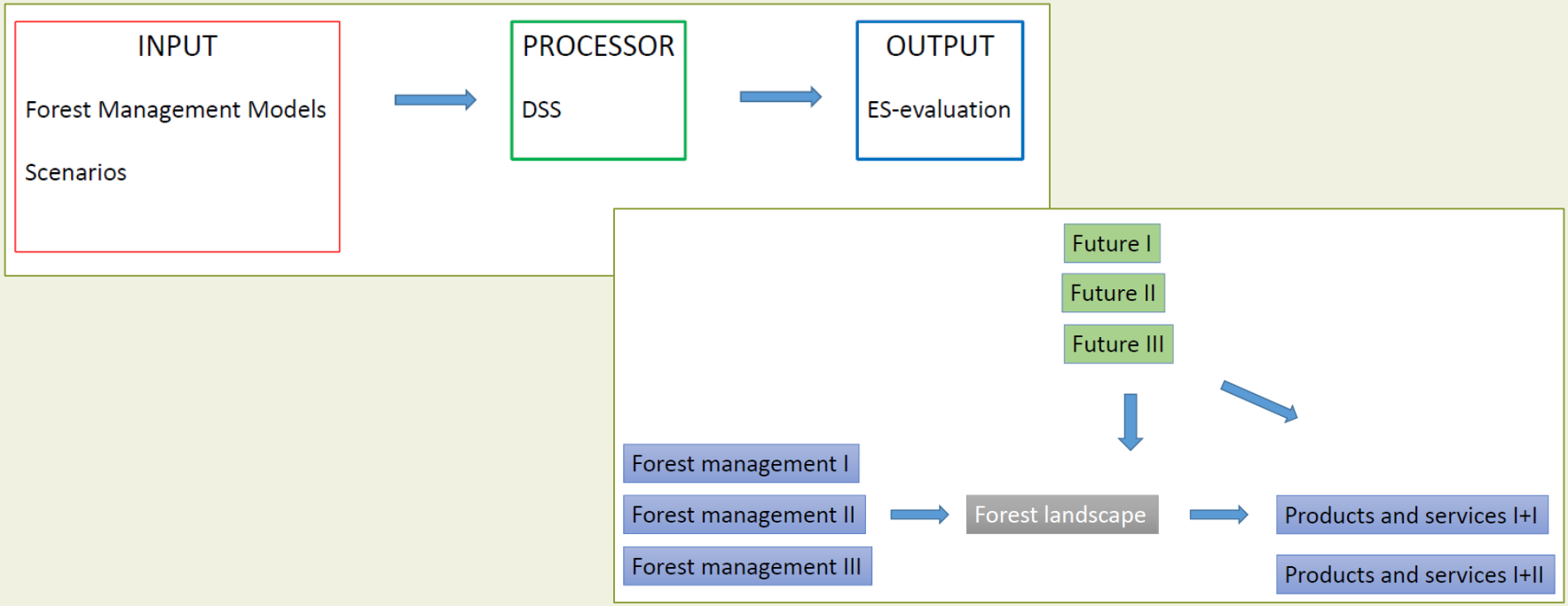
ALTERFOR – main idea

To evaluate/to assess different forest management models (FMM) – currently applied and new/alternative ones – in the conditions of different/alternative/possible futures…

To made FMM evaluation from the point of view of forest ecosystem services provision on the stand and landscape level…



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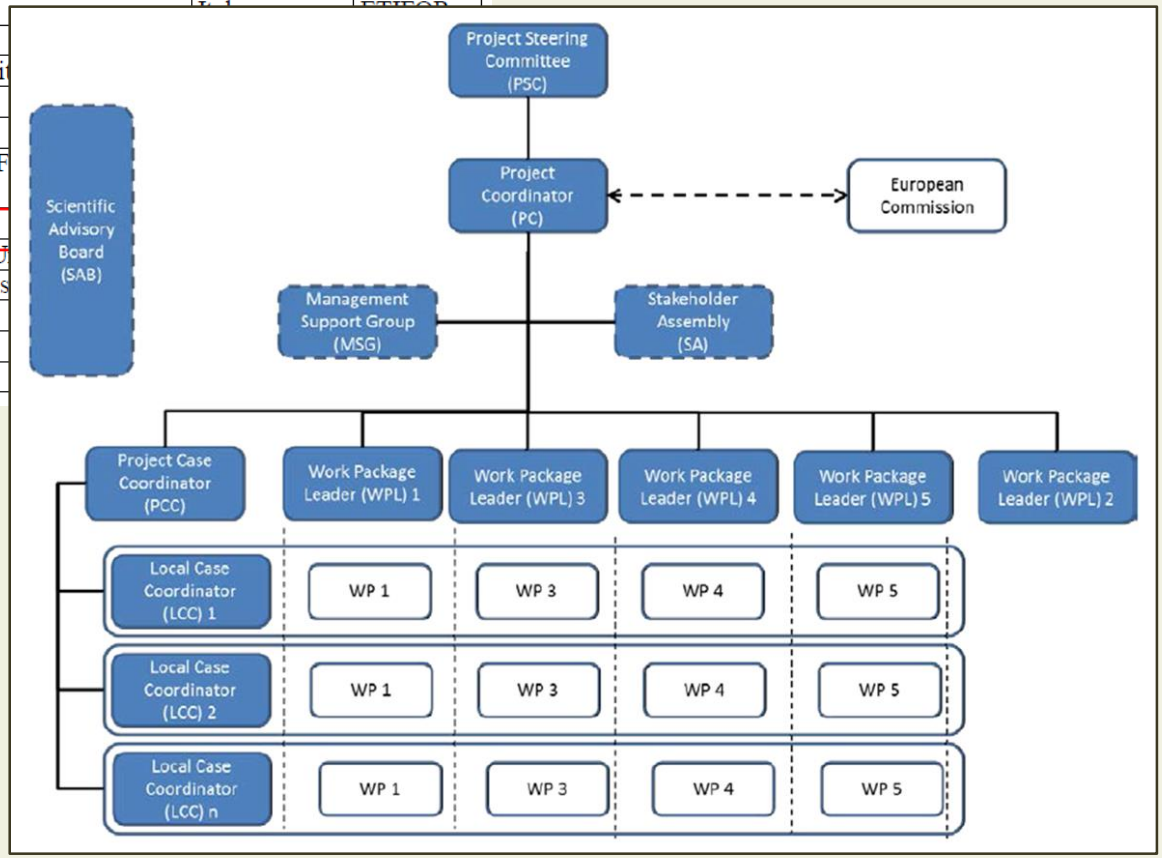
ALTERFOR – project goal

ALTERFOR vision is to identify and facilitate the adoption of FMMs in Europe suited to sustaining desired ES delivery over the coming century. To pursue the vision, ALTERFOR sets the following three main objectives to be achieved within the duration of the project:

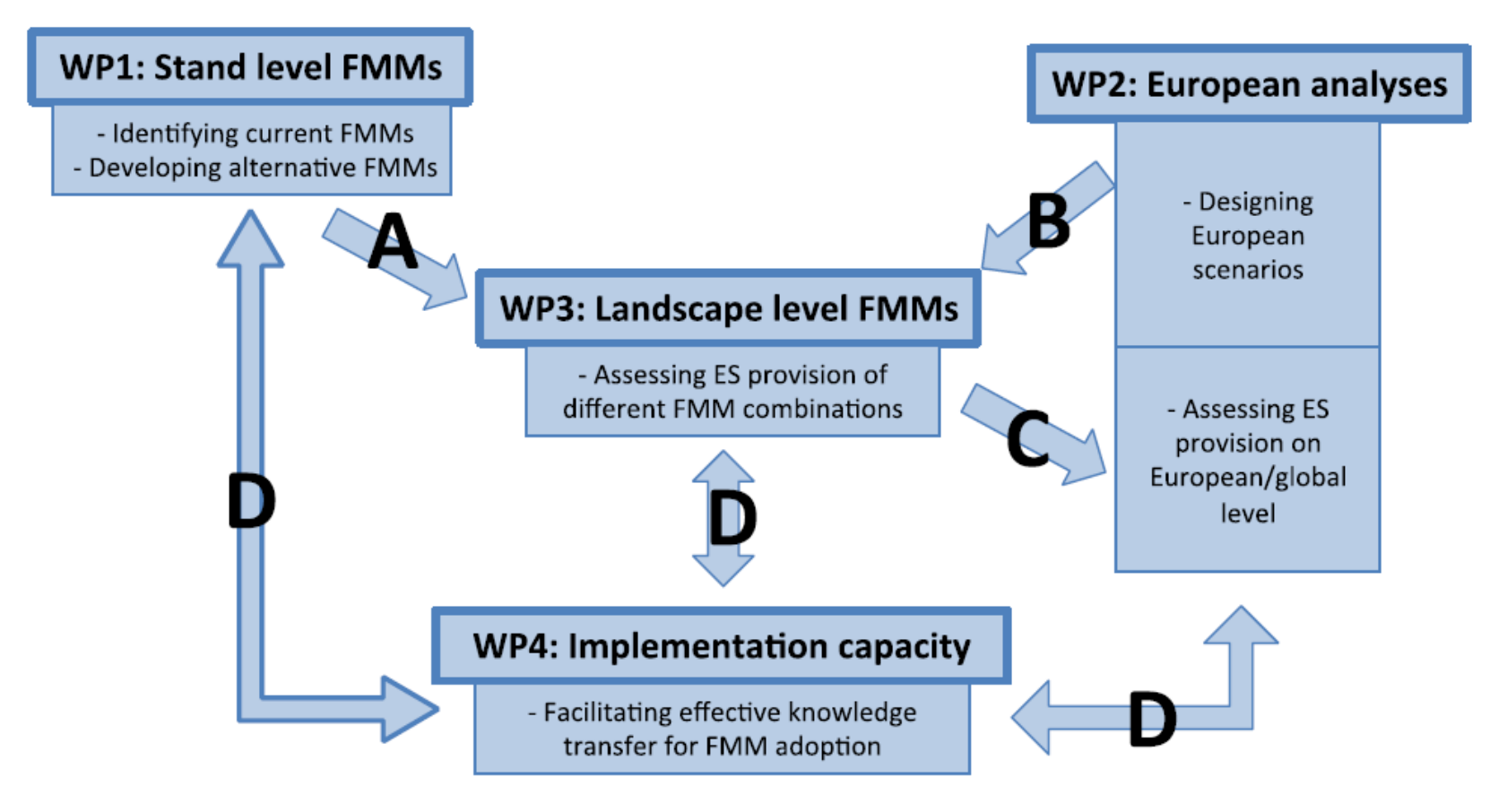
1. To identify and develop FMMs robust in their capacity to deliver ES and reduce vulnerabilities at stand to landscape
2. To assess the impact of different FMM combinations in terms of resultant ES baskets on the European level.
3. To facilitate the implementation of desired FMMs through the integration of scientific research and its practical utilisation.

Formal organisation – konsortium, structure

Partici-pant No	Participant organisation name	Country	Short name
1	Coordinator: Swedish University of Agricultural Sciences	Sweden	SLU
2	Forest Owner Association Södra	Sweden	Södra
3	Georg August University Göttingen	Germany	UGOE
4	Technische Universität München	Germany	TUM
5	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V	Germany	Fraunhofer
6	German Forest Society	Germany	GFS
7	National University of Ireland Dublin – University College Dublin	Ireland	UCD
8	Coillte Teoranta	Ireland	Coillte
9	The University of Padova	Italy	UNIPD
10	ETIFOR		
11	Aleksandras Stulginskis University		
12	State Company Forest Inventory and Management Insti		
13	Wageningen University		
14	University of Lisbon		
15	Associação Florestal de Vale do Sousa / Sousa Valley F Association		
16	Technical University in Zvolen		
17	Karadeniz Teknik Üniversitesi / Karadeniz Technical U		
18	Orman Genel Müdürlüğü / General Directorate of Fores		
19	International Institute of Applied Systems Analyse		
20	Joint Research Centre		



Workpackages relationships



A WP1 serves WP2 with a set of current an alternative FMMs,

B WP2 provides a range of prospective scenarios or framework conditions on European/global level encompassing climate, market and related developments,

C Output of FMM assessment at landscape level (WP3) informs the assessment of ES provision on European/global level in WP2,

D Guided by WP4, FMMs are developed continuously and iteratively, with a view of their adoption.

Case studies – experimental areas

(Country code) Name(s)	Area, 1000 ha (% forest)	Forest ownership (%)	Main stakeholders[1]	Main ES[2]	Availa-ble DSS(s)
(SE) Krono-berg county	847 (77)	83 Private 17 Public	FOA, ENGO, forest industry, Swedish Forest Agency, public	Timber, Biodiversity, Water, Recreation	Heureka LandSim
(LT) Telšiai	254 (34)	63 Private 37 Public	Institute of Forest Management Planning, state forest managers, PFO, ENGO, regional park	Timber, Biodiversity Water, Recreation	Kupolis
(SK) Podpolanie	34 (57)	7 Private 93 Public	State forest managers, PFO, ENGO, general public	Timber, Biodiversity Water, Recreation	Sibyla
(IR) BA Unit 2 of Coillte	1,061 (11)	30 Private 70 Public	forest service, advisory services, PFO, ENGO, industries, public, fisheries, investment bodies	Timber, Biodiversity Water, Recreation	Growfor Remsoft
(IT) Veneto	76 (100)	74 Private 26 Public	PFO, logging enterprises, municipalities, regional forest administration, ENGO	Timber, Biodiversity Water, Erosion control	InVEST RockyFO CO2Fix
(PT) Sousa Valley	15 (10)	100 Private 0 Public	FOA, forest owner federation, forest industry, forest service, local municipality, other NGO	Timber, Recreation	StandSim SADfLOR
(TR) Gölcük	83 (58)	1 Private 99 Public	(General Directorate of Forestry = key stakeholder) PFO, ENGOs, forest industry, general public	Timber, Biodiversity Water, Recreation NWFP	APP ETÇAP
(GE) Bavaria (West Augsburg)	150 (33)	50 Private 50 Public	PFO, ENGOs, forest service forest industry, general public (stable ownership structure for decades)	Timber, Biodiversity, Recreation, Water, Soil protection	SILVA
(GE) Brandenburg	50 (37)	57 Private 43 Public	PFO (their share steadily increasing), forest service ENGOs, forest industry, general public	Timber, Biodiversity, Recreation, Soil protection	SILVA
(NL) South-East Veluwe	8 (75)	70 private 30 public	PFO, public (inhabitants, visitors), conservation agencies, local/ provincial/national government	Timber, recreation, biodiversity	LandClim

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ALTERFOR: specific challenge for current forest management (planning) in Slovakia

Absence of the real computer aided decision making in final phases of the FM planning procedure – both methods and tools (DSS).

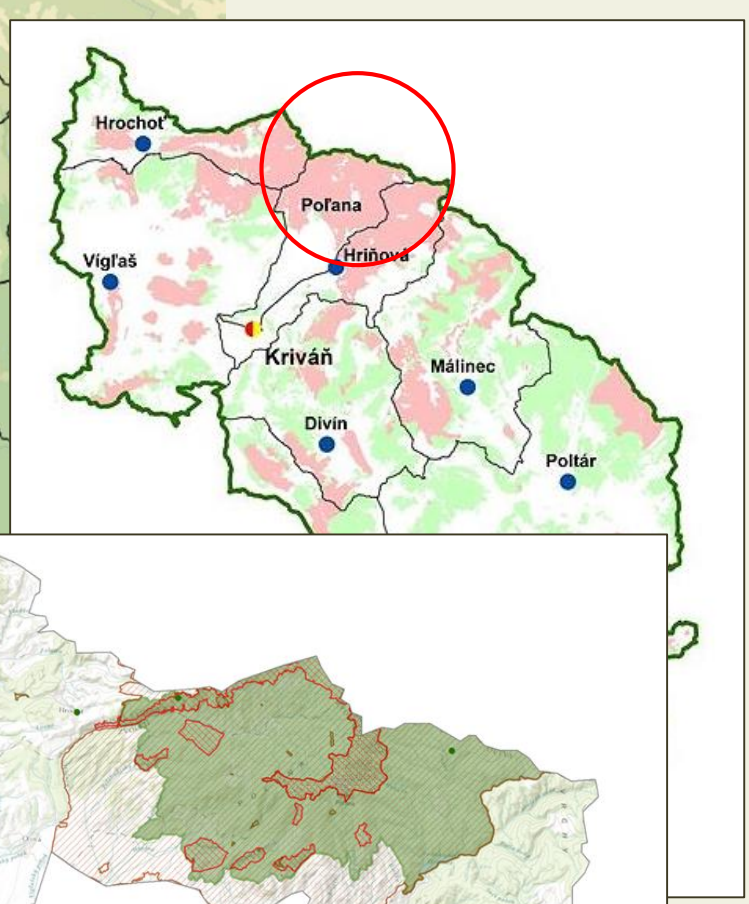
Pre determination of FM goals and their preferences by environmental/site conditions and current forest status independent to owner/forest manager opinion.

Low economic effectivness of FM planning – (1) strictly regulated planning is obligatory based on very expensive forest inventory and (2) final product of planning process (Forest Management Plan) is used mainly as control tool for state (not as tool for real optimization of ES provision for forest owners).

Complicated transfer of new knowledge into planning practice due to over-complexity of current approaches and strict legislative regulation.

Low adaptivness of planning to abrupt and/or cumulative changes of forest status, natural environment and economic situation.

Case study area Podpoľanie



State Forest Banská Bystrica, branch Kriváň,
Forest districts Hrochoť, Vígľaš, Poľana, Hriňová,
Area about 37 000 ha, more then 7 000 forest stands.

TUZVO team

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Non academic partner – Lesy SR, š.p.

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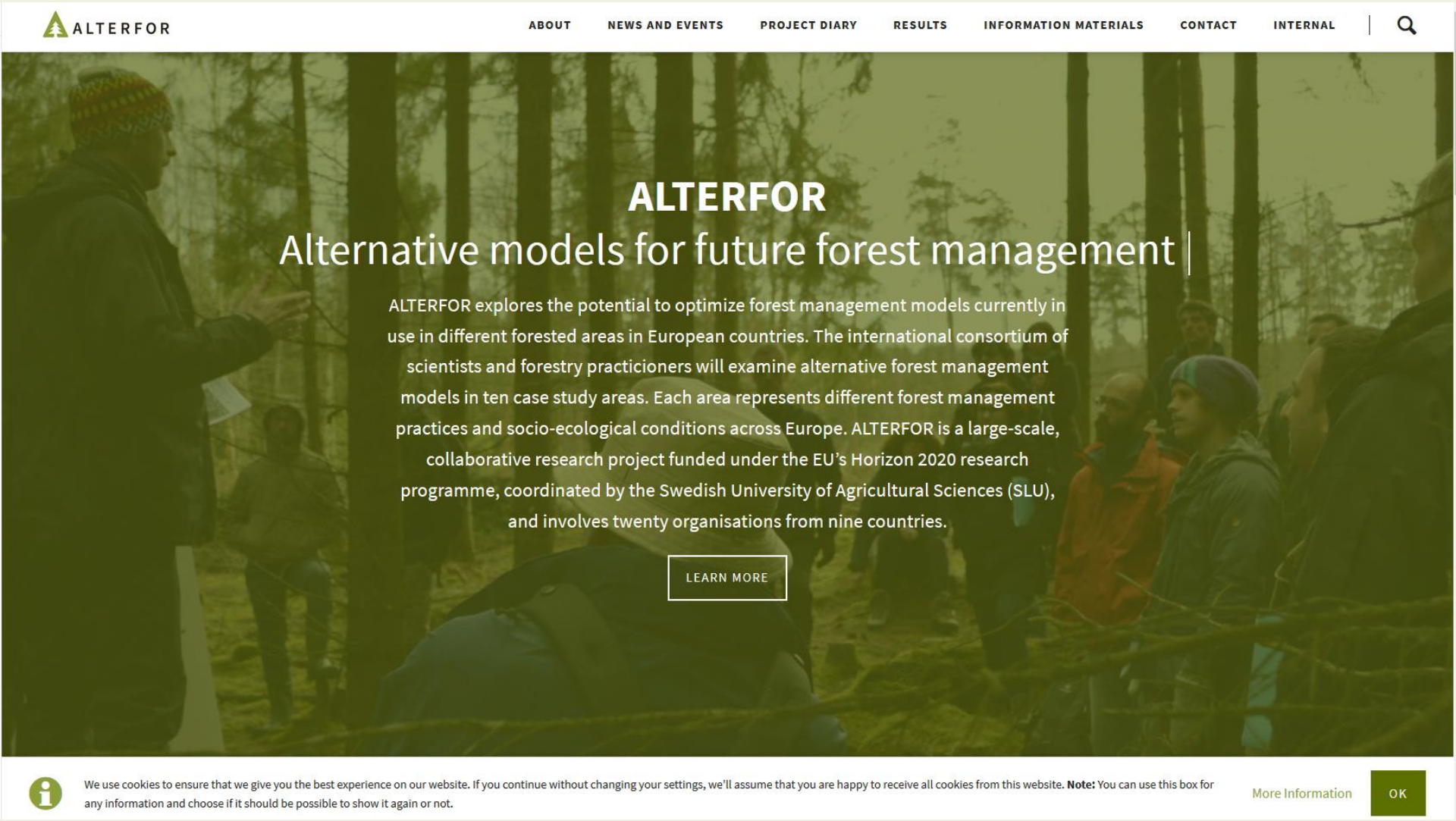
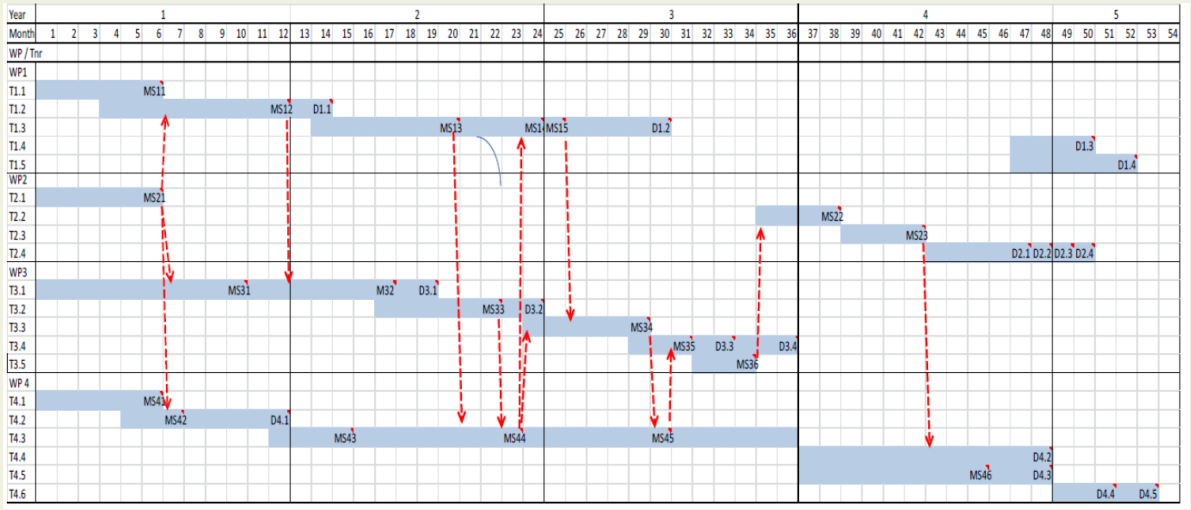
https://www.alterfor-project.eu/





Deliverables and Milestones

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Milestone 6 – Global and country specific prospective scenarios

Project Title	Alternatives models and robust decision-making for future forest management

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Milestone 9 - Quality standard to be met by the up-graded DSSs

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Deliverable 1.1 – FMM descriptio

Project Title	Alternatives m management
Project Acronym	ALTERFOR
Project Coordinator	Ljusk Ola Eriksso
Scientific Coordinator	Vilis Brukas, Sw
Project Administrator	Giulia Attocchi,
Project Duration	1 April 2016 – 3
Project Duration in months	54
Authors, organizations (short name)	Main authors: E Co-authors: loc
WP No., WPL(s)	WP1, Urban Nil
Date of delivery by Coordinator	07 June 2017
Date of delivery according to DoA	31 May 2017
Reviewed by	
Project coordinator, scientific coordinator, administra	
Type of Deliverable	
Report	X
Demonstration	
Websites, patents, fillings, etc.	
Dissemination level	
Public	X
Confidential, only members of the consortium (including the Commission Services)	
Other	

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Deliverable 1.2 – Alternative Forest Management M for ten Case Study Areas in Europe

Project Title	Alternatives models and robust decision-m management
Project Acronym	ALTERFOR
Project Coordinator	Ljusk Ola Eriksson, Swedish University of Agr
Scientific Coordinator	Vilis Brukas, Swedish University of Agricultur
Project Administrator	Marta Agostinelli, Swedish University of Agri
Project Duration	1 April 2016 – 30 September 2020
Project Duration in months	54
Authors, organizations (short name)	Eric Agestam, Kristina Wallertz, and Urban N Co-authors: local case coordinators and WP
WP No., WPL(s)	WP1, Eric Agestam, Kristina Wallertz, Urban
Date of delivery by Coordinator	17 October 2018
Date of delivery according to DoA	30 September 2018
Reviewed by	
Project coordinator, Scientific coordinator, Administrative coordinator, WP5, and	
Type of Deliverable	
Report	X
Demonstration	
Websites, patents, fillings, etc.	
Dissemination level	
Public	X
Confidential, only members of the consortium (including the Commission Services)	
Other	

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Deliverable 3.2 – Synthesis report: discrepancies be ES outputs under current FMMs

Project Title	Alternatives models and robust dec management
Project Acronym	ALTERFOR
Project Coordinator	Ljusk Ola Eriksson, Swedish University
Scientific Coordinator	Vilis Brukas, Swedish University of Agr
Project Administrator	Giulia Attocchi, Swedish University of A
Project Duration	1 April 2016 – 30 September 2020
Project Duration in months	54
Authors, organizations (short name)	Peter Biber, TUM and Maarten Nieuw With contributions by the ecosyster Marco Borga, José G. Borges, Adam F Matts Lindbladh, and Davide Zoccatelli
WP No., WPL(s)	WP3, Maarten Nieuwenhuis and Peter
Date of delivery by Coordinator	24 May 2018
Date of delivery according to DoA	31 March 2018
Reviewed by (see list of abbreviations used)	
PC, PCC, PA and MSG	
Type of Deliverable	
Report	X
Demonstration	
Websites, patents, fillings, etc.	
Dissemination level	
Public	X
Confidential, only members of the consortium (including the Commission Services)	
Other	

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Deliverable 4.1 –
Report on actors driving forest management in selected European countries

Project Title	Alternatives models and robust decision-making for future forest management
Project Acronym	ALTERFOR
Project Coordinator	Ljusk Ola Eriksson, Swedish University of Agricultural Sciences (SLU)
Scientific Coordinator	Vilis Brukas, Swedish University of Agricultural Sciences (SLU)
Project Administrator	Giulia Attocchi, Swedish University of Agricultural Sciences (SLU)
Project Duration	1 April 2016 – 30 September 2020
Project Duration in months	54
Authors, organizations (short name)	Main authors: Nataly Juerges (UGOE); Max Krott (UGOE) Cases Germany: Nataly Juerges (UGOE) Case Ireland: Anders Lundholm (UCD); Edwin Corrigan (UCD) Case Italy: Mauro Masiero (UNIPD); Davide Pettenella (UNIPD) Case Lithuania: Ekaterina Makrickienė (ASU); Gintautas Mozgeris (ASU); Nerijus Pivoriūnas (SC State Forest Inventory and Management Inst.); Martas Lynikas (SC State Forest Inventory and Management Inst.); Vilis Brukas (SLU) Case The Netherlands: Bas Arts (WU); Marjanke Hoogstra-Klein (WU); Jim van Laar (WU) Case Portugal: José G. Borges (ISA); Marlene Marques (ISA); Pedro Ochôa Carvalho (ISA); Maria João Canadas (ISA); Ana Novais (ISA); Américo Mendes (AFVS); Miguel Sottomayor (AFVS); Sandra Pinto (AFVS) Case Slovakia: Yvonne Brodrechtova (TUZVO); Róbert Smreček (TUZVO); Ján Bahýľ (TUZVO); Michal Bošeľa (TUZVO); Róbert Sedmák (TUZVO); Ján Tuček (TUZVO) Case Sweden: Isak Lodin (SLU) Case Turkey: Emin Zeki Başkent (KTU); Uzay Karahalil (KTU); Uğur Karakoç (GDF); Burak Sarı (KTU)

1. Current FMM for Podpoľanie case study area identification (10 models for stand level),

2. Alternative FMM design (1. Model for sustainable multifunctional management in partly uneven-aged mixed stands, 2. Model for sustainable timber provision in even-aged mixed stands),

3. Modelling of Climatic Change Scenarios for Podpoľanie case study area,

4. System of natural identificators for ecosystem services provision on stand level (based on modelling/simulation tool applied – Sibyla in Slovak case),

5. Research of Forest management models preferences by participants of the first Workshop

6. Research of Forest Management Goals preferences by participans of the second Workshop,

7. Evaluation of ecosystem services provision – multicriterial evaluation on stand and landscape level using current and alternative FMM (repeating, iteratively).

ALTERFOR Travellab

Travellab is an innovative format for crossregional learning in ALTERFOR, combining the conventional field excursion with round table discussions and other follow up sessions together with local stakeholders.

04/2019 Fourth Travellab in Padova
10/2018 Third Travellab in Porto
10/2017 Second Travellab in Galway
11/2016 First Travellab in Zvolen

European Journal of Forest Research (2019) 138:561–581
https://doi.org/10.1007/s10342-019-01189-z

ORIGINAL PAPER

Forest decision support systems for the analysis of ecosystem services provisioning at the landscape scale under global climate and market change scenarios

Eva-Maria Nordström[1] · Maarten Nieuwenhuis[2] · Emin Zeki Başkent[3] · Peter Biber[4] · Kevin Black[2] · Jose G. Borges[5] · Miguel N. Bugalho[6] · Giulia Corradini[7] · Edwin Corrigan[2] · Ljusk Ola Eriksson[1] · Adam Felton[8] · Nicklas Forsell[9] · Geerten Hengeveld[10] · Marjanke Hoogstra-Klein[10] · Anu Korosuo[9] · Matts Lindbladh[8] · Isak Lodin[8] · Anders Lundholm[2] · Marco Marto[5] · Mauro Masiero[7] · Gintautas Mozgeris[11] · Davide Pettenella[7] · Werner Poschenrieder[4] · Robert Sedmak[12,13] · Jan Tucek[12] · Davide Zoccatelli[7,14]

Received: 29 November 2017 / Revised

Abstract
Sustainable forest managemen
and methods concerned with cl
forest landscapes is very much
needed that incorporate these a
cope with these issues. The ass
the output of current and alter
these FMMs in the face of incr
quantify the impacts of both st
horizon. DSSs can be used to
owner behavior as reflected by
DSSs need more data and dev
other ESs. Spatial analysis func
output of ESs from both curren

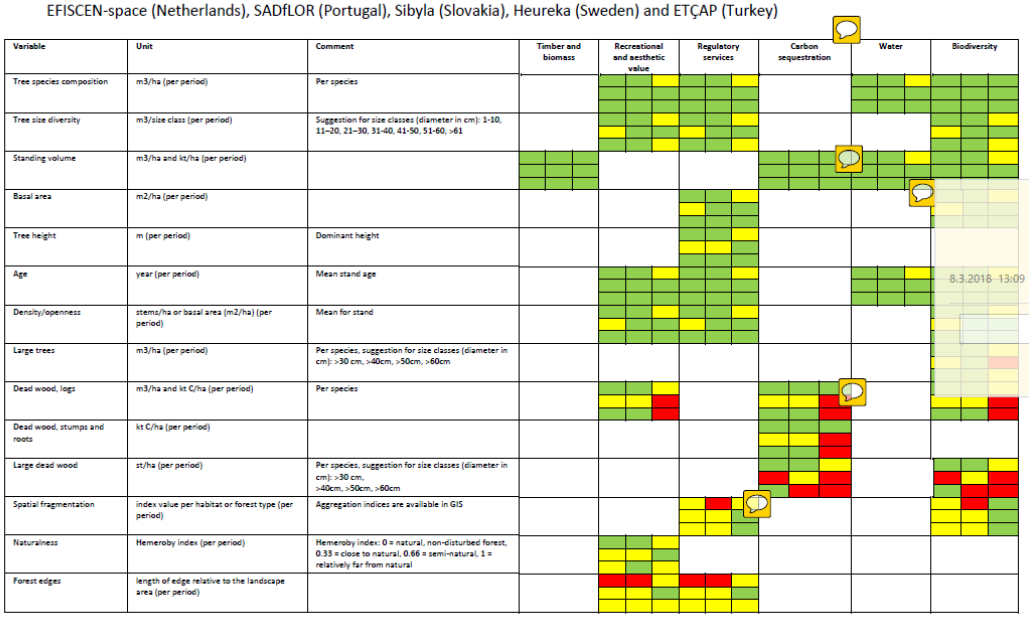
Keywords ALTERFOR · Biodi

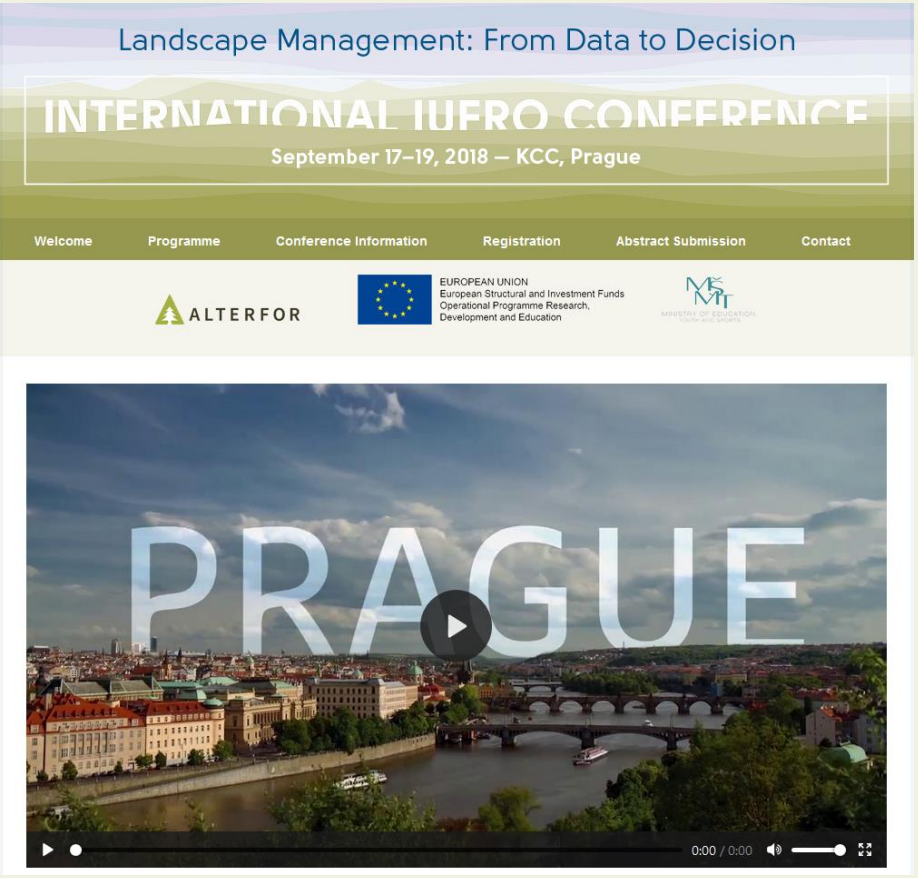
Table 1 Description of the DSSs considered in the assessment

System name	Country	Forestry dynamics model type[a]	Modeling approach[b]	Further information on DSS
SILVA	Germany (GER)	Stand dynamics model	Simulation	Pretzsch (2009), Pretzsch et al.
Remsoft Woodstock	Ireland (IRL)	Tightly and f		
InVEST and VALE	Italy (IT)	Not for (GIS		
Kupolis	Lithuania (LIT)	Tightly and f		
EFISCEN-space	The Netherlands (NL)	Matrix ics w		
SADfLOR	Portugal (POR)	Tightly and f		
Sibyla	Slovakia (SVK)	Stand d		
Heureka and HoldSim	Sweden (SWE)	Tightly and f		
ETÇAP	Turkey (TUR)	Loosel and f		

[a]Corresponds to the categorization of forestry dynamics
[b]Corresponds to the methods groups categorization of I

Table 4. Classification of the nine DSSs according to their ability to quantify the variables required for the ES provision assessment. A green cell indicates that the variable is part of the DSS and the ES is assessed within the DSS; a yellow cell indicates that the variable is part of the DSS but the ES is assessed outside of the DSS following the simulation/optimization; and a red cell indicates that the variable is not part of the DSS. The DSSs included are (left to right, starting at the top row): SILVA (Germany), Remsoft (Ireland), InVEST and VALE (Italy), Kupolis (Lithuania), EFISCEN-space (Netherlands), SADfLOR (Portugal), Sibyla (Slovakia), Heureka (Sweden) and ETÇAP (Turkey)





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ALTERFOR session

Biber P.: Assessing Forest Ecosystem Service Provision with Fuzzy Logic Methods

Eriksson L.-O.: An approach to develop robust landscape-level forest management models in the Vale do Sousa, Northwest Portugal. The ALTERFOR experience

Eriksson L.-O.: A microsimulation approach to long term landscape simulation in a fragmented landscape

Mozgeris G.: Assessing the influence of more adaptive forest management approaches on future delivery of ecosystem services in Lithuania

Corradini G.: Stand and landscape alternative management models for addressing new demands on forests by society: the case of lowland forests in northern Italy

Sedmák R.: Evolutionary multicriteria optimization – tool for improvement of integrated forest management in central Europe

Bingöl Ö.: Monitoring the Amount of Different Wood Types and Price Levels Under Different Silvicultural Approaches in Gölcük Planning Unit

Lundholm A.: Implementing climate change and future timber prices in a Forest Management Decision Support System designed for management of Irelands Western Peatland forests

Príspevok vznikol vďaka projektu ALTERFOR, financovaného Európskou úniou v rámci programu HORIZONT 2020 „Výskum a inovácie" (projekt č. 676754).

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ALTERFOR NEWSLETTER

www.alterfor-project.eu

ALTERNATIVE MODELS AND ROBUST DECISION-MAKING FOR FUTURE FOREST MANAGEMENT

ISSUE 10/2018

CONTENTS

1. CROSS-PROJECT MEETING IN PORTO

The third cross-project meeting took place in Porto, at the Catholic University of Portugal on 12-14 June 2018. It focused on alternative ways to manage forests at stand level, and the simulations of current approaches to management on the landscape level, under different market and climate scenarios. In addition, the project partners presented the "lessons learnt" from the first round of stakeholder workshops[1] conducted in several European countries.

The Portuguese project team[2] organized TRAVELLAB sessions shedding light on the local conditions in the Portuguese Case Study Area "Vale do Sousa" and exploring the needs for alternative forest management models. The project partners visited different forest stands in the case study area, e.g. short rotation coppice eucalyptus and maritime pine forests, including plots heavily damaged by

included representatives of state forest administration, private forest owners, municipal foresters, environmental NGO, and researchers. The biggest challenges are posed by high risks of fire and the fragmented ownership, where many holdings are unmanaged due to passive or unknown ownership.

2. SECOND ROUND OF STAKEHOLDER WORKSHOPS IN ALTERFOR IN AUTUMN 2018

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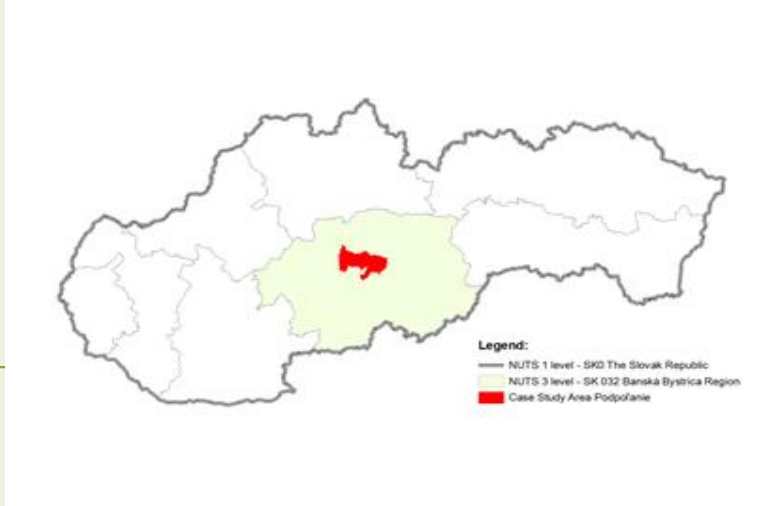
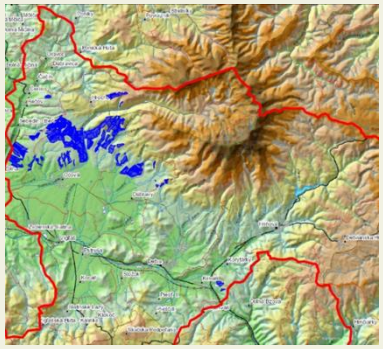
Main goal

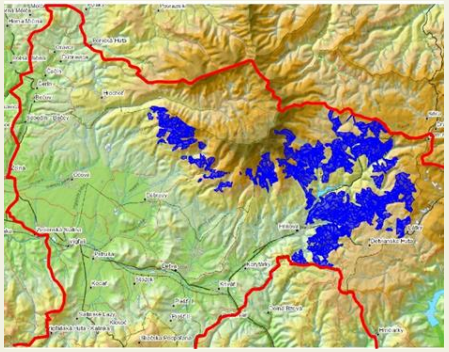
To explore improved alternative approaches in forest management that are robust enough to fulfill multiple demands of forest owners in diversified and changing environmental and economic situation in Europe

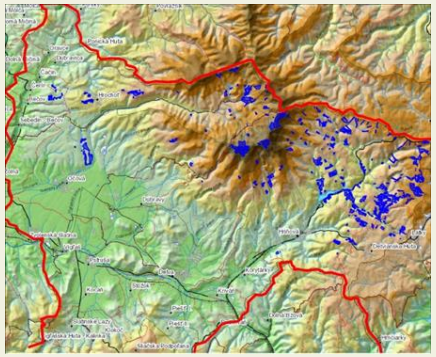
Slovak Case Study – diverse central European temperate forest

Over 30 000 ha and 7473 stands on highly diversified territory covering almost all important vegetation formation of western Carpathians (from oak and oak-beech through beech to mixed and spruce dominated formations









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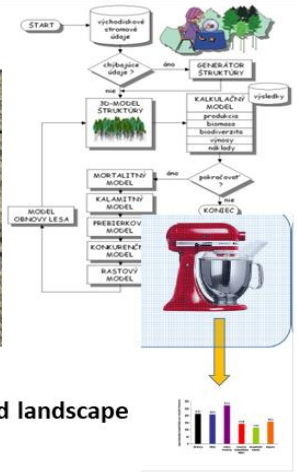
Simulations

forest growth under scenarios



Future I

Future II

Future III

Scenarios

- Environmental politics
- Climate change
- Biodiversity protection
- Bioenergy demand
- Owner behaviour

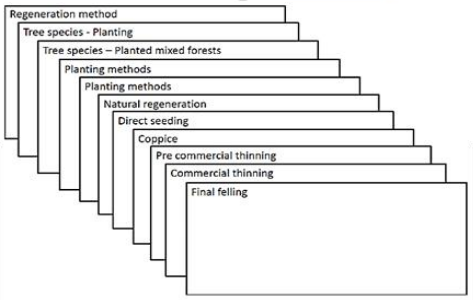
Management options

silviculture strategies for stand and landscape

Forest management I

Forest management II

Forest management III



Forest landscape

Ecosystem services

- Wood and bioenergy production
- Risk regulation
- Water regulation
- Carbon sequestration
- Recreation and aesthetic
- Biodiversity

Products and services I+I

Products and services I+II

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Simulation - Tree growth simulator Sibyla used for growth simulations in 7473 forest stands over 100 years (2010-2110) in each scenario

Scenarios (12) – Variation of three factors:

- **climate scenarios** - slight, medium and strong climate change (CC)
- **biodiversity demands** - no change vs. enlargement of nature reserves by 100 %
- **ownership structure** - no change vs. restitution of private ownership on 30 % of area

+ 1 baseline scenario (no change for all factors)

Management options:

Current management

10 classic silviculture strategies for rotation period distributed among stands according site and species predetermined rules (planning decisions outside the owner)

Innovated alternative management is based on innovative silviculture strategies at stand level that are distributed among forest stands according to different rules than are used now.

Five ecosystem services (ES) indicated in scale 0-1

- Wood and Bioenergy
- Water regulation
- Risk regulation
- Carbon sequestration
- Recreation and aesthetic

and

- Biodiversity

Multicriterial utility:

$$U = w_1 Wood + w_2 Risk + w_3 Water + w_4 Carbon + w_5 Recreation + w_6 Biodiversity$$

Weighhs w_i determined by survey (AHP)

Identified actor types:

- Economically-oriented
- Balanced
- Nature-oriented

Ecosystem service	Economically oriented	Balanced	Nature oriented
Wood and Bioenergy	0,27	0,19	0,05
Water regulation	0,27	0,19	0,26
Risk regulation	0,20	0,22	0,14
Recreation	0,05	0,07	0,10
Carbon seq.	0,11	0,11	0,14
Biodiversity	0,11	0,22	0,32

nion's Horizon 2020 research

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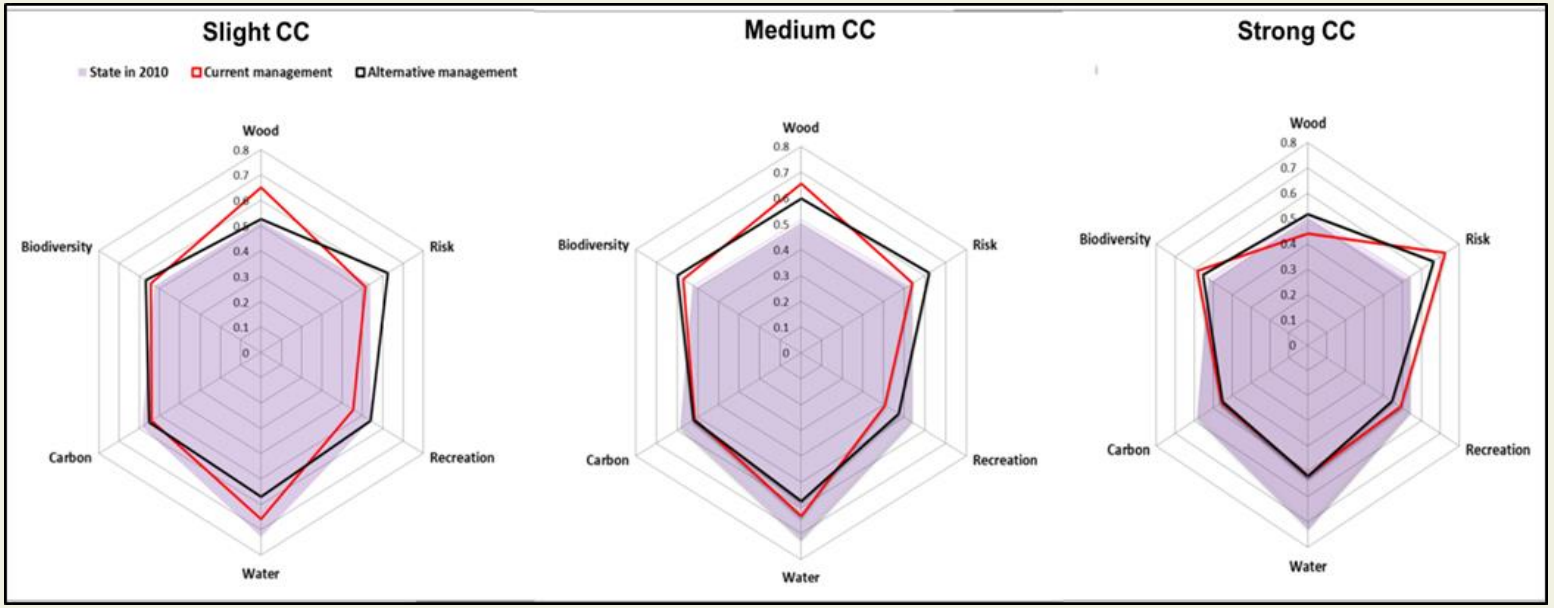
Key findings



1. Differences in final multicriterial utilities U between management strategies and from current state are small
2. Climate change has stronger impact on U - Strong CC will probably cause worsening of considered ES bundle, medium and sligth CC will promote the provision of considered ES
3. The improved provision of wood/bioenergy production, risk regulation and biodiversity and worsened water regulation, carbon sequestration and recreation will be highly probable in the future
4. Changes in nature conservation and ownership structure will not significantly affect the analysed ES
5. The preference of management strategy vary among actors in dependence of CC scenario – final result BAU vs. Alternative management 5-4

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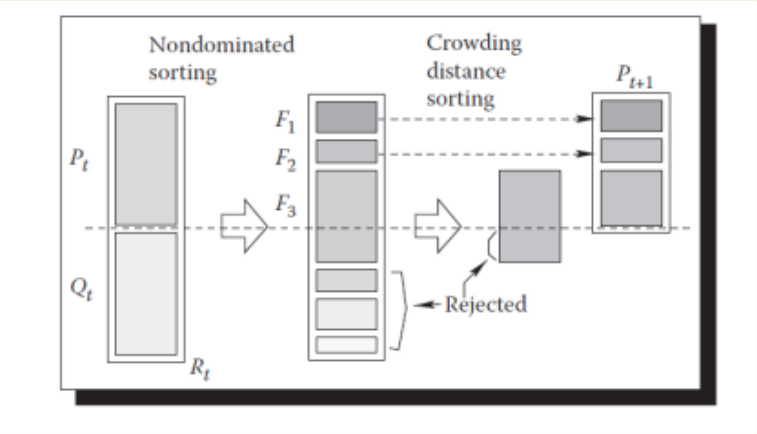
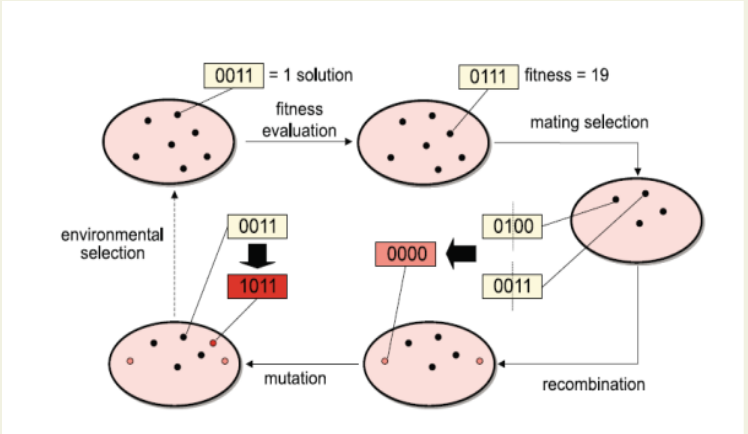
Evolutionary heuristic optimization – promising tool for forestry planning

Evolutionary alghorithms NSGA-II (Deb et al. 2017) and SPEA-II (Zitzler et al. 2004)





The two phases of general optimization approach (3-4) are iteratively rotated untill the set (or population) of multicriterially optimal solutions is founded:

1. The initial population) of alternative FMP is randomly generated and provision of ES is evaluated for each individual plan
2. **Iterative „breeding“ of FMP** till set of **Pareto optimal FMP** is obtained in final generation
3. **Selection of one final Pareto optimal FMP with ES provision prefered by** end user or group of end-users

Our final intention ...

ALTERFOR

Thank you for your attention !