SUSTAINABLE INNOVATIVE MOBILISATION OF WOOD

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D 2.2. –EUROPEAN SUMMARY REPORT OF REGIONAL PROFILES OF WOOD MOBILISATION CHALLENGES		
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R	*Report*	**x**
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SUMMARY	
Keywords	**Policy; regional outlook; model regions; ownership; governance; management; forest functions; harvesting; focus studies**
Abstract	An overview of the European policy framework for wood mobilisation and an analysis of the future outlook on wood mobilisation in Europe is given. The current state of knowledge regarding wood mobilisation in the regions is also outlined. The overview shows that a large number of the EU's policies and initiatives affect forests. These policies influence wood mobilisation either through incentives or through restrictions to protect the climate and environment. In the context of the EU's Renewable Energy Directive an increase in demand for woody biomass is projected. Based on current supply and demand, a significant shortfall in woody biomass from within EU resources is expected which may have be filled by imported chips and pellets. Yet based on assessments of the theoretical levels of wood supply within the EU it is evident that current EU forests are underutilised and hence could potentially be used to address the increasing demand. The actual availability of these untapped wood resources however is influenced by a wide range of technical, social and logistical factors. The 17 SIMWOOD regions were selected to represent a range of forest types and a range of experience in forest governance and wood mobilisation. They were also considered to share the common trait of having a strong potential for further wood mobilisation. An initial assessment of the state of knowledge regarding wood mobilisation in each of the model regions is presented. A cross-regional synthesis confirms that a range of forest types is represented in the regions. In some, plantations dominate; in others, natural forests are most common. The sites on which the forests are found also vary; in some regions these are predominately found on steep slopes, in others they are typically found on flat ground. Despite these differences the regions share common characteristics that influence wood mobilisation. Fragmentation is common, particularly in the private forests owned by individuals or families (i.e. non-industrial private forest owners-NIPF owners). In many regions the growing spatial and/or emotional detachment of owners from their forests was noted as was the lack of forestry knowledge and skills among owners. The attitude to governance, the tradition of forest management and the historical policy focus differs between regions. Nevertheless, a number of factors related to the governance domain were shown to influence wood mobilisation. These include the need for: more owner associations; less complex regulations; and greater communication and trust among stakeholders. A need for management plans and better organisation among the industry was also identified. The need for management plans was also identified under the forest management domain as a very relevant factor in the context of the provision of wood and other goods and services of forests. While the forest type varies in the regions an unbalanced age class structure (with a dominance of young and overmature stands) and an increasing importance of mixtures is common in many. The age structure shows the importance of first thinning operations in young stands (including biomass commercial thinning) and late thinning and harvest operations in over-mature stands. Further over-mature stands are more vulnerable to natural hazards. Thinning in these over-mature stands could help to (1) mobilise wood, (2) increase the resilience against hazards and (3) promote

	the growth of higher dimension wood that can occupy alternative premium market niches (i.e. veneer wood). The increasing proportion of mixed species stands will pose challenges for management and wood mobilisation as knowledge of silvicultural interventions in such stands is limited. Increasing wood mobilisation must ensure that other forest functions are not negatively affected. In general forest functions were not considered as constraints to wood mobilisation in the SIMWOOD regions, with some exceptions. Conflicts between mobilisation and water related functions and services are anticipated, particularly in streamside forests and forests in steep slopes. Income is considered of high importance when considering wood mobilisation in the regions. Means of reducing harvesting costs and hence increasing income were identified including getting owners to associate when undertaking management and forestry operation. The need for markets for hardwoods to be developed in some of the regions to motivate owners to mobilise their timber was also identified. A prerequisite to wood mobilisation is the provision of an adequate road and trail network. A lack of access was identified as a barrier to wood mobilisation in three of the regions. In some regions the level of mechanisation of harvesting is high, however, there is an inadequate number of such machines. In others the lack of mechanisation is a challenge. Particular wood mobilisation challenges were identified for regions with sloped terrains and sensitive soils. Many data/knowledge gaps were identified in the profiles. Nineteen focus studies were conducted to address these gaps. A broad range of topics were covered in these studies including: forest owners, their motivations and their skills as well as those involved in the contractor sector (8 studies); demand for wood (on a European level and local level) (2 studies); and supply of wood and non-wood products (2 studies). In addition a number of regions choose to develop tools that could be used to increase mobilisation (7 studies). The results of these studies are summarised in this report.

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Content of Deliverable

This report sets out to present a summary of the regional profiles of wood mobilisation challenges. It presents the final results of WP2, the objectives of which were to:

- assess the current state of knowledge in the model regions (see Figure 1) in all socio-economic, technical and environmental domains relevant for stronger wood mobilisation and carry out specific studies to close urgent knowledge gaps;
- collect a comprehensive set of best-available, consistent data and information on wood mobilisation domains for a range of forest types, and the European context;
- identify the model regions' main barriers and opportunities for stronger wood mobilisation.

The report includes a cross-regional synthesis of the profiles of wood mobilisation that have been produced for each of the regions. These profiles provided:

- an overview of data/knowledge that currently is available in the model regions relating to wood mobilisation[1] by identifying and collating data from a wide range of sources;
- information on the knowledge gaps that exist that may be constraining wood mobilisation;
- a description of local initiatives that have tried to address the problem of mobilisation of wood, i.e. local solutions.

Many data/knowledge gaps were identified when completing the regional profiles. Some of these gaps arose because no data were available at the regional level or national level and resources beyond those of SIMWOOD would have been required to address them. The majority of the SIMWOOD partners chose to address a particular data/knowledge gap in the profile through a focus study (Annex 1).

The information collated in WP 2 and presented here provides the contextual information needed in WP 3 to identify the factors that have contributed to particular wood mobilisation outcomes in the Regions. The information collated also contributes to the SIMWOOD Information system, in WP 5.

1 Wood mobilisation is defined as the factors and processes involved in bringing wood to market in the context of sustainable forest management.

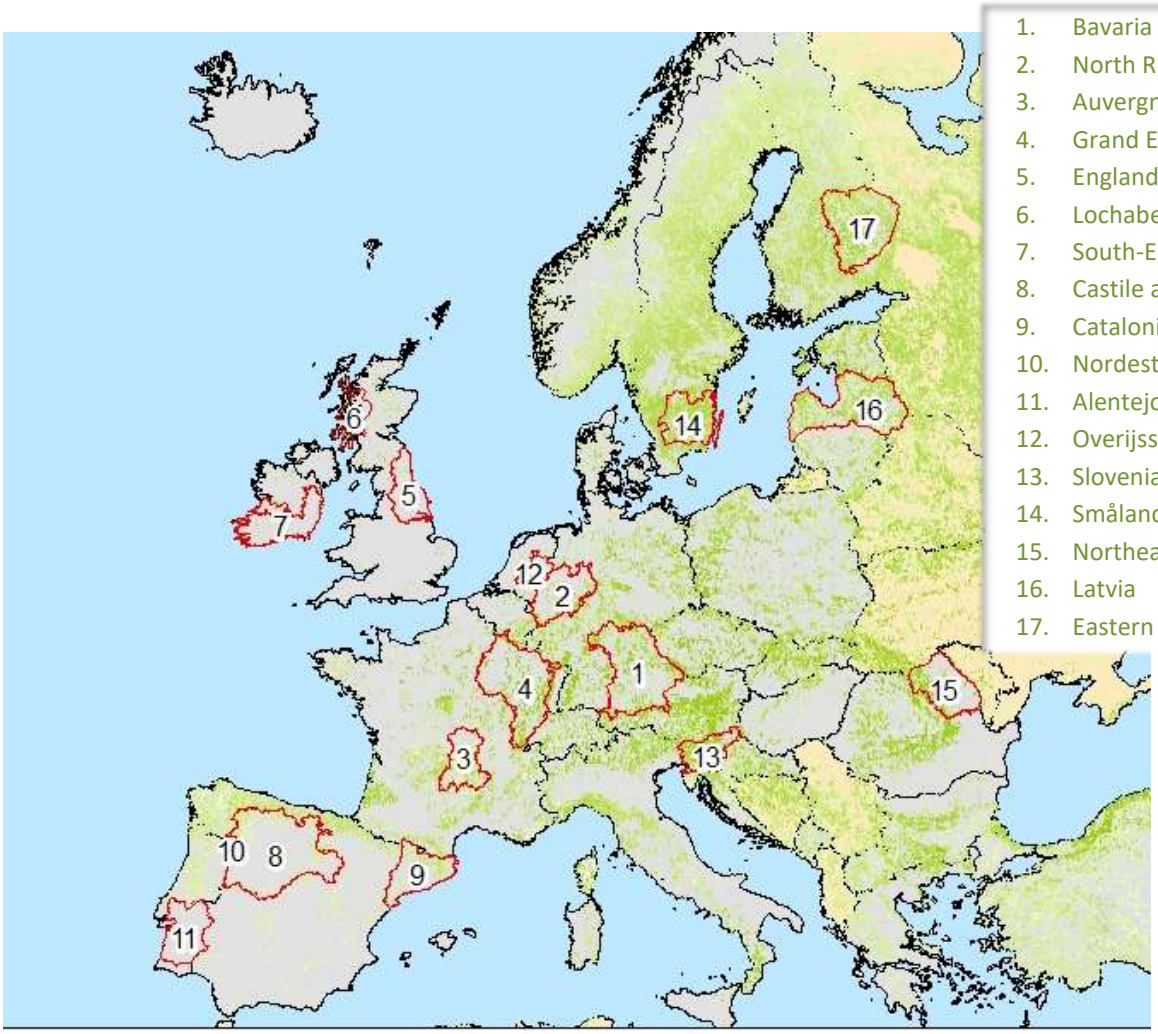

Figure 1. SIMWOOD Model Regions.

Methods

Wood mobilisation involves a complex interplay of socio-economic, demographic, political, technical and environmental factors. In this study, these factors were organised into five domains, i.e. forest ownership, forest governance, forest management, forest functions and forest harvesting. To gain an understanding of the present situation in the regions, SIMWOOD partners were requested to produce a profile of their region by completing a common questionnaire. The questionnaire was divided into two major sections. The first section provided the contextual information, which gives an overview of the situation in relation to the forests and forest owners in the region with an emphasis on characteristics that influence wood mobilisation. The data requested in this section were organised into the five domains as outlined above. When devising the questionnaire, the domain experts had the main responsibility for identifying the list of items to be addressed under each domain. In this section partners were provided with the first opportunity to identify the five key factors that influence wood mobilisation in their region.

Partners in each region were requested to use the data sources available to them, including national and regional databases as well as published research findings and grey literature. In compiling the profiles, SIMWOOD partners were requested to identify the source of the data and to provide some indication as to the quality of the data i.e. if data were derived from surveys the sample size and the form of sampling etc. should be noted. If the information/data were not available from such sources expert opinion was used with respondents requested to identify the organisation in which the expert was based.

Section 2 of the template gave the SIMWOOD partners the first opportunity to identify and describe in detail initiatives, i.e. solutions that have been successful in increasing wood mobilisation in their region.

Overview of the European policy framework for wood mobilisation

(Sarah Mubareka and Richard Sikkema, JRC, Belgium)

The European Union does not have a common forestry policy. Given the absence of the provision of forest policy in the Treaties establishing the European Union, the National Forest Programmes are the basic policy tools for the forest sector in Europe. The responsibility for forest policy lies therefore with Member States. The multi-functionality of forests however, has resulted in many of the EU's policies and initiatives affecting forests. Figure 2 provides an overview of the relevant policy to wood mobilisation within their relative sectors in chronological order.

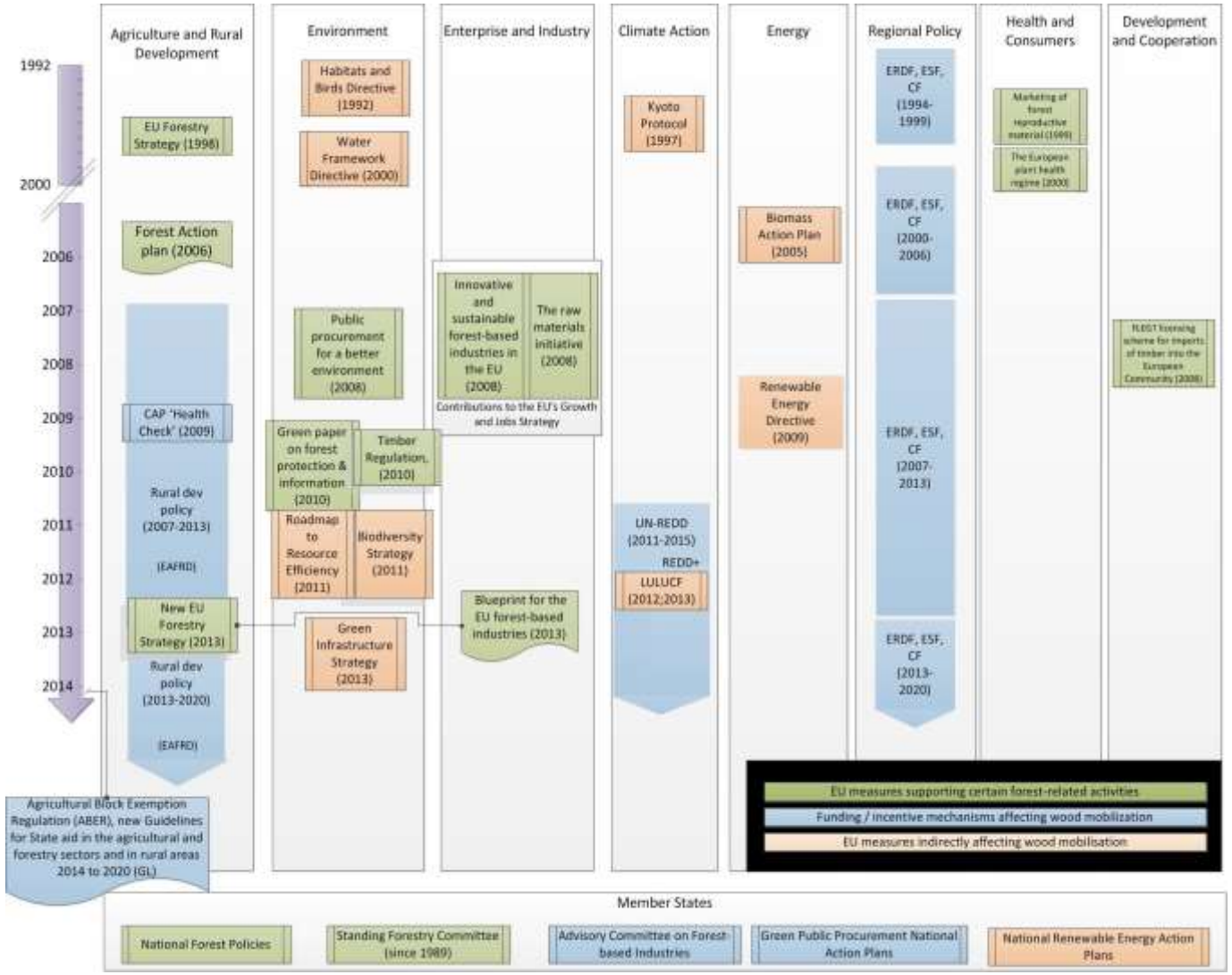

Figure 2: Overview of policy areas affecting wood mobilisation.

The 1998 EU Forest Strategy, a basic charter on a forest strategy for Europe, addresses the need for better integration of forests and their derivatives, in all relevant policy sectors. The new EU Forestry Strategy, adopted by the European Commission in September 2013 (COM(2013) 659), proposes an EU reference framework to be used when drawing up sectorial policies that will impact forests. Accompanying the new EU Forest Strategy is a blueprint (SWD(2013) 343), which specifically addresses measures to be taken within the European wood-using sector.
Policy affecting wood mobilisation, either through incentives or through restrictions to protect the climate and environment, are summarised in Table 1 by policy area and by their effect on wood mobilisation within Europe. The policy is further categorised according to the domain topics, as they are described throughout the SIMWOOD project.

Table 1. Summary of policy areas affecting wood mobilisation in Europe; by SIMWOOD domain.

Policy area	Policy	Effect on wood mobilisation (by domain)
Environment	Birds and Habitats Directives[2] Water Framework Directive[3] Green Infrastructure Strategy[4]	Governance Functions Management Harvesting
	Resource Efficiency Roadmap[5] EU Timber Regulation[6]	Governance Management Harvesting
	LIFE+ Green Public Procurement[7] Eco labelling[8] Waste Directive[9] (wood cascading)	Functions Management Harvesting Governance
Climate Action	Kyoto Protocol[10] LULUCF[11] UN-REDD[12]; REDD+[13]	Governance Management Harvesting

[2] Directives 92/43/EC & 79/409/EC
[3] Directive 2000/60/EC establishing a framework for the Community action in the field of water policy
[4] COM(2013) 249 final Green Infrastructure (GI) and SEC(2013)155 final Technical information are a key step in implementing Target 2 of the Biodiversity Strategy that requires that 'by 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems'
[5] COM(2011) 571 final Roadmap to a Resource Efficient Europe, containing references to the Communication on the sustainable competitiveness of the construction sector, 2011 and the Communication on sustainable buildings, 2013
[6] Regulation (EU) No 995/2010 laying down the obligations of operators who place timber and timber products on the market
[7] COM (2008) 400 final Public procurement for a better environment
[8] Regulation (EC) No 66/2010 on the EU Ecolabel and the 'Commission Decision of 30 November 2009 on establishing the ecological criteria for the award of the Community eco-label for wooden furniture (2009/894/EC)
[9] Directive 2008/98/EC Waste framework Directive
[10] http://ec.europa.eu/clima/policies/forests/docs/kpeng_en.pdf
[11] Decision No 529/2013/EU on accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry and on information concerning actions relating to those activities and COM(2012) 94 final Accounting for land use, land use change and forestry (LULUCF) in the Union's climate change commitments
[12] http://www.un-redd.org
[13] REDD+ is a climate change mitigation solution that many initiatives, including the UN-REDD Programme, are currently developing and supporting. Other multilateral REDD+ initiatives include the Forest Carbon Partnership Facility (FCPF) and Forest Investment Program (FIP), hosted by The World Bank

Energy	Renewable Energy Directive[14] National renewable energy action plans[15] Sustainability requirements solid biomass[16] State-of-play sustainability requirements[17] Climate and energy policies 2030[18] Biomass Action Plan[19]	Harvesting Governance Management
Enterprise and Industry	Contributions to the EU's Growth and Jobs Strategy Blueprint for the EU forest-based industries (2013)	Management Harvesting Governance
Regional Policy	ERDF[20], ESF[21],CF[22] Support for SMEs	Management Harvesting
Agriculture and Rural Development	EU Forestry Strategy (1998) Forestry Action Plan (2006) New EU Forestry Strategy (2013) EAFRD[23] ABER[24] GL[25] Health Check[26]	Management Functions Governance Harvesting
Health and Consumers	Plant disease, plant health control[27]	Management Governance
Development and Cooperation	FLEGT[28]	Harvesting

[14] Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC
[15] Directive 2009/548/EC Establishing a template for NREAP's under Directive 2009/28/EC
[16] SEC (2010) final 65 Report to the Council and the European Parliament on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling.
[17] SWD (2014) 259 final State of play on the sustainability of solid and gaseous biomass used for electricity, heating and cooling in the EU
[18] COM (2014) 15 final A policy framework for climate and energy in the period from 2020 to 2030
[19] COM(2005) 628 final Communication from the Commission of 7 December 2005 – Biomass Action Plan
[20] European Regional Development Fund, Regulation (EU) No 1301/2013 of the European Parliament and of the Council of 17 December 2013 on the European Regional Development Fund and on specific provisions concerning the Investment for growth and jobs goal and repealing Regulation (EC) No 1080/2006
[21] European Social Fund, Regulation (EU) No 1304/2013 of the European Parliament and of the Council of 17 December 2013 on the European Social Fund and repealing Council Regulation (EC) No 1081/2006
[22] Cohesion Fund, Council Regulation (EU) No 1300/2013 of 17 December 2013 on the Cohesion Fund and repealing Council Regulation (EC) No 1084/2006
[23] European Agricultural Fund for Rural Development, Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005 (90% of EU funding to the forestry sector comes from this)
[24] Agricultural Block Exemption Regulation, Regulation (EU) No 702/2014
[25] new Guidelines for State aid in the agricultural and forestry sectors and in rural areas 2014 to 2020, Regulation (EU) No 702/2014
[26] Official Journal of the European Union, L 30, 31 January 2009
[27] Directive 2000/29/EC, the European plant health regime
[28] Forest law enforcement, governance and trade, Regulation (EU) No 995/2010 laying down the obligations of operators who place timber and timber products on the market and Regulation (EC) No 1024/2008 laying down detailed measures for the implementation of Council Regulation (EC) No 2173/2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community

EU funding and incentives related to wood mobilisation

The Common Agricultural Policy (CAP) is the main source of EU funds for forests, with roughly 90% of EU funds for forests coming from the European Agricultural Fund for Rural Development (EAFRD, Regulation (EU) No 1305/2013). The main measures specifically relating to forestry concern investment in developing forest areas and improving the viability of forests; restoration of damaged forests and damage prevention; improved resilience and environmental value of forest ecosystems; investment in forestry technologies and processing; mobilisation and marketing of forest products, as well as forestry, environmental and climate control services and forest conservation. Funding for forest-related climate change measures; renewable energy; water management and biodiversity measures was further made available under the CAP 'Health Check' (undertaken in 2009). It is up to Member States to decide which forestry measures they will implement. Regulation (EU) No 702/2014 of 25 June 2014 declaring certain categories of aid in the agricultural and forestry sectors and in rural areas compatible with the internal market in the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union facilitates the administrative burden for owners to claim assistance. Some measures may lock wood potential, while others may encourage unlocking of this resource.

Under **regional policy**, forestry projects can be co-financed by the European Regional Development Fund (ERDF). Two mechanisms exist at EU-level to help Member States with costs incurred from major natural disasters, such as storms and forest fires: 1) ESF, the Solidarity Fund (Regulation (EC) No 2012/2002); 2) the Community Civil Protection Mechanism (Decision 2007/779/EC). Supporting the development of renewable and alternative energy sources is a key objective for the structural and cohesion funds. The EU and the Member States can therefore promote the development of renewable energy sources through regional policy. This may contribute to the funding of small and medium enterprises (SMEs) in encouraging innovative means for unlocking the potential of renewables from the forest-based sector.

Under EU **environment policy**, the approximately 37.5 million hectares of forest belonging to the Natura 2000 network for nature protection are covered by a financial instrument, LIFE+, supporting various forestry projects. Also under environment, the EU promotes ecological tendering under the Communication *Public procurement for a better environment* (COM(2008) 400), which may encourage demand for sustainably produced wood. Another cornerstone for the EU's sustainable wood supplies is voluntary certification of sustainable forest management (SFM), both for harvested wood destined for the manufacturing sector or the bioenergy feedstock market. In addition to forest legislation within a country, sustainability schemes and standards are meant to prevent a range of unwanted socio-economic and environmental consequences, such as negative impacts on biodiversity (Englund and Berndes 2014). At present, there are two major SFM frameworks: Forest Stewardship Council (FSC) and the Programme for Endorsement of Forest Certification (PEFC 2013; FSC international Center 2014). The UK, as a frontrunner, has used these SFM certification frameworks as a basis for its legal framework for renewable energy, starting in 2015 (Sikkema et al 2014). Furthermore, the FLEGT Action Plan (Development and Cooperation policy) provides for 'Voluntary Partnership Agreements' with wood-producing countries and a regulation to ban the marketing of illegally harvested wood came into force in March 2013 (Regulation (EU) No 995/2010). Under the EU's **climate policy**, funding for projects under the REDD+ Programme to reduce emissions linked to deforestation and forest degradation in Asia, Africa and Latin America is available.

EU policy affecting wood mobilisation

Several pieces of legislation generated from **environment policy** encompass aspects of wood mobilisation. Directive 1999/105/EC regulates forest reproductive material in which several implementing measures were taken, including exceptions that authorize temporary marketing and planting of otherwise barred or unlabelled seed; or the contrary: national-level authorization to ban

seed. Directive 2000/29/EC, the European plant health regime, aims to prevent harmful organisms spreading to forests to maintain healthy growing stock. The Timber Regulation, Regulation (EU) No 995/2010, describes the obligations of operators who place timber and timber products on the market. The EU Biodiversity Strategy (COM(2011)244 final whose resolution was adopted by Parliament in 04/2012), incorporates aspects of Green Infrastructure (COM(2013) 249 final), directly related to the spatial structure of natural areas such as forests. This Strategy stipulates that sustainable forest management plans for publicly owned forests must be in place by 2020. This, together with the Water Framework Directive, which encourages forest management techniques that are safe - and may even improve freshwater environments- contribute to the multi-functional aspects of forests (a domain to be considered carefully in wood mobilisation). An overarching action is the Roadmap to a Resource Efficient Europe (COM(2011)571). This document encompasses aspects of economic growth with sustainable resource use, with an emphasis on resource productivity.

Under **energy policy**, the EU is addressing the increasing dependence on imported energy by introducing a new energy policy whose three main objectives are competitiveness, sustainable development and security of supply. In the Biomass Action Plan (COM(2005) 628 final), the heat production, electricity production and transport sectors are identified as priorities. Through the Biomass Action Plan, Member States were encouraged to establish national Biomass Action Plans. Following the Action Plan, in the Renewable Energy Directive (Directive 2009/28/EC), the EU has set itself the legally binding target of 20% of total energy consumption coming from renewable energy sources by 2020. This Directive also improves the legal framework for promoting renewable electricity, requiring national action plans to find a way to develop renewable energy sources including bioenergy; and encourages MS to cultivate cooperation mechanisms to help achieve the targets in a cost effective manner. The Directive furthermore establishes the sustainability criteria for biofuels. An overview of the secondary EU legislation (directives and regulations), in force as of April 2014, is available here:
http://ec.europa.eu/energy/doc/energy_legislation_by_policy_areas.pdf

Regarding **climate**, greenhouse gas accounts of forests in industrialised nations are governed by Kyoto Protocol rules for the land-use, land-use change and forestry sector (LULUCF). Policy development related to forests in non- industrialised countries are covered in the “Reducing Emissions from Deforestation and Forest Degradation” framework, UN-REDD and nationally-implemented plans (REDD+). Unsustainable management leads to forest degradation and loss, contributing to greenhouse gas emissions. Since forests and agriculture remove an amount of carbon from the atmosphere equal to about 9 % of the EU's total greenhouse gas emissions in other sectors, management practices can limit emissions of carbon, as well as enhance removals from the atmosphere. In summary, under the EU’s Climate Action policy, initiatives regarding the forestry sector include the Green Paper on preparing forests for climate change (COM(2010) 66); consideration of the role of forests in the EU’s international commitments on climate change (COM(2012) 93); support for halting the loss of global forest cover by 2030 at the latest and reducing tropical deforestation by at least 50% by 2020 (COM(2008) 645).

Enterprise and Industry is also very active in promoting the forest based sector in Europe. The Communication on innovative and sustainable forest-based industries in the EU - A contribution to the EU's Growth and Jobs Strategy (COM(2008) 113 final) - outlines measures to make the forest-based sector in the EU more competitive including aspects related to access to raw materials. The domestic supply of unprocessed wood is therefore encouraged to guarantee availability. This said, a sustainable management of forests is advocated at EU level within Enterprise and Industry. Member States, industries and forest owners are encouraged to promote tree planting and reforestation; use biomass in a balanced way (i.e. not reserving it exclusively for the production of renewable energies);

encourage the development of the recycled paper and wood markets with the aim of increasing the use of recycled paper and wood; continue their efforts to reduce illegal felling and the sale of products derived from illegally felled wood.

Finally, **the Standing Forestry Committee** represents Member States in advising and managing forestry measures. The Committee represents EU Member States, with the European Commission acting as the chair of the Committee. Topics covered by the Committee include rural development, FLEGT, Natura 2000 and forests, research and forest certification. The Committee actively ensures that the EU Forest Action Plan is applied in practical terms, and facilitates exchanges and cooperation between the Committee and stakeholders. It may also prepare recommendations on specific topics.

Future outlook on wood mobilisation

(Richard Sikkema, JRC, Belgium)

EU's renewable energy directive & future outlook

The EU Renewable Energy Directive (RED) strives for mobilisation of domestic and imported (woody) biomass, as detailed in the EU Member State's National Renewable Energy Action Plans (NREAP's) in 2020. A first inventory by the European energy sector (Eurelectric 2011) about the NREAP implications in 2020, projects that about 55 million to 85 million dry tonnes of wood is likely to be sourced from outside the EU-28 for heating and electricity (Table 2).

Table 2. Expected demand for woody biomass for energy in the EU (million tonnes of pellet equivalents).

Demand for all kinds of solid biomass in the EU (electricity, heating & transport)	**Of which demand in the EU for woody biomass sources only**	**Woody biomass covered by domestic sources in the EU**	**Net import of woody biomass (pellet equivalents)**	**Reference**
Detailed prognoses 2020 (with consideration of EU's targets for 2020)				
325 (5.7 EJ)	**Not indicated**	**Not indicated**	**55-85** **(1.1-1.2 EJ)**	EU's Power and heating sector 2020 (Eurelectric 2011)
335 (5.9 EJ)	**225 (4.0 EJ), excluding wood waste**	**175** **(3.1 EJ)**	**51** **(0.9 EJ)**	NREAP's 2020 (DG Energy 2014)
286 – 332 (5.0 – 5.8 EJ)	**Not indicated**	**Not indicated**	**15-22** **(0.3-0.4 EJ)**	Europe 2020 (Hoefnagels et al 2014)
58.3 (solid biomass) NREAP's NW Europe (1.0 EJ)	**Not indicated**	**Not indicated**	**13.5** **(0.2 EJ)**	NW Europe 2020 (Lamers et al 2014)

The latest NREAP's indicate an energy demand (electricity, heating and transportation fuels) of 335 million tonnes (5.9 EJ), to be supplied by all kinds of solid biomass in 2020. The Member States reported that 175 million tonnes can be supplied by woody biomass, excluding post-consumer waste wood[29] (Banja et al 2013). Following the aggregated figures of the individual NREAP's, an additional 95 million m^3 woody biomass could potentially be mobilized from EU forests and the by-products generated from EU forest industries, equivalent to 50 million tonnes, but this is not sufficient to cover the EU's RES target for 2020[30]. The remaining NREAP gap for virgin woody biomass supplies within the EU-28 is calculated to be about 0.9 EJ (51 million dry tonnes). The gap is expected to be largely filled by imported wood chips and pellets. For comparison Hoefnagels et al (2014) and Lamers et al (2014) estimated between 13.5 million and 22 million tonnes external (non EU-28) feedstock needs in 2020. The lower range is valid for major users of solid biomass in the NREAP's NW Europe (Belgium, Germany, Denmark, The Netherlands, and United Kingdom). The upper range is valid for a scenario without sustainability regulations, thus no restrictions on biomass imports.

[29] Unknown volumes of wood waste remain in the EU's municipal (24 million tonne) and industrial waste (13 million tonne) in 2020.
[30] SWD(2014) 259 final State of play on the sustainability of solid and gaseous biomass used for electricity, heating and cooling in the EU

The EU has made official recommendations for the use of solid biomass for heating and electricity in 2020 (Ends Europe 2013). The responsibility for checking the sustainable use of solid biomass for energy production is actually delegated to the level of individual Member States[31] . A limited number of Member States have adopted sustainability schemes and no apparent internal market barriers have been identified thus far. Therefore, at this stage, it is considered that the risk of market distortion caused by national schemes can be effectively managed. For the post-2020 period, an improved biomass policy will be developed for the EU's 2030 Framework on climate and energy, which will minimize the risks of unintended environmental impacts[32].

In March 2014, the European Commission proposed new climate and energy policies to the European Parliament. The goals for GHG emission reduction will be more stringent for the new horizon of 2030: The EU-28 should emit 40% less GHG relative to 1990 levels by 2030 (the current 2020 goal aims at a 20% reduction of GHG emissions). From the proposed 2030 measures, it can also be concluded that the future share of renewable energy sources (RES) will possibly increase, from 20% in 2020 to 27% in 2030. The new measures for extra use of woody biomass involve three sectors (power, heating and transportation) as the EU strives for the new use of woody feedstock, also called 2nd generation biofuels (Van Vliet et al, 2009). Anticipating the new strategy for Europe's bioeconomy, new plans are being prepared through the new EU Forest Strategy, to involve more sectors (e.g. the chemical sector) in using wood as a renewable feedstock for their products. The Commission services are undertaking a number of research activities to assess future biomass availability, in order to inform the development of the post-2020 biomass policy.

Trends in future forest management

New approaches in forest management, with changing harvesting regimes and possible use of fallow land, are also relevant for the additional future supply of woody biomass (Creutzig et al., 2014). For example de Wit and Faaij (2010) suggested a significant increase of supply (depending on the type of energy crop and the actual availability of land), plus the possibility to recover forest harvesting residues. With rising demands for bioenergy from woody biomass, more intensive harvesting is practised or under research in some areas, for example in Scandinavia, the United Kingdom, Canada and the United States (Abbas et al., 2011; Kimsey et al., 2011; Fritsche et al., 2013; Geijer et al., 2014). Usually, only the main part of the tree stem is removed, after which it is further processed by forest industries. Slash (branches and tops), small trees, and roots are harvested together with the main part, but not always removed. In state-of-the art Scandinavian forest practices, it is recovered from the forest site and transported to energy plants. It is not fully understood to what extent new practices will affect environmental and other conditions in boreal and temperate forests and how these practices are covered by SFM frameworks in relevant production regions (Kardell, 1992; Scott and Dean 2006; Thiffault et al., 2010; Walmsley and Godbold 2010; Abbas et al., 2011; Mason et al., 2012; Klockow et al., 2013).

Regarding the EU's private forest sector, with relatively small forest areas, it is uncertain whether the private forest owners are ready to make a change to deliver forest biomass to energy markets instead of wood product markets, at least for stemwood supplies. The recovery of slash and stumps was not taken into account in this forest management and market survey, among 800 private forest owners in Sweden, Germany and Portugal (Blennow et al 2014).

[31] SEC(2010) 65 final Impact Assessment Accompanying document to the Report from the Commission to the Council and the European Parliament on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling COM(2010) 11 final

[32] 2030 Framework for climate and energy policies.
http://ec.europa.eu/clima/policies/2030/documentation_en.htm

Legal harvesting and sustainable sourcing

The expected growth in demand for power, and heat but also other markets has led to increased concerns by non-governmental organizations on the impacts and sustainability of increasing harvests (Greenpeace 2011; Birdlife International 2012; WWF 2012). The EU and European national governments have discussed the possibility of a legally binding agreement on forests and sustainable wood use in Europe, including substitution of energy intensive materials etc. (IISD 2013). The European Union Timber Regulation (EUTR) places specific obligations on operators who place timber and timber products on the EU market and traders that import and distribute the products. The EUTR covers a broad range of wood products, including wood chips and wood pellets for bioenergy use.

The forest harvesting intensity currently varies markedly across Europe. In general, harvest volumes are well below the increment is most regions. The harvesting intensity is relatively high in southern parts of Finland, Sweden, southwest France, Switzerland and Czech Republic (Levers et al 2014). In the latest wood market prospects for all European countries (EFSOS-II), it is expected that the harvest may considerably increase in a scenario that promotes bioenergy (UNECE 2011).

EU Waste directive & cascaded use of wood

An important point meriting attention, is the cascaded use of wood first for material purposes and ultimately for energy, which makes inclusion of post-consumer waste wood in analyses relevant. The EU Waste Directive (2008/98/EC) prescribes a certain hierarchy for waste, in which cascading should be promoted. Harvesting and industrial wood residues are not regarded as waste and thus not subject to the Waste Directive. Post-consumer wood waste is considered a waste and therefore needs to follow the waste hierarchy. Where possible, post-consumer wood waste should be re-used or recycled after end of life, before using it as a feedstock for energy applications. Certain specified waste “shall cease to be waste after it has undergone a recovery operation, including recycling” (article 6 of the Waste Directive). The re-use of discarded wood products or the recycling of waste fibres into other products is prioritized (cascading), when those processes have no adverse environmental or human health effects.

European power utilities are using regionally sourced post-consumer wood chips (waste wood) as an extra fuel for power production. At the same time, this waste wood is used by Europe’s particleboard sector. The supply of post-consumer waste wood in the EU is roughly estimated to be about 30 million tonnes, of which 10 million tonnes is estimated to be recovered for particleboard, 9 million tonnes for energy and the remainder landfilled (Mantau 2012). Waste wood chips can also be used as a feedstock to produce wood pellets (Hoefnagels et al., 2014b). However, due to international trade restrictions for waste, the production has not yet been developed (van Dam et al 2013). Overall, it is unclear to what extent the current uses of waste wood by the power and particle board sectors are affected by subsidy schemes for RES and how future use of waste wood for recycling and energy use can be increased via international trade. Further, the special status of waste wood, in comparison with the legal and sustainable sourcing requirements for virgin fibres, is not yet well identified.

Conclusions

Future demand and supply of woody biomass for the forest, energy and other sectors need more attention. Based on current forest management and current consumption patterns for virgin wood fibres and recycled wood, future wood shortages are expected. The competition between wood for traditional forest industries and wood for the energy sector; and the consequential changing market conditions for wood product manufacturing companies and how they compete with energy utilities, remains virtually unaddressed (Baron et al., 2013). To illustrate the current use (2012 data) of energy

related feedstock in the forest sector: approximately 70 million tonnes of low quality roundwood, chips and other industrial residues are used by the pulp industry, and 32 million tonnes by the panel board industries in the EU-28 (CEPI, 2013; Hendrickx, 2010; Sikkema et al., 2014). In a recent inventory for DG Enterprise, it was highlighted that both the use of roundwood from forests and residues for forest industries is expected to increase in order to cover the growing demand for forest products and bioenergy (Indufor, 2013). Other feedstock studies (Raunikar et al., 2010; Buongiorno et al., 2012; Hänninen et al., 2014) predicted additional sources of biomass for bioenergy, by including harvest residues (e.g. slash) to the existing feedstock supplies. These studies also forecasted that with increased subsidies for energy plants, pulpwood in particular, would be reallocated from its traditional forest sector use to the bioenergy sector. In terms of volumes, it remains unclear how the markets will be affected and to what extent the EU should rely on its own supplies to fulfil the demand for woody biomass in 2020 and beyond.

Forests are a major natural resource that fulfil multiple functions. As well as being part of landscapes, ecosystems, natural cycles and biological diversity, they also represent the backbone for production and employment in forestry and numerous industries that all use wood as primary raw material. The forest-based sector plays an important role in sustainable growth, local employment and climate change mitigation (Schreiber, 2013). Boreal and temperate forests in the Northern hemisphere hold a considerable unused potential of wood resources. Utilization of those forest resources can be increased considerably, because current harvesting levels are generally below the margin of sustainable allowable cuts or net increment rates (Federal forest agency 2009; NRCan 2011; Forest Europe 2011; FAO 2012; Levers et al 2014). However, better information on the possible impacts of increased overall woody biomass removals from EU forests is required. The amount of sustainable extra removals that are possible, and to which extent these removals will be in line with the long-term increment of a country's forest area, are to be quantified.

Alternative methods need to be investigated further. For example, slash and stump recovery may appear as a viable approach, but the ecological effects of this practice should be carefully considered. In some Member States, landfilling practises for wood waste (integrated into municipal or industrial waste) are still ongoing. It is relevant to inventory whether these integrated waste streams should instead be directly incinerated for energy (with state-of-the-art conversion rates) or should be separated into different waste types. In case of post-consumer waste wood, separation makes sense, only if the waste wood volumes are sufficient and appropriate for further recycling in products or pellets (cascading principle). So far, the potential of waste wood per Member States remains unknown, as the NREAP's do not distinguish wood in the municipal and industrial wastes.

Results and Discussion

Forest ownership

(Áine Ní Dhubháin, NIUD-UCD, Ireland)

To understand wood mobilisation, it is necessary to know who owns the forests in the model regions and to know more about the forest structure. In the first section of the profile those who own the forests in the region were identified and the size distribution of the forests estimated. Additionally, information on the socio-demographic characteristics of a subset of private forest owners (i.e. non-industrial private forest owners) was also queried. Information about the aims and objectives of private owners for their forests was also requested. Finally, in the ownership section, data on the extent to which private forest owners were harvesting their forests were requested.

Who owns the forests in the model regions?

The extent of private forest ownership in the model regions ranges from 28% (Nord-East Romania) to almost 100% (Alentejo). In the former region the restitution process is on-going. In seven of the 17 model regions private forest ownership accounts for between 41% and 66% of the forest estate; in a further six, private forest ownership exceeds 66%. In Lochaber private ownership is only 33%; however, in this region there is a large area where ownership is not known. There is considerable regional variation within countries. In Grand-Est private forests account for 41% of the total forest cover; in the second French region, Auvergne, the percentage is much higher at 85%. Similarly, in Spain, private forests account for 50 to 70% in the two model regions.

Private forest owners are a heterogeneous group. They include industrial private owners (i.e. companies, co-operations; private investors); non-industrial private multiple owners (groups of individuals jointly owning forest land); and non-industrial private forest owners (individual and family owners) (NIPF owners). In many of the model regions ownership data were not available for such sub-categories. In general, in those model regions where such data were supplied, NIPF ownership dominates (i.e. Grand-Est, Yorkshire & North-East England, Nordeste, Auvergne, Nord-East Romania and Eastern Finland). The exception was Overijssel & Gelderland, in the Netherlands, where non-industrial private multiple ownership is the predominant form of private ownership. In Eastern Finland industrial private ownership accounts for a significant proportion of the forest area, i.e. 17%. In the other regions this ownership category was small (where such data were available); although in Grand-Est it did account for 15% of the forest area.

Variation in the level of state ownership was also noted. For example, in Nordeste, in Portugal, none of the forest area is in State ownership. In contrast in South-Eastern Ireland the State is the predominant forest owner (i.e. accounting for 53% of the forest area). Municipal forests are non-existent in some model regions (e.g. in South-Eastern Ireland; Småland and Slovenia) but in others (e.g. Grand-Est and Castile and León) they account for more than one third of the forest area.

What is the size distribution of the forests in the model regions?

Fragmentation of forest ownership has been identified as a key challenge to wood mobilisation (Stern et al., 2012) and it is a phenomenon that is particularly associated with private forests arising either from the restitution process in Eastern Europe or inheritance patterns. While the size of holding only provides one element of the fragmentation picture it nevertheless serves as a useful indicator.

Details on holding size were not supplied in some model regions, e.g. Småland. Where data on holding size was supplied, the size-classes used varied (reflecting the variation in size-classes used in national/regional databases), making cross-regional comparisons difficult. Nevertheless a number of

common trends were evident. First, NIPF owners tend to own small forests; the proportion of such owners with forests of less than one hectare is as high as 63% in Slovenia and 52% in both Bavaria and Catalonia. In contrast in South-Eastern Ireland only 13.8% of owners own such small areas.

To facilitate cross-regional comparison the categorisation reported in most profiles is used, in the profiles this is the size category "less than 10 hectares". Most NIPF owners in the model regions own less than 10 hectares of forest (Table 3); however, forests of this size, in general, account for a much smaller proportion of the total area of private forests. In Eastern Finland holdings of less than 10 hectares are less common than in any other region, accounting for only 34.6% of all NIPF holdings and less than 5% of the area owned by NIPFs (Table 3).

Table 3. The percentage of NIPF owners/area in the < 10 ha category.

	Region	% of owners	% of area
1	Bavaria[1]	94	49.0
2	North Rhine-Westphalia	Not known	25.0
3	Auvergne	85	56.0
4	Grand-Est	68	66.0
5	Yorkshire & North-East England	75	24.0
6	Lochaber	87	20.0
7	South-Eastern Ireland [1]	73	33.7
8	Castile and León	Not known	Not known
9	Catalonia	90	18.8
10	Nordeste	Not known	66.0
11	Alentejo	Not known	Not known
12	Overijssel & Gelderland	Not known	Not known
13	Slovenia	96	59.7
14	Småland (Sweden)[2]	Not known	Not known
15	Romania	Not known	Not known
16	Latvia	78.5	10.5
17	Finland	34.6	4.8

1. All private forest owners
2. Average private forest size = 49 ha

Characteristics of owners

Age

It has been noted that few European private forest owners are less than 30 years of age, and in many countries, a large proportion is over 60 years (Schmithüsen and Hirsch 2008). Where this information is available in the model regions it confirms this trend. The average age of forest owner ranges from 51 years in Slovenia to 64.7 years in Auvergne. In Eastern Finland it is lower, with 61% being in the 30-60 age category. The proportion of owners older than 60 years is high (i.e. 49% in Catalonia; 68 % in Auvergne; 72% in Grand-Est). In Bavaria 28% of forest owners are older than 65 years. For some model regions no data on the age structure of forest owners are available (e.g. Castile and León; Overijssel & Gelderland, Nord-East Romania); for others only national statistics are available (e.g. Yorkshire & North-East England). The age structure of forest owners can have implications for wood

mobilisation; with Kuuluvainen et al. (1999) noting that older forest owners tended to harvest less volume per hectare than younger ones.

Gender

The gender of forest owners has been shown to influence wood mobilisation. For example, Lidestav and Ekstrom (2000) found that female forest owners carried out less final felling, thinnings and other cuttings than male owners. They also found that the total harvested volume from the three types of cuttings did not differ according to the gender of the owner. Obtaining gender data on forest owners can be challenging, even at the national level. In the profiles very few model regions provided data on the gender profile of private forest owners. A contrast is evident from those who did with one group of model regions indicating a relatively large proportion of female forest owners i.e. greater than 30% in Bavaria, Slovenia, Småland, Latvia and Nordeste and in another group comprising North Rhine-Westphalia and Catalonia the percentages are much lower, i.e. 14% and 12%, respectively. In Alentejo, data on agriculture owners were given as a proxy for forest owners as no such data are available. As exclusive forest owners are rare those compiling the Alentejo report considered that errors associated with using such a proxy would be minor. Data on gender of owners is provided for this region with 22% of owners female. This is a similar percentage to that reported in Eastern Finland.

Marital status/family status of owners

Only two model regions supplied data on the marital/family status of private forest owners, i.e. North Rhine-Westphalia where 76% of owners are married and had 2.7 children on average and Alentejo where 74% are married with 53% with children.

Occupation

Traditionally forest owners in Europe have been farmers. However, the proportion of owners who are farmers has been declining in recent decades arising from structural changes in agriculture and the transfer of ownership from farmers to non-farmers through inheritance or the sale of lands (Van der Ploeg and Wiersum 1996; Ripatti and Jarvelainen 1997). A small number of model regions supplied information on the proportion of owners who are farmers; the proportion ranges from 83% in South-Eastern Ireland to only 12% in Grand-Est. In the latter most owners are retired. In some model regions the location of the residence of the owner was used an indicator of the owner's occupation; in Sweden 78% live at their own forest estate or in the same municipality; in Slovenia 70% owners live within 19 km of their forests.

Training and knowledge of owners

Owners who have had training and/or availed of extension activities are more likely to mobilise wood (Ní Dhubháin et al. 2010). Few regions had information on the forestry knowledge and training of forest owners. For those that did report such figures the figures range from 28% of owners in Catalonia to 77% of owners in Nordeste (it should be noted that the data from Nordeste related to farmers rather than specifically forest owners; however as almost all forests are owned by farmers the authors of the Nordeste report considered the values valid for forest owners). In Grand-Est just over half the forest owners have had information or training on forestry practices; in North-Rhine Westphalia a slightly smaller percentage of owners had some forestry education/training. In Nord-East Romania survey data suggest that most forest owners do not have forestry education. In Eastern Finland survey data indicate that 35% of owners have participated in mass training and 14% in group training.

Objectives of owners

Understanding owners' objectives is essential to understanding/influencing wood mobilisation. Those objectives can be determined directly from owners through surveys or can be interpolated from management plans or regional designations of forest land by forest functions. In very few model regions were surveys of owners' objectives reported on. The data from the model regions suggest that many private forest owners do have timber production as an objective. For example, in Ireland survey data showed that 88% of private forest owners have timber production as their primary objective; similarly a survey in North-Rhine Westphalia found that 77% of private forest owners manage their forests on a regular basis – 89% producing timber for sale. In Catalonia 70% of the area owned by NIPFs is used for timber production. In Auvergne, only 2.3% have wood production as their sole objective, a further 37.3% have multiple objectives that include wood production. In Alentejo 65% of the forest area privately owned has wood production as an objective.

Holding multiple objectives also seems common for private forest owners. In Småland the majority of the private forest area (94%) has multiple objectives including timber production; similarly in Castile and León it is estimated (expert estimation) that almost 92% of owners have multiple objectives including timber production for their woods. In Eastern Finland just over one-third of NIPF forest land is classed as having a timber production objective with a further 44% being assigned a multiple-use objective. In Grand-Est and Auvergne amenity is an important objective of owners (40% and 38.7% respectively); with a further 39% having multiple objectives including wood production. A similar trend was noted in Bavaria. In Lochaber it was estimated that most forest owners hold multiple objectives for their forests.

In other model regions i.e. Nordeste, only small a proportion of the private estate is considered to be managed (i.e. on 13%).

In some model regions it was not possible to distinguish objectives according to ownership categories; instead figures are given for all forests, e.g. in Slovenia (based on information from regional management plans) 64% of the forest area has wood production as a primary objective. In others only national statistics were provided (e.g. Yorkshire & North-East England).

Harvesting activities of private forest owners

Although of key relevance to wood mobilisation there is limited information available on the proportion of the forest area which is routinely harvested and the proportion of owners that harvest. Only a small number of model regions supplied regional data on the harvesting activity of owners over the previous 5-year period. The sources of these data varied. In Bavaria, survey data were used to indicate that 6-10% of owners have not undertaken harvesting in their forest over the previous 5 years. Those owning large areas (> 20 ha) tended to harvest solidwood/pulpwood rather than fuel (energy) wood, those with broadleaves were more likely to harvest energy-wood. In contrast the proportion of forest owners who had not harvested (in the previous five years) in both French regions is much higher (i.e. ~50%). However, this does not imply that 50% of the area is not harvested and in the small holdings that dominate in this region harvesting is usually only carried out every ten years (thinnings) or 40 years (in the case of coppices). The Grand-Est region supplied particularly detailed data on harvesting activities in private forests; this is possible as a private forest owners' enquiry (applies to those owning greater than 1 ha) is conducted there routinely. In Slovenia data were available on the number of owners who have harvested; this varies from year to year, but never exceeds 50%. In Eastern Finland 62% of NIPFs were shown to have at least one timber sales agreement in a period. In Småland expert opinion was that 30% of owners had harvested in the past 5 years; primarily using hired labour.

Other model regions provided data at the national level (i.e. Overijssel & Gelderland for the Netherlands) where 50% of private forest owners (i.e. NIPF owners and NIP multiple ownership) had not harvested in the previous 5 years. Yorkshire & North-East England also provided an estimate of the area harvested from private forests which they obtained from a combination of felling licence records and NFI data on the area of woodland felled; data on the percentage of owners who harvest were not available. In Catalonia the area of private forest that had a management plan was used as a proxy for the harvesting activities of owners as was the case in Nord-East Romania; in the latter only 70% of private owners have such a plan.

Forest Governance

(Bianca Ambrose-Oji and Anna Lawrence FCRA, UK)

Understanding how and why forest owners and businesses are able to mobilise wood in different contexts means that we have to explore the decision-making context influencing them. This is the governance domain. It includes forest owners and the other people and organisations that have an influence on their behaviour. It also includes the policy tools and other mechanisms such as regulations and incentives that present barriers and opportunities to action, as well as the advice and decision support mechanisms that owners view as legitimate and useful. So, in summary the governance domain includes the actions and influence of:

- actors and organisations;
- projects and programmes;

and governance interventions affecting wood mobilisation include:

- regulations;
- incentives;
- advice and information;
- decision support systems.

Governance innovation can be combined with technological innovation to stimulate increased mobilisation. For example, more appropriate harvesting technology often needs to be combined with financial incentives, or advisory services, in order to support owners to adopt the technology. Projects and programmes are interventions which combine various innovations (governance plus or minus technological) as a package.

Research by SIMWOOD in each of the model regions emphasised that several key factors affect the governance context in each region, and the impact this had on wood mobilisation, including:

- general attitude to 'soft' vs. 'hard' governance, i.e. to the balance between persuasion through advice and incentives, and compulsion through regulation, monitoring and inspection;
- tradition of forest management – many regional profiles refer to tradition, and the effect this has on owners' interest in engaging with wood mobilisation and other policy agendas;
- historical policy focus – for example in some model regions the focus has been on forest planting and expansion, with less attention to mobilisation.

Actors and organisations

Table 4 summarises which *types* of organisation were mentioned in each region, these include:

- public institutions;
- owner association;
- non-government /non-profit organisations;
- service providers (e.g. forestry consultants).
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For example, it is interesting to note that the forestry sector in Finland is very well populated with a range of organisations that serve the interests of the large array of public, industrial and small and medium sized private non-industrial owners. This includes industry organisations promoting the interests of large industrial companies, as well as local level Forest Management Associations (FMAs) to which more than 65,000 non-industrial woodland owners belong to. In Latvia, the Latvian Forest Owners Society acts as a lobbying body pressing government to simplify regulation, instate incentives and compensatory schemes, as well as promoting forest management practice. There are also four private owner co-operatives which provide networks that enable non-industrial woodland owners to better access advice, equipment and access to markets. In other regions the situation is very different. For example, in Romania the transition from state run to private run forests is still ongoing, and two important owner associations have only recently been formed to represent the interests of private forest owners.

Table 4. Actors and organisations in the model regions available to help woodland owners make decisions regarding woodland management.

Region	Owners' association	Mixed state and private landowners association	Government forest service	Other government advisory services (e.g. Rural Devt Programme)	Industrial actors (and consortia)	Forest managers / consultants / agents	State forest enterprise	Non-government (non-profit) organisations	Stakeholder networks and associations	Universities	Research institutes	Trade chambers
1. Bavaria	x		x		X	x	x	x		x		
2. North- Rhine Westphalia	x				X				x			
3. Auvergne	x		x			x						
4. Grand-Est	x						x				x	
5. Yorkshire & North-East England	x		x		X	x			x			
6. Lochaber	x		x	x	X	x	x	x	x			
7. South-Eastern Ireland	x			x	X	x						
8. Castile and León	x				X			X	x			
9. Catalonia	x		x						x		x	
10. Nordeste	x											
11. Alentejo	x		x		X			x			x	
12. Overijssel & Gelderland	x	x			X			x				
13. Slovenia	X	x								x	x	X
14. Småland	x			x								
15. Nord-East Romania	x					x		x				
16. Latvia	x		x	x				x		x		
17. Eastern Finland	x		x		X	X						

Projects and programmes

The wood mobilisation projects across the regions are quite diverse, and include those relating to:

- demand stimulation;
- supply stimulation;
- support for forest management;
- new forest establishment;
- science and decision support tools.
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The EU Rural Development Programme has been significant in most regions. In addition, it is clear that there have been a considerable number of initiatives, for example in Grand-Est, Forest Charters, and Forest Development Schemes; in North-Rhine Westphalia, in 2006 a 'Mobilisation Strategies for Energy Wood' report was produced. Many others are also listed. In contrast in some model regions there are no programmes and this has not been a priority. In Nordeste Transmontino for example, the priority has been reforestation not wood mobilisation. In Latvia and Finland EU funded programmes related to wood mobilisation have previously involved woodland owners, for example the Natura 2000 payments available in Latvia that supported woodland conservation and which could have had either a supportive or negative impact on mobilisation. Both Latvia and Eastern Finland have had or continue to have state funded programmes: Puu liikkeelle (2008-2013) in Eastern Finland was a wood mobilisation project aiming at a higher and more balanced use of forest resources, and in Latvia the Forest Development Fund aims to encourage economic activity in woodlands.

Regulations

All model regions are subject to forestry regulations that impact owner behaviour and therefore wood mobilisation. It is hard to discern specific impacts on wood mobilisation across the regions. In some regions regulation is seen to make harvesting more difficult, or to present an overall disincentive to harvesting. For example, in the Netherlands the focus on nature protection policies restricts opportunities for timber harvesting. In other cases, it was the complexity of regulations that was seen as the problem, in the Auvergne, France the regulations are considered too many and too difficult to navigate. There does though seem to be a political and cultural influence at work here too: where forestry /active forest management is part of the culture, regulations seem to be much better known and compliance is high whilst still mobilising wood. Sweden and Finland are notable examples here.

Incentives

Incentives are the traditional tools for encouraging forest creation, management and harvesting. In many countries the main form of financial incentive is tax relief on forest operations. There may be other forms of incentives which are not cashed-based, for example, the 2014 Finish Forestry Act and Forest Strategy 2025 recognised the large array of different owners and the needs of smaller non-industrial owners, by changing some of the forestry modalities to act as incentives to owners. These included: increasing forest property sizes; allowing inter-generational transfer of forest properties; and the provision of new types of grants and new transport infrastructure. Most regions reported with some confidence that significant numbers of owners adopt incentives, but were uncertain of the impact in terms of wood mobilisation.

Advice and information

Across the regions, five main sources of advice and information were identified:

1. government agencies;
2. owners' associations;
3. private consultants;
4. NGOs;

5. industry (purchasers).

Owners' associations play a key role and it must be assumed that an important factor in this is trust – it is easier to communicate with like-minded stakeholders. However, there is a great reliance on information dissemination, rather than proactive engagement, workshops, seminars etc. The section on 'engagement' was often completed in a sketchy way; Information about engagement was even more variable than other parts of the governance section of the protocol, and the term seems to be understood in diverse ways. Some replied in detail showing ways in which outreach had sought to include and interact with forest owners who had not previously been active in forest management, while others saw this as a repetition of the section on dissemination. Again, it is clear that a wide range of outreach and publicity methods are being used, but that the impact is either not measured, or not known to the authors of the profile. Yet current research shows the importance of proactive communication in changing behaviour.

It is particularly notable across all model regions that the impact and effectiveness of advisory services and information dissemination is poorly known. In some cases, the impact has been assessed as disappointing; for example, seven years of federal-funded initiatives in North-Rhine Westphalia 'showed minimal success'. In eastern Finland the SIMWOOD case study suggests that it is not a lack of advice or information which presents a barrier to wood mobilisation as much as the interest of owners to do something with their woodland regardless of what they know. In Romania, the suggestion is that it is the mode of delivery that presents a key barrier: most advice comes from the state agencies – Romasilvi - but accessing this information requires owners travelling distances to meet with public forest managers.

Decision Support systems

The topic, decision support systems, is closely linked to 'advice and information'. Much recent academic attention has focused on this and in particular on the applicability and usability of more complex decision support systems. Many responses to this question in the SIMWOOD regional profiles highlighted the increasing utility of quite simple computer-based decision support tools, such as GIS based mapping of properties and forest roads. Forest owner associations and government forestry services often play a key role in providing access to such tools some of which may have a significant impact on both vertical and horizontal integration within the sector and strengthen land owner behaviour in support of wood mobilisation. For example, Metsään.fi is a web-based service provided by the government Finnish Forest that is free to owners and helps harvest planning as well as linking owners to other concerns along the value chain.

Forest Management

(Felipe Bravo, UVA, Spain)

Forest management is a key element in wood mobilisation, but it is especially relevant when it is compulsory to maintain a balance between the goods and services that forests deliver. In this part of the report different questions were posed to experts in the regions involved in the project. The current productive forest area and the changes in this area in the past and in the foreseeable future were queried. The species composition and age class distribution (both in area and growing stock) of this forest area were also considered relevant. The silvicultural regimes being used in these forests and the proportion of the forests that had management plans and had certification of the management were considered important aspects of management influencing mobilisation. Finally, the main hazards experienced by the forests in the Regions were described and assessed by experts.

Total area of productive forest

It is important to note that there is no common definition of productive forests in the Regions which makes comparisons difficult. In some cases, there is a lack of a clear definition of what constitutes a productive forest (i.e., Nordeste or Latvia) while in others a minimum productivity threshold is used

(over 1 m^3/ha per year in Eastern Finland). Also, there are differences in the definition of ownership (i.e., 'communal forests' can be private or public) that affect the data presented here. Irrespective of these issues, there are differences in the main characteristics of productive forests between Regions. In some cases, as in South-Eastern Ireland**,** productive forests are dominated by plantations and self-sown exotic forests (with just one species, Sitka spruce, accounting for 52.5% of the total area) while in others productive forests are dominated by natural forests (dominated by softwoods and hardwoods depending on site conditions). Natural mixed forests are present in almost every Region but only in Slovenia do they dominate the entire forest area. Plantations also represent an important share of the forest area in Castile and León (poplar plantations but also pine afforestation) while in other regions (such as Catalonia) they are not so important. Locally, (Grand-Est) coppices with standards (mainly oaks) account for a high (20%) proportion of the forest area. Agroforestry systems and other open forests can represent a high opportunity for mobilisation of wood biomass. However, in some cases, these are included in the productive forests definition (as Dehesas in Castile and León) while in others they are not, e.g. firebreaks in South-Eastern Ireland, although these latter areas are still integral to the forest and are included in the definition of the total forest area in Ireland. In some Regions, such as in Overijssel & Gelderland, there was no way to differentiate, in the statistics, between total and productive forests so the figures presented are for total forest area. In others there was simply no information available (as in Auvergne). In Nord-East Romania the productive forests are partly inaccessible due to a lack of roads.

Changes in % forest cover over the past ten years, gross and by net additions/reductions

Although the reference period varies between Regions, it is possible to identify two different situations in the Regions: (1) area stabilisation (small increase or decrease in forest cover) and (2) area increasing by afforestation or abandonment of agricultural lands. The first group includes Regions such as Bavaria (+ 0.27%), North-Rhine Westphalia (+ 0.34%), Grand-Est and Auvergne (decrease in public forests; increase in private), Yorkshire and North-East England, Slovenia (- 0.9%), Eastern Finland (no change recorded), Småland where the forest cover has not significantly changed, Overijssel & Gelderland (slight increase: 0.2 to 0.7%), Nord-East Romania (+0.5%) and South-Eastern Ireland where the afforestation programme supported by the government has led to an increase of 0.3% in the productive forest area over the past 6 years. The second group includes Castile and León, Catalonia, Latvia and Nordeste where an increase was experienced due to forest expansion jointly with afforestation programmes (Castile and Leon and Latvia). No data were available for Alentejo. In Lochaber the data suggest an increase in forest cover in the region of 8%; however, this is largely attributed to improved detection techniques rather than a genuine expansion of woodland.

Predicted change of forest cover over the next ten years by ownership type and species

In different model regions expert assessment envisages a higher percentage of hardwoods (Bavaria, Grand-Est, Yorkshire and North-East England, Auvergne), in some cases connected with storm calamities (Bavaria) or the lack of new plantations and reforestation after softwood clear-cuts (Grand-Est, Auvergne) or due to lower agriculture land use (Auvergne). In Nordeste, the expansion of hardwoods and softwoods is expected because of the abandonment of former agricultural systems and their replacement by low maintenance perennial crops, such as agroforestry chestnut systems. Wind damage is also connected with the slight decrease in softwoods in Småland while the expected slight increase in hardwoods in the Region during the next ten years is attributed to an increase in the area of birch (by natural regeneration) observed after the big hurricane which hit the region in 2005. In Catalonia the political goal is to maintain the forest area for the next ten years while in North-Rhine Westphalia an increase in the forest area is a political goal of the State but due to the high demand for agricultural land use, the net increase in forest area is likely to be rather low (estimated to be a maximum of 1,000 ha). No changes are expected in the forest area for the next ten years in Overijssel & Gelderland (no data available for afforestation), Nord-East Romania (small changes both in softwoods and hardwoods in public and private lands) and Slovenia while only a very

small increase is expected in Alentejo and Lochaber. An expansion of productive forests is expected in South-Eastern Ireland through afforestation on agricultural land (softwoods around 4500 ha/year and hardwoods 1500 ha/year) and in Castile and León by forest expansion over former grazing areas with low livestock density (around 1400 ha/year) and afforestation (600 ha/year). In Latvia an expansion of hardwoods (around 24 k ha) is envisaged while a reduction in the area of softwoods (around 39 k ha) is expected. No changes are expected in Eastern Finland.

Present composition of forests in terms of single species stands

Single species stands are not in the majority in some model regions (Bavaria, Grand-Est, Nordeste, Overijssel & Gelderland and Catalonia). Their significance will decline in the near future arising from natural expansion (Castile and León), regeneration after clear-cuts (Nord-East Romania) or from the increasing use of mixtures in plantations in recent years (i.e. Sitka spruce and Japanese larch) in South-Eastern Ireland. Promotion of mixtures can lead to wood mobilisation (i.e. due to the temporary increase of coniferous wood supply) but can also constrain it due to a lack of new plantations to replace poplars and softwoods as in Grand-Est. In North-Rhine Westphalia, most of the forests are pure stands equally divided between deciduous and broadleaves. Similar figures are observed in Auvergne where a large proportion of the forest area is dominated by a single species (50% overall; 47% in private forests and 71% in public forests), in Slovenia where 51% of the forests are single species stands (46% in private forests and 61% in public forests), in Eastern Finland (55% of the area is in single species stands) and Småland where up to 60% of the forests (both public and private) are single species stands. In Latvia, Alentejo, and Lochaber precise data on species composition are not available although it is indicated that single species stands comprise most of the forest estate in the former. Differences in the definition of what a single tree species stand between Regions complicate the comparisons.

Total productive area by age-class, species and forest type

In general, the forests in the Regions do not exhibit a balanced age class distribution with young stands (under 20 years) and old-mature stands (over 120 years) over-represented. This general trend is especially evident in Bavaria where hardwoods are concentrated in the young (less than 20 years) and older stands while softwoods comprise a large part of the 80-100 age class cohort. In Grand-Est there is a limited representation (around 39 k ha) of young softwood forests, which limits the Region's ability to meet the industrial demand in softwood. Moreover, there are a lot of old hardwood forests (over 474 ka ha) accounting for twice the area in the other age classes. Where intensive silviculture is applied as in Yorkshire and North-East England there is a lack of forest over 60 years (in softwoods) and over 80 years (in hardwoods) but at the same time hardwood forests are over represented in the 0-20 years age class. In South-Eastern Ireland most of the forests are under 40 years old, while in Eastern Finland they are less than 60 years old. In this last case, the age-class distribution of the forests reflects the afforestation trends in the area during the last decades and explains why almost all the private forests are first rotation forests; a considerable proportion of the State forests are similarly first rotation forests. In North-Rhine Westphalia, softwood forests account for over 225 k ha of young-mature stands (21-60 years old) while hardwoods account for 87 k ha of the over 120 years cohort.

A very different situation can be found in the Overijssel & Gelderland Region where there is a low proportion (6%) of young stands (under 20 years) and mature stands (over 120 years) (5.4%). In public forests this trend is more pronounced. Intermediate-mature ages (from 40 to 100 years) account for 57.80% of the forest area. In Småland, there is a lack of mature and old forests and an over representation of young stands (under 20 years old). A similar situation is found in Latvia where there is an under-representation of younger (< 20 years) or older (> 120 years) stands. A more balanced situation is found in Nord-East Romania but with a small area surplus of stands between 20 and 60 years.

Data by age class are not available for Catalonia and Slovenia. Instead data by diameter classes are given for Catalonia showing that lower diameter classes are over represented (a situation that can be attributed to the dominance of young stands). Most of the area is in the diameter class ≤ 22.5 cm; this is especially the case in private forests where 86% and 92% of the softwoods and hardwoods respectively are in this size class. Data by developmental phases and stand structure are presented for Slovenia. These show a low representation of regeneration stands while pole and mature stands dominate. No information (or limited data) was available for Auvergne, Castile and León, Nordeste, Alentejo and Lochaber.

Where information is available on the growing stock the trend follows that for the age-class distribution of the total area. In Bavaria most of the growing stock can be found in private forests and generally in the coniferous age class 80-100 or deciduous age class > 120 years. In Eastern Finland, non-industrial privately-owned forests comprise 375 million m^3 of wood, in the forests owned by companies 86 million m^3, in the State forests 63 million m^3 and others 27 million m^3 with 95% of growing stock on land available for wood production.

Forest management alternative/silvicultural regime

In most Regions no data on forest management alternatives were available. Where data were provided it was based on expert assessment. 'Combined objective forestry' and 'close-to-nature forestry' were the main silvicultural regimes in almost every Region. Latvia is an exception where unmanaged forest nature reserves account for a similar area to all the other management alternatives together (however no information about the area dedicated to intensive even-aged forestry or wood biomass production is provided). In Nordeste all forests are classified as 'combined objective forestry' despite the presence of plantations (i.e. Eucalyptus) in the region. Similarly, in Lochaber all forestry is classed as 'combined objective'. In Overijssel & Gelderland none of the forest area was assigned to the "wood biomass production" forest management alternative and only 5.7% of the forest area was classed as "intensive even-aged forestry". It seems that this class, i.e. 'combined objective forestry' is like a basket where everything is put. For instance, 62% of the public forest in Eastern Finland is classed as such. In Bavaria 49% of public forests are considered to be at a very natural or close-to-nature state. For the private forests this figure is only 35%. In Castile and León no information is available but it is estimated that most of the area is under 'combined objective forestry' (i.e. 2635 k ha from a total of 2982 k ha). Finally, in Catalonia most of the area is under 'combined objective forestry' (~ 455 k ha). A similar situation exists in Alentejo. In Slovenia most of the forests are classified as 'multipurpose forests –close to nature forestry'. No data are provided for South-Eastern Ireland, however the vast majority of public and private forests can be classed as "intensive even-aged forestry".

Management plans by forest ownership type

Management plans play an important factor in wood mobilisation by ensuring wood provision through a higher likelihood of harvesting (in Nord-East Romania, without a management plan harvesting operations are limited). There is a great difference between ownership types regarding the implementation of management plans. Usually in public forests most of the area is under management plans (100% in Bavaria, Gelderland/Overijssel, Slovenia, Lochaber; over 98% in South-Eastern Ireland, over 85% in Castile and León, around 80% in North-Rhine Westphalia and Auvergne and close to 70% in Eastern Finland (but data from 2007 show that 48% of Finnish State forests had a forest management plan not older than 5 years old and 21% not older than 10 years old)). In other Regions, generally the proportion of the public forest area under management plans exceeds that of the private forest area. In some Regions there are regulations to promote the implementation of management plans in private forests (e.g., in South-Eastern Ireland where management plans are

mandatory for properties over 10 ha; in Auvergne and Grand-Est where a forest management plan is mandatory for properties over 25 ha and in Castile and León where a management plan is compulsory for all forests over 100 ha). In Latvia management plans are only required in large forests (over 10 k ha) but 25% of the forest area (50% in public lands and close to 0% in private lands) are under forest management plans. All public forests in Romania are under management plans while only 70% of conifer and 50% of broadleaf private forest have such a plan.

In Lochaber it is estimated that 64% of the private estate has a management plan. In Nordeste, there are no public forests under management plans. In private forests 57.24% of the conifer area and 39.58% of the broadleaf area (only 3.18% in mixed forests) are under management plans. A special case is the 'Baldios' because all of them have forest management plans even when they are not managed.

In some cases (i.e., private forests in South-Eastern Ireland) there are concerns about the quality of the management plans (which are compulsory for those in receipt of subsidies with areas greater than 10 ha). Experts indicate that the plans don't facilitate proper management as they do not include an estimate of volume production or provide detailed planning and in many cases these plans are never referred to again by the owners who see them as a requirement (as an expense rather than an investment that will protect their investment in the long term) to get the next forest premium. Further, the owners' lack of forestry knowledge means they don't appreciate the need for a management plan. This situation is also common in other model regions and this is one of the reasons for the low proportion of private forests under management plans (i.e., less than 15% of the private forests are under a management plan in Bavaria and Auvergne; 27.4% of the private forest area in Catalonia) but with exceptions (75% and 52% of the private forests in Småland and North East-UK are under a management plan). No data are available on the area under management plans in Alentejo.

Hazard risks by type

Hazards influence the forest management regime by changing the harvest schedule due to the urgency of wood salvaging (i.e. after wind storms) or emergency harvests to reduce pest outbreaks (i.e. after wildfires). Data about hazards/risks are limited in some model regions (i.e. Bavaria, Grand Est, North-Rhine Westphalia, Gelderland/Overijssel, Småland or Yorkshire and North-East England) or concentrated on the most frequent hazard (i.e. wind storms in South-Eastern Ireland or fires in Castile and León, Catalonia, Nordeste and Alentejo). There is an increasing awareness about the hazard/risks and their effects (i.e. the storms of 2013/14 which it is reckoned damaged 1% of the Irish forests or fire that burned around 29000 ha in Castile and León between 2008 and 2012). It is important to stress that 20% of the Romanian forests are damaged to some degree or other by forest insects; wind damage is also important. In Eastern Finland around 25% of the area is damaged by different hazards but there is no dominant factor. Fire, pest and diseases, wind and snow damage and drought impact were cited as the main relevant hazards in the Regions. However, only good statistics are available for wildfire and to a lesser extent for pests and other risks.

Certification

The relevance of certification for mobilisation remains uncertain but the tendency is to certify Europe's forests. There are two dominant standards in Europe: PEFC and FSC. In Continental Europe (except for Overijssel & Gelderland and Slovenia) PEFC dominates while in Britain and Ireland FSC dominates. In Småland, where 100 % of public forests and 75% of the private forests (80% of the total forest area) are certified, both standards are used (PEFC and FSC are used) However in this region, certification is not considered to be relevant for wood mobilisation. In Bavaria, most of the forests (77.1 % of public forests; 77.4 % of private forests) are PEFC certified. In Eastern Finland 95% of the area is certified by PEFC and FSC. The FSC certificate is mainly held by big private industrial

companies and those private non-industrial forest owners who have a contract with them and therefore they are included in their group certificates. State forests do not hold a FSC certificate, but hold a PEFC certificate. PEFC is the only forest certification standard which is implemented in Auvergne where the proportion of forests that are certified is quite modest (17% of the total area; 23% of hardwood area and 16% of softwood area). In Grand-Est 55% (over 1261 k ha) of the total forest area is under PEFC certification (79% of the public forests and 25% of the private forests - most of them over 25 ha) and in the public forests of Castile and León (FSC only is implemented in around 11 k ha of private forests). In Britain and Romania no PEFC certification is reported while in Ireland PEFC is quite new and is not well established. No detailed information is available for Yorkshire and North-East England but for the whole of England 100% of the public forest area is certified by FSC. In Lochaber 100% of the public forest is certified while the proportion of the private estate certified is unknown. In the Irish market, 85% of the timber is FSC certified (from public forests) while private owners don't certify due to the cost. Similarly, in Overijssel & Gelderland FSC certification is quite common in state forests (above 80%) and non-industrial private multiple ownership (above 70%) while it is not common in industrial private ownerships and non-industrial private individual or family owners. A similar situation is found in Romania where more than 80% of the public area is FSC certified while none of the private forest area is certified. In Slovenia all national forests and four larger private forest owners (22% of the total forest area) are certified by the FSC system while the PEFC system was introduced in the country (in 2013) by a regional certification. In Latvia State Forests are both PEFC and FSC certified; additionally, around 300 k ha in private lands are certified.

Forest Functions

(João Azevedo, IPB, Portugal)

In this protocol we considered Forest Functions in a broad sense allowing the concept to overlap with the evolving concept of Ecosystem Services since we were interested in evaluating Forest Functions from the perspective of the beneficiaries in the model regions. Although in the Ecosystem Services literature ecosystem functions (the capacity of the ecosystem to provide a service) are considered separate from, although dependent on, ecosystem services (the utilisation by humans of ecosystem functions that contribute to their well-being) (e.g. Haines-Young and Potschin, 2010), in this report we considered both simultaneously. The major practical advantage of this approach was to be able to use an Ecosystem Services framework, a field that has received considerable attention from researchers, to describe Forest Functions in SIMWOOD model regions.

The Forest Functions section of the protocol followed, therefore, a conventional structure used in the classification of Ecosystem Services (e.g. de Groot et al., 2010): provisioning services (non-wood forest products (NWFP)), regulation services (water, air, soil), cultural services (tourism), and habitat. Provisioning of wood products is covered in other sections of the protocol. Biodiversity was additionally addressed in the protocol where the attitudes of national and regional communities toward forest conservation was queried.

Through this protocol we wanted to know how the importance of particular forest services/functions were perceived in the model regions (i.e. very important; important; minor importance; not important) and how they were actually evaluated regionally (their economic value). These quantitative estimates can also provide a relative measure of the importance of services/functions allowing simple comparisons among model regions and classes of services/functions to be made. They can also help address multi-functionality in actual forest systems and to analyse trade-offs between services/functions.

What is the role of the Region's forests in sequestering and storing carbon?

Forests in all the model regions (although four regions did not include data for this item) seem to make a strong contribution to carbon sequestration and storage (Table 5). The availability of data

concerning this service illustrates the importance given to it by the scientific and administrative communities in the model regions. Overall, the total carbon in the aboveground parts of trees in all model regions is around 1.1 billion tonnes of C (57 ton C /ha of forest area on average). In a small number of model regions data on sequestration rates are reported. Soil carbon, the largest carbon pool in many forests in temperate regions, is sometimes included in the estimates. However, in most of the cases, only carbon in living biomass is reported. In some areas carbon was estimated from data collected at broader scales.

Given the size of many of the model regions and the high proportion of forests in terms of land cover, regions such as Bavaria, North-Rhine Westphalia, Finland and Castile and Leon share a high percentage of all carbon stored in the model regions. Further, carbon stored in the forests in the model regions seems to follow a productivity pattern with higher stocks in northern regions and lower in southern.

Table 5. Carbon sequestered in forests in the model regions.

Region	Name	Carbon stock (million ton)	Carbon density (ton/ha)
1	Bavaria	265*	106
2	North Rhine Westphalia	90*	98.36
3	Auvergne	-	-
4	Grand Est	-	-
5	Yorkshire and North East	15.247**	78.21
6	Lochaber	4.780989*	57.00
7	Southern and Eastern Ireland	27.522	79.03
8	Castilla Leon	176.982338	59.34
9	Catalonia	38.4*	29.54
10	Nordeste	1.97*	14.12
11	Alentejo	50.1076*	35.23
12	Gelderland Overijssel	3.26***	25.33
13	Slovenia	91.988352*	77.73
14	Smaland	137*	65.24
15	Nord-East Romania	-	-
16	Latvia	-	-
17	Finland	188.1*	44.79

*aboveground carbon
** above and belowground carbon
*** awaiting confirmation

How important are Non-wood forest products (NWFP) in the regions? How do they compare with forest products?

The importance of NWFP varies between model regions. Regions in Portugal and Spain are those where NWFP seem to have the highest importance, either in terms of diversity or economic significance (Table 6). These model regions along with Bavaria and Latvia are the only ones where NWFP were recognized in the protocols as 'very important'. In the southern European model regions and Latvia the diversity of products is higher than in Bavaria. In the former regions several products are considered simultaneously to be 'very important' (up to 5 different NWFP are reported for Castile and León) including mushrooms. In Alentejo, fruits and seeds and cork are 'very important'. In North-

Rhine Westphalia, Slovenia, and Småland NWFP are considered to be 'important' while in the remaining regions NWFP are considered of minor importance. In the Nord-East Romania NWFP are important for the rural communities but are of minor importance for forest owners. Game and fish animals, berries, medicinal plants and wild mushrooms are the most important NWFP.

Generally, there are no data available for the value or income associated with NWFP in the model regions. Where data are available, however, NWFP have a high or very high value. For instance, Christmas trees in North-Rhine Westphalia are responsible for an annual income of €300 million (€328/ha of forest/yr). In Alentejo, cork, seeds, mushrooms, and resin alone account for €413 million (€291/ha of forest/yr). In Nordeste, chestnuts and mushrooms account for €25 million annually (€179/ha of forest/yr). In Latvia the most important products are wild mushrooms, with an estimated value of 51 million EUR per year, fruits, berries and nuts (17 million EUR), other plant products (22.5 million EUR) and game meat, Christmas trees, honey and wax, game skins and trophies with a much lower value. In Catalonia, in 2006, the total income from forests was €41.91 million, of which 79%, i.e. €33.01 million was attributed to the sale of NWFP. Some model regions, although not providing values for the commercial importance of NWFP, provide results in physical units that make it possible to calculate their value and importance.

NWFP management/use does not seem to create constraints to wood mobilisation in the model regions except for game in areas where this is an important activity. Game animals are considered in this report as a NWFP although hunting was included in recreation and tourism to be discussed below. In Alentejo non-wood forest products are considered as favouring wood mobilisation since human presence and management for the production of these products improve the condition of forests and have a positive impact on wood productivity. Given their importance in Latvia, it is considered there that the impacts of increasing mobilisation on of NWFP should be evaluated.

Table 6. Importance of Non-Wood Forest Products in forests in the model regions.

Region	Name	Overall Importance of NWFP	Major NWFP*
1	Bavaria	Very important	Game, Seed harvest, Honey
2	North Rhine Westphalia	Important	Christmas trees
3	Auvergne	Minor importance	
4	Grand Est	Minor importance	
5	Yorkshire and North East	Very important	Game
6	Lochaber	Important	Game
7	Southern and Eastern Ireland	Minor importance	
8	Castilla Leon	Very important	Game, Fish, Mushrooms, Stone pine nuts, chestnuts, Cork
9	Catalonia	Very important (more important than wood)	Game, Mushrooms, Stone pine nuts, Cork
10	Nordeste	Very Important	Mushrooms, Chestnuts
11	Alentejo	Very Important	Cork, Seeds, Mushrooms, Resin
12	Gelderland Overijssel	Minor importance	
13	Slovenia	Important	Game
14	Smaland	Important	Game
15	Nord-East Romania	Important (for populations)	
16	Latvia	Very important	Mushrooms, Fruits, berries and nuts, Other plant products
17	Eastern Finland	Important	Game, Fisheries

*-Major NWFP whenever considered individually as Very Important in any region

What is the importance of forests for water and air regulation in the model regions?

Overall, it was considered that forests are important in the regulation of hydrological and atmospheric processes in the model regions (Table 7). Thirteen out of 17 regions considered these services as either 'very important' or 'important'. These ecosystem services were considered as 'not important' in two of the model regions (South-Eastern Ireland and Småland) and of 'minor importance' in one (Auvergne and Gelderland Overijssel). It is not clear whether the latter responses are due to the fact that in these regions there are no risks of deregulation of services (e.g. snow avalanches are not a threat in regions where there are no high mountains), or due to the condition, location and size of forests that don't make forests important in the overall regulation of these services, or simply due to failures in the perception of processes, functions, and services. There was no quantitative information on the value of these regulation services in any of the model regions. There are, however, partial data for water yield in Eastern Finland

Table 7. Importance of forests in regulation (water, air, soil) in model regions.

Region	Name	Overall Importance of Forests for Regulation Services
1	Bavaria	Very Important
2	NRW	Very Important
3	Auvergne	Minor Importance
4	Grand Est	Important
5	Yorkshire and North East	Very Important/Important
6	Lochaber	Important
7	Southern and Eastern Ireland	Not Important
8	Castilla Leon	Important/Minor Importance
9	Catalonia	Very Important
10	Nordeste	Very Important
11	Alentejo	Very important
12	Gelderland Overijssel	Minor Importance
13	Slovenia	Important
14	Smaland	Not Important
15	Nord-East Romania	Important
16	Latvia	Very Important
17	Eastern Finland	Important

How important are forests for tourism in the model regions?

In almost all model regions forests are considered as 'important' or 'very important' for tourism and recreation activities (Table 8). The exception was Nord-East Romania where forest tourism is not considered as important although hunting is a relevant activity. In the protocol, tourism included a wide range of activities including hiking, birdwatching, hunting and fishing, and outdoors sports. In general, however, hunting and fishing seem to be most frequently important economically in the forests of the model regions. Only three regions presented estimates of annual revenue associated with tourism. The estimates for Yorkshire & North-East England and Catalonia were high corresponding to values of €82 and €46/ha of forest /yr, respectively.

Table 8. Importance of forests for tourism in the model regions.

Region	Name	Tourism (recreation)	Value* (million €/yr)
1	Bavaria	Very important/important	-
2	NRW	Important, however huge differences between localities in NRW	-
3	Auvergne	Import in the summer	-
4	Grand Est	Very important	-
5	Yorkshire and North East	Very important/important	16.14
6	Lochaber	Very important	-
7	Southern and Eastern Ireland	Important	-
8	Castilla Leon	Very important	-
9	Catalonia	Very Important	60.6
10	Nordeste	Very Important	-
11	Alentejo	Important	-
12	Gelderland Overijssel	Very important	1.1
13	Slovenia	Very Important	-
14	Smaland	Very Important (for hunting and fishing)	-
15	Nord-East Romania	Not important	-
16	Latvia	Very important	-
17	Eastern Finland	Important	-

*Based on a range of different activities and elements for evaluation

What is the importance of forests for biodiversity conservation?

In almost all model regions forests are considered as 'important' or 'very important' for biodiversity conservation (Table 9). These regions describe important elements of biodiversity requiring special conservation measures including, species, habitats, or landscapes. Species rarity and singularity is often referred to in the profiles when describing the importance of forest biodiversity. The claims of high importance for conservation are supported by data from the model regions which show that a considerable percentage of forests have been assigned a conservation status (there is considerable overlap among conservation schemes in all model regions and some variation in the classification of conservation areas from region to region). North-Rhine Westphalia is the region with the highest proportion of forests with a conservation classification (79%) followed by Slovenia (50%). In the case of Slovenia the figure presented is particularly significant considering that forests represent almost ¾ of the country's area. Grand-Est is the region showing the lowest percentage of forests with a conservation status among those providing data allowing the calculation of estimates.

Eastern Finland and Nord-East Romania differ from all other regions as forests are seen as of minor importance for biodiversity conservation. Eastern Finland provides, however, the list of habitats of special importance in commercial forests, as defined in the Forest Act and the areas of each in the region. In Nord-East Romania, although forests are considered of minor importance for conservation, 23.4% of all forests have a conservation status.

Table 9. Importance of forests in model regions for biodiversity conservation.

Region	Name	Importance of forests for conservation	Forest Conservation* (% of forests in the region with conservation status)
1	Bavaria	Very Important/Important	30.0
2	NRW	Important	78.7
3	Auvergne	Important	28.5
4	Grand Est	Important	11.3
5	Yorkshire and North East	Important	-
6	Lochaber	Very important	-
7	Southern and Eastern Ireland	Important	32.3
8	Castilla Leon	Very Important	34.9
9	Catalonia	Important	24.7
10	Nordeste	Very Important	38.7
11	Alentejo	Important	-
12	Gelderland Overijssel	Very Important	21.0
13	Slovenia	Very Important	50.0
14	Smaland	Important	
15	Nord-East Romania	Minor importance	23.4
16	Latvia	Very important	14.3
17	Eastern Finland	Minor importance	2.0

*includes only areas with a protection status directed to conservation of biodiversity (excludes soil, noise, water, etc., protection areas)

Are there schemes for the payment for Ecosystem Services in the model regions?

In most model regions it appears that there are no payments *per se* for Ecosystem Services (Table 10). There is, however, a large number of model regions where there are, at least, some schemes established for the payment of services provided by forest ecosystems. The Yorkshire & North-East England and South-Eastern Ireland have particular Forest Service/Forestry Commission schemes directed to forests. In Ireland the objectives of the Native Woodland Scheme are to support land owners to develop native woodlands and it has a strong biodiversity orientation. The Neighbourwood scheme in this region provides support to local authorities to develop woodlands close to communities for recreation and public use. In Overijssel & Gelderland national schemes that subsidize both production forests and non-production forests (the latter attract slightly higher payments than the former) are available. The payment for recreation is € 33/ha/yr, for biodiversity €32 - 86 /ha/yr. In Overijssel & Gelderland the total amount of forest for which the additional subsidy for recreation is given is 82,972 ha (64% of the region's forests). The total amount of subsidy for Overijssel and Gelderland in 2014 amounts to €2,738,067. In Småland owners receive payments when they don't fell forest stands. In Catalonia there are small-scale experiments relating to Ecosystem Services Payment Schemes. In Nord-East Romania the government has schemes to compensate private forest owners whenever they cannot harvest due to environmental restrictions, even if these compensations have never been paid. In other cases environmental NGOs pay municipalities for the maintenance of pristine forests without management and harvesting (Sinca Noua). In Eastern Finland payments are made in privately owned forests to maintain particular

habitats for species conservation. New funding instruments for the payment for ecosystem services were included in the Financing of Sustainable Forestry Act.

Table 10. Situation in model regions concerning the payment for ecosystem services.

Region	Name	Payment	Examples
1	Bavaria	No	
2	NRW	No	
3	Auvergne	No	
4	Grand Est	Yes	Natura 2000 protection areas only
5	Yorkshire and North East	Yes	The Forestry Commission's EWGS and Natural England ELS and HLS Schemes
6	Lochaber	No	
7	Southern and Eastern Ireland	Yes	Forest Service's Native Woodland Scheme and Neighbourwood Scheme
8	Castilla Leon	No	
9	Catalonia	No	
10	Nordeste	No	
11	Alentejo	No	
12	Gelderland Overijssel	Yes	Nationwide subsidy scheme with payments for production forests and non-production forests (higher payment)
13	Slovenia	No	
14	Smaland	Yes	When owners decide not to fell forest stands (no quantitative info provided)
15	Nord-East Romania	Yes	Compensations for conservation of biodiversity
16	Latvia	No	
17	Eastern Finland	Yes	Compensations for conservation of biodiverstiy; Financing of Sustainable Forestry Act

The importance of forest functions for the model regions

Forest functions, as defined for the purpose of the current protocol, are considered in general of high/very high importance in the SIMWOOD regions. General patterns for all the variables considered were hard to find. However, there seems to be a tendency for the regions in the Iberian Peninsula to value ES higher than the other Regions. At this point the reasons for this can only be speculated and could form the basis of a hypothesis that could be tested in this project.

Forest Harvesting

(Philippe Ruch, FCBA, France)

Although of key relevance to wood mobilisation there is limited information available in some model regions on the markets and the logging enterprises. Nevertheless, more wood mobilisation can only be possible if there is a potential market and attractive prices for the wood products and operational

logging enterprises. Therefore, all solutions for more wood mobilisation have to include an analysis of the system/product/value/market/logging system/logging constraints.

Markets and wood mobilisation

The ratio of the harvest volume to increment in the private forests is commonly low in the regions (i.e. 11 to 45%) except in Småland where it is 78% and in Eastern Finland 68% (Table 11). In some regions, the ratio in private forests is similar to that in public forests (e.g. Bavaria); in others it is higher than in public forests (e.g. Småland and Catalonia). These figures show that there is a real potential for more wood mobilisation in private forests (and also in public forests).

Table 11. Annual harvest volume and increment[1].

Region		Annual harvest volume	Annual increment	Rate harvest/increment		
		Total	Total	Private forests	Public forests	Total
1	Bavaria	15 142 400	32 558 000	45%	49%	47%
2	North-Rhine Westphalia	4 109 000	5 412 261			76%
3	Auvergne	2 906 000	5 084 858			57%
4	Grand-Est	9 103 429	14 624 382	low	nearly 100%	62%
5	Yorkshire & North-east England	not known	1 439 342			not known
6	Lochaber	not known	not known			not known
7	South-Eastern Ireland	1 800 100	4 225 700	11%	62%	43%
8	Castile and León	1 176 777	7 202 055			16%
9	Catalonia	730 372	3 484 346	25%	6%	21%
10	Nordeste	not known	not known			not known
11	Alentejo	3 863 104	not known			not known
12	Overijssel & Gelderland	not known	not known			not known
13	Slovenia	3 641 139	8 491 883	38%	57%	43%
14	Småland	13 550 000	18 200 000	78%	59%	74%
15	Nord-East Romania	5 194 500				
16	Latvia	13 852 930	27 780 000			50%
17	Eastern Finland	16 860 000	26 650 000			63%

1. m^3 over bark - except Regions 1, 2, and 8 where figures reported are m^3 under bark.

The analysis of the wood market in the model regions shows that, in general, sawmills and energy plants use local supplies of timber (in general < 100 km and often < 50 km distance from forest) (Table 12). It is national for Eastern Finland (only 18% is processed locally, average distance from forest to sawmills: 161 km), and so makes this latter Region different from others.

Table 12. Average distance (km) from forest to consumer and market development.

		Sawmills		Pulpmills and panelboard mills		Energy plants		Firewood market	
	Region	Dist[1]	Market dev[2]	Dist[1]	Market dev[2]	Dist[1]	Market dev[2]	Dist[1]	Market dev[2]
1	Bavaria	50	stable		slowly decreasing	20	increasing	10	increasing
2	North-Rhine Westphalia		stable		increasing		stable to increasing		increasing
3	Auvergne	40	increasing	>200		30	increasing	30	stable
4	Grand-Est	100	stable	150	stable	<100	increasing	<50	stable
5	Yorkshire & North-east England		increasing						
6	Lochaber		increasing				increasing		increasing
7	South-Eastern Ireland				increasing	100	increasing		increasing
8	Castile and León	100	increasing	100	increasing	100	increasing		increasing
9	Catalonia	80	stable, light increasing						
10	Nordeste								increasing
11	Alentejo	50	increasing	150	increasing	50	increasing	150	increasing
12	Overijssel & Gelderland								
13	Slovenia	52			stable		increasing	38	stable
14	Småland	40	increasing		increasing hw decreasing sw	30	increasing		
15	Nord-East Romania	20	stable	50		150		10	
16	Latvia	55	stable	55	stable			55	stable
17	Eastern Finland	161	increasing	161	Pulp ↑; others ↓		increasing	44	increasing

For the model regions that provided information on how markets might change in the future, it appears that markets are at least stable or increasing, especially the biomass market for the energy sector. The panelboard industry is an exception in Eastern Finland when a decline in the marked is expected.

Sales of timber

The most common method of timber sales reported in the model regions is that the forest owners are contacted directly by timber buyers (logging companies, timber merchants, wood procurement companies etc.) (Table 13). They often sell the timber standing, except in Småland and Slovenia,

where the timber is sold at the roadside. In South and Eastern Ireland, this method is clearly described as inefficient and a costly way to market timber.

In Eastern Finland, NIPFs sell their timber standing and contract often directly with the forest industries. Contrary to the other Regions, most of the timber sellers in Eastern Finland and Latvia contact the timber buyers by themselves. In Nord-East Romania, most of the wood harvested is offered in auctions as standing wood. This method is preferred as many forest owners lack skills and equipment to do the harvesting.

In some forests managed by forest managers, they take over the organisation of all aspects of timber harvesting and sales even the logging and transportation operations. The manager takes the initiative to get in touch with the timber buyers. This solution is seen as an efficient means of delivery of timber to the market (South-Eastern Ireland, Grand-Est). The processing sector would prefer to deal with a small number of managers looking after the forest owners.

An example of collaboration is given in Bavaria, whereby private forest owners sell about 40% of the timber through forest owner associations. In that region, forest owners in conjunction with the timber industry, finance an organisation (proHolz Bayern) that advertises the availability of timber. The use of the Web based sales is described as not being a very successful method of selling timber (Slovenia, South-Eastern Ireland).

Table 13. Method of timber sales.

	Region	Standing	Roadside	Mill
1	Bavaria	++	++	-
2	North-Rhine Westphalia		++?	
3	Auvergne	75%	Through forest cooperatives	
4	Grand-Est	90% selling alone	90% selling through cooperatives	
5	Yorkshire & North-east England			
6	Lochaber	+	+	
7	South-Eastern Ireland	90	10	
8	Castile and León	99	1	
9	Catalonia	70	25	5
10	Nordeste	100		
11	Alentejo	80	20	
12	Overijssel & Gelderland			
13	Slovenia	3	87	10
14	Småland	5	95	
15	Nord-East Romania	28.5	70.9	0.6
16	Latvia			
17	Eastern Finland	87	13	

Logging enterprises and logging systems

Data were often not available for the logging enterprises and the logging systems within the model regions, so the conclusions that can be drawn on these aspects are limited. In Eastern Finland and Nord-East Romania harvesting (felling operations and hauling operations) is carried out by local

enterprises (very often small companies). This is similar to the situation in the SIMWOOD regions. There is no identified lack of enterprises for more wood mobilisation.

The felling operations are mainly carried out motor-manually in hardwood stands, except in Yorkshire North-East England, Småland and Eastern Finland (Table 14). In Alentejo, felling operations are often manual but processing is mechanized; in this case, mechanized felling was considered. In Nord-East Romania, the prevailing harvesting method is the tree-length system. Trees are felled by chainsaw (98% of the volume) and then extracted to the roadside generally by a skidder (or tractor plus winch).

Table 14. % of the volume harvested by felling type.

	Region	Country	Hardwood		Softwood	
			motor-manual	mechanized	motor-manual	mechanized
1	Bavaria	Germany				
2	North-Rhine Westphalia	Germany				
3	Auvergne	France	91%	9%	53%	47%
4	Grand-Est	France	90%	10%	40%	60%
5	Yorkshire & North-East England	UK	50%	50%	10%	90%
6	Lochaber	UK	80 %	20%	20%	80%
7	South-Eastern Ireland	Ireland	90%	10%	0%	100%
8	Castile and León	Spain	90%	10%	20%	80%
9	Catalonia	Spain	95%	5%	80%	20
10	Nordeste	Portugal	95%	5%	100%	0%
11	Alentejo	Portugal	75%	25%	5%	95%
12	Overijssel & Gelderland	Netherlands				
13	Slovenia	Slovenia	94%	6%	98%	2%
14	Småland	Sweden	10%	90%	5%	95%
15	Nord-East Romania	Romania	99	1	99	1
16	Latvia	Latvia				
17	Eastern Finland	Finland	10	90	1	99

The main changes and needs for the next 10 years identified for the logging systems for the Regions, can be grouped as follows:

- **More efficient harvesting methods on steep slopes (and cable crane utilization):** *Bavaria, Nord-Rhine Westphalia, Auvergne, Grand Est, Castile and León, Catalonia, Slovenia, Nord-East Romania;*

- **More efficient harvesting methods in general (particularly economics):** *Yorkshire & North-east England, Catalonia, Nordeste, Slovenia, Småland, Nord-East Romania, Eastern Finland,*

- **More efficient harvesting methods on swampy terrain:** *Bavaria, Grand Est, Småland, Eastern Finland,*

- **More efficient harvesting methods in the field of fuelwood (often hardwood stands):** *Nord-Rhine Westphalia, Grand Est, Castile and León,*

- **Define the criteria of high environmental quality logging operations, improved level of skill and awareness:** *Grand Est, Yorkshire & North-east England, Småland, Nord-East Romania, Latvia;*

- **Investments in appropriate forest trails:** *Slovenia*, *Nord-East Romania;*

- **Better road access** : *Slovenia*, *Lochaber*

Logistics, Climate and Environmental constraints

The road network for trucks is an important element for wood mobilisation. In 4 model regions, the proportion of the forests that have no access is significant: i.e. 9% in Bavaria and 16% in Catalonia. Although no precise data were provided in South-Eastern Ireland and Lochaber, access (lack of) was mentioned as a very important issue in private forests. In Nord-East Romania inaccessible forests (hauling distance over 2 km) represent 30% of the total area. Snow is also a problem, as well as flooding, because in most of the cases the forest roads are situated next to the valleys.

The data on road networks were not categorised by forest ownership type, but it can be assumed that issues regarding roading apply to private forests and are potentially more of an issue for such forests than public forests. Consequently, more wood mobilisation means that the projects in these regions have to take into account road development or alternative solutions (e.g. cable yarding).

In some model regions, road access is not identified as a constraint: e.g. Småland, Grand-Est and North-Rhine Westphalia, Alentejo, Slovenia (nevertheless forest trails have to be developed in this country). In Eastern Finland, the road network is considered to be over the optimum level. All forests are on flat or gently sloping terrain. Mechanisation is theoretically possible everywhere but the high amount of peatlands (25%) limits harvesting. In fact, wood harvesting in peatlands in spring and in summer can only be done with special equipment or not at all, because the soil is soft and wet. Stoppages lower the utilisation rate of harvesting machines and therefore have a negative impact on the profitability of wood-harvesting. It is also challenging to overcome work volume variation with permanent personnel, because during the stoppages employees are likely to search for the other jobs. This causes the constant need to train new drivers and search for new employers when the high season starts.

Latvia is a lowland country and the main climate constraints are snow, rain and cold temperatures. In order to ensure the conservation of biodiversity, binding nature protection requirements are included in all Latvian forest managements plans.

Mountainous model regions have, not surprisingly, a significant proportion of their forests located on “sloping ground” and “very sloping ground”: e.g. Nordeste (51%), Catalonia (49%) and Auvergne (30%). In North-Rhine Westphalia and Grand-Est these site types make up a smaller proportion of the estate (23% and 17% respectively) (Table 15). In these sites, harvesting is more difficult to perform and the mobilisation costs are higher than in flat sites. Moreover, two constraints to mobilisation (climate and environmental) are identified in such areas: a limitation to the harvesting period due to snow and the risk of soil erosion. This last constraint was also mentioned for Bavaria and Castile and León.

Finding relevant solutions (environmentally friendly and economically efficient) will contribute to increased wood mobilisation on sloped terrains.

Even if very few model regions could provide data about the proportion of the forest estate that was on normal soils and/or sensitive soils, soil protection during the rainy periods is often mentioned as an important issue: e.g. in Småland, Slovenia, Nordeste (in steep slopes), Castile and León, South-Eastern Ireland, North-Rhine Westphalia, Grand-Est and Bavaria. Rain increases the susceptibility of the soil to rutting and compaction. Traditional wheeled machines have then to stop working to allow the soil to dry out. Trying to find the most relevant season is not always easy. Frozen periods are less frequent due to the changing climate (Småland, Slovenia, Grand-Est). Thus, relevant harvesting solutions are needed to perform high environmental logging operations.

Other environmental issues were not mentioned as particularly important constraints in private forests.

Table 15. The private forest estate by topography/slope.

	Region	Country	**Flat:** mechanization is possible	**Sloping ground:** mechanization with specific equipment	**Very sloping:** only cable crane
1	Bavaria	Germany			
2	North-Rhine Westphalia	Germany	77%	15%	8%
3	Auvergne	France	70%	15%	15%
4	Grand-Est	France	83%	12%	5%
5	Yorkshire & North-East England	UK			
6	Lochaber	UK			
7	South-Eastern Ireland	Ireland	94%	6%	0%
8	Castile and León	Spain			
9	Catalonia	Spain	51%	42%	7%
10	Nordeste	Portugal	49%	50%	1%
11	Alentejo	Portugal	95%	5%	
12	Overijssel & Gelderland	Netherlands			
13	Slovenia	Slovenia	94%	5%	1%
14	Småland	Sweden	100%	0%	0%
15	Nord-East Romania	Romania			
16	Latvia	Latvia			
17	Eastern Finland	Finland	100	0	0

Specific needs for forest types

In the protocol an attempt was made to identify the forest types in the model regions where the harvesting is below increment. For these situations, we should try to find together solutions if possible (research needs through focus studies, pilot projects, data exchanges…) in order to improve mobilisation. They are partly linked to the needs identified for the logging systems (see paragraph **Logging enterprises and logging systems).**

The issues contributing to the relatively low harvesting rates in these forest types are described below (unfortunately, all the regions did not achieve this task in the first round of this study):

- **Alpine coniferous forest:** Bavaria, Grand-Est, Auvergne, Catalonia

Harvesting techniques have to be improved to reduce the harvesting costs on sloped sites. There is another issue for over-aged fir stands in Auvergne. Soil protection is mentioned in Catalonia.

- Acidophylous oak and oak-birch forest : *Grand-Est, South-Eastern Ireland*

Poor timber quality and environmental constraints in Ireland, sensitive soils in Grand Est are the main issue.

- **Beech forest:** Bavaria, Grand-Est, Auvergne, Catalonia, Nord-East Romania

The value of the beech stems is quite low, this negatively effects the profitability of the logging operations. In Grand Est, there are challenges to mobilizing the increment when the beech stands are on sensitive soils. Accessibility and forest management planning are, as for the Hemiboreal forest type in Nord-East Romania, identified difficulties. The low productivity of the logging system and the wood quality are also mentioned

- Mountainous beech forest: *Bavaria, Auvergne*

Added to the low value of the beech timber, the high harvesting costs on sloped sites are a handicap for the exploitation of these stands.

- Mire and swamp forests; foodplain forests, non-riverine alder, birch and aspen forest: *South-Eastern Ireland*

Timber quality and environmental issues during harvesting are the constraints.

- Softwoodous forest of Mediterranean regions: *Auvergne, Catalonia, Alentejo*

Two major constraints were identified for these forest types: the low value of the pine and high fire risks in Catalonia. In these forest types harvesting exceeds increment in Alentejo due to the lack of investment on afforestation.

- **Mesophytic deciduous forest:** Catalonia, South-Eastern Ireland, Grand-Est

Very few local industries can process high quality hardwood timber in Catalonia. Timber quality and environmental constraints are identified in Ireland and harvesting on sensitive soils in Grand Est.

- Thermophilus deciduous forest and broadleaved evergreen forest: *Catalonia*

The market is limited to fuelwood and the stands are located in areas with high fire risks.

- **Plantations:** South-Eastern Ireland, Grand-Est, Alentejo

- **Boreal forest:** *EASTERN FINLAND*

There is a need to motivate the forest owners and one of the key issues is the low profitability of the wood harvesting companies due to seasonal work. Harvesting on peatlands has to be improved.

- **Hemiboreal forest:** *NORD-EAST ROMANIA*
  Accessibility and forest management planning are the main difficulties. Timber resources are underused mainly because of limited accessibility to forests, hierarchical and bureaucratic control of harvests, lack of information on timber stocks and flow, the lack of awareness regarding the advantages of modern forestry techniques, and in some cases outdated forestry norms.

The lack of private owner groups and the lack of roads are identified in Ireland as constraints; in Grand-Est, the low value of the pine was identified. In these forest types harvesting exceeds increment in Alentejo due to the lack of investment on afforestation.

In Castile and León, all forest types are concerned (harvest below increment) and particularly hardwood stands. In North-Rhine Westphalia, no problems specific to a forest type were identified

Factors influencing wood mobilisation in the model regions

SIMWOOD partners were requested to identify in the protocol, the five main factors influencing wood mobilisation in their region. These are summarised by domain in Table 16 and discussed below. In this section these factors are discussed by domain.

Forest ownership factors influencing wood mobilisation

(Áine Ní Dhubháin, NIUD-UCD, Ireland)

Forest fragmentation was identified in many of the model regions as a factor influencing wood mobilisation. In particular, the small sizes of the forest properties and the consequent large number of owners posed a challenge to wood mobilisation in many of the model regions (i.e. Grand-Est, Slovenia, Catalonia, Overijssel & Gelderland , Nordeste, Bavaria). In North-Rhine Westphalia the effect that such fragmentation has on diluting the economic role of forests was alluded to and was considered to lead to irregular or no management in some instances. Joint ownership was considered to hinder forest management in Slovenia. The size distribution was also identified as very important in the context of wood mobilisation in Småland. Forest size was also identified as important in Grand-Est as there are sometimes legal threshold levels for the requirement to have a management plan.

The challenges that the growing disconnection of owners to their forests raise for wood mobilisation were also highlighted. In some model regions this was referred to as spatial detachment (e.g. in Grand-Est) where owners usually don't live in the region where their forests are located. The spatial detachment makes it more difficult for them to manage their forest and also makes it more difficult to contact them. The emotional detachment of owners was also highlighted in North-Rhine Westphalia where the "new" forest owners' motivation with regard to harvesting was not known. A general lack of knowledge (even amongst owners themselves) of what forest owners objectives are for their forests was also highlighted. The significant role of owners' objectives was also identified in Bavaria (willingness of – various types of – forest owners and other actors).

In conjunction with this increasing spatial and emotional detachment is the lack of forestry knowledge and skills among owners. In Grand-Est the belief that private forest owners often don't know how to manage their forest and don't know who to ask for help was identified as a challenge for wood mobilisation. A similar lack of forestry knowledge among NIPF owners in South-Eastern Ireland and in Småland was highlighted. In Ireland the NIPF owners are first time forest owners and their forests are also new; in other model regions the forests may have been in the family for generations but the owners are "new" and don't have the traditional knowledge of forest management. Something similar is highlighted in Nordeste where the lack of forestry tradition in the region arising from the relatively recent afforestation with softwoods was identified as a factor influencing mobilisation.

The ownership factors interact to influence mobilisation. The fragmented and small-scale nature of private forests was considered to discourage owners from investing in technical equipment and further reduce the likelihood that owners would work in their forests resulting in a loss of skills in forest practices among owners.

The age of the owners was considered to have an important influence on wood mobilisation in South-Eastern Ireland. In the region essentially all private forest owners are "first-time" forest owners who have established their forests in the past 30 years; they were typically aged 50+ years when they established their forest so will be 70+ years when they are expected to thin their stands for the first time; it was considered that they may not have the energy or the motivation to get their stands harvested.

Forest governance factors influencing wood mobilisation

(Bianca Ambrose-Oji and Anna Lawrence, FCRA, UK)

Several factors related to the governance domain, particularly in terms of advisory systems and effective communication between stakeholders were noted as impacting on wood mobilisation. Those specifically mentioned were, the:

1. lack of, and consequent need for, more owner associations (Catalonia, Slovenia);
2. complexity and number of regulations (North-Rhine Westphalia, Gelderland-Overijssel) and / or incentives impacting on forest management (England);
3. legislation that has a very direct impact on mobilisation by restricting harvest volumes, and harvesting on sites without approved management plans (Nord-East Romania; Latvia);
4. lack of management / management plans, which reflects weak advisory systems (Castile and León) or poor forestry knowledge and clear management objectives among owners (Ireland);
5. need for better communication strategies so that information is better targeted towards forest owners and what they need or want to know about in a format that suits them best: this could be related to reliance on old-fashioned models of forest extension rather than more contemporary knowledge exchange and participatory approaches (Grand-Est, Castile and León, Ireland);
6. need for trust to be built through better communication and relationships so that different cultures and traditions among forest stakeholders are overcome and forest owners and forestry professionals interact more comfortably (Grand-Est);
7. under resourced state forest services, or lack of alternative forest management services (North-Rhine Westphalia);
8. lack of industry organisation leading to issues such as weak supply chains etc (Slovenia);
9. lack of expertise among forestry professionals (Nord-East Romania).

There are two other connected areas of influence that are worth noting, i.e. economic and cultural. Many of the factors considered most important in influencing mobilisation are economic, e.g. markets, costs, uncompetitive processing sector. Solutions to overcoming these barriers, such as policy or market intervention might also be considered under the remit of 'governance'. Cultural factors are mentioned in many of the regions and are particularly about:

1. lack of a wood harvesting culture amongst owners, or a decline in wood harvesting tradition, so that owners are just not aware of nor imbued with understanding of woodland management and harvesting;
2. and, to a lesser degree, a prejudice against felling amongst 'the public' which means that there can be local opposition to harvesting operations, which influences owner actions.
3.

However, all the factors listed above vary by region. For example, some regions note that there is a strong tradition of forest management (e.g. Grand-Est). On the issue of legislation, rather than being considered negative, in Eastern Finland legislation is seen as a positive factor: The Act on the Financing of Sustainable Forestry incentives there recognises the needs of different kinds of (smaller) forest owner, and provides a cost-sharing programme for harvesting on sites where the profitability of harvesting would otherwise be poor due to the site conditions and tree size.

In addition, it is important to note that what is considered relevant to wood mobilisation in one region may not be in another region. For example, in some regions the historic assumption has been that support for forest management planning will lead to harvesting / mobilisation. However, there is little evidence that it has done so. SIMWOOD research shows the need for more explicit questioning of the intended and actual impacts of wood mobilisation projects.

Forest management factors influencing wood mobilisation

(Felipe Bravo, UVA, Spain)

Between the forest management indicators analysed, the main management factors influencing wood mobilisation are the following:

1. Composition and Structure of forests
2. Silvicultural schemes
3. Hazard risks

Composition and Structure of forests. Unbalanced age classes (with dominance of young and over mature stands) and increasing importance of mixtures are the main factors that appear in the analysis. The age structure shows clearly the importance of first thinning operations in young stands (including biomass commercial thinning) and late thinning and harvest operations in older stands while the increasing proportion of mixed species stands mean that silvicultural regimes must consider mixed stands interventions. Such interventions traditionally have not been included as regular operations in silvicultural regimes and there is a lack of knowledge regarding them.

Silvicultural schemes. Besides the silvicultural interventions described above and as part of the management regime, the implementation of management plans must be considered a relevant factor for wood mobilisation because the adequate regulation of forestry helps ensure the provision of goods (i.e. timber) and services. The quality and detail of management plans should be discussed at regional level within the framework of national and European regulations.

The relevancy of certification for mobilisation remains unclear but should be considered because certification can help to differentiate (by quality of management) the European timber in the global market (and perhaps facilitating the use of European timber in Europe). However, forest certification is expensive, especially for the individual forest owners. Higher levels of management processes and procedures are associated with certified forests (this fact should be translated to a better management that provides a higher return).

Hazard/risks. Hazards constitute an unwanted but often very effective factor for wood mobilisation due to salvage operations but this not should be the point for a sustainable wood mobilisation. The key point is that the lack of silviculture and forest management results in over-mature forest stands that may increase the forest sensitivity to natural hazards. The economic crisis has resulted in a reduction in the demand for solidwood, especially the larger size solidwood, while the demand for wood for biomass and for the board industry has increased. Thinning operations in over-mature stands could help to (1) mobilise wood, (2) increase the resilience against hazards and (3) promote the growth of higher dimension wood that can occupy alternative premium market niches (i.e. veneer wood).

Forest function factors influencing wood mobilisation

(João Azevedo, IPB, Portugal)

Generally, forest functions were not considered as constraints to wood mobilisation in the model regions, with some exceptions. For example in many model regions it was considered that there might be conflicts between mobilisation and water related functions and services since harvesting options might affect hydrological processes, particularly in streamside forests and forests in steep slopes. Reflecting this view, it was noted in the Bavaria profile that water and soil quality can affect the choice of harvesting methods and therefore the mobilisation potential. In Grand-Est it was also noted that water regulation can constrain forest mobilisation when there is a stream in the stand. In

Catalonia harvesting levels are affected in forests that have regulation purposes. It was highlighted in Auvergne that areas that are less suited for forest production become more important for regulation functions. From the perspective of Castilla Leon, Gelderland Overijssel, and Småland there are no conflicts although Småland considered that forestry can be affected in a negative way. The remaining regions did not comment on this topic which might indicate that no conflicts are foreseen there.

Tourism (recreation) is another function where potential conflicts were mentioned by model regions, particularly for hunting. Bavaria considered that hunting practices can affect forest ecosystems and outcomes strongly as well as the wood mobilisation potential. The Grand-Est region also considered that hunting can be a constraint for mobilisation but that other touristic activities were not constraints. North-Rhine Westphalia considered that tourism and mobilisation are unrelated. Yorkshire & North-East England mentioned that "tourism related constraints on the harvesting of timber are realistically limited to public access within forest blocks, particularly on public rights of way where the forest works manager and contractor need to be aware of health and safety related issues. For example, footpaths may have to be temporarily closed or diverted whilst felling activity is taking place and or felling could be restricted to certain times of the day/year".
For the other functions there were usually no comments made by the model regions with the exception of occasional indications that there are no conflicts (e.g., Overijssel & Gelderland and NFWP).

It should be noticed, however, that although model regions have not mentioned that expressly, conservation status restricts forest activities in some areas. For conservation two model regions indicated that there are no conflicts with mobilisation (Grand-East and Nordeste). South-Eastern Ireland mentioned very specific restrictions associated with hen harrier SPAs. On the other hand, Alentejo mentioned that the fact that high biodiversity relies on landscape heterogeneity created and maintained by human activities, including forest management, and land use change, supports the maintenance of these activities as a way to achieve conservation objectives. Although in this region some forest areas might have conditioned management in the future, this will have no significance at regional scale. It was noted in Lochaber that increased mobilisation in the future could provide income to improve the management of designated conservation sites.

Forest harvesting factors influencing wood mobilisation

(Philippe Ruch, FCBA, France)

The income that the forest owner derives from harvesting is directly linked to the harvesting costs and the value of the timber (the wood price). Income is of high importance when it comes to wood mobilisation in many of the model regions (Auvergne, Grand-Est, Catalonia, Alentejo, South-Eastern Ireland, Nordeste, Overijssel & Gelderland, Slovenia, Småland). In North-Rhine Westphalia income is also identified as important, but an increase in timber prices alone is not seen as a sufficiently, strong mobilisation factor. In Eastern Finland, one of the key issues is the profitability of the wood harvesting companies. For them, it is not possible to grow due to the low profitability of their businesses, mainly due to the limited duration of harvesting in peatlands. A solution could be to build more multi-purpose machines and machines which are more suitable for harvesting when the soils have low bearing capacity.

The existence of a valuable market is another main factor influencing wood mobilisation. In North-Rhine Westphalia and Castile & León for example, the markets for hardwoods have to be developed to motivate the forest owners to produce hardwood timber. In the section "**Specific needs for forest types,** the low market for beech timber was mentioned as a constraint (Bavaria, Grand-Est, Auvergne, Catalonia). In Catalonia, there is a lack of profitability in forest harvesting because of the low added value of forest products. The great majority of harvested wood is destined for the pallet,

packaging and particle board industry, all of which are low added value products. A structured market (meaning a better interaction among industries and forest operators) is suggested as a means to improve the efficiency of the value chain in several model regions (Catalonia, South-Eastern Ireland, Slovenia). In Latvia, a substantial wood mobilisation factor is the present and the future tree species composition and proportion in the forests. Indeed the market demand and prices are not equal for all the tree species.

Logistics is an important issue in wood mobilisation. No access means no wood harvesting (or very high harvesting costs). Only 3 regions mentioned logistics as a main barrier. In South-Eastern Ireland, where most forests are first generation, they do not have the required access. Road building has actually dropped in the last couple of years in this region (as a result of a reduction in the State-subsidised roading grants) compared to what should have been roaded. In Catalonia, the harvesting costs are high, because of some additional operations –i.e. forest road maintenance, shrub cleaning, pruning, transport limitations, etc. A shortage of forest towing paths and forest roads is a problem in Slovenia. One of the first steps in wood mobilisation is to create a relevant road and trail network. Logistics are the main issue in Nord-East Romania (lack of infrastructure) and also in Latvia (impact on the forestry costs).

Logging systems have to be more efficient in order to reduce the costs and the impacts on the soil (soil erosion, soil compaction), as it was described in paragraph **Logging enterprises and logging systems**. Expectations are especially high for the logging operations on sloped terrains, on sensitive terrains and for fuelwood in hardwood stands. The lack of modernisation is also a constraint for better wood mobilisation (Catalonia). The mechanization in modern machines is a solution. In South-Eastern Ireland, the availability of harvest haulage machines has become critical in the last couple of years. There are not enough modern machines to carry out the work leading to increased costs and delays in mobilising timber. NIPF owners need to achieve critical mass to prepare clustered contracts and offer industry large lots with harvesting plans, planned harvesting operations and good timber so that the logging companies can invest in machines. In Nord-East Romania, there is also a need to improve logging systems (machinery and professional expertise in timber harvesting). Other factors that are relevant are the lack of accurate information on timber volumes, a system of timber mensuration for sales and a lack of appropriate controls.

Environmental and climate constraints were identified in a number of regions; South-Eastern Ireland, where increased numbers of environmental designations and requirements have delayed and stopped timber mobilisation; Grand-Est, where fear of the impacts of the logging machines has also constrained wood mobilisation and Småland, where arising from the climate change it is harder to ensure that the logging operations don’t damage the soil and the remaining trees. This a real challenge during the rainy periods.

Table 16. Summary of key factors influencing wood mobilisation.

Clustered factors \ Model Regions	1 Bavaria	2 North-Rhine Westphalia	3 Auvergne	4 Grand-Est	5 Yorkshire & North-East England	6 Lochaber	7 South Eastern Ireland	8 Castille & Leon	9 Catalonia	10 Nordeste	11 Alentejo	12 Overijssel Gelderland	13 Slovenia	14 Småland	15 Romania	16 Latvia	17 Eastern Finland
Forest Ownership																	
Size distribution of forests	x	x	x	x				x	x	x		x	x		x		x
Characteristics of private forest owners	x	x		x		x					x						x
Knowledge and skills of private forest owners	x			x			x		x		x		x	x			x
Forest owner objectives	x	x					x			x							
Forest Governance																	
Actors and their programmes	x								x				x				
Regulations	x	x					x		x			x		x	x	x	
Incentives	x										x						x
Advice/information/trust	x	x	x	x											x		
Forest Management																	
Composition of forests	x				x				x	x	x						
Silvicultural scheme				x							x	x			x		
Hazard risks		x		x					x	x	x		x				
Lack of management							x				x						
Forest Functions																	
Awareness of forest functions	x			x									x			x	
Forest Harvesting																	
Markets		x				x	x	x	x		x		x			x	
Price/Cost		x	x			x	x		x	x	x	x		x		x	
Logging systems					x	x	x		x				x		X		x
Logistics					x	x	x		x		x		x		X		x
Environmental constraints	x			x							x						x
Climate constraints														x			

Solutions/Initiatives

In completing regional profiles SIMWOOD partners were provided with the first opportunity to identify solutions (initiatives) that were already being undertaken in their region to address wood mobilisation. These initiatives are explored further in WP 3. Some of the "existing" solutions form the basis of some pilot projects (in WP 4); while new initiatives/solutions identified in the Regional Learning Labs (WP 3) form the basis to the remainder of the pilot projects.

In the following section existing initiatives are summarized according to domain (Table 17). Many, as outlined in D.2.1, are in the governance domain. These include forms of forest owners associations either newly established (i.e. producer groups in South and Eastern Ireland) or existing (North-Rhine Westphalia, Catalonia, Bavaria). In Latvia, the formation of forestry co-operatives to address the challenges associated with the small size of forests is identified as a potential solution to the challenge of wood mobilisation. In Bavaria there are a number of Government led initiatives, such as the Mountain Forest Initiatives in alpine regions (BWO), in Eastern Bavaria (WIO) and in other Bavarian regions (SPP) which promote in a participative approach the integrative multi-functional forest management.

Other initiatives in the governance domain include incentives. In Eastern Finland, for example, incentives to promote joint ownership/discourage fragmentation of forests are available; lower tax rates apply to joint ownership compared to other forest ownership forms. Additionally, favourable deductions from a tax perspective also apply to those purchasing a new forest area. In Småland a form of "forest account" is described which allows forest owners to spread their revenue from timber sales over a number of years, thereby avoiding adverse tax consequences. A second incentive scheme is also available in Småland which provides flat rate subsidies to forest owners for their conservation efforts.

A number of initiatives which aim to develop links between the timber/biomass suppliers, i.e. forest owners and the consumers are described for Overijssel & Gelderland.

Logistics, specifically access, can be a challenge to wood mobilisation. In Grand-Est a road creation scheme was a particularly successful initiative. Similarly appropriate logging systems are essential. In Småland an accumulated harvester which facilitates harvesting is described as an initiative which encourages wood mobilisation.

An initiative identified in both Grand-Est and Småland which is seen to positively affect wood mobilisation is for forest owners to have management plans. This is a requirement in Grand-Est for forests of greater than 25 ha.

A number of solutions in the harvesting domain were identified in Latvia. Demand for fuel in the form of forest wood logging residues has increased, which has in turn increased the economic benefits associating with timber harvesting. Additional the gradual replacement of the equipment being used in forestry in general, and in harvesting more specifically, with a more modern and efficient equipment is having a positive effect on wood mobilisation.

In the broader context an active research programme directed towards the development of new wood and non-wood forest resource products is being pursued in Latvia so as to provide Latvian-produced products with high added value.

Table 17. Initiatives undertaken in the regions to address wood mobilisation.

Region	Initiative	Domain
		Governance
Grand-Est	Forest development scheme (PDM) contributes to the installation of neutral forest councilors who can assist forest owners in the understanding of their role and status in the local mobilization chain. The forest development scheme is a partnership between public institutions and service providers: both work together to contact and explain the private woodland owners how to manage their forests.	Actors and their programmes
North-Rhine Westphalia	Forest Management Federations (Forstwirtschaftlichen Vereinigungen, FWV). FWV are umbrella organisations that include other organisations as members (see chapter 2.2.4). At the moment 7 FWV with an area of circa 100,000 ha exist in NRW. Their main purpose is to have an impact on wood mobilisation.	Actors and their programmes
Southern Eastern Ireland	In 2014, the development of three discussion groups into a commercial producer group; working with members to build their capacity to understand the need for forestry management, cluster their forestry for harvesting and the development of markets. The group has 400 members, with 4,765 tonnes harvested to date and supplies woodchip weekly year round.	Actors and their programmes
Bavaria	136 Forest Owner Associations (77 % of communal and private forest area, about 30 % of PFO and CFO) exist in Bavaria. Their main purpose is to support the members (Advice, forest management, timber marketing).	Actors and their programmes
Bavaria	Bavarian Forest Service provides counselling for all forest owners (free of charge)	Actors and their programmes

Bavaria	Governmental led initiatives such as Mountain Forest Initiatives in alpine regions (BWO), in Eastern Bavaria (WIO) and in other Bavarian regions (SPP) promote in a participative approach the integrative multi-functional forest management.	Actors and their programmes
Latvia	Formation and operation of forestry co-operatives make it possible for the small forest owners to engage in a more efficient and higher quality timber resource management	Actors and their programmes
Catalonia	BOSCAT, Catalan Federation of Forest Owners Association. The seller is BOSCAT. It brings together the marketing of all the associations in relation to the Public Administration, they also work together with its customer, the industry. The goal of the seller is to solve the problem of fragmentation of forest ownership. In this way, they can join all the forest production and the customer, the forest industry, can be sure to find the material it need.	Actors and their programmes
Småland	So called “forest accounts” which is a kind of bank account that means that even a forest owner with small areas can make a big harvest. A forest account makes it possible to spread the revenue over several years, in order to avoid adverse tax consequences.	Incentives
Småland	One sub-project, called “diversity forests” under the European union funded project “Rural Development Programme” (Landsbygdsprogrammet), which made it possible for the Swedish forest agency to give flat rate subsidies to forest owners for their conservation efforts.	Incentives
Eastern Finland	Non-industrial private forest owners have the option of deducting 60 per cent of the procurement expense of a new forest area as a specific forest deduction. A forest deduction may amount to no more than 60 per cent of the annual capital income obtained from the corresponding forest area. The lowest annual limit for this deduction is € 1,500 (in 2005).	Incentives
Eastern Finland	Owners of jointly owned forests are subject to a slightly smaller applicable tax rate (28%) than other forest owners (30% or 33%).	Incentives

Gelderland & Overijssel	The biomass module for CMSi is to provide insight into the biomass availability on the longer term, should lead to a reduction in the costs of harvesting, pre-treatment and transport of biomass, should encourage the cooperation between various forest owners in a certain area and should provide a link between forest harvesting and local energy use.	Organisations/networks & markets
Gelderland & Overijssel	Duurzaam energiebedrijf gemeente Rheden. The project aims a realizing a renewable energy chain around the municipality of Rheden. Through the development of a local biomass market 'wharf', producers are coupled to local incinerators (<5 Mw). Lower quality wood resources are aimed for.	Organisations/networks & markets
Gelderland & Overijssel	Stoken op Streekhout**.** Interreg project aims to use biomass from the landscape for small scale combustion. The project continues in developing the chain from small forest and hedges owners to harvesting companies and consumers.	Organisations/networks & markets
		Management
Småland	Individual plans for management of forests, which are valid ten years and is necessary for an individual membership in PEFC or FSC, leads to more active forestry for wood mobilisation.	Management plan
Grand-Est	The obligation of having a management plan for all the forests of more than 25 ha is also a good initiative: the management plan is sometimes the only way for the woodland owner to benefit of tax reductions. Moreover, in such plans, forests have to be harvested.	Management plan
		Harvesting
Småland	Accumulated harvester which extract around cultural land in conjunction with extraction in areas for thinnings.	Logging systems

Latvia	Gradual replacement of the forestry work provider equipment with a more modern and efficient equipment	Logging systems
Grand-Est	The road creation was also a successful initiative, because roads were created in areas with a high harvesting potential, and where the lack of access to the forests was a real problem to the mobilisation. But it's important to have someone (of public institution and/or service providers) that leads these operations, because the forest owners usually don't act by themselves. They have to be advised.	Logistics
Latvia	Amounts of forest wood logging residues used as a fuel are increasing, thereby the negative effects of fossil fuel use by replacing it with forest biomass are reduced, greater economic benefits are derived from logging and timber harvesting, and forest timber resource use is rationalized.	Markets

Focus Studies

A total of 19 focus studies have been completed (Table 18) addressing a range of topics. A summary of each focus study can be found in Annex 1. An overview of the studies according to the main theme they addressed is presented below.

Table 18. Focus studies conducted in the Regions.

Focus study	Model region	Topic	Group
1	Nordeste	Forest owners profile; the role of associations of forest owners in providing forestry services	1
2	Overijssel & Gelderland	Economic aspects of forest harvesting by private owners in Overijssel & Gelderland	1
3	Lochaber	What motivates land owners and managers to manage their woodland?	1
4	Auvergne (relevant to a wider area)	Modelling forest owners' willingness to consider active management, including harvesting operation	1
5	Bavaria	Actors and their role in Bavarian forest initiatives' networks	1
6	Slovenia	Actors and their role in Slovenian forest owner associations' networks	1
7	Ireland	Irish private forest owners decision-making in wood mobilisation: the influence of the social network	1
8	Yorkshire and the North East	Forestry sector skills audit	1
9	Overijssel & Gelderland	EU wide market demand for wood	2
10	Småland	Evaluation of installed forest energy effect and available amount of forest fuel in the region of Småland	2
11	Grand-Est + others	High environmental quality criteria for deeper trust in Logging	3
12	Castila and León	Tree selection behaviour in thinning operations	3
13	Nordeste	Tool to assess suitability of areas for different management objectives and to identify conflicts among uses/objectives	3
14	Nordeste	Forest logistics evaluations	3
15	Nordeste	Tools for forest growth/yield modelling	3
16	Nordeste	Establishment of a regional inventory systems to support forest evaluation and management	3
17	Nordeste	Trade-offs analysis. Optimizing forest uses, functions, and services	3
18	Alentejo	Improving the estimation of harvested wood by species and type of use	4
19	Alentejo	Improving the information about the non-wood products and services provided by forests	4

1. Forest owners, their motivations and skills

Demand for wood is increasing and studies have shown the theoretical maximum harvesting level in European forests to be greater than the actual harvest levels. In Europe over half of the forests are privately owned; this varies by country and by Region as outlined earlier in this report. Thus the supply of timber is significantly influenced by the objectives and actions of private forest owners.

Information on private forest owners, their objectives and the extent to which they harvest and their social networks was lacking in many Regions and often could be obtained only with expert opinion. A number of Regions therefore chose to undertaken focus studies to address this knowledge gap.

The owners of private forests

In the Nordeste Region a detailed investigation of forest owners was undertaken in one case study area, the Lomba Forest Intervention Zone (Study 1). In addition the study aimed to understand the role of the local association of forest owners (Arborea) and its impact on wood mobilisation. By accessing information on forest owners in the case study that had previously been collected by Arborea a profile of the owners within the case study was produced. An assessment of the forest management procedures being used to mobilise wood and other forest products was made based on interviews with the Head of the Lomba Forest Intervention Zone and other stakeholders. The information collected in this focus study will provide the grounds for the development and application of the Pilot Project in the Region.

Forest owners' motivations regarding harvesting

In both Overijssel & Gelderland (Study 2) and Auvergne (Study 4), studies were undertaken to identify the factors that influence the harvesting behaviour of NIPFs. In the former, a survey of 73 such owners in the Region was conducted; in the latter data were obtained on forest owners from information collected by the Ministry of Agriculture and Forestry. In Lochaber a focus study was also carried out to get a better understanding of the motivations of forest owners (Study 3). The Bavarian Focus Study (Study 5) also includes a comparative analysis of the priorities of forest owners (distinguishing 8 different owner types) and the relevancy for action in regard to various issues of forest management (219 forest owners).

The results from the Overijssel & Gelderland study showed that the primary management objective of those surveyed was to conserve or increase the natural values of the forest. Earning an income from the forest was, in general, only a minor objective. The results from Bavaria show that for Bavarian forest owners an increased wood production for the markets and site development (roads) is only a secondary priority. Although considerable differences exist between owner types, the income from forests ranges only from one to four per cent of the total household income. In addition the study found that owners already participating in various forest initiatives are more 'mobilisation-oriented' than those that have not participated. The latter group holds the least household income from forests (1%) and has the lowest roundwood production.

In Overijssel & Gelderland despite the overriding objective of conservation, a significant number of NIPFs interviewed had harvested timber, primarily as a means of supporting their other objectives for their forest. Almost three-quarters of owners have plans to perform a harvest, either a final felling or a thinning, within the coming 5 years. Their main motivations for conducting such a harvest were to ensure optimal growth of potentially valuable trees along with economic and ecological reasons. The reasons for not planning to harvest were investigated; these varied from the lack of importance of the income to the owner to the unsuitability of the timber stock for harvesting. It should be noted

that even though financial motives are less important than other motives, NIPFs appear to be sensitive to financial incentives. This suggests that a substantial number of forest owners in this Region would increase the volume they harvest if timber prices increased significantly.

The influence of a wide range of socio-demographic factors on the decision to harvest was explored in Overijssel & Gelderland. Some of the key findings were that 50% of those surveyed indicated that they would like to develop the timber stock to make it more suitable for harvesting; almost one fifth indicated that they wanted to improve the accessibility of their holdings so as to be able to harvest more timber from then.

Residues are expected to provide a significant proportion of woody biomass. The Overijssel & Gelderland study investigated the willingness of owners to harvest residues. It found that half of owners did not harvest residues; the primary reason being that this is as of yet not an economically viable option for them. Also some owners had concerns about the potential negative impact that harvesting these would have on soil nutrients.

In the Auvergne Region forest owners' motivations to harvest timber were investigated. The overall aim was to produce a typology of owners based on their motivations; different strategies could then be developed and targeted at the different groups to encourage them to harvest. The study had access to data collated during a national survey of forest owners conducted by the Statistical Department of the Ministry for Agriculture and Forestry. In addition, NFI data were used. Using both these data sources models that predicted:

a) the probability that a forest owner will harvest (Model 1);
and
b) the volume (m^3) harvested by a forest owner (Model 2),

were developed. Only variables that were recorded in both data sources were used as potential explanatory variables and these were variables associated with the forest, i.e. forest size; species composition; forest increment in the region etc. Model 1 was shown to work well when it was applied to a validation data set and predicted the likelihood of an owner harvesting quite well. Model 2, however, has a low explanatory power. This can be partly explained by the fact that it relies on the owners' recall of the volume harvested; a comparison of their estimates extrapolated to the Region with the estimate provided by the NFI for the Region revealed that the owners appeared to be underestimating the volume they harvested. Hence this model as currently developed is not precise enough. Further work could be done to improve its precision.

In Lochaber interviews were conducted with woodland owners, managers and contractors; the database from which their names and contact details were drawn had been initiated at the first RLL. Following the interviews a workshop was held to share and analyse some of the issues that emerged during the interviews. The interviews and workshop also helped to build relationships to support the work of the pilot project. The interview participants identified a range of aspects relating to wood mobilisation that could be addressed to increase the number of woodlands being managed and in turn the volume of timber being produced; these included:

- A deficit of knowledge with respect to all aspects of forestry, including understanding, skills, knowledge of markets and how to negotiate with them;
- The capacity of the landowner/manager to engage with forestry (e.g. time);
- Geography and scale;
- Trust (who are the contractors and can they be trusted? What advice is available and how can this be accessed? The need for contractors to understand the individual needs and objectives of small woodland owners;
- How to maximise management for local value.

The results from the focus study provided information that will be used to target the pilot project, i.e. the target will be woodland that is accessible for management; smaller areas of woodland where forestry is not the main objective and community owned or managed woodland where there are skills and capacity deficits.
The outline for the pilot project for Lochaber included the pro-wood mobilisation measure to be tested as:
'Does increased knowledge and capacity with respect to the viability (both economic and practical) of management of underutilized woodland mean that landowners would take measures to bring that woodland into management? Can this be achieved through collaborative working?'

The focus study supported this as a measure.

Forest owners' and forest initiatives' social networks

A number of focus studies addressed the topic of social networks; as wood mobilisation can be viewed as a social process. The social networks surrounding forest owners; forest owner associations and governmental forest initiatives were explored using social network analysis. In Ireland (Study 7) over 50 forest owners were interviewed to gain insight into what actors (organisations or persons) influence their decision-making. In Slovenia the networks of 25 forest owners associations were investigated (Study 6). In Bavaria (Study 5)[33] the networks of 21 forest owners associations, 44 governmental forest initiatives and 219 forest owners were investigated, primarily using electronic questionnaires /telephone surveys (544 persons) as well as of face-to-face interviews (240 persons). These focus studies collectively addressed a number of questions:

1) Who are the persons or organisations within governmental forest initiatives in Bavaria (Study 5)?
The most influential actors for governmental forest initiatives are the local forest administrations, forest owner associations and communes. Each of these organisations and the persons involved in them may have different priorities for, or interests in, forestry; hence, the goals of an initiative depend on what organisations/persons are involved. Their support for an initiative's goals (political programme) depends on their willingness (degree of coincidence of their interests with the programme's goals), their individual capacities and the capacities of third party actors, they can gain from the network (c.p. Aurenhammer, 2013, 2015). At a minimum, the above actors will need to be considered, when establishing initiatives or pilots, as they decide upon and determine change in forest management (at the project level).

In the composition of participating organisations/people the influential actors may either focus on a strong coherence of interests and beliefs ('advocacy coalitions') or may try or need to involve a broader group of organisations to gain legitimacy, solve cross-sectoral problems, gain attention or avoid counter movements. The more diverse the coalition of organisations the more relevant it is that important and comparatively influential allies are satisfied (implementation of their goals) and do not turn into opposition. On the other hand, initiatives limiting themselves more to traditional partners may face opposition from other networks or organisations, external to their initiative.

Persons and organisations that participate in the initiative perceive interests and goals for road construction and marketing of wood as strongly implemented; forest owners and forest owners associations discern medium success in implementing wood production in current initiatives.

[33] * As a contribution to the focus study in Bavaria KWF developed „Fact Sheets" to show the status quo and potential of harvesting in steep terrain, for the 2 sub-regions of Bavaria (Upper Franconia and Schwaben), where also the pilots are located. It was a valuable contribution to harvesting part. It was developed in regional learning labs and is it intended that it will be used also as a training tool in workshops (in German language) (See Annex 2).

2) Who are the persons or organisations involved in Forest Owner Associations (Study 5 and 6)?
The most influential actors in Bavarian FOAs networks are the FOAs themselves, their regional umbrella organisation and the local forest administrations. These three actors hold locally the highest potential to initiate change in forest management.

Forest owner associations differ regarding their organisational structure, activity and goals in forestry. Their goals do include wood mobilisation; within different associations this goal attracts different levels of support and success. The implementation of goals is perceived strong for marketing of wood, and good for road construction and wood production.

In Slovenia (Study 6) the most important actors for the forest owner associations were the Slovenian Forest Service, the National Forest Owner Association (an umbrella group for the forest owner associations) and the Chamber for Agriculture and Forestry, the latter two are predominantly advocacy organisations. The Agricultural and Forestry Cooperatives (AFCs) gain medium overall influence – they are allowed to market wood. Organisations related to harvesting, trading and processing timber are less influential. These findings may reflect the main goal of forest owner associations which is advocacy and providing advice rather than harvesting, marketing and forest roads (which, however, is the category of goals with the third highest priority).

3) Who are the persons or organisations that private forest owners perceive as important for them (Study 5 and 7)?
The Bavarian study (Study 5) shows that private forest owners who are members of forest owner associations or who participate in governmental initiatives credit local forest administrations and forest owner associations with providing more influential and relevant forest information, financial, material and personnel capacities, irreplaceability and with receiving higher trust than any other person or organisation. In comparison, private forest owners who are not part of a forest owner association or governmental initiative perceive less influence or relevancy of (the various capacities of) the local forest administrations and forest owner associations in their forest management decisions, but consider family as more important and influential parts of their networks.

Differences were noted in the socio-demographic characteristics of members/participants and non-members/non-participants of forest owner associations or initiatives. The latter have smaller forestry plots, live further away from their forest and have less interest and actual activity in roundwood production than the former.

Results further show that for Bavarian forest owners increased wood production for the markets and site development (roads) is only a secondary priority. However, generally they perceive that wood production for markets could be better implemented and holds relevancy for action, in contrast to road construction. Because considerable differences exist between owner types (8 types have been distinguished), generally with the youngest, largest and locally-living more attached to 'mobilisation' issues, this needs to be considered in policy and practice. In some communes, female forest owners are more interested in wood production than males.

In comparison, the focus study in Ireland (Study 7) shows that private forest owners who are a member of a forest producer group (somewhat similar to an owner association) use the group as an additional information source rather than using it as a substitute for any other person or organisation. The producer group is also the only organisation mentioned to be irreplaceable during the harvesting process by members of a producer group.

For all private forest owners, forest information from public bodies is perceived as good but such organisations generally don't provide advice on how to market timber. It is persons or organisations that could give such advice and who may conduct the harvesting that Irish private forest owners miss most in their social network.

Skills of owners, woodland manager and contractors

Wood mobilisation requires skills and knowledge among forest owners and contractors. The RLL conducted in the Yorkshire and the North East Model Region identified a concern about skills and knowledge amongst contractors in regard to undertaking management of small or complex undermanaged woodlands. Hence a focus study was undertaken in the Region that aimed to obtain a better understanding of the present skills and knowledge levels of forest/woodland owners as well as small to medium sized enterprises involved in the management of woodlands (Study 8). In addition the entire supply chain was looked at to identify any gaps and suggest solutions through either existing training provision or by highlighting where additional provision is required. A targeted online survey was produced and circulated to woodland owners and SMEs involved in the management and supply chain of the regions' woodlands. The target sampled was identified using the SME's own contact list as well as other network's contact lists such as Forestry Commission Yorkshire and North East district as well as through the Royal Forestry Society.

The results showed that the training undertaken by those within the contractor/woodland manager group was more focused towards health and safety activities and machinery operational skills, with activities such as establishment, management and harvesting. Falling further down the list of activities is training in relation to environmental best practice and forest management skills. These are important areas that are required for the management of small undermanaged and complex woodland sites where further wood mobilisation could be achieved. In the case of woodland owners 45% had undertaken no training which is relevant to the management of their woodland. For those woodland owners that had undertaken training, the range of subjects was greater, with health and safety associated training being the focus, shortly followed by forest management and regulation and grants and licences. As with the contractors/woodland managers, the number of respondents that said they attended any training associated with establishment or harvesting was very low.

The majority of training (49%) was undertaken towards statutory minimum standards or to a basic level, introductory certificate or diploma through to first certificate or diploma, with respondents only looking to undertake courses that are required to legally and contractually obtain and fulfil a contract. The main barriers to accessing training were the cost associated it and the loss of income arising with the time spent training. Only 16% of owners and managers had taken on apprentices in the past. When they were asked if they would look at taking on an apprentice in the future the response from both groups doubled with 38% saying they would. The reasons given for not taking on an apprentice were clearly different between woodland owners and the contractor/woodland managers. The woodland owners cited the lack of demand required for an apprentice, whilst contractors/woodland managers cited time and cost as the main barrier to taking on apprentices.

2. Demand for wood

The demand for, and supply of, wood was addressed in two focus studies; one on a European level conducted in Overijssel & Gelderland (Study 9); another taken a much more localised approach (Study 10). The former addressed the topic of current and future demand for wood at EU level and was a meta-study of four previously conducted studies regarding projections of future wood markets including:

- EU Wood (Mantau et al., 2010)
- European Forest Sector Outlook Study II (EFSOS II)

- Forest biomass for energy in the EU (IINAS, EFI, JR, 2014)
- Future of the European Forest-Based Sector (Hetemäki, 2014)

A thorough qualitative analysis of the aforementioned studies was conducted in this focus study. The modelling approaches used and the assumptions made in these four studies were identified. A number of variables which could possibly affect demand were identified from theory, and it was found that six of those were identified in the four mentioned studies. Each of the aforementioned studies was evaluated and it was concluded the future energy biomass demand level from the EU Wood study and EFSOS II study are the most plausible. The focus study outlines if the forecast demand from these studies occurs and assuming that energy wood would account for a considerable share of the supply (40-50%) this would result in substantial demand for wood for primary energy production; between 740 Mm^3 and 808 Mm^3 by 2020 and between 967 Mm^3 and 1030 Mm^3 by 2030. The study questions whether it is possible to mobilize such amounts of wood; the National Renewable Action Plans suggested a total of 477 Mm^3 to be mobilized by 2020. EFSOS II does state that it is possible to supply such amounts, but considers import of wood from outside Europe, and warns about detrimental effects on national and international forests. The study also highlights that the declining demand for pulp and paper will not be sufficient to counterbalance for the expected increase.

Demand for wood is also explored in another focus study conducted in Sweden (Study 10); this focuses on identifying the current demand for wood arising from the installation of bioenergy boilers in Småland. The study estimates the total number of bioenergy boilers in the Småland Region to be 73; each with a power equal to or in excess of 3 MW. The study also looks at how this demand could be met; it finds that potential energy that primary forest fuels (i.e. logging residues, stumps and weak trees) could supply is 1 TWh/year (assuming the most efficient harvesting and handling systems are used).

3. Development of tools

Focus studies in which tools were developed that addressed a number of issues relating to wood mobilisation were undertaken in a number of Regions. Tool 1 to engender trust in owners can and has been applied in a number regions. The other tools are not suitable for use in other regions as they use local data and/or models. However, their approach and methods can be replicated in other Regions and it is intended to investigate this further.

Tool to engender trust in owners in forest operations (Tool 1; Study 11)

Forest owners who have never previously engaged in harvesting may need to be reassured that the harvesting operation can be/has been conducted according to the principles of sustainable forest management. If reassured, this should increase the likelihood that they will conduct another harvest. It may also result in them telling other forest owners how satisfied they are and increase the likelihood of others harvesting. To this end a “high environmental quality” (HEQ) logging tool was developed in Grand-Est (Study 11) and tested in three Regions (Grand-Est; South-Eastern Ireland; and Bavaria). The following is a brief description of the tool:

- The HEQ-dialogue tool allows the expectations (and also fears) of the owner to be clearly identified to reassure him/her and explain to him/her what is going to take place in his/her forest. The document also highlights preventive measures that might be relevant and how to take them into account, as they can have an impact on the financial balance of the operation.
- The HEQ-dialogue tool is a “support document” quite simple in its form and includes photos and simple, comprehensive vocabulary. All the photos can be customized to the company (user of the document) and its regional context.

This tool can be used in each pilot project where logging operations will be carried out.

Tool for forest growth modelling (Tool 2; Study 15)

In Nordeste there is a lack of knowledge on forest growth, and forest growth modelling tools are rare. In the focus study undertaken in this region existing growth models for *Pinus pinaster* and *Quercus pyrenica* were tested against national forestry inventory data to identify the ones that provide the best estimates of growth and yield for the forests in the region (Study 15). These models were compiled in libraries developed in C# language. Tools were developed that allow users to simulate growth and the effects of thinning on stand structure and on yield in a user friendly fashion. For academics and researchers two desktop tools were developed that allowed access to both the growth models and the thinning design model. A cloud computing tool was also developed for forest owners and managers which gives access to the same models but which has a different interface. These developments will allow both sets of users model/predict the consequences of their actions/management practices. Making these models accessible in this fashion will be the basis for professional forest management in Region, allowing the scheduling of thinning operations, providing knowledge about the volume to extract and the time (age) to harvest.

Tool to analyse CO_2 emissions and cost of transporting timber (Tool 3; Study 14)

Increased wood mobilisation should be achieved in a sustainable way. This means, among other things, that the economic costs along with negative environmental impacts of such mobilisation be minimised. In one focus study, the CO_2 emissions and cost of transporting timber along different routes in the Nordeste region were investigated (Study 14). Transportation in this Region is quite challenging due to the high elevation and difficult topography associated with it. The evaluation of transportation fuel costs and carbon emissions requires access to spatial and non-spatial data; however, the first type of data is difficult and expensive to access. In this focus study the potential use of a free/open geographical database to provide the spatial data required to address the issue was investigated. The road network data provided by OpenStreetMap© along with a digital elevation model for the Region provided the spatial base to run an empirical truck kinematic model to build a truck simulator. Combining this truck simulator for the region with the equations of EMEP/EEA (Air Pollutant Emission Inventory Guidebook) a tool was built to estimate the fuel consumption and CO_2 emissions for a determinate route or set of routes for the Region associated with forest products transportation. The tool can be used to analyse the spatial movement of wood, taking into account different factors that define a specific region, such as road typology, truck types, topology, etc., to evaluate and map fuel consumption, costs and CO_2 offering the possibility of taking these results into account in forest management decision-making. The results of the application of this tool provide spatial and numerical information that can be used in forest logistics in a given area to detect problems and to look for solutions to minimize costs and CO_2 emissions.

Tool to assess suitability of areas for different management objectives and to identify conflicts among uses/objectives (Tool 4; Study 13)

There is a lack of tools that can aid forest planning for multi-functionality. The values of some of the various functions of forests are subjective and can be addressed by expert knowledge or public opinion. In a focus study undertaken in Nordeste (Study 13) a tool was created that converted the subjective assessments of experts and society (public opinion) of the value of the various products/functions/services of forests in the Region. Two methods, the Analytic Hierarchy Process (AHP) and multi-Attribute Utility Theory (MAUT), were used to convert stakeholders' opinions into quantitative data that were used to generate values that could be used, *inter alia*, in operational modelling. This tool could be used to evaluate the suitability of the Nordeste Region for different

forest management objectives and to identify potential conflicts among uses/objectives in the Region.

Tool to analyse trade-offs in multi-functional forest management (Tool 5; Study17)

Sustainable wood mobilisation requires knowledge of the relationship between the different products and services of forests including timber. In Nordeste a focus study was conducted (Study 17) in which a tool was developed that allowed trade-offs between various forest products and services to be analysed using linear programming. The tool, known as Apptitude, is a matrix generator tool that builds generic linear programing problems automatically, with the goal of maximizing the NPV (net present value) for the region involving all the services and forest products under different restrictions (spatial and temporal). AppTitude can be used to simulate how a forest will be in the future (max of 20 years) under different scenarios.

This is a management tool that should be applied at the regional scale and could be used to test the implications of different policy programmes. Users will be managers from companies, associations, and public bodies. The tool is also useful for research. The tool is of great importance for forest mobilisation since it provides the background to decision-making processes involving multiple forest products and ecosystem services in a region where multi-functionality is of paramount importance.

Tool to educate public about selection of trees for thinning and impact of thinning on stand development (Tool 6; Study 12)

In Castila and León (Study 12), a marteloscope, which is a fixed area plot in which a detailed inventory has been undertaken, was established in the Focus study undertaken there. The marteloscope was used to show the consequence of tree selection in thinning on stand development. Twelve people with different levels of forestry knowledge and different socio-demographic backgrounds selected trees for a thinning; they were told in advance of the marking exercise that the objective of the thinning was to produce timber and firewood while improving biodiversity and protective value. The study provides insight into the behaviour of different people with regard to marking trees and highlighted the role of marteloscopes in 'educating' people about marking and its impact on the stand, and wood mobilisation in the long term.

4. Supply of wood and non-wood products

In some of the Regions information is lacking on wood production. In the Alentejo Region a focus study attempted to determine the volume (quantity) of wood products (by species) consumed in the region (Study 18). The Study initially attempted to do this by approaching those supplying the wood, i.e. forest owners and those consuming it, i.e. the industry and other users. However the data obtained from both these sources were inconsistent. Instead field work was undertaken in a selection of stands on which data had been available from a previous inventory. The growth since the last inventory was simulated using growth models to determine what volume should be removed and to determine if the silviculture management model, previously established, was followed. This gives some indication on the volume of wood harvested, by species. The contact with the owners and the field work provided information on the actual management model followed by the owners. The contact with the industry gave an indication of future demand. This information can be used to develop action plans for each species, i.e. plans for how management could be changed to address these future demands for the species. The overall aim in the context of SIMWOOD is to improve management so as to improve productivity so that more timber will be available for harvesting and to address the increasing demand.

In the Alentejo Region a focus study was conducted to obtain information on the importance of non-wood products and services in this Region and to determine the trends in these products and services over time (Study 19). Currently there is no systematic recording of data on the majority of these products and services. A sample of forest owners, forest companies and forest owner associations were surveyed to determine the trends in the production and importance of non-timber products and services. Data were collected from additional sources including: market studies; associations that represent the producers of these products and service providers; and regional studies. The information gathered from both sources was compared with that from the National Statistics Institute in an attempt to organise data on the non-wood products and services so as to allow comparisons over time. With the data collected in this focus study it was possible to make some comparisons over time.

This information is relevant to SIMWOOD as the objective is the sustainable mobilisation of timber. To address this issue information is needed on trends in non-wood products and services to ensure that any increased mobilisation that may occur is not to the detriment of other products and services. In addition, the information gained could also be used to adapt management so that the non-wood products that are important can continue to be produced. This balance in production is very important to ensure that the forest owner has the financial capacity to invest in wood production and sustainable management.

Reliable and detailed information on the wood (and other resources) within the Regions is a perquisite to any work being undertaken to mobilise timber. In Nordeste a focus study to identify modifications that could be made to the sampling protocol of the National Forest Inventory, in particular in relation to sampling intensity and location of sampling plots, was undertaken (Study 16). It quantified the sampling errors associated with the current estimates of growing stock in the two major species within the Region, i.e. maritime pine and Pyranean oak, and explored a number of ways in which this sampling error could be reduced.

This study identified ways with which forest inventory data with regional resolution could be made available, therefore filling the existing gap in detailed data in Nordeste, and making it possible to estimate forest resources that can be mobilised at the regional scale. This information can have an effect on markets, local industries, consultancy firms and other local actors related to forest mobilisation.

Annex 1: Summaries of focus studies

Study 1: Forest owners' profile; Role of Associations of forest owners in providing forestry services

Author: Dr. Sílvia Nobre, CIMO/IPB, Portugal

Simwood Model Region	Nordeste Transmontano (Portugal)
Objective of the Focus Study	Objectives: • To get to know the profile of forest owners in the Northeast Region of SIMWOOD • To understand the fieldwork carried out by a local association of forest owners and its impact on wood mobilization. Knowledge gap: • Detailed information on forest owners in the Pilot Project area
Methods used	Taking as *the main source of data collection on forest owners the information previously collected by Arborea* (Local association of forest owners and simultaneously entity integrating the SIMWOOD project) we focused in a case study of the Lomba ZIF (Forest Intervention Zone), whose management is outsourced to *Arborea*. Thus we proceeded to a *brief description of the Lomba ZIF*, namely: - by tracing the profile of its forest owners; - doing the characterization of the two Commons that (in varying proportion) comprise the ZIF. *Interviews were also made* - to the operational head of the ZIF; - to the leading bodies of the commons; - with some forest owners (if any) *in order to better assess forest management procedures for the mobilization of wood as well as other forest products.*
Results	Total area of LOMBA ZIF (Forest Area of Intervention): 2 142 ha LOMBA ZIF area belonging to forest owners: 1369,2 ha Number of forest owners in the ZIF: 55, 89% of whom reside in the parishes that comprise the ZIF; 11% live outside, mainly in the country but in some cases immigrants in Europe. In spite of most of the owners are resident in the parishes that comprise the ZIF, not all work there, nor have occupations related to agriculture Number of Commons of ZIF: 2 Total area of 2 Commons included in the ZIF: 772,68 ha The prevalence within the ZIF areas of woods and pastures (53%) highlights the importance of forest grazing and the conditions for the development of

	hunting. This study is important for the understanding of the community of owners and the processes used in forest management in the area where the Pilot Project will be implemented. The data gathered in this focus study will provide the grounds for the development and application of the Pilot Project.
Domains addressed (ownership; management; governance; forest functions; management)	Ownership; governance; management;

Study 2: Economic aspects of forest harvesting by private owners in Overijssel & Gelderland

Authors: Wouter van Os, Wageningen University; Supervised by Wageningen Univ., Alterra and BTG

Simwood Model Region	Overijssel & Gelderland (The Netherlands)
Objective of the Focus Study	Especially with respect to for private forest owners, information on the economic aspects of forest harvesting in the model region Gelderland/Overijssel is scarce. Economic aspects of forest harvesting by private owners is believed to be an important factor in wood mobilisation, which explains the relevance of the topic.
Methods used	There are major knowledge gaps when it comes to private forest ownership in Europe as well as in the Netherlands. To overcome some of these the focus study has investigated the way certain variables influence harvest behaviour of non-industrial private forest owners in Gelderland and Overijssel. The research methodology was the use of a questionnaire to gather data from NIPF owners in Gelderland and Overijssel. A total of 346 NIPF owners – identified in the 6th Dutch National Forest Inventory – were approached with the questionnaire. The response was 21% (73) questionnaires. These questionnaires were analysed using Excel and SPSS.
Results	Conserving and increasing the ecological values of the forest is found to be most important management objective amongst the respondents, confirming the notion that NIPF-owners prioritize certain non-timber related amenities above profit maximization. The income from the forest is found to be for the most part intended to cover certain costs related to the forest. For 73% of the respondents harvesting timber is a means to achieve their forest management objectives. It is found to mainly serve the prosperous growth of trees that could become valuable timber in the future and the economic objectives of the owners. 3rd main reason is to directly enhance the ecological functions of the forest. 26% of the respondents is not planning to harvest in the next 5 years. Their main reasons not to are of various scope ranging from the unimportance of the income from timber to stating that the conservation values of the forest are more important and not possessing the right timber stock. 49% of the respondents indicate not to collect harvest residues such as branch and topwood. The main motivation for not harvesting/collecting these residues such are that as of yet this is economically not profitable. Also some respondents are afraid that collecting these residues will take out too many nutrients from the forest. Cooperating to bring down costs and providing education on sustainable timber harvest could lead to increased levels of harvest intensity and the collection of harvest residues.

	In the realm of the socio economic variables it was found that the owners with an educational background, either formal or informal, in forestry tend to act more often (82% against 25%) according to a formal management plan. The harvest intensity of the respondents with a formal management plan was found to be lower (5.5 m^3/hectare) than those with informal or no forestry education (13 and 14.6 m^3/hectare). It is not clear why this is the case. The study also found a difference in the management objectives in that the 'educated' group ranked the amount of financial return from the forest holding as most important while the 'non educated' group ranked conserving or improving natural values of the forest as most important. 72% of the respondents were found to live within a 25 km radius of their forest holding and 58% even within a 5 km radius. Respondents living closer (within 5 km radius) to their forest holding tend to have larger holdings (140 against 117.6 hectares), have a larger harvest intensity (12.9 vs 8.5 m^3/hectare) and have more often a background in agriculture (45% against 26%). Concerning the forest resource, 23% of the respondents own a forest holding smaller than 5 hectare. Insight into how the size of the holdings developed over time could not be obtained from this study. When dividing the respondents based on being engaged in harvesting or not, it is found that the group not engaged in harvest is to a larger degree represented by owners who possess a smaller forest size. The smaller (<5 hectare) owners more frequently obtain income from activities other than timber harvest or subsidies (75% against 54%). Another important result related to the forest resource is that we found some 50% of the respondents that would like to develop their timber stock to make it more suitable for harvesting. Furthermore, 16.7% of the respondents indicated they would like to improve the accessibility of their forest holding to be able to harvest more timber. These are important findings because it improvement on these points could directly lead to an increase in the harvest intensity in those forests. Within the market variable category the following was found. The average price at which a m^3 of timber was sold the last time a harvest was undertaken is 34.38 Euro. On average the income from timber makes up 53.25% of the total income from the forest holding. In line with Oldenburger and Kuiper (2005) this study found that the price at which timber sells can be an incentive to increase harvest volumes for some 35.8% of the respondents. The average price increase should be about 25.2% for these respondent to be willing to increase their harvest intensity. Contrary to most studies investigated by Beach et al. (2005) this study found a negative relation between price and harvest intensity. A slight positive, though not significant, relation was found between forest size and timber price. This could indicate that larger owners can negotiate better prices and have to sell relatively less timber to achieve an often indicated objective of covering the costs associated with the forest holding. 56% of the respondents were found to receive an average subsidy of 61.66 Euro per hectare. It was found that the average forest size of the

	respondents receiving a subsidy is quite a bit larger (192 against 56.7 hectare). 25% of the respondents were found willing to increase their harvest intensity to compensate for a loss in income from subsidy of, on average, 22.9%. Most subsidies now are mend to increase certain natural values of the forest. It could be that when subsidies are given for timber harvest related practices the harvest intensity increases. This study however did not investigate this. **Relevance for SIMWOOD –** This study provides a interesting overview of NIPF owners in Gelderland and Overijssel. Contemporary information on this group was not available, and hence this information is very valuable, especially because SIMWOOD targets forest owners to increase the amount of wood mobilisation. The entire dataset is available for further study and comparison with other model regions.
Domains addressed (ownership; management; governance; forest functions; management)	Ownership, harvesting, management.

Study 3: What motivates landowners and managers to manage their woodland?

Authors: Amanda Calvert, Small Woods, Scotland

Simwood Model Region	Lochaber, UK
Objective of the Focus Study	The objective of the focus study is to gain a better understanding of the motivations of woodland owners, the reasons why they manage or don't, and their actual and perceived barriers to mobilisation. Information gathered through the regional profile, at the region's RLL, and through interview with stakeholders, identified a gap in knowledge with respect to the motivations of woodland owners for woodland management. This is seen as a barrier to wood mobilisation. This focus study will address this gap. The information gathered will feed into the pilot project through increased understanding with respect to the level of knowledge and the capacity of landowners and managers. It will act as a baseline for evaluation, guide where each activity is best focussed, and help define where to target aspects of the pilot project geographically.
Methods used	• The database of landowners and managers, which was started with the regional profile and RLL, was expanded and from this a diverse range of landowners, managers and contractors were selected for interview for the study • A series of closed and open questions were produced and used in telephone and face to face interviews. The closed questions only to establish geographical location, type of owner/manager/contractor, type and area of woodland, and to open conversation. Open questions were then asked to test understanding, give time to reflect and respond with opinion • A workshop was held to share and analyse some of the key aspects from the interviews. To seek further opinion, to discuss collaboratively, to gain ideas and capture outputs for further development of the pilot project The interviews and workshop were also designed to help build relationships with individuals to support work through the pilot project. Landowners/managers/contractors involved in the focus study were selected from as broad a range as possible from across the region and included individuals from: • The public sector • Industry • Community • Private sector (e.g. estate owners) • Farmers • Crofters • NGO's
Results	Brief overview of results – In this section also indicate what contribution has this focus study made to SIMWOOD – in what way has it helped achieve the objectives of SIMWOOD

Key observations:

- Woodland across Lochaber that is not currently being managed ranges from large forest owners with areas that are not economically or practically viable to access and manage, to smaller areas of woodland where forestry is not the main objective of the owner/manager for land management (e.g. farming may be the overriding objective)
- Amongst the second category detailed above there is a combination of lack of knowledge and physical capacity to manage the woodland

The Study:

The participants in the study felt that there were a range of aspects of wood mobilisation that could be addressed which would help increase the number of woodlands being brought into management and hence increase the volume of product being brought onto markets:

- A deficit of knowledge with respect to all aspects of forestry, including understanding, skills, knowledge of markets and how to negotiate with them
- The capacity of the landowner/manager to engage with forestry (e.g. time)
- Geography and Scale
- Trust (who are the contractors and can we trust them? What advice is available and how can this be accessed? The need for contractors to understand the individual needs and objectives of small woodland owners)
- How to maximise management for local value

The results from the focus study provide key information to target aspects of the pilot project. The main aim of SIMWOOD is to increase mobilisation, the focus study illustrated that the most practical way to achieve this would be to specifically target woodland that is accessible for management; smaller areas of woodland where forestry is not the main objective and community owned or managed woodland where there are skills and capacity deficits.

The outline for the pilot project for Lochaber included the pro-wood mobilization measure to be tested as:
'Does increased knowledge and capacity with respect to the viability (both economic and practical) of management of underutilized woodland mean that landowners would take measures to bring that woodland into management? Can this be achieved through collaborative working?'

The focus study supported this as a measure. Discussions with the participants support the focus of the pilot project with respect to:

- Addressing how to increase capacity through clustering and working together and maximising local value through the expansion of local woodfuel markets.
- Examination of options for interventions, increasing knowledge,

	access to information, training, support, advice and economics
Domains addressed (ownership; management; governance; forest functions; management)	Domains addressed include: Ownership Management Governance

Study 4: Modelling forest owners' motivation to sell timber

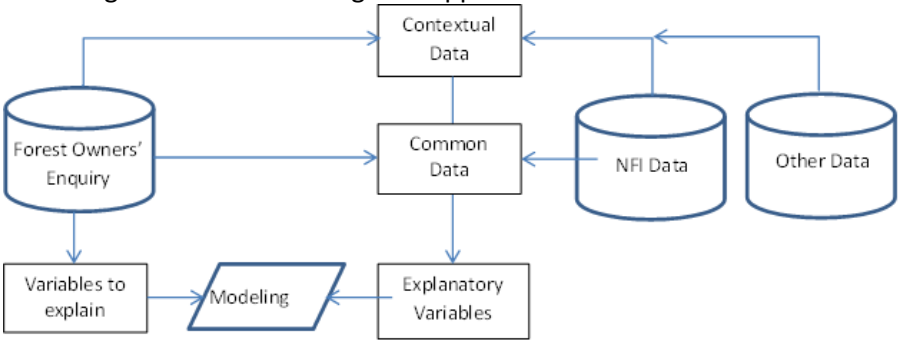
Authors: Alain Thivolle-Cazat & Morgan Vuillermoz, FCBA, France

Our current incapacity of sorting out the vast population of forest owners as sub-groups to be addressed with relevant strategy (or left alone because they are a dead-end) is a barrier to the implementation of well-balanced mobilization action plans on national or local level. This focus study is an attempt to overcome this difficulty by modelling the forest owners' motivation to sell timber & launch forest operations based on current socio-economic knowledge of this population.

Table: Summary of focus study

Simwood Model Region	R3 Auvergne – in fact National scope

Objective of the Focus Study	• Develop a model capable of reflecting forest owners' motivation to sell timber;
	• Establish the relationship between information on forest owners and total wood availability (TWA) in order to determine:
	  ○ the ratio between current harvest and TWA
	  ○ the variation of this ratio when forest owners' willingness varies.

Methods used	Data available : • A national survey was done in 2012 to collect extensive information about forest owners, their characteristics and motivations. The information was collected and processed by the statistical department (SSP) of the ministry for agriculture and forestry. FCBA signed an agreement with SSP to access the data-set in order to investigate possible exploitation as a model capable of reflecting forest owners' motivation to sell timber. • FCBA regularly determines the volume of wood available in France at national or regional level, based on NFI data. The final aim is to determine the ratio between Economical and Technical wood availability which is harvested by forest owners. Following scheme shows the global approach :  Two modelling approaches where implemented : • Modelling of FO' willingness to harvesting (Probability for a given FO to harvest) • Modelling of harvested volume (m3 harvested by a given FO).
Results	<u>Modelling of FO' willingness to harvesting</u> Two series of variables where determined for each FO of the enquiry :

	• From FO survey: surface owned, forest type, harvest in last 5 years (sawn wood, pulpwood, fuelwood, hardwood, softwood), etc. • From NFI Data: Mean forest cover rate, mean forest increment in the region (NUT3), Ecological region, etc. The model has the following form : Decision to harvest probability = constant $*\sum_j\sum_i$ (coefficient$_i$ * Modality value$_j$ of variable$_i$ The way FO are classified by the model was considered to be appropriate for 72 % of forest owners on a sample which were not used to assess the model (i.e. a FO is classified appropriately if the probability to harvest is over 50 % when the FO is known to have harvested some wood in the last 5 years or if the probability to harvest is less than 50 % when the FO has not harvested any wood in the five last years.) The model assessed shows a positive influence of forest size. This result is not surprising but the coefficient variation quantifies the probability variation. Region also influences harvest (Mediterranean region a negative one, North East a positive one). Private forest rate has a negative effect. For others variables the effect is more difficult to explain(total forest rate, sawn wood, pulpwood or fuel wood harvested in the region) Over variables were tested but finally non retained in the model, for instance: harvesting difficulty (share of the regional surface), hardwood or softwood rate in the region, fuelwood sold to a professional. This model must be improved with a new variable concerning the use of the wood (own-use or professional use) But, it can be yet used to improve the assessment of the wood availability in private forest for a given region <u>Modelling of FO' harvest</u> The aim of the modelling was to determine the intensity of the harvest (or volume harvested compared to volume availability). The model assessed has a low explanatory power: the volume harvested predicted for a given owner is in a range of 50 % - 200% for only 39 % of them. This can be explained by the low precision of the harvested volumes declared by FO: the volume harvested declared by FO is lower than the volume really harvested in private forest (NFI measures). The harvested volume declared was corrected but this correction introduced new variability which is probably not explained by the variables used in the model. For the moment this kind of model can't be used.
Domains addressed (ownership; management; governance; forest functions;	Ownership Governance

management)	
Next steps and relevance to the objectives of SIMWOOD	*output* : a model proven to be satisfactory & trust worthy → *this is partly achieved and yet to be improved, hopefully through cooperation with Domain leader FO* *outcome* : capacity to use the model to correct estimations on forest resources' availability with the "forest owner behaviour" factor → *a test will be run on one of the French region (probably Auvergne) during Autumn 2015* *impact* : knowledge -based decisions funded on more accurate information of the resource to be possibly mobilized ; adapted local strategies as an answer to a cleared target population → *to be discussed within French RLL from 2016 - on*

Study 5: Actors and their role in Bavarian forest initiatives' networks

Authors: Dr. Peter Aurenhammer, Bavarian State Institute of Forestry

Introduction and Objectives

This research aims at identifying the actors and their role in 21 private (Forest Owners Associations, FOAs) and 44 governmental forest initiatives' partial networks (N=65) of Bavaria. These initiatives have been developed over the last decade(s), which much effort from the forest administration to support FOAs and the activation of forest owners. Today, researchers as well as practitioners are interested to find out more about how these initiatives work and what role they may play for the mobilization of wood and other forest products and services. Besides insights to the influence and role of actors in the various initiatives, this research aims to identify and learn from (differences and similarities in) actors' priorities, perceived implementation of these priorities, qualitative and quantitative measures of change, potentials for further improvement and solutions to solve future forestry problems.

At the implementation level of these initiatives, private forest owners decide how to use their forests. Forest owner structures are very different. Therefore this research focuses on analyses of forest owners' (and 8 owner types') egocentric decision-making networks (N=180 owners, from 8 communes), to find out who the actors/people are that gain influence or important roles in forest owners' decision-making. This includes also an analyses of owners' (and owner types') management priorities, the implementation of these priorities as well as collection of other structural data, relevant to wood mobilisation.

In addition to filling gaps in, mainly, the domains governance and ownership, the knowledge created from this research, is being constantly used in the SIMWOOD project and is the basis for further research and activities in the project. Results have been/are being discussed with the actors at the Round Tables (regional learning labs) of our region, are being used as material to support the local forest administrations (AELFs) in their counselling strategies (i.e. what difference it makes to approach female forest owners?), add to the development of measures in the pilot projects, build a reliable basis for comparative evaluations of the pilot projects (they are governmental initiatives too) and feed into the development of BBN-scenarios and modelling.

Mobilization is seen as a social process. Therefore we analyse the actors and their roles as well as the decision-making processes in various initiatives and from different forest owner types. This unfolds existing processes, valuable to assess the scope of action and to later also develop strategies/policy advice for improved wood mobilization. Further, this allows us to compare presently existing differences, from within and outside the bounds of initiatives (their networks, forest areas and owners), and to base later evaluations of initiatives, such as the pilot projects, on a reliable basis for an ex-ante – ex-post evaluation (that ideally thrives also from data outside the bounds of initiatives, to answer the question what difference initiatives'/pilots' activities make).

In this focus study, actor-centred, analytical theory is applied. Following, among others, Max Krott's (2005, 2012, et al. 2013; c.p. also Krott and Giessen, 2013) analytical approach, Aurenhammer (2011, 2013a, 2013b, 2013c, 2014a, 2016) developed an *actor-centred analytical approach* for the analysis of forest development policy and projects. Many scholars develop and apply today analytical approaches on the basis of Krott's analytical approach (i.e. Hasanagas, 2004; Devkota, 2010; Maryudi, 2011; Giessen, 2010).

Material and Methods

With respect to methods, a focus is given on social network analyses (SNA) of decision networks, combining quantitative and qualitative analyses. To explain actors' roles in/for forest initiatives, SNA

includes theoretically relevant independent variables: financial/material resources, trust, formal/informal competences and information variables. The other parts of the survey (perceptions on goals, success and solutions for future problems) are integrated to the actor-centred SNA, so that the survey on perceptions follows the principles of network analyses.

The analyses of *governmental initiatives* included: quantitative SNA-based power analyses (N=37 cases, included; 252 persons; electronic questionnaires / telephone interviews); quantitative SNA-attached analyses of perceptions (N=44 cases, from 4 no data, 271 persons, same methods); and qualitative analyses (N=16 cases, approx. 175 persons; semi-structured expert interviews). The analyses of *private initiatives* included: quantitative SNA-based power analyses (N=11 cases, included; 93 persons; methods as above); quantitative SNA-attached analyses of perceptions (N=21 cases, from 4 no data, 74 persons; methods as above); and qualitative analyses (N=8 cases fully and 8 egocentric, approx. 65 persons; semi-structured expert interviews). The SNA-attached quantitative analyses of perceptions with regard to future forest problems included both types of initiatives (N=65 cases, 364 persons; methods as above). Other methods applied include document analyses and field visits.

The forest owners' analysis is based on a telephone survey (N= 180 people; 8 communes), including egocentric network analyses and perception related survey components. The sampling was random within 8 layers, drawn from parent populations (datasets of 8 communes' forest owners). The method used for calculations, was a weighted/unweighted layer analyses, considering 8 types of forest owners (the 10%-oldest, -youngest, -'smallest', -'largest'[34], -most distant living (to their forests); the local living, the female and the male). Forest owner analyses, drawn from initiatives, were chosen randomly too (i.e. from the parent population of forest owners in the boundaries of an initiative), but are included in the N above (methods: personal interviews).

Network analysis is applied to describe and explain social relations and actions resulting from these. It aims at the mapping of all units of a network (nodes) and their interrelations (vectors) (c.p. Schnell et al. 1993). Usually, networks analysed are partial networks, contrary to total networks. Limitations are among others, the difficulty to clearly boarder networks (c.p. ibid., Aurenhammer 2016). The main objective of quantitative network analysis, in this study, is to gain empirical data from initiatives' networks to be able to: estimate the influence of actors (by power and information factors); get knowledge about the actor composition of networks; describe what factors make actors influential and what factors gain relevancy in the decision making within / of initiatives; add to participatory processes and evaluation of initiatives

Estimation of actors' overall influence is derived from the sum of third-party actors' assessments on how important an actor is to them (c.p. Aurenhammer 2011, 2013a, 2013b, 2014a, 2016; Hasanagas 2004; Devkota 2010; Maryudi 2011), in terms of financial and material support provided (directly or indirectly), human and time resources provided, in how trust-worthy an actor is regarded (the centrality of the actors' trust positions in the network) and in how irreplaceable an actor is formally and informally (legal, customary, societal or other decision-making dependence).

The estimation of actors' relevancy in terms of information is measured in the same way, for the variables general information and forest-related information and know-how, hence reflecting a form of centrality measure.

Both the power and the information estimates provide us with a picture of the role and influence that various actors hold in a network. In addition, this is tested by the actors' overall influence, also based on third-party actors' assessments, and by the actor's own assessment of its own influence.

Comparative analyses of governmental forest initiatives of Bavaria

34 To prevent misunderstandings: Here and in the following this relates to the size of forest land owned.

The most ***influential actors*** (quantitative network analyses) are the local forest administrations (AELFs), forest owner associations (FOAs) and communes.

The AELFs are in all cases mentioned as important actors of the network (37/37 cases). They attain frequently high overall influence (33/37). Their influence is explained mainly in their high relevancy regarding forest information (33/37), formal/informal competences (36/37) and importance regarding personnel/time capacities (35/37). The latter is clearly stronger developed than that of other actors. The local forest administration also attains often high relevancy regarding financial/material support, although less frequently (22/37). It succeeds, in most cases (36/37), to gain strong trust from the actors of the network. (c.p. Table 1)

Communes or towns (including their forest administrations) are frequently identified as important actors (30/37). They attain often strong influence (12/37) in these initiatives, which is mainly based the frequently high trust (20/37) and their formal/informal competencies (12/37). (c.p. Table 1)

Forest owner associations/cooperatives (FOAs) are very often considered important actors (36/37) too. They attain often (14/37) strong influence, which is explained by the trust they gain (20/37), the formal/informal competencies they hold (19/37) and the relevancy of their forest information (15/37) in the initiatives' networks. *Individual private forest owners* are identified in 33 cases to be important actors. They can reach in 9 cases stronger influence, mainly due to trust gained and formal/informal competences. (c.p. Table 1)

In some cases also *other local administrations*, *superior administrations, the Bavarian State Forests* (BaySF), *forest research organizations* play important roles. (c.p. Table 1)

Table 1: Frequency actors attain influential roles in 37 governmental forest initiatives.

Actor type	overall influence	forest information	trust	financial/material resources	personnel/time resources	formal/informal competences	N total, mentioned
local forest administration	33	36	36	22	35	36	37
other local administration	4	4	6	1	2	6	24
superior administration	1	1	2	1	1	1	18
Bavarian State Forests	2	1	1	1	0	1	4
forest research organisations	0	1	3	0	0	2	10
private forest owners (as groups)	9	6	10	0	3	13	33
communes/towns (incl. forest admin.)	12	6	16	2	8	12	30
forest owner associations/cooperatives (div.)	14	15	20	3	11	19	36
private forest consultants/experts	2	2	2	0	2	1	9
harvesting-/road construction companies	3	2	5	1	4	7	15
hunters and hunting associations (div.)	6	3	7	0	2	9	31
other forest/land owner associations	1	2	1	0	0	1	5
nature conservation associations / areas	1	1	1	1	1	1	7
youth-/tourism-organisations	0	0	1	0	0	1	8
Legend: Frequency of actors reaching more than 30% of the maximum value within a variable. red: in more than 30 cases; yellow >15 cases; green > 5 cases.							
Source: own data, Aurenhammer (2015)							

At a minimum, the above actors will need to be considered, when establishing initiatives or pilots, as they decide upon and determine change in forest management (at the project level). Actors' support of the program (=initiative) depends on their capacities and willingness. Their willingness is defined as the degree of coincidence of their interests with the program's goals. Actor-centred strategies will need to base on actor's position (see above) and priorities (see below), in the network.

The most ***important priorities*** of governmental initiatives (N=44, 271 pers.), as perceived by the actors involved, are *the support to forest road/hauling road construction* (13%) as well as *measures to sustain/improve the protective functions of forests (soil, infrastructure)*, the *support to private forest owner counselling* and to undertake *public relation and awareness raising measures* (each 11%). Next to the road construction goal also other goals with short-term impact on wood mobilization reach higher values, such as the *support of roundwood marketing from private forests* (9%), *supporting forest owner associations (WBV/FBGs)* (9%) and the *development and (joint) implementation of additional roundwood harvesting* (7%).

However, in some initiatives also other priorities are set by the actors involved, such as *activities in tourism and recreation* (in 5 / 44 cases), *strengthening/developing new local value chains* (3 cases), the *development of nature conservation concepts and legal advice in this area* (2 cases), the *development of hunting management plans / concepts* (5 cases), to mention only a view.

Actor groups differ in the priorities they set. The *additional roundwood harvesting* is the highest priority for other forest related associations. But also the AELFs, FOAs, private forest service companies or actors like the local nature conservation administrations and the nature conservation organizations attribute higher/some priority to this goal. It is of medium relevancy to private forest owners and doesn't constitute a priority for tourism and youth organizations. The *support of roundwood marketing* is a priority to private forest owners, the BaySF, other forest related associations and private forest service companies. It is no priority for the local nature conservation administrations as well as tourism and youth organizations. *The support to road construction* is a priority to the AELFs, private forest owners, communes/towns, the FOAs and many others. This is in contrast to the nature conservation organizations and the BaySF. The *support to private forest owner counselling* is a priority for the AELFs, the private forest owners, FOAs and many others, but not for the local nature conservation administrations or nature conservation organizations. (c.p. Table 2)

Governmental initiatives put strong emphasis also to priorities directly linked to (problems of) wood mobilization. Therefore they seem to suit well for mobilization related pilots. However, initiatives put emphasis on a set of priorities, decided upon by the actors of their networks. Usually a holistic approach is taken. Developing activities will have to take this into account. Actors differ in their support to goals and to keep them 'on the round table' (supporting rather than resisting) one will have to also serve their interests (to some extent), especially if they are irreplaceable in any aspect (i.e. nature conservation administration for road construction). Noteworthy, additional roundwood harvesting is only of *medium* priority to private forest owners – at similar level as for nature conservation administrations.

The ***implementation*** is perceived most successful (N=44 cases, 271 pers.), for the goals *focus on cooperation with small and medium enterprises (SMEs) in forestry* (2.0 from 3.0 points), *the utilization and marketing of non-wood-forest products* (2.3 points), *supporting forest owner associations* (2.1 points) and the *support of private forest owner counselling* (2.0 points). The latter goal is also considered a top priority, while the former ones appear more rarely as important goals. Among the most important goals is also *the support to road construction,* attaining a high evaluation score of 1.9 points*. Additional roundwood harvesting* receives medium results (1.6). Comparing the overall evaluation, initiatives receive, in most cases they are perceived very successful or attain medium success.

Table 2: Comparison of priorities for goals of governmental forest initiatives (in %), as set by different actor groups.

Comparison of priorities for goals of Bavarian governmental initiatives (in %), as set by different actor groups (N=44 cases, 271 persons)	actor groups													
	local forest administrations	local nature conservation adm.s	other local administration	private forest owners	communes / towns	Bavarian State Forests	Bavarian forest owner associations	other forest related associations	tourism and youth organizations	nature conservation organizations	hunters and hunting associations	private forest service companies	forest industry and energy utilities	**all groups (incl. 'others')**
Public relation and awareness raising measures	15	17	9	6	13	2	9	0	13	18	12	3	n.d.	**11**
Cooperation with social/youth organizations	3	0	0	1	4	0	1	5	0	0	0	0	n.d.	**2**
Activities in tourism and recreation	4	0	6	3	8	0	2	0	12	14	5	3	n.d.	**4**
Strengthening/developing new local value chains	4	8	5	3	3	0	3	0	0	0	4	5	n.d.	**4**
Strengthening/developing global value chains	0	0	1	3	0	0	3	0	0	0	0	0	n.d.	**1**
Focus on cooperation with Small and Medium Enterprises (SMEs) in forestry	0	0	4	4	1	0	2	0	5	4	4	5	n.d.	**2**
Utilization and marketing of Non-Wood-Forest-Products (NWFPs)	0	0	0	0	0	9	1	0	0	0	1	0	n.d.	**1**
Support of forest road / hauling road construction	12	5	12	17	18	2	12	16	10	8	9	12	n.d.	**13**
Measures to sustain/improve the protective functions of forests (soil, infrastructure)	10	5	14	10	11	20	9	14	30	12	17	8	n.d.	**11**
Cooperation with alpine pasturing associations	2	8	4	2	2	9	3	0	8	8	6	1	n.d.	**3**
Supporting Forest Owner Associations (WBVs, FBGs)	9	6	2	10	8	0	13	14	0	0	5	10	n.d.	**9**
Support the roundwood marketing from private forests	6	0	9	10	8	18	11	16	0	6	7	17	n.d.	**9**
Develop and implement (joint) additional roundwood harvesting	10	8	5	5	5	11	9	21	0	8	4	9	n.d.	**7**
Support to the private forest owner counselling	15	0	11	12	5	7	12	4	8	2	10	10	n.d.	**11**
Development of hunting management plans / concepts	4	3	10	5	6	0	3	2	5	6	7	7	n.d.	**5**
Development of nature conservation concept and legal advice in this area	1	19	3	2	4	0	0	0	0	14	6	4	n.d.	**3**
Measures related to water protection	0	21	4	3	2	0	1	0	5	0	2	2	n.d.	**2**
Measures related to forest preservation (protection against pests)	3	0	1	4	2	22	5	9	3	0	3	3	n.d.	**4**
N	76	9	11	36	30	3	50	4	4	4	21	20	0	**271**

Legend: values: relevancy of goals (for Bavarian governmental forest initiatives) in % of maximum points, as set/perceived by the actor groups from 44 cases/networks; the highest 3 values for each actor group are marked orange. Source: own data: Aurenhammer (2015).

Actor groups differ in their perceptions of success. Comparing the overall evaluation results, the tourism and youth organizations, the nature conservation organizations and the private forest service companies consider the initiatives as very successful. The local nature conservation administrations and other forest related associations, in contrast, constitute only a medium success to these initiatives. The forest administration, communes/towns, BaySF, FOAs (and other actor groups), perceive the initiatives' goals are rather strongly implemented. (c.p. Table 3)

The *additional roundwood harvesting* receives rather medium evaluations. Private forest service companies, local nature conservation administrations and other local administrations, consider this goal as strongly implemented. Also the AELFs, as well as hunters and hunting associations, perceive the goal is being rather strongly implemented. On the contrary, private forest owners, communes/towns and the FOAs as well as other forest related associations see its' implementation at more medium levels. Finally, nature conservation organizations and the BaySF consider its' implementation as low. *The support to forest road/hauling road construction* is perceived by most actor groups as strongly or fully implemented. Only medium success is attributed to the issue by other forest-related associations and the Bavarian State Forests (BaySF) do not see any implementation results yet. The success of the *support of roundwood marketing* receives more diverse evaluations. For many actors the issue is implemented with medium or strong success.

However, other forest related associations and nature conservation organizations perceive its implementation as rather low. (c.p. Table 3)

The implementation of the *development of hunting management plans* is considered as low by many actors: private forest owners, FOAs, other forest related associations and tourism and youth organizations and also by the AELFs. Interestingly the local nature conservation administrations feel the issue is fully implemented. Hunters and hunting associations and private forest service companies assess its' implementation as strong to full too. (c.p. Table 3)

Table 3: Evaluation of the implementation of goals in 44 governmental forest initiatives, as perceived by actor groups.

Evaluation of the implementation of Bavarian governmental initiatives' goals (in points, max. 3), as perceived by different actor groups (N=44 cases, 271 persons)	actor groups													
	local forest administrations	local nature conservation adm.s	other local administration	private forest owners	communes / towns	Bavarian State Forests	Bavarian forest owner associations	other forest related associations	tourism and youth organizations	nature conservation organizations	hunters and hunting associations	private forest service companies	forest industry and energy utilities	**all groups (incl. 'others')**
Public relation and awareness raising measures	**1,6**	**1,0**	1,5	1,6	**1,8**	3,0	1,8	2,0	**2,3**	**n.d.**	**1,6**	2,0	n.d.	**1,7**
Cooperation with social/youth organizations	1,5	n.d.	n.d.	**1,0**	2,2	n.d.	1,4	2,0	n.d.	n.d.	n.d.	n.d.	n.d.	**1,7**
Activities in tourism and recreation	1,2	n.d.	**1,0**	1,4	1,5	n.d.	2,3	n.d.	**1,5**	**2,0**	1,5	2,5	n.d.	**1,5**
Strengthening/developing new local value chains	1,4	n.d.	**1,0**	1,8	1,5	n.d.	1,7	n.d.	n.d.	n.d.	2,3	1,9	n.d.	**1,6**
Strengthening/developing global value chains	n.d.	n.d.	n.d.	**1,0**	n.d.	n.d.	1,6	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	**1,4**
Focus on cooperation with Small and Medium Enterprises (SMEs) in fore	2,0	n.d.	3,0	1,7	2,0	n.d.	2,2	n.d.	n.d.	2,0	1,3	1,8	n.d.	**2,0**
Utilization and marketing of Non-Wood-Forest-Products (NWFPs)	2,0	n.d.	n.d.	n.d.	2,0	3,0	1,6	n.d.	n.d.	n.d.	3,0	n.d.	n.d.	**2,3**
Support of forest road / hauling road construction	**1,9**	2,0	**2,2**	**1,9**	**1,8**	0,0	**2,5**	**1,5**	2,3	3,0	1,1	**2,3**	n.d.	**1,9**
Measures to sustain/improve the protective functions of forests (soil, ir	1,5	0,0	**2,1**	1,5	**1,7**	**1,0**	1,7	0,5	**2,5**	2,0	**1,9**	2,5	n.d.	**1,7**
Cooperation with alpine pasturing associations	2,0	0,0	3,0	**1,0**	2,3	2,0	1,8	n.d.	3,0	2,0	1,2	2,7	n.d.	**1,4**
Supporting Forest Owner Associations (WBVs, FBGs)	1,9	2,0	2,0	**2,1**	2,3	n.d.	**2,0**	2,0	n.d.	n.d.	2,3	2,5	n.d.	**2,1**
Support the roundwood marketing from private forests	1,6	n.d.	1,8	**1,9**	2,1	**1,7**	2,0	**1,3**	n.d.	1,0	2,1	**2,0**	n.d.	**1,9**
Develop and implement (joint) additional roundwood harvesting	1,8	2,0	2,0	1,5	1,3	1,0	1,5	**1,5**	n.d.	1,0	1,8	2,4	n.d.	**1,6**
Support to the private forest owner counselling	**1,8**	n.d.	**1,6**	**2,1**	1,9	3,0	**2,2**	2,5	2,0	3,0	**2,2**	**2,4**	n.d.	**2,0**
Development of hunting management plans / concepts	**1,1**	3,0	1,6	0,9	1,6	n.d.	0,9	0,0	1,0	n.d.	2,0	2,5	n.d.	**1,3**
Development of nature conservation concept and legal advice in this ar	1,8	**1,0**	2,0	2,5	1,6	n.d.	n.d.	n.d.	n.d.	**n.d.**	0,7	2,0	n.d.	**1,6**
Measures related to water protection	2,0	**0,8**	2,0	2,2	2,0	n.d.	1,7	n.d.	2,0	n.d.	2,3	3,0	n.d.	**1,8**
Measures related to forest preservation (protection against pests)	**1,4**	n.d.	n.d.	1,7	1,3	**1,7**	1,8	**1,0**	2,0	n.d.	1,5	2,5	n.d.	**1,4**
mean for all above issues:	**1,7**	**1,3**	**1,9**	**1,6**	**1,8**	**1,8**	**1,8**	**1,4**	**2,1**	**2,0**	**1,8**	**2,3**	**n.d.**	**1,7**
N	76	9	11	37	30	3	49	4	4	4	21	20	0	**271**

Legend: values: mean evaluation of the implementation of goals (for Bavarian governmental forest initiatives) in points, as perceived by the actor groups from 44 cases/networks (from 0=not implemented to 3=fully implemented); red numbers indicate the (evaluation of the) top-3 priorities of an actor group; green = high evaluation values (>=2.0), yellow = low evaluation values (1.1-1.5); orange = very low evaluation values (<=1.0). Source: own data: Aurenhammer (2015).

The interviewees also qualitatively addressed ***aspects of improvement*** for the implementation of their goals, relating mainly to the project management, hunting management and forest road construction, but also to sustaining protective functions, silviculture and forest conversion, harvesting and markets, support to private forest owner counselling and tourism and recreation (see full report).

Quantitative measures of change show, the AELF's subsidy input lies between 1.1 and 848.5 €/ha, y and the personnel input ranges from 0.1 to 1.4 man-years per anno. With respect to the output, given data availability, the road construction/improvement ranges from none to 22.7 running metres/ha, y, the additional wood mobilized ranges between none and 36.4 m³/ha, y. Forest conversion output ranges from none to 975 m²/ha, y. As comes to participation, the number of actors directly involved in the networks, ranges from 4 to 16. The number of participating forest owners in the area of the initiatives ranges from 0 to 100%.

The evaluations' outcome considers three types of data: the mean perception on the success (of the implementation of goals), the problem density of the initiatives' networks and the project leaders' perception of success. One can note in many cases these are similar.

Qualitative perceptions on change and 'success' are received from qualitative semi-structured interviews (N~175 persons; 16 cases). Factors determining success related to information and participation, the availability of existing structures, informal/formal competencies, 'strong' forest owners as partners and natural factors and their social effects (see full report), i.e.:

- All actors necessary for the initiative were included from the very beginning.
- The integration of the local regulars' table of farmers, a strong institution in the village, with monthly meetings.
- The support of the project by the mayor of the commune (within the commune and among forest owners).
- The design of the cooperation agreements of initiatives (esp. regarding hunting management).
- Participation of the commune as an important forest owner.
- The willingness of individual private forest owners to engage in activities was strongly influenced by natural calamities (snow damage and bark beetles) before the initiative.

Also *aspects perceived as successful or unsuccessful* were identified and related to a broad variety of areas (see full report). Selected examples you can find below:

Harvesting and silviculture (successful)

- The amount of wood mobilized and the increased economic efficiency in wood mobilization i.e. because all the wood was stored in one place. Additional fire wood production was reached.
- Individual or joint thinnings were implemented. A higher share of forest owners participated in thinnings (more than 20 percent). The use and subsidies for cable crane based hauling. In the course of a joint thinning the most important protective forest of a commune was thinned and regeneration was prepared.
- A clear increase in forest management service contracts with FOAs.

Road construction (successful)

- The established access to the forest areas, because forest attains only economic interest with a good site development. It was a great ease for forest owners, who were not able to use their forests at all or only with disproportional effort. Some initially sceptic forest owners are now happy about the constructed hauling road. Forest management has not changed yet, but at least we have road access.

Road construction (unsuccessful)

- The forest road/hauling track construction was exaggerated in the initiative's area; after complaints by one forest owner, the agreement with this owner was cancelled by the AELF; with the consequence that the road could only partly be realized (elsewhere).
- Some forest owners' wishes to improve a hauling track with better ballast instead of establishing a fully upgraded, therefore, more expensive forest road, were not considered.

Further, both qualitative and quantitative results, on whether the initiative made any difference in the *cooperation* or led to a change in behaviour, are described (see full report), i.e.:

Yes, the initiative made a difference compared to the previous cooperation:

- Before the initiative, there were hardly any joint activities with the AELF.
- The cooperation was more intensive and the flow of information improved.
- The cooperation of two FOAs in the region has improved.
- The cooperation between local forest and local nature conservation administration got more flexible.
- The cooperation with forest owners was more complicated than before, because the initiative put some pressure on forest owners, which they returned, so the initial phase was counterproductive.
- The conventional cooperation between actors was destroyed by the initiative, which let to great resentment and the feeling of unequal treatment. The partnership between actors should be further developed and the idea of 'common welfare' should have been more taken into account in the initiative.

In most cases and by most actors the governmental initiatives are considered as successful. The implementation of goals is perceived strong for road construction and also marketing of wood, but forest owners and FOAs perceive the wood production reaching only medium success. Indeed, the quantitative change and its qualitative interpretation differ. We can learn, among others, that improvements can be made in project management, hunting and road construction. Many indications exist, that the cooperation between actors has changed, mostly in positive directions.

Comparative analyses of Bavarian Forest Owner Associations' networks

The most ***influential actors*** in FOAs' networks are the FOAs themselves, their regional umbrella organizations (FVs) and the AELFs. In some cases wood trading companies, communes, energy and waste management companies, superior administrations, private forest service companies, forest- and wood-processing industries and labelling/certification organizations gain important roles.

The *FOAs* are considered important actors in all cases (11/11). They reach high overall influence (>30% of the maximum value) in all of their networks/cases (11). On average they reach a very high overall influence of 71%. The FVs are considered important actors in some cases (4/11). They reach high overall influence in one case. On average they reach a high overall influence of 31%. The *AELFs* are considered important actors in most cases (9/11). They reach high overall influence in seven cases. On average they reach a high overall influence of 46%. *Superior administrations* are considered important in only one case, where they reach medium influence (22%). *Communes* are considered important in only one case. They do not reach high overall influence in in any case though. On average they reach a medium overall influence of 28%. (c.p. Table 4)

Table 4: Comparing actors overall influence in 11 forest owner associations' networks.

actor type (below) / cases	1	2	3	4	5	6	7	8	9	10	11
local forest administration	56			40	67	17	33	100	17	50	33
superior administration										22	
forest research organisations						7	3	0		11	
private forest owners (as groups)			10	+	0	13					
communes/towns (incl. forest admin.)			28								
forest owner associations/cooperatives (div.)	42	67	78	87	58	53	69	83	92	56	100
regional forest owner associations						13	6	83		22	
forest experts, consultants				+							
private forest service companies			10	+	8	13	11		8		33
hunters and hunting associations (div.)						20					
other forest related associations						7	6				
energy utilities	8	33					5			33	
forest industry				+		13	6		13		
trading companies	33	50		+					13		
labelling/certification companies	11						5	33			
technology producers						17					
N (persons)	4	3	7	7	4	5	13	3	5	3	2

Legend: Actors overall influence in % of the maximum value. + indicated non-quantified feedback.
red: values >= 70%; yellow 50-69%, dark green 30-49%, light green <30%. N (persons) = responds.
Source: own data, Aurenhammer (2015)

Above actors decide upon and determine change in forest management (at the local level). Differences can be found also in the complexity of FOAs' decider networks, relating mostly to their organizational structure and scope of activities. Actor-centred strategies will need to base on actor's position (see above) and priorities (see below), in the network.

The most ***important priorities*** (N= 21 cases, 74 pers.) for the FOAs are to *support the roundwood marketing from small private forests* (16%), to *implement joint harvesting (i.e. service contracts) and road construction measures* (15%) and to have a *close cooperation between the forest administration and the FOAs (WBVs/FBGs), in counselling and initiatives* (11%).

However, in some initiatives also other priorities are set by the actors involved, such as to undertake *public relation and awareness raising measures* (in 5 / 21 cases), *to focus on cooperation with Small and Medium Enterprises (SMEs) in forestry* (5 cases), to provide for *further education and training (i.e. chain saw courses)* (4 cases), to engage in *measures to protect regeneration, afforestation, collective orders of seedlings* (3 cases), to mention only a view. Also the *strengthening and developing of new local value chains* (5 cases) and *to support the roundwood marketing from large private forests* (2 cases) reach in some cases high values (priority).

Actor groups differ in the priorities they set for goals in FOAs. *The support of the roundwood marketing from small private forests* is a priority of the AELFs (16%), the FOAs (15%), private forest service companies as well as forest industry and energy utilities (both 21%). *Joint harvesting and road construction measures* are a priority of the AELFs (19%), private forest owners (27%), the FOAs (14%), private forest service companies (13%) as well as forest industry and energy utilities (14%). *To provide further education and training* is also a priority of FOAs (10%) and trading, labelling/certification companies (33%, N only 1). (c.p. Table 5)

Table 5: Comparison of priorities for goals of forest owner associations (in %), as set by different actor groups.

Comparison of priorities for goals of Bavarian Forest Owner Associations (in %), as set by different actor groups (N=21 cases, 74 persons)	actor groups						
	local forest administrations	private forest owners	Bavarian forest owner associations	private forest service companies	forest industry and energy utilities	trading, labelling/certification companies	**all groups (incl. 'others')**
Public relation and awareness raising measures	12	13	8	0	3	20	**7**
Activities in tourism and recreation	0	0	1	0	0	0	**0**
Strengthening/developing new local value chains	1	0	8	10	5	7	**6**
Strengthening/developing global value chains	2	0	2	0	7	0	**2**
Focus on cooperation with Small and Medium Enterprises (SMEs) in forestry	3	0	9	24	10	13	**9**
Utilization and marketing of Non-Wood-Forest-Products (NWFPs)	1	3	3	0	0	0	**1**
Measures to sustain/improve the protective functions of forests (soil, infrastructure)	0	0	1	0	0	0	**0**
Further education and training (i.e. chain saw courses)	7	0	10	6	7	33	**8**
Support the roundwood marketing from small private forests	16	0	15	21	21	0	**16**
Support the roundwood marketing from large private forests	0	0	3	5	9	0	**3**
Implement joint harvesting (i.e. service contracts) and road construction measures	19	27	14	13	14	0	**15**
Organising auctions/submissions of high grade timber	5	17	4	5	3	0	**4**
Development of hunting management plans / concepts	3	7	3	0	5	0	**3**
Development of nature conservation concept and legal advice in this area	3	27	1	0	2	0	**2**
Measures related to water protection	2	0	0	0	3	0	**1**
Measures related to forest preservation (protection against pests)	2	0	1	0	0	0	**1**
Measures to protect regeneration, afforestation, collective orders of seedlings	8	0	9	5	4	0	**7**
Close cooperation betw. the forest admin. & WBV/FBG, in counselling and initiatives	15	7	9	13	8	27	**11**
N	16	2	33	9	12	1	**74**

Legend: values: relevancy of goals (for forest owner societies) in % of maximum points, as set/perceived by the actor groups from 21 cases/networks; the highest 3 values for each actor group are marked orange. Source: own data: Aurenhammer (2015).

Private initiatives put strong emphasis to priorities directly linked to (problems of) wood mobilization. Therefore their participation in RLLs and/or pilots would be key. However, initiatives put emphasis on a set of priorities, decided upon by the actors of their networks. Actors differ in their support to goals. For private forest owners, joint harvesting and road construction is important.

Actors' perceptions on the implementation of goals in Bavarian Forest Owner Associations

The ***implementation*** is perceived (N=21 cases, 74 pers.) most successful, with respect to the goals of *support of the roundwood marketing from small private forests* (2.2 from 3.0 points), *the close cooperation between AELFs and FOAs* (2.3 points), *measures to protect regeneration, afforestation and the collective orders of seedlings* (2.3 points) and the *further education and training* (2.3 points). The former two goals attained also highest priority in the FOAs' networks. Also high evaluation scores attain *joint harvesting and road construction measures* (1.9) and the *cooperation with SMEs in forestry* (2.0). The overall evaluation results show, most FOAs were considered very successful or successful.

Actor groups differ in their perceptions of success. Comparing the overall evaluation results (mean from all issues) for FOAs in Bavaria, the FOAs themselves (2.0), the private forest service companies (2.1) as well as the forest industry and energy utilities (2.0) consider the FOAs as very successful and their goals to be strongly implemented. Differences to the overall evaluations from other actors are minor (1.7-1.9), the lowest from the AELFs (1.7). (c.p. Table 6)

Table 6: Evaluation of the implementation of goals in 21 forest owner associations, as perceived by actor groups.

Evaluation of the implementation of Bavarian Forest Owner Associations' goals (in points, max. 3), as perceived by different actor groups (N=21 cases, 74 persons)	actor groups						
	local forest administrations	private forest owners	Bavarian forest owner associations	private forest service companies	forest industry and energy utilities	trading, labelling/certification companies	**all groups (incl. 'others')**
Public relation and awareness raising measures	1,8	1,0	1,8	2,0	2,0	1,0	**1,7**
Activities in tourism and recreation	n.d.	n.d.	2,0	n.d.	n.d.	n.d.	**2,0**
Strengthening/developing new local value chains	1,0	n.d.	1,7	2,0	2,0	2,0	**1,8**
Strengthening/developing global value chains	1,5	n.d.	1,0	n.d.	1,8	n.d.	**1,5**
Focus on cooperation with Small and Medium Enterprises (SMEs) in forestry	2,0	n.d.	1,8	2,4	2,5	2,0	**2,0**
Utilization and marketing of Non-Wood-Forest-Products (NWFPs)	1,0	2,0	1,5	3,0	n.d.	n.d.	**1,7**
Measures to sustain/improve the protective functions of forests (soil, infrastructure)	1,0	n.d.	2,0	n.d.	n.d.	n.d.	**1,5**
Further education and training (i.e. chain saw courses)	2,3	n.d.	2,4	2,0	2,1	2,0	**2,3**
Support the roundwood marketing from small private forests	2,0	n.d.	2,4	2,4	2,0	n.d.	**2,2**
Support the roundwood marketing from large private forests	n.d.	n.d.	2,0	2,0	1,5	n.d.	**1,7**
Implement joint harvesting (i.e. service contracts) and road construction measures	1,8	2,0	2,0	2,2	1,7	n.d.	**1,9**
Organising auctions/submissions of high grade timber	2,0	1,5	2,4	1,0	n.d.	n.d.	**1,8**
Development of hunting management plans / concepts	2,0	2,0	1,8	n.d.	2,0	n.d.	**1,8**
Development of nature conservation concept and legal advice in this area	2,5	2,5	2,0	n.d.	n.d.	n.d.	**2,5**
Measures related to water protection	1,0	n.d.	n.d.	n.d.	2,0	n.d.	**1,0**
Measures related to forest preservation (protection against pests)	1,0	n.d.	2,0	n.d.	n.d.	n.d.	**1,4**
Measures to protect regeneration, afforestation, collective orders of seedlings	2,0	n.d.	2,3	2,0	2,0	n.d.	**2,3**
Close cooperation betw. the forest admin. & WBV/FBG, in counselling and initiatives	2,1	2,0	2,3	2,2	2,0	2,0	**2,3**
mean for all above issues:	**1,7**	**1,9**	**2,0**	**2,1**	**2,0**	**1,8**	**1,9**
N	16	2	33	9	12	1	**74**

Legend: values: mean evaluation of the implementation of goals (for forest owner associations) in points, as perceived by the actor groups from 21 cases/networks (from 0=not implemented to 3=fully implemented); red numbers indicate the (evaluation of the) top-3 priorities of an actor group; green = high evaluation values (>=2.0), yellow = low evaluation values (1.1-1.5); orange = very low evaluation values (<=1.0). Source: own data: Aurenhammer (2015).

Supporting the roundwood marketing from small private forests is perceived by all actor groups as strongly to fully implemented (values from 2.0 to 2.4), *joint harvesting and road construction measures* as rather strongly or strongly (values from 1.7 to 2.2). However, *measures related to water protection* and *to the forest preservation (protection against pests)* are perceived by the AELFs as being implemented with low success (1.0, both), whereas in the latter the FOAs' themselves view their performance as strong (2.0). Similarly is the case with *sustaining/improving the protective functions of forests,* reaching low evaluation results (1.0) from the AELFs and a strong (2.0) self-evaluation from the FOAs. However, none of these goals were key priorities of the FOAs' networks. The *organization of auctions/submissions of high-grade timber* is perceived very successful by the AELFs (2.0) and FOAs (2.4), in contrast to the views of private forest owners (1.5, N only 2) as well as private forest service companies (1.0). The *support of roundwood marketing from large private forests* is considered strongly implemented by the FOAs and the private forest service companies (both 2.0), contrary to an only medium evaluation (1.5) from industry and energy utilities. Regarding

the focus on cooperation with SMEs in forestry, the FOAs receive better results from all others (2.0-2.5) than is their own evaluation (1.8). With respect to *the strengthening/development of new local value chains*, however, the AELFs see only low success (1.0), the FOAs' themselves perceive rather strong implementation (1.7) and others strong implementation (2.0). (c.p. Table 6)

The interviewees also qualitatively addressed some ***aspects of improvement*** for the implementation of their goals, relating mainly to harvesting and road construction, hunting and forest conversion, the cooperation between AELFs and FOAs, support to FOAs, strengthening existing/developing new local value chains, public relation and awareness raising, diversification strategies and property rights (see full report).

Quantitative measures of change show, the AELF's subsidy input is around 3.5 €/ha, y (data only from one case), and the personnel input ranges from 0.08 to 1.6 staff / 1,000 ha. The average forest resource input of the members ranges from 5 to 164 ha/member. We can distinct three legal forms. With respect to the output, given data availability, the wood mobilized ranges between 1.9 and 7.6 m^3/ha, y or 10.7 and 513 m^3/member, y. The mean annual turnover ranges from 151 to 588 €/ha, y (mostly based on estimates though). As comes to participation, the number of actors directly involved in the networks, ranges from 3 to 14. The percentage of forest owners in the served area that are members of the FOAs is between 55 and 60% (given only data from two cases). The presence in the internet (number of sites in a Google search) ranges from about 400 to 6,200 sites. This can be compared to the mean evaluations per FOA.

Qualitative perceptions on change and 'success' are received from qualitative semi-structured interviews (N~65 persons; 8+8 cases). *Aspects perceived as successful or unsuccessful* were identified and related to a broad variety of areas (see full report). Selected examples you can find below:

Internal organization of the FOA and diversification strategies (successful)

- Part of the success of the FOA is the low rate of fixed costs they need to cover and the cost-efficient work they do, especially since they established an executive director position (…)
- A centralized system of decision-making – that does not base on out-dated systems such as the chairmen system.
- The FOA (jointly with other FOAs) established an own limited company, enabling them to buy and sell also timber of non-members, among others.
- The FOA has (jointly) established a own wood processing or energy related companies, which broadens their field of activities, increases the value added for their members, diversifies risk and secures the supply/demand to the local companies.
- The FOA holds an own truck fleet.

Further, both qualitative and quantitative results, on whether the initiative made any difference in the *cooperation* or led to a change in behaviour, are described (see full report), i.e.:

Yes, the FOA made a difference compared to the previous cooperation:

- Actively approaching private forest owners they increase they share of owners willing to do i.e. thinnings.

- Due to the presence of the FOA in the whole region and its effect on forestry and wood processing actors, the FOA gains an important 'intermediary role' for private forest owners, through which it can also change their thinking and decision-making. This can be seen in the clearly increased amount of marketed wood and in the improved prices.

In most cases and by most actors the private initiatives (FOAs) are considered as successful. The implementation of goals is perceived strong for marketing of wood, and good for road construction and wood production, that of measures related to water protection and forest preservation is more controversial. We can learn, among others, that improvements can be made in harvesting and road construction, hunting and forest conversion or the cooperation between AELFs and FOAs.

Actors' perceptions on solutions for future forest problems

The actors (N=364 pers.) identified who could be the ***facilitators of solutions*** to future forest problems and what ***instruments*** would work best to solve these problems.

Across all future problem areas, the overall perception is that both the state (39% of total points) and the individual citizens / forest owners (26%) would be the ideal facilitators. At this general level we can see a mix of preferred instruments, headed by the awareness raising and public relations (21%), positive financial incentives (19%) and the laws (18%). (c.p. Table 7)

At a second glance we can recognize differences. The role of the *state* varies. In aspects such as wind power facilities in forest areas (62%), the role of hunting in forest management (50%), the role of ecosystem-services (65%) and challenges to the protective function (64%) the actors of Bavarian forest initiatives perceive the state in a clearly dominant role for facilitation. With respect to new areas of application for wood, the *market* (private economy) is given the highest role (63%), whereas for wood production from private forest land the main facilitator should be the *individual owners* (65%). Roundwood marketing from private forest land is considered to be facilitated best *by the market, the society and the individual owners* (31, 32, 34%, respectively). The use of wood for energy purposes, should be facilitated by the state, the market and the individual owners (31, 33, 23%, respectively). The adaptation of forests to climate change and the population development in rural areas as well as the role of ecosystem services gains comparatively high support 'to leave it to the nature' (13, 12, 11%, respectively) – however the state is given the key role as facilitator (46, 44, 65%, respectively) in all of the issues, next to others. (c.p. Table 7)

Awareness raising and *public relations* measures are perceived as appropriate to almost all issues (often ≥20%), especially to the role of new recreational activities (32%), but also for the issues new areas of application for wood (23%), the role of ecosystem services (24%) and the adaptation of forests to climate change (23%). *Positive financial incentives* are seen as most appropriate for the adaptation to climate change (30%), but also for issues related to nature conservation on private forest land (27%) or population development in rural areas (29%), reaching more than 20 percent in many other issues. The application of *laws* is most prominent in the case of wind power facilities in forest areas (41% of total points), hunting (36%), but also regarding the role of new recreational activities in forests (33%). *Advice and training* is seen as reasonable instrument in areas of wood production from private forest land, adaptation to climate change, nature conservation, roundwood marketing and challenges to the protective function of private forests (all between 20-25%). A *liberal formation of prices* is clearly the most appropriate instrument for issues of roundwood marketing from private forests (32%) from private forests, but also gains an important role for the issues new areas of application for wood (20%) and wood production from private forests (18%). (c.p. Table 7)

Table 7: Facilitators of solutions to future forest problems and suitable instruments, as perceived by actors of forest initiatives

	facilitator					instruments							
Facilitators of solutions to future forest problems and suitable instruments, as perceived by actors of Bavarian forest initiatives (N=364 persons; values in % of max. points)	State (Ministry)	Market (private economy)	Society (unions, associations, citizens´ initiatives)	individual citizens / forest owners	leave it to the nature	laws (dictates, bans)	standards/norms	taxes / duties	positive financial incentives (subsidies, financing)	awareness raising, public relations	advice and training	exchange offers, contracts by private law	liberal formation of prices (supply, demand)
Wind power facilities in forest areas	62	6	19	12	1	41	12	2	13	20	5	4	3
The role of hunting in forest management	50	1	14	34	1	36	12	1	7	22	17	2	3
Wood production from private forest land	8	17	9	65	1	7	10	3	21	15	25	3	18
Role of ecosystem-services (water, air, carbon)	65	2	14	9	11	26	13	3	19	24	12	1	3
Adaptation of forests to climate change	44	2	7	36	12	11	7	1	30	23	25	1	2
Nature conservation on private forest land	36	2	9	49	4	18	9	1	27	21	21	2	2
Role of new recreational activities in forests (i.e. mountain biking, geo-caching)	44	3	32	19	2	33	12	3	5	32	7	5	3
Roundwood marketing from private forest land	2	31	32	34	1	3	11	4	14	10	21	6	32
Population development in rural areas	46	14	21	6	13	8	7	13	29	22	8	2	10
The use of wood for energy purposes	31	33	12	23	1	12	9	5	22	20	13	3	16
(New) areas of application for wood	13	63	16	7	2	3	11	3	20	23	17	2	20
Challenges to the protective function (soil, infrastructure) of private forests, due to climate change	64	1	8	21	6	24	9	1	22	21	20	2	1
overall perceptions	39	15	16	26	4	18	10	3	19	21	16	3	9

Legend: values: % of total points distributed over facilitators (max. 100%) and instruments (max. 100%), by the actor group; red: very high values (>=70%), orange = high values (>=50%), yellow = medium values (>=30%), green = lower values (>=20%); Source: own data/calculations: Aurenhammer, P., 2015

Differences in the perceptions of different actor groups are identified (see full report), i.e.:

The role of the *state* varies. The BaySF, tourism and youth organizations, nature conservation organizations and other forest related associations perceive the state as ideal facilitator for the issue of the use of wood for energy purposes. The role of the *market* varies. The AELFs, forest industry and energy utilities, FOAs and others perceive the market as ideal facilitator for new areas of application for wood. For the *AELFs* the market gains still an important role also in the issues of wood production from private forest land, roundwood marketing from private forest land and in the use of wood for energy purposes. This is similar to the perceptions of forest industry and energy utilities, but *less emphasis* is given to the market, by FOAs, other forest related associations, other local administrations, tourism and youth organizations (for wood production) as well as by individual private forest owners, hunters and hunting associations, private forest service companies, nature conservation organizations and administrations (for wood production and marketing). Communes perceive the market plays a *higher* role in marketing, the BaySF in both production and marketing. The role of the *society* varies. The AELFs perceive the society as the most important facilitator in issues such as roundwood marketing. This is true also for FOAs, (…), but only to a *less* extent for forest owners, communes, private forest service companies, other forest related associations, the BaySF, other local administrations, tourism and youth organizations and hunters/hunting associations; and to a *greater* extent by forest industry and energy utilities as well as nature conservation organizations. For the nature conservation administration society is key to wood production, but less to marketing. The role of the *individual citizens/forest owners* varies. The AELFs perceive the individual forest owners as the most important facilitators in issues such as roundwood production and marketing. *Less* emphasis is given in this respect by the BaySF (in production); *higher* emphasis by communes, FOAs, individual private forest owners themselves, hunters/hunting associations, the forest industry and energy utilities (in marketing), private forest service companies, other forest related associations, other administrations as well as tourism and youth organizations. Nature conservation organizations perceive the individual forest owners as most important facilitators in roundwood production, nature conservation administrations only in roundwood

marketing. The role of the *nature* varies. The AELFs don't see a point to leave any issue considerably to the nature. Only nature conservation administrations see natures' hands somewhat broader applied, including also wood production or wood for energy issues.

Positive financial incentives are most prominently related to wood production and also marketing only by nature conservation organizations. However, they are also considered important by the AELFs and FOAs, communes, the BaySF and private forest owners (especially for production), but *less* so by other forest related associations. For the AELFs, the application of *advice and training* is most prominent, i.e. in the cases of wood production and marketing. This is similar to the position of FOAs, BaySF, communes, private forest service companies, private forest owners and nature conservation administrations. *Less* emphasis is given to the above by other forest related associations (for marketing), hunters/hunting associations, forest industry and energy utilities, *higher* emphasis by other administrations (for marketing), nature conservation organizations as well as tourism and youth organizations.

For the AELFs, the application of a *liberal formation of prices* is prominent only in the case of roundwood marketing. This is similar to the position of forest industry and energy utilities. The FOAs, communes, the BaySF, hunters/hunting associations, private forest service companies and other forest related associations put emphasis on this instrument, also for wood production. For the nature conservation administrations, other local administrations, nature conservation organizations and tourism and youth organizations this instrument is only important for new areas of application for wood.

The actors (N=364) highlighted potential ***'solutions'***, related to areas such as the mobilization of wood from private forests, hunting, new recreational activities, *wind power facilities in forests, project management / organizational priorities and preferred instruments* (see full report), i.e.:

Mobilization of wood from private forests

- The subsidies for cable crane hauling in steep terrain or given wet soils, in areas where are regular management is not possible, as well as subsidies for forest road construction and maintenance are key.
- Support in the biomass logistics (common storage points run by communes) and support for the marketing in rural areas (small suppliers) is key. Common, centralized storage, especially in areas with many small forest owners.

Hunting

- Game needs dormancy, which laws should consider better, by restricting recreational activities.
- A more consequent implementation of 'Wald vor Wild' ('first forests, then game') towards an ecological hunting management (by a hunting organization).
- Change to self-management of hunting (instead of renting). Shorten the periods of renting contracts, include obligations to participate in driven hunts in areas with wild boar population as well as for tolerance of flushing dogs.
- Increase subsidies for natural regeneration, especially of browsing-sensitive species like fir and oak, and reclaim of subsidies, if the bark of older trees is peeled off – the forest owner needs then to claim his hunting rights on the renter. Also, for browsing protection no 'hidden' subsidies should be provided.

New recreational activities

- First approaches to deal with touring skiing and other sports are tested already i.e. 'Skibergsteigen umweltfreundlich' (DAV) and the project 'Respektiere Deine Grenzen' (respect your limits). Awareness raising for forest user and education for the forest owner.
- Locally (alpenstock level) all-season protection zones, season-dependent protection areas and 'resilient' forest areas should be designated to prevent game disturbances and damages by game (game ecological land use planning).
- Access to forests for leisure activities should not be restricted by law, but innovative design of paths is needed. Restriction/prohibition of the access to (sensible) forest areas for recreational activities.

Forest Owner Type analyses from communes and initiatives

Below provides us with an overview of private forest owners' ***structural differences*** (N=180; 8 communes), by owner types.

The average largest land plot (ha) differs only significantly between the smallest-10% (0.4 ha) and the largest-10% (7.1) ha. The (multiply-weighted) mean is 3.9 ha. Regarding the distance of living from their largest forest land plot, results show, the youngest-10% live more far away (21.4 km) than the oldest-10% (4.5), similarly for the smallest, compared to the largest owners. The most distant-10% are indeed most distant living (159.8). Locally living means on average 3.5 km from the forest. Men do live on average farer away (36.8) then women (10.4).

74% are members of FOAs. The youngest (95%), largest (100%), locally living (79%) and men (70%) are more frequently members – leaving the main part of challenges to the oldest, smallest, distant and women (which hold values between 52-65% though). 88% of owners do however know about FOAs (with only the distant-living ones lacking behind).

19% of the owners participated in governmental forest initiatives – mostly the largest and locally living ones (32 and 30%, respectively). Again, we can see the future challenge, if aiming on whatsoever changes of forest management/use. Nevertheless, 59% know about such initiatives (again largest, locally-living and to some extent men are in the forefront).

28% of the owners do (have) also participate(d) in other forest related initiatives. 48% are members of hunting-cooperatives (which obviously lack female and smaller forest owners, but also to some extent the youngest).

Generally speaking, 89% of the owners are interested in roundwood production – smallest and most distant-living ones have the last interest (67 and 76%, respectively). Forests do make only 1-5% of the household income of the interviewees. Interestingly for the most distant-living ones with 4% a comparatively high value exists. Also the roundwood production (per ha, y) varies.

Only the largest forest owners (note, mean of 7.1 ha) use less than 50% for their subsistence needs (42%). 62% of this volume is used for energy purposes. Other actor types are having higher shares for both (especially smallest and women, around >80%).

Tendencies for the future developments were asked, using the scale (1) for increase (0) stable and (-1) decrease. There are no relevant changes to be expected in the share of subsistence. Tiny growth for the selling of roundwood is found only from the oldest – and from the women (mean of 0.23 and 0.22 respectively), which is a surprising result, also proven by other data below. Asked, if they however could imagine to increase their roundwood production, just based on their timber stocks, the oldest, smallest, locally-living and women see a potential for slight increase (ranging from 0.28-0.39).

Below we describe, what differences exist, comparing the forest owners, being members of FOAs (WBV/FBGs) (communes' survey, N=126), the forest owners, being participants of governmental initiatives (communes' survey, N= 33) – with the forest owners, who don't belong to either of the above (communes' survey, N=48); as well as comparing this with data from semi-structured interviews of initiatives (randomly chosen), considering the members of FOAs (WBV/FBGs) (initiatives' selection, N=10) and the owners, (participating) in governmental initiatives' forest areas (initiatives' selection, N=29).

From the ***comparison of forest owners attached to private or governmental initiatives and those who are not***, we can learn that the latter group has smaller forest land plots (largest plots' mean: 1.8 ha), lives at least twice as distantly from their forest (53.5 km), holds less interest in roundwood production (71% as compared to 90+% of the others). They hold the least household-income from forests (1%) and have the lowest roundwood production (per ha, y). Around 80% of the production is for subsistence needs and 80% of this for energy use, clearly higher than for the other groups. They also see no tendencies to change their productions.

Qualitative answers to the question 'What roundwood sales depend on?' (N=88, from communes' surveys), show that 27% of the comments relate to wind or beetle calamities (so onwners do only randomly, occasionally use their forests), 17% to wood prices, 14% wait after further growing stock, for the next generation to overtake (3%) or until wood quality is reached (3%), 8% sell as long as it is sustainable (meaning they don't want to risk overcutting, although often objectively there stand 'too many trees' in their forest, similar to the comment on waiting the stock to grow further), and 6% state 'if I have time' – only to list some of the most frequent reasons, that inform of a very occasional basis for harvesting.

The ***most important and influential actors*** for forest owners are: the local forest administrations (AELFs), forest owner associations (FOAs), other associations/societies, harvesting companies, family or relatives and other forest owners / farmers. Generally, the AELFs (0.9 / 5.0 points), the FOAs (1.7) and the family or relatives (0.9) are *most influential* to the forest owners' management decisions. In the owner groups 10%-largest, men, 10%-youngest and locally living owners, AELFs and FOAs gain more influence (than in that of the oldest, women, most distant-living and smallest). The AELFs gain less influence in the group of the 10%-most-distant-living owners. The FOAs have best results in the groups of largest owners (2.5) and men (2.1), the AELFs in the groups of the youngest (1.3) and the largest (1.4) owners. The family is most important to the oldest (2.1) and woman (2.2). (c.p. Table 8)

Generally, the *forest information* of the AELFs (1.4 / 5.0 points), the FOAs (2.4) and the family or relatives (0.9) *gains the highest relevancy* to the forest owners' management decisions. The AELFs' and FOAs' forest information gains highest relevancy in the same owner groups as mentioned above. The FOAs have best results in the groups of largest owners (3.2), locally living and men (both 2.5), the AELFs in the groups of men (1.8) and the largest (2.1) owners. The family is most important to the oldest (1.8) and woman (2.3). Similar results can be found also from the relevancy their financial/material/personnel capacities gain, for their trust-centrality (comparatively higher values, though) and for their irreplaceability. The problem density is low, but exists mostly with AELFs (0.1) and FOAs (0.2). (c.p. Table 8)

Table 8: Actors and their role for private forest owners' decision-making in forest management, by owner types.

Private Forest Owners' (N=180; 8 communes) perception (by owner types) on the relevancy of actors for their forest managment decisions	overall influence						for. information						financial/material/ personnell capacities						trust-centrality						irreplaceability						problems						
	local forest administrations	forest owner associations	other associations / societies	harvesting companies	family or relatives	other forest owners / farmers	local forest administrations	forest owner associations	other associations / societies	harvesting companies	family or relatives	other forest owners / farmers	local forest administrations	forest owner associations	other associations / societies	harvesting companies	family or relatives	other forest owners / farmers	local forest administrations	forest owner associations	other associations / societies	harvesting companies	family or relatives	other forest owners / farmers	local forest administrations	forest owner associations	other associations / societies	harvesting companies	family or relatives	other forest owners / farmers	local forest administrations	forest owner associations	other associations / societies	harvesting companies	family or relatives	other forest owners / farmers	N
10% oldest	0,6	1,4	0,4	0,2	2,1	0,4	0,9	1,5	0,5	0,1	1,8	0,8	0,6	1,2	0,4	0,2	2,5	0,8	1,4	1,8	0,6	0,3	2,5	1,0	0,7	1,4	0,4	0,2	2,4	0,5	0,1	0,1	0,0	0,0	0,0	0,0	29
10% youngest	1,3	1,9	0,5	0,1	0,4	0,0	1,7	2,7	0,2	0,0	0,3	0,0	1,5	2,0	0,1	0,3	0,4	0,0	2,5	3,8	0,3	0,4	0,4	0,0	1,5	1,9	0,5	0,2	0,3	0,0	0,1	0,4	0,3	0,0	0,0	0,0	21
10% smallest	0,2	1,1	0,2	0,0	0,3	0,0	0,6	2,2	0,3	0,0	0,4	0,0	0,5	1,4	0,1	0,1	0,4	0,0	1,5	2,6	0,3	0,4	0,5	0,0	0,1	1,3	0,2	0,0	0,4	0,0	0,1	0,0	0,0	0,0	0,0	0,0	17
10% largest	1,4	2,5	0,2	0,1	0,6	0,0	2,1	3,2	0,2	0,1	0,5	0,0	2,3	2,9	0,1	0,2	0,6	0,0	3,1	3,9	0,2	0,3	0,7	0,0	1,7	2,6	0,2	0,1	0,6	0,0	0,1	0,3	0,0	0,0	0,0	0,0	24
10% most distant	0,5	1,8	0,5	0,0	0,7	0,2	0,7	2,1	0,4	0,0	0,5	0,7	0,8	1,6	0,3	0,1	0,8	0,4	1,0	2,9	0,6	0,1	0,8	0,5	0,5	1,9	0,5	0,0	0,7	0,2	0,1	0,1	0,0	0,3	0,0	0,2	20
living locally	1,0	1,5	0,5	0,1	0,6	0,0	1,3	2,5	0,5	0,0	0,7	0,0	1,8	1,8	0,5	0,1	0,7	0,0	2,0	3,3	0,6	0,1	0,9	0,0	0,9	2,0	0,5	0,1	0,6	0,0	0,0	0,4	0,0	0,0	0,0	0,0	22
woman	0,7	1,3	0,1	0,0	2,2	0,5	1,2	1,9	0,2	0,0	2,3	0,5	0,9	1,1	0,1	0,0	2,8	0,5	1,4	2,0	0,2	0,0	2,6	0,5	0,7	1,3	0,1	0,0	2,5	0,5	0,0	0,2	0,0	0,0	0,0	0,0	22
men	1,0	2,1	0,4	0,0	0,6	0,1	1,8	2,5	0,4	0,0	0,7	0,1	1,1	1,9	0,4	0,2	0,6	0,1	2,2	3,4	0,5	0,0	0,8	0,1	0,9	2,0	0,4	0,0	0,8	0,1	0,0	0,0	0,0	0,0	0,0	0,0	25
all types & communes	0,9	1,7	0,3	0,1	0,9	0,1	1,4	2,4	0,3	0,0	0,9	0,2	1,3	1,8	0,3	0,2	1,0	0,2	2,0	3,1	0,4	0,2	1,1	0,2	0,9	1,9	0,4	0,1	1,0	0,1	0,1	0,2	0,0	0,0	0,0	0,0	180

Legend: values: multiply weighted means of points (from 0= not at all important/relevant to 5= extremely important/relevant) for each variable, by owner types and for all types/communes; the most important actors as perceived within an owner type are marked dark green (if values are >=2.0), green (if 1.0-1.9) or light-green (if <1.0). N= number of forest owners (interviewed). Source: own data, Aurenhammer (2015).

Comparing who the relevant actors are for forest owners attached to private or governmental initiatives and those who are not, one can recognize that the AELFs and FOAs gain among the groups of members/participants of initiatives considerably higher overall influence as well as higher relevancy of their forest information and financial/material/personnel capacities, higher trust centrality and higher irreplaceability (formal and informal decision-making competency), with values (means) often well above 2.0 up to 4.2 (from 5.0 points) – but also minor problem densities (clearly below 1.0 mostly). On the contrary, the AELFs and FOAs don't gain stronger influence or other relevancy among the group of forest owners who aren't members/participants of initiatives (all values are well below 1.0 from 5.0 points), only family or relatives gain importance (values between 1.4 to 1.8) among this group.

Above results show that both the FOAs' and the AELFs' efforts for their respective initiatives have led to considerably higher success for them in addressing and counselling of forest owners than this is the case with forest owners not participating in such initiatives. On the other hand, above structural data suggest that the owners, participating/being members of the initiatives, differ structurally from their colleagues, who are not.

Generally, the most ***important priorities*** for Bavarian forest owners are to *secure roundwood production in the long run for subsistence needs* (4.2 points / 5.0), to *sustain and improve forest preservation and protection* (3.9), *to sell and process their timber by local SMEs* (3.8) and to *implement measures related to water protection* and *forest conversion* (both 3.5). (in the following referred to as the 5 major goals) Priorities more directly linked to wood mobilisation follow later, with i.e. *increased roundwood production for the markets* (2.7) or *improving of the site development (forest roads)* (3.1). (c.p. Table 9) We can notice a higher priority for these goals among the youngest, largest and locally-living forest owners mainly. Discriminating between members and non-members of forest initiatives, one can notice the two groups do not differ with respect to the priorities they assign to the above-mentioned five major goals. On the contrary, roundwood marketing and site development does not gain as high priority among the 'non-members' (1.7 and 2.4, respectively), than it does for 'members' (values range from 2.9 to 3.7 for marketing and 3.0 to 3.4 for site development). These results indicate, the owners participating in initiatives have different priorities than those not participating, which could be partly also a result of activation efforts and counselling, but partly may be also due to (still) existing structural differences of the two groups.

Table 9: Private forest owners' priorities in their forest management, by owner types.

Private Forest Owners' (N=180; 8 communes) perception (by owner types) on the importance of various goals in their forest managment / utizilation	support activities with children and the youth	support measures for recreation and tourism	increase roundwood production for the markets (marketizing)	secure roundwood production in the long run for subsistence needs	our timber should be especially sold to and processed by local small/medium companies	our timber should be increasingly sold to more distant and/or larger wood processing industries	byproducts of forestry and non-timber forest products should be increasingly used and developed	the site development (forest roads, hauling tracks) of forests should be improved	changes in hunting practice / new hunting concepts are needed	improvement of the local organisation among forest owners	create better connected forst land plots (voluntary land exchange)	(joint) implementation of nature conservation measures	sustain and improve forest preservation (pests) and forest protection (soil and infrastructure) measures	implement measures related to drinking/spring water protection	adaptation of forest use to agricultural (pasturing) needs	construct wind energy plants in your forest (forest region)	support forest conversion (more broadleaved species or fir) to increase the adaptation of my forests to climate change	develop new income possibilities for forest ecosystem services (water, air, carbon)	N
10% oldest	2,6	2,0	1,9	3,9	3,5	1,5	1,8	3,0	2,3	2,4	1,6	2,3	3,6	3,5	2,3	1,4	2,7	2,1	29
10% youngest	3,0	1,8	2,8	4,7	3,4	1,3	2,6	3,4	2,9	2,0	2,0	2,5	4,1	3,5	2,3	1,4	3,3	2,6	21
10% smallest	3,8	2,8	2,1	3,7	3,9	0,9	2,5	2,7	2,5	1,7	2,3	3,4	4,0	3,6	2,2	1,2	3,9	1,9	17
10% largest	2,1	2,2	3,4	4,8	3,7	1,6	2,3	3,9	3,4	2,7	2,0	2,7	4,3	3,4	2,4	1,2	3,5	1,7	24
10% most distant	3,1	2,3	1,9	3,3	2,5	1,1	2,6	2,1	2,3	2,1	2,1	2,9	3,6	3,4	1,6	1,3	3,5	1,8	20
living locally	3,0	2,6	3,2	4,2	4,4	1,5	2,7	3,4	2,4	2,9	1,7	2,9	3,8	3,6	2,8	1,9	3,4	2,1	22
woman	3,0	2,6	3,0	4,4	4,1	1,2	3,0	2,5	2,3	2,3	1,9	3,5	3,9	3,6	2,6	1,4	3,8	2,2	22
men	2,9	2,7	2,6	3,9	3,9	1,2	2,6	2,8	2,6	2,5	2,3	2,9	3,9	3,4	2,2	1,3	3,9	2,6	25
all types & communes	2,9	2,4	2,7	4,2	3,8	1,4	2,5	3,1	2,6	2,4	1,9	2,8	3,9	3,5	2,4	1,5	3,5	2,2	180

Legend: values: multiply weighted means of points (from 0= not at all important/relevant to 5= extremely important/relevant) for each priority, by owner types and for all types/communes; the most important priorities as perceived within an owner type are marked dark green (if values are >=3.5) or green (if >=2.5). N= number of forest owners (interviewed). Source: own data, Aurenhammer (2015).

Generally, forest owners perceive their five primary goals (see above) comparatively well implemented (values from 1.8 to 2.4 / 5.0 points), except regarding *water protection* (1.4). Among the key goals with lowest ***implementation*** are *activities with children/youth* (0.9), *the marketing of non-timber forest products* (0.7), but also *the increase of roundwood production for the markets* (0.9), while *site development* is considered as well implemented (2.5). Regarding *the increase of roundwood production for the markets* the owner types of the youngest, largest and also men perceive low implementation (0.3 to 0.7). For *improving the site development (forest roads)* the oldest forest owners perceive the lowest implementation (1.0), and within the paired groups also the smallest and women have comparatively lower implementation values (2.4 and 2.2, respectively). Discriminating between members and non-members of forest initiatives, one can notice the two groups do not differ with respect to the implementation they perceive for the above-mentioned five major goals (all values well above 2.0). Also the implementation of increased roundwood production/marketing is evaluated at similar rates. However, for the site development 'non-members' perceive considerably lower implementation (1.2) as compared to 'members' (2.4-3.1).

The ***differences between priorities and implementation*** provide us with an estimation of the 'relevancy for action' or 'problem pressure', as perceived by forest owners. Generally, the highest need for action is seen in four of the five major priorities (see above) (+1.9 to +2.1), with the exception of *forest conversion* (+1.1). Also the *increase of roundwood production for markets* (+1.9) reaches higher relevancy for action, in contrast to *improving the site development* (+0.6) receiving lower urgency. A higher relevancy for action for roundwood production/marketing is seen by the owner groups of the youngest, largest and locally-living owners (+2.2 to +2.5). With respect to site development a higher urgency is seen only by the oldest owners (+2.0), while those living most distantly perceive the issue as overfulfilled/exaggerated (-1.2). Discriminating between members and non-members of forest initiatives, for some of the priorities no or no clear differences can be found, but several differences exist. Regarding the *improvement of the site development* the group of non-members perceives clearly higher relevancy for action (+1.1), while with respect to *increased roundwood production/marketing* the non-members perceive this as already overfulfilled (-1.7), hence they do not see 'problem pressure' in this regard. The 'members' perceptions vary, but they perceive this issue mostly rather positively (+0.1 to 1.0). (c.p. Table 10)

Table 10: Private forest owners' perceptions on the relevancy for action, in various issues and by owner type.

Differences between Private Forest Owners' (N=180; 8 communes) perception (by owner types) on the importance of and the implementation of various goals in their forest managment / utizilation ("relevancy for action" or problem pressure)	support activities with children and the youth	support measures for recreation and tourism	increase roundwood production for the markets (marketizing)	secure roundwood production in the long run for subsistence needs	our timber should be especially sold to and processed by local small/medium companies	our timber should be increasingly sold to more distant and/or larger wood processing industries	byproducts of forestry and non-timber forest products should be increasingly used and developed	the site development (forest roads, hauling tracks) of forests should be improved	changes in hunting practice / new hunting concepts are needed	improvement of the local organisation among forest owners	create better connected forst land plots (voluntary land exchange)	(joint) implementation of nature conservation measures	sustain and improve forest preservation (pests) and forest protection (soil and infrastructure) measures	implement measures related to drinking/spring water protection	adaptation of forest use to agricultural (pasturing) needs	construct wind energy plants in your forest (forest region)	support forest conversion (more broadleaved species or fir) to increase the adaptation of my forests to climate change	develop new income possibilities for forest ecosystem services (water, air, carbon)	N
10% oldest	1,2	0,3	0,3	1,0	1,3	0,8	0,6	2,0	1,6	0,1	1,6	0,7	0,5	1,6	1,4	0,5	0,7	2,1	29
10% youngest	2,9	1,4	2,4	3,0	1,4	0,5	1,8	1,1	1,8	0,3	1,9	1,9	2,4	2,9	1,4	1,4	2,4	2,6	21
10% smallest	2,3	1,3	1,4	0,8	1,1	n.d.	2,2	0,3	2,5	1,5	2,3	2,2	2,4	2,4	0,2	0,7	2,0	1,9	17
10% largest	2,1	1,8	2,2	3,3	2,8	1,2	1,8	0,6	1,3	-1,0	0,7	-0,3	1,6	1,7	0,7	0,0	-0,1	1,7	24
10% most distant	3,1	2,3	1,2	1,8	1,4	1,1	1,9	-1,2	1,2	-0,6	1,9	2,2	2,1	3,1	1,2	1,3	1,6	1,8	20
living locally	1,1	-0,2	2,5	1,8	2,0	0,7	1,6	0,4	-0,4	0,2	-0,5	0,6	1,7	1,9	1,7	1,5	1,0	2,1	22
woman	2,9	2,6	2,0	3,2	2,0	0,7	2,0	0,3	1,6	-1,6	1,7	1,5	2,7	3,4	1,6	1,4	1,9	1,5	22
men	2,0	1,2	2,3	1,8	3,3	1,1	2,6	-0,1	0,2	0,7	1,8	2,5	2,9	1,8	2,1	1,3	0,8	2,6	25
all types & communes	**1,9**	**1,0**	**1,9**	**2,0**	**2,1**	**0,8**	**1,8**	**0,6**	**1,0**	**0,1**	**1,2**	**1,3**	**1,9**	**2,1**	**1,4**	**1,0**	**1,1**	**2,1**	**180**

Legend: values: multiply weighted means of points, from the difference between importance and implementation (from – 5 to + 5; 0 being indifferent, the more positive the higher the relevancy for future action) for each issue, by owner types and for all types/communes; the issues reaching highest relevancy for further action (values >=2.0) are marked green, those where existing implementation clearly exceeds perceived importance ('over-implementation') (values <= - 1.0) are marked orange. N= number of forest owners (interviewed). Source: own data, Aurenhammer (2015).

Above results show that for Bavarian forest owners an increased wood production for the markets and site development (roads) is only a secondary priority. However, generally they perceive the wood production for markets could be better implemented and holds relevancy for action, in contrast to road construction. Because considerable differences exist between owner types, generally with the youngest, largest and locally-living more attached to 'mobilization' issues, this needs to be considered in policy and practice. In some communes, female forest owners are more interested in wood production (than male). Considerable differences exist also, comparing owners who are participants/members of initiatives, with those who are not.

Study 5a: Fact Sheets on the status quo and potential of harvesting in steep terrain contribution of KWF to the Bavarian focus study

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For the original Fact Sheets pls. contact Mr. Dietz.

Simwood Model Region	Bavaria
Objective of the Focus Study	The „Fact Sheets“ are developed to show the status quo and potential of harvesting in steep terrain, for the 2 subregions of Bavaria (Upper Franconia and Schwaben), where also the pilots are located. It is believed to be a valuable analyses and contribution to the Harvesting part. It has been developed in regional learning labs and is supposed to be used also as a training tool in workshops (in German language).
Methods used	Secondary Data Analyses (i.e. databases) and Expert Interviews (i.e. in the course of RLLs).
Results	Factsheet Fichtelgebirge – eastern Thiemitztal and Bibersberg = Region Upper Franconia **Initial situation** **Terrain** The Fichtelgebirge is part of the Thüringia-Franconia Mittelgebirge. 38 % of the region Thüringia-Franconia Mittelgebirge is covered with woodland up to 45 %. This percentage is well above the average. Both RLLs are situated mostly in the central mountain range, that means they are between 500 and 650 m above sea level. **Tree species** In the high altitudes of the Fichtelgebirge spruce is dominating. Today the forest is 85 % spruce, 10 % other conifers (pine) and 5 % hardwoods (mainly beech). **Forest ownership** The Wunsiedel district has 11.100 ha private forests area with approximately 4.000 forest owners. **Nature conservation** In the Fichtelgebirge is located the Nature Reserve: Fichtelgebirge, which also has outlets in the Czeck Republic. A special feature of the Fichtelgebirge is the quite frequently encountered swamp land. There are two RLLs in the Fichtelgebirge : • **Bibersberg** ○ Technical measures in the field to improvement of opening-up have already taken place and timber harvesting has been already carried out.

- Up to 30 – 40 % slope, as a technical constraint

- **Eastern Thiemitztal**
  - 95 % spruce stands
  - Slopes over 45 %, plus terrain breakpoints
  - Little timber harvests conducted yet
  - High timber-growing stock

- For both RLLs
  - Reluctance of the forest owners to engage in active forest management and harvesting although market conditions are favorable and professional.
  - Service providers do not have any limitations in terms of capacity to intervene.
  - Little interest from owners to manage forests (passive management)
  - Distant woodland owners; unidentified owners; lack of awareness of value of forests
  - Adapt harvesting working methods for steep slopes (including use the adapted machinery) to specific conditions in region

Barriers

- Missing or inadequate development of opening-up and driveways of the forests
- Organization: Mobilising and pooling of forest owners
- Local experience at highly technical procedures are not available
- Due to the lack of opening-up and driveroads the harvesting costs and skidding costs are about 30 % higher
- Harmonize management activities. For more harvest volume the harvesting costs could be reduced by min. 1 €.

Potential

- Harvesting of high standing volume (about 400 cubic meters wood per hectares)
- Stabilization of forests through thinning procedures
- Rising demand of wood for market request
- Good network of machinery, skilled labour, professional contractors

Entrepreneurs structure

(Source: Unternehmerdatenbank LWF Region Oberfranken)

Harvester companies: 176
Skidding companies: 248
Cable crane companies : 43

Solutions

- The main objective: opening-up of the forests, partially also the forest roads are missing
- Addressing the forest owners
  - Organization, clustering of procedures
  - Joint selection of timber harvest methods
- Clarification of possible own work
- Possible timber harvest methods
  - cable crane
  - Mountain harvester
  - Harvester with traction winch
- Possible demonstration of recommended timber harvest methods

Timber harvesting rates

- Due to lack or inadequate development of driveroads/opening-up the harvesting/skidding costs rise by 30 %
- A bundling of forest owners is mandatory. For more logging the harvesting costs could be reduced by min. 1 €

Basic parameters for eco-friendly timber harvesting (HEQ)

1. **Occupational Safety and Ergonomics**

The forest work in steep slope terrain is accident-prone both for the working person and for the use of machinery. Therefore attention should be paid at personal contribution of the forest owners on relevant expert knowledge and competence.

2. **Environmental restrictions**

Generally the forests in steep slopes in low mountain ranges and in the Alps have a particular importance in terms of the protective function. The soil and crop protection will be borne in terms of technological and process selection special consideration.

3. Efficiency and costs

The technical requirements in steep slopes lead to constraints in labor productivity. The combination of processing- and skidding procedures also require a higher organizational effort in particular with the inclusion of different partners (forest owners, care foresters, entrepreneurs). This generates higher processing costs than in flat or slightly inclined layers.

Steps for selecting a suitable timber harvesting method:

a. Which methods are due to the initial situation into consideration?
b. Which methods can expect an economical result in terms of wood assortments and wood quantity?
c. How can an allocation, of parts of the work, if necessary, take place (own power, foreign power)?

Factsheet Allgäu – Grünten = Region Schwabia

Initial situation

Terrain

The RLL Grünten is part of the Allgäuer Alpen and is thus located in a mountainous area. In the district area of the AELF Kempten 34 % of the landscape is covered with woodland, this corresponds to 64.500 ha forest.

Tree species

In the mountain forest dominates the tree species mix: spruce, fir and beech. Other trees are mountain maple, elm and whitebeam. Partly you can also find pure stands of spruce.

Forest ownership

Of the 64.500 ha forest area 67 % belong to the private forests.

Nature conservation

From conservation point of few, the area belongs to the natural area Grünten. 46 % of the forest area includes protection forest.

Grünten

The timber harvest methods are usually set (mechanized procedures with

	traction winch; various cable crane methods). Local experiences are available. **Barriers** • Partly lack of opening-up (supplement, expansion) • Process optimization possible, particularly in respect to cable crane methods (short or medium hole cable crane) • Due to the lack of opening-up the harvesting costs and skidding costs are about 20 % higher Harmonize management activities. For more harvest volume the harvesting costs could be reduced by min. 1 €. **Potential** • Good network of machinery, skilled labour, professional contractors • Rising demand of wood for market request • Maintain stable mixed mountain forests • Higher value added to harvesting **Entrepreneur structure** (Source: Unternehmerdatenbank LWF Region Schwaben) • Harvester companies: 171 Skidding companies: 233 • Cable cran companies: 44 **Solutions** • Partial opening-up optimization • Discuss possible harvesting methods with the forest owners (Organization and bundling) • Clarification of possible forest owners work contribution (Maschinenring) • Demonstration of recommended timber harvest methods **Timber harvesting rates** • Due to lack or inadequate development of driveroads/opening-up the harvesting/skidding costs rise by 30 % • A bundling of forest owners is mandatory. For more logging the harvesting costs could be reduced by min. 1 € **Basic parameters for eco-friendly timber harvesting (HEQ)**

	1. Occupational Safety and Ergonomics • The forest work in steep slope terrain is accident-prone both for the working person and for the use of machinery. Therefore attention should be paid at personal contribution of the forest owners on relevant expert knowledge and competence. **2. Environmental restrictions** Generally the forests in steep slopes in low mountain ranges and in the Alps have a particular importance in terms of the protective function. The soil and crop protection will be borne in terms of technological and process selection special consideration. **3. Efficiency and costs** The technical requirements in steep slopes lead to constraints in labor productivity. The combination of processing- and skidding procedures also require a higher organizational effort in particular with the inclusion of different partners (forest owners, care foresters, entrepreneurs). This generates higher processing costs than in flat or slightly inclined layers. **Steps for selecting a suitable timber harvesting method** • Which methods are due to the initial situation into consideration? • Which methods can expect an economical result in terms of wood assortments and wood quantity? • How can an allocation, of parts of the work, if necessary, take place (own power, foreign power)?
Domains addressed (ownership; management; governance; forest functions; management)	Harvesting

Study 6: Actors and their role in Slovenian Forest Owner Associations' networks

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The **25 Forest Owner Associations (FOAs)**, sampled by egocentric network analyses, identified most frequently the Slovenian Forest Service (SFS), the National Forest Owner Association (NFOA), an umbrella organization of the currently 29 FOAs, municipalities and the Chamber for Agriculture and Forestry (CAF) as 'important actors' to them. It is interesting that the local FOAs perceive the NFOA and CAF, being predominantly advocacy organizations, as so important for their (local/practical) work.

The SFS gains very strong, the CAF, the NFOA and municipalities gain strong, the Agricultural and Forestry Cooperatives (AFCs) gain medium overall **influence**, as perceived by the 25 FOAs. For the SFS this is mainly explained by its very high trust centrality and the very high relevancy of its information to FOAs. Also for the CAF and NFOA their influence is mainly based on the factors trust centrality and information relevancy (high/very high). Municipalities gain high trust centrality and hold important positions regarding financial/material resources, for the FOAs – they i.e. fund development activities of associations, they have public tenders for non-refundable financial incentives. Furthermore, they provide the facilities for meetings of FOS members and for various other events (e.g. expert lectures). AFCs medium influence is explained by their medium trust centrality and information relevancy to FOAs (c.p. Table 1).

Table 1: Actors' overall influence and roles (absolute) in 25 egocentric networks of Slovenian Forest Owner Associations.

Actor groups (below) / varialbles (right):	N	overall influence	general information	forest information	trust	financial, material resources	human or time resources	(in-)formal competen-cies	problems
Slovenian Forest Service (SFS)	24	53	62	67	60	11	47	51	6
Forest Owner Ass. (National)	19	39	45	48	52	5	19	42	3
Communes	16	24	13	11	32	33	9	30	0
Agricultural & Forestry Chamber	15	22	23	21	33	5	20	12	0
Agricultural & Forestry Cooperatives	6	12	13	11	16	6	8	12	0
Machine rings	5	9	10	9	14	6	7	6	0
Harvesting and trading companies	7	9	7	10	17	9	8	0	3
Forest related schools	5	7	5	7	12	2	3	6	0
Wood processing companies	4	6	3	8	11	5	7	6	0
Slovenian Forestry Institute (SFI)	3	5	8	8	9	5	4	0	0
Tourism	1	3	3	3	3	3	3	3	0
Live stock production societies	2	3	2	2	5	1	3	0	0
Wood energy societies	1	3	3	3	3	0	1	0	0
Development Agencies	1	3	2	2	3	3	2	3	0
Foreign energy companies	1	2	1	2	2	0	2	3	3
Agricultural Chamber (Foreign)	1	2	3	3	3	0	2	3	0
Rural development societies	2	2	3	3	6	1	2	0	0
Foreign wood processing industries	2	2	4	4	4	0	0	6	3
European Landowner Organisations	1	2	3	3	3	0	0	3	0
Ministry for Agriculture, Forestry and Food	1	2	2	1	1	1	0	3	0
Machine producers/traders	1	1	2	2	2	0	0	0	0
other Agriculture/Forestry research org.	2	1	4	1	6	2	1	0	0
Forest authorities	1	0	2	2	2	0	0	0	0
other Forest Owner Associations	1	1	2	1	3	0	2	0	0

Legend: The table includes absolute values (points) for each variable, combining 25 egocentric networks. Colors indicate actors with very strong roles (> 50 points), strong roles (>20) and medium roles (>10) – as perceived by the 25 Forest Owner Associations - in red, yellow, green, respectively. N refers to the number of occurrences of an actor group within the 25 egocentric networks (values above 14, 2, 0 are marked red, yellow and green respectively). Source: own data/calculations: Ščap, Š., Aurenhammer, P., 2015

Machine rings and their association, harvesting and trading companies, forest related schools, wood processing companies and the Slovenian Forestry Institute (SFI) are still among those more frequently mentioned actors. Considering all 25 networks, they do not gain much influence, as their capacity related values remain low too. They do however reach medium trust-centrality. Interestingly, only for a few FOAs contacts to actors related to harvesting, trading and processing of wood are among the most important ones (c.p. Table 1).

This may be partly explained by the FOAs' perception of their **goals**. These relate most importantly to the categories advocacy and society, advisory services to forest owners, but on a third rank also to roundwood harvesting, marketing and roads. Results for individual forest-related goals show *education and awareness* of initiative's members in all areas of forestry and the active advocacy for the interests of members in the formulation of *forestry and hunting policy* are stated by the 25 FOAs of holding the highest importance. This focus may also explain the above-mentioned priority towards contacts with advocacy organizations like CAF and to their umbrella organization NFOA. Only at a lower support level exist goals such as the *joint appearance on the markets*, *informal socializing* of initiative members, networking of initiative's members in *introducing new technologies* and representing the interests of the initiative's members in the process of *adopting forest management plans*. Joint forest management, combining several estates, and caring for nature protection receive least attention/priority (c.p. Table 2).

Table 2: Preferences of Forest Owner Associations (absolute values, N=25)

Preferences of the Forest Owner Societies (25 egocentric networks)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	tota
Actively advocating the interests of members in the formulation of forestry and hunting policy.	3	0	4	5	0	2	0	5	0	2	3	0	4	5	0	5	5	4	5	5	1	4	2	0	4	68
Implementation of joint works in forests.	2	4	0	0	0	0	0	0	2	5	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0	18
Joint appearance on the markets.	0	5	0	4	0	0	0	0	0	5	0	4	0	0	0	0	0	3	4	0	2	0	5	0	0	32
Education and awareness of initiatives members in all areas of forestry.	5	3	5	3	5	5	5	0	5	4	0	5	5	0	5	4	0	5	3	0	3	5	4	5	5	89
Caring for nature protection.	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4
Networking of initiatives members in introducing new technologies.	4	1	3	0	1	0	0	0	0	0	0	0	3	0	4	0	0	1	0	0	0	0	0	4	3	24
Networking of initiatives members in the construction and maintenance of forest infrastructure.	0	0	0	0	0	0	0	4	1	5	0	0	0	1	0	3	0	2	0	0	0	0	0	0	0	16
Representing the interests of the initiatives members in the process of adopting forest management plans.	0	0	0	1	0	4	0	4	0	0	4	0	0	2	0	1	4	0	0	2	0	0	0	0	1	23
Networking of initiatives members for the implementation of silviculture.	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	7
Networking of initiatives members for uniform forest management in a certain area (combining several estates).	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
The development of tourism, eco-tourism, promotion of natural sights.	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0	0	0	0	0	0	0	0	0	3	0	8
Work in partnership with other organizations (social, international, research institutions…).	0	0	2	2	0	0	0	0	0	0	0	3	2	0	3	0	0	0	0	0	0	3	0	0	0	15
The organization of the joint purchase of equipment.	0	2	1	0	3	1	4	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	3	0	17
Informal socializing of initiatives members.	0	0	0	0	4	0	3	2	3	0	1	1	1	0	2	3	2	0	0	0	5	2	0	1	1	31
Caring for forest protection (prevention of damage to trees caused by pests).	0	0	0	0	2	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	8
Representation of members' interests in the joint production and marketing of non-timber forest products.	0	0	0	0	0	3	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0	1	0	0	10

Legend: values are points distributed over preferences, for 25 Forest Owner Associations and for all of them (total); orange (cases 1-25) = the goals ranked highest (5 points), colors in the column 'total': orange = >70 points, yellow = > 50 points, green = > 20 points; Source: own data/calculations: Ščap, Š., Aurenhammer, P., 2015

The FOAs evaluated their **success** in terms of the grade of implementation of their goals, and perceived the highest success with the category 'advocacy and society', followed by '*markets for NWFPs*', '*roundwood harvesting, marketing and roads*' and '*advisory services to forest owners*'. Only the category 'nature conservation and forest preservation' gained lower implementation results. Five FOAs generally evaluate their Associations with medium success, four state very strong or complete implementation of their goals. Perceived success regarding the implementation of individual goals of FOAs was assessed highest for '*education and awareness*', '*informal socializing of initiative's members*', '*implementation of joint work in forests*' and '*joint appearance on the markets*'. Lower performance is with aspects such as the introduction of new technologies, organizing joint purchase of equipment, support in adopting management plans, implementation of silviculture, uniform forest management (combining several estates), partnerships with other organizations (social, international, research institutions). Hardly any implementation took place in the development of tourism and related to caring for forest protection (pests) (c.p. Table 3).

Potential for improvements is seen by the 25 FOAs both in changes to internal/organizational structures and the external functioning of the FOAs. According to qualitative interviews, potential is seen *internally* i.e. in improving internal, organizational structures, by professionalization of own representatives and the education of forest owners, by strengthening a joint forest management and appearance on the market and by raising the engagement of forest owners. Also, the hand-in-hand functioning of joint harvests and joint marketing as well as cooperation in construction and maintenance of forest infrastructure could be (further) developed. Forest owners could be made collectively apply for rural development program funds of municipalities (i.e. for infrastructure maintenance). Additionally the marketing of eco-social services is not (well) developed. Silviculturally an excellent quality of wood in private forests should be aimed at and private hunting areas allowed (many FOAs' members strive for the right to private hunting on a larger forest estates, which present not a case in our legislation). (25 interviews)

Externally, improvements mentioned include better cooperation and communication with other actors, for instance with the SFS for joint forest management in a certain area, with the public, also with neighboring FOAs or for joint trainings at a higher level (including the education of instructors who would then further educate members of the FOAs). FOAs could more actively involve themselves in biomass-supply markets, improve their joint appearance (also among several FOAs) on the market and engage in eco-tourism. Further, several FOAs see a need to change the legislation regarding the restriction of property rights (amendment of Article 5 of the current Forest Act to obtain hunting rights in accordance to the Constitution, no free and unrestricted gathering of non-timber forest-products, hunting, free access and movement in the forests; prohibition of the driving of motor vehicles). (25 interviews)

Table 3: Implementation of specific goals as perceived by Forest Owner Associations (N=25)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	mean (25)	mean % (25
Actively advocating the interests of members in the formulation of forestry and hunting policy.	1		2	3		3		2		2	2		2	3		3	1	2	2	1	2	2	2		2	2,1	69
Implementation of joint works in forests.	1	2							3	3								2		3						2,3	78
Joint appearance on the markets.		3		3						3		2						2	3		1		1			2,3	75
Education and awareness of initiatives members in all areas of forestry.	3	2	3	2	3	3	3		3	3		2	3		2	2		2	2		2	3	2	2	3	2,5	83
Caring for nature protection.														2												2,0	67
Networking of initiatives members in introducing new technologies.	1	1	3		1								1		2			2						2	2	1,7	56
Networking of initiatives members in the construction and maintenance of forest infrastructure.									3	0	3				0		3		2							1,8	61
Representing the interests of the initiatives members in the process of adopting forest management plans.				2		3		2			2			2		1	2			1					1	1,8	59
Networking of initiatives members for the implementation of silviculture.								1												2						1,5	50
Networking of initiatives members for uniform forest management in a certain area (combining several estates).	0																			3						1,5	50
The development of tourism, eco-tourism, promotion of natural sights.										1				2									1			1,3	44
Work in partnership with other organizations (social, international, research institutions...).			1	3								1	2		1							1				1,5	50
The organization of the joint purchase of equipment.		2	2		1	0	3		3							2								1		1,8	58
Informal socializing of initiatives members.					3		2	3	3		2	1	2		2	2	4				3	3		3	1	2,4	81
Caring for forest protection (prevention of damage to trees caused by pests).					1					1									1					2		1,3	42
Representation of members' interests in the joint production and marketing of non-timber forest products.						3						2									2		1			2,0	67

Legend: values refer to the average points for individual preferences as evaluated by the FOAs (or the mean of the 25, in absolute and relative values); used scale: 0 … not, 1 … hardly, 2 … strongly and 3 … completely implemented (as well as 'x' … I cannot assess); empty = goals not among the 5 most important ones for the FOA and therefore left without evaluation; colors (mean %): green = >=70%, yellow = >=60%, orange >=50%, red = <50% 'implementation'; Source: own data/calculations: Ščap, Š., Aurenhammer, P., 2015

Asked for **facilitators of solutions** to future forest problems and what **instruments** would work best, the 25 FOAs generally argue that, both, the individual citizens / forest owners and the state would be the ideal facilitators as well as consider laws and positive financial incentives as most appropriate instruments (c.p. Table 4).

However, the role of the *state* varies. In aspects such as the provision of ecosystem services and the consultation and implementation of sanitation the FOAs perceive the state in a clearly dominant role for facilitation. In the areas of hunting, construction of forest roads and care and protection of forests the *state and the individual owners/citizens* gain roughly equal roles. Roundwood production from private forests is a topic strongly to be facilitated by the *individual owners*. In roundwood commercialization from private forests in addition to the individual owner also the *market* is seen among the leading facilitators. For new areas of application for wood the *market* is given the highest

role. The adaptation of forests to climate change should be rather *left to the nature*. (25 FOAs' networks) (c.p. Table 4).

The application of *laws* is most prominent in the case of hunting, but also in issues of ecosystem services, climate, nature conservation, tourism and the marketing of non-timber forest products. *Positive financial incentives* are seen as most appropriate for issues relating to care and protection of forests, forest roads, preservation of countryside and sanitation. *Awareness raising* and *public relations* are measures relevant to issues related to ecosystem services and nature conservation. *Advice and training* is seen as reasonable instrument in areas of sanitation, climate change or roundwood production. A *liberal formation of prices* is clearly the most appropriate instrument for issues of roundwood production and roundwood commercialization from private forests. (25 FOAs' networks) (c.p. Table 4).

Table 4: Facilitators of solutions to future forest problems and suitable instruments (FOA, N=25)

Facilitators of solutions to future forest problems and suitable instruments, as perceived by Slovenian Forest Owner Associations (N=25)	State (Ministry)	Market (private economy)	Society (unions, associations, citizens´ initiatives)	individual citizens / forest owners	leave it to the nature	laws (dictates, bans)	standards/norms	taxes / duties	positive financial incentives (subsidies, financing)	awareness raising, public relations	advice and training	exchange offers, contracts by private law	liberal formation of prices (supply, demand)
Implementation of the care and protection of forests.	42	0	0	54	4	17	4	12	43	4	17	1	1
The construction of forest roads.	46	0	0	54	0	23	4	11	38	4	17	0	2
The role of hunting in forest management.	50	8	0	42	0	60	5	6	6	9	6	1	7
Roundwood production from private forests.	0	17	4	79	0	3	11	14	16	4	18	2	31
Provision of ecosystem services (water, air, carbon) of forests.	67	0	13	8	13	41	5	10	15	20	9	0	0
Adaption of forests to climate change.	25	4	8	8	54	33	12	4	13	17	19	3	0
Nature conservation.	54	0	29	13	4	41	8	8	10	25	9	0	0
Use of forests for tourism and recreation.	21	13	25	42	0	32	7	7	22	16	7	0	9
Roundwood commercialisation from private forests.	4	29	8	58	0	4	9	9	13	3	15	5	42
Preserving the countryside.	46	0	17	33	4	25	2	14	35	6	14	2	3
The use of wood for energy purposes.	21	38	13	29	0	15	13	13	19	7	12	3	17
(New) areas of application for wood.	21	58	8	13	0	16	5	12	18	14	14	4	16
Marketing of non-timber forest products.	33	0	13	54	0	46	10	14	6	14	7	0	4
Consultation and implementation of sanitation.	63	0	0	38	0	24	4	8	30	7	22	3	3
overall perceptions	**35**	**12**	**10**	**38**	**6**	**27**	**7**	**10**	**21**	**10**	**13**	**2**	**10**

Legend: values: % of total points distributed over facilitators (max. 100%) and instruments (max. 100%), by the actor group; red: very high values (>=70%), orange = high values (>=50%), yellow = medium values (>=30%), green = lower values (>=20%); Source: own data/calculations: Ščap, Š., Aurenhammer, P., 2015

Qualitatively the 25 FOAs highlighted potential '**solutions**' related to laws and politics, economics and markets mainly. Legally or politically relevant solutions include, that *the state* should change the concept of counselling in rural areas (consultants for people who are present in the field), support the civil initiatives (provincial parliament), combining various institutions for networking (e.g. research institutions, national public forestry service, forestry educational institutions, institutions which represent the forest owner's interests, ministries engaged with nature and environment) and mutual trust, the state should have a fair attitude to the NAFO, by taking them into consideration during the preparation of legislation. Further should the state limit the export of timber and – as above – amend Article 5 of the Forest Act. If the state would introduce a property tax, picking forest fruits in private forests should be prohibited. Also should the public forestry service *SFS* receive greater competencies in nature conservation, for cooperation in the organization of felling, skidding and the sale of timber and for coordination of forest owners' associations. *Forest owners* should be stronger involved in the construction of forest roads (i.e. owners are involved in the construction of forest roads, they are completely or partly financing it. They are less involved in maintenance of

forest roads – only through representatives at SFS and communes. The opinion expresses a need for closer cooperation with SFS on that field). (25 interviews)

Solutions related to markets and economics include the need for unifying estates and wood production for improved marketing of roundwood from private forests, improved joint appearance on the market or the introduction of taxes and duties for those who do not manage their forests and relief for those who exploit allowable cut. More incentives and a more efficient subsidy system would improve forest care and protection. (25 interviews)

Further, a more in-depth analysis of **four partial FOAs' networks** was done (20 actors interviewed), to explore other actor groups' roles and positions and compare the four FOAs, selected based on their difference in the active implementation of activities (page 4 in questionnaire) and their successfulness in the initiatives if they have had it. The first ones chosen were the most and the least active FOAs. For the most active FOA we based on the random selection method, because 2 FOAs were very similar. Secondly, we have chosen 2 FOAs, being 'medium performers', also based on a random selection method.

In the selected 4 FOAs, the SFS, the CAF, but also the Slovenian Forest Institute (SFI), are frequently considered important and very **influential actors**, by the involved actors (20 interviews). The NAFO was considered important in all cases, but is very influential only in one case. Ten municipalities are considered important in three of the cases, some gaining influence due to the high relevancy of their informational and financial/material resources, high trust-centrality and high informal/formal competencies.

A comparison of the **goals** of these four Forest Owner Associations – as perceived by the actors involved in these Associations (20 interviews) shows, that measures related to '*education and awareness*' reach in all four initiatives high relevancy. *Advocacy* is of priority to one case only. A '*joint appearance on the markets*' is important in two cases. Neither is the implementation of joints works in forests or a common forest management combining several estates a priority in the four cases, nor caring for nature protection or forest protection (preservation).

Differences occur in the priorities for goals related to FOAs, as set or perceived by actor groups. Results show, '*education and awareness*' raising for forest owners is a major goal, FOAs should thrive for, in the view of all actor groups but the wood processing companies. *Advocacy* is perceived an important goal for FOAs by the CAF, the NAFO and AFCs – this is shared by the 25-FOAs' perception. Developing *inter-organizational partnerships* is perceived important by the SFI, the NAFO, the machine rings and the wood processing industry – for the FOAs these are no priorities though.

The goal of the 'implementation of joint works in forests' is supported mostly by the CAF, 'joint appearance on the markets' by the SFI, the wood processing companies and the AFCs – gaining less importance from the point of view of FOAs though. Caring for nature protection is interestingly 'voiced' strongest by the wood processing companies, caring for forest preservation is not given much attention by any actor group.

A comparison of the evaluation of the **success**/implementation of goals in the four FOAs – as perceived by the actors involved in these Associations, shows, measures related to '*education and awareness*' are perceived strongly implemented in three cases. *Advocacy* was a priority to only one case and is perceived as completely implemented in three cases. In the two cases where a '*joint appearance on the markets*' is considered a priority, the goal is also perceived to reach medium to strong implementation.

Joint works in forests is regarded as hardly implemented in three cases. Caring for nature protection receives varying implementation across cases and forest protection (preservation) is important only

to one case, where its implementation is regarded medium. The organization of equipment isn't at high priority in any case – its implementation is considered mostly low.

Differences occur in the perception of success by different actor groups. The implementation of '*education and awareness*' raising for forest owners is perceived as strong or even complete, by the FOAs themselves, the AFCs and the SFS, but only as hardly or medium by the NAFO and machine rings. Activities of *advocacy* by FOAs are regarded as strongly or completely implemented by the CAF, the AFCs and the FOAs themselves, the SFS and municipalities see room for improvements (see below).

The goal of the 'implementation of joint works in forests', supported mostly by the CAF, but not being of priority to the FOAs (see above), is nevertheless considered strongly implemented by the FOAs themselves, but the SFS and CAF consider it only as hardly implemented. The implementation of 'joint appearance on the markets' is considered low by the municipalities and strong by the other actors - FOAs themselves perceive it strongly or completely implemented. 'Caring for nature protection' is perceived by the wood processing companies as completely implemented, again the CAF sees hardly any implementation. Caring for forest protection is evaluated as hardly implemented by the FOAs, only from municipalities as strongly. All actor groups perceive the goal of organizing of equipment as hardly achieved.

Qualitative comments of 20 actors, involved in the four networks, showcase **potential improvements,** especially in the regularity of carried out trainings (more trainings, i.e. 1 per months), in the joint appearance on the market and joint works in forests, in the establishment of additional areas of cooperation (forest infrastructure), in establishing cooperation with the SFS for joint forest management, in increasing the reliability of contractors, in the attention of FOAs to the tourism sector and actors and in the activity of the FOAs in local biomass-supply markets. Further, for wood processed in Slovenia, sawmills should be offered flat-rate allowance (compensation). Forest owners should be entitled to part of the income from marketing of non-timber forest products (as shown in the Sylvamed project: possible solutions for the payment of ecosystem services (PES)). Similarly to this, owners should also get the adequate compensation for the hunting right and the fair compensation for the damage in forests caused by game. (20 interviews)

There is also seen a need to better define what kind of work the SFS can carry out for the FOAs and what kind of work is prohibited because of the non-compete clause. Also the establishment of forest learning paths could be valuable activities for FOAs. (20 interviews)

Differences occur also in the preferences for **facilitators of solutions** to future forest problems and the preferences towards the most appropriate **instruments**, between the FOAs (25 or 4) and other actor groups.

The FOAs generally prefer the individual citizens / forest owners and the state as facilitators. They favor a mix of instruments, headed by the laws and positive financial incentives. For the SFS the ideal facilitators are individual citizens / forest owners and the society (unions, associations, citizens' initiatives) and preferred instruments are positive financial incentives and taxes/duties – so less state/top-down order focused than the FOAs' position. The CAF again has a general tendency for the state, the market and the society as facilitators, while viewing positive financial incentives, laws and the liberal formation of prices as the most appropriate mix of instruments. Interestingly, incentives and liberal prices formation are both high. The NAFO sees clearly a focus on the state as facilitator and perceives laws and positive financial incentives as most appropriate instruments. The municipalities prefer the state, the market and the individual citizens / forest owners as facilitators. Most appropriate instruments are to them positive financial incentives, laws and awareness raising / public relations.

However, differences exist, looking at specific aspects. The FOAs perceive the state in a clearly dominant in aspects such as the provision of *ecosystem services* and the consultation and implementation of *sanitation*. This is shared by NAFO and the municipalities, while the SFS perceive the state herein only as one of several facilitators. In contrast the CAF sees sanitation as a topic for the individual forest owner and ecosystem services provision as one of the society but sees the state in the forefront for other issues.

For the FOAs, in the area of *hunting*, construction of forest *roads* as well as *care and protection of forests* the state and the individual owners/citizens gain roughly equal roles. The NAFO and the municipalities see this similarly, but for NAFO the state is given more priority in hunting issues, again for the municipalities the state gains more priority regarding the care and protection of forests. Contrary to the above, the SFS perceives the individual forest owners as primary facilitators in above aspects. CAF prefers the state regarding forest care and hunting, but forest roads construction is left to the individual forest owners.

For the FOAs, *roundwood production* from private forests is a topic strongly to be facilitated by the individual owners. In *roundwood commercialization* from private forests, in addition to the individual owners, also the market is given priority. This view is shared by the municipalities. However, for the NAFO commercialization is primarily seen as an issue of society. The SFS see only individual forest owners as facilitators, while the CAF refers only to the market. For *new areas of application for wood* the market is given the highest role by all actors.

According to FOAs' perceptions, the *adaptation of forests to climate change* should be rather left to the nature and 'to some extent' to the state. This is similar to NAFO's perception (nature, but also society). For the SFS and CAF the society is considered most relevant. The municipalities prefer the state in this subject.

For the FOAs, the application of *laws* is most prominent in the case of hunting, but also in issues of ecosystem services, climate, nature conservation, tourism and the marketing of non-timber forest products. For the SFS, laws play an important role for issues of ecosystem services, nature conservation, tourism and hunting. Again for the CAF, laws are important especially for hunting, nature conservation and the marketing of non-timber forest products, while for climate issues advice and training and for tourism positive financial incentives are considered most appropriate instruments to solve problems. For the NAFO, laws are suited best to solve problems related to hunting, the construction of roads, tourism and ecosystem services, while for climate issues advice and training and for nature conservation awareness raising / public relations are considered ideal instruments. Finally, for the municipalities, laws are important for solving problems related to hunting, but also for such related to the construction of forests roads, climate change adaptation, preserving the countryside and sanitation. However, awareness raising / public relations are considered best for nature conservation and tourism, by the municipalities.

For the FOAs, *positive financial incentives* are seen as most appropriate for issues relating to care and protection of forests, forest roads, preservation of the countryside and sanitation, so is the case for the SFS. Also CAF shares this view, but considers incentives also most appropriate for issues like the provision of ecosystem services, tourism, the use of wood for energy. Also for NAFO, incentives are well suited for some of above aspects, like forest care and countryside preservation, but also for roundwood commercialization, where FOAs have a clear preference to a liberal formation of prices. Municipalities share the preference of incentives in areas as FOAs do, but prefer incentives also in other areas, such as related to the use of wood for energy, new applications for wood and roundwood production (the latter in contrast to FOAs).

For the FOAs, a*wareness raising* and *public relations* are measures relevant to issues related to ecosystem services and nature conservation; also to the adaptation to climate change. Similarly perceives the SFS, focusing though more strongly on awareness raising in climate change issues. For

the CAF this instrument has higher relevancy in other areas, such as marketing of non-timber forest products (NTFPs). Municipalities see their role mainly for nature conservation and tourism. For NAFO this instrument is the primary one to solve problems related to nature conservation.

For the FOAs, *advice and training* is seen as reasonable instrument in areas of sanitation, climate change or roundwood production. The SFS see it appropriate for issues related to hunting, sanitation, roundwood commercialization and new applications for wood. For the CAF, this instrument is relevant mainly for issues of forest care and climate change adaptation. For the municipalities, advice and training play an important role for nature conservation, tourism and new applications of wood. Finally, for the NAFO, this instrument suits best to solve problems related to climate change adaptation, roundwood production and commercialization as well as forest care.

For the FOAs, a *liberal formation of prices* is clearly the most appropriate instrument for issues of roundwood production and commercialization from private forests. This is similar to the perception of municipalities. The CAF sees this instrument as the only appropriate one to roundwood production and commercialization as well as to new applications of wood, contrary to the SFS, for whom the liberal formation of prices is not a dominant instrument to solve problems in any area. Also for the NAFO, this instrument plays only some role for the marketing of NTFPs.

The actors of the four networks highlighted the following potential "**solutions**" related mainly to laws and politics, economics and markets. The *state* should change the concept of counselling in rural areas (consultants for people who are present in the field), support the civil initiatives (provincial parliament), combining various (see above) institutions for the networking and mutual trust, amend Article 5 of the Forest Act (see above), steer jointly with the forest owners the construction and maintenance of forest roads, the state should introduce additional incentives for the wood-processing sector and support innovative projects in the field of wood use through financial incentives. Further, when people harvest non-timber forest products in private forests, the owner should get some financial compensation. Changes in the effectiveness of the subsidy system and provision of incentives are seen key to improving care and protection of forests. Finally, the excessive amounts of wood residues remaining in the forest should be used for energy production.

Study 7: Irish private forest owners' decision-making in wood mobilisation: the influence of the social network

Author: Ms Evelyn Stoettner, University College Dublin

Simwood Model Region	**South and Eastern Region, Ireland**
Objective of the Focus Study	The objective is to gain knowledge about which individuals and organisations are present and relevant for forest owners and how they support or hinder considerations of forest owners when it comes to harvesting. There is particular focus on the role of forest owner groups (Producer Groups). A particular aim was to determine whether there was a difference in the social networks of those who have harvested and those who have not as well as understanding whether membership of a producer group had a bearing on the social networks.
Methods used	A forest owner-centred Social Network Analysis assessed forest owners' perceptions of which persons and/or organisations are relevant and available in the context of harvesting. Those individual social networks were compared among forest owners to show differences and common features.
Results	The generated ego-centred social networks are based on interviews with 55 individual forest owners throughout the model region. The sample of owners interviewed was random; instead the study relied, in general, on the pool of owners that the two SMEs had access to. This pool was stratified according into two groups (harvested and non-harvested) and within each of these whether a member of producer group or not, yielding four groups. Visualisation of the social networks as regards harvesting shows that the four groups differ in the number of persons/organisations surrounding the forest owners. The number is lower in the groups where forest owners have not harvested compared to those where forest owners have. Although this is not surprising, it is important to investigate the reason further; It became evident during the interviews that it was not necessarily that forest owners who have not harvested were not reaching out but that on occasions the owners had tried to make contact but were let down by contractors or were offered unfair prices. The social networks that differed most were those of non-members of a producer group who have harvested and non-members who have not. Using Blau Index (to quantify the diversity/consensus within a category and compare that to other groups) as well as interviews, there is an equal sense of trust in each of the four groups and no indication that any person/organisation was irreplaceable during the harvesting process, except within the group of members of a producer group who have harvested; there, the producer group itself is irreplaceable for a small number of forest owners because it offers something that lies between public service and private business and is perceived as acting in the forest owner's interest ("us" vs. "they"). Advice from public bodies is perceived as good information but is less useful when it comes to marketing timber. What hindered forest owners in selling timber were private companies' being secretive about accurate timber prices

	and “cartels” going on between harvesting and marketing partners. In their social network forest owners missed persons/ organisations who support through advice (be it from independent or public advisors, for finances, marketing/prices or management) or being available to extract small timber.
Domains addressed (ownership; management; governance; forest functions; management)	Harvesting, Ownership, Governance

Study 8: Forestry skills audit

Author: Andrew Kitching, Rural Development Initiatives Ltd, UK.

SIMWOOD Model Region	Yorkshire and the North East Model Region
Objective of the Focus Study	**Outline objective indicating also what gap in knowledge the focus study is addressing** This focus study's main aim was to enable the model region's SME (RDI Ltd) to gain a better understanding of the skills and knowledge levels of forest owners as well as small to medium sized enterprises involved in the management of woodlands and its associated supply chain. It looked to identify any gaps and suggest solutions through either existing training provision or by highlighting where additional provision was required.
Methods used	**Very brief description of methods used** The SME captured the information about the skills and knowledge levels at that time through a targeted online survey, using SurveyMonkey. The survey was circulated to forest owners and SMEs involved in the management and the associated supply chain of the region's forests. Where respondents did not have access to the online survey, paper versions were made available, with the results being incorporated into the online survey via input from the SME. The survey was set up using skip logic settings which meant, depending on the answers the recipient gave to certain questions, it would skip to the next relevant question in the sequence e.g. if a recipient answered they were a forest/woodland owner, they would be asked a series of questions about their woodland holding before being asked about their level of knowledge and skills; whereas a contractor would be asked to answer a series of questions relating to their knowledge and skills, however this would be by more detailed questioning. The survey was circulated using the SME's own contact lists and was also circulated through other regional partners contact lists and networks such as Forestry Commission England regional office, Confor and Royal Forestry Society regional members, as well as smaller forest owner representative bodies such as the Small Woodlands Owners Group. It was anticipated that some of the responses would be from outside the SIMWOOD model region. Responses from outside the model region were only incorporated if the responses followed similar trends to those from those within the model region; otherwise they were removed, therefore maintaining the regional focus.
Results	**Brief overview of results – In this section also indicate what contribution has this focus study made to SIMWOOD – in what way has it helped achieve the objectives of SIMWOOD**

	The focus study investigated the present skills and knowledge levels amongst forest owners and the contracting sector associated with the management of woodlands across the model region in order to identify any gaps. The rationale for the focus study came out of the first Regional Learning Lab, held in October 2014, and has been backed up with findings of the Roots to Prosperity[35] report, which highlighted a concern across the sector regarding the skills and knowledge levels amongst contractors to undertake management of small or complex undermanaged woodlands. By increasing the level of skills and knowledge amongst forest owners and the contracting sector, it is thought that they are more likely to consider managing these undermanaged woodland sites, especially as this represents an untapped resource and provides a significant opportunity for the sector to increase wood mobilisation of home grown timber. We have provided an overview of the survey results below with a more detailed report having been submitted as part of Work Package 2. The survey focused on two distinct parts of the sector; forest owners and forest managers and contractors. The reason for having the two separate groups was mainly due to the difference in skills and knowledge requirements between them and the typically lower knowledge levels amongst forest owners. The survey attracted 105 individual responses which comprised of 45% contractors and woodland managers and 55% forest owners. The survey asked both parties what types of training they had taken over the last 5 years, the level of that training, and what types of training they were planning to take over the next 5 years. <u>Results – Contractors and Woodland Managers</u> The results showed that the training undertaken by those within the contractor and woodland manager group was more focused towards health and safety activities and machinery operational skills, focusing on specific activity areas such as establishment and harvesting. Falling further down the list of activities was training in relation to environmental best practice and forest management skills. These are important areas when considering increasing the mobilisation of the home grown resource, especially on small undermanaged and complex woodland sites. <u>Results – Forest Owners</u> The largest response (45%) was from forest owners who had not undertaken any forest or woodland related training within the last 5 years. This demonstrated that, in many cases, woodland owners did not undertake any form of training as there was no real motivation to do so.

[35] RDI Associates, Cumbria Woodlands and Martin Glynn (2014) Roots to Prosperity, A Strategy and Action Plan for the Growth and Development of the Forestry Sector in Northern England.

For those forest owners that had taken some type of training, the range of subjects was greater, with health and safety associated training being the focus, shortly followed by forest management and regulation including grants and licences.

The majority of the training (49%) undertaken was to a statutory and/or minimum standard or a basic level, with many of the respondents only looking to undertake courses that are required to legally and contractually obtain and fulfil a contract.

Barriers to training

Cost of the training and taking 'time off' were both identified as being the main barrier for both groups. Various training providers across the model region, including the model region SME, have accessed Rural Development Programme funding to run courses at discounted rates to organisations involved with the forestry and timber sector previously. This has helped to reduce the cost of that training, however this funding did not reimburse attendees with the cost of having 'time-off'.

Both groups were also asked the questions about the use of apprenticeships as a way of supporting new entrants into the sector. Responses to this question highlighted that 16% of respondents had taken on apprentices in the past.

When respondents were asked if they would consider taking on an apprentice in the future, 38% said they would. When respondents were asked the reasons why they would not take on an apprentice, each group provided different reasons for their responses, with forest owners citing the lack of demand whilst contractors and managers cited the time and cost as the main barrier to taking on an apprentice.

Following discussions with a number of stakeholders, and supported by the results of the sector skills audit, a common theme was developing; that if increased wood mobilization is to take place within the model region, one area that will need to be developed further is the uptake of new entrants to the sector.

The full report investigated what the current training provision is and what opportunities are available to the sector to help support both forest owners and contractors and woodland managers, to improve their level of knowledge and skills to aid the development of bringing small undermanaged woodland back into management and to promote the use of home grown timber as a premium product.

The report submitted as part of Work Package 2 provided full details of the questions asked and the responses to those questions.

The SME's pilot project 'adopting a marketing brand for home grown timber products' used the findings of the survey to promote and increase the level of understanding about woodland management and the use of home grown timber products to help create a marketing pull. This was undertaken by

	developing a Group Licensing Scheme as part of the Grown in Britain initiative. This Group Licensing Scheme is an innovative approach for the UK model region, raising the profile of home grown timber, supplying a quality assured premium product with clear traceability therefore providing a return to the forest owner which would have the long term outcome of making it more financially viable to bring forests back into active management. In addition to this, a further clear message coming out of the research is that lack of recruitment to the sector, especially of new entrants and young people, could have the significant impact of inhibiting growth and wood mobilisation.
Domains addressed (ownership; management; governance; forest functions; management)	Domains addressed as outlined in 'list of focus studies' include: Ownership Governance Management Harvesting

Study 9: EU wide market demand for wood

Author: Fiona Boonk, Wageningen University; Supervised by Wageningen University and BTG

SIMWOOD Model Region	Yorkshire and the North East Model Region
Objective of the Focus Study	**Outline objective indicating also what gap in knowledge the focus study is addressing** This focus study's main aim was to enable the model region's SME (RDI Ltd) to gain a better understanding of the skills and knowledge levels of forest owners as well as small to medium sized enterprises involved in the management of woodlands and its associated supply chain. It looked to identify any gaps and suggest solutions through either existing training provision or by highlighting where additional provision was required.
Methods used	**Very brief description of methods used** The SME captured the information about the skills and knowledge levels at that time through a targeted online survey, using SurveyMonkey. The survey was circulated to forest owners and SMEs involved in the management and the associated supply chain of the region's forests. Where respondents did not have access to the online survey, paper versions were made available, with the results being incorporated into the online survey via input from the SME. The survey was set up using skip logic settings which meant, depending on the answers the recipient gave to certain questions, it would skip to the next relevant question in the sequence e.g. if a recipient answered they were a forest/woodland owner, they would be asked a series of questions about their woodland holding before being asked about their level of knowledge and skills; whereas a contractor would be asked to answer a series of questions relating to their knowledge and skills, however this would be by more detailed questioning. The survey was circulated using the SME's own contact lists and was also circulated through other regional partners contact lists and networks such as Forestry Commission England regional office, Confor and Royal Forestry Society regional members, as well as smaller forest owner representative bodies such as the Small Woodlands Owners Group. It was anticipated that some of the responses would be from outside the SIMWOOD model region. Responses from outside the model region were only incorporated if the responses followed similar trends to those from those within the model region; otherwise they were removed, therefore maintaining the regional focus.
Results	**Brief overview of results – In this section also indicate what contribution has this focus study made to SIMWOOD – in what way has it helped achieve the objectives of SIMWOOD** The focus study investigated the present skills and knowledge levels amongst forest owners and the contracting sector associated with the management of

	woodlands across the model region in order to identify any gaps. The rationale for the focus study came out of the first Regional Learning Lab, held in October 2014, and has been backed up with findings of the Roots to Prosperity[36] report, which highlighted a concern across the sector regarding the skills and knowledge levels amongst contractors to undertake management of small or complex undermanaged woodlands. By increasing the level of skills and knowledge amongst forest owners and the contracting sector, it is thought that they are more likely to consider managing these undermanaged woodland sites, especially as this represents an untapped resource and provides a significant opportunity for the sector to increase wood mobilisation of home grown timber. We have provided an overview of the survey results below with a more detailed report having been submitted as part of Work Package 2. The survey focused on two distinct parts of the sector; forest owners and forest managers and contractors. The reason for having the two separate groups was mainly due to the difference in skills and knowledge requirements between them and the typically lower knowledge levels amongst forest owners. The survey attracted 105 individual responses which comprised of 45% contractors and woodland managers and 55% forest owners. The survey asked both parties what types of training they had taken over the last 5 years, the level of that training, and what types of training they were planning to take over the next 5 years. <u>Results – Contractors and Woodland Managers</u> The results showed that the training undertaken by those within the contractor and woodland manager group was more focused towards health and safety activities and machinery operational skills, focusing on specific activity areas such as establishment and harvesting. Falling further down the list of activities was training in relation to environmental best practice and forest management skills. These are important areas when considering increasing the mobilisation of the home grown resource, especially on small undermanaged and complex woodland sites. <u>Results – Forest Owners</u> The largest response (45%) was from forest owners who had not undertaken any forest or woodland related training within the last 5 years. This demonstrated that, in many cases, woodland owners did not undertake any form of training as there was no real motivation to do so. For those forest owners that had taken some type of training, the range of

[36] RDI Associates, Cumbria Woodlands and Martin Glynn (2014) Roots to Prosperity, A Strategy and Action Plan for the Growth and Development of the Forestry Sector in Northern England.

	subjects was greater, with health and safety associated training being the focus, shortly followed by forest management and regulation including grants and licences. The majority of the training (49%) undertaken was to a statutory and/or minimum standard or a basic level, with many of the respondents only looking to undertake courses that are required to legally and contractually obtain and fulfil a contract. <u>Barriers to training</u> Cost of the training and taking 'time off' were both identified as being the main barrier for both groups. Various training providers across the model region, including the model region SME, have accessed Rural Development Programme funding to run courses at discounted rates to organisations involved with the forestry and timber sector previously. This has helped to reduce the cost of that training, however this funding did not reimburse attendees with the cost of having 'time-off'. Both groups were also asked the questions about the use of apprenticeships as a way of supporting new entrants into the sector. Responses to this question highlighted that 16% of respondents had taken on apprentices in the past. When respondents were asked if they would consider taking on an apprentice in the future, 38% said they would. When respondents were asked the reasons why they would not take on an apprentice, each group provided different reasons for their responses, with forest owners citing the lack of demand whilst contractors and managers cited the time and cost as the main barrier to taking on an apprentice. Following discussions with a number of stakeholders, and supported by the results of the sector skills audit, a common theme was developing; that if increased wood mobilization is to take place within the model region, one area that will need to be developed further is the uptake of new entrants to the sector. The full report investigated what the current training provision is and what opportunities are available to the sector to help support both forest owners and contractors and woodland managers, to improve their level of knowledge and skills to aid the development of bringing small undermanaged woodland back into management and to promote the use of home grown timber as a premium product. The report submitted as part of Work Package 2 provided full details of the questions asked and the responses to those questions. The SME's pilot project 'adopting a marketing brand for home grown timber products' used the findings of the survey to promote and increase the level of understanding about woodland management and the use of home grown timber products to help create a marketing pull. This was undertaken by developing a Group Licensing Scheme as part of the Grown in Britain initiative.

	This Group Licensing Scheme is an innovative approach for the UK model region, raising the profile of home grown timber, supplying a quality assured premium product with clear traceability therefore providing a return to the forest owner which would have the long term outcome of making it more financially viable to bring forests back into active management. In addition to this, a further clear message coming out of the research is that lack of recruitment to the sector, especially of new entrants and young people, could have the significant impact of inhibiting growth and wood mobilisation.
Domains addressed (ownership; management; governance; forest functions; management)	Domains addressed as outlined in 'list of focus studies' include: Ownership Governance Management Harvesting

Study 10: Evaluation of installed forest energy effect and available amount of forest fuel in the region of Småland

Author: Göran Gustavsson, Energikontor Sydost AB - Energy Agency for Southeast Sweden, Sweden

SIMWOOD Model Region	Yorkshire and the North East Model Region
Objective of the Focus Study	**Outline objective indicating also what gap in knowledge the focus study is addressing** This focus study's main aim was to enable the model region's SME (RDI Ltd) to gain a better understanding of the skills and knowledge levels of forest owners as well as small to medium sized enterprises involved in the management of woodlands and its associated supply chain. It looked to identify any gaps and suggest solutions through either existing training provision or by highlighting where additional provision was required.
Methods used	**Very brief description of methods used** The SME captured the information about the skills and knowledge levels at that time through a targeted online survey, using SurveyMonkey. The survey was circulated to forest owners and SMEs involved in the management and the associated supply chain of the region's forests. Where respondents did not have access to the online survey, paper versions were made available, with the results being incorporated into the online survey via input from the SME. The survey was set up using skip logic settings which meant, depending on the answers the recipient gave to certain questions, it would skip to the next relevant question in the sequence e.g. if a recipient answered they were a forest/woodland owner, they would be asked a series of questions about their woodland holding before being asked about their level of knowledge and skills; whereas a contractor would be asked to answer a series of questions relating to their knowledge and skills, however this would be by more detailed questioning. The survey was circulated using the SME's own contact lists and was also circulated through other regional partners contact lists and networks such as Forestry Commission England regional office, Confor and Royal Forestry Society regional members, as well as smaller forest owner representative bodies such as the Small Woodlands Owners Group. It was anticipated that some of the responses would be from outside the SIMWOOD model region. Responses from outside the model region were only incorporated if the responses followed similar trends to those from those within the model region; otherwise they were removed, therefore maintaining the regional focus.
Results	**Brief overview of results – In this section also indicate what contribution has this focus study made to SIMWOOD – in what way has it helped achieve the objectives of SIMWOOD**

	The focus study investigated the present skills and knowledge levels amongst forest owners and the contracting sector associated with the management of woodlands across the model region in order to identify any gaps. The rationale for the focus study came out of the first Regional Learning Lab, held in October 2014, and has been backed up with findings of the Roots to Prosperity[37] report, which highlighted a concern across the sector regarding the skills and knowledge levels amongst contractors to undertake management of small or complex undermanaged woodlands. By increasing the level of skills and knowledge amongst forest owners and the contracting sector, it is thought that they are more likely to consider managing these undermanaged woodland sites, especially as this represents an untapped resource and provides a significant opportunity for the sector to increase wood mobilisation of home grown timber. We have provided an overview of the survey results below with a more detailed report having been submitted as part of Work Package 2. The survey focused on two distinct parts of the sector; forest owners and forest managers and contractors. The reason for having the two separate groups was mainly due to the difference in skills and knowledge requirements between them and the typically lower knowledge levels amongst forest owners. The survey attracted 105 individual responses which comprised of 45% contractors and woodland managers and 55% forest owners. The survey asked both parties what types of training they had taken over the last 5 years, the level of that training, and what types of training they were planning to take over the next 5 years. <u>Results – Contractors and Woodland Managers</u> The results showed that the training undertaken by those within the contractor and woodland manager group was more focused towards health and safety activities and machinery operational skills, focusing on specific activity areas such as establishment and harvesting. Falling further down the list of activities was training in relation to environmental best practice and forest management skills. These are important areas when considering increasing the mobilisation of the home grown resource, especially on small undermanaged and complex woodland sites. <u>Results – Forest Owners</u> The largest response (45%) was from forest owners who had not undertaken any forest or woodland related training within the last 5 years. This demonstrated that, in many cases, woodland owners did not undertake

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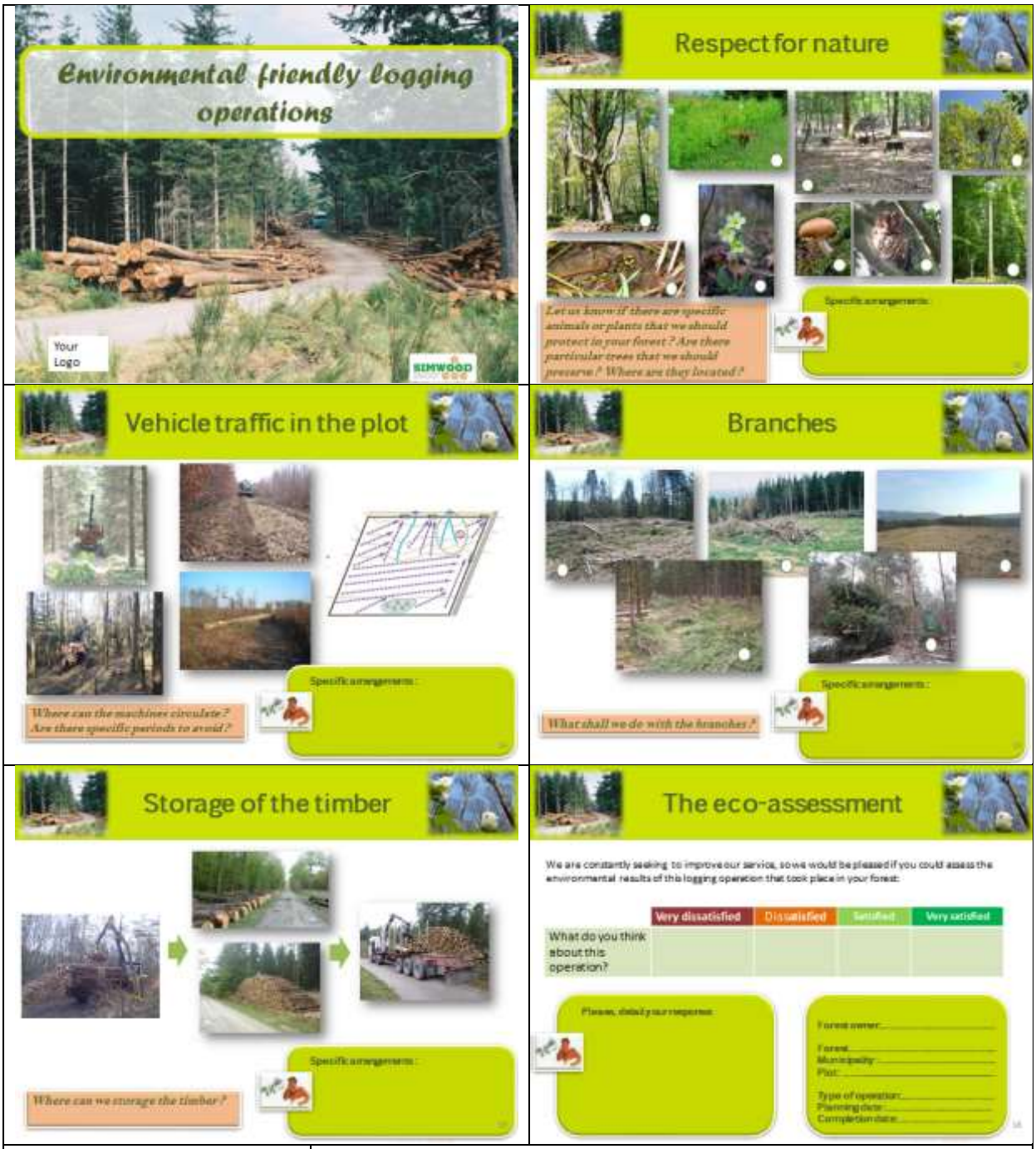
	any form of training as there was no real motivation to do so. For those forest owners that had taken some type of training, the range of subjects was greater, with health and safety associated training being the focus, shortly followed by forest management and regulation including grants and licences. The majority of the training (49%) undertaken was to a statutory and/or minimum standard or a basic level, with many of the respondents only looking to undertake courses that are required to legally and contractually obtain and fulfil a contract. <u>Barriers to training</u> Cost of the training and taking 'time off' were both identified as being the main barrier for both groups. Various training providers across the model region, including the model region SME, have accessed Rural Development Programme funding to run courses at discounted rates to organisations involved with the forestry and timber sector previously. This has helped to reduce the cost of that training, however this funding did not reimburse attendees with the cost of having 'time-off'. Both groups were also asked the questions about the use of apprenticeships as a way of supporting new entrants into the sector. Responses to this question highlighted that 16% of respondents had taken on apprentices in the past. When respondents were asked if they would consider taking on an apprentice in the future, 38% said they would. When respondents were asked the reasons why they would not take on an apprentice, each group provided different reasons for their responses, with forest owners citing the lack of demand whilst contractors and managers cited the time and cost as the main barrier to taking on an apprentice. Following discussions with a number of stakeholders, and supported by the results of the sector skills audit, a common theme was developing; that if increased wood mobilization is to take place within the model region, one area that will need to be developed further is the uptake of new entrants to the sector. The full report investigated what the current training provision is and what opportunities are available to the sector to help support both forest owners and contractors and woodland managers, to improve their level of knowledge and skills to aid the development of bringing small undermanaged woodland back into management and to promote the use of home grown timber as a premium product. The report submitted as part of Work Package 2 provided full details of the questions asked and the responses to those questions. The SME's pilot project 'adopting a marketing brand for home grown timber products' used the findings of the survey to promote and increase the level of understanding about woodland management and the use of home grown

	timber products to help create a marketing pull. This was undertaken by developing a Group Licensing Scheme as part of the Grown in Britain initiative. This Group Licensing Scheme is an innovative approach for the UK model region, raising the profile of home grown timber, supplying a quality assured premium product with clear traceability therefore providing a return to the forest owner which would have the long term outcome of making it more financially viable to bring forests back into active management. In addition to this, a further clear message coming out of the research is that lack of recruitment to the sector, especially of new entrants and young people, could have the significant impact of inhibiting growth and wood mobilisation.
Domains addressed (ownership; management; governance; forest functions; management)	Domains addressed as outlined in 'list of focus studies' include: Ownership Governance Management Harvesting

Study 11: High environmental quality criteria for deeper trust in logging operations

Author: Philippe Ruche, FCBA, France

Simwood Model Region	All are concerned
Objective of the Focus Study	The satisfaction of the forest owner, in compliance with sustainable management of the forest, has to be the objective n°1 of a logging operation. = > A satisfied forest owner is an owner who will dare launch other logging operations in the future and he will speak about it positively to his circle of acquaintances. So, the objective was to build up a support document, the DiaLOG tool, to improve/facilitate the dialogue between the forest technician and new forest owner, for whom a logging operation is a first, by enabling the identification of individual «High Environmental Quality operation" criteria.
Methods used	1st step: The support document was elaborated by the domain leader of harvesting (FCBA) by identifying the main criteria and by designing the document. 2nd step: Tests of the DiaLOG tool were carriedout during the summer 2015, in: - South-Eastern Ireland by IWP, - Grand Est by the cooperative FBE, - Bavaria and Lower Saxony by KWF. 3rd step: Adjustments of the tool and promotion for its use (in progress)
Results	▪ The HEQ DiaLOGe tool allows to identify clearly expectations (and also fears) of the owner, to reassure him/her and explain to him/her what is going to take place in his/her forest. The document also highlights preventive measures that might be relevant and how to take them into account, because they can definitely have an impact on the financial balance of the operation. ▪ The HEQ DiaLOG tool is a "support document" quite simple in his form: photos and simple, comprehensive vocabulary. All the photos can be customized to the company (user of the document) and its regional context. ▪ This tool can be used in each pilot project where logging operation will be carried out.
Extracts of the DiaLOG tool	



Domains addressed (ownership; management; governance; forest functions; harvesting)	Harvesting and Ownership

Study 12: Tree selection behaviour in thinning operations

Authors: Felipe Bravo, Fátima Cruz, Carlos del Peso and Cristóbal Ordóñez (Universidad de Valladolid & INIA); Pablo Sabin (Agresta Sociedad Cooperativa)

Simwood Model Region	Castilla and León (Spain)
Objective of the Focus Study	To obtain knowledge on the impact of tree selection criteria in thinning and to transfer the results to operational forestry.
Methods used	This focus study will integrate a marteloscope where different tree selection criteria will be tested and dissemination action will be conducted. This focus study will involve the following activities: • **Measurement and evaluation of the marteloscope** 1 ha plot has been installed and measured in a pine-oak stand. Each tree has been measured (dbh and total height) and located with coordinate. The plot has been divided in 16 quadrats (25 by 25 m) • **Survey on tree selection preference by different stakeholders** Three quadrats (see figure 1 and table 1) were selected to represent different stand types (pure pine, pure oak and mixed pine-oak)

Fig. 1. Tree distribution in the analysed quadrats. Circle size proportional to tree dbh. black circle: pine; empty circle: oak

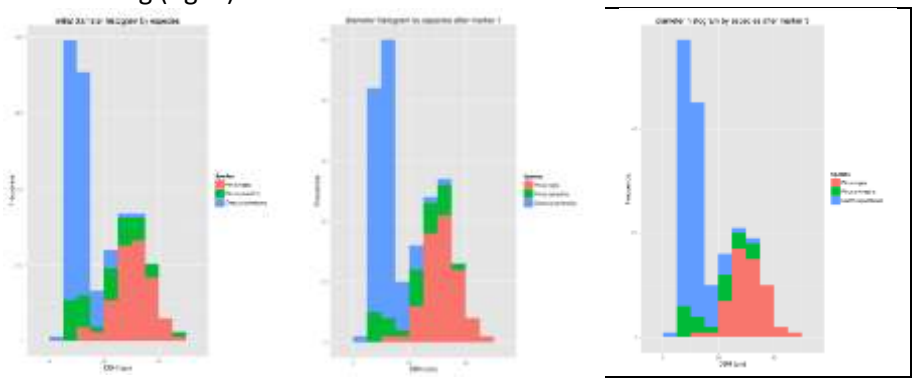
Quadrat	Tree/ha	Basal area m^2/ha	Volume m^3/ha
3	1168	56.46	32.95
7	976	49.97	28.44
11	1664	36.86	15.58

Table 1. Main characteristics of each quadrat

For the evaluation a set of 12 people has been involved in as experiment on tree selection preferences. These 12 people are grouped as follows: Gender (male/female); Education (University Degree/Non University studies); Forestry background (Forestry formal education: Yes/No), Orientation toward thinning (professional forester (any level); environmentalist; neighbour with low interest in forest; neighbour with interest in non-wood uses of forests: hunters, mushroom pickers,…) Each participant has been requested to mark trees for a thinning in each quadrat independently. The thinning objective proposed was '*timber and firewood production while biodiversity and protective values are improved*'

• **Evaluation of the impact of thinning intensities on tree growth**

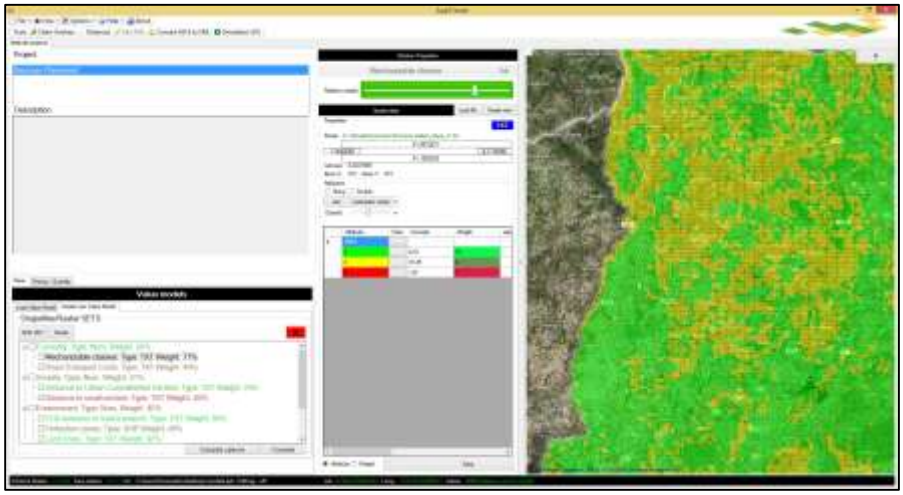
Tree and stand growth after thinning has been simulated by using SIMANFOR

Results	Different personal attitudes toward thinning and harvest lead to societal willingness toward the use of wood products and the mobilisation of forest resources. Differences between people groups as is show in the diameter distribution after thinning (fig. 2)  Diameter distribution before thinning Diameter distribution after thinning following the selection of two participants Fig. 2. Impact of tree selection on diameter distribution The results obtained by analysing logistic regression show differences in tree selection attitudes between people with different education and background. Species were selected differently while marker age also impact on tree selection. Results from focus study will help to define pilot studies including forest growth and mushroom production and training and education regarding forestry operations to inform local population and society as a whole about its impact.
Domains addressed (ownership; management; governance; forest functions; management)	Forest Governance, Forest Management and Forest Function

Study 13: Tool to assess suitability of area of different management objectives and to identify conflicts among uses/objectives

Author: Fernando Pérez, CIMO/IPB, Portugal

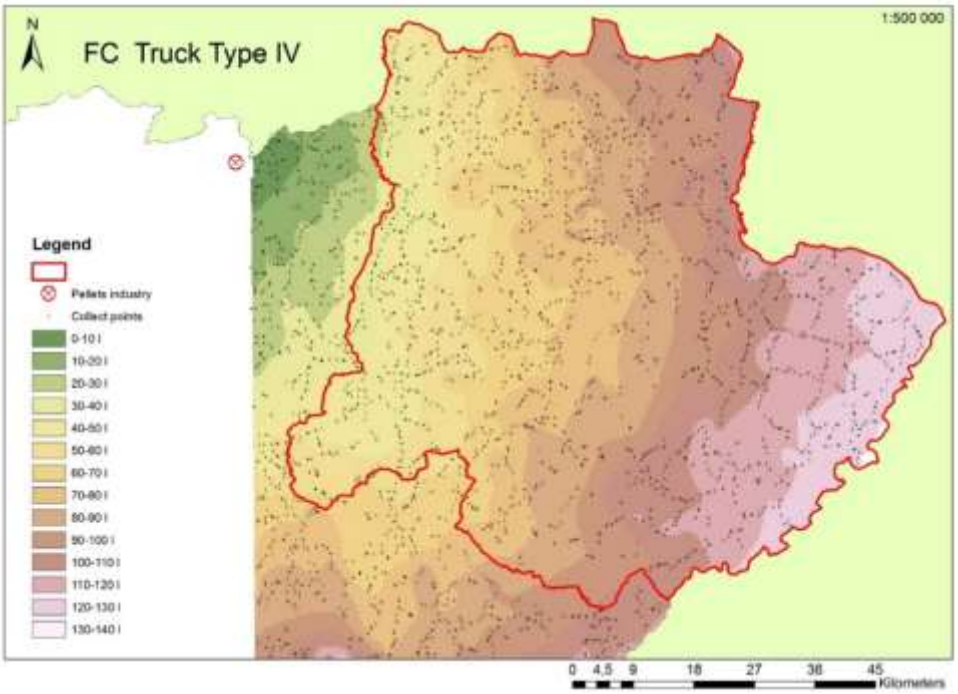
Simwood Model Region	Nordeste Transmontano
Objective of the Focus Study	Objectives: ○ To build alphanumerical and geographic databases of the Nordeste Region. ○ To determine potential land suitability for the production of wood and non-wood forest products and services using Expert Opinion Mining and Forest Growth Models ○ To define areas of potential conflicts Knowledge gap: ○ This study is intended to address lack of land and forest planning information and tools to address multifuncionality
Methods used	The value of a product, service or function has a large subjective component, and it is for this reason that this value can fluctuate temporarily and spatially. This subjective component can be addressed by expert knowledge or public opinion. Expert opinion is based upon individuals with a large experience in the forest sector who can provide enough information to evaluate suitability of forests according to different objectives, products, services, and uses. Public opinion is based on the judgments of the persons that use the forest directly or indirectly without a professional relationship. This study consists of creating a tool for evaluating the suitability of the Nordeste Region for different forest management objectives and to identify potential conflicts among uses/objectives in the Region. To achieve these goals, two methods have been used: Analytic Hierarchy Process (AHP) and the utility models of Multi Attribute Utility Theory (MAUT). The Analytic Hierarchy Process (AHP) proposed by TL Saaty in the late seventies of the twentieth century is one of the most widely used methods around the world. The method has been and continues to be extensively studied and applied to many fields of science. Briefly, AHP is based on the pairwise comparison of the criteria of a decisional scheme as well as of the alternatives under each criterion, using a certain scale. AHP is the basis of many other methodologies of multi-criteria decision making. Within the broad application of the AHP methodology to decision making in various fields of knowledge around the world, it is also possible to find important applications specifically to forestry. The MAUT (Multi-Attribute Utility Theory) was developed by Keeney and Raiffa. Methodologically, a complex decision MAUT is divided into the following steps: i) Identification of different decision attributes or criteria, ii) Description of each of the attributes and their measurement scale, iii)

	Weighting of attributes or criteria regarding their relative importance, iv) Quantification of importance among different attributes, v) Evaluation of each alternative with respect to each attribute, vi) Combination of all scores among the attributes to calculate the weight of each alternative. There are few examples of application of this methodology in forestry. Both methods are used and implemented to convert stakeholders opinions in quantitative data to be uses in operational modelling. The combination of AHP and MAUT is made to incorporate stakeholder's opinion (Expert and Public opinion) and the establishment of Value Models for each forest product, service and function.
Results	In the present focus study, the methods above were automatized to obtain Value Models. The tool developed, AppTitude (Fig. 1) is the base tool that involves all modules created in the current focus study of the SIMWOOD project for the Nordeste Transmontano region.  Fig. 1: main form of AppTitude. This tool provides an interface of experts or public opinion analysis methods with spatial information. AppTitude generates maps of suitability distribution of the Nordest region. This study resulted in a fundamental tool to address multifuncionality and to integrate stakeholders opinion into forest management and planning. With AppTitude, forest managers have the possibility of analysing alternatives in order to optimize forest resource value therefore providing key information to support forest mobilization in the region.
Domains addressed (ownership; management; governance; forest functions; management)	Ownership; Management; Governance; Forest functions, Harvest

Study 14: Forest logistics evaluations.

Author: Fernando Pérez, CIMO/IPB, Portugal

Simwood Model Region	Nordeste Transmontano (Portugal)
Objective of the Focus Study	Objective: ○ To study the impact of logistics alternatives on the costs and availability of wood products, and on CO2 emissions ○ To produce digital cartography of average costs and CO2 emissions for the region according to scenarios of industry, plant locations, vehicles, harvesting processes ○ To identify constrains and evaluate solutions to promote wood mobilization in the Region Knowledge gap: ○ Lack of data on transportation costs and emissions
Methods used	Costs and environmental impacts are key elements in forest logistics and they must part of decision-making. The road network in the Nordeste Region (Portugal) is particularly affected by topography which can impact forest logistics in terms of Fuel Consumption, CO_2 emissions and associated costs. The evaluation of transportation fuel costs and carbon emissions depend on spatial and non-spatial data but in many cases the first type of data are difficult or expensive to obtain. On the other hand, the availability of software tools to evaluate with rigor transportation fuel quantities and costs and emissions of carbon dioxide is limited. Due the lack of information in region or the difficult to get it, the hypothesis of "*Open geographical databases are an alternative for these regions"* was marked. Using the road network data provides by OpenStreetMap© and the digital elevation model for the region it is possible build a spatial base to run an empirical truck kinematic models building a truck simulator. Combining this truck simulator for the region with the equations of EMEP/EEA (Air Pollutant Emission Inventory Guidebook) we build a tool to estimate the fuel consumption and CO2 emissions for a determinate route or set of routes for the region associated with forest products transportation.
Results	The tool has been developed to analyze the spatial movement or resources taking into account different factors that define a specific region, like road typology, truck types, topology, etc., to evaluate and map fuel consumption, costs and CO2 offering the possibility of taking these results into account in in forest management decision-making. Basically, the tool runs the truck simulator automatically using the spatial data provides by OpenStreetMap©. An example of application is the fuel consumption distribution for a big articulated truck evaluated for all the region for an specific wood destination (biomass industry sited in Chaves) (Fig. 1)

	 Fig. 1: Spatial distribution of fuel consumption for a big articulated truck for a biomass destiny industry sited in Chaves. The results of the application of our tool are important and very useful in providing spatial and numerical information that can be used in forest logistics in a given area to detect problems and to look for solutions to minimize costs and CO2 emissions, but the possibility of other applications is open
Domains addressed (ownership; management; governance; forest functions; management)	Governance; Management; Harvest

Study 15: Tools for forest growth/yield modelling

Authors: Fernando Pérez & Luís Nunes, CIMO/IPB, Portugal

Simwood Model Region	Nordeste Transmontano
Objective of the Focus Study	Objectives: ○ To collect all forest growth and yield models that can be applied in the study region for the major forest species ○ To create tools to define future scenarios using Expert Opinion Mining ○ To create modelling tools to apply in the simulation of future forest and land use scenarios in the Region under defined parameters Knowledge gap: ○ Modelling tools for the regions and rare and scattered among several applications; managers have no access to reliable and adequate modelling tools to be used in forest management
Methods used	The forest grows constantly and all forest managers and owners want to know how the forest will be in the future. This temporal factor is associated with the uncertainty of what will happen in the future, overall in terms of economic viability evaluation. In the region there are a large variability of the forest characteristics in terms of management and non-management, and this derived in difficulty of get representative results like volume of wood in region. An example of this is that the forest inventory data that has an error higher than 40% for the volume of *Pinus pinaster*. To develop applicable tools for modeling growth and forest management, first we looked at all the forest growth and yield models applicable in the region, in particular for Pinus pinaster and Quercus pyrenaica due their importance. Secondly, we tested the models with the national inventory data and selected the more representative ones. Finally, we developed tools for two types of users: researchers and forest owners and managers.
Results	The selected models for the most important species in the region (Pinus pinaster and Quercus pyrenaica) were compiled in libraries developed in C# language to be used in the implementation of the models in other applications or interfaces. In addition, a tool for thinning design for Pinus pinaster was developed, parameterizing a Weibull distribution using relationships like average diameter vs. geometrical diameter and diameter vs. height. The library is used too in the forest quantity model of AppTitude© We applied this library in different tools developed with two different final user's philosophy: academic/researcher and forest owners/managers:

i) For the academic/researcher users two desktop tools were developed: one for apply growth models (Fig. 1), and another for designing thinning operations (Fig. 2). The goal of this developments is to establishment a base to learn to develop forest tools and test new models and management schemes.

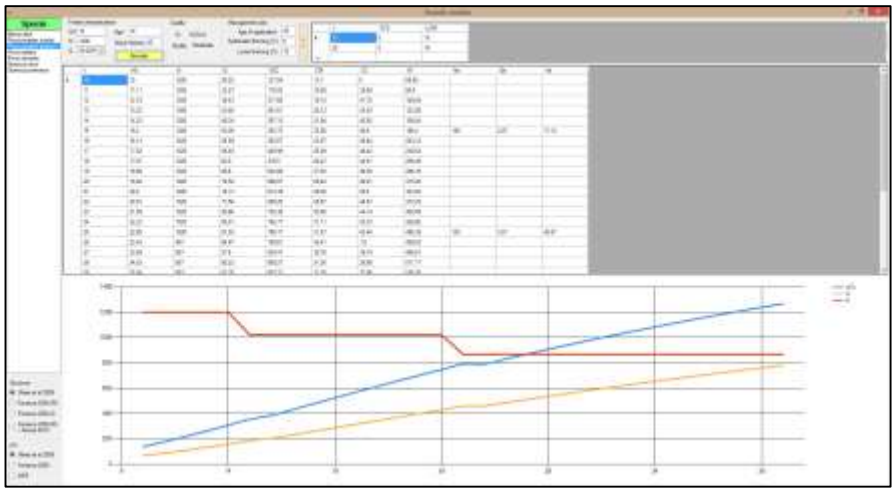


Fig 1: Desktop tool development for using growth models library

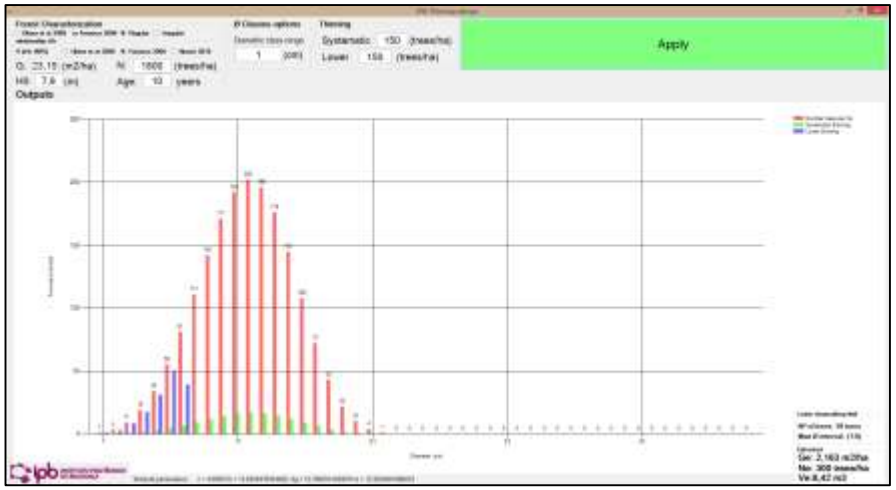
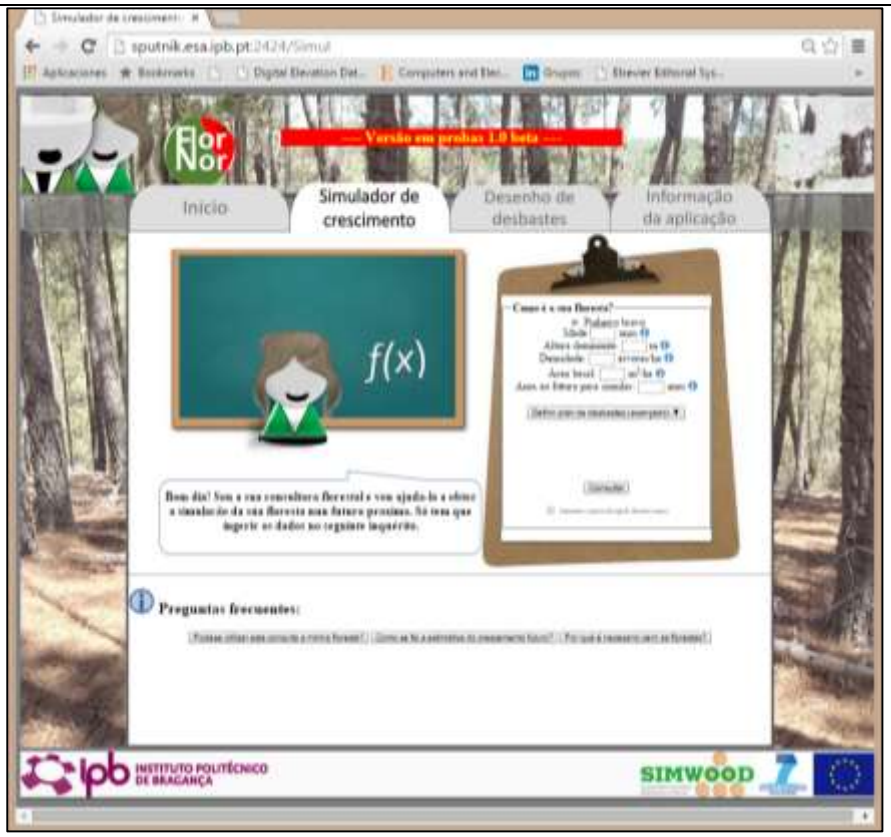


Fig 2: Desktop tool development for designing forest thinning.

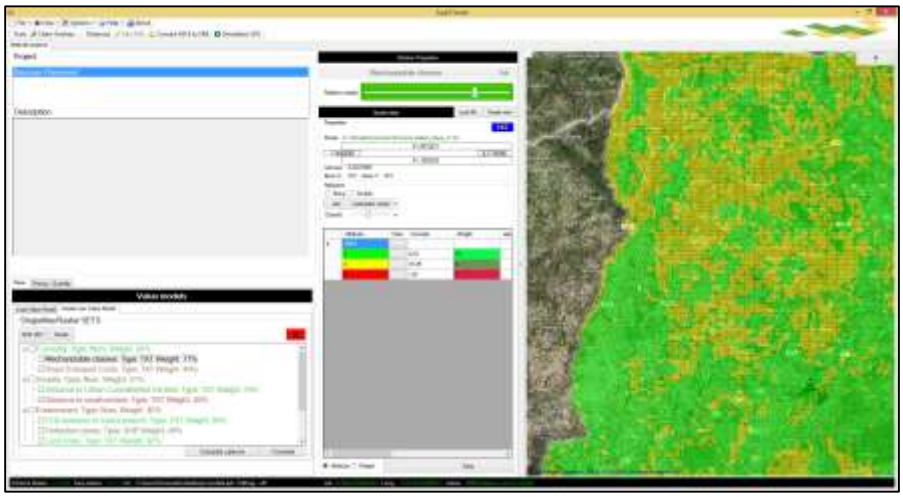
ii) For the forest owners and managers, a cloud computing was developed (Fig. 3). This tool uses the same library of the desktop tools above, but the interface is different. The philosophy of this cloud tool is to make use of silviculture methods friendly and easy, provide all the information to the user that is already working directly or indirectly with forest management. This tool combines the growth simulation with the thinning design models, and the interactions between them, and was implemented with the different forest management schemes for the region.

	 Fig 3: A cloud computing tool to apply forest growth models and thinning design in friendly and easy forms A final web location will be made available shortly. This focus study will provide the basis for professional forest management in the region allowing the schedule of thinning operations, volume to extract in thinning, volume growth, and harvesting age, etc. Since these tools were not available for the region, this study is a major contribution to SIMWOOD goals and objective.
Domains addressed (ownership; management; governance; forest functions; management)	All

Study 16: Establishment of a regional inventory system to support forest evaluation and management.

Authors: Luís Nunes and Fernando Pérez, CIMO/IPB, Portugal

Simwood Model Region	Nordeste Transmontano
Objective of the Focus Study	Objectives: ○ To build alphanumerical and geographic databases of the Nordeste Region. ○ To determine potential land suitability for the production of wood and non-wood forest products and services using Expert Opinion Mining and Forest Growth Models ○ To define areas of potential conflicts Knowledge gap: ○ This study is intended to address lack of land and forest planning information and tools to address multifuncionality
Methods used	The value of a product, service or function has a large subjective component, and it is for this reason that this value can fluctuate temporarily and spatially. This subjective component can be addressed by expert knowledge or public opinion. Expert opinion is based upon individuals with a large experience in the forest sector who can provide enough information to evaluate suitability of forests according to different objectives, products, services, and uses. Public opinion is based on the judgments of the persons that use the forest directly or indirectly without a professional relationship. This study consists of creating a tool for evaluating the suitability of the Nordeste Region for different forest management objectives and to identify potential conflicts among uses/objectives in the Region. To achieve these goals, two methods have been used: Analytic Hierarchy Process (AHP) and the utility models of Multi Attribute Utility Theory (MAUT). The Analytic Hierarchy Process (AHP) proposed by TL Saaty in the late seventies of the twentieth century is one of the most widely used methods around the world. The method has been and continues to be extensively studied and applied to many fields of science. Briefly, AHP is based on the pairwise comparison of the criteria of a decisional scheme as well as of the alternatives under each criterion, using a certain scale. AHP is the basis of many other methodologies of multi-criteria decision making. Within the broad application of the AHP methodology to decision making in various fields of knowledge around the world, it is also possible to find important applications specifically to forestry. The MAUT (Multi-Attribute Utility Theory) was developed by Keeney and Raiffa. Methodologically, a complex decision MAUT is divided into the following steps: i) Identification of different decision attributes or criteria, ii)

	Description of each of the attributes and their measurement scale, iii) Weighting of attributes or criteria regarding their relative importance, iv) Quantification of importance among different attributes, v) Evaluation of each alternative with respect to each attribute, vi) Combination of all scores among the attributes to calculate the weight of each alternative. There are few examples of application of this methodology in forestry. Both methods are used and implemented to convert stakeholders opinions in quantitative data to be uses in operational modelling. The combination of AHP and MAUT is made to incorporate stakeholder's opinion (Expert and Public opinion) and the establishment of Value Models for each forest product, service and function.
Results	In the present focus study, the methods above were automatized to obtain Value Models. The tool developed, AppTitude (Fig. 1) is the base tool that involves all modules created in the current focus study of the SIMWOOD project for the Nordeste Transmontano region.  Fig. 1: main form of AppTitude. This tool provides an interface of experts or public opinion analysis methods with spatial information. AppTitude generates maps of suitability distribution of the Nordest region. This study resulted in a fundamental tool to address multifuncionality and to integrate stakeholders opinion into forest management and planning. With AppTitude, forest managers have the possibility of analysing alternatives in order to optimize forest resource value therefore providing key information to support forest mobilization in the region.
Domains addressed (ownership; management; governance; forest functions; management)	Ownership; Management; Governance; Forest functions, Harvest

Study 17: Trade-off analysis. Optimizing forest uses, functions, and services

Authors: Fernando Pérez, João Azevedo, Fernando Pérez, Luís Nunes, Sílvia Nobre, Luís Nunes, and Felícia Fonseca, CIMO/IPB, Portugal

Simwood Model Region	Nordeste Transmontano (Portugal)
Objective of the Focus Study	Objectives: ○ To study the relationship among different products and services in forest management, incompatibilities and synergies ○ To analyse trade-offs using LP with multi-objective evaluation Knowledge gap: ○ To provide a tool for addressing simultaneously different forest products and ecosystem services in a region where forest mobilization is strongly dependent upon multifunctionality
Methods used	We combined multiple objective programing with linear programming to build a tool to evaluate simultaneously value, price and quantity of forest products and services addressed in previous focus studies (Study of forest and its context. Past and Present; Forest Logistics evaluations; Tools for forest growth/yield modelling).
Results	The outcome of this focus study is a matrix generator tool to build generic linear programing problems automatically, with the goal of maximizing the NPV (net present value) for the region involving all the services and forest products under different restrictions (spatial and temporal). This is a module within the "AppTitude" tool. AppTitude returns a simulation of how the forest will be in the future (max of 20 years) and is totally flexible to create different scenarios. This is a management tool to be applied at the regional scale, focused in test different policies programs. Users will be managers from companies, associations, and public bodies. It is also useful for research. The tool is of great importance for forest mobilization since it provides the background of decision making processes involving multiple forest products and ecosystem services in a region where multifunctionality is of paramount importance.
Domains addressed (ownership; management; governance; forest functions; management)	All

Study 18: Improving the estimation of harvested wood by species and type of use

Authors: Pedro Ramos, Alexandra Oliveira, Margarida Tomé, Susana Barreiro, Paula Soares and João Rua, ForestFin and Universidade Técnica de Lisboa, Portugal

Simwood Model Region	Alentejo
Objective of the Focus Study	The objective of this study was to define and quantify the use of wood products in the region, by species, depending on the type of consumer industry.
Methods used	The data obtained through simple contact with the different agents showed some inconsistency, especially in the relationship between what is produced and what is consumed. Unfortunately the last available inventory (IFN5) does not have much updated data, but we had access to some data from the inventory that is still not published, especially related with areas and stand features, and the permission to use them. The methodology chosen to get more reliable data about the wood that is harvested every year in the region and the use that is given to it was based on two procedures: 1. to make an estimation using the data that is already available from the 6th National Forestry Inventory (2012-213); 2. to make a survey near the industry and companies from the region that work and mobilise the wood to try to estimate the volumes that they work every year.
Results	From the results we can easily understand that, for the region studied, one thing is the forest area, the other thing is the wood available, since, regarding the species, most of the forest areas is used to produce other products than wood. In relation to the study carried out, we conclude that some of the main species in the area are not exploited for timber production, due to legal impositions, as is the case of cork and holm oak. We believe, however, that without this legal restriction, new models of forestry could be developed to holm oak and implemented so that the objective was the production of wood to be used by local industry. The local industry, despite available wood, still has to buy wood outside the region, which may be associated with the question of a large part of the available wood being eucalyptus. That is the species with the highest production of wood and is not used by the industry in the region. We also believe that existing productivities are very low and that more wood could be obtained through new models of forest management and that will be studied in the Pilot Project.
Domains addressed (ownership; management; governance; forest functions; management)	Management, Governance

Study 19: Improving the information about the Non Wood Products production and Services provided by Forests

Authors: Pedro Ramos, Alexandra Oliveira, Margarida Tomé, Susana Barreiro, Paula Soares and João Rua, ForestFin and Universidade Técnica de Lisboa, Portugal

Simwood Model Region	Alentejo
Objective of the Focus Study	The objective of this study was to organize and systematize information on non-wood products and services produced in the region.
Methods used	The first step was the definition of the non-wood products and most important forest services produced in the region, with the higher impact on the regional economy : - Cork; - Umbrella pine cones; - Resin; - Honey; - Mushrooms; - Medicinal and aromatic plants; - Hunting; - Eco-tourism; through contacts, carried out on samples with different agents operating in the region. Then the methodology used to organize and systematize the information about them was based on three fundamental pillars - the surveying through the agents that are operating with the chosen products / services or associations representing them, analysis of their evolution and definition of quantitative indicators, definition of the most recent value of these indicators, if possible in line with the parameters used by the National Statistical Institute.
Results	The inventory and systematization of non-timber products and services related to forest allows to know and evaluate the global economy associated with good forest management. Diversification of revenue obtained from the forest allows the owner to get a higher investment capacity that is reflected in the sustainable management of the forest area. Improving the sustainable management of the forest area allows an increased mobilization of the timber, as it is associated with an increase in productivity and the correct utilization of the produced timber. Cork and pine cone production, which have the highest values in terms of indicators, are the products that will have a more positive evolution with the improvement of the forest management as a contribution to the sustainable wood mobilization. The improvement of forest management will imply a greater and better production of cork and pinion. Intensification of the density of pine stands will increase the mobilization of sustainable timber but will simultaneously allow an increase in resin production. In relation to honey, mushrooms and aromatic and medicinal plants, the intensification of wood production as a means of increasing the mobilization of wood in a sustainable way could have a negative impact on these farms since these are systems that need space for their production. Therefore, the use of species in denser stands or the intensification of stands with the aim

	of increasing their wood mobilization will lead to a reduction in the area available for these production systems or will lead to operations that may be detrimental to these productions, such as excessive soil mobilization. In relation to hunting, hunters generally prefer less intense forest systems, which means, more open stands, since they allow a greater amplitude for the accomplishment of the shot. So, dense stands are not attractive for hunters and so if we intensify the density as a way of improve the wood mobilization it will probably reduce the attractiveness of areas for hunting. In relation to eco-tourism, it will be difficult to assess the impact of the measures of wood mobilization on this activity, since care is taken in the management of stands and at the choice of species, it does not seem that there is a great impact on eco-tourism. These principles will be taken into account in the management models that will be studied in the Pilot Project from the region.
Domains addressed (ownership; management; governance; forest functions; management)	Management, Forest functions

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