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AGRICULTURE & INNOVATION



# **EIP-AGRI Focus Group** **Sustainable Mobilisation of** **Forest Biomass**

STARTING PAPER

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## Introduction

### The EIP-AGRI Focus Groups

EIP-AGRI Focus Groups (FG) collect and summarise knowledge on best practices in a specific field, listing problems as well as opportunities by taking stock of the state of play in research and practice and highlight possible solutions to the problems identified. Based on this, the Focus Groups suggest and prioritise innovative actions. They identify ideas for applied research and for testing solutions in the field, involving farmers, forestry stakeholders, advisers, the industry and other stakeholders, and propose ways to disseminate good practices. Focus Group results provide new and useful ideas to solve practical problems and start new Operational Groups or research projects.

The purpose of this starting paper for the Focus Group on Sustainable Mobilisation of Forest Biomass is to establish a common understanding about the scope of the Focus Group and its objectives, and also identify key questions for discussion within the Focus Group.

### Scope of the Focus Group on Mobilisation of Forest Biomass

This EIP-AGRI Focus Group on Sustainable Mobilisation of Forest Biomass (SMFB) group will concentrate on innovation in mobilising different types of forest biomass for all potential markets and better interlinking supply and demand. Overall demand for forest biomass is forecast to increase in the future. This is currently driven by an increasing demand for biomass for energy generation, but other new and innovative uses for wood fibres and chemicals are on the horizon. Questions of sustainability, competitiveness of the forest-based industries, efficiency and economic viability and fragmentation, organisation and motivation of forest owners represent the major challenges for forest biomass mobilisation. In mobilising forest based biomass, economic, environmental and social functions of forests have to be safeguarded<sup>1</sup>.

A clear potential to increase forest biomass utilisation for energy exists in most countries of the EU as only 60-70% of the annual increment of EU forests is harvested. Much of the potential for expansion can be found in small private holdings and silvicultural practices such as pruning and complementary felling (namely first thinning).

Previous work on this subject includes the publication in 2010 of the 'Good practice guidance on the sustainable mobilisation of wood in Europe', produced jointly by the European Commission, FOREST EUROPE, and the UN's Economic Commission for Europe and Food and Agriculture Organisation<sup>2</sup>. This publication addressed good practice across a wide range of aspects of mobilisation.

This Focus Group however, will address in particular the currently underused potential supply of forest biomass, and will consider challenges and opportunities to increase the sustainable supply of forest biomass as a raw material for all potential markets. The main question to address is:

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1 See the EU Forest Strategy <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52013DC0659>

2 [http://www.foresteurope.org/documentos/Wood\\_Mobilisation\\_Guidance\\_Report.pdf](http://www.foresteurope.org/documentos/Wood_Mobilisation_Guidance_Report.pdf)

## How to improve the sustainable mobilisation of biomass from our forests in the EU?

In order to tackle the topic, the following tasks will be carried out by the experts of the Focus Group:

- **Identify success and fail factors** that stimulate or limit the sustainable mobilisation of forest biomass, and to summarise how to address these factors and explore the role of innovation and knowledge exchange in addressing them.
- **Identify and to describe** with adequate examples and compare the different means of improving the cooperation of small forest owners with regard to forest biomass availability and production.
- **Provide examples of best practices, and identify barriers to implementation.**
- **Analyse supply and demand factors**, and the means to provide a link between the two – for example electronic marketing tools and other measures.
- **Propose potential innovative actions** for stimulating the knowledge and the use of management practices and strategies in sustainably mobilising forest biomass.
- **Identify remaining research and innovation needs coming from practice** associated to sustainable biomass mobilisation in forests.
- **Provide ideas for Operational Groups and other innovative projects** taking into consideration the differences of forests in the various European regions and the composition of their corresponding forest-based industries.

Nota bene:

Some important aspects related to the environmental impacts of SMFB and its connections with climate change are not tackled in detail within this Focus Group for two reasons: Focus Groups need to have limited scope and the scope of this group focuses on SMFB's economic aspects; the analysis of issues related to environmental and climate aspects of SMFB is being discussed in other fora.

However, this Focus Group will always take into account the overall sustainability of SMFB, for instance the analysis of economically promising new ways of mobilising biomass should always take into account their environment-climate and social sustainability.

## Context

### European forest types

33% of land in Europe is covered by forests that represents >215 million hectares, with a variety among countries ranging from Ireland with approximately 11% coverage to Finland with 73.1% coverage. The European forest ecosystems are classified in fourteen forest types<sup>3</sup>.

According to the report "State of Europe's Forests 2015", Europe's forest area has expanded by 17.5 million ha over the last 25 years. On average, Europe's forest area increased by 700 000 ha (0,33%) per year. Those are net changes and resulted from afforestation, natural forest expansion and deforestation. The area of forest in Europe for wood supply in 2015 amounted to 166 million ha, which corresponds to 79% of the existing forest area.

<sup>3</sup> EEA Technical report No 9/2006

The differences in the forest ecosystems are manifold in relation to biomass production time, quality and quantity, the economic, environmental and societal values.

The more obvious differences are given by the variety of tree species, structured into coniferous and broadleaved forests. Coniferous forests are dominant in the northern rim, whereas broadleaved forests and mixed forests are the types mostly found in Central, East and West Europe<sup>4</sup>. The Mediterranean forest type is unique worldwide as it is composed by more than 50% of endemic species that are not known in any other region and which need the specific conditions for growth around the Mediterranean basin.

All European forest types serve a multitude of interlinked functionalities, production of biomass, contributing and securing soil fertility, securing water management and water schemes, tackling climate change, storing carbon, developing fitness (resilience) to abiotic and biotic risks and impacts (storms, windfalls, insects and other calamities, forest fires, floods, snow and ice damages, erosion, etc.), producing non-wood forest products, facilitating recreation activities, habitat for wildlife, green infrastructure, producing and securing biodiversity, and many more.

Forest biomass is one of the most important renewable resources in Europe, originating from a multitude of complex ecosystems. Its sustainable mobilisation has to be looked at in a "microscopic way" as regional differences ask for tailor-made approaches to address well their specific value chain(s) composition(s).

Even if 33% of Europe is covered with forests, a change in land-use is ongoing. New combined agro-forestry concepts are developed and tested to adapt to climate change impacts (shadow production of trees for agricultural production of crops, seeds, etc.). Afforestation and plantation forests are key assets for the production of biomass, either in short rotation systems or in classical forest types with longer rotation and management systems (up to 100 years and older).

The ongoing urbanisation process in some areas of Europe has an impact on the land-use and forestry operations. Big cities and urban areas are for example the focal points for the supply and consumption of biomass for energy production.

On the contrary, the expanding forest areas play a vital role in tackling current challenges like climate change and stances new challenges in terms of their accessibility and the sustainable mobilisation of their forest biomass.

The mobilisation of forest biomass in a sustainable way requires a paradigm shift in forest management schemes. The increasing demand on forest biomass can have negative impacts on the environment if specific measures are not taken into account.

Today some environmental impacts can for example be caused by globalisation effects, e.g. the import of invasive species. They can find conditions in new habitats for growth in an unbalanced way, causing devastating damages to forest ecosystems and destroying huge areas (e.g. bark beetles in Central Europe, nematodes in Portugal and Spain). Their negative impact on the forest biomass production and availability is evident. On the contrary, due to international cooperation and exchange of knowledge, a positive option is the plantation of new tree species that are best suited for various purposes.

Biodiversity is a key element in relation to the fourteen European forest types. Forest ecosystems in Europe present a green infrastructure that connects the different types and allows the movement and mix of species.

Specific forest management systems contribute to manifold objectives, like water management for securing the availability and quality of water. Soil erosion, protection against avalanches, noise reduction, natural wind shields and many other aspects are essential for the stability and health of forests.

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<sup>4</sup> <http://forest.jrc.ec.europa.eu/forest-map-download>

## DISCUSSION QUESTIONS

- Which are the main challenges and opportunities for the SMFB (economical, environmental, social) for the different types of forest ecosystems in Europe?
- How can environmental issues contribute to the sustainable mobilisation of forest biomass?
- How to integrate essential contributions of SMFB in relation to environmental aspects?

## Challenges and opportunities for improving the sustainable mobilisation of forest biomass in Europe

Today the European forest-based value chains are impacted by some effects of globalisation. All goods based upon forest ecosystems are traded on the global markets (roundwood, sawn timber, pulp and paper, boards, panels, semi-finished products, non-wood forest products, etc.). Within the bioeconomy, the traditional European forest-based sector (pulp and paper, woodworking industries, forestry) represents around 35% of its turnover. This may increase as new value added products are under development at the moment (textiles, transportation means, food ingredients, cosmetics, pharmaceuticals, etc.).

Forestry value chains and the way they are managed play an important role in achieving the goal set by the political agenda of the European Union and its Member States to become a stronger knowledge-based, resource-efficient and sustainable (bio-)economy. Forest and agricultural biomass contribute already largely to the substitution of non-renewable resources and to the renewable production of energy.

While the demand for forest biomass is strongly increasing, the potential for increasing forest biomass supply is limited by urbanisation processes and the creation of new reservation areas where forest management is not applied, both affecting the availability of European forest biomass. At the same time the European forest-based value chains are facing a fierce competition from larger primary production areas like Russia, Africa and South America.

However, the potential for mobilising more forest biomass in a sustainable way is still given. It needs tailor-made actions and facilitation of collaborative multi-actor approaches taking regional differences into account. The complexity of this topic has to take all relevant parts of the forestry-wood value chain(s) into consideration and there will not be "one solution fits all" recipe. Each part of the forestry-wood value chain(s) has to be analysed and reflected taking regional differences into account. For example, there may be problems in some regions that can be solved by mobilising stakeholders, like e.g. the private forest owners, while in other parts of Europe they are already active market players (differences between North-South Europe).

To avoid a decrease of production areas it is important to involve and focus on all forest ownership types, and to make a special effort to involve small forest owners, so that the right potential can be identified and used in a sustainable way.

## Market trends

Europe is only covered by 7% of the global forest area, but it is still producing more than 35% of value added forest-based products worldwide. The traditional forest-based sector in Europe is still the technology leader, but there are challenges ahead. The globalisation has a significant impact on the forest-based sector as today even bulk commodity of lower quality is traded on the world market. Services and solid wood is purchased by all regions in the world as the independence on fossil sources will become a competitive factor in the near future.

In addition to the traditional forest-based sector (pulp and paper, woodworking industries, forestry), new value chains emerge that use the rich forest biomass in Europe (e.g. new hygiene products, new transportation means, new textiles (technical and fashion), new food additives, new chemicals, cosmetics, pharmaceuticals, leisure goods, etc.). Bulk commodity will be produced most feasibly in other regions of the world, where primary production times are much lower than in Europe. The competition for primary materials and resources is increasing.

#### DISCUSSION QUESTIONS

- What type of forest biomass is needed in future?
- Are the forestry value chains prepared to address these needs?

## State of the art: mobilisation of forest biomass and the connected value chains

This section of this starting paper for the Focus Group SMFB is structured into the main parts of value chain(s) for the sustainable mobilisation of forest biomass.

### Harvesting (Provision of biomass)

Europe profits in many of its regions from the plantations and regeneration of forest after Second World War. Traditional forest management schemes are usually build upon the production of high quality timber for first transformation processes. But on the other hand today new technologies use already stems that are younger and are produced in shorter time frames. Therefore the whole value chain from biological production to the supply at the industrial production site has to be optimised. New forest management schemes are required for increasing the sustainable mobilisation of forest biomass.

Forest management systems require harvesting of trees and the use of the biomass for various applications. Today harvesting technologies are quite developed and can be differentiated into manual/motor-manual and machine-based operations.

For the manual and motor-manual operations the safety of the workforce is a pre-requisite. Forest harvesting has the second highest risk of severe and fatal accidents after the mining sector in Europe. Developments are ongoing to produce ergonomic tools (chainsaws, thinners and others) that decrease the risks of health impacts to their operators. Also intelligent protective textiles communicate with manual machinery when in use to avoid severe injuries. But even if the risks are high, manual harvesting will remain an important part for forest management systems due to regional peculiarities like steepness, soil humidity and vulnerability of stands.

Harvesting technologies that are machine-based are well developed for conifer stands and softwood species. They have already achieved a high automation degree, but further developments are needed. The integration of information and communication technologies (ICTs) for the whole operation starting from the planning until the logistic will achieve a higher degree in future. This will allow to better fix the quantity, quality and location of biomass.

Harvesters for broadleaved species are tested and under further development. Breakthroughs in this area may allow to develop novel forest management systems that will be tailor-made for the hardwoods characteristics. The collection and further processing of precise information of the harvested biomass taking into consideration its further use, is one key asset for Europe's forest-based sector.

## DISCUSSION QUESTIONS

- Where is the potential for innovations (e.g. planning, level of integration, environmental, labour safety, etc.)?
- Who are the experts for the various harvesting systems?
- Which are the most promising ICT solutions?
- Are there success stories that can be used by other regions/actors?

## Infrastructure and Logistics

The existing infrastructure of the European forest-based sector faces challenges for securing its competitiveness. Access to forest stands needs to be secured as without an infrastructure, surveillance and management of forests cannot be operated (pest control, planning of operations, etc.).

Well-developed infrastructure needs to be maintained and further developed for allowing novel harvesting, storage and logistic concepts (rail, road, water, and air) to be installed. For this purpose, ICT play a prominent role in this field for connecting the planning and development of forest management systems with its following operations and provisions.

With an increase of sustainable mobilised forest biomass, Europe has to modernise some of its infrastructure. E.g. some Northern European countries are currently testing the use of so called Train trucks for road transportation for heavy and bulk commodity. Also new combinations of integrated logistic concepts, including all transport means are currently being tested in a diversity of European regions, based the regional conditions and circumstances.

The urbanisation process and the migration trends lead to the development of new infrastructures and logistic concepts. Migration can lead to the impact that forest ecosystems are less or not managed and become abandoned. As a result, the risk of abiotic (fire, storms, etc.) and biotic (insects, fungi, etc.) threats increase. Forest ecosystems in rural areas produce primary resources. But the biomass is used and turned over in urban communities/environments. Therefore urban areas need to be better connected with the primary production zones.

## DISCUSSION QUESTIONS

- Who are the actors concerned for improving the infrastructure and logistics for SMFB?
- How can a better cooperation be achieved?
- Are there any success stories that can help other regions?

## Risk management

Biological production in forest ecosystems and its management concepts demands a specific tailor-made storage capacity of forest biomass for different time frames (short to long term storage). Storage concepts (capacity) can generally be classified into two simplified activities: close to the biological production (in or at the forest) and at the industrial transformation site.

Storage of biomass is generally risky and costly as the biological ageing of the material takes place after harvest. In the past, after storm, ice, insects or any other calamity induced use of forest biomass in a large quantity, so called ad-hoc solutions were applied to secure the quality of the material. Water storage in lakes, wet-storage campuses in improvised areas were built for a sometimes undefined period of time. This can limit the economic activities for selling roundwood on the markets and includes always the risks of deteriorating the quality and the quantity.

## DISCUSSION QUESTIONS

- How and when to address abiotic and biotic threats?
- Which role does storage play?
- Who are the actors in this field?
- How could innovative solutions look like?

## Transformation processes of forest biomass

Europe is today technological leader in transformation of forest biomass in almost all technologies (sawmill, panel and board, pulp and paper production, etc.). Thus, the European sawmill industries are the key drivers as first transformers of forest biomass within the forest-based sector followed by pulping industries.

For the production of sawn timber and for pulping, specific requirements have to be fulfilled by the forest biomass. Resources and cost efficiency are the main elements for both industries. Residues and side products are resources for other transformation processes that are well connected. Sawn timber is almost used up to 100% in the construction and furniture sectors.

Pulping industries are having a renaissance today, especially in Northern Europe. Various processes feed into value chains like paper, packaging, chemicals, cosmetics, carton, hygiene products, bioenergy and biofuels, food production, textiles and others.

## DISCUSSION QUESTIONS

- How do transformation processes affect and trigger SMFB?
- Are new technologies needed for improving the SMFB?

## Ownership structure (Key actors in the forestry value chain)

Each of the 14 European forest types is differently composed by specific tree species. In addition, tradition on how to manage them and use their forest biomass has led to the development of different type(s) of ownership structures, and different type(s) of forest-based industries.

- State forest represents around 40.3% of forest area and produces 1/3 of timber in the EU-28. The implementation of policies lies often in the hand of the forest state departments and impacts the production area they manage<sup>5</sup>.
- Private forest-ownership is a crucial factor in Europe. Today there are more than 16 million private forest owners in the Europe representing around 60% of forest areas<sup>6</sup>. The size of private ownership varies largely in Europe from the North to the South from West to East. It will be one crucial factor to mobilise the private forest owners to become active in the sustainable mobilisation of forest biomass in Europe.
- Community forest ownership plays an active role in some regions in Europe. Lessons learned to stimulate other regions for mobilising more forest biomass is one objective for community forest managed areas.

<sup>5</sup> European State Forest Organisation (EUSTAFOR), [www.eustafor.eu](http://www.eustafor.eu)

<sup>6</sup> Confederation of European Forest Owners (CEPF) <http://cepf-eu.org>

### DISCUSSION QUESTIONS

- Is the fragmented ownership structure the only significant problem?
- Who are the main actors to be involved?
- Are there any successful examples to overcome the problem (cooperation)?

## End of life

Post-consumer wood (products, e.g. Medium-Density Fibreboards - MDF) is recycled and used for the production of particle boards today. Solid wood is primarily recovered for energy production. Paper products are recycled for the production of newsprint or carton boards, packaging materials. Recovered and recycled solid wood products can become a rich source.

Wood products like paper, boards, construction elements, and furniture as well consumer products can therefore largely contribute to the sustainable development of Europe. Some experts forecast that the recovery of wood products for being re-used in a cascading way may increase to 11-14% by 2030<sup>7</sup>.

Today new methodologies, collection and separation technologies are developed and tested to take advantage of post-consumer wood as a resource to avoid landfill.

### DISCUSSION QUESTIONS

- How can waste management be integrated into SMFB?
- Are there examples of good practices in re-use and recycling materials during SFMB processes?

## Citizen's perception & urban forestry

Urbanisation trends are still present in Europe, even if they follow a lesser pace compared to other continents. The majority of Europeans live in urban societies more or less disconnected from natural processes and nature in their daily life. Harvesting and managing natural resources become more and more misinterpreted by the public as having in general negative impacts on the environment and the ecosystems. There is a lack of effective communication and integration of the public to raise the awareness that managing forest ecosystems in a sustainable way can secure environmental aspects while guaranteeing the quality of life. Contradictions in the increasing demand for eco-friendly bio-based materials and food, while at the same time reducing the production area by installing national parks, reservation and conservation areas need to be solved.

How to set-up a dialogue with the European citizen's for a better understanding of the contributions from the forestry-wood value chains will be crucial for getting their support.

### DISCUSSION QUESTIONS

- How much does the citizens' perception hinder SMFB?
- How can the relevant actors be involved / integrated to better understand SMFB?
- Are there innovative approaches of SMFB linked to urban forestry?

<sup>7</sup> Nemry et al, 2008, Mantau et al. 2010

## Innovation and research activities in relation to sustainable mobilisation of forest biomass

Innovation and research projects and activities are taking place on regional, national, trans-national and European level to find appropriate solutions for the sustainable mobilisation of forest biomass.

The innovation and research programs of the European Commission services fund(ed) projects that are focussing on all relevant parts in the complexity of mobilisation of biomass.

Under Framework Programs (today Horizon2020) the mobilisation of forest biomass is worked on within many projects. Few are listed below to illustrate the complexity of the topic itself and that multi-actor approaches are needed if breakthroughs shall be achieved.

### SIMWood

FP7 project "**Sustainable Mobilisation of Wood – SIMWood**"  
(<http://www.simwood.efi.int/>)

SIMWood's overall goal is to promote collaborative wood mobilisation in the context of multifunctional forest management across European forest regions. In other words, seeks the integration of all stakeholders of the forest value chain, while taking regional differences and legal framework conditions into account.

The project focuses on eight general objectives:

1. Understand the current and future motivations of forest owners
2. Promote forest governance and joint action of stakeholders
3. Develop multifunctional forest management adapted to forest types
4. Integrate forest ecosystem services while minimizing environmental impacts
5. Establish improved adapted forest harvesting techniques
6. Demonstrate collaborative regional initiatives and solutions
7. Recommend tailor-made instruments to policymakers
8. Encourage broad outreach and exploitation in EU regions

SIMWOOD's main output is the 'SIMWOOD Mobiliser', a novel, cross-regional, pan-European monitoring and policy support information system with modern communication tools for targeted outreach to forest owners and other stakeholders

## FlexWood

FP7 project "**Flexible Wood Supply Chain - FlexWood**"  
(<http://www.flexwood-eu.org/>)

The overall objective was to develop a novel logistic system, 'FlexWood', to provide value recovery along the wood supply chain. An online platform integrates advanced quality and quantity information on wood resources measured in the forest with novel technology. Optimisation models for tactical and operational planning (bucking, harvesting, allocation of wood) and optimisation models and enhanced processes for novel and more flexible concepts for mill production, improved information transfer between all stages of the wood supply chain to create new knowledge for decision making.

Within the FlexWood concept, existing solutions for value recovery opportunities in these areas were tested and/or adapted or developed, which was followed by an interlinking of the single solutions that allows the modelling of the entire information flow with benefits and efficiency gains in time, quality and cost.

## DEBAL +

Balloon logging is an ancient technique, tested in the 60s in the USSR and used in 80's in the USA. The revival of the R & D on aerostats and use of electric power opens the opportunity to test a new concept: the skidding by balloon electric propulsion.

This system is characterized by a length skidding line of 2000 m which gives access to more resources without investing in additional forest access and protects biodiversity (no preparatory work, no penetrating ways in mass). Ultimately, the challenge is to provide an economically comparable alternative to cable logging cable car that offers technical advantages, less energy consumption and low environmental impact.

DEBAL + has gained much knowledge on technical options (balloon design, management of ropes (mooring, towing, and carrier), command & control module and on the system terms of use: newline skid management and dirigible mode.

More Info:

<http://www.fcba.fr/catalogue/1ere-transformation-approvisionnement/actions-/debal-debardage-ballon>

## SYMBIOSE Rhône-Alpes

### (SYNERGIES between TIMBER INDUSTRY, ENERGY AND EMPLOYMENT IN the RHONE ALPES Region)

SYMBIOSE Rhône-Alpes is a project of 14 economic and institutional partners in the French region of Rhône-Alpes, who responded to the call for expressions of interest (AMI) DYNAMIC WOOD ADEME. Through this AMI, ADEME finances projects promoting the mobilization of additional forest biomass. As part of this project, communities, businesses, organizations involving forest owners and public operators of Rhône-Alpes, who define common goals to increase the use of forest resources in the Rhône-Alpes Region. After 3 years of implementation of "SYMBIOSE FRENCH ALPS (2016/2017/2018)", the partners will have committed to sign contracts for additional 85 000 tonnes of forest biomass.

More Info:

<http://www.territoiresforestiers-rhonealpes.eu/index.php?NoIDA=400>

## TRANSNATIONAL PROGRAMS (ERA-Net/ERA-Net+)

### WoodWisdom-Net<sup>+</sup>, FORESTTERRA and SUMForest

The aspects of sustainable mobilisation of forest biomass is also part of three major ERA-Nets that exist within the Europe, WoodWisdom-Net<sup>+</sup>, FORESTTERRA and SUMForest.

Since 2004 European coordination of national research programmes in the area of wood material science and engineering in the forest-based value chains has been facilitated through the **WoodWisdom-Net** ERA-NET (today running as an ERA-NET Plus Action until November 2017). Later two other ERA-NETs were launched: the **FORESTTERRA** ERA-NET (running from 2012 to December 2015 with the aim to reinforce scientific coordination and integration of Mediterranean forest research programmes as well as scientific cooperation among Mediterranean EU and non-EU member states and countries from other Mediterranean Climate Areas (MCA), including Australia, South Africa, Chile and California), and the **SUMFOREST** ERA-NET (running from 2014 to 2017 to reinforce scientific cooperation on European forests, and build new cooperation arrangements with EU-neighbouring regions, aiming at reduced fragmentation and maximised impact of research activities on sustainable forest management and multifunctional forestry).

In total the three ERA-NETs have had national funding of around 67 million euros invested in a variety of transnational co-funded RDI projects with the total value of the 64 currently funded projects being around 86 million euros.

Projects funded under the three ERA-Nets covered all different parts of the forestry value chain(s), while also putting strong emphasis on the "mobilisation" aspect by providing innovative solutions (technical or non-technical).

More Info:

<http://www.woodwisdom.net/>

<http://www.foresterra.eu/>

<https://www.sumforest.org/>