

WoodWisdom-Net Contributions to the FP7

## **Towards Biobased Industry - Competitiveness from sustainable and innovative forest-based products, processes and services**

### **1 SUSTAINABLE AND COMPETITIVE FORESTRY SECTOR AND FOREST BASED INDUSTRY**

*The future of Europe's forestry sector and forest-based industry is dependent on human capacity – knowledge and competent people*

Europe's forestry sector and forest-based industry employ 4 million people, generate an annual turnover of more than 500 billion euros and the productivity growth is higher than in the US. There are 17 million forest owners and forests cover one third of Europe's land area. The forests and wood as a renewable raw material has a unique potential to contribute to the sustainable development of Europe. The forestry sector plays an important role in carbon sequestration and is essential in land use questions. Overall, the competitiveness of forest-based industry is important for the well being of the European citizens.

The European forest-based industry is competitive in global markets. The European pulp and paper companies as well as wood products producers are among the top ten companies of the sector, although a high majority of the wood industry companies are SMEs. The technology leadership, achieved through cooperation in an industrial cluster, has played a key role in the competitiveness development. However, the benefits gained by improving the process efficiency is easy to lose while the technology development is in the hands of equipment suppliers and new production capacity has been built in regions with low production costs. At the same time, the trends in the marketplace are generating increasing demand for new innovative eco-efficient cost-competitive products, processes and services. Although industry has responded to the impacts of increased environmental awareness, the potential of wood as a renewable raw material is not utilized in full and the industry is in starting face to meet the opportunities of the ITC for real.

The main challenge of the forestry sector and forest-based industry is, how to stay competitive in the global competition. Today the R&D is focusing in improving, optimising and increasing efficiency of products and processes. The industry has also successfully utilized technology developed in other sectors. In order to be able to develop innovative, eco-efficient, cost-competitive products, processes and services, forest industry should transform from a technology leader to an innovator. The knowledge and competent people is the basis of the competitive forestry sector and forest-based industry. Thus the future focus should be in innovations and new businesses and business concepts, which means investments in people and know-how, and building cooperation with other sectors.

*Multidisciplinary research in wood material science promotes the competitiveness of forest cluster*

Wood material science research plays a key role in developing new, innovative, eco-efficient and cost-competitive products, processes and services. It opens opportunities for new business models and thus promotes the creation of knowledge intensive businesses. A strong material scientific knowledge base is also needed in order to utilize the potential of wood, as a renewable raw material source of sustainable products.

Material scientific innovations can offer a solution to the requirement set by the sustainable development: to reduce radically the use of raw material in wood and fibre-based products. Combining of wood with other materials creates new functionalities for wood-based products. Application of modern biotechnology and molecular genetics opens new possibilities to improve and tailor wood and fibre properties as well as tools to develop environmentally sound processes. Biomass from wood and annual plants are natural sources for bioenergy and speciality chemicals and thus has a great influence in the land use issues of the bio-based society.

Multidisciplinarity is emphasised in forestry sector and forest-based industries research and besides conventional technological approaches and material science knowledge also biotechnology, ICT and social science knowledge is required for innovations. It is also important that the European forestry and forest-based industries join their resources and build cooperation with other sectors to strengthen the innovation system, and also promote knowledge and technology transfer in order to transform the R&D investments into the competitive edge for the cluster.

## **2 EUROPEAN RESEARCH POTENTIAL**

The research in the forestry sector and the forest-based industry is fragmented in Europe and that is especially the case in the wood material science research, which is based on a large number of sciences in addition to forestry and the traditional wood and paper technology. There are highly specialised research groups in wood material science especially in wood rich countries and the research community was active in the FP5, but has had difficulties to find their own area in the FP6.

The volume of on-going national RTD activities and programmes in the area of wood material science and engineering is more than 100 million euros. However, the research resources in the area of wood material science and engineering are scattered in numbers of uncoordinated activities. As research priorities have been set independently by the involved actors, there has not been any systematic way to achieve complementarity. Before the introduction of the ERA-Net instrument, the European-level coordination has been missing and cooperation of national research groups has occurred mainly in separate EU funded projects. Apart from the Finnish-Swedish joint Wood Material Science Programme the cooperation between national research programmes has been limited. However, there is now a common view among different actors of the forest sector that wood material science research should be deepened and a European cooperation is essential when aiming for the generation of new strategic knowledge in this area.

The WoodWisdom-Net ERA-Net project ([www.woodwisdom.net](http://www.woodwisdom.net)), which started in the beginning of the year 2004, is building sustained cooperation between the national research activities in the area of wood material science and engineering and is creating a common research platform that will promote

the sustainability and competitiveness of European forestry and forest-based industry. Five European countries, taking part in the WoodWisdom consortium, provide around 60% of the total added value of the sector and after joining the three new members next year this number will increase up to 75%. The WoodWisdom-Net seeks to identify complementary research in national programmes involved in the WoodWisdom-Net with the volume of 65 million euros annually. The final goal of the consortium partners, twelve funding organisations at present, is to prepare a joint trans-national RTD programme and to launch its first call in the year 2007. The research topics of this programme will be identified in collaboration with different stakeholders in the research community and industry.

Besides the national programmes and WoodWisdom-Net there are European networks, which also have activities related to the wood material science. These networks have a very important role in creating links between different stakeholders in the field. However, so far the different groups like wood industry RTD network (ERA-WOOD [www.era-wood.info](http://www.era-wood.info)), researchers network (INNOVAWOOD [www.innovawood.com](http://www.innovawood.com)) and the network of innovation funding organizations (Taftie) have been working in own groups. There has also been very active COST-cooperation allowing information exchange of nationally funded research on a European level. In the material science area there are running COST actions like: E28, E32, E34, E35, E37, and E41. These networks are valuable tools in building a knowledge base in the area of wood material science and engineering in knowledge and technology transfer operations.

The WoodWisdom-Net project is supporting the European forest-based sector Technology Platform initiative “Innovation through renewable forest resources for a more sustainable Europe”. The trans-national programme, to be launched by WoodWisdom-Net consortium in 2007, will be funded mainly with national sources. In order to get benefits for the whole Europe and especially the new Member States the thematic area – wood material science and engineering – should be included in the FP7, and tight cooperation between the thematic area and the trans-national programme should be built.

### **3 EUROPEAN ADDED VALUE AND RESEARCH NEEDS**

At the same time as the science and technology of the forestry sector and forest-based industries in Europe is facing a technological crossroad, new technologies like nano- and biotechnology offer a great potential for new sustainable technologies as well as real S&T breakthroughs with a high scientific and economic impact.

The future development of S&T requires not only a higher critical mass of researchers, but also utilization of a multidisciplinary approach to build new technologies and develop methods that enable the use of nano- and bio-technologies on a large scale. In this context Europe is facing a serious drawback compared to the US and Japan not only due to limited funding, but also because the present research is fragmented and mainly organised on a national level hindering the development of a unified European research area. By defining the wood material research as one of the thematic priorities in the FP7 and by forming close cooperation with the planned trans-national programme, will make European S&T within the area of material science and engineering a global leader.

The development of innovative, eco-efficient, cost-competitive products, processes and services are in good accordance with the objectives of the sustainable development put forward by the European Commission. In a sustainable bio-based economy wood will be the major biomass feedstock for a

number of applications. A strong liaison between European research and industry within wood materials science and engineering will be vital for a stable economy and ensure possibilities for sustainable growth and development.

Examples of the research needs:

1. Socio-economic aspects related to scientific innovations of bio-based (wood-based) materials
  - Framework to understand the changes in operating environment
  - Framework to understand societal and cultural changes
  - Contribution to sustainable development
2. Knowledge-based products and services
  - new value-added products e.g. for construction, interior design, information, packaging and health-care purposes
    - Utilizing wood-based biopolymers to composites
    - Eco-friendly chemicals and polymers
    - Creating new functionalities to products/materials
    - Combining wood/fibres with other materials
    - Creating new innovative wood and fibre structures for different end-uses
  - Creating new business models and businesses
3. Biorefinery concept for efficient utilization of wood raw material
  - Modification and processing of wood raw material into innovative, eco-efficient products
  - Effective utilization of side streams
  - Development of recyclability characteristics
  - Increased production of bioenergy
  - Utilization of enabling technologies to improve productivity and reduce capital costs
4. Sustainable, renewable raw material production
  - Techniques for measurement and characterization of properties of wood and fibres
  - Tree breeding using traditional or genetic techniques
  - Factors affecting wood and fibre properties
  - Silvicultural methods, procurement and harvesting
  - Optimizing the raw material supply chain