



Action T1 / Deliverable D1.5 – Life+_ Effect of scenarios on the competitiveness of the recovered wood and rubber sectors

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Executive Summary

According to the contingency plan, the aim of new Task 1.5 is to analyse the effect of the future scenarios described previously on the competitiveness of the European wood and rubber sectors.

The consortium cooperated closely with the European Panel Federation EPF (wood-based panels) and the European Tyre Recycling Association ETRA for identifying the effects of every of scenario on the competitiveness as well as the impact of the new wood/ rubber composite products.

Therefore, approaches on strengthening the linkages among waste wood/ rubber suppliers and companies utilising these materials are identified.

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PART A: WOOD

1. Examples of wood/ rubber applications for the particleboard sector

1.1. Introductory note

The aim of Task 1.5 is to evaluate the effects of the realistic future scenarios for the European particleboard sector, which were identified and described in detail on the competitiveness of the sector.

The intention of the project was to help particleboard industry:

- to process stock materials in an optimal manner
- to utilize them in new innovative products
- to introduce new recovered materials (e.g. rubber) in the production

The market success of any new composite product is governed by many factors - every factor playing a role on the competitiveness of the sector should be considered. Therefore, the solutions provided by the project to the particleboard sector should undergo a two-fold analysis:

1. The role and impact of the new composite products in the future scenarios of the sector
2. The future prospects of the new products within the sector

It should be noted that the market success of wood composites is governed by many factors. These factors are not directly and necessarily linked with prices and can be many others like:

- quality
- functionality
- processing
- trust
- reliability
- etc.

Of course, price is a very important factor for the market success of any new composite but not the only one and thus any development – innovation aiming at introducing new products (like wood/ rubber products) should also address the above mentioned factors. Also, not every WoodRub prototype will be end up to the market or it will possible for particleboard companies to adopt the production line for their manufacturing. Below it is given the set of WoodRub prototypes together with their uses, as they were described in Task 5.1, that particleboard sector might be interested in:

WoodRub prototype	Intended use
WOODRUB ACOUSAN	Highways facing
WOODRUB ACOUFRAME	Acoustic walls (offices, residential buildings), Work walls (acoustic barriers)
WOODRUB PLAYMAT	Playground
WOODRUB SAFETYMAT	Anti-slip floor
WOODRUB PATH	Garden path
WOODRUB URBAN	Bench, Bin, Flower pot
WOODRUB BRICKS	Internal walls

The discussion and analysis hereafter will refer to these prototypes.

1.2. WoodRub products and competitiveness

The introduction of the new WoodRub products is expected to increase the competitiveness of particleboard industry:

- Outside the sector against energy plants being able to utilise recovered wood in value added products
- Within the sector against particleboard competitors not having the production capacity for manufacturing the new products

Particleboard industry, as represented by GLUNZ in this project, is directly involved in the production of WOODRUB ACOUSAN, WOODRUB ACOUFRAME, and WOODRUB SAFETYMAT. However, the industry is also interested in the other 4 prototypes as they provide utilisation opportunities for wood residues from particleboard production in added-value products rather than used again in the production line or serve for energy generation.

Public use of furniture, as represented by AIDIMA in this project, faces directly with the wood and rubber residues to give them this new social and pleasure facet, through the design and installation in collaboration with furniture sector of the products WOODRUB URBAN. From our point of view, a demand market to these products will be generated, locally and in all EU.

Plywood is made from thin sheets of wood or veneer sheets. Generally, plywood production requires straight logs of large diameter which are more efficient than logs of small diameter. Logs are then peeled into thin sheets, and layers are glued together. Some amounts of the centre core remain, but the amount of residuals depends on the sophistication of peelers. In order to maximize productivity, firms tend to utilize larger logs, which mostly come from old growth forests. Recently, many institutions and firms have invested huge amounts of money to develop efficient production methods for logs of small and medium diameter because of the difficulty in acquiring large-dimension logs. However, many firms, especially in developing nations, depend on large-dimension logs from old growth forests to produce plywood.

Fibreboard is made from wood fibre instead of sheets of veneer. Wood fibre is glued and pressed to make boards. Medium density fibreboard (MDF), oriented standard board (OSB), particle board

and hard board are included in fibreboard, but the sizes of flakes or fibre to produce the board panel are different. Since it is possible to produce fibreboards from lower grade logs, such as aspen or Eucalyptus from plantations, fibreboard is sometimes considered as a green product. The size of wood diameter is not really important since wood has to be ground into small particles, strips or flakes.

Fibreboard and particle board Size and quality of wood cannot create competitive advantage for fibreboard production. However, if firms locate close to raw material production sites, they have competitive advantage. Raw wood is cut and compressed to become particle board or fibreboard, so the volume of fibreboard should be much less than the raw material; thus the final products are much easier to transport. Plantations are one source of raw materials for fibreboard. When a nation has big plantations with fast-growing species, it should have competitive advantage. Also, natural forests can produce raw materials for fibreboard and particle board industries. Besides the logged wood, recycled wood and by-products can be utilized to produce fibreboard.

2. WoodRub products and future scenarios for the particleboard sector

The role and impact of WoodRub products in the future scenarios for the particleboard sector is as follows:

2.1.1. *Competitive sectors and their prospects*

It is projected that wood energy in Europe will be almost double in the coming decade. Specifically, energy applications account for 42% of the entire wood fibres consumption in the EU 27 at the moment while wood volumes for energy generation are expected to increase by 66% between 2010 and 2020. Biomass power plants are expected to grow steadily while no major changes will take place to other wood energy sectors (households, liquid biofuels, etc.). The growth of this sector is mostly depended on the ability of European countries to meet energy efficiency targets set by EU in increasing the share in energy from renewable sources in the future. The European Commission and the member states support research and development in other renewable energy technology and the higher efficient combustion units achieve in the future will decrease the amounts of wood necessary to satisfy the future wood energy needs.

The relative amounts of raw material used depend largely on the local availability of wood resources, but nowadays an increasing amount of post-consumer wood is recycled into wood-based panels. Some companies in Southern Europe even use up to 100% of sawmills by-products and recovered wood because of the scarcity of virgin wood.

The production of wood-based panels, including particleboard, is expected to continue to grow during the coming decades, as is the use of recovered wood. The bar charts show the growth in recovered wood seen in just one country, Spain, as well as projections for Europe as a whole.

The use of recycled wood is expected to grow much faster than the overall use of wood within the Wood Working Industries and faster than the growth in harvest

A great deal of work is currently underway across Europe to develop new markets and new products for recovered wood,

If the future wood energy needs increases as projected, the WoodRub prototypes are not expected to play a substantial role in the future prospects of the wood energy sector. But if the needs decreases in the future thanks to other renewable energy sources and the higher efficient combustion, but they will only support the position of particleboard industry in the competitive world by giving opportunities for new eco-efficient products.

2.1.2. *Legislation*

WoodRub products enable a more efficient use of waste raw materials, thus they will support the industry to meet the waste legislation targets. WoodRub products relate directly with the green policy measures within European Union, e.g. the wood waste issue. It is well-known that the waste from construction and demolition accounts for approximately 25% (by volume) of all waste generated within EU and has been targeted as a priority area in the context of the 70% reuse and recycling target set by the Waste Framework Directive for 2020. European Commission has officially identified wood as one of the waste fractions of construction materials and substances that comprise the construction and demolition waste category. Thus, the use of recycled wood for the production of wood-based panels is identified as one of the existing recovery options.

WoodRub products provide an advantage to particleboard industry in the competition between material recovery and energy recovery from waste wood which nowadays is a barrier to re-use and recycling wood waste. Of course there still some important steps to be done towards this direction such as standardisation of the classification categories including contamination limits of post-consumer wood in European countries, acceleration in the implementation of the Landfill Directive, and formation of efficient recovery and recycling circuits and markets.

WoodRub products comply with the “Energy-efficient buildings PPP”, published by the European Commission in 2010 as part of the European Economic Recovery Plan. WoodRub products provide extended service life, more efficient use of raw materials, more recycling as well as greater use of renewables to reduce energy and carbon loads. Being lightweight materials WoodRub products can reduce the environmental impact of the construction process, which has the potential to positively benefit particleboard industry.

Moreover, the WoodRub products are in accordance with the sustainability and climate protection characteristics of the particleboard industry as help in getting independence from virgin wood sources. Legislative aspects around sustainability and climate protection will be more and more important in the future, therefore the industry is seeking for solutions not only for their “green image” but also to turn them into selling points.

2.1.3. Raw materials availability and quality

All the future projections agree that wood is going to be a scarce resource in the future, especially because low quality wood that has been used for wood-based panels is increasingly used to produce energy. Severe competition for high quality wood with the energy sector it is also expected in the near future. On the other hand the use of alternative raw materials (short rotation plantation, agricultural residues, wood from small, private forests, use of hardwood, etc.) will not be sufficient to supply the increasing demand, and the quality of new products made with vegetal species still has to be increased through research activities. The scarcity of raw material for the wood based panel industry has several implications, such as used wood/recycling. Others relate to global purchasing, change in the wood mix (more industrial log wood), optimisation of consumption, used wood/recycling, use of alternative raw materials, geographic relocation of the wood-based material industry, and price management.

It has been estimated that in the EU27 the supply of post-consumer wood will increase at 13-29% for the period up to 2030 as compared to 2010. This is a very important source for the particleboard industry and WoodRub products help in their effective use.

For the above mentioned reasons, this scenario affects directly the particleboard sector. Particleboard companies have to utilise the available materials whatever the source is and the role of WoodRub products is a contribution towards a cost effective use of waste raw materials.

2.1.4. Prices

According to estimates, increasing prices for wood will not be a competitive disadvantage for particleboard companies, because price of energy also increases, which makes the production of alternative materials more expensive. On the other hand, producers of wood based panels will have problems, because wood accounts for a high percentage of total production costs and the price for (basic) particle board is unlikely to increase.

In this respect, new augmented products (???) need to be developed. WoodRub prototypes are such products with improved functionalities, making also use of waste materials, for providing cost-effective solutions for many applications from highway barriers to flooring. There will be a real

benefit for the particleboard industry if WoodRub products arrive at a reduced cost to particleboard customers. Moreover, WoodRub products might offer a competitive advantage towards other materials.

2.1.5. Innovation in manufacturing processes

The most important fields of innovation in the wood-based panel industry are related to climate protection and efficient use of resources. The most important trends at the moment regarding innovation in the wood-based industry are fulfilled by the one or more WoodRub products:

- Standardisation
- Selling “all-in-one solutions” instead of intermediate products or commodities
- Composite materials
- Lightweight design
- “Fast-smart products”, do-it-alone products instead of custom built products
- Products with added value

However, improvements will be required to enhance the performance of WoodRub products, such as to find new binder systems or new binder combinations with less release of formaldehyde and application of suitable after-treatment methods of wood-based panels to decrease their emission potential.

The WoodRub products will benefit by future developments in techniques and procedures for classification and separation of waste wood. New methods might provide recycling options of foreign bodies (metal, plastic, stones, etc.) and wood particles. To effectively use waste wood into WoodRub products, new concepts of waste wood sorting and new techniques have to be investigated for a more efficient and save recycling.

2.1.6. Markets

WoodRub products have a reduced impact on the environment by using waste materials, thus the particleboard industry considers this as an advantage and can market it accordingly.

Recent changes of European markets and structures in the broad wood industry sector favour the success of WoodRub products:

- Wood based composites are increasingly used for construction (e.g. opportunities for WoodRub barriers, acoustic walls, bricks) while use for furniture decreases
- Engineered wood products (such as WoodRub products) substitute massive wood
- Maintenance and assembly of pre-fabricated WoodRub products will be more important than new construction
- Internationalisation of markets for standardised WoodRub products

However, it should be kept in mind that the success of WoodRub products will be related to future developments in (a) new residential construction and renovation, and (b) long-term consumption.

3. Future prospects of WoodRub products within the particleboard sector

Having in mind the previous analysis and after having the point of view of the European Panel Federation and of the participating particleboard industry (GLUNZ), it was made clear that the WoodRub project would make an impact to the sector only under the following circumstances:

- WoodRub prototypes would be able to compete or even replace other commercial products
- WoodRub prototypes are integrated in the manufacturing process of the industry. According to the views of the industry this is only possible for traditional panels (e.g. using only wood) as the use rubber would create many problems in the production line
- WoodRub prototypes, e.g. according to the previous point WOODRUB ACOUSAN, WOODRUB ACOUFRAME, and WOODRUB SAFETYMAT that use directly wood based panels and not mixed wood-rubber composites, can be integrated in the construction of highways and residential building sectors. Of course under the condition that the markets for highways facings and acoustic walls/ anti-slip floors are big enough, so the industry can really make a profit by selling wood based panels for these constructions

PART B: RUBBER

1. WoodRub products and future scenarios for the rubber sector

The role and impact of WoodRub products in the future scenarios for the rubber sector is as follows:

3.1.1. Competitive sectors and their prospects

Energy from End of Life Tyres is the most competitive sector in comparison with tyre recycling. It is expected that by 2030 about 40% of the ELT's will be used for energy applications. However, in the same scenario recycling of the ELT's will be their most common use by that time. About 50% of them will be recycled. That means that the availability of recycled tyres for the WoodRub prototypes will not be harmed in the next decades.

Inside the recycling sector WoodRub prototypes are leading to new prospects. The existing products from recycled tyres might have the same uses, but they are improving their characteristics, thus it makes them more competitive. On the same time they are more eco-friendly products, as they are coming from the recycling both wood and rubber.

3.1.2. Legislation

The developments in policies on international and EU levels have direct impacts on the national waste management strategies and frameworks in Europe including both Member States and accession countries. Therefore, it is important to highlight the main features and trends evolving on the supranational level.

In accordance with the international and EU regulations, shipment of waste tyres is governed as trade in non-hazardous waste while tyres are listed on the green list (OECD, EU Regulation on shipments of waste) and B list (Basel Convention). Waste on the green and B list is commonly traded without further restrictions unless otherwise specified.

Waste hierarchy, which underlies the European waste policy, is an important concept applied in the EU waste management strategy. It proposes a list of waste management options which are defined in descending order of priorities including the prevention, recovery and final disposal. The principles of hierarchy apply to all waste streams, including used tyres.

Based on the recommendations prepared by the Priority Waste Stream Group, several features in tyre management have been discussed in EU, whereas the degree of implementation on the EU level is still limited. Ban on landfill of used tyres and tyre waste, included in Proposal for Directive on the Landfill of Waste is among the most important recommendations which are expected to be implemented. If implemented the ban on landfill will promote environmentally more sound waste management practices which will have positive impacts on the environment.

Setting targets for used tyres and tyre waste, specified for all individual management routes including prevention and collection, is another trend which evolved on the EU level. Although the implementation of targets set for tyres on the EU level is rather uncertain, these play important role in setting national targets all around Europe.

In addition, a voluntary agreement has been recognized within the EU as a primary measure which should be considered within national policies when managing the waste tyre streams. Voluntary approach in combination with the producer responsibility is recommended also by the reviewed 1996 Community Strategy for Waste Management which calls for their adoption in national waste management strategies.

The WoodRub prototypes were design in order to meet all the criteria that the EU directives and regulations define.

3.1.3. Raw materials availability and quality

There is no indication that there would any change on the availability of ELT's. In the next couple of decades it is expected that there is going to be a slight increase on ELT's, most of which from the Asian market (India, China, Japan etc.). As recycling of ELT's is going to be increased at the same period, it is concluded that there is an abundant number of them that could be used on the production of the WoodRub products. There are of course some other uses of ELT's that could demand them as a raw material, such as road applications (crumb rubber is used as a modifier into bituminous mixtures), but still it seems that there will be sufficient material to cover the demand.

3.1.4. Prices

ELT's are a totally different category of material from economical aspect, as unlike most other goods, they command a negative price. Far from recyclers having to pay suppliers for tyres, suppliers usually pay recyclers to take the tyres off their hands. This is because suppliers are not permitted to dump tyres at zero cost. If they could, ELT'S would never command a negative price, they would be dumped first. Thus the price of ELT's is controlled and it's not expected to present great variation.

Of course WoodRub products will have improved characteristics in comparison with the traditional products that have the same uses, such as larger lifetime and that makes them more competitive.

3.1.5. Innovation in manufacturing processes

The most innovative trend currently on tyre recycling sector is pyrolysis. Unfortunately recycled tyre from pyrolysis and WoodRub products are not compatible, as pyrolysis creates spherical particles which creates a void issue and this would eventually have as a result higher binder content.

There are though some fields that could eventually lead to innovation in manufacturing processes. For example, there could be developed processes that creates a totally unpurified from metal and textile.

3.1.6. Markets

One of most important reasons for which recycled tyres became such a successful material was the fact of being eco-friendly. WoodRub products take that fact one step further, so it is reasonable for the market to accept them.

Of course by the time that the WoodRub products were designed, the market's demands had been taken into account. In the construction sector, there are a vast number of kilometers of roads across Europe that needs to be covered by acoustic barriers. With the related WoodRub products (ACOUSAN, ACOUFRAME) having improved characteristics comparing to the traditional ones, they are obviously more competitive.