Project description

Background

The recycling of waste wood products is on the increase. This is a positive development, as it increases the total volume of CO2 stored as wood-based products, broadening the lifecycle of the fixed carbon in the newly recycled products. However, such wastes currently contain physical and chemical contaminants including metals, stones, glues, paints and melamines. Concerning the latter, an estimated 1.5 billion rubber tyres are discarded annually worldwide, including some 250 million in Europe. The management of used tyres is not yet fully resolved. There are a number of options available, but to date, these have not proven to be sufficiently cost effective to drive the market for recovery. The disposal and incineration of tyres releases potentially harmful compounds into the environment, e.g. polycyclic aromatic hydrocarbons (PAHs), benzene and phenol, which have carcinogenic properties. At the time of the project proposal, some local programmes for recycling had been started around Europe. However, few were targeted at a national or even a regional level.

Objectives

The main aim of the WOODRUB project was to develop, test and demonstrate innovative, environmentally-friendly products made from recycled wood or rubber from used tyres. The idea was to develop materials for construction from
these products and to demonstrate them to various stakeholder groups.

The project would provide managers of wood and rubber wastes with a new end-of-life route for their products, and offer public and private construction firms with a more environmentally-friendly product option. Moreover, the planned products would operate as carbon sinks – increasing the carbon storage in buildings, and replacing other less eco-friendly building materials.

The recovered wood category is wastes from households (furniture, doors, windows, floors, etc). This material is contaminated by chemicals from glues, lacquers, paints and other coatings. After collection, the material would be processed into chips without any prior biological, thermal or chemical treatment. This was an innovative approach, as the removal of such chemicals can be difficult and costly. Recovered rubber tyres (in the form of particles free from other materials such as wires, ropes and synthetic fibres) would be used with recovered wood chips or sawn timber for the production by thermal processes of innovative composite products.

The development of these products/panels was carried out firstly on laboratory scale, to be scaled-up in order to develop and design the wood/rubber composite prototypes. An environmental study and a lifecycle assessment (LCA) was carried out on the developed products: The products made from recycled wood and/or rubber were compared with other conventional building materials and with other end-of-life routes of waste wood and waste rubber.

Results

The WOODRUB project developed different types of prototype products using recycled wood and rubber panels adapted to the different requirements of the respective end applications. These were environmentally analysed using the methodologies of lifecycle assessment and eco-efficiency.

The behaviour and mechanical, thermal and acoustic characteristics of the products produced were analysed and the results served to select their most appropriate uses. Specifically, seven different applications were tested (on nine prototypes). These included for: outdoor acoustic barriers, indoor acoustic barriers, non-slip anti-vibration mats, pathways, paddle for children playground, urban furniture and bricks. The results from the tests confirmed the technical viability of the prototypes and, consequently, the success of the project: All the products met standards’ criteria. Consequently, it is expected that the new opportunities to use wood and rubber recycled materials will help the substitution of alternative virgin materials currently employed. The new wood products proved to be as eco-efficient as other recycled alternatives; while the rubber ones are even more so, as indicated after the LCAs.

These results showed that the main negative impact of the manufacturing of the panels are from the glues, as the other raw material are recycled waste which have a very low impact. Also, the tests were based on the assumption that the energy consumed for the pressing of the boards uses power from a co-generation plant.

For every m3 of WOODRUB panel used, about 900 kg of wastes can be recovered, avoiding landfilling. On the other hand, the production of the boards with
recycled material required less energy than for the non-recycled ones. The analysis of the LCAs showed among other results, that:

- For several applications, the WOODRUB products can substitute recycled plastics or wood-plastic composites;
- When comparing the project panels with treated softwood for outdoor use and with recycled plastic lumbers, any of the WOODRUB product has lower impact than the other materials; and
- When comparing several market products, specific design and densities have an important influence in the final environmental profile. But, the WOODRUB products are comparable and sometimes better than other market alternatives (both in environmental and eco-efficiency terms).

The main environmental issue tackled by the project is the need of reduction of wood and rubber residues by creating new added value products. This can help to diminish the quantity of land filled or burned residues with a subsequent decrease of their environmental impacts (water, air and soil pollution). The achievements of the project are especially relevant for:

- Waste - offering a substantial contribution to the implementation of the Waste Framework Directive (Directive 2008/98/EC) and the new Circular Economy Action Plan (COM/2015/0614 final), by offering both waste recycling technologies and new composite materials that can be integrally recycled at end-of-life;
- Energy and climate change - contributing directly to energy savings in the manufacturing industry, because when analysing the products, the energy required in manufacturing is a major source of greenhouse gas emissions; and making available new materials with lower energy demand is a key element of the European climate change strategy. Thus the achievements are also helping to contribute to the EU’s 2020 and 2050 targets for cutting CO2 emissions.

In terms of economic value, no clear conclusions could be drawn as further development needs to be done specially in finding a niche in the market. The interest of the manufacturers may come from the availability and costs of the new raw materials. The wood sector is not much interested in the project results at this moment because there are a large number of options to re-use the waste wood, from recycled boards to energy generation. On the contrary, the rubber waste managers showed high interest in knowing the new possibilities that their residues can have and that could help them to open a new market opportunities.

Further information on the project can be found in the project's layman report and After-LIFE Communication Plan (see "Read more" section).

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Environmental issues addressed:

Themes

- Waste - Construction and demolition waste
- Waste - Waste recycling
- Waste - End-of-Life Vehicles (ELV's) and tyres
Keywords

recycling, building material, tyre, wood

Target EU Legislation

- Waste

Natura 2000 sites

Not applicable

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Beneficiaries:

Coordinator Asociación de Investigación y Desarrollo en la Industria del Mueble y Afines
Type of organisation Professional organisation
Description AIDIMA, the wood, furniture and packaging technology institute, is a non-profit making organisation, founded in 1984, which is active throughout Spain.
Partners Glunz AG, Germany Marché Multiservizi SPa, Italy Aristotelio Panepistimio Thessalonikis, Greece Brunel University, United Kingdom Consorzio del Mobile S.P.A., Italy Acciona Infraestructuras S.A., Spain Keridis Christoforos S.A., Greece Enjily International Ltd., United Kingdom

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Administrative data:

Project reference LIFE09 ENV/ES/000454
Duration 01-SEP-2010 to 31-MAR-2014
Total budget 1,838,968.00 €
EU contribution: 918,192.00 €
Project location: Comunidad Valenciana (España)

Read more:

- **Leaflet**
  - Title: Project leaflet (1.30 MB)
  - Year: 2012
  - No of pages: 2

- **Leaflet**
  - Title: "Utilisation of recovered wood and rubber for alternative composite products = Verwertung von Altholz und Altgummi für alternative Verbundwerkstoffe" (1.134 KB)
  - Year: 2012
  - No of pages: 2

- **Leaflet**
  - Title: "Utilisation of recovered wood and rubber for alternative composite products = Utilizzo di legno e gomma riciclata per lo sviluppo di prodotti composti alternativi" (1.10 MB)
  - Year: 2012
  - No of pages: 2

- **Leaflet**
  - Title: "Utilisation of recovered wood and rubber for alternative composite products = Utilización de madera reciclada y caucho recuperado para el desarrollo de nuevos composites" (1.10 MB)
  - Year: 2012
  - No of pages: 2

**Project web site**

**Publication: After-LIFE Communication Plan**

- Title: After-LIFE Communication Plan
- Year: 2014
- No of pages: 18

**Publication: Layman report**

- Title: Layman report
- Year: 2014

**Publication: Technical report**

- Title: Project's final technical report
- Year: 2014
- Editor: AIDIMA
- No of pages: 51