



‘Absorbing the Potential of Wood Waste in EU Regions and Industrial Bio-based Ecosystems — BioReg’

D1.4: INTERNATIONAL EXPERT WORKSHOP REPORT

„IDENTIFICATION OF THE GOOD PRACTICES IN WASTE WOOD MANAGEMENT”

To the attention of the Research Executive Agency

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Due date	30.06.2017
Issue date	20.12.2017



This project has received funding from the European Union’s H2020 research and innovation programme under grant agreement no 727958

Document information

Document title	D1.4: WORKSHOP „Identification of the good practices in waste wood management”
Document file name	Bioreg D1.4
Revision number	2
Issued by	Magdalena Borzęcka
Issue date	June 27, 2018
Status	Final

Nature of the deliverable

R	Report	x
P	Prototype	
D	Demonstrator	
O	Other	

Dissemination Level

PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission	
CO	Confidential, only for members of the consortium (including the Commission Services)	x

Document Approval

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Document Review

Date	Version	Reviewers
20.12.2017	1	Paul Antoine, Dominique Boulday
27.06.2018	2	Paul Antoine, Dominique Boulday, Teodora Marinova



ACKNOWLEDGEMENT

This report forms part of the deliverables from the project "BioReg" which has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 727958. The Community is not responsible for any use that might be made of the content of this publication.

BioReg project proposes to create a platform of stakeholders who are able to influence and develop their regions towards bio-based industries and products.

The project runs from January 2017 to December 2019, it involves 8 partners and is coordinated by "le CABINET D'ETUDES SUR LES DECHETS ET L'ENERGIE" (CEDEN).

More information on the project can be found at <http://bioreg.eu/project/>.

ABSTRACT

This document provides an analysis of the legal, policy and institutional frameworks in each recipient region. Within the task, analysis was carried out to:

- Assess synergies between Bioreg and RIS3 strategies existing in national and regional policies for the development of the region or any regional bio-economy strategies for each recipient region;
- Examine the legislation which either facilitates or hinders the development of policies and strategies.
- Assessing the potential for the development of an environment which will support and facilitate the creation of an effective industrial wood waste ecosystem. The analysis will define how barriers to policy adoption and implementation might be overcome and managed as well as how policies might be reformulated to circumvent the barriers.

The results were discussed during the workshop „Identification of the good practices in waste wood management” which took place on the 29 June 2017 in the conference centre of Institute of Soil Science and Plant Cultivation ul. Al. Królewskie 17 in Puławy. The workshop was organized by the Department of Bioeconomy and Systems Analysis IUNG-PIB and funded by the BioEcon project. The aim of the workshop was to analyse good practices identified in the previous stages and assess them during an expert group workshop.

Stakeholders from Lisboa/Alentejo and Normandy were informed about the findings and results and then questioned in order to get their feedback regarding the content of the workshop.



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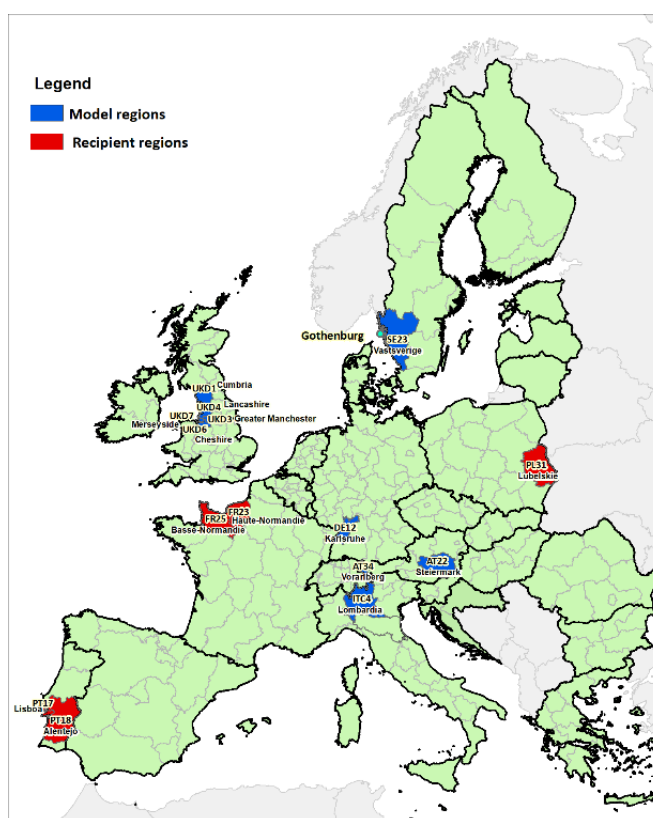
ABBREVIATIONS

All abbreviations shall have the meaning defined either herein or in the Rules for Participation or in the Grant Agreement (GA) including its Annexes without the need to replicate said terms herein.

INTRODUCTION

The BioReg project aims to identify good practices that could be implemented in the recipient Regions. Within the BioReg project we have identified five model regions which were analyzed and presented in the workshop. The best practices from model regions were identified and presented to the stakeholders from recipient regions.

Map 1: Regions of BioReg project



ANALYSIS OF THE LEGAL, POLICY AND INSTITUTIONAL FRAMEWORKS IN THE RECIPIENT REGIONS

NORMANDY (FR)

SYNERGIES WITH RIS3 STRATEGIES, EXISTING NATIONAL AND REGIONAL POLICIES FOR THE DEVELOPMENT OF THE REGION

In January 2016, the Lower Normandy Region and the Upper Normandy Region have merged and became Normandy. Both of them elaborated in 2014 (before the fusion) their own strategy regarding RIS3: that is the reason why Normandy comprises two strategies depending on the territory of the former Regions.

The **Lower Normandy Region** defined a strategy based on 4 axes, which do not focus on any specialization domain, that form strategical priorities in order to increase the innovative dynamic of the territory:

- Accompany innovation in companies with a project approach from detection to marketing,
- Encourage an efficient contribution of the public research and training system as well as the valorisation and technology transfer system in innovative project development and innovative entrepreneurship within the Region,
- Accompany skill improvement and adaption of human resources in companies,
- Rely on territorial excellence domain to gain in visibility and attractiveness.

In parallel, five specialization domains, which define a strong specificity of the territory, have been specified:

- Sustainable and smart materials,
- Science and technology innovation in biomedicine,
- Society and digital,
- Energy transition,
- Resources and sustainable, safe and healthy food.

The **Upper Normandy Region** has divided its strategy in 6 axes:

- Boost the valorisation of Research to generate more added-value on the territory,
- Make innovation become a lever to remedy thresholds transition issues (regarding workforce, size, internationalisation...) for companies,
- Encourage transdisciplinarity of research and branch to stimulate innovation,
- Promote enlarged innovation (technological and non-technological),
- Accompany skill improvement of human resources in companies to answer the industrial mutation challenge,
- Take benefit of the emerging smart specialization to increase the attractiveness of the territory on its excellence thematic.



The Upper Normandy Region also specified 6 specialization domains (emerging and mature):

- Materials performance and ageing,
- Components and systems reliability in embedded systems,
- Energetic propulsion system efficiency,
- New technologies in chemistry and biology applied to healthcare and wellness,
- Wind energy,
- Multimodality and performance in logistics.

Since the Energy Transition part of the Lower Normandy strategy is exclusively focused on marine energies and nuclear dismantling, it seems that neither the axes nor specialization domains fit with the BioReg program.

However, there is a national strategy on renewable energy funding especially for biomass with substantial subsidies provided to collective and industrial boiler plants. This strategy has led Normandy to be one of the most developed region in France regarding wood-fuel energy.

On a regional level, Upper and Lower Normandy defined their own strategy regarding climate, air and energy and called it SRCAE (Climate, Air and Energy Regional Scheme) in 2013 and 2009. Among other things, these policies settle targets for industrials and municipalities on wood-fuel energy consumption from 2020 onwards. Altogether, the 2020 objective and the situation of the end of 2016 are shown on the following figure:

Table 1. Objectives for 2020 of Normandy SRCAE regarding wood-fuel energy consumption

	Municipalities	Industrials
Situation by the end of 2016	718 GWh/year	1 725 GWh/year
Objectives for 2020	1 047 GWh/year	2 584 GWh/year

Recently, the use of wood wastes for energy has been approved and the region needs to take benefits of the situation in order to lower the tension on natural resources and learn from model regions to implement a local wood waste value chain.

LEGISLATION WHICH EITHER FACILITATES OR HINDERS THE DEVELOPMENT OF SUCH POLICIES AND STRATEGIES WILL BE EXAMINED AND PROPOSED FOR DISCUSSION DURING ROUNDTABLES WITH POLICY MAKERS AND LEGAL BODIES

The French legislation established several sections for installations classified regarding environmental protection. Besides, it is currently evolving due to the transcription of the European MCP Directive in the French law.

Nevertheless, and until the final adoption of the new decrees that may occur by the end of the year 2017, it was possible from a regulatory perspective to valorise waste wood in the plants classified under the following sections:



- Combustion installations (Code 2910A), for packaging wood that have previously been following an end-of-waste procedure,
- Combustion installations (Code 2910B), for waste wood, except the ones that might contain halogenated organic compounds or heavy metals due to wood conservation treatments or coatings in which waste woods originating from construction and demolition. The definition that has been specified on the decree implies that wooden furniture could be valorised in such plants subject to validation during discussions with government services. However, these wastes must respect thresholds regarding heavy metals, Chlorine, PCP and PCB contents that are very low. Today, this aspect of the regulation seriously hinders the implementation of combustion plants concerned by the section 2910B,
- Heat or power production installations using non-hazardous wastes prepared as RDF (Code 2971),
- Thermal treatment of non-hazardous wastes installations, except the ones targeted by 2971 installations (Code 2771). This section concerns incineration plant connected or not to a heating district network. In France, it is tough to implement new incineration plants due to the low acceptability by the population. The existing incinerators registered as 2771 already consume waste wood originating from bulky wastes, industrial activities, domestic wastes...

However, waste treatment professionals due to economical concerns and profitability perspectives use to landfill their waste wood. Indeed, in contrary to our European neighbours where waste wood landfilling is strictly forbidden, these practices are still widespread in France and the low landfilling taxes (and more broadly low landfilling costs) also do not enable to stem it.

ASSESSING THE POTENTIAL FOR THE DEVELOPMENT OF AN ENVIRONMENT WHICH WILL SUPPORT AND FACILITATE THE CREATION OF AN EFFECTIVE INDUSTRIAL WOOD WASTE ECOSYSTEM.

In Normandy, stakeholders are perfectly aware of the potential for the development of a waste wood ecosystem. Waste wood streams are known, outflows have been identified (for energy recovery and material valorisation) thanks to the ECIRBEN program led by Biomasse Normandie and CEDEN. Stakeholders just expect financial tools and an appropriate regulatory framework in order to implement and support a waste wood ecosystem in Normandy and generally speaking for the whole country.

From a regulatory point of view, changes turn out to be mandatory among which:

- Review of thresholds for 2910B installations regarding fuel inputs in order to valorise wooden furniture and eventually other deposits,
- Ban landfilling of waste wood,
- Implement a dissuasive landfilling tax for waste wood.

The development of a waste wood ecosystem also goes through:

- The implementation of a classification for waste wood; this is currently discussed within the national waste wood plan and has been identified as one of the priority to execute (probably based on the German classification),



- The implementation of tippers dedicated to waste wood in municipal waste collection sites,
- Raising public awareness on energy and environmental efficiency of incinerators and their flue gas treatments,
- Raising public awareness on the harmfulness of using waste wood in households.

LUBELSKIE (PL)

SYNERGIES WITH RIS3 STRATEGIES, EXISTING NATIONAL AND REGIONAL POLICIES FOR THE DEVELOPMENT OF THE REGION

There are 20 smart specializations in Polish national smart specialization which are contained in 4 main groups: healthy society; agro-food, forest-wood and environmental bioeconomy; sustainable energy, natural resource and waste; innovative technologies and industrial processes.

Ris3 strategy in **Lublin region** include 4 main specializations:

1. Bioeconomy,
2. Medicine and health,
3. Information technology and automation,
4. Low carbon emission energy production.

In regional strategies for Lubelskie voivodeship bio-economy is one of the priority subject including business activities based on biotechnology in particular plant and animal production, feed production and agro-food processing. An important aspect is also environmental protection, waste managements, recycling. The fact that there are **97 universities and research and development units in the Lublin region**, is a great advantage. Institutes are source of knowledge and experience. BioReg project is likely to be acknowledged by local authorities, since project issues fit in with the local strategies. Solution and knowledge from model regions can help significantly to improve the management of wood waste, and straighten efficiently use stock of wood waste.

LEGISLATION WHICH EITHER FACILITATES OR HINDERS THE DEVELOPMENT OF SUCH POLICIES AND STRATEGIES WILL BE EXAMINED AND PROPOSED FOR DISCUSSION DURING ROUNDTABLES WITH POLICY MAKERS AND LEGAL BODIES

According to the ordinance of the Minister of Environmental (based on 2000/532/WE) in Poland waste codes are in force. There are around 15 codes which include wood waste. In addition, article 17 (1) on packaging waste management identifies who is in charge of recycling and also determinates the amount of used packaging that needs to be recycled. Recycling level should be at least 56% of total packaging (and 16% of wood packaging). Wood



waste management policy is not clear. There is no uniform distribution of wood waste. Poland use waste codes from the 2001/573/WE directive however in case of wood waste management it's not best solution. The EU should introduce a uniform distribution of waste wood to make wood waste management easier. Another problem is lack of statistic data. There is only information from waste codes, but not all wood waste are included in this statistic, some of wood waste are sold earlier, which is not recorded in the statistics, so the exact amount of wood waste are unknown.

ASSESSING THE POTENTIAL FOR THE DEVELOPMENT OF AN ENVIRONMENT WHICH WILL SUPPORT AND FACILITATE THE CREATION OF AN EFFECTIVE INDUSTRIAL WOOD WASTE ECOSYSTEM.

Potential for development of an effective industrial wood waste ecosystem in Lubelskie region is high. There are lot of resources of scientific institute, with can help to improve management of wood waste. Region introduces innovative solution, and is open to new technology. In regional strategies, bio-economy is one of main priority. Thanks to education of the youngest, that new generation will be more aware of waste and wood waste management will be known to them.

In the region, vast majority of wood waste is recovered (mostly by panel board industries) or used as a fuel in energy plant. In the region there are two cement plants which are able to incinerate hazardous wood waste. There is a potential in the rural areas to collect more waste wood. In those regions municipal wood waste is not collected, inhabitants are used to valorise wood waste in their fireplace or heating stove (with a risk of harmful emission and dust). There is still high potential for wood waste from households, that why **education and awareness of society** are so important. It is possible to increase collection of wood waste, especially in villages and smaller cities.

ALENTEJO, LISBOA (PT)

SYNERGIES WITH RIS3 STRATEGIES, EXISTING NATIONAL AND REGIONAL POLICIES FOR THE DEVELOPMENT OF THE REGION

ALENTEJO REGION

The regional smart specialization strategy for Alentejo (RIS3 Alentejo) is a key element of the regional development strategy for the period 2014-2020. It aims at improving the competitiveness and internationalisation of the regional economy by focusing on the competitive advantages of Alentejo's scientific and technological regional system.

The **regional smart specialization strategy** established the following strategic priorities:

- Food and forestry
- Economy of the mineral, natural and environmental resources



- Heritage, cultural and creative industries and tourism services
- Critical technologies, energy and smart mobility
- Technologies and specialised services of the social economy.

The strategic priorities of Alentejo fit the BioReg project on the following:

1) **Food and forestry:** One of the key industries in this region is linked with the production, extraction and processing of cork. In this industrial chain, several wastes, including wood wastes, are being produced. Focus is on the reduction of the energy costs of the processing plants (either by improving the energy efficiency and the ratio energy output/input), to create added value to those wastes in a biorefinery concept, to improve the environmental sustainability of the processes, e.g. by improving the renewable character of the energy feedstock.

2) **Economy of the mineral, natural and environmental resources:**

- a) improving the sustainability: at the reduction of the environmental and social impact of production, with implications on the market value of products is leading to the development of product traceability and carbon counting systems. To give wood waste a value fits those targets,
- b) Materials recycling: in a context of circular economy and "zero waste" and a sustainable exploitation and processing, wood waste being produced in the region may play an important role, and it is mandatory to find solutions that reduce liabilities of future management. From a competitive perspective, the reuse of wood waste, as a raw material for other applications, will lead to the emergence of new enterprises and the consequent boost of employment and of the economy in the region. To complement the activities related to the use and new applications of waste, the product design can make an important contribution; Energy: opportunities for renewable energy and biofuel production from wood waste.

3) **Critical technologies, energy and smart mobility:** Energy is an emerging domain in which the Alentejo has a consolidated economy in the field of conventional fuels and energy sources, but increasingly affirms itself as a producer of technology for renewable energies. In this context, due to its natural characteristics, the region has hosted several renewable energy projects. This stake can leverage the development of a specialization in energy production technologies from renewable sources, exploring also the biomass potential associated with agro-food waste (and wood waste) and the existence of scientific competences and a chemical cluster (Sines Petrochemical Complex).

The **Alentejo regional action plan** (2014-2020) indicates the following areas that fit the BioReg project and that are linked with giving wood waste a value:

- 1) **Green Economy: Renewable energies and Low carbon.** In rural areas of low density (such as Alentejo), there is a close link between the Green Economy and the territorial model, in the fulfilment of objectives of promoting energy efficiency, translated into the following areas:
 - a) Eco-efficiency of waste management, ensuring the preservation of resources, minimizing negative impacts on public health and the environment, applying the principles of reduce, recycle, reuse.
 - b) Energy valorisation of infrastructures and buildings to be affirmed in city politics.
 - c) Production of clean energy with microgeneration units of electric and thermal energy based on renewable sources.



LISBON REGION

The Lisbon Regional Smart Specialization Strategy (RIS3 Lisbon) was written in the framework of the regional development strategy 2014-2020. In fact, the establishment of the regional development strategy 2014-2020 involved several parallel initiatives conducive to various strategic documents, such as the “Regional Smart Specialization Strategy 2014-2020”, “Regional Action Plan 2014-2020” and “Regional Operational Programme 2014- 2020”, which are all necessarily interconnected.

The following priority specialization areas have been identified in the document:

- Tourism and hospitality
- Mobility and transport
- Creative and cultural industries
- Research, technology and health services
- New knowledge, exploration and exploitation of marine resources.

There is also a cross-cutting priority thematic area, which is relevant in the Lisbon region and which intersects with others, that concerns advanced services to businesses.

The strategic priorities of Lisbon seem not to fit the BioReg project except on the following:

- 1) **Mobility and transport** - Experimental projects in the area of fibres (that can be obtained from wood waste) for application in vehicle construction. Innovative materials for applications in "efficient mobility" (lighter, etc). Those innovative materials could reuse wood waste:
 - Carbon-based composites for new transport applications
 - Innovative methods of manufacturing carbon-based composite parts
 - New composites based on recyclable materials for applications in mobility solutions.
 - Energy optimization of existing systems and creation of complementary systems that optimize the use of energy applied to mobility (that could use wood waste).
- 2) **Research, technology and health services** - The industrial investment in the areas of biomaterials may rely also on the use of wood waste after treatment and processing.

However, the Lisbon regional action plan (2014-2020) indicates the following actions that fit the BioReg project:

- 1) **Sustainable growth:**
 - a) Resources, Environmental services and Risks: To promote the resolution of environmental liabilities, the reduction of landfill, as well as the prevention and recycling of municipal waste. Giving waste wood a value fit the project. Specific aim: Waste recovery by reducing production and landfill, increasing selective collection and recycling (including wood waste).
 - b) Low carbon economy: to promote the production of energy from renewable energy sources, exploiting the high endogenous energy potential (including wood waste) and the use of innovative technologies. To promote an energy and environmental culture, in particular in the construction sector, promoting a greater energy efficiency of public and private buildings. To increase the economic competitiveness of the industrial fabric by means of new energy consumption patterns supported by a growing focus on



energy efficiency and the use of renewable energies. To create the conditions for an effective energy efficiency policy in the Region, based on integrated strategies of low carbon. To take a multi-sectoral approach to the implementation of the low carbon strategy, highlighting their inclusion in integrated urban development strategies, in order to reduce energy and carbon intensity in cities. Reusing wood waste fit these activities.

At National level BioReg project also fit the following Operational programs:

- 1) **Sustainability and Efficiency in the use of resources**
- 2) **Rural development Program - PDR 2020.**

LEGISLATION WHICH EITHER FACILITATES OR HINDERS THE DEVELOPMENT OF SUCH POLICIES AND STRATEGIES WILL BE EXAMINED AND PROPOSED FOR DISCUSSION DURING ROUNDTABLES WITH POLICY MAKERS AND LEGAL BODIES

In Portugal, wastes are classified with codes and for wood waste there are several codes, following the indications from European legislation. According to national rules, there are commitments to recycle wood packaging and to make use of wood waste. Concerning non-contaminated wood waste, traditionally, those are reused for pellets and energy or incorporated in new materials (such as panel board). Concerning contaminated wood waste: it is mandatory that those wastes are channelled to CDR (waste-derived fuels) production units where industrial pellets are produced. These industrial pellets are delivered to cement factories that have the license, and are certified, to use them in their furnaces. The aim is not to deliver those wastes to landfill. Several companies work in this field (collecting, reusing and recycling) but at the national level not at the regional level, due to the dimension of the country. The collected wood waste is mostly coming from municipal or industrial sources and regarding statistical data, at regional level, there are some limitations. This is mostly due to the fact that some industrial wastes are collected at a national level and not at the regional level.

ASSESSING THE POTENTIAL FOR THE DEVELOPMENT OF AN ENVIRONMENT WHICH WILL SUPPORT AND FACILITATE THE CREATION OF AN EFFECTIVE INDUSTRIAL WOOD WASTE ECOSYSTEM.

Potential for development effective industrial wood waste ecosystem in Lisbon and Alentejo regions is high. Both in Lisbon and in Alentejo, there are several academic and scientific institutions that can help municipalities and entrepreneurs to improve management of wood waste. Both regions are focused in the circular economy, to reduce wastes, and on the green and carbon economy, to develop energy production systems from renewable sources and to create added value to wastes in a biorefinery concept.

In **Alentejo**, as regards the structure of expenditure on research and technological development, there is a strong regional bipolarisation between Academia and the business sector, in a proportion of approximately 60% and 40%, respectively. In this region there are 2 Universities (one public and one private), 4 polytechnic institutes (3 publics and 1 private), 9 research and technological centres, 4 interface entities, 2 technological parks, and 1 cluster. From those it can be highlighted that in the University of Evora there is a chair in Renewable Energies.; the Centro de Biotecnologia Agrícola e Agro-Alimentar do Alentejo (CEBAL), is a research centre with expertise in biotechnology;



and the Instituto Politécnico de Portalegre, is linked with a research centre that is enrolled in energy technologies. In this region there is also a chemical cluster, the Sines Petrochemical Complex.

The **Lisbon Region** concentrates a significant part of the country's resources in terms of production, innovation and research, giving it a solid basis for deepening industrialization processes linked with the BioReg project and for the further deepening of value chain logistics into integrated activities along the length of the wood waste value chain. In Lisbon Region, there is a strong concentration of higher education and polytechnic institutions and scientific research and development, including State laboratories in comparison to the rest of the national territory. On the basis of innovation are the research and technological development, and the transfer of knowledge and technology from research and higher education institutions to the business sector.

In both regions but especially in Alentejo region due to its rurality, there is still potential to collect more wood waste from households. To improve the household collection of wood waste, the BioReg project in partnership with both municipalities, associations and entrepreneurs will address this issue.

Regarding the industrial and municipal wood waste, options for improvement are not so much related with amount collected (although still it can be improved) but to how it can be reused, recycled and valorised.

MODEL REGIONS

VÄSTSVÉRIGE; GOTHENBURG (SE)

Lia DETTERFELT, representing RENOVA group presents waste management in Västsverige region in Sweden. Västsverige is a region in the west part of Sweden. NUTS2 id SE23. The area is 29 399 km², population according to Eurostat is 1 963 466. Density of population: 62 people on km². Crude rate of total population changes 14.4%. Purchasing power standard (PPS) is 32.500.0. The biggest city in the region is Goteborg (population of 447 thousand people).

NATIONAL CONTEXT

Preventing the creation of waste is the first step in the waste hierarchy. It is the priority of both Swedish and European waste legislation. The waste hierarchy priority is:

- Waste prevention
- Reuse
- Material recycling and biological treatment
- Other recycling, e.g. energy recovery
- Disposal

Exceptions to this hierarchy may be necessary for technical, financial or environmental reasons. According to the definition in the Swedish Environmental Code (1998:808), waste is any matter or object that the bearer disposes of, intends to dispose of, or is obligated to dispose of.



There are different methods for treating waste:

- Material recycling
- Biological treatment
- Energy recovery
- Landfill

Hazardous waste can be treated using one or more of these methods, depending on its properties. Recycling means that the waste will be used as replacement for another material. Preparation for reuse is also a recovery operation. According to the definition, it means inspecting, cleaning or repairing any item that is waste so it can be reused without further treatment.

Material recycling reduces environmental impact by saving both energy and natural resources. Biological treatment closes the ecocycle and returns nutrients to the soil. The waste is treated through anaerobic digestion (treatment without access to oxygen) or composting (treatment with access to oxygen, which is known as aerobic treatment). Anaerobic digestion produces digestate and biogas, which can be used as vehicle fuel. Compost is a soil conditioner which can be used in gardens, parks and landscaping.

Energy recovery is a method ideally suited for waste which cannot be recycled in any other way.

Recovering energy from waste provides both district heating and electricity.

Landfill is a treatment method for waste that cannot or should not be recycled. Landfill entails waste being stored in a manner that is safe in the long-term. Sending organic or combustible waste to landfill is prohibited.

CASE STUDIES

SÄVENÄS WASTE-TO-ENERGY PLANT

Renova has a permit to receive 550,000 tonnes of waste each year at Sävenäs. About half comes from households and half from business and other activities. The facility burns the waste in four furnaces, each with its own cleaning line for flue gases. The energy recovered provides district heating, which is delivered to Gothenburg's network, and electricity to the grid. The waste-to-energy plant delivers 30% of the heat for the regional district heating network and the equivalent of 5% of Gothenburgers' electricity consumption. This means:

- Heating and hot water for around 150,000 apartments
- Electricity for close to 110,000 apartments each year.

Renova ensures an appropriate mix of fuel, air supply and the right temperature for the most efficient combustion possible. Random daily checks are carried out to ensure that the waste coming into the plant is being properly sorted. The waste-to-energy plant runs 24/7, all year round. In summer, when the heating demand drops, Renova takes the chance to repair and maintain one furnace at a time. Combustible waste from businesses and other activities are baled and stored until the heating demand rises. Then the plant runs at full capacity again. Waste that does not burn comes out of the furnaces as slag.



At Renova's facility based in Tagene, the slag is being separated and the plant recovers approximately 10,000 tonnes of metals each year. The residue (bottom ash) is recycled as building material.

Adjacent to the waste-to-energy plant is a reception facility for impregnated waste wood. This is a sorting and chipping plant for any impregnated wood such as sleepers (cross-ties), discharged telephone and electricity poles and demolition wood. The impregnated wood is crushed and delivered by conveyor belts directly into the Waste-to Energy bunker. Approximately 20 000 tons of impregnated wood is energy recycled at the plant per year.

GOBIGAS

GoBiGas (Gothenburg Biomass Gasification Project) is a major Göteborg Energi project set to produce biogas via the gasification of biomass and waste from forestry. When the plant is at optimal production, it will deliver 160 GWh, which corresponds to fuel provision of 16,000 cars.

At GoBiGas, biogas is produced via thermal gasification of the raw materials of the forest, such as branches, stumps and forestry residues. Biofuel is transformed into a combustible gas, syngas, which is purified and upgraded to biogas, with a quality that is comparable to natural gas. This means that both gas types can be mixed in the same gas grid. Since the biogas is efficiently produced from renewable sources, it does not contribute to a climate change.

So far wooden pellets, different fractions of bark and wood chips have been tried in the process. Supplier, among others, has been Södra.

DIESEL BASED ON RENEWABLE TALL OIL

Preem Evolution Diesel is a unique standard diesel that works in all vehicles with diesel engines, both old and new. Preem Evolution Diesel contains the highest proportion of renewable fuel in conventional standard diesel on the market. Using Preem Evolution Diesel instead of fossil diesel cuts fossil carbon dioxide emissions by up to 46 percent. In 2016, the use of Preem Evolution Diesel helped cut Sweden's carbon dioxide emissions by 975,000 metric tons. This is equivalent to emissions from just over 415,000 cars, or nearly nine percent of Sweden's entire car fleet.

A large proportion of the renewable raw materials in Preem Evolution Diesel is made from tall oil, a residual from the Swedish forest and paper industry. Tall oil is the renewable raw material in green diesel that is the most climate efficient of those currently on the market. A joint owned factory SunPine in Piteå, Northern Sweden, processes tall oil from the paper industry into crude tall diesel. The crude tall diesel is then refined into renewable diesel at the Gothenburg refinery. Other vegetable oils and animal residuals are used as raw materials in addition to tall oil.

BIOCOMPOSITES GRANULES



Stora Enso has invested in a new production line that will manufacture biocomposite granules at Hylte Mill in Sweden. Biocomposite granules could be used in furniture parts or as deckings and claddings, complementing Stora Enso's wood products businesses. Other potential areas include automotive and transport products. Combining one or more renewable materials together with other bio-based or inorganic components, biocomposites have the potential for a wide range of industrial and consumer applications.

The driver is a growing global demand for products based on renewable, non-food competing raw materials which supports the bioeconomy and the environment. Beyond the Hylte investment, Stora Enso is looking further at the potential development of biocomposites into products for the building sector, as well as for renewable packaging.

The primary components with potential use in biocomposites include novel modified fibres, and refined natural wood components such as lignin, hemi cellulose and cellulose to be used as natural biopolymers. The most commonly produced biocomposites in the market today contain woody biomass or cellulosic fibre and are called Wood Polymer Composites (WPCs). These can be used in decking and garden products, facades, other building products, automotive parts, furniture and a variety of consumer products.

VORARLBERG; STYRIA (AT)

Vorarlberg is a region in the west part of Austria. Borders with 3 countries (Switzerland, Lichtenstein and Germany) and from the east with the Tyrol region. NUTS 2 id AT34. The area is 2 601,48 km², population according to Eurostat 383 657. Density of population is 145 people per km². Crude rate of total population changes 14.8%. Purchasing power standard (PPS) per inhabitant is 38.200.0. The capitol of the region is Bregenz (population 28 thousand people).

NATIONAL CONTEXT

The overall framework conditions for waste management are defined in the Austrian Waste Management Law from 2002 (WML 2002). It defines the order of priority for waste management measures (waste prevention/avoidance first and disposal last) and the areas of responsibility in the national waste management system. Municipal waste and waste from commercial operations similar to municipal waste is managed by the nine Austrian provinces (municipal wood waste, demolition wood), while all other waste is managed at federal level (industrial waste wood streams).

Based on the WML 2002, several ordinances have been issued since:

- Landfill ordinance (LO) → Since its amendment of 2004, waste with more than 5% (weight) organic carbon must not be disposed of in landfills. All waste wood has to be either reused/recycled or, burned in designated heating or combined heat and power plants.
- Recycling wood ordinance (RWO 2012) → It was prepared with the aim to increase the recycling rate of waste wood. The maximum share of waste wood that can be recycled in a product increases with increasing quality (e.g. decreasing contents of harmful substances).



- Waste incineration ordinance (WIO) → Definition of framework conditions for waste incineration plants, including waste wood combustion plants. Based on the respective EU directives (2000/76/EG and 2010/75/EU).

Another important law is the Law regarding the remediation of contaminated sites. It provides the financial resources to remedy contaminated sites by collecting fees and fines for legal and illegal waste utilization and disposal measures. It promotes measures aiming for a re-use of waste over others like combustion.

CASE STUDIES

VORARLBERG

- Waste wood-fired combined heat, cooling and power plant based on an ORC process:
- Utilizes 15,000 tons of quality sorted waste wood per year
- Waste wood is treated in a specific treatment plant before it enters the combustion plant
- Thermal capacity of the furnace: 7,800 kW; Electric capacity: 1,150 kW; Thermal capacity available for heating and cooling: 6,000 kW
- Start of operation: 2002

Causes of its success:

- Increased feed-in tariff over a period of 13 years (the period ended in 2015)
- A constant base load for the heat demand was given
- Funding with 30% of the investment costs
- Legal framework conditions that prohibit the disposal of waste wood on landfills provide a rather constant supply of waste wood (however, the RWO 2012 put some pressure on the waste wood to energy market).

STYRIA

About 83% or 130,800 t of the waste wood generated in Styria are recycled or reused, the remaining 17% or 26,500 t are thermally utilized.

Causes of its success:

- Current legal framework conditions that prohibit the disposal of waste wood on landfills (LO) and promote the use of waste wood in wood products such as particle board, ply wood or OSB (RWO).
- A dense net of municipal waste collection centres and the foundation or expansion of commercial waste management operations promoted by the WML 2002.
- Short distances to the next waste collection centre for private suppliers and the wide range of waste management services commercial and industrial waste wood suppliers can choose from enable an easy and convenient manipulation, sorting, treatment and end-use of waste wood in Styria.

BADEN-WÜRTTEMBERG (DE)



Karlsruhe is one of the north- western regions in Baden-Württemberg. NUTS2 id DE12. The area is 6 919.17 km², population according to Eurostat 2 761 977. Density of population is 400 people per km². Crude rate of total population changes 14.8%. Purchasing power Standard (PPS) per inhabitant is 38.600.0. The biggest city is Karlsruhe. The region in 2013 generated 1 268.9 thousand tons of municipal waste based on Eurostat data.

NATIONAL CONTEXT

- Market

Germany generates around 8,4 million tons of waste wood: 2 million tons are recycled in panel industry (rising market) in Germany (stable), Austria and Czech Republic. Energetic valorisation concerns 6,3 million tons of waste wood (all types), burnt in 76 plants.

Germany has a high treatment rate and only landfilled 1% of municipal waste in 2014 (Landfilling is banned for organic products). The recovery of wood waste mainly concerns the recovery of energy (80%) for classes All-AIV and to a lesser extent recycling (20%) for class A1 or even A2.

Germany is a net importer of waste wood (750 kt/y - 900 kt/y). The greatest volumes come from the Netherlands with an import volume of 333 000 tons amounting to about 50 % of total imports. In contrast, quantities exported, predominantly to the Netherlands, are very little.

- Regulatory framework concerning waste wood

The regulatory framework comprises:

- European framework: waste, IED, RE directives
 - o Waste management act 2012
 - o Remind waste hierarchy: reuse, recycling and recovery, and finally disposal
- Producer responsibility: Packaging ordinance
- Wood Waste Ordinance (2002)
 - o Very thorough act: has allowed the development of the collecting of waste wood and its valorisation since 15 years
 - o Classification which split waste wood in 4 categories, depending of the origin and quality of wood. According to the classification, different valorisations are recommended depending of the categories
- Pollution Control Act on incineration and co-incineration - 17. BImSchV
- German Renewable Energy Sources Act "EEG"
 - o Implementation of EU Directive 2009 the promotion of the use of energy from renewable sources.
 - o 18% of gross final energy consumption by 2020
 - o Feed-in tariff system combined with a guaranteed right of access to the grid for renewable energy projects
 - FIT applied 20 years after commissioning
 - o Overall policy "energy transition" aiming to:
 - Phase-out nuclear energy by 2022



- Significantly reduce fossil energy use in the longer-term (i.e. by 2050)
- Achieve GHG emission reductions.
- GUIDE VDI 4087
 - The application of this standard contributes to a consistent approach for Germany in the approval procedures, the implementation and monitoring.
 - The standard addresses operators, consultants, contractors and relevant authorities.
 - The standard describes the state of the art and applies to stationary, mobile and semi-mobile equipment and adherent facilities of other industries such as particle board plants or power plants, where waste wood is stored, treated and handled.
- Focus on the waste wood classification
 - Most thorough classification on waste wood in Europe and probably beyond
 - Regulates the mass flow practicably, effectively and sustainably
 - Has given visibility to the actors since 2002: same frame for all
 - Accepted by all stakeholders
 - The classification crosses origins and outlets and promotes recycling for best categories (AI, All) at the expense of energy recovering
 - In line with waste directive (waste management hierarchisation)
 - Based on the European waste catalogue (EWC)
 - Specifics threshold for panel recycling and more binding than EPF (European panel federation) standard.

REGIONAL CONTEXT

Baden-Württemberg is one of the economically most competitive regions in Europe. The population is over 10 million and the quantities of waste wood reach nearly 1 million tons.

Beyond national regulation and objectives, Baden-Württemberg has launched a waste management plan for municipal waste in 2015. Among the 6 priorities, the plan focuses on recyclable materials and construction waste, in which waste wood is included.

The area hosts several panel manufacturers, biomass plants and sorting platforms for waste wood. Besides we note the presence of relevant structures like Fraunhofer Institut, Max Planck research centres (KIT, EIFER) and a cluster.

Table 2. Identified waste wood sorting sites (CEDEN)

Name	Location	Capacity (t)
BEB Karlsruhe	Karlsruhe	
Holz-recycling (HRU)	ULM	20 000 t
Lämmle Recycling GmbH	Furamoos	
BKO	Odenwald	72 000 (directly on the site of the CHP plant)



At least 6 plants valorize more than 400 000 t/year of waste wood and for a regional production of waste wood evaluated at 1 million t/year. We also note the presence of at least 6 waste-to-energy plants.

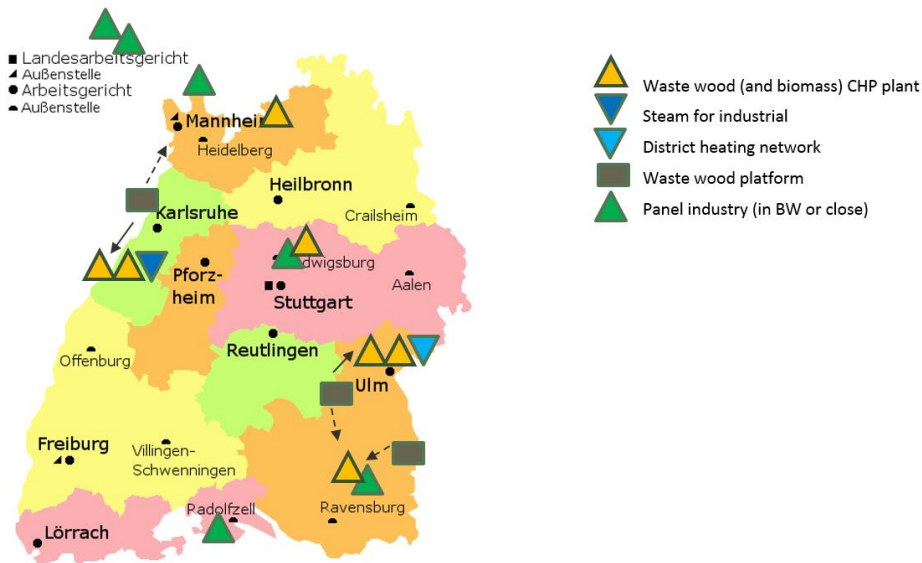
Table 3. Identified biomass plants with waste wood (CEDEN)

Name	Location	Supplie
BEB Kelh	Kehl	110 000
Biomass power plant ULM I	Ulm	120 000 (included 50% waste wood)
Biomass power plant ULM II	Ulm	60 000 (included waste wood)
BioHKW	Herbrechtingen	140 000 (with up to 50% of waste wood)
BMHKW Odenwald	Odenwald	72 000 of which waste wood
	Eberhardzell	53 000 t of which waste wood

The region also hosts 3 panel manufacturers, and 3 others are close to the regional border.



Figure 1. Facilities regarding waste wood in Baden-Wurttemberg (CEDEN)



CASE STUDIES

3 case studies identified in Baden-Wurttemberg county are exposed:

- A waste wood sorting platform (Karlsruhe) linked to a biomass plant located in Khel
- Two biomass (waste wood) plants connected to a district heating network in Ulm
- A biomass plant located in Odenwald which prepares waste wood on-site. This plant will be visited on July 7 by CEDEN, BIOMASSE NORMANDIE and BIOCOMBUSTIBLES SAS (industrial from Normandy). At this occasion, a round table will be organised by CEDEN and STEAG.

Figure 2. Location of case studies



- BKO Odenwald

The main interest of this plant is, unlike most of others plants, the preparation of waste wood fuel on-site. Indeed, bulk waste wood are collected in an area of 70 km and brought on the plant site. Here, waste wood is processed very merely, to be burnt for production of electricity. Besides, the consortium BKO which operates the plant, includes as a shareholder a public society AWN which is in charge of waste collecting in the area. Thus, BKO ensures, at least in part, the waste wood supply.

Photo 1. Bulk waste wood in the platform of BKO (source : CEDEN)

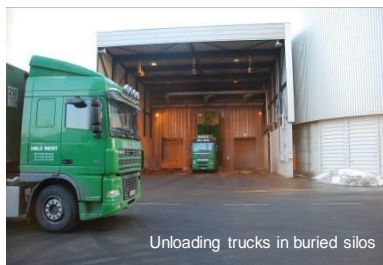


- Bio-KHW - ULM

2 biomass plants feed in heat the district network of ULM. The two plants burn 180 000 t of biomass of which more than 100 000 t of waste wood (AI-AIV), in substitution of coal. They contribute for 60% of the heat of the district heating network of ULM.

Photo 2. Biomass plant of ULM

(Source : <http://www.standardkessel-baumgarte.com> and CEDEN)

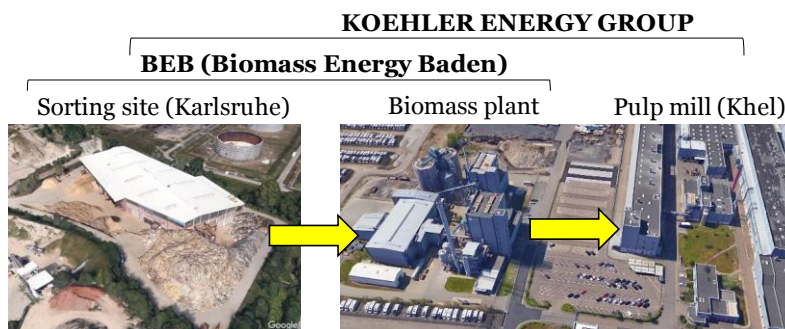


The district heating company of the city of ULM rely on several sources of energy, an in particular biomass, thanks to the 2 biomass plants. The biomass, included waste wood, contributes to 57% of the fuel.



- Biomasse plant KHEL

Figure 3. Integrated organisation of KOEHLER Group (CEDEN)



CAUSES OF THEIR SUCCESS

These 3 cases are considered as success stories in particular because they:

- Valorise **mainly or exclusively waste** wood for energy production (BKO Odenwald, ULM and KOEHLER)
- Comprise an **integrated organization**: KOEHLER Group involves the supplier, the energy producer and the consumer (paper mill), the heating network of ULM relies on several biomass or waste to energy plant, BKO involves as a shareholder AWN which is a public organism in charge of the waste collecting
- Prepare directly on site the biofuel **from bulk waste wood** (BKO Odenwald).

THE REASONS WHY BADEN-WÜRTTEMBERG IS A MODEL REGION

Baden-Wurttemberg is a model region in Europe for the management of waste wood for several reasons:

The German context is suitable and incentive

- Ordinance of waste wood (2002) which have given to the relevant actors a clear framework, allowing them to undertaken projects with a visibility in long term
- Landfill forbidden
- Incentive feed-in tariff
- Necessity of stop using coal and decision to stop nuclear
- Long experience of district heating network with incineration of municipal waste
- Long experience of separated collecting and recycling.

The region of Baden-Wurttemberg has assets conferring it the status of model region:

- Presence of facilities for sorting of waste wood (Karlsruhe, Ulm)
- Presence of 4 biomass plants consuming waste wood (at least 250 000 tons per year)
- The region hosts several districts heating network, included ULM
- The region hosts several industrials producers of wood panel and numerous industrials with high needs of steam.



At last, the region hosts several technical and research centres (KIT, EIFER...) which can accompany the development of the valorisation of waste wood.

LOMBARDY (IT)

Lombardy and Emily-Romagna which host 14 million of inhabitants forms an area considered as one of the richest region of Europe. Quantities of waste wood reach nearly 1 million tons (4,4 million tons for whole Italy).

NATIONAL CONTEXT

- Market

Italy produces more than 4,4 million tons of waste wood and imports 500 000 tons from France mainly but also from Switzerland, for recycling valorisation in panel industry. Wood waste is mainly used in the panel industry in Italy (89% according to WKI) thanks in particular to an organization for the optimized collection of wood waste.

- Regulations

The main regulation directly regarding or with a link with recycling of waste wood are:

Decree on recycling of non-hazardous waste

Decree for production of electricity of 2012

System of green certificates: a minimum share of renewable energy in the production of energy is imposed.

The producer pays a tax if the green energy rate is not high enough

Since 1 January 2012, Italy has prohibited the land filling of combustible waste with a calorific value greater than 13 MJ/kg.

Italy is one of the three European countries that started early on the road to the end of waste status for high-quality CSR. Italy has early also introduced a CSR standard: UNI 9903

Regarding collecting, Rilegno is the organism in charge of the collecting of wood packaging mainly but also wood waste; this way of collecting is unique in Europe. In France for example, ECOMOBILIER collects only furniture's waste wood. Rilegno provides a wood waste collection and recovery service for 4 300 Italian municipalities, covering 38,5 millions of inhabitants, 65% of the national population.

REGIONAL CONTEXT

Lombardy hosts no energy plants based on waste wood but the region is the core of the panel industry in Italy. And some Italian manufacturers use up to 100% of waste wood for panel production. Besides, Lombardy beneficiates of relevant structures as ASSOPANNELLI (National Association of the panel maker and in semi-finished wood) and CMC-TEXPAN (panel industrial designer).



CASE STUDY: ECOLEGNO ET GRUPPO SAVIOLA: 100% OF WASTE WOOD IN PANEL BOARD

Mauro Saviola Group collects and processes 1.5 million tons of post-consumer wood material per year:

Service of collection of waste wood is based on collaboration with more than 1 000 municipalities

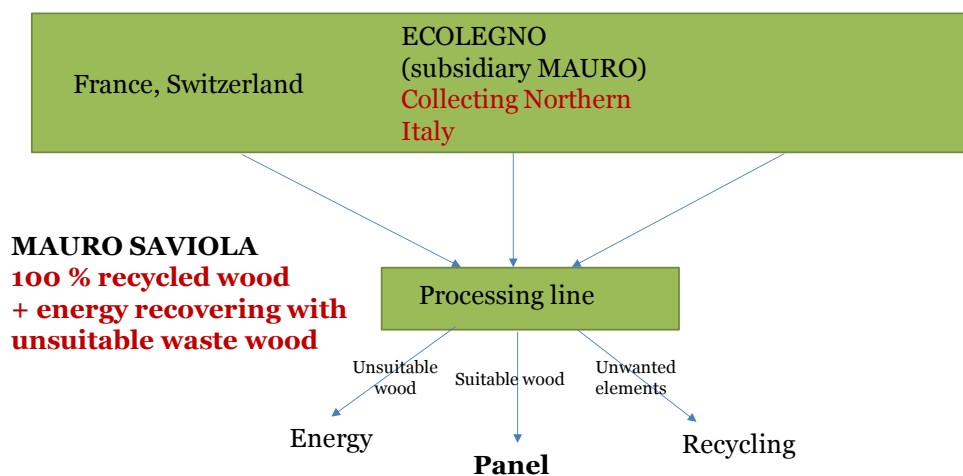
Ecolegno: A network of platforms (collection centres) located close to the major urban centres

Each collection centre is equipped with means with spider and containers to be left on deposit at the company.

- Collecting

Centres are mainly located in Northern Italy, and in particular in Lombardy and Emily-Romagna. The Saviola Group is the only one to use 100% recycled wood on the entire range of particle board.

Figure 4. Organisation of the collecting and of the valorisation (CEDEN)



- Transformation of waste wood in both panel and energy

After sorting/visual checking, waste wood pass through in a processing line (process - purely mechanical - dedicated to the cleaning material). The sorting equipment ("traps"), allows the separation of everything that is not wood, without using chemical solvents or reagents:

Tub to remove inert materials, such as stones,

Magnets to attract the iron

Eddy current for non-ferrous material

Centrifuges that operating a gravity separation ...

Even materials other than wood are destined for recycling. All production waste (iron, plastic, paper, aluminium, glass, present in the incoming wood), once separated, are then forwarded to the companies that recycle them. Recycling of iron concerns up to 20 000 tons per year.

The emissions from combustion are regulated by electrostatic filters capable of capturing dust and organic substances.



CAUSES OF ITS SUCCESS

The panel manufacturer MAURO has created a subsidiary (ECOLEGNO) in charge of collecting waste wood and ensure supply. ECOLEGNO has set up a network of centers in Northern Italy in order to collect waste wood from municipalities as well as industrials. Besides, ECOLEGNO is well located for collecting waste wood from France and Switzerland. MAURO uses 100% of waste wood for processing panel, thanks to an important and efficient preparation sorting chain. The woody part not exploitable derived from screening and cleaning of the material is burned to power the processes. It thus produces electrical and thermal energy to be used in the production cycle, so as to drastically reduce the consumption of fossil fuels.

THE REASONS WHY LOMBARDY IS A MODEL REGION

Lombardy/Emily-Romagna is a model region in Europe for the management of waste wood for several reasons:

- The Italian context is suitable and incentive
 - o Landfill restriction
 - o Green certificates
 - o Specific collecting of waste wood (Rilegno but also private companies as ECOLEGNO or VALORI)
 - o Wood panel industry with the higher rate of recycled woods for production of panel in Europe.
- The Lombardy/Emily-Romagna region has assets conferring it the status of model region:
 - o Presence of numerous centres for collecting waste wood
 - o The region hosts several panel industrials of which at least 3 currently use recycled wood
 - o Besides, the region hosts several associations, clusters and industrials (Assopannelli, Lombardy Energy Cluster, Texpan...) which can accompany the development of the valorisation of waste wood.

NORTH WEST ENGLAND (UK)

North West England is one of nine regions in England. NUTS 1 id is UKD. The area 14 165 km², population according to Eurostat 7 187 231. Density of population is around 500 people on 1 km². Crude rate of total population changes 4.3%. Purchasing power Standard (PPS) per inhabitant 25.200.0. Gross value added 231 billion-pound, 18 438 pounds per habitant. There are 2 cities with more than 400 K inhabitants- Manchester and Liverpool. Region has 3 National Parks and 3 areas of Outstanding Natural Beauty.

NATIONAL CONTEXT

In the UK the traditional destination of waste wood as alternative to landfill disposal was the recycling into mainly feedstock for panel board or animal bedding. During the past five years, the UK's Renewable Energy Policy has driven a shift in the use of woody biomass including waste wood, for energy purposes. The Renewable Obligation Scheme earlier and the Renewable Heat Incentive later, have created the conditions for a massive use of woody biomass in large-scale plants for power generation, as well as for combined heat and power, and heating and cooling applications. The UK's Renewables Policy has played a big part in this, realising rapid growth in biomass supply to generate electricity.



Between 2016 and 2017 around 3.5 million tonnes of waste wood were recycled or recovered into the industry's mainstream products, including feedstock for panel board, animal beddings, arena and play area surfaces. In the same period the use of waste wood for energy has increased significantly. In 2016 around 1.5m tonnes of processed postconsumer waste wood were delivered to biomass facilities. This trend is likely to expand even further in 2018 and 2019, when new biomass plants should become operational, with a capacity addition that should generate a demand of over 2 million additional tons of biomass for energy use. Biomass plants and co-fired plants that accept recovered wood as fuel must comply with the Waste Incineration Directive (WID). The WID aims to minimise the environmental impact of waste burning and specifies what types of biomass can be used as feedstock for energy plants. At present, only clean recovered wood can be burnt in non-WID compliant plants, whereas wood that contains contaminants can be burnt only inside a WID-compliant boiler.

CASE STUDIES

TOUCH WOOD (EMERGE)

Emerge is network of wood recycling social enterprises providing an efficient and cost-effective collection service for all types of waste wood from all sorts of building sites. Touch wood is an initiative started in April 2013 as a member of the National Community Wood Recycling Project (NCWRP), with a charity purpose.

The project covers the areas of Great Manchester and its surroundings, collecting all types of waste timber, wood composites, furniture and wooden among other useful materials. After the classification, volunteers (usually unemployed people) transform the less valuable pieces in new items that can be sold such as benches or garden sheds.

CASE STUDY: HARTFIELD

Hadfield Wood Recyclers is one of the largest and oldest wood recyclers in the UK. It handles wood waste for many national and international waste management companies, local authorities and other public sector bodies as well as businesses from all industries, including construction, waste and retail.

The company recovers around 250,000 tonnes of waste wood in total a year, recycling it into a range of products including animal bedding, arena and play surfaces, panel board feedstock, as well as biomass wood chip.

At the same time as the industry undertakes waste fire trials aimed at influencing storage regulations, the UK is also currently awaiting a huge increase in capacity for burning recovered wood to produce renewable heat and energy. The UK currently has in operation about seven biomass energy plants which count recovered wood among their feedstock ranging from very large tonnage capacities to very small, making up what would be an absolute maximum total UK capacity of under 1.3 million tons. Based on the available knowledge and estimation, there would be as many as 23 operating across the UK by 2019, potentially representing a massive 2.5 million tons increase in waste wood capacity, almost trebling the current UK total. Among the plants planned to implement, one of the largest ones is located in Great Manchester.



WORKSHOP WITH STAKEHOLDERS FEEDBACK

A workshop has been organised following the project management meeting on June 29, 2017 in the Institute of Soil Science and Plant cultivation of Pulawy (Poland). The objective of this workshop was to analyse and assess the good practices that were identified during the previous stages of BioReg by involving external experts from beneficiary Regions (regional authorities, industrial associations).

Photo 3. Attendees to the workshop



Since only polish experts were available to attend the workshop, it has been decided to contact Portuguese and Norman experts afterwards and transcribe their recommendations and remarks in the present document.



Table 4. List of attendees to the workshop

Name	Organisation
Ana Luisa Fernando	FCTUNL
Teodora Marinova	EP
Natali Dimitrova	EP
Klaus Supancic	BIOS
Marina Vargas	EUBIA
Mathieu Fleury	ARBN
Paul Antoine	ARBN
Dominique Boulday	CEDEN
Lia Detterfelt	RENOVA
Paweł Radzikowski	IUNG
Tomasz Noga	
Małgorzata Gałczyńska	FRL
Mikołaj Rudawski	Timberpak
Alina Bochniarz	IUNG
Krzysztof Borzęcki	IUNG
Magdalena Borzęcka	IUNG
Rafał Pudełko	IUNG
Wiesław Oleszek	IUNG
Małgorzata Wydra	IUNG
Małgorzata Kozak	IUNG
Anna Jędrejek	IUNG
Jerzy Kozyra	IUNG
Alina Syp	IUNG

LUBELSKIE (PL)

Waste wood is a very important subject according to the attendees of the workshop. Especially to those who are directly involved in the works on organization of the market for collecting and purchase of wood waste in the area of Northern and Eastern Poland. The presented solutions outline the scale and rate of creating and reusing waste wood in particular countries based on the definition of their classification. Considering the structure and scale of the wood waste generation, the following matters should be taken into account:

1. The site where waste occurs (household or industry in general sense)
2. Sources of waste wood



3. Public attitude towards environmental protection and lack of awareness among the younger generations of the role of wood waste
4. Legislative solutions regulating the trade of wood (countries which produce wood and put it on the market may reduce wood waste generation due to reusing it in industry)
5. Inconsistency in the classification of wood waste in particular European countries
6. Lack of actors specializing in wood waste processing and utilization, and possible reuse in industry
7. Increase in the proportion of RES in particular countries (Germany, Sweden) which affects the burning of wood beyond identification
8. Increase in the proportion of wood waste in heat production (pellets, briquettes, sawdust)
9. Dispersed structure of wood waste reuse in particular countries in relation to the energy industry
10. The export of wood products from particular countries generates the share of wood waste in a country which did not produce it, e.g. pellets.

Presentation delivered by Klaus Supancic on Austrian experience showed that depending on a region - competition and local public awareness, the process of collecting waste wood may be conducted smoothly or be full of challenges. It has been noted that there is a need for organizing an information campaign on the possibilities of wood waste management. It is also crucial to educate the young generation on the importance of waste segregation and reusing of wood residues including waste wood. Building the awareness of proper waste and waste wood management should take place in schools from the very beginning of the educational process. It will allow us to improve the quality of natural environment at the micro- and macro- scale, eradicating both residential combustion of old furniture as well as dumping those in forests, and the quality of the air we breathe. Promotion of these ideas may be initiated in the Lublin Eco-Energy Cluster. Furthermore, a representative of the Cluster suggested creating of a working group on the re-use of wood waste and promoting the idea on the lke.fundacja.lublin.pl website. It was also suggested to promote these ideas within the potential energy clusters in Lublin voivodeship.

In case of Poland crucial are Polish and EU legal regulations, particularly the possibility of introducing incentives, such as tax exemptions for actors handling re-use of wood waste. Emphasis should be placed on the creation of the wood waste management system at local and regional levels, or creation of local centres for collecting wood waste. It was also underlined that there is a need for creating a team for promotion and development of actions related to re-use of wood waste in the Lublin voivodeship.

In Poland it is important to increase the share of RES in the total energy production, and countries such as Germany and Sweden may serve as examples. Particular attention was paid to the presentation delivered by Lia Detterfelt from Renova, who presented the waste wood and biomass management at a highly advanced level. Thanks to the awareness of the role of the abovementioned materials for the country and its economy Sweden achieved a high degree of energy autonomy and self-sufficiency, e.g. when it comes to heat energy.

In the light of the foregoing, at the current legislative stage it is difficult or even impossible to indicate the solutions fitting into the European model of wood waste management. The above aspects need to be clearly defined with the emphasis on classification and a model defining and determining the percentage of waste should be presented for each country. Additionally, there is a lack of institution or organization, which would associate private actors dealing with wood processing, and which would report on the share of this kind of waste.



NORMANDY (FR)

Experts from Normandy could not join the workshop organised in Poland. Thus, it has been decided to contact them afterwards in order to question them and gather their comments and suggestions.

Three experts have been interviewed by Mathieu FLEURY, Director of Biomasse Normandie:

- Pascal LEON, Wood expertise major account development director for SUEZ R&V Trading France, Member of the Executive Board of FEDEREC (Professional federation for recycling companies) and President of FEDEREC Wood and Pallets
- Louis DE REBOUL, Recycled wood and wood fuel department Director for VEOLIA Propreté France Recycling
- Jean-Jacques RIBOT, President of BIOCOMBUSTIBLES SAS.

As part of the BioReg program, which consists in the identification of good practices regarding waste wood valorisation in European model regions in order to replicate them afterwards in beneficiary region, national and regional expertise have been requested on these thematic.

On the 7 million tons of waste wood are produced every year in France, 1.4 million tons are sparsely or not valorised. Sometimes, waste wood are even not collected and burned in open air or landfilled as a mix with other wastes. Simultaneously, the producers' responsibility regarding wooden furniture enables the collect of additional waste wood volumes that have been quantified at 200 000 tons at the present time; perspectives assess the waste wood flows originating from this chain at 600 000 tons a year in 2020.

However, it exists a certain number of barriers to overcome that do not enable the valorisation of the resource in France. The direct consequence is a growth of exported flows and a massive congestion of storage platforms.

Regarding waste wood that are still landfilled in France, the State of the art led by the BioReg program showed that the countries which valorise these streams are the ones where a dissuasive landfilling tax is applied or where it is even forbidden to landfill waste wood such as in Sweden or Germany.

Questioned experts fully approve this analysis while warning on the necessity to find out outlets in France in advance because of the additional amounts of waste wood that would inevitably be collected. One of the suggested solution would consist in an adjustment of the regulatory framework for combustion installations section 2910B adapted to waste wood, which implies beforehand to implement a new reliable classification as it has been done in Germany. In this context, representatives of several professional federations are presently formulating proposals to the French administration.

ICPE (Classified Installations for the Protection of the Environment) Rubrics currently available in France for waste wood energy recovery are linked to the incineration and co-incineration (sections 2771 and 2971). The implementation of such projects faces several obstacles:

- Very high investment and operating costs
- Complex societal acceptability



- Subsidies system not fully suitable and dedicated to these issues
- Lack of flexibility regarding the contractual supply plan of existing facilities (where it can be mandatory to burn large amounts of forest residues for instance).

To that day, the 2771 and 2971 installations are supplied with wastes (RDF, household wastes ...) at more competitive prices than waste wood. Without a sizable landfilling tax and a high landfilling cost, the situation will remain unchanged without a way to solve the flows beside temporary exportations.

Regarding waste wood material recovery, there will not be any major upheaval to expect in the future. Panel manufacturers will be able to incorporate more waste wood if markets are promising and growth is confirmed in the building sector. Objective of additional 400 000 tons/year in 2025 has been taken as hypothesis within the CSF* works by considering an increase of the incorporation rate from 37% to 45% of recycled woods in the French panel board industry.

CSF is the Strategic Chain Committee, a task force formed on the ministries initiative as part of industrial branch development.

ALENTEJO, LISBOA (PT)

Experts from Portugal could not join the workshop organised in Poland. Thus, it has been decided to contact them afterwards in order to question them and gather their comments and suggestions. A meeting was scheduled in Porto on the 25th September 2017, in a parallel event to the Conference “Wastes – Solutions, Treatments and Opportunities”. In this meeting, several stakeholders participated in the discussion. There were scientists and academics with competences in the area of biorefinery and valorisation of wastes; representatives of associations linked with the recovery and recycling of wood packaging and waste; entrepreneurs linked with collection of wood waste; entrepreneurs linked with the wood reuse and recycling; entrepreneurs linked with panel industries and energy technologies based on carbon-based feedstock's. A total of 14 participants attended this meeting. Participants from municipalities and some governmental institutions could not attend but they were also informed about this report.

In this meeting the project was presented along with the presentations of the wood waste valorisation practices followed by the model regions.

The total amount of wood waste produced in Portugal, in 2014, was 0.27 million tons. In the region of Lisbon, 67 thousand tons of wood waste was produced (25% of the total wood waste being produced in Portugal). In the region of Alentejo, only 27 thousand tons of wood waste was produced (10% of the total wood waste being produced in Portugal). The recovery of the wood wastes is high. On average in Portugal, 89% is being recovered. But information relating the amount being recovered per region is lacking. However, there is no knowledge on how the wood waste is being reused to more than half of the wood waste recovered (156 thousand tons, 57% of the total wood waste). A survey indicates that part of those wastes and being reused either for household storage or in home heating systems. Reuse of wood waste as material represents 28% of the total wood waste being produced in Portugal (77 thousand tons). Statistics of Portugal indicate that 10 thousand tons of wood waste are being recovered for energy (3.5% of the total wood waste).



Therefore, experts indicate that there are still options for improvement regarding the knowledge on how the wood waste that is being collected is reused and recycled. And they also have agreed that knowledge on the regional status of those wood wastes would help to define strategies. Moreover, concerning the non-hazardous wood wastes, and based on the presentations made from the model regions, they identified that the current known use of wood wastes for pellets, energy and materials (such as panel board), can be also improved. The majority of the audience identify that wood recycling and cascading use are some topics that are wide open to innovative solutions that can provide excellent products, with added benefits towards the green and the carbon economy and the circular economy. However, they have stressed that the new and innovative solutions should be sustainable, not only from the economic point of view but also environmentally and socially. Everybody in the audience agreed that only non-hazardous waste wood that cannot be recycled should be used as a source of energy and this information should be better transmitted to the different stakeholders and nationwide. Stressing that recycling is mandatory to prolong the life of the forest, and allows carbon to be kept preserved should be campaigned to reach a wider audience. Recycling through the incorporation of more waste wood in biomaterials (such as those produced by panel manufacturers) is promising, especially because we are assisting to a boom in the building sector along with consumer preferences for more ecological options. In the meeting it was also highlighted that some objectives for the sector should be imposed. If the municipalities adhere, objectives could be given per region. BioReg project could be a tool to link stakeholders and to improve discussions in this field.

Regarding contaminated waste wood, the information gather indicates that, currently those wastes after being collected they are channeled to CDR (waste-derived fuels) production units where industrial pellets are produced. These industrial pellets are delivered to cement factories that have the licence, and are certified, to use them in their furnaces. Yet, experts warned to the necessity to find additional solutions to this contaminated waste. In fact, the amounts of hazardous wastes (where wood wastes are included) exceed the capacity and the needs of the cement factories and incinerators available in the country which causes market prices to be controlled by those incinerators and cement factories. Representatives of entrepreneurs from CDR's production units are already in association trying to overcome this problem. Suggestions made are linked with the hypothesis to link those wastes in a cascading use. In addition, societal acceptability is keen on solutions addressing the bio refinery concept and not the incineration option currently in place.

The BioReg project and the solutions presented by the model regions can also provide additional information for the different stakeholders. But those solutions presented by the model regions need to be evaluated by the different stakeholders with care, in order to understand if they fit the Alentejo and Lisbon regions situation. Adjustments of some regulatory frameworks adapted to wood waste were also highlighted as hypothesis following some examples from other countries in the European Union limits.

Barriers to improve solutions to recycle and reuse more wood waste are majorly connected with the investments needed and the operating costs. On the other hand, innovative solutions require specialized personnel which can also contribute to reduce the exodus of skilled persons from regions such as Alentejo.



CONCLUSION

All stakeholders involved in the workshop were in agreement that there is a need to:

- Organise educational programs for a wide audience or information campaign on possibilities of managing wood waste - (energy production, compost preparation material, litter for animals, raw material for panel panels, furniture, decorative elements)
- Change of legal regulations binding in the EU and in National laws
- Improve of a local and regional level of waste management system
- Creation or improvement of local collection centers for wood waste
- Develop of R & D in the reuse of wood waste.

ANNEXES

Annex 1. Presentation of Wood waste management in Lubelskie, Normandy, Lisboa and Alentejo Regions

Annex 2. Presentation of good practices in wood waste management- Austria

Annex 3. Presentation of good practices in wood waste management - Italy

Annex 4. Presentation of good practices in wood waste management - Sweden

Annex 5. Presentation of good practices in wood waste management – UK

Annex 6. Presentation of good practices in wood waste management – Germany

