



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

### D2.2: TOOLBOX DOCUMENT OF EU SUCCESS FACTORS

To the attention of the Research Executive Agency

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## Document Approval

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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

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According the conclusions of WP1 and tasks 2.1 in WP2, this document aims to identify and to provide a toolbox of EU success factors for sustainable wood waste valorization which will be available at the BioReg platform.

The implementation pathways or trajectories for the case studies examined were analysed and 'success factors', i.e. factors that have contributed to the development of successful wood waste ecosystems, were identified. The factors were linked to the classification developed in the previous task (2.1) and to the information collected in WP1.

The information collected and systematized was the basis for the construction of a toolbox of EU success factors which will be available at the BioReg platform.



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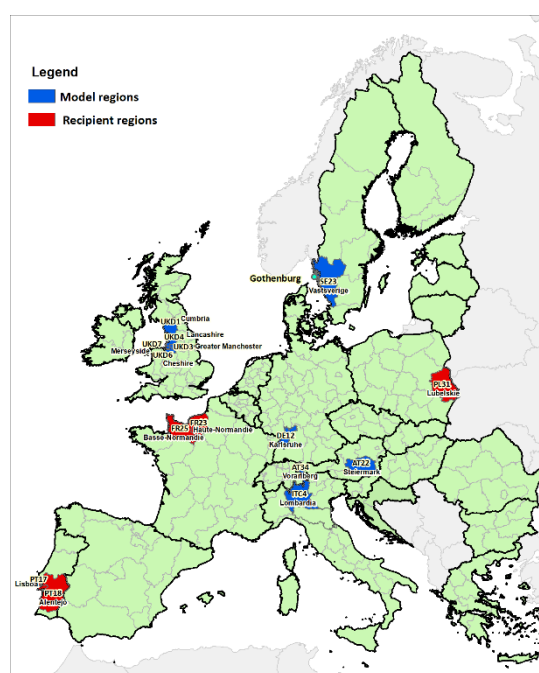
## ABBREVIATIONS

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.

## 2 INTRODUCTION

The BioReg project aims to identify good practices that could be implemented in the recipient Regions. Within the project five model regions were identified and analysed. The information related to those regions was presented in the workshop held in Pulawy, Poland. The best practices from model regions were identified and presented to the stakeholders from recipient regions.

Map 1. : Regions of BioReg project



This task aims to systematize the information collected that aimed to identify the EU success factors that contribute to a sustainable wood waste valorization. The output of the task will be a toolbox of EU success factors which will be available at the BioReg platform.

Findings and evidences highlighted in WP1 and tasks 2.1 of WP2, as well as discussions among partners led to the identification of the EU success factors that contribute to a sustainable wood waste valorization. The information collected was systematized according to the following:



- For every model region, a check list was made towards four different subjects: i) the existence of legislation and policies that promote wood waste valorization; ii) the existence of classification, conditioning and sorting platforms ; iii) the valorization as energy; iv) recycling.
- Identification of common features among the model regions.
- Identification of the EU success factors for sustainable wood waste valorization.
- Construction of a toolbox of EU success factors which will be available at the BioReg platform.
- Conclusions and recommendations.

### 3 EUROPEAN SUPPORTIVE LEGISLATION

The orientations of the European Union towards waste management hierarchy and objectives in terms of recycling, landfilling reducing, and production of renewable energy sources has made it possible to increase waste wood valorisation in whole Europe. Effectively, waste policies and legislation, strategies of energy recovery, renewable energy production and reduction of greenhouse gases have an impact on the management of wood wastes. Taxation, which varies from country to country, also influences management methods.

The most significant and relevant waste policies and legislation that represent an impact on the management of wood wastes within the European framework are described below:

- 1) Waste framework Directive (2008/98/CE), it aims to encourage national waste prevention programs and promote recycling and recovery of waste. This Directive reinforces the principle of hierarchy of waste treatment methods by encouraging Member States to prevent, reuse, recycle and, ultimately, eliminate, by this order.
- 2) Directive 2009/28 / EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources. The Directive creates a common framework for the use of renewable energies in the EU to reduce greenhouse gas emissions and promote cleaner transport. To this end, it sets targets for all EU countries with the overall ambition of achieving a 20% share of energy from renewable sources in EU energy and a share of 10% of this type of energy in transport by 2020.
- 3) Decision N ° 406/2009/EC, to reduce CO<sub>2</sub> emissions in the EU countries by 20%
- 4) Directive 2010/75/EU on industrial emissions (the Industrial Emissions Directive or IED) which regulates pollutant emissions from industrial installations. It aims to take into account the whole environmental performance of the plant, covering e.g. emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure. For certain activities, i.e. large combustion plants (capacity of more than 50 MW waste), incineration and co-incineration plants, among others, the IED also sets EU wide emission limit values for selected pollutants.
- 5) Medium Combustion Plant (MCP) Directive (Directive (EU) 2015/2193) is on the limitation of emissions of certain pollutants into the air from medium combustion plants and it regulates pollutant emissions from the combustion of fuels in plants with a rated thermal input equal to or greater than 1 megawatt (MW) and less than 50 MW. This Directive fixes limit values for the emission of SO<sub>2</sub>, NO<sub>x</sub> and particles (dust) from those plants.



## 4 WOOD WASTE VALORIZATION IN MODEL REGIONS: CHARACTERISTICS

For every model region, a check list was made towards four different subjects: i) the existence of legislation and policies that promote wood waste valorization; ii) the existence of classification, conditioning and sorting platforms; iii) the valorization as energy; iv) Recycling.

### 4.1 GOTHENBURG (SWEDEN)

Map 2 shows the Gothenburg region.

Map 2. : GOTHENBURG Region

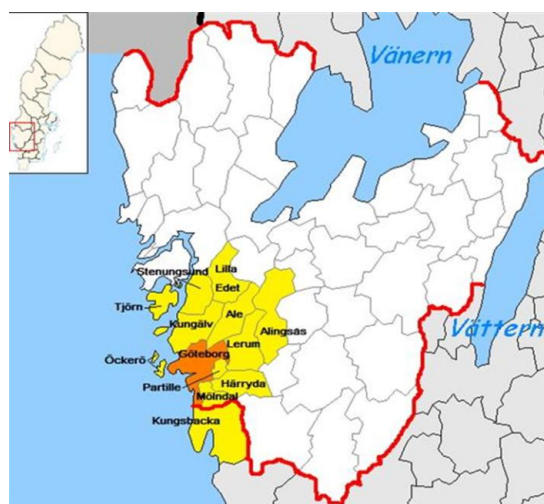


Table 1 shows the characteristics towards the wood waste valorization systems identified in the Gothenburg Region.

In the Region there are Industry players – e.g. Renova, Goteborg Energy, industry clusters.

*Table 1. Characteristics towards the wood waste valorization systems identified in the Gothenburg Region*

Legislation and policies that promote wood waste valorization	<ul style="list-style-type: none"><li>• Landfilling is not allowed</li></ul>
Existence of classification, conditioning and sorting platforms	<ul style="list-style-type: none"><li>• Sorting by waste wood and impregnated wood</li><li>• Waste wood, separated between treated and non-treated</li></ul>
Valorization as energy	<ul style="list-style-type: none"><li>• Non-treated, clean wood, energy recovery in biomass Combined heat and power plants (CHP)</li><li>• Treated wood, sold for Energy recovery mainly to produce energy for the pulp and paper industry</li><li>• Impregnated wood, sent to the Waste-to-Energy plant</li></ul>
Recycling	<ul style="list-style-type: none"><li>• Non-existence</li></ul>



## 4.2 BADEN-WÜRTTEMBERG (GERMANY)

Map 3 shows the Baden-Württemberg region.

Map 3. : BADEN-WÜRTTEMBERG Region



Table 2 shows the characteristics towards the wood waste valorization systems identified in the Baden-Württemberg Region.

In the Region there are Industry players, a cluster portal, and research and technical institutes.

*Table 2. Characteristics towards the wood waste valorization systems identified in the Baden-Württemberg Region*

Legislation and policies that promote wood waste valorization	<ul style="list-style-type: none"><li>• Landfilling is not allowed</li><li>• Biomass plants to substitute coal and nuclear energy</li></ul>
Existence of classification, conditioning and sorting platforms	<ul style="list-style-type: none"><li>• Sorting facilities</li></ul>
Valorization as energy	<ul style="list-style-type: none"><li>• Waste wood, sent to biomass power plants to provide heat to district network and industrials, and electricity</li><li>• Waste wood to produce wood chips to provide energy to industrials</li></ul>
Recycling	<ul style="list-style-type: none"><li>• Recycling by incorporation into particle boards, MDF (35% in Germany)</li></ul>





### 4.3 LOMBARDY (ITALY)

Map 4 shows the Lombardy region.

Map 4. : LOMBARDY Region



Table 3 shows the characteristics towards the wood waste valorization systems identified in the Lombardy Region.

In the Region there are big Industry players, and clusters.

Table 3. Characteristics towards the wood waste valorization systems identified in Lombardy Region

Legislation and policies that promote wood waste valorization	<ul style="list-style-type: none"><li>• A minimum share of renewable energy in the production of energy is imposed</li><li>• Prohibited the landfilling of combustible waste with a calorific value greater than 13 MJ / kg</li></ul>
Existence of classification, conditioning and sorting platforms	<ul style="list-style-type: none"><li>• Sorting facilities, optimized collection of wood waste</li></ul>
Valorization as energy	<ul style="list-style-type: none"><li>• Mechanical treatment to all the collected wood waste, wood part not exploited to be auto-used for energy</li></ul>
Recycling	<ul style="list-style-type: none"><li>• Recycling by incorporation into panel boards, majority of players use 100% recycled wood on the entire range of particle board</li><li>• Recycling of wooden packaging, household wood waste to furniture</li></ul>



#### 4.4 NORTH-WEST ENGLAND (UK)

Map 5 shows the North-West England region.

Map 5. : NORTH-WEST ENGLAND Region

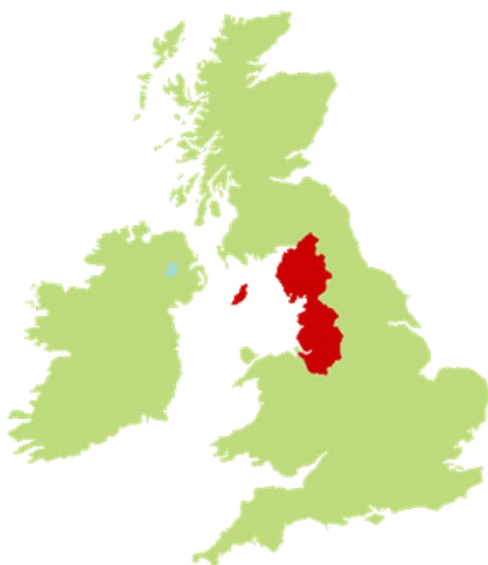


Table 4 shows the characteristics towards the wood waste valorization systems identified in the North-West England Region.

In the Region there are big Industry players.

*Table 4. Characteristics towards the wood waste valorization systems identified in North-West England Region*

Legislation and policies that promote wood waste valorization	<ul style="list-style-type: none"><li>• Landfilling is not allowed (or very expensive)</li></ul>
Existence of classification, conditioning and sorting platforms	<ul style="list-style-type: none"><li>• Sorting facilities</li></ul>
Valorization as energy	<ul style="list-style-type: none"><li>• Projected biomass power plant fuelled primarily by recycled wood (CHP)</li></ul>
Recycling	<ul style="list-style-type: none"><li>• Largest and ancient wood recycling plants</li><li>• Recycling through animal bedding, mulches, compost, coverings, paths, rides, arenas, garden products</li></ul>



## 4.5 STYRIA (AUSTRIA)

Map 6 shows the Styria region<sup>1</sup>.

Map 6. : *STYRIA Region*

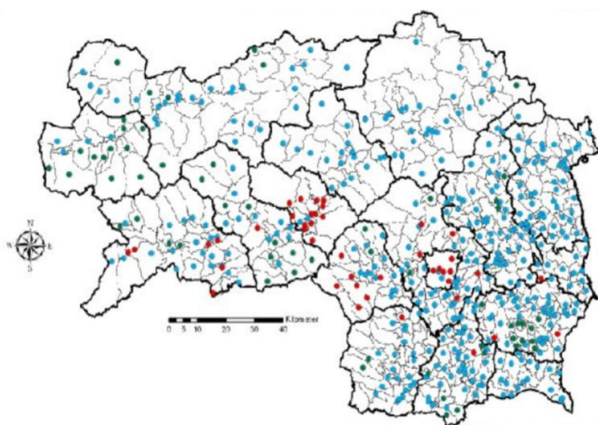


Table 5 shows the characteristics towards the wood waste valorization systems identified in the Styria Region.

In the Region there are Industrial players.

Table 5. *Characteristics towards the wood waste valorization systems identified in Styria Region*

Legislation and policies that promote wood waste valorization	<ul style="list-style-type: none"><li>• Ban of waste with an organic carbon content &gt; 5 % (weight) from landfilling</li></ul>
Existence of classification, conditioning and sorting platforms	<ul style="list-style-type: none"><li>• Sorting facilities</li></ul>
Valorization as energy	<ul style="list-style-type: none"><li>• Waste wood, sent to produce combined heat &amp; power and cooling plants - district heating plants, waste wood incineration plant</li></ul>
Recycling	<ul style="list-style-type: none"><li>• Recycling is being focused and wood burned for energy is being limited</li><li>• Recycling and pre-treatment waste wood treatment plant</li><li>• Recycling and sent to panel industry (out of the region)</li></ul>

<sup>1</sup> The model is very similar in the region of Vorarlberg.



## 5 IDENTIFICATION OF COMMON FEATURES AMONG THE MODEL REGIONS

Table 6 shows the common features among the model regions.

*Table 6. Common features among the model regions*

Regions	Legislation and Policies	Conditioning and sorting platforms	Valorization for Energy	Recycling
GOTHENBURG	✓	✓	✓	x
BADEN-WÜRTTEMBERG	✓	✓	✓	✓
LOMBARDY	✓	✓	x	✓
NORTH-WEST ENGLAND	✓	✓	✓	✓
STYRIA	✓	✓	✓	✓

In all the model regions it was observed that the existing legislation and policies contribute to promote the valorization of wood waste. In all the model regions it was also observed the existence of conditioning and sorting platforms that help to classify and sort the wood waste. Concerning the types of valorization, in Sweden, wood waste is entirely reused for energy. Antagonistically, in Italy all the wood waste is recycled, and reused by the panel industry. Only the wood waste that is not exploited is auto- used for energy. Concerning Germany, England and Austria, wood waste is being reused either for energy or being recycled. In England and Austria, the trend is to recycle, and in Germany, wood waste is majorly reused for energy. In all the model regions there are industrial stakeholders that valorize wood waste. It can also be argued that the geographical context can explain the models: the climatic heating needs in Northern countries and big forests contribute to a higher reuse of wood waste for energy. The coal and nuclear dependence in countries like Germany and France reduces the impact of wood waste reuse for energy.

## 6 IDENTIFICATION OF THE EU SUCCESS FACTORS FOR SUSTAINABLE WOOD WASTE VALORIZATION

Based on the information collected in WP1 and task 2.1 it is possible to identify what are the success factors that contributed to classify Gothenburg, Baden-Württemberg, Lombardy, North-West England and Styria as model regions for sustainable wood waste valorization. As systematized in point 4 of this document, all the regions present common features. Therefore, the following success factors can be highlighted as the ones that need to be implements in regions for sustainable wood waste valorization.

- National legislation and policies that promote the wood waste valorization (e.g: Germany ordinance);
- Suitable classification which ease management for producers and operators;
- Landfilling with organic waste prohibited, restricted/with very high taxes;
- Existence of a good network within the region or in the country to collect (e.g : Rilegno in Italy), to classify, to sort the wood waste;



- Existence of valorization options for wood waste in the region; those may differ from region to region and from country to country; Valorization for energy or recycling through incorporation into panel boards, are some options. Most of the model regions are constructing a pathway of valorization, that ranks first recycling and after energy, following the EU policies and recommendations. Reuse exists, in particular for beams from demolition which are more and more reused for construction (ex in Belgium). This mode of valorisation is badly known and badly estimated.
- Existence of solutions of valorisation for by-products (fine fraction generated by screening, ash from combustion)
- Existence of industrial players in the Region/Country with competences to valorize wood waste.

## 7 TOOLBOX OF EU SUCCESS FACTORS

Based on the information collected it is possible to construct a toolbox of EU success factors for sustainable wood waste valorization. This toolbox is presented primarily as a decision tree that can help recipient Regions and other regions to contribute to construct a robust system that will enable the valorization of wood waste. This decision tree is presented in Diagram 1.

To operationalize the design and implementation of wood waste valorisation practices in Europe, a toolbox of EU success factors has been developed.

This toolbox has been developed within the BioReg project, an EU project which aims to identify, develop and fully unlock the unused wood waste potential at European level and allow for the implementation of the full range of wood waste valorisation practices among European regions.

This toolbox was prepared to give clear indications to the different stakeholders on what exactly they should focus when building up new valorisation options. Several groups linked with wood waste valorisation have been identified to whom the toolbox could be useful: policy makers; waste management stakeholders linked with classification, collection, sorting, valorisation options and deposition; wood waste recycling units; energy processing units; researchers and academia; general public.

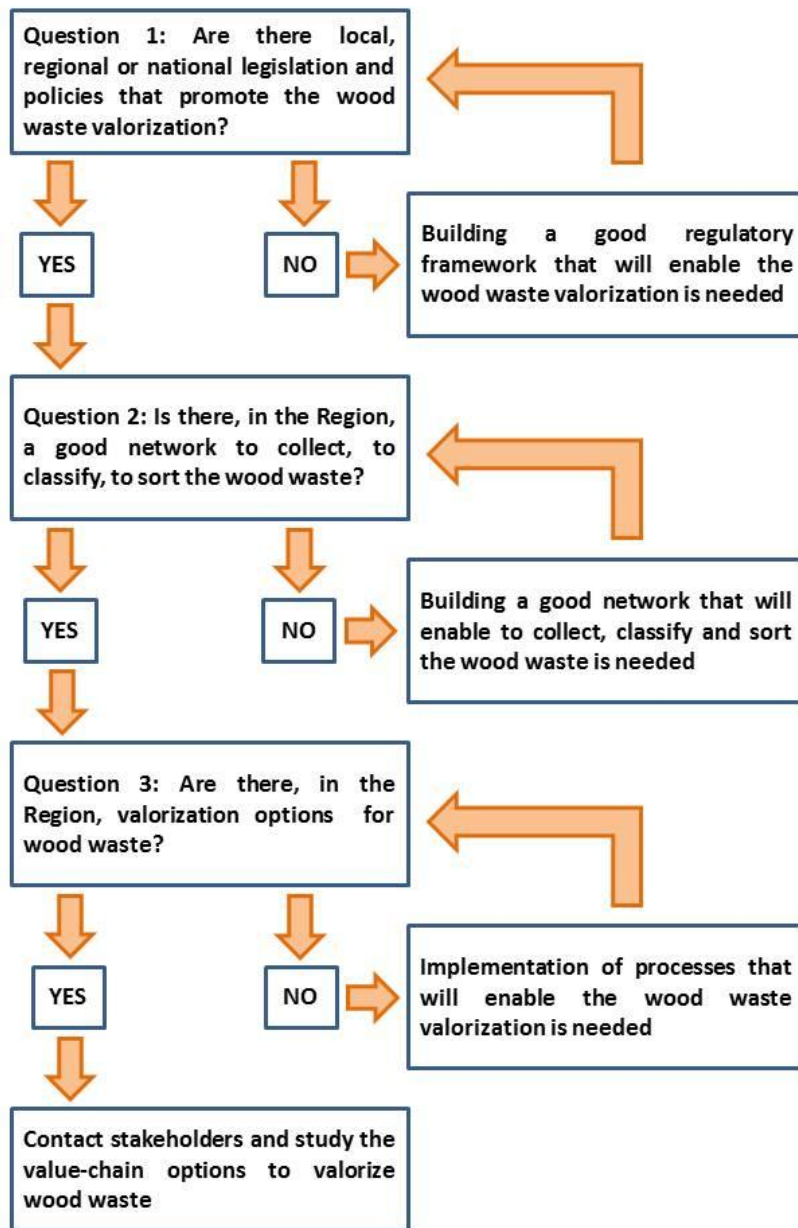
This toolbox is made to provide a practical and useful starting point to support the application of the different steps and key activities towards wood waste valorisation.

The toolbox has been structured in four levels of information, (1) main page with the identification of the different stakeholders and the aim of this toolbox; (2) for each group of stakeholders, scene setting up; (3) key activities; (4) examples taken from the model regions. An overview of this structure is presented in Figure 1a and b.

The following chapters will describe tools for the different groups of stakeholders.



Diagram 1: A toolbox of EU success factors for sustainable wood waste valorization



## TOOLBOX OF EU SUCCESS FACTORS

- ✓ To operationalize the design and implementation of wood waste valorisation practices in Europe, a toolbox of EU success factors has been developed.
- ✓ This toolbox was prepared to give to the different stakeholders clear indications on what exactly they should focus when building up new valorisation options.
- ✓ This toolbox is made to provide a practical and useful starting point to support the application of the different steps and key activities towards wood waste valorisation.

Policy makers

Waste management

Wood waste recycling

Energy processing

Researchers and Academia

General Public

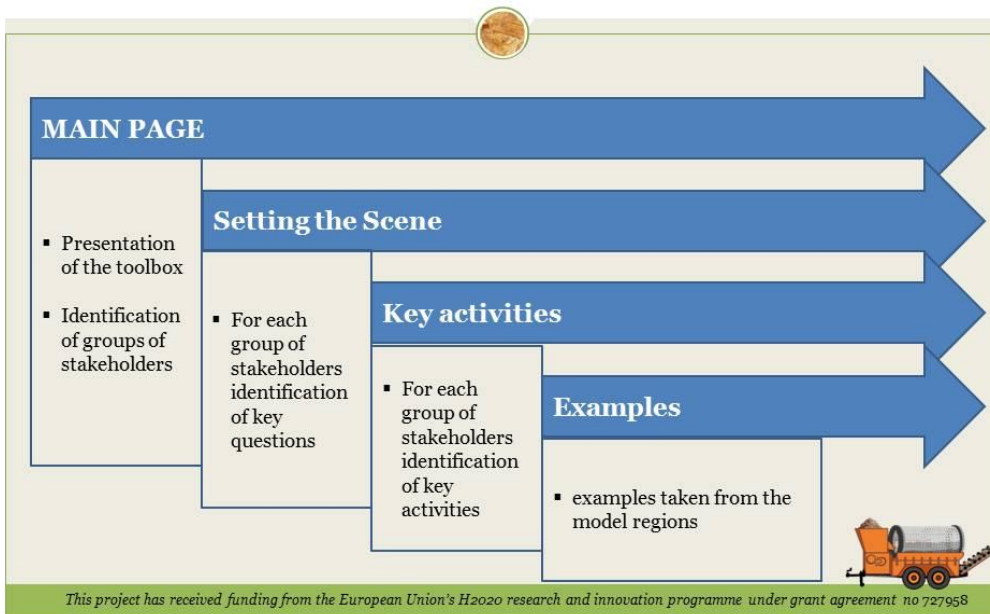
*This project has received funding from the European Union's H2020 research and innovation programme under grant agreement no 727958*

(a)





## Toolbox of EU success factors



(b)

Figure 1. Main page (a) and four-level structure of the toolbox (b)

### 7.1. Policy makers tool

Supporting policy-makers developing adaptive policies and legislation in Europe towards wood waste valorisation is the main aim of this tool.

This step defines that a current baseline analysis of the existing institutional, political and legal framework in wood waste valorisation is needed. The scope and direction of necessary interventions is then derived from comparing the regulatory framework with the defined objective, for example, encouraging the valorisation of wood wastes either by energy recovery or recycling into new materials.

The implementation and development of wood wastes policies depend on various factors. These include governance, communication, shared common objectives, financial resources and influence, coordination of actions and stakeholder and public management, amongst others.

Key-Question: Are there local, regional or national legislation and policies that promote wood waste valorisation?

#### 7.1.1. Key activities





### **Step 1: Identification of the existing institutional, political and legal framework in wood waste valorisation**

#### Gather information and determination of the current situation

- Overview of the current situation of national legislation and policies regarding waste valorisation

**Step 2: Identification if the existing institutional, political and legal framework in wood waste valorisation is effective or if building a good regulatory framework that will enable the wood waste valorisation is needed.**

#### How to do it?

✓ Involvement of experts and stakeholders

- Identification of the group of experts and stakeholders to be involved
- Understand the expertise, skills and roles of those to be involved
- Analysis of the current existing institutional, political and legal framework in wood waste valorisation

**Step 3: The existing institutional, political and legal framework in wood waste valorisation is effective - no further action is needed**

-

**Step 4: The existing institutional, political and legal framework in wood waste valorisation needs to be improved**

✓ Involvement of experts and stakeholders

✓ Development and definition of policy principles and goals

- Definition of key principles that will act as a guideline throughout the policy design and implementation.
- Definition of policy goals and the criteria to determine when these goals are achieved.
- Agreed on a common understanding (i.e. consensus) of the issues to be treated among policy makers, experts and stakeholders.

#### **Tools for policy makers (Step 2 and 4)**

Policy and stakeholder meetings

Policy makers and stakeholder workshops / Implementation of a strategic committee

Policy makers and stakeholders analysis

Institutional analysis



#### **Possible actions from policy makers (Step 4)**

Structuring the offer of wood waste products: development of a suitable classification system for the wood waste

Increment of the exploitable deposit by building a good regulatory framework that enhances collection and reduces landfill

Building of a good regulatory framework that helps the development of efficient sorting systems of different classes of wood waste

Building of a good regulatory framework that promotes wood waste recycling options and the development of wood waste recycling units

Building of a good regulatory framework that promotes energy recovery from wood waste and the optimization of wood waste energy processing units

#### **7.1.2. Examples from model regions**

##### Austria

Legislation and regulations

Austrian Waste Management Law (WML 2002)

- Definition of overall framework conditions
- Order of priority for waste management measures:
  1. Waste prevention/avoidance
  2. Preparation for re-use
  3. Recycling
  4. Other utilization measures (e.g. combustion)
  5. Disposal
- Definition of areas of responsibility
  - o Municipal waste and waste from commercial operations similar to municipal waste is managed by the nine Austrian provinces (municipal wood waste, demolition wood)
  - o All other waste is managed at federal level (industrial waste wood streams)



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

## Italy

Four main levels for energy and waste policies and regulation are co-existing in Italy:

- The national level is in charge of overall waste management strategy establishing the legislative framework, setting targets at national level and drawing up national waste management plan. Also the national level is where the national energy policy is anchored
- The regional level is responsible for preparing regional waste management plans based on criteria in national legislation; the formulation of plans for reducing landfilling of biodegradable municipal waste; defining ATOs (optimal areas for the management of waste) that are responsible for meeting targets on landfilling of biodegradable waste and separate collection of municipal waste. These plans must ensure that the collected wastes are assigned with some sort of treatment or disposal, and should include a list of authorized facilities. In Lombardy, the key actor is the Regione Lombardia with its Directorate-General for Environment, Energy and Sustainable Development.
- The provincial level (the ATOs) is responsible for developing waste management plans conforming to regional plans, for coordinating the municipalities waste management activities, and for identifying instruments for separate collection.
- The municipal level is in charge of municipal waste collection and of collecting charges for managing waste. The municipalities - or the operators they contract the waste collection service to - are legally responsible for disposal and treatment of the waste according to the directions given in the regional plans.

### Legislation and regulations

- Recycling of waste wood
  - o decree on recycling of non-hazardous waste
- Recovering in energy
  - o Decree for production of electricity
  - o Subsidies for the biodegradable part of waste which decreases with the power of the plant.
  - o Minor incentives for heat production.
- Italy has set up a system of green certificates:
  - o A minimum share of renewable energy in the production of energy is imposed.
  - o The producer pays a tax if the green energy rate is not high enough.
- Since 1 January 2012, Italy has prohibited the landfilling 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 RDF.
  - o Italy introduced a RDF standard: UNI 9903



### United Kingdom

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.

#### Legislation and regulations

- Environment Agency Permit required up to 50,000 tonnes/y (Exempt from Waste Management License)
- Waste Management License will be required for volume
- The UK environmental legislation 1990 'Duty of Care Regulations'
- UK Waste Packaging Regulations 1997
- PPC Regs 2002
- EWC Jan 2002
- WID 2004
- Hazardous Waste Regs July 2004
- BSI PAS 111: Processing wood waste

### Sweden

Preventing the creation of waste is the first step in the waste hierarchy.

The waste hierarchy priority is:

- waste prevention
- reuse
- material recycling and biological treatment
- other recycling (e.g. energy recovery)
- disposal



Swedish legislation sets the responsibility of waste management to the municipalities, to the producers, to the households and to the business, from separating and depositing to energy production and recycling.



## Germany

Germany has committed to a legally binding target of sourcing 18 per cent of its gross final energy consumption from renewable energy sources. The central pillar of the German renewable energy regime is the fixed feed-in tariff system (guaranteed tariff for 20 years) combined with a guaranteed right of access to the grid for renewable energy projects. The Renewable Energy Sources Act or EEG (first text in 2000) is a series of German laws that originally provided a feed-in tariff (FIT) scheme to encourage the generation of renewable electricity.

### Legislation and regulations

- 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 last 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
- Pollution Control Act on incineration and co-incineration -17. BImSchV)
- German Renewable Energy Sources Act “EEG”
  - o implementation of EU Directive 2009the 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
- Overall policy “energy transition” aiming to :
  - o phase-out nuclear energy by 2022,
  - o to significantly reduce fossil energy use in the longer-term (i.e. by 2050),
  - o and achieve GHG emission reductions in parallel.
- Guide VDI 4087
  - o The application of this standard contributes to a consistent approach for Germany in the approval procedures, the implementation and monitoring.
  - o The standard addresses operators, consultants, contractors and relevant authorities.
  - o 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.



## 7.2. Waste management stakeholders tool

Supporting waste management stakeholders towards wood waste classification, collection and sorting is the main aim of this tool.

This step defines the current baseline analysis of the existing network of waste management stakeholders operating in the wood waste collection, classification and sorting, in order to increase the wood wastes fraction subjected to recycle or to energy valorisation.

Key-Question: Is there, in the region, a good network to collect, to classify and to sort the wood wastes?

### 7.2.1 Key activities

#### Step 1: Identification of a network to collect, to classify and to sort the wood wastes in the region

How to do it?

Gather information and determination of the current situation

Overview of the current regional wood wastes production volume and the number of regional collection, classification and sorting centres needed to deal with the wood wastes volume produced in the region.

**Step 2: Identification if the network to collect, to classify and to sort the wood wastes in the region is effective or if building a good network that will enable the collection, classification and sorting is needed.**

Tool:

Involvement of experts and stakeholders

- Identification of the group of experts and stakeholders to be involved
- Understand the expertise, skills and roles of those to be involved
- Identification of the existing collection methods in the region
- Identification of the existing classification and the sort methods in the region

**Step 3: The network to collect, to classify and to sort the wood wastes in the region is effective - no further action is needed**

**Step 4: The network to collect, to classify and to sort the wood wastes in the region needs to be improved**

- ✓ Involvement of experts and stakeholders
- ✓ Development and definition of wood wastes management practices of:





- Definition of the need for new collection, classification and sorting centres
- Definition of new methods of wood waste collection, classification and sorting
- Classification, collection, sorting and separation of wood wastes and inorganic matter commonly associated with wood wastes, in order to better identify the valorisation options for wood wastes whether by recycling or by energy conversion.

#### **Tools for waste management stakeholders (Step 2 and 4)**

Waste management stakeholders meetings

Waste management stakeholders workshops

Waste management stakeholders analysis

Institutional analysis

Communication templates and tools

#### **Possible actions from waste management stakeholders (Step 4)**

- Development of a dense network of municipal waste collection centres (including wood wastes collection) and the foundation or expansion of commercial waste management
- Structuring the offer of wood waste products: classification and sorting
- Issue wood waste collection guidelines to generate high quality wood waste streams
- Promote the development of wood waste stream recovery for board production or energy valorisation
- Enable short distances between the waste collection centres and the wide range of waste management services commercial and industrial wood waste suppliers.



### 7.2.2. Examples from model regions

#### Austria

Waste wood from households is collected separately as packaging material (yellow waste containers) or as bulky waste (municipal collection centres). Waste wood from companies is separated at source, collected and further treated in waste collection and treatment companies. Waste wood from the construction industry and demolition wood is collected separately at source and is then further treated in designated waste collection and treatment companies.

As a consequence of the Austrian legal framework conditions and especially the ban of organic waste (including wood waste) from landfilling, a dense network of municipal and commercial wood waste collection, treatment and recycling operations exists. Sorting the wood wastes initially from other waste streams and then by wood quality allows high recycling rates.

A company, located in the south eastern part of Styria, collects about 20,000 t of wood waste per year from surrounding municipal waste collection centres, construction and demolition sites and industrial operations. The collected waste wood is distributed among three different qualities: chemically untreated waste wood (e.g. pallets, wooden packaging), treated waste wood suitable for recycling and treated waste wood suitable only for thermal utilisation.

While chemically untreated waste wood is directly forwarded to the next treatment step (grinding, screening), the chemically treated waste wood fractions need to be separated in two different fractions:

- a fraction usable for recycling in the board industry (old furniture, glued laminated, painted or coated waste wood) and
- a fraction only usable for thermal utilisation (windows, railway sleepers, or waste wood treated with wood preservation agents).

The waste wood treatment plant comprises several grinding and screening steps, ferrous and non-ferrous metal as well as glass and stone removal, a drying step and the necessary conveying equipment. Finally, the treated waste wood is transported to the board industry.



### Italy

Different platforms were contracted to carry out the first selection and volume reduction of the wood wastes (e.g. pressed, crushed, shredded or chipped). The main goal of this first treatment is to optimise the transportation of the raw material but also, to deliver functional and ready materials for the subsequently processing in the recycling facility. Additionally, the collection platforms are able to collect other types of waste wood from the furniture industry, construction and demolition, scraps from the wooden packaging industry and other wooden artefacts. Some panel industries have set up its own collecting organisations in order to ensure wood waste supply.

Italian wood waste collection and recovery service (Rilegno) serves about 65% of the national population. Such a widespread coverage is made possible by 700 conventions signed with private operators, municipalities, town congregations and environmental managers. Presently there are 405 collection platforms distributed throughout all Italian regions. Mauro Saviola (italien panel producer) ensures its supply (1,5 Mt wood wastes) thanks to subsidiaries in Italy (Ecolegno) or in France (Valecobois) : this strategy is unique in Europe.

### Sweden

Producers are responsible for collecting and disposing of end-of-life products. This means that there must be suitable collection systems and treatment methods for recycling.

Producer responsibility is also intended to encourage producers to develop products that are more economic with resources, easier to recycle and do not contain substances which are harmful to the environment.

Households are responsible for separating and depositing waste at available collection points. They must also follow the municipality's rules for waste management.

### United Kingdom

Households are responsible for separating and depositing waste at available collection points. They must also follow the municipality's rules for waste management.

Grade A material often goes to higher value markets such as animal bedding and panel products. Grade B can be used in panel products and combustion plants compliant with the Waste Incineration Directive. Grades C and D can only be used for incineration.



### 7.3. Wood Waste Recycling Units Tool

Supporting wood waste recycling units towards wood waste recycling is the main aim of this tool.

This step defines the current baseline analysis of the wood waste recycling units, in order to increase the wood wastes fraction subjected to recycle. All model regions prioritise waste wood recycling over energy valorisation.

Key-Question: Is there, in the region, processes that will enable wood waste valorisation by recycling methods?

#### 7.3.1 Key activities

##### Step 1: Identification of wood waste recycling units in the region

###### How to do it?

###### Gather information and determination of the current situation

Overview of the current wood waste recycling units already operating in the region and the respective recycling options.

**Step 2: Identification if the wood waste recycling units in the region are effective or if some more recycling units are needed.**

Tool:

###### Involvement of experts and stakeholders

- Identification of the group of experts and stakeholders to be involved
- Understand the expertise, skills and roles of those to be involved
- Identification if the recycling centres can handle the volume of wood wastes available and have the resources to recycle them.
- Identification of the quality of wood wastes available. If the quality is high enough to allow the recycling process or if it needs to be sent to energy valorisation

**Step 3: The wood waste recycling units in the region are effective - no further action is needed**

**Step 4: The wood waste recycling units in the region needs to be improved**



- ✓ Involvement of experts and stakeholders
- ✓ Development and definition of wood wastes recycling practices:
  - Definition of the need for new recycling centres
  - Adapt the existing centres to process different types or different quality of wood wastes.

#### **Tools for recycling units (Step 2 and 4)**

Waste management stakeholders and recycling units stakeholders meetings

Waste management stakeholders and recycling units stakeholders workshops

Recycling units analysis

Institutional analysis

Communication templates and tools

#### **Possible actions from waste management stakeholders (Step 4)**

- Development of wood waste stream recovery for board production
- Development of recycled products flow channel
- Structuring the offer of recycled wood waste products
- Channelling of non-recyclable wood wastes derived from the recycling process to wood waste energy recovery units

### **7.3.2. Examples from model regions**

#### Austria

According to the Austrian WMP 2017, more than 70% of the wood waste collected in Austria is recycled in the board industry. Most of the wood waste recycled comes from industrial sources. The recycling ratio of wood waste from municipal sources is only 19% but still above the EU target. Since there are not any board manufacturing companies in Styria or Vorarlberg, the wood waste is transported to neighbouring provinces such as Tyrol, Salzburg and Lower Austria.



### Germany

Wood waste recycling represents about 20 % of the wood waste valorisation. Wood waste is mainly used for energy production in Baden-Wurttemberg, in an equal level to Germany. The energy recovery has been encouraged by incentive policies since early 2000 to meet renewable energy production targets, while the panel industry has gradually increased the recycled wood rate to reduce panel cost production and increase carbon storage.

Since 2012, Germany tries, through the Closed Loop Substance Management Act to evaluate the current common practice regarding wood waste valorisation and to promote the cascade utilisation and recycling of wood waste. Cascading does not have one universal definition, although a common theme is that “material use of wood should be prioritized over energy use of wood”.

### Italy

The main beneficial factors that favour valorisation of waste wood are the setting up of a dedicated organisation (Rilegno) at a national scale for the collecting of waste wood, and the existence of a strong panel industry in Northern Italy which promotes recycled wood in its process (higher rate in Europe). In parallel at Rilegno, panel industry has set up subsidiaries (as Ecolegno) to ensure supplying of waste wood.

Rilegno and Italian public and private bodies now manage to facilitate the recycling of 61% of wood released for consumption, around 1,5 billion tons of wood packaging waste.

In Lombardy, wood waste is used in this way:

- packaging wood: reuse when it is possible or panel recycling. A little part is recovered in energy.
- other waste wood: demolition and construction, included do-it-yourself waste (household), and furniture: panel recycling and energy recovery in panel industry for no-suitable wood waste after sorting.

### Sweden

Producer responsibility is highly developed in Sweden. Although Sweden is strong on collection, wood waste valorisation tends to be used only for energy recovery.

### United Kingdom

Grade A material often goes to higher value markets such as animal bedding and panel products. Grade B can be used in panel products and combustion plants compliant with the Waste Incineration Directive.



From 2007 to 2013 the volume of recycled wood waste into panel boards has dropped around 25% due to government incentives for power and heating from biomass which have driven the use of waste wood for energy.

#### 7.4. Energy Processing Units tool

Supporting wood waste reclaim for energy production is the main aim of this tool.

This step defines the current baseline analysis of the wood waste energy processing units. All wood wastes that are unsuitable for recycling should be directed to the production of energy. Wood wastes classification is key to define the waste that will be subject to recycling and the ones that should be sent to energy production.

Key-Question: Is there, in the region, processes that will enable the wood waste energy recovery by thermal processes?

##### 7.4.1 Key activities

###### Step 1: Identification of wood waste energy processing units in the region

How to do it?

Gather information and determination of the current situation

Overview of the current wood waste energy processing units already operating in the region.

**Step 2: Identification if the wood waste energy processing units in the region are effective or if some more units are needed.**

Tool:

Involvement of experts and stakeholders

- Identification of the group of experts and stakeholders to be involved
- Understand the expertise, skills and roles of those to be involved
- Identification of the quality of wood wastes available. If the quality is not high enough to allow the recycling processes it can be sent to energy valorisation.

**Step 3: The wood waste energy processing units in the region are effective - no further action is needed**

**Step 4: The wood waste energy processing units in the region needs to be improved**



- ✓ Involvement of experts and stakeholders
- ✓ Development and definition of wood wastes energy processing practices:
  - Definition of the need for new energy processing units
  - Adapt the existing units to process different types or different wood wastes qualities.

#### **Tools for energy processing units (Step 2 and 4)**

Waste management stakeholders and energy processing units stakeholders meetings

Waste management stakeholders and energy processing units stakeholders workshops

Energy processing units analysis

Institutional analysis

Communication templates and tools

#### **Possible actions from waste management units (Step 4)**

- Development of wood waste stream recovery for energy production
- Assessment of the energy needs (heat, power or both)
- Channelling of low quality wood wastes or non-recyclable wood wastes derived from the recycling process to wood waste energy recovery units

### **7.4.2. Examples from model regions**

#### Austria

Most of the bark, shavings, cutting and saw dust is directly used at the source, either as fuel (paper mills, sawmill) or raw material (e.g. pellet production for thermal utilization). In Vorarlberg, the share of thermally utilised wood waste is with about 31% significantly higher. This is due to the rather high capacity of the waste wood incineration plant in that province.

#### Germany

80 % of wood waste is directly valorised in energy, without entering in a multi-stage cascade system. Indeed, energy use of wood was supported by the Renewable Energy Sources Act (EEG), Renewable Energies Heat Act





(EEWärmeG) and Market support programme incentivising wood in household's fireplace, reduced value added tax (VAT) rate of 7% instead of 19% for wood pellets and firewood.

In 2014, the share of renewable energy for electricity generation in Germany is 25,8 % of which 8 % is biomass. The inventory done in the region of Baden-Wurttemberg shows that nearly half of the wood waste resource is valorised into energy in dedicated power plant.

#### Italy

Among the 13 incineration plants, 4 are running with RDF (Refuse Derived Fuel), which can possibly contain waste wood but none biomass plant is running with natural fuel like virgin wood, sawdust, pellets or straw is mentioned in Lombardy.

Only wood that cannot be recycled is reused as biomass for self-supply. It thus produces electrical and thermal energy to be used in the production cycle, so as to drastically reduce the consumption of fossil fuels.

#### Sweden

Businesses are responsible for managing their own non-household waste. Some businesses have their own landfill sites at their disposal or can recover energy from waste in their own incineration plants. Even though Sweden is strong on collection and recycling of waste, wood waste tend to be used in energy recovery.

#### United Kingdom

Renewable Heat Incentive 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 wood waste grading system adopted by the wood recovery industry in the UK defines four different grades of waste wood:

- Grade A – “clean recycled wood”.
- Grade B – “industrial feedstock grade”.
- Grade C – “Fuel grade”.
- Grade D – “hazardous waste”

Grade B can be used in panel products or in combustion plants compliant with the Waste Incineration Directive. Grades C and D can only be used for incineration.



## 7.5. Research and Academia tool

The aim of this tool is to gain knowledge to improve processes that can contribute to wood waste valorisation.

Examples like the cascade use principle (used by most of the model regions) as a key to efficient utilization of wood wastes are essential to maximise the waste wood valorisation.

The waste hierarchy priority (figure 2) is:

- waste prevention
- reuse
- material recycling and biological treatment
- energy recovery
- disposal



Figure 2: Waste hierarchy priority

Key-Question: Is there in the region research focus on wood waste valorisation?

### 7.5.1 Key activities

**Step 1: Identification of wood waste valorisation research institutions**



## Gather information and determination of the current situation

Overview of the current wood waste valorisation research institutions in the region.

**Step 2: Identification if the wood waste valorisation research institutions are sufficient or if it needs to be expanded.**

### How to do it?

#### Involvement of experts and stakeholders

- Identification of the group of researchers and stakeholders to be involved
- Understand the expertise, skills and roles of those to be involved
- Identification of the research areas needed for the wood wastes available in the region

**Step 3: The wood waste valorisation research institutions in the region are sufficient - no further action is needed**

**Step 4: The wood waste valorisation research institutions in the region needs to be expanded**

- ✓ Involvement of researchers and stakeholders
- ✓ Definition of the expansion needs in terms of infrastructure, equipment or human resources

#### **Tools for research institutions (Step 2 and 4)**

- Researchers and wood waste related stakeholders meetings
- Definition of the expansion according to the wood waste quality and availability in the region

#### **Possible actions from research institutions (Step 4)**

- Assessment of the wood waste characteristics available in the region
- Assessment of lines of research to improve the cascade method
- Assessment of lines of research to improve wood waste valorisation

## **7.6. General Public tool**



The aim of this tool is to provide information to the general public about the existence of door-to-door collection or the existing dedicated wood waste stream in the drop-off recycling centre in order to increase wood waste valorisation.

Key-Question: Is there in the region a wood waste collection system?

### 7.6.1 Key activities

#### Step 1: Identification of the wood waste collection systems available to the general public

##### Gather information and determination of the current situation

The existence of a wood waste collection system in the region available to the general public, either by door-to-door collection or by depositing in a drop-off recycling centre.

**Step 2: Identification if the wood waste collection systems available to the general public in the region are sufficient or if it needs to be expanded.**

##### How to do it?

##### Involvement of experts, stakeholders, and regional municipalities

- Identification of all the institutions needed to be involved
- Understand the expertise, skills and roles of those to be involved

**Step 3: The wood waste collection systems available to the general public in the region are sufficient - no further action is needed**

**Step 4: The wood waste collection systems available to the general public in the region needs to be expanded**

- ✓ Definition of the expansion needs
  - Create or expand the existing door-to-door wood waste collection
  - Create or expand the wood waste drop-off recycle centre

##### **Tools for general public (Step 2 and 4)**

- Verify the available methods of wood waste collection and sorting in the region



#### Possible actions from general public (Step 4)

- Sorting the wood waste according to the defined quality in the region
- Deliver the wood waste at the regional recycling centre or use door-to-door collection system

#### 7.6.2. Examples from model regions

##### Sweden

Households are responsible for separating and depositing waste at available collection points. They must also follow the municipality's rules for waste management.

##### United Kingdom

Household wood waste is usually collected at household waste recycling centres (HWRC) or via council's waste collection systems where these are available.

## 8 CONCLUSIONS

Based on the information collected in the framework of the BioReg project it is possible to identify what are the success factors that contributed to classify Gothenburg, Baden-Württemberg, Lombardy, North-West England and Styria as model regions for sustainable wood waste valorization. As systematized in this document, all the regions presented common features and specific success factors. Based on the information collected it was possible to construct a toolbox of EU success factors for sustainable wood waste valorization. This toolbox is presented as a decision tree that can help recipient Regions and other regions to construct a robust system that will enable the valorization of wood waste. However, in order to increase the sustainability of wood waste valorization systems, and to build more effective decision support systems, in the near future, more information is needed towards knowledge on the environmental, social and economic impact of the wood waste value-chains. Lifecycle analysis, environmental impact analysis, life cycle cost assessment and social life cycle assessment studies are needed to build SWOT and Integrated sustainability assessment reports that can complement the toolbox presented. Also, the technological limitations and constraints associated with each value-chain should be clarified. This will help



Regions to identify and depict the most sustainable options in value chains in order to boost wood waste valorization systems.

