



**RERAM**  
research to innovation in  
resource efficiency



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## **Resource Efficiency and Raw Materials in the Forest-based Sector of Eastern Europe**

### **Final Summary Report**

### **1. Executive Summary**

The renaissance of wood as a renewable resource leads to a globally increasing demand and more and more non-sustainable exploitation of forests, especially in the Eastern European countries Ukraine, Moldova and Georgia (ENP-EaP). Preserving natural forests and fostering sustainable use of wood to ensure their key role in climate protection is one of today's grand societal challenges. Wood is an astonishingly versatile raw material: it is at the same time renewable, recyclable, reusable and refineable, offering a multitude of environmentally friendly products to society, such as construction, furniture, flooring, interior, paper products, bioenergy and innovative bio-chemical products. Using wood efficiently is good to substitute fossil fuels or energy-intensive materials and is therefore an active contribution to climate protection.

RERAM's goal is to improve raw material consumption in the forest-based sector through adapted solutions for resource efficiency. Saving resources is important for the SMEs to become competitive and reduce environmental impacts. In general managers are not aware that inefficient processing and low maintenance generate high losses of wasted material and energy, which in fact sum up high, hidden costs. RERAM developed an instructive training programme and hands-on reality checks for efficiency coaching of SMEs. 19 woodworking companies benefited directly from practical checks and knowhow to improve environmental performance of their businesses.

The **RERAM Handbook and Toolkit** offers a practical guide for managers and technical personnel on how to implement a tangible self-check of their company. It introduces Cleaner Production principles, effective tools and improvement options that can leverage a variety of common saving potentials in the woodworking industry. RERAM has demonstrated that resource efficiency and sustainability represent smart win-win solutions for business and the environment and offer a real opportunity for SMEs in Eastern Europe.

## 2. Context and Objectives

### 2.1 Challenges of the ENP-EaP forest-based sector

RERAM's main objective is to improve **Resource Efficiency and Raw Material consumption of the forest-based sector in Eastern Europe** (ENP-EaP European Neighbourhood - Eastern Partnership countries) by bridging eminent gaps between Research 2 Innovation (R2I) among SMEs, science and authorities. The project was funded by the European Commission's FP7 programme from 2014 - 2016 and carried out by a cooperation of 11 organisations based in Germany, Austria, Belgium, Poland, Ukraine, Moldova and Georgia.



Figure 1 - The EU forest-based sector: A multitude of sustainable products

Forests are an **abundant natural resource of Europe**, covering around 17 million hectares or 42% of the continent, which play a key role in the protection of the natural environment and climate change mitigation. The concept of the forest-based sector has been put forward by the European Union to unite industries closely related to the common resource 'forest'.

Wood sourced from forests is an astonishingly versatile raw material: it is at the same time renewable, recyclable, reusable and refineable, enabling a **multitude of environmentally friendly products to society**, including sawn timber, panels, construction, furniture, flooring, interior, crafted goods, and various paper products. Wood is also the main source for the growing biomass-based renewable energy (bioenergy) and innovative biochemical products industries. In sum, the **EU forest-based sector** is an unknown giant in regional employment, which counts around 600,000 enterprises, 4-5 million employees and 550 billion Euro annual turnover, corresponding to around 10-15% of the total manufacturing sector.

The renaissance of wood as a renewable resource leads to a **globally increasing demand**: in the EU, a major 'wood gap' of several hundred million cubic meter of timber is projected for 2030. Eastern Europe (ENP-EaP region) is gaining in importance today as a growing raw material supplier for the EU.



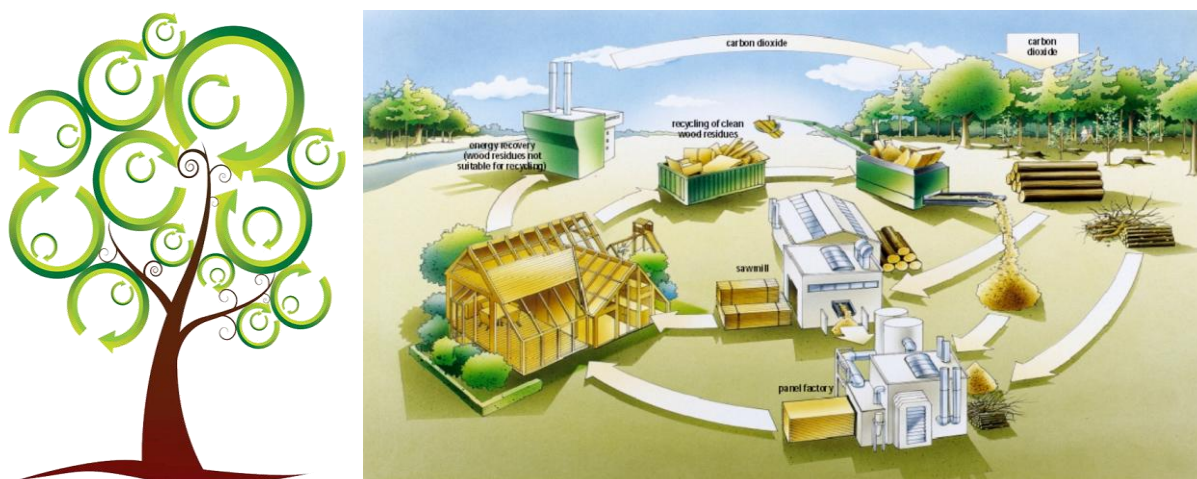


Figure 2 - Efficient use of wood: carbon sinks in forests and carbon storage in wood products (CEI Bois 2012)

**Preserving natural forests** and fostering sustainable use of wood to ensure their key role in climate protection is one of today's grand societal challenges. The considerable **raw material savings potentials** in the forest-based sector are a major opportunity to increase efficiency and sustainability, in the EU as well as in the ENP region. Using wood efficiently is good to substitute fossil fuels or energy-intensive materials and is hence an active contribution to **climate protection**.

ENP forests face **unsustainable management** and raw material exploitation: the increasing demand for wood leads to even more exploitative harvesting and forest clear-cuts, illegal logging and timber trade, plus widespread corruption in the ENP forest-based sector. The local wood industries are very inefficient and are part of the problem: huge amounts of **precious raw materials are wasted** owing to a **lack of modern knowhow** about efficiency and cleaner production.



Figure 3 - Challenges of the ENP-EaP forest-based sector: unsustainable forestry, outdated equipment, inefficient use and large wastes of wood raw material, lack of modern knowhow

## 2.2 Project Objectives

Therefore RERAM addresses the EU2020 Societal Challenge of '*Climate Change, Resource Efficiency and Raw Materials*' with a focus on the following objectives:

- **Raise awareness** on resource efficiency potentials along the regional value added chain forestry → primary wood processing → secondary wood manufacturing.
- **Optimize conversion pathways** of wood raw materials in SMEs by introducing innovative technologies, production processes, and planning methods.
- **Promote the competitive research potential** of innovation clusters by introducing new business models, cleaner products and collaborative processes with a focus on 'living and building with wood'.
- **Enhance regional to international collaboration** in knowledge value chains by promoting joint action, transfer of knowledge and outreach between R2I actors, delivering instant and tangible results to end users communities.

To respond to the evident widespread lack of knowhow on eco-efficiency in the ENP-EaP forest-based sector, and to raise awareness for the problem and practical solutions among woodworking companies, the RERAM team accomplished the following main outcomes.

## 3. Main results

### 3.1 ENP-EaP Forest-based Sector Study

The study provides important baseline information about the current state and future opportunities of the sector's resource potentials. The results show that today the forest-based sector in Eastern Europe is **undersized compared to the national wood potential**. The sector relies largely on timber extraction and only basic processing for the export of raw materials. Production efficiency in ENP countries is in general much lower than in the EU. Capacities of secondary processing are not developed, and the sector is comprised of a large number of SMEs, mostly lacking proper organisational structures and staff to implement efficiency measures.

Improvements are urgent, because the sector consumes huge amounts of raw material per employee, which is currently harvested in an unsustainable manner. **Technological upgrading** in resource efficiency and **international markets** are however identified as real perspectives for the ENP-EaP sector, which could develop a significant impact on domestic production, employment and value adding – based on regionally available forest resources.

→ [Read the Forest Sector Report D2.3 \(90 p.\) on ResearchGate or on Issuu](#)

## 3.2 Meta-study on Saving Potentials

The meta-study is a survey of existing guidelines and manuals on energy and resource efficiency in the woodworking sector. It collects reference information on typical material and energy consumption and corresponding saving potentials in different branches of the woodworking industry in Central and Eastern Europe.

The results provide applicable benchmark values for various typical production steps that are of practical relevance for companies of all sizes of different branches of woodworking.

→ [Read the Meta-study Report D3.1 \(28 p.\)](#)



Figure 4: The Cost of Waste Iceberg

## 3.3 Train-the-Trainers Programme

The programme is a 50-hours training course for professionals in wood industries. It comprises lectures about Cleaner Production, Material Flow Analyses, Waste Management, Energy Efficiency, Green Procurement, and Environmental Controlling, among other topics. It also includes practical problem solving and teamwork exercises. The course can be complemented through hands-on training during actual enterprise checks in woodworking industries. **17 wood industry experts** from 6 countries successfully completed this training course and were enabled to apply this knowledge during the course of the RERAM project. The training programme is included in the Wood Innovation Toolkit (see 3.7).

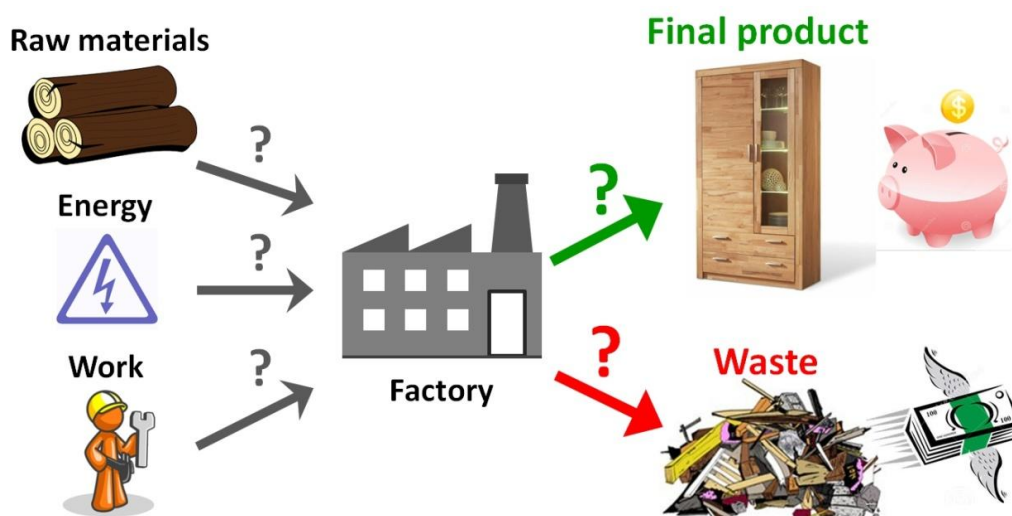


Figure 5 - Wastes and emissions once were input materials, which were bought for money, but have not been converted into products to be sold for money.



### 3.4 Enterprise Efficiency Checks

The Enterprise checks offer a hands-on approach to raise awareness for Cleaner Production among companies. A team of trained experts visits a company to perform a quick 1-day check of the state of efficiency. A list of potentials and low investment solutions is identified and then discussed with the company manager (1<sup>st</sup> report), pointing out the **benefits of saved input resources** that can be valorised in the final product, which makes the company as a whole more efficient and competitive. Follow-up training and coaching is then offered to support the implementation of measures for improved material and energy use, safety and skills of workers. Within RERAM, **19 enterprise checks** of woodworking and furniture companies in Ukraine, Moldova, Georgia and Austria were completed successfully. Each company obtained an individual check report identifying a set of savings and improvement options, ready to be implemented.

### 3.5 Joint Company Trainings

The comprised special workshops were conducted in conjunction with the enterprise checks. In total **5 joint trainings** were held in Ukraine, Moldova and Georgia at the facilities of participating companies, where the Austrian experts and local advisors trained the ENP companies 'on the spot' about principles and solutions of cleaner production. The **RERAM Study tour to Austria** was another special benchmarking event hosted by the Wood Cluster Styria (HCS) and FORZA NGO. Nine dedicated Ukrainian wood entrepreneurs had the possibility to visit nine high profile Styrian wood industries and organisations, to learn and exchange directly with Austrian managers and experts on resource efficient technologies and business solutions in modern wood manufacturing.

→ [Read the Benchmarking Report D3.3 \(public version, 23 p.\)](#)



Figure 6 - Practical enterprise checks and trainings to raise awareness for resource efficiency

### 3.6 RERAM Handbook

The RERAM Handbook offers a practical guide for managers and technical personnel on how to implement a tangible self-check of their company. Based on the lessons learnt from the enterprise checks, the **most common problems of lacking efficiency in ENP woodworking industries** are identified, which include: i) inefficient storage, handling and logistics of wood raw materials, ii) ineffective dust collection and defect compressed air systems, iii) low energy efficiency and high energy losses, iv) poor or inexistent waste management, v) lacking maintenance of equipment, vi) careless use of hazardous materials, and vii) unresolved workers' safety issues. Often considered as 'minor problems', most managers are not aware that neglected inefficiencies generate large losses of material and energy and sum up an unexpected 'iceberg of hidden costs'!

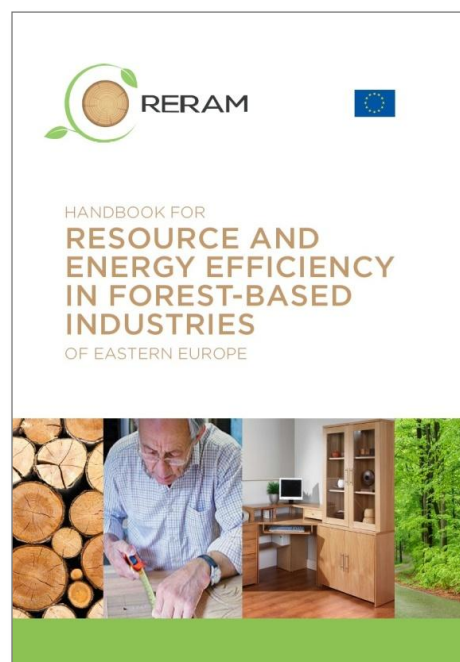


Figure 7 - RERAM Handbook cover

The Handbook illustrates these common problems in an easily understandable and visualised manner, to **make companies aware of the need to monitor raw material use, waste streams and energy efficiency** of their production. As tangible solutions, the Handbook introduces Cleaner Production principles, effective tools and improvement options that can leverage a variety of common saving potentials in the woodworking industry. These options can easily be applied in any company without significant investment ('low hanging fruits').

→ *Read & download the **RERAM Handbook** (English version, 34 p.) on Issuu*

### 3.7 Wood Innovation Toolkit

The Toolkit complements the Handbook with tools and guidelines that allow company production managers to innovate their business and processes towards higher efficiency and improved environmental 'win-win solutions'. The kit comprises a set of practical, low-level **tools to collect, analyze and monitor critical data** on raw material consumption patterns and waste streams. It offers to managers a **tangible decision support** to set their own targets for cost-effective measures of waste control and Cleaner Production projects. The tools can be applied by production managers, technical staff and consultants for their own purposes, but it is recommended to use them in cooperation with external advisors. The toolkit comprises Worksheets, Checklists, Training Lectures and Manuals.

→ *Download the **RERAM Toolkit** on [www.reram.eu/outputs/toolkit.html](http://www.reram.eu/outputs/toolkit.html)*

## 4. Impacts, dissemination and exploitation

RERAM's results have been disseminated broadly through numerous presentations and speeches at national and international conferences and events and in various publications, e.g. reports, journal articles, web articles, newsfeeds, brochures, flyers. All publications and items are accessible at the project website [www.reram.eu/outputs/dissemination.html](http://www.reram.eu/outputs/dissemination.html).

### 4.1 Research-to-Innovation (R2I) Dialogues

The R2I Dialogues comprised **moderated roundtables, workshops and conferences** engaging multiple regional stakeholders. In total, RERAM was represented in 37 events which include events organized and hosted by RERAM beneficiaries and events of third parties, e.g. other R2I initiatives, RTD institutions, the EC or international organizations, with participation of RERAM members. Several of them have been co-organised as **Joint Events** together with complementary on-going projects in Eastern Europe.

The R2I Dialogue events had a major dissemination function for the project and its partners, enhancing their visibility and networking in the ENP-EaP region towards other RTD initiatives and organizations both on the national and international level. The events covered all target stakeholder groups, first and foremost SMEs in the forest-based sector, but also administrations, scientists, policy-makers, NGOs, consultants, intermediaries, donors, and the press. The dialogues initiated new impulses for follow-up research, industry and policy development initiatives within the target countries and across the ENP-EaP region.



Figure 8 - Impressions from RERAM R2I Dialogues and Joint Events



R2I Dialogue events - a few highlights, among others, have been:

- **ener2i/RERAM Joint Workshop** and Brokerage Event in Chisinau, Moldova (Dec 2014)
- **Ukrainian R2I Roundtables** hosted by the Wood Processing and Furniture Cluster in Lviv, Rivne and Ivano-Frankivsk, Ukraine (March 2015)
- **AFET-ITRE Conference** in the European Parliament in Brussels, Belgium, during which RERAM was presented as one of six ENP success stories (March 2015)
- **Joint UNECE-FAO/RERAM Event** 'Capacity building for Sustainable Forest Management and Resource Efficiency in the Caucasus and Central Asia' in Tbilisi, Georgia, providing a platform for exchange among initiatives and stakeholders in the region, in which 40 experts from 18 countries participated (April 2015)
- **'Wood Invest Forum 2015'** innovation workshop at the National Ukrainian Wood Industry Fair Lisderevmash, Kiev, Ukraine (Sep 2015)
- **UNECE/FAO-UNDA Balkan workshop** on Forest Products Markets and Forest Sector Workforce in Podgorica, Montenegro (Dec 2015)
- **RECC side event** at the UNECE 8th Ministerial Conference in Batumi, Georgia (June 2016)

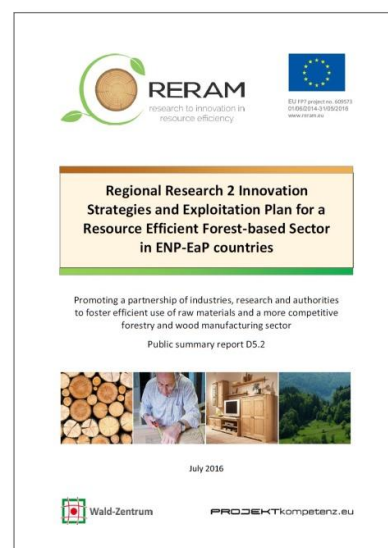
→ [Read the R2I Dialogues Report D4.2 \(public version, 49 p.\)](#)

## 4.2 R2I Strategies and Exploitation Plan

The R2I Strategies and Exploitation Plan rolls out the international cooperation challenges, opportunities and recommendations for the integration of research actors. Fostering growth and innovation of the EaP forest-based sector requires stronger communication and cooperation among all stakeholders, to stimulate a broader market uptake of efficiency solutions, and to improve the business climate for ambitious SMEs that are well positioned to step up onto international markets. To facilitate this market uptake, the RERAM project recommends three main actions:

- First, **joint forest-based sector initiatives** should be formed, which can unite and join the forces of the different sub-industries, develop a common vision, priorities and innovative actions, and raise awareness and improve the public perception of the sector's potentials for sustainable growth in the bioeconomy.
- Second, the **principle of resource efficient use of raw materials needs to be promoted** widely in the EaP sector in the form of support programs for SMEs. The programs should aim at reduced wastes, higher recycling, less pollution and technological modernisation and include a range of methods, e.g. innovation vouchers, grants, credit schemes, checks and audits, prizes, joint market promotion, and dedicated training and qualification.
- Third, the EaP sector needs a **transformation from 'from volume to value added'**. New investments in higher level manufacturing and domestic markets need to be stimulated through support and facilitation of companies in upgraded technologies, innovations, enhanced management systems and technical competence.

A series of new **future joint R2I pilot actions** was developed by the RERAM consortium, which target these critical knowledge gaps and aim to enforce entrepreneurial power in SMEs in the ENP-EaP region. Engaging notably regional stakeholders, these 27 actions are being developed and proposed to national, bilateral and international funding programs. Among these, several projects have already started the implementation. The actions include for example: i) a joint resource efficiency platform, ii) new competences for the wood industries, iii) transition to zero waste and circular economy in wood industries, iv) counteracting corruption in the forest sector, v) efficient bioenergy production from wood, vi) empowering forest communities for climate change adaptation, vii) innovation hubs for technological upgrading, viii) sustainable land use planning, or ix) a mentoring programme for innovative students.



→ **Read the R2I S&E Plan D5.2**  
(public version, 18 p.)

### 4.3 RERAM Final Conference

The RERAM Final Conference, held on 18-19 May 2016 in Lviv, Ukraine, offered an **international platform for networking and exchange** among businesses and stakeholders in the ENP-EaP region, and was well attended by a total of 85 participants. The main goal was to present and debate the project's tangible solutions for improved efficiency and competitiveness of the forest-based sector. **Three panel discussions** with woodworking companies and experts provided a vital forum to showcase these solutions and explore new ways of business innovation in the ENP-EaP region.



Figure 9 - Participants of the RERAM Final Conference

→ **Read the RERAM Final Conference Proceedings D6.4 (130 p.) on Issuu**

## 4.4 Outcomes and Impacts

The RERAM project demonstrated successfully that **resource efficiency represents a real solution and opportunity for SMEs in the ENP-EaP region** to improve their production and the environmental performance, while saving costs at the same time. The participating companies have expressed the immediate benefit of the hands-on enterprise checks for their business, and first successful implementations of the saving options are already confirmed. The company owners engaged very positively in the knowledge transfer and become proactive to learn more about and further apply the concept of efficiency management in their business.

The project facilitated a unique opportunity for **sharing the expertise and experience in resource efficiency from EU countries with the emerging industrial sector in ENP countries**. RERAM's training programs, enterprise checks and the benchmarking study trip helped to generate valuable first hand information and results about tangible solutions how to best promote a sustainable development of the raw material-intensive ENP forest-based sector, and raise awareness among SMEs. The project results, especially the RERAM Handbook and Toolkit, are readily available means to further disseminate and exploit these solutions and the successful company cases in the wider ENP-EaP region.

The **foundation of the Forest Sector Council for the Lviv Oblast**, which was proposed through the initiative of the RERAM partners, is one major first step to initiate this transformation in Western Ukraine. The Council, who represents members of the regional administration, the state forest enterprise and the wood industries, will give important impulses for the region to valorise its rich forest resources and to improve the situation of woodworking SMEs.

Given the large forest resources and the considerable size of the **forest-based sector as a major pillar in the EaP regional economies (?)**, the recommended strategies and follow-up actions will decisively strengthen the domestic potential of SMEs and higher employment in local communities, and thus contribute to sustainable growth and climate change adaptation in the ENP-EaP region.

### *Citation, Acknowledgement and Disclaimer*

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