TREE
Micro- and project-based learning programme for Teaching ciRcular Economy and Ecological awareness in VET

Funded by the European Union

TRAINING LESSON 2 - Part 2 (Wood sector)

Title	○ **The role of timber in the shift toward CE**
Part of the training course referred to in this lesson	○ Part 1 □ General information about sustainability and CE Part 2 Specific Information about: X Wood sector □ Plastic sector □ Agrifood sector
EQF level	Level 3
Where the lesson was tested	//
General Learning objective(s) according to the Bloom Taxonomy https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/	X **Create** Produce new or original work (design, assemble, construct, investigate, formulate) X **Evaluate** Justify a stand or decision (appraise, argue, defend, critique, select, support) X **Analyze** Draw connections among ideas (differentiate, organize, relate, compare, distinguish, test, experiment) □ **Apply** Use information in new situations (execute, implement, solve, use, demonstrate, operate) X **Understand** Explain ideas or concepts (classify, discuss, describe, identify, locate, translate) □ **Remember** Recall facts and basic concepts (define, duplicate, list, memorize, repeat)
Specific learning objective(s)	• Understand what the EU is doing for the purpose of protecting and restoring the world's forests. • Understand the different purposes, which timber can be used for. • Be able to evaluate whether and to what extent the different uses of timber and mainly those in construction, correspond to the requirements of circular economy.

Cognitive, socioemotional and behavioural outcomes based on https://www.unesco.de/sites/default/files/2018-08/unesco_education_for_sustainable_development_goals.pdf	**SDG 4 | Quality Education** Cognitive learning objectives: The learner understands the important role of education and lifelong learning opportunities for all (formal, non-formal and informal learning) as main drivers of sustainable development, for improving people's lives and in achieving the SDGs. Socio-emotional learning objectives: The learner is able to recognize the importance of their own skills for improving their life, in particular for employment and entrepreneurship. Behavioural learning objectives: The learner is able to use all opportunities for their own education throughout their life, and to apply the acquired knowledge in everyday situations to promote sustainable development. **SDG 9 | Industry, Innovation and Infrastructure** Cognitive learning objectives: The learner understands the concepts of sustainable infrastructure and industrialization and society's needs for a systemic approach to their development. Socio-emotional learning objectives: The learner is able to argue for sustainable, resilient and inclusive infrastructure in their local area. Behavioural learning objectives: The learner is able to evaluate various forms of industrialization and compare their resilience. **SDG 11 | Sustainable Cities and Communities** Cognitive learning objectives: The learner knows the basic principles of sustainable planning and building, and can identify opportunities for making their own area more sustainable and inclusive. Behavioural learning objectives: The learner is able to participate in and influence decision processes about their community.
Green skill(s) addressed	X Creative problem-solving X Forward-thinking ☐ Monitoring skills ☐ Analytical skills X Lean production X Maintenance and repair skills X Pollution prevention X Eco-design ☐ Management skills X Impact quantification X Life-cycle management ☐ Science skills X Waste management ☐ Environmental auditing ☐ Ecosystem management ☐ Other_____

Duration	20 minutes
Structure and content of the lesson	**INTRO** The European Union accounts for approximately 5% of the world's forests, however, contrary to what is happening in many other parts of the world, the forested areas of the EU are slowly expanding. European forests are an important factor in mitigating climate change and provide a wide range of ecosystem services. Wood is certainly the most important forest product obtained from the 177 MHa of forests and wooded lands the EU boasts. Production of wood is however, not the only target and actually only two thirds of the annual wood growth is used for building, furniture, other life-style products, or for producing energy. Cork and resin are other important non-wood forest products. Some facts: ● Most EU forests are boreal (northern) type with a small variety of predominantly coniferous tree species, or temperate forests with mainly broadleaved tree species in the lowlands with additions of coniferous species as we increase the elevation. There are no tropical trees in EU countries, except in the French overseas Departments. ● Timber volume – out of the annual wood growth or net annual increment (NAI) 56% were harvested in 2010 and 63% in 2019, representing a small increase. Out of the harvested timber approximately 80% is industrial round wood and the remaining share is fuel wood. ● The gap between the annual wood growth and the amount harvested explains why EU forests are both accumulating growing stock but also ageing. Harvesting is limited by several constraints, which make the calculations about how much more could safely and legally be harvested difficult ● Cork, which is a non-wood forest product, is produced from cork oak trees. The greatest concentration of production of cork material is in Portugal, followed by Spain and to some extent France, Italy, and Greece. Stripping cork material, which consists of the outer bark of the tree, usually starts from the age of about 22 years and is repeated at roughly nine-year intervals, depending on local conditions. ● Resin is harvested as the sap of coniferous trees, usually pines. It is collected by making cuts in the bark and collecting the oozing resin in receptacles, secured below the cuts. ● Tall Oil, a viscous yellow-black odorous liquid, obtained from the process of pulping coniferous trees. This specific residue is a rich

source of natural chemicals, used for production of paints, varnishes, and medicinal compounds.

- Substances, extracted from trees are also used for medicinal purposes. Thus, for instance, Taxol is a natural medicine, produced from the bark of yew trees (the longest living trees in northern Europe) that has cancer-fighting properties.

TOPIC 1

EU ACTION TO PROTECT AND RESTORE THE WORLD'S FORESTS

As a feature of its expansive arrangement of activities to tackle deforestation and forest degradation, which has been outlined in the 2019 Communication on 'Stepping up EU action to protect and restore the world's forests', on 17 November 2021, the Commission adopted a Proposal for a Regulation to curb EU-driven deforestation and forest degradation.

Perceiving that the principal driver of deforestation and timberland corruption is the extension of farming area, the proposed Regulation is to apply to imported and domestically-produced cattle, cocoa, coffee, palm oil, soy and wood (key commodities associated with deforestation and forest degradation), as well as certain products derived from these commodities.

It will require mandatory due diligence for all administrators placing commodities and items on the EU market (or exporting them from the EU), to guarantee that these items are both legitimate as per the laws of the nation of origin and have not been produced as a result of deforestation as per the definition set out in the Regulation (for example produced on land that has not been established through deforestation or forest corruption after 31 December 2020). All products must be accompanied by a due diligence statement, which will be hosted in a Union-wide digital information system. This will enable Member States (MS) to implement the Regulation. MS authorities will have to carry out a minimum level of inspections and there will be a requirement for effective, proportionate and dissuasive penalties to be imposed. The first review of the Regulation, which is about to take place two years after its enforcement, is going to consider expansion to other ecosystems and commodities. The proposed Regulation is to repeal the EU Timber Regulation (EUTR). This new Regulation and its rules is expected to reduce greenhouse gas emissions and biodiversity loss. The Regulation will complement and is aligned with other existing EU political commitments, among which the European Green Deal, the EU Biodiversity Strategy for 2030, the new EU Forest Strategy for 2030 and the Farm to Fork Strategy. The Regulation will also be in concert with commitments made at CoP26 and listed in the Glasgow Leaders Declaration (UNEP-WCMC, 2022).

TOPIC 2: Various uses of timber

Fuel

The primary usage of timber globally is for fuel. Even if for Europe this share is twice smaller, around 40% of timber around the world is utilized as fuel. The African and Latin American countries consume a more substantial portion of timber as fuel for both commercial and domestic purposes.

Construction

The next most predominant usage of timber is in the building industry. As will become clearer in the following topics, timber construction can greatly contribute to the circular economy, not only in the field of constructing bridges and small private housing, but also large public buildings.

With the growing population, the need for construction is constantly increasing. Timber has so far been widely used for producing boxes, furniture, matches, and crates and in construction – as sawn wood, veneers and plywood, and fiberboards. As of late though, as is discussed in topic 4, it is also used in the form of mass timber. In general though, timber is a popular material for light construction works such as doors, window frames, flooring, roofing and fencing poles, electric poles and gates.

Pulp and Paper

There is an ever-increasing demand for timber in the industry producing paper and pulp. Even if timber is not the only substance producing paper (containing cellulose and lignin), it is the most popular among the existing variety of vegetable fibres that can also make paper.

Paper is not the only product of the pulp industry. The use of other products such as the already mentioned fiberboards and particle boards are also common for construction works. Sawmill residues are highly utilized in northern European countries and the USA. Much of the forest waste also finds its use in the production of resinous materials, which form boards.

Synthetic Textiles

Rayon is the type of wood cellulose that forms the grounds of synthetic textiles. Rayon can be used to produce ‘artificial silk’, which is spun, dyed, woven and finished. The leading rayon producers are Japan, USA, and some European countries such as Italy.

Other Uses

Timber has a wide array of uses in different industries such as the chemical industry and the dye producing industry. Timber is a sustainable material also utilized in the production of a number of other items and pieces of equipment

such as artificial limbs, air dispensers, terraces, decks, balconies, beehives, cladding, sculptures, carvings, saunas, scaffoldings, bathtubs, shingles, various sports goods and musical instruments, as building blocks for ships, buses, and trains, for decorative purposes in homes and offices in the form of showcases and furniture.

TOPIC 3: How timber usage corresponds to the principles of circular economy

There are numerous benefits of using timber, which is a renewable, and ecologically safe resource, which also has immense natural aesthetic values. The use of timber also helps in reducing the emissions of greenhouse gases.

Housing: Timber versus brick! High-quality timber, such as from pine and spruce trees, is used as the construction material for building not just separate elements, but whole houses. Due to the fact that in Canada, Finland, Japan, Norway, Sweden, the USA, and Eurasia there are forest rich regions, a large number of such houses can be discovered in those countries. In Japan for instance, around 90% of dwelling houses are made of wood, in Norway their share is 60%. Wood is strong, inexpensive, renewable, and in many areas easily available. Wood is much better at handling earthquakes than brick. Wood structures are far more flexible than brick structures, they can move with the quake, which limits the structural damage and they do not collapse like brick structures do.

Heating with wood is becoming increasingly important due to the economic advantages. If the rate of deforestation is well managed and growth and re-growth are not compromised, the resource will never be depleted, unlike fossil fuels such as oil or natural gas, which due to their limited availability are already scarce. Not mentioning global conflicts that make them even scarcer and their prices more exuberant.

Wood fuels include barbecue briquette, bark briquette, wood chips, and wood pellets. In the case of wood pellets, the release of CO2 during the burning is roughly equal to the CO2 absorbed by the tree. In the timber industry this is called a neutral ratio. Burning wood that was close to the end of its lifespan is the best scenario and has the lowest carbon footprint, due to the fact that wood gives off the same amount of carbon whether it is burned up or left to decay naturally. The release of carbon cannot be avoided, considering that this is a natural process during its eventual biodegradation.

No waste! Unlike other materials, wood hardly causes any waste, which is a substantial environmental benefit. By-products such as sawdust and woodchips can be used for the production of furniture for example or for modern heating systems. They can even be used for paper production.

TOPIC 4: MASS TIMBER

Mass timber is used as a term for larger panel or beam products made by connecting a series of smaller timber elements together. The connection does not have to be made with glue only, but also through nails, dowels or interlocking. Mass timber should not be confused with lightweight construction elements such as plywood, or with solid wood, which is for example sections of sawn timber (lumber).

The supply chain for mass timber is expanding and considering that its production follows basic engineering principles and the materials are easy to design and specify in regular and relatively simple buildings, mass timber is gaining popularity. This popularity, among the circular economy supporters is also related to the intuitive feeling that the use of material, created from something that grows, should have less environmental impact than something that is artificially created. Products that come from established and certified forests have inherently lower carbon dioxide or energy impacts, even with a certain degree of processing and transport (Dangel, 2017), and are renewable.

One of the key elements of a circular economy is the circular flow of materials, which also translates into maintaining product value at the highest possible level at all times. Mass timber is a relatively new product, with few precedents of reuse or disposal from buildings that have reached the end of life, which means that not all challenges to effective disassembly at a larger scale are known, as initial research and development has really happened only in the last 20 years (Brandner, 2013). Solutions for easy disassembly may lie in defining standard zones for fixings such as lap joints or bearing details as a basis for cutting out of large panel or beam elements from building without hitting connectors. New all-timber fixings systems are also being developed by various manufactures, which could make cutting apart rather simple (Campbell, 2019).

CONCLUSION

Circular economy is about extracting raw resources, while having their entire life cycle in mind. It is also thinking how to build products and assets in such a way that they would last longer, be more durable, can be repaired and used further, so that the full value is extracted from them at the termination of their life. I.e. following regenerative economic principles.

When applied to the construction sector, the regenerative economic principles can cut waste, reclaim lost value, and generate new economic, social, and environmental benefits. In order to contribute to CE, the construction industry needs to look for more circular inputs that have lower environmental impacts. Naturally renewable materials are such. When it comes to outputs, supporting the CE would be manifested by maximising the benefits and minimising the negative impact of products over their entire lifespan.

Wood, straw, hemp, bamboo and other similar types of fibre are naturally renewable, reusable, and biodegradable. This makes these sustainably

	harvested and naturally renewable materials well-fitting into the circular economy.
References	Brandner R. (2013). Production and Technology of Cross Laminated Timber (CLT): a State of the Art Report, in COST Action FP1004 with TU Graz. University of Bath, Bath, UK Campbell A (2019) Mass timber in the circular economy: paradigm in practice? Proceedings of the Institution of Civil Engineers – Engineering Sustainability 172(3): 141–152, https://doi.org/10.1680/jensu.17.00069 Dangel U. (2017). Turning Point in Timber Construction: a New Economy. Birkhäuser, Basel, Switzerland Internal Market, Industry, Entrepreneurship and SMEs (n.d.). *Wood and other products.* https://single-market-economy.ec.europa.eu/sectors/raw-materials/related-industries/forest-based-industries/sustainable-forest-management/wood-and-other-products_en Naturally: Wood (2021). *Coming full circle: wood and the circular economy* https://www.naturallywood.com/blog/coming-full-circle-wood-circular-economy/ UNEP-WCMC. (2022) *Briefing Note on the EU Timber Regulation and on sourcing of deforestation-free commodities October 2021 – April 2022*. https://ec.europa.eu/environment/forests/pdf/EUTR_Briefing_Note_April_2022-23May22.pdf
Interactive questions for R3	Q1: Mass timber products are produced out of sawn timber: True **False** Q2: When discussing circular economy and the use timber in construction: **Experts consider timber as relevant both as far as input and output is concerned** Experts only accept the input relevance for the CE Experts refuse to accept any relevance of the use of timber as a contributing factor to CE Q3: Timber left to decay naturally emits as much carbon as the amount it would emit if used for heating. **True** False
Keywords	Circular economy, Forests, Mass timber, Timber Wood
Questions for reflection	1. Discuss eventual disadvantages of using timber for construction. You can discuss this article about turning timber disadvantages into advantages: https://www.landmarkpro.com.au/timber-

	disadvantages-become-advantages/ 2. Share your thoughts on the new EU Regulation, prohibiting the import and export of products and items that have been produced at the cost of deforestation. Dig deeper into the administrative checks, which the respective EU officials will have to carry out in order to consider a certain item acceptable. Do the punitive measures seem realistic and feasible to the class?
Additional resources	EU Timber regulation: https://ec.europa.eu/environment/forests/timber_regulation.htm Forestry-related multilateral environmental agreements and processes: https://ec.europa.eu/environment/forests/finternational.htm New EU Forest Strategy for 2030: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0572
Icons & related info for the hints of the PowerPoint presentation	 This hint is used to show sources on further information according to the topic.  This hint indicates that something important is written.  This hint indicates a question/task for reflection.
Author(s)	Zornitsa Staneva and Ivana Tsvetkova, Zinev Art Technologies Ltd., Bulgaria