TRAINING LESSON 3 - Part 1

Title	The Circular Economy: definition and benefits
Part of the training course referred to in this lesson	X Part 1 General information about sustainability and CE Part 2 Specific Information about: □ 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/	□ **Create** Produce new or original work (design, assemble, construct, investigate, formulate) □ **Evaluate** Justify a stand or decision (appraise, argue, defend, critique, select, support) □ **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)	- *Learn what the Circular Economy is and which are its benefits* - *Understand and analyze the difference between a linear and a circular economy model* - *Understand the impact and consequences on a "glocal" scale of the CE* - *Understand which are the current obstacles to the CE and how to overcome them*
Cognitive, socioemotional and behavioural outcomes	**SDG 4 "Quality education"** Cognitive learning objectives: the learner understands the important role of

based on https://www.unesco.de/sites/default/files/2018-08/unesco_education_for_sustainable_development_goals.pdf	culture in achieving sustainability; the learner understands that education can help create a more sustainable, equitable and peaceful world. 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; the learner is able to engage personally with ESD. 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 12 "Responsible consumption and production"** Cognitive learning objectives: the learner understands how individual lifestyle choices influence social, economic and environmental development; the learner understands production and consumption patterns and value chains and the interrelatedness of production and consumption (supply and demand, toxics, CO2 emissions, waste generation, health, working conditions, poverty, etc.); the learner knows about strategies and practices of sustainable production and consumption. Socio-emotional learning objectives: The learner is able to communicate the need for sustainable practices in production and consumption; the learner is able to encourage others to engage in sustainable practices in consumption and production; the learner is able to envision sustainable lifestyles; the learner is able to feel responsible for the environmental and social impacts of their own individual behaviour as a producer or consumer. Behavioural learning objectives: The learner is able to promote sustainable production patterns; the learner is able to take on critically on their role as an active stakeholder in the market; the learner is able to challenge cultural and societal orientations in consumption and production.

	SDG 13 "Climate action" Cognitive learning objectives: the learner understands the current climate change as an anthropogenic phenomenon resulting from the increased greenhouse gas emissions; the learner knows about prevention, mitigation and adaptation strategies at different levels (global to individual) and for different contexts and their connections with disaster response and disaster risk reduction. Socio-emotional learning objectives: the learner is able to encourage others to protect the climate; the learner is able to collaborate with others and to develop commonly agreed-upon strategies to deal with climate change; the learner is able to understand their personal impact on the world's climate, from a local to a global perspective; the learner is able to recognize that the protection of the global climate is an essential task for everyone and that we need to completely re-evaluate our worldview and everyday behaviours in light of this. Behavioural learning objectives: the learner is able to evaluate whether their private and job activities are climate friendly and – where not – to revise them; the learner is able to anticipate, estimate and assess the impact of personal, local and national decisions or activities on other people and world regions; the learner is able to support climate-friendly economic activities.
Green skill(s) addressed	□ Creative problem-solving X Forward-thinking □ Monitoring skills X Analytical skills □ Lean production □ Maintenance and repair skills X Pollution prevention X Eco-design □ Management skills □ Impact quantification □ Life-cycle management □ Science skills □ Waste management □ Environmental auditing □ Ecosystem management □ Other_____
Duration	20 minutes
Structure and content of the lesson	**INTRODUCTION** Climate change, global warming and pollution of water, air and soil are sending us a clear signal: our current economic model is unsustainable for the Earth. Climate change is threatening plant, animal and human life as we have known them until now. That is why, experts have started to look for alternative economic models that are more sustainable from the social, environmental, and economic point of view. In this context, the European Union and the Organisation of the United Nations together with many others are promoting

an economic system designed to regenerate itself, called Circular Economy (CE). CE has become an increasingly attractive alternative, because a shift to this economic model would make it possible to address and solve many of the world's major problems (climate change, pollution, wasting etc.) fully or partially. The European Union in 2015 unveiled the "Circular Economy Action Plan", marking the birth of the so-called "right to repair" and a new regulatory apparatus that promoted more sustainable product design, reduce waste and empower consumers. The "New Circular Economy Action Plan" was adopted in 2020 with the aim of describing a set of actions needed to achieve carbon neutrality by 2050 in Europe through the adoption of the EC. In order to implement the latter plan, in 2022 the European Union launched the first package of measures to support sustainability and CE.

TOPIC 1 - DEFINITION AND BENEFITS OF CIRCULAR ECONOMY

The European Union defines the Circular Economy (CE) as "*a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible*." The primary goal of this economic model is to extend the life of objects as much as possible, so that less is produced and less is wasted/thrown away. According to the Ellen MacArthur Foundation, one of the main supporters of this model, the CE is based on three main principles, driven by products design:

1. Eliminate waste and pollution;
2. Regenerate the nature;
3. Circulate products and goods.

EC is thus more than recycling or reuse, as it is presented as a complete economic system that includes these actions, but also much more. Specifically, recycling is something that happens at the end of an object's life, whereas EC impacts the entire life cycle of an object from the moment of its conception and design. Processes to extend the life of objects and eliminate goods' "planned obsolescence" are:

- **Reuse** = *"it consists in using something again"* (Cambridge Dictionary,https://dictionary.cambridge.org/dictionary/english/reuse), either for its original purpose or for new ones. E.g. When you donate your clothes to someone else, those clothes will be reused.
- **Repair** = "*to put something that is damaged, broken, or not working correctly, back into good condition or make it work again"* (Cambridge Dictionary, https://dictionary.cambridge.org/dictionary/english/repair.) E.g. if you decide to repair your broken mug instead of buying a new one, you are extending the lifetime of that object.
- **Refurbish** = "*the process of restoring an old or discarded product and bringing it up to date to serve its initial function*." (Lombard Odier,

2020) E.g. an old chair that is modernised, painted and decorated is going under a refurbishing process.

- **Remanufacture**= it consists in refurbishing and reusing parts of a discarded product in order to produce a new product. (Retrace, 2019) E.g. parts/components of computers, cars, furniture can be taken, updated and used to create new ones.
- **Repurpose = "***The process of repurposing involves using a product to serve another purpose."* (Rubbish P., 2018) E.g. you can turn empty glass bottles into flower vases.
- **Upcycle** = "*upcycling is the process of enhancing a product. The functionality of the item is still the same, however, it looks and serves much better than previously*." (Rubbish P., 2018) E.g. when you convert old bulbs into oil lamps or candles or glass bottles into lamps you are upcycling them.
- **Recycle** = *"The recycling process involves breaking (usually melting) the product down into its basic raw material (plastic, glass, metal etc.) and then formed into new products."* (Rubbish P., 2018) E.g. when you return empty glass bottles and they are used to create new glass objects.

All of these actions can be done at the macro level, by states and companies, but also at the micro level, by each of us in our everyday lives (see some examples mentioned above).

The CE is commonly defined as a "*resilient*" economic system, because it can lead us to face effectively environmental, social and economic challenges in a sustainable way. In fact, by simultaneously intervening in the way we design, produce and consume goods, we can obtain the following beneficial and significant effects:

- on the environmental level: reduction of CO2 emissions, pollution levels, landfill and waste; mark a shift to the use of renewable energy and materials.

- on the economic level: as numerous research studies have shown the significant savings that businesses would have if they could "do more, with less."

- on the social level: as we are experiencing an increase in the number of "green" jobs (e.g. the EU estimates that by 2030 there will be 178,000 more jobs just in the area of waste management). EC, by reducing the cost of raw materials, would also provide significant savings for the end consumer, as well as having a medium to long term beneficial effect on health by mitigating the adverse effects of climate change and pollution.

TOPIC 2 - LINEAR VS CIRCULAR ECONOMY

The economy model currently in use is defined as "linear", because it consists of successive stages that lead inevitably from the creation to the "death" of a

good. The stages of the materials' lifecycle in the linear economy model are:

1. Production;
2. Distribution;
3. Use;
4. Waste.

Based on this economic model, every item and material has an expiration date and is destined to become junk, so that many speak of a "planned obsolescence" of products and materials. This model, however, is showing all its limitations and problems because it is based on a wrong assumption: indeed, one cannot produce new materials and objects indefinitely in a limited world and with limited primary resources. This in fact is the first major limitation of the linear economy: the fact that it requires potentially infinite energy, raw materials and other resources to keep producing new things.

The processes of production, as well as those of distribution, consumption and disposal often cause a negative impact on the environment in a linear economy model and that is why the second major limitation is that it causes high levels of pollution. The pollution is mainly caused by having to produce new objects and materials all the time and by the disposal of old products that have become waste.

To get an idea of how much is thrown away each year, according to the European Union, each European consumes an average of 14 tons of raw materials (water, wood, etc.) per year and produces 5 tons of waste.

Another substantial difference between the linear economy and the circular economy is that the latter promotes greater collaboration between enterprises and between different economic sectors. The levels of interdependence between one economic sector and another are much higher in the CE, and this leads to greater collaboration. Within this dense network of cooperation, what is waste for some becomes a resource for others.

TOPIC 3 - "CIRCULAR" EXAMPLES

The increasingly high attention toward the environment has prompted large and small businesses and public administrations to launch "circular" initiatives. Most of them foresee actions that aim at extending the life of goods by reusing, recycling, refurbishing, etc.

An example in the fashion industry are the many apps and websites for buying and selling used clothes, renting clothes, and that are at the heart of the increasingly popular "second-hand" sector. In the fashion field, there are also apps and sites that allow people to take baby clothes for a period and return them for others to use when they grow up. This keeps emissions of pollutant gases down and it reduces costs for the consumer.

Similar initiatives are springing up in other sectors, such as electronics, cars

(e.g., car sharing) and even bricks (which are cleaned up, inspected and reused for new construction).

But EC's examples are not always as "simple" as an app. For example, the De Clique project, adopted in the Netherlands (https://declique.nl/en/), involved the creation of a dense network of relationships between different entities ranging from soap to beer producers. In fact, the project deals with collecting coffee grounds, orange peels and other organic waste from different types of businesses. After collecting these materials, they are divided, controlled and distributed to other organisations that will create orange soaps, compost and fertiliser and beer from those wastes.

But it is not only businesses that have started these kinds of initiatives. Public administrations in numerous cities around the world have also begun to adopt sustainable development plans to be implemented in the coming years and to also financially support projects aimed at creating circular realities. In São Paulo, for example, authorities support and promote a shift toward organic and regenerative agriculture that is more sustainable for the soil, healthier for people, and produces compost that can be reused to produce food again. The city of New York, on the other hand, has initiated a project to establish numerous pick-up points for used or broken clothing and electronics, the parts/components of which are recovered and reused.

This list of examples is not and is not meant to be exhaustive, but is intended to show how widespread and varied interventions are being implemented around the world to make it more "circular."

TOPIC 4 - CURRENT OBSTACLES TO THE FULL ADOPTION OF CIRCULAR ECONOMY

Despite the international attention on the topic of CE, some obstacles to its implementation remain.

One of the main obstacles is the lack of adequate infrastructure for waste management. In some cases, in fact, the technology to recycle materials has not yet been developed, while in other cases the technology is there but is not distributed between states or between regions/cities. The situation is made even more complicated by the fact that, in our society, materials that cannot be recycled even with the most modern technologies have become very common. In fact, the circular economy essentially includes two types of materials: those of the "technical" sphere (inorganic and non-biodegradable, such as polymers and plastics) and those of the biological sphere (naturally biodegradable, such as wood and plants). The combination of materials belonging to these two spheres occurs for example in the textile industry (e.g. with poly cotton) and it does not allow recycling the resulting object or material.

Another obstacle to EC implementation is the inadequacy of many business

plans. In the EC we need to rethink the way we do things, think and produce them, taking into account many new factors and this brings with it the need for new and more adequate business plans.

Along with these “technical” reasons, there is also a more "emotional" one: on the one hand, many consumers are afraid of change because they fear that it will have a negative impact on them, for example economically; on the other hand, many manufacturers fear that the alternatives to some materials they adopt (for example, plastic) are not equally performing and that they affect the image of their brand.

Finally, some obstacles to the EC are due to national or regional laws that encourage, albeit unintentionally, waste. An example has been provided by the World Resources Institute (2018): “*expiration date labels are often required by law to protect the consumer, but may not account for differences in how food is stored. Expiration dates are also often misunderstood to mean that a food is no longer edible, when in reality it is still safe to eat but may not meet the manufacturer's quality standards*”.

Given the focus on the issue and the formal commitment that many States and international organisations (such as the European Union and the United Nations Organisation) have subscribed to, it is expected that these obstacles can be overcome or significantly reduced in the coming years (in fact, it is good to remember that the European Union has set itself the goal of achieving carbon neutrality by 2050, the UN to achieve the Sustainable Development Goals by 2030).

Awareness-raising campaigns are also needed to explain what the EC and its benefits to people mean in order to overcome their mistrust. Instead, businesses are required to build strong networks to collaborate with others and business plans that promote and support change.

CONCLUSIONS

The linear economy is showing its limits: the effects it is having on plants, animals, humans and the environment in general are increasingly evident and serious. To turn the tide, many states and international organisations have begun to talk about a new economic model, called the "Circular Economy". This one differs from the previous model because it aims at extending the lifecycle of objects and materials as much as possible and at ideally reaching a “zero waste” situation.

While several obstacles remain to the full implementation of the EC (legislative, organisational, economic, etc.), many states have formally committed to achieving EC-related goals, and many people are doing the same, adopting a more "circular" and environmentally friendly approach in everyday life.

References	Bear I., Edgerton B., Hirsch P., Kraanen F., Plomp R., Ramkumar S., Walrecht A. (2018), *Linear Risks*, Circle Economy, PGGM, KPMG, WBCSD and EBRD. https://assets.website-files.com/5d26d80e8836af2d12ed1269/5de8eff3bbf4da023e254ea4_FINAL-linear-risk-20180613.pdf Ellen MacArthur Foundation (n.d.), *What is circular economy?* Ellen Macarthur Foundation website – Overview. https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview Crippa C.M., Drąsutė V. (2022). *Circular Economy, Education for Sustainable Development and Green skills: T(h)REE elements for a better future.* Lithuania. Kaunas University of Technologies, Public Institution "eMundus" https://conference.pixel-online.net/files/foe/ed0012/FP/7967-ESOC5674-FP-FOE12.pdf CESME Interreg Europe & European Regional Development Funds (n.d.). *1.3 Environmental, Social and Economic Benefits of the Transition from Linear to Circular Economy.* https://www.cesme-book.eu/book/1-circular-economy-policies-and-framework/1.3 Lombard Odier (2020). *The 10 steps to a circular economy*. Rethink sustainability. https://www.lombardodier.com/contents/corporate-news/responsible-capital/2020/september/the-10-steps-to-a-circular-econo.html The Clique Project. https://declique.nl/en/ Ellen MacArthur Foundation (n.d.), *Featured circular economy examples: Cities.* Ellen Macarthur Foundation website. https://ellenmacarthurfoundation.org/circular-examples-collection-cities Bahraini A. (2021). T*he 5 Common Obstacles in Implementing Circular Economy.* Waste Management. Waste4Change https://waste4change.com/blog/the-5-common-obstacles-in-implementing-circular-economy/#:~:text=The%20previous%20problems%20that%20we,implements%20the%20circular%20economy%20concept Stanislaus M. (2018). *Reasons the World Wastes So Much Stuff (and Why It's Not Just the Consumer's Fault)*. World Resources Institute. https://www.wri.org/insights/barriers-circular-economy-5-reasons-world-wastes-so-much-stuff-and-why-its-not-just Rubbish P. (2018). *Recycling, Upcycling, Repurposing, What's the Difference?* Rubbish Removal. https://www.paulsrubbish.com.au/difference-recycling-upcycling-repurposing/#:~:text=Repurposing%20is%20similar%20to%20upcycling,differ

	ent%20%27purpose%27%20hence%20repurposing ReTrace (2019) *Circular Economy and the 6 REs*. ESR Blog. https://www.retrace-itn.eu/2019/07/15/the-6-res-of-the-circular-economy-reduce-reuse-repair-remanufacture-recycle-and-recover/ Cambridge Dictionary, checked on 19/09/2022. Definition of reuse https://dictionary.cambridge.org/dictionary/english/reuse and repair https://dictionary.cambridge.org/dictionary/english/repair
Interactive questions for R3	What does "upcycling" mean? A. it consists in using something again, either for its original purpose or for new ones; B. it consists in refurbishing and reusing parts of a discarded product in order to produce a new product with the same function; **C. it consists in taking a discarded product and in using it for a new purpose. (correct)** Recycling consists in converting waste materials into new materials and it can be done at any stage of the lifecycle of an object, from its production to its "death". A. True **B. False (correct)** Which are the actions foreseen by the EC in order to extend the life of an object? **A. Reuse, repair, refurbish, remanufacturing, repurpose / upcycling, recycling (correct)** B. Upcycling and recycling C. Reuse, remanufacturing, recreating, upcycling, wasting, recycling
Keywords	Circular economy, linear economy, sustainability
Questions for reflection	1. What things that you normally throw away could you reuse/repair/refurbish? Try to think of creative ways to do it. 2. What could your school do to reduce waste of energy, materials, etc.? 3. Can you think about other benefits of the CE? 4. Can you think about other differences between the linear and the circular economy? 5. Try to think about other negative impacts that the linear economy is having on our society. 6. Can you think about other examples of circular economy that you know about? 7. Can you think about other current obstacles for the implementation of CE? How would you overcome them?

Additional resources	Documents/ websites - The European Commission (2019), The European Green Deal, COM (2019) 640 final. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en - Ellen MaCarthur Foundation's website https://ellenmacarthurfoundation.org/ - The European Commission (2021). The New Circular Economy Action Plan https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf Videos - Ellen MacArthur Foundation. The basics of Circular Economy https://www.youtube.com/watch?v=NBEvJwTxs4w
Icons & related info for the hints of the PowerPoint presentation	 This hint is used to indicate that there's a link to other websites with additional information.  This is used within the PPT to indicate that something important is written/ to invite the reader to pay attention to essential information.  It indicates a question for reflection
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