How can sustainability be applied to the forest products industry? Is the circular economy a panacea for sustainable production?

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Introduction

- Today, sustainability is a well-known and widely applied concept in various fields.
- It can be defined as the development plans to meet the current generation's needs without compromising future generations' capacity to meet their own needs.
- To understand the importance of this concept, recalling the continuously and exponentially increasing world population, scarcening resources, and environmental problems will be more than enough.

- For this reason, both theoreticians and practitioners try to implement sustainability in different fields.
- In forestry, forest management is where the sustainability approach is implemented the most.
- With sustainable forest management practices, sustaining wood production is aimed. Even though various studies exist on this matter, sustainable production of forest products has unfortunately not been adequately studied.

Turkish Forest Products Industry

- The forest products industry is one of the driving industries of the Turkish economy.
- In the Turkish manufacturing system, the forest products industry is one of the areas where advanced technology and business management practices are applied after other sectors, such as the automotive and chemical industries.
- According to the Istanbul Chamber of Industry's (ISO) Turkey's Top 500 Industrial Enterprises 2018 study, which mirrors the industrialization and development process of Turkey, 5.8% (29) of total enterprises are forest product enterprises (Bayram, 2020).

- The forest products industry comprises the following forest products and product aggregates: industrial roundwood, sawn wood, wood-based panels, fiber furnish, paper and paperboard, wood fuel, charcoal, and pellets (FAO, 2018).

- The Turkish Forest products industry's ongoing raw material import issue has been known for years.
- Despite the efforts of the General Directorate of Forestry (OGM), a significant supply gap still exists (Akkaya et al., 2020).

- Unfortunately, being dependent on imports severely affects the final products' prices.
- For instance, amid the COVID-19 pandemic, businesses have struggled to obtain raw materials, and this caused a 45% increase in product prices…
- Due to a lack of raw materials, firms had to reduce their capacities.
- Fallen capacity has skyrocketed the prices, and this has put consumers, employees, and businesses in a difficult situation (Bayram, 2021).

- Especially after this global incident, businesses and the sector have begun searching for alternative ways to supply raw materials for manufacturing.
- Sustainability and its approaches have gained significant importance at this point.

Sustainability?

- The conventional concept of sustainability, and perhaps the most agreed, is based on the growth that should be planned to meet the current generation's needs without compromising future generations' ability to meet their own needs (Agostinho et al., 2019).

- As often discussed at the United Nations Conferences on Environment and Sustainability, sustainable forestry is assumed to be one of the most essential focal points of sustainable development (Atmiş & Çil, 2013).
- A management approach based on sustainability principles is needed to ensure sustainable development.

- The sustainable forest management (SFM) view has been adopted since the eighteenth century (Wiersum, 1995).
- The definition of sustainability in the forestry sector had a narrow focus, emphasizing only sustainable wood production when it was first presented.
- Since then, the notion is still evolving (Santos et al., 2019).

- Now, it can be described as managing and using the forests and forest lands in a way and at a rate to maintain both the biodiversity, generation capacity, productivity, and vitality of forests and their potential local, national, and global relevant ecologic, economic and social functions without compromising the needs of now and the future (Bayram, 2021).

Circular Economy

- To address these and other sustainability issues, the Circular Economy (CE) concept has recently gained importance in policymakers' agendas (Brennan et al., 2015).

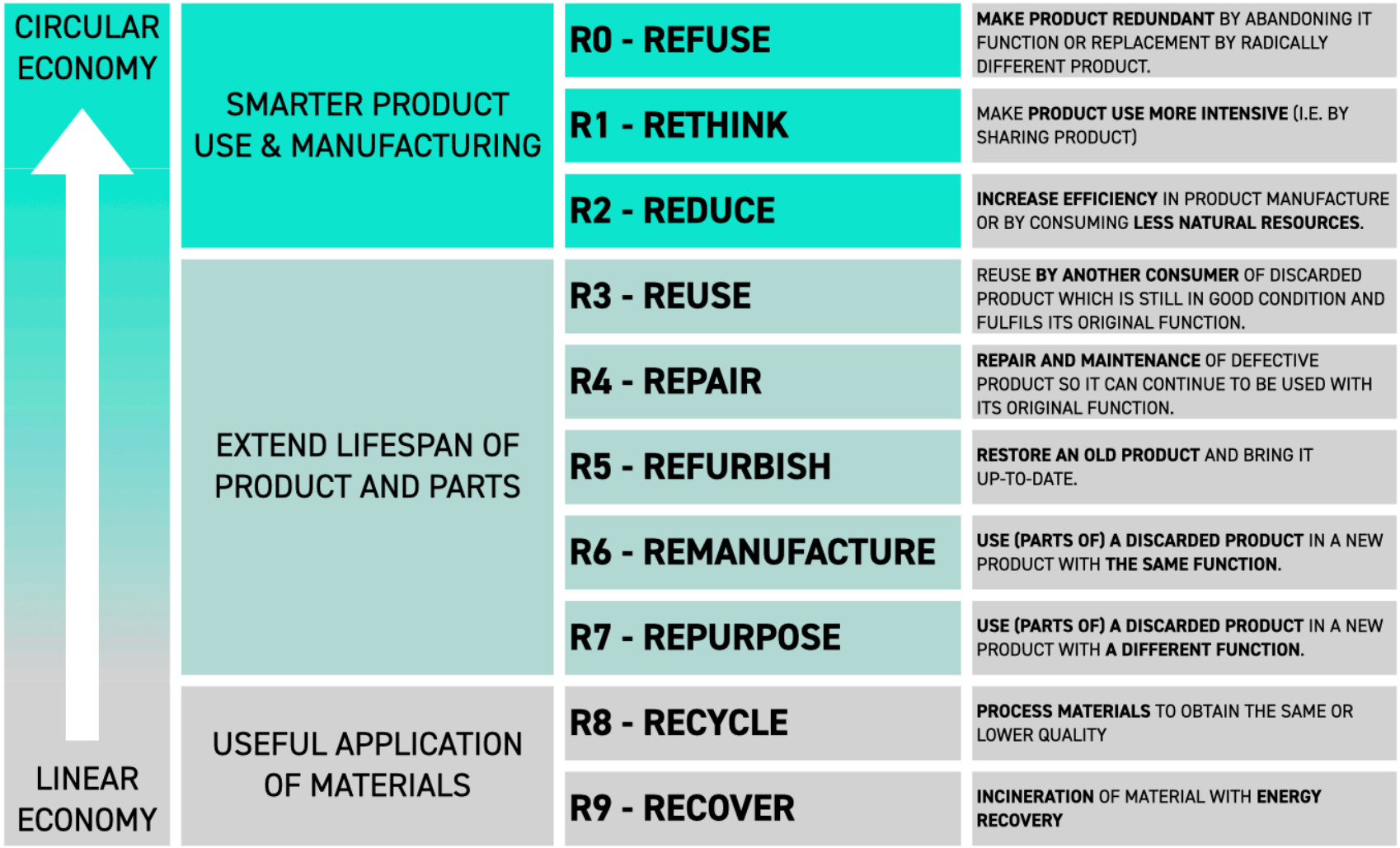
- CE implies a shift from the classical "linear" (take, produce, and dispose) to a "circular" economy approach, which involves closing, slowing, and narrowing the loop of materials flows.
- The basic idea behind CE is to return to the production stage the end-of-life products, which until now were intended for final disposal in landfills.
- Another critical point of the CE concept is that it consists of two components, i.e., "circular," which emphasizes the technical cycle of materials, and "economy," which provides new opportunities and trends for the economy and society (Nikolaou et al., 2021).

- The circular economy has recently been globally promoted as a sustainability avenue, promising to reconcile environmental protection with economic and social development.
- Several countries worldwide have adopted CE principles as part of their future strategies, mainly to address resource scarcity, economic growth, employment, and environmental challenges.
- In Europe, the CE is among the critical contemporary policy goals.

- Mainly, the European Commission associates the move to a more CE with strategies such as boosting recycling and preventing the loss of valuable materials, protecting natural resources and industrial symbiosis, and creating jobs and economic development, which can move Europe toward zero-waste, reducing greenhouse emissions and preventing environmental degradation.
- Estimations reveal that the circular economy could yield over €600 billion per year to European economies and generate an additional €1.2 trillion in non-resource and externality benefits that could boost GDP by 7% (Lazaridou et al., 2021).

- CE is essential for its power to attract both the business and policy-making communities to sustainability work.
- Still, it needs scientific research to secure that the actual environmental impacts of CE work toward sustainability.

- The European Commission has recently provided a conceptual framework to business approaches: the 9R principles (short: 9Rs) in a Categorization System for the Circular Economy (CSCE).
- These principles are also known as Value Retention Processes.
- The 9Rs basically represent an extension of the well-known 3Rs principles commonly referred to as 'reduce, reuse, recycle,' providing a more detailed classification for different types of sustainable use of resources (EUC,2021).


CIRCULAR ECONOMY
LINEAR ECONOMY
SMARTER PRODUCT USE & MANUFACTURING
EXTEND LIFESPAN OF PRODUCT AND PARTS
USEFUL APPLICATION OF MATERIALS
R0 - REFUSE
MAKE PRODUCT REDUNDANT BY ABANDONING IT FUNCTION OR REPLACEMENT BY RADICALLY DIFFERENT PRODUCT.
R1 - RETHINK
MAKE PRODUCT USE MORE INTENSIVE (I.E. BY SHARING PRODUCT)
R2 - REDUCE
INCREASE EFFICIENCY IN PRODUCT MANUFACTURE OR BY CONSUMING LESS NATURAL RESOURCES.
R3 - REUSE
REUSE BY ANOTHER CONSUMER OF DISCARDED PRODUCT WHICH IS STILL IN GOOD CONDITION AND FULFILS ITS ORIGINAL FUNCTION.
R4 - REPAIR
REPAIR AND MAINTENANCE OF DEFECTIVE PRODUCT SO IT CAN CONTINUE TO BE USED WITH ITS ORIGINAL FUNCTION.
R5 - REFURBISH
RESTORE AN OLD PRODUCT AND BRING IT UP-TO-DATE.
R6 - REMANUFACTURE
USE (PARTS OF) A DISCARDED PRODUCT IN A NEW PRODUCT WITH THE SAME FUNCTION.
R7 - REPURPOSE
USE (PARTS OF) A DISCARDED PRODUCT IN A NEW PRODUCT WITH A DIFFERENT FUNCTION.
R8 - RECYCLE
PROCESS MATERIALS TO OBTAIN THE SAME OR LOWER QUALITY
R9 - RECOVER
INCINERATION OF MATERIAL WITH ENERGY RECOVERY

- In this context, the CE concept can be adopted for the forestry and forest products industry.
- This particularly means a reduction in the input of virgin natural resources in production systems and a reduction of CO_2 emissions as well the reuse and lifetime extension of wood products, recycling by optimization of potential wood assortments (e.g., recycled natural fibers from medium-density fiberboard wastes), and nutrients and energy recover from the wood products.

- CE in the forest sector means an economy where raw materials and their value are employed as efficiently as possible, converting the under-valued forest residues and wood waste into value-generating market forest waste use.
- The CE framework provides opportunities for the forest sector, environmental protection, new job creation, and economic growth.
- Increased cascading of wood and waste wood recycling are among the practices that have been identified and are mainly associated with the CE.

- On the other hand, CE could advocate for protecting forests by utilizing forest wastes that otherwise could be a potential source of wildfires or a growth media for forest pests.
- The forest-based industry could play an increasingly crucial role in implementing CE principles.
- In particular, the forest products industry generates several residues apart from actual products, many of which can be used further after being properly treated (Lazaridou et al., 2021).

Circular Economy, Sustainability, and Turkiye

- In the world, especially in European Union member countries, reducing the use of virgin raw materials and reusing the raw materials added to production in different ways is aimed.
- E.g., for wood composite materials production, collecting useless wood-based furniture (especially panel furniture) from consumers and re-introducing them into production as a cost-effective raw material was aimed.

- However, in Türkiye, there are some critical issues to mention before evaluating the situation.
- No data on waste furniture or recycled furniture have been found during the official database queries.
- Therefore, these numerical data are urgently needed for cost-efficiency and feasibility analyses.
- All stakeholders and end consumers, especially public institutions, should be encouraged to track the number/amount of waste wood-based products.

- It is known that scrap furniture is suitable for use in particleboard industry.
- However, the most significant obstacles are these raw materials' chemicals, such as dyes and coatings.
- How can we remove these chemicals most economically and efficiently?
- Large recycling plants are needed for these kinds of processes.

- In countries that are good examples of such activities, municipal waste collection facilities are used to collect these materials from consumers and dispose of them appropriately.
- Obtaining particleboard from products consumers dispose of is an excellent example of complete recycling.

- Particleboards produced from these materials have generally been found to be technically efficient.
- To elaborate further, it is known that almost 85% of the material of a board can consist of waste wood or woody materials.
- The content rate of recycled woody material at the European level for this type of production is usually around 30-75% (Kies and Jancke, 2022).

- Considering the laws and practices in our country regarding encouraging or forcing consumers to recycle, it can be seen how difficult and essential it is to collect waste material.
- Reintroducing discarded wooden products into production is extremely important, primarily to ensure energy efficiency.

- Encouraging cooperation between particleboard manufacturers, local waste collectors, and public institutions and establishing a good waste management and collection system are also recommended by the European Union (Kies and Jancke, 2022).

- Likewise, using the low-density fibreboards produced from disposed furniture, wooden boards, etc., is recommended for insulation.

- Low amounts of binder, water, virgin fibers, and small chips obtained from recycling can be used to produce these materials.
- Since this application can use 100% untreated recycled fibers, it can be produced from wholly recycled materials that are technically suitable and have high economic added value.
- In addition, all of its raw materials can be obtained from recycling centers or completely destroyed in relevant centers (Kies and Jancke, 2022).
- Some manufacturers reuse used wood panels to produce insulation boards, while others waste furniture.

- Eventually, It is seen that producing wood composite boards from waste wood materials has economic, environmental, and social contributions as it will create employment.
- Relatively low energy needs and low carbon emission values for reprocessing used material are significant from an environmental perspective.

- However, the inadequate recycling process of wooden products in our country and the lack of consumer awareness, laws, and incentives are extremely troubling in supplying recycling materials.
- Local recycling facilities and especially municipal waste collection efforts should focus on scrap wood, which should be encouraged by the state.
- In other words, finding waste materials of suitable quality and quantity is a bigger problem than the difficulties that factories will face in incorporating waste materials into their production processes.

- The benefits of adopting the CE principle in the forest sector are mainly in the environmental and economic sectors.
- The most significant environmental benefit of increased wood cascading comes from avoiding resource extraction from the natural environment.
- It also enables and promotes the material use of wood.

- Among the most significant advantages of cascading is the lifetime extension of wood products and the postponed release of carbon stored in products into the atmosphere.

- In summary, reusing forest products means consuming fewer resources, less energy, and less labor than creating products from virgin materials.
- Energy and material efficiency provide a competitive advantage for forest sector companies.
- Besides, the cascading use of woody biomass offers economic benefits for companies because it reduces the amount of waste produced and the disposal costs.
- It also merits attention that circular economy practices on wood would create value based on a sustainably sourced material flow, local jobs, and more professional and qualified employment.

➢Thank you for your attention.

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