C-ENTRY: CIRCULAR ECONOMY ENTREPRENEURSHIP COMPETENCIES FOR YOUTH

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CONTENT

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INTRODUCTION

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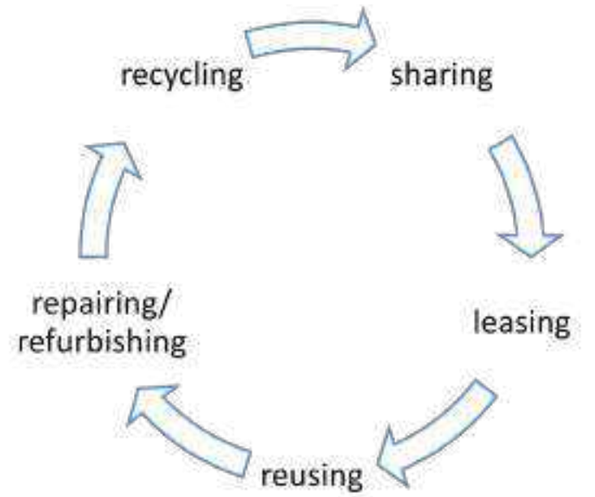
According to the European Parliament article “Circular economy: definition, importance and benefits” (Parliament, n.d.) the circular economy is a model of production and consumption of existing materials and products as long as possible, which involves:



In this way, the life cycle of products is extended. In practice, it implies reducing waste to a minimum. This model relies on large quantities of cheap, easily accessible materials and energy. Also, part of this model has planned obsolescence, when a product has been designed to have a limited lifespan to encourage consumers to buy it again.

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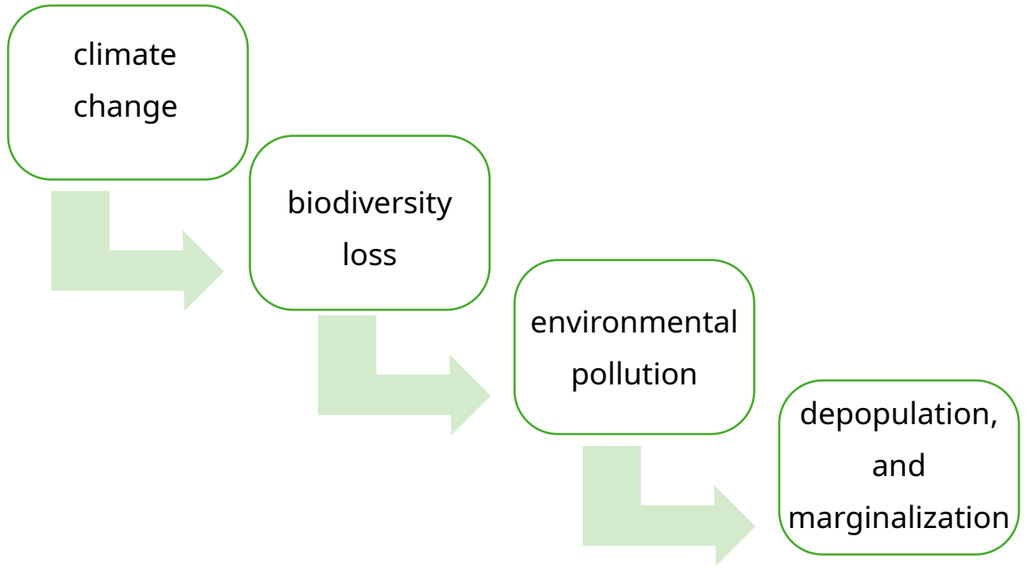
Circural Economy	Linear Economy
When a product reaches the end of its life, its materials and kept within the economy wherever possible. These can be productively used again and again, thereby creating further value.	This is a departure from the traditional, linear economic model, which is based on: - take - make - consume - throw away pattern.

Recent growth in interest in the circular economy (CE) is a result of environmental problems, climate change, and a very linear economic approach of society, companies, and organizations. Rural communities in particular face significant environmental issues caused by linear economy mechanisms (fossil fuel industry, resource depletion, intensive agriculture, waste pollution) such as:



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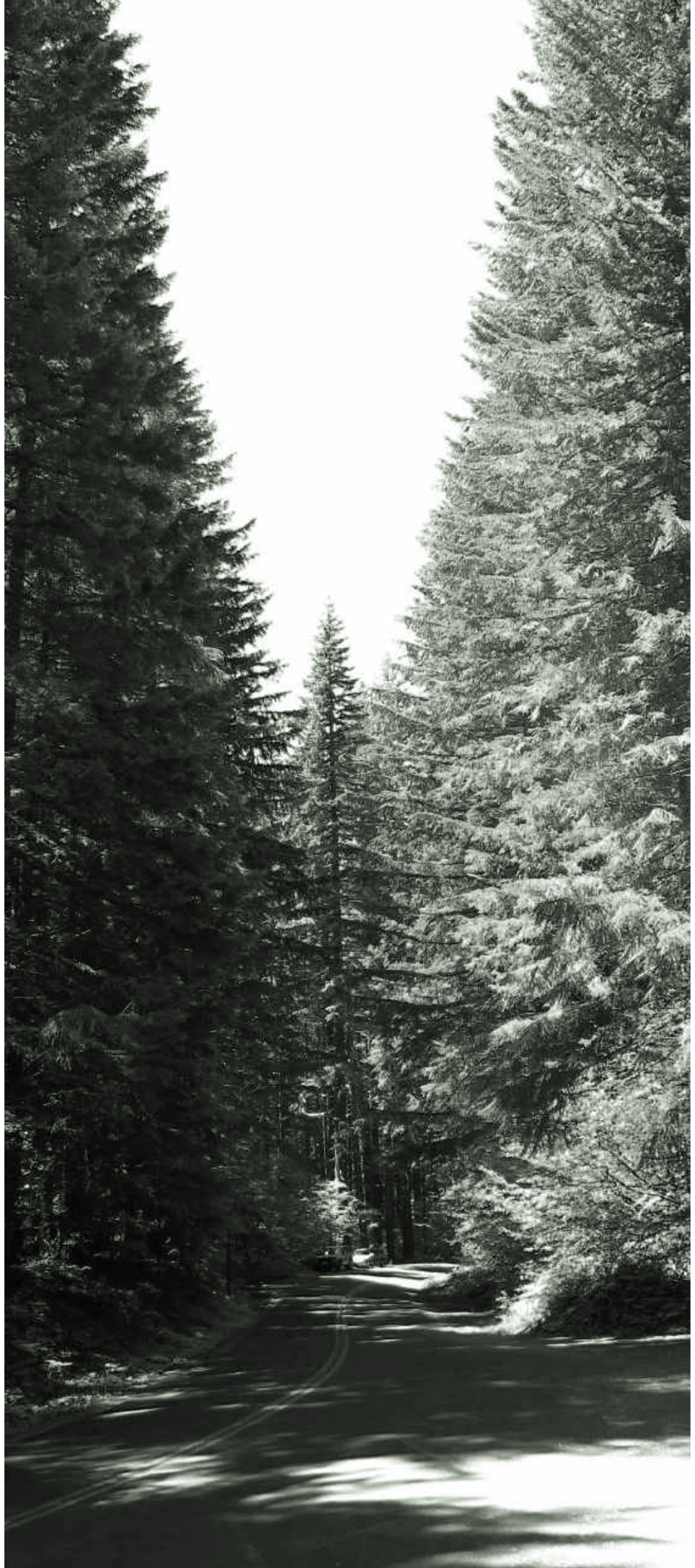
In this context of climate change, unequal access to services, and limited development possibilities, rural communities must manage such cascading occurrences. (Florin-Constantin Mihai)

By 2030, the Sustainable Development Goals (SDGs) of the United Nations seek to lessen these dangers. In addition, the European Green Deal (EGD), a strategy for the European Union, aims to create a sustainable economy by turning environmental and climate change problems into new opportunities across all policy domains. The goal is a modern, competitive, and resource-efficient economy with zero net greenhouse gas emissions by 2050. The EU wants to reduce net greenhouse gas emissions by at least 55% from 1990 levels by 2030 in accordance with European climate regulations. (Damjan Krajnc, 2022)

However, in order to achieve the sustainable development goals (SDGs) and European Green Deal (EGD), the transition towards circular economy approaches must be also implemented in rural communities. The holistic approach to the circular economy could prove particularly successful in rural areas because it provides a methodology that could aid rural territories in designing sustainable and resilient development strategies. (Florin-Constantin Mihai)



To successfully approach this change towards a circular economy model (CE) in rural areas, the entrepreneurial activities of young people need also to be encouraged. Younger generations are increasingly accustomed to the idea and practices of the CE, such as trash sorting and the purchasing of products that have been previously used or recycled.

A recent review through the Web of Science (WoS) followed by Leximancer analysis by (Damjan Krajnc, 2022) has shown that young people believe in the principles and priorities of CE but do not receive enough support to participate and implement the priorities actively as they are unable to process and evaluate in an entrepreneurial way when linking the CE to business opportunities. The analysis has also shown that relating them to business models and entrepreneurship also seems to be problematic. As a result, the majority of them are unable to design, develop, and create new business solutions.

The amount of education is likewise strongly correlated with public acceptance of the concept of a CE. Although they are organizations with great revolutionary potential, schools and universities face a number of systemic difficulties. At the institutional level, when

there is no evidence of the integration of education on this topic in the curricula, limitations in fostering action-oriented and participatory. In addition, even carefully planned programs for educating people about climate literacy, their implementation is frequently difficult as a result of outside forces. Because of this, it is incredibly unlikely that students will take courses on climate change. (Damjan Krajnc, 2022)

Despite all this however, young people are becoming more and more interested in CE. They have one of the biggest impacts on the transition from linear to circular models. Additionally, they have higher expectations for sustainability than previous generations did. Young people are taking a more active role in the sustainability movement and are committed to addressing the climate crisis. 60% of young people are worried about the state of the environment in the future in the face of unrelenting climate change.

Applying the most recent knowledge to a CE is necessary for young people who are taking the lead in enacting environmental change and starting their own businesses. (Damjan Krajnc, 2022)

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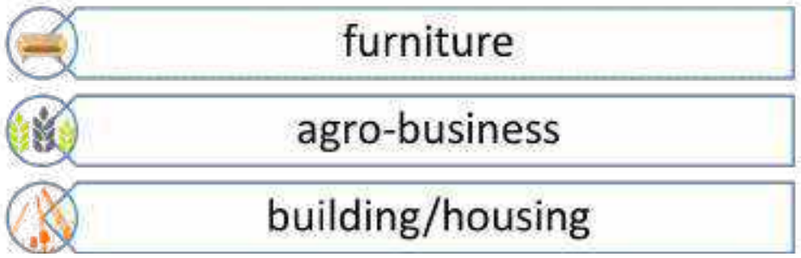
C-ENTRY (Circular Economy Entrepreneurship Competences for youth) project aims to promote employment and entrepreneurship in EU rural areas by equipping young people with the skills to establish co-working and start-up incubators that take advantage of the Circular Economy's opportunities, with concrete examples in three economic sectors:



These sectors are strategic fields for Europe's smart economic and social development. The initiative is based on one of the primary pillars of the European Union's new Circular Economy Action Plan.

In this context of the first result **(R1) of C-ENTRY** project shall result in the self-assessment tool that will:

Evaluate the adoption degree of CE policies in the organizations with the aime to provide a clear illustration of the type of investments for young people that may be supported in the context of the CE.

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In the framework of the project R1 (CE Sectorial Assessment Methodology), questionnaires were distributed to 10 organizations active in the field of furniture, housing/building or agro-business sector per partner's country.

All organizations that were surveyed are engaged with CE activities to assess the current state of each sector against specific circularity aspects, as well as to discuss existing barriers and potential policy interventions towards a successful transition.

The questionnaire included closed-ended questions with quantitative and qualitative characteristics, grouped into 3 different groups and a total of 19 questions.

- 5 questions related to the company/organization profile to see how they are connected with the other questions.
- 6 questions related to the knowledge and evaluation of the circular economy in the business sector.
- 8 questions related to the practical applications of the company/

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organization in the model of the circular economy.

The questionnaire was created online on Google Forms and can be found at the link: https://forms.gle/j8nSknGqEXSEGmP88

In the context of **C-ENTRY (R1)** the next pages present a specific methodology approach, so that young people can be equipped with new skills and knowledge, explore new CE opportunities and be able to invest and improve their employability and entrepreneurial mindset in the green and circular economy.

Section	Description
1.Conclusions Report analysis	A report analysis from each partner organization survey conclusion.
2.Compiled conclusion report analysis	A compiled report analysis from all the partner organizations' survey conclusions alongside • 2.1: a list of the best practices mentioned by all the organizations throughout the questionnaire (the most frequently mentioned indicated by the number of responses). • 2.2: a categorization of best practices of each sector (agro-business, housing/building, furniture) according to four objectives: -reduced resource consumption, -intensified product use, -the extended life of products/components, -and giving resources new life.
3.C-ENTRY Result one - CE Sectorial Assessment Methodology	With the conclusion compiled report analysis from all surveys and relevant research data, the final "section C-ENTRY Result one - CE Sectorial Assessment Methodology" will provide: • 3.1: Useful and supportive tools, educational material, and financing programs for a better and deeper understanding of the Circular Economy for young people. • 3.2: A list of the necessary circular economy skills and competencies for young people. • 3.3: Criteria to assess and evaluate the level of circularity for organizations based on key aspects of the C.E. and an analysis of existing business models • 3.4: An analysis of current business approaches for the selected rural areas sectors in all product life cycles and perspectives of the Circular Economy. • 3.5 An analysis view of the organizations' transitions toward a circular model • 3.6 Perspectives for the future of the Circular Economy

1. REPORT ANALYSIS FROM EACH PARTNERS ORGANIZATIONS SURVEY CONCLUSIONS

1.1 LITHUANIA

Lithuania is ranked 18th among the nations of the European Union in terms of the 2019 Ecological Innovation Index. The ranking of the nation has somewhat slipped from previous years, although further analysis of Lithuania's development in this area is impossible given the index's evolving methodology.

However, despite the revisions made to the index's computation, Lithuania continues to rank below the average for the European Union and alternates between the categories of catching-up and moderately advanced nations. In 8 of the 5 categories of the eco-innovation index, according to the most recent analysis for 2018–2019, Lithuania holds the top spot. This is due to the country's extraordinarily high employment rate in the eco-industry, which is higher than the EU average.

Additionally, Lithuania is performing well in improving resource efficiency, as evidenced by the fact that its metrics are comparable to those of the European Union as a whole (exceptionally high-water productivity indicator). Lithuania lags much behind the EU average in the remaining categories (eco-innovation expenses, eco-innovation activities, and eco-innovation results).

According to experts, the nation's public investments should be focused on the development of sustainable economic growth based on the principles of the circular economy in order to accomplish national and European Union strategic goals.

The amount of waste produced by production and other economic activities is rising, and Lithuania currently uses resources less efficiently than the EU average. As a result, it is necessary to improve and develop appealing investment tools for business that can support sustainable and creative management of corporate resources.

The fact that Lithuania pays insufficient attention to the promotion of circular design and design innovations as well as the creation of circular business models contributes to its gap with the leading EU nations in the area of the circular economy. Companies must plan and build new processes and models based on eco-efficiency, durability, renewal, remaking, sharing, greater reuse, and recycling in order to make the transition to a circular economy sustainably.

These business models have not yet received much attention in the media, which indicates that neither policymakers nor the businesses themselves have a thorough understanding of CE or the skills required to put it into practice. A specialized knowledge dissemination center, a platform for collaboration where various interested groups would have the chance to carry out joint initiatives, develop inclusive innovations, or incorporate good circular economy practices in their activities, would also help to promote the development of the circular economy in the nation.

The survey data presented in this report also shows the direction of society towards a circular economy, but it also reveals difficulties - the lack of qualified workers and funding and highlights the weak points of motivation tools. However, based on statistical data and experts' assessments, it is clear that positive changes are taking place, but they require a longer time.

1.2 CYPRUS

The linear economic model, which is based on production, consumption, and waste includes the elements: take, make, use, dispose and pollute. Due to the increase in population and increased demand for resources, it is vital and crucial to moving from the linear model to the circular economy model.

The materials in the Circular Economy (CE) model are collected and reused after each use. The elements of this model are making, using, collecting, transforming, and reusing. By rethinking resource efficiency and material flows, the European Commission developed a framework to promote systemic change. Engaging policymakers across different policy areas and levels of governance, as well as various stakeholders, it aimed to promote a collaborative approach.

Cyprus as well as other European countries try to adjust and use this model for production and consumption as well. Assessing the most important aspects of CE indicators of the organizations belonging to the furniture, housing/building, and agri-food sectors in Cyprus we can summarize and analyze them in the following concluding paragraphs. Most businesses/organizations are well informed about the Circular Economy Model, but there are some of them that lack knowledge about it. It is suggested that the media, campaigns, discussions, etc, should contribute to increasing their awareness. To most organizations, Circular Economy means to them zero waste reconstruction/design, reuse of waste as raw material, resource/recovery, and recycling.

Minimizing the environmental impact of the product life cycle, the ability to reuse products and the biodegrading and composting of the products help mostly the organizations in Cyprus to move from the Linear to Circular Economy Model. But, not so many organizations use the CE model in the production/processes.

The main policies in Cyprus that best promote the Circular Economy Model are found to be the increasing CE knowledge base by collecting and providing information and data; promoting innovative business models for the Circular Economy (leasing and distribution) and promoting the adoption of the CE from the media.

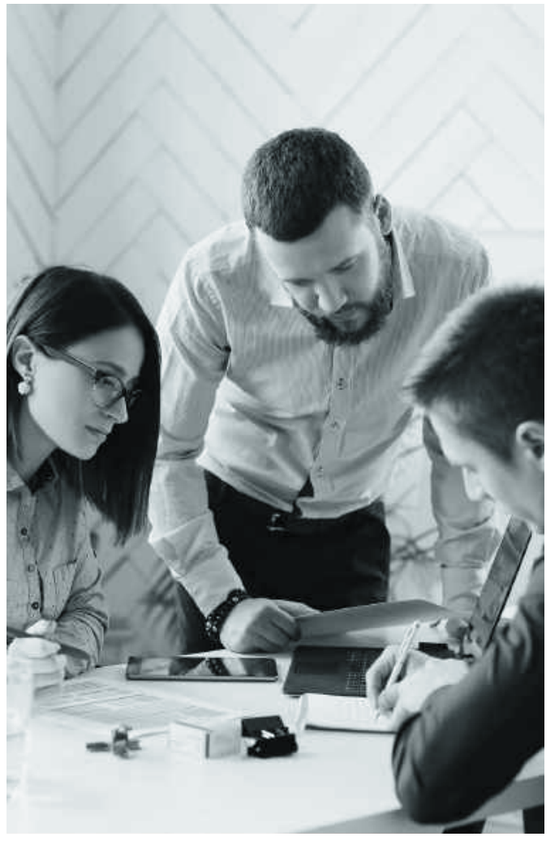
After five years, all the organizations agreed that the CE prospects and policies will be expanded. The organizations are willing to participate in CE training activities to promote sustainable development in their communities, which is one of the CE business model objectives.

Resource recovery and product-life extension are the business models that are used mostly by organizations. Moreover, purchasing of

products and raw materials with ecological certifications and recycling materials are the practices that the organizations use the most. What has led the organizations to implement CE practices are the expansions in new markets and partnerships.

Considering the aim of the first Result, which is the evaluation of the type of investments for young people that may be supported in the context of the CE and the evaluation degree of the organization in CE aspects, the organizations consider as most important benefit the introduction to the labour market of new skills and knowledge.

Organizations wait that the principles of the CE models will increase their profits after 1-10 years. Waste and energy are the indicators that they notice better results. Although organizations try to implement CE practices in their production processes, the lack of funding; non-supportive legislation, and consumer indifference, seem to be the main obstacles/problems in the implementation. Promoting sustainable products, empowering organizations to transition into a new business economic model which is green; rearranging the production process, and creating new strategic tools will fill each gap between linear and circular economy models and will lead to a successful transition in Cyprus, based on the circular economy action plan, introduced by European Commission.



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1.3 GREECE

The transition to a low-carbon, resource-efficient, and circular economy is of paramount importance for Greece to ensure environmental protection but also to boost green growth, create new jobs, fight unemployment, and support innovation in production, consumption, value chain of materials, sharing use methods and reduction, reuse and recycling of waste, in order to extend the life circle of products and optimize the resources, water, and energy.

The long-term (2030) goals of the National Action Plan on Circular Economy can be summarised as follows:

- moving up the waste hierarchy by focusing on preventing waste and improving recycling
- supporting circular entrepreneurship by promoting “industrial symbiosis” and business clusters

According to the participants ‘views expressed through this survey, there is a significant number of companies that have started including circular economy practices in their activities and realized to a significant extent the gradual transition to renewable resources, and recovery of the materials and products.

The economic model of the Circular economy as a regenerative ecosystem has definitely started gaining ground. What became evident from the results of this survey is that companies believe that high levels of sustainability can be achieved without diminishing their profitability.

Finally, through the collected best practices it became evident that some circular business models have gained significant market share, but typically only in restricted economic niches, namely: Sustainable resource sourcing, Energy efficiency, and Waste management.

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1.4 ITALY

The European Commission, in its recent Second Action Plan for the Circular Economy, emphasizes that with a linear model of the economy, based on high resource and energy consumption, climate neutrality cannot be achieved.

In order to turn to a Circular Economy Model, it is necessary to close existing circularity gaps, related to:

- reduction of resource utilization, by decreasing the amount of material used in making a product or providing a service through circular design, focusing on sharing models and the development of digitization;
- lengthening the use of resources, optimizing the use of resources, and increasing product life through durable design, the use of materials and services that extend the life of goods, reuse, repair, and remanufacturing;
- use of regenerative raw materials, replacing fossil fuels and non-renewable materials with renewable energies and materials, maintaining natural capital and ecosystem services;
- re-use of resources, with recycling of waste and re-use of secondary raw materials.

For each of these four pillars of the transition to a circular economy, in Italy there are specific gaps that can be filled in the short to medium term with technologies and, moreover, operational and management methods; others are longer term and require research and development of innovation and new measures by the Italian National Authorities, which should support Organisations interested in the transition to a more sustainable entrepreneurial model.

Recovering these gaps, for instance by reducing the use of a certain amount of material to provide a certain service, or by extending the useful life of a certain product by a certain number of years, or by increasing the share of renewable material or energy for a certain product, or by increasing the share of recycled material used to replace virgin materials in a certain product, also leads to energy savings, reductions in the use of fossil energy and thus also reductions in greenhouse gas emissions in the short term period while increasing benefits for the Organisations and the whole National and European Economy.

1.5 ROMANIA

Starting with 2021, Romania has its first Strategy for Circular Economy - ROCES 2030. The existence of such a document, which comprehensively addresses the essential elements of the circular economy (waste recovery, circular business models, public green acquisitions, etc.) is crucial for obtaining financial funding for circular economy projects and also for monitoring the progress of the transition to a circular economy through specific and measurable objectives.

Another important event is the Recovery and Resilience Mechanism (MRR), which is the mainstay of #NextGenerationEU, a temporary financial instrument with the main purpose of providing support to Member States to meet the challenges posed by the Covid 19 Crisis and its economic consequences. The first pillar of this plan, the Green Transition has a special section dedicated to Waste Management and Circular Economy, through which it will be possible to obtain financing and support for projects aimed at facilitating the transition towards a circular economy (e.g.: the inclusion in the economic circuit of secondary raw materials derived from materials recovered from the population in the form of waste, the development and implementation of the guarantee-return system for packaging, including the acquisition of hardware and software infrastructure., investments in aerobic storage, management, and composting systems, etc).

Notwithstanding all this, the level of recycling, considering all the recycling loops, remains extremely low in Romania, and the negative evolution raises numerous challenges. Recycling is 5 times lower than the European average according to Eurostat. In a context where raw materials are becoming increasingly scarce and expensive, recycling only 13% of waste generated in Romania means wasting valuable resources available.

The main challenge is to address the gap between the results of waste management (waste containing convertible materials in accordance with the development stage of solutions and technologies) and their effective reintroduction into new products. The establishment of a market for convertible waste, and a transparent and dynamic market for secondary materials are paramount tasks that should be carried out by the government in collaboration with the private sector.

Another pressing issue is the revision of regulations on the reuse and recycling of textiles in order to be able to create a market for sustainable and circular textiles.

Romania's performance in implementing the principles and regulations of circular economy is pretty poor compared with the other EU countries that have a tradition in this sense and have put lot of efforts

into improving the performance. The efforts consist of setting forth a regulatory framework that encourages companies to build circular business models (both in terms of incentives and penalties), doubled by awareness raising campaigns meant to change people mindset about healthy circular consumption habits.

Unfortunately, the very low separate waste collection and recycling rates put us among the last countries in Europe in this area and the circular economy strategies and regulations remain only on paper, with no significant implementation tangible results. The isolated efforts of companies on bringing a positive impact on circularity cannot compensate the lack of initiative of the competent authorities or the poor regulation.
Implementing and monitoring the circular economy in Romania requires on one hand updating the national legislation to conform with European regulations, and on the other hand opening up all activities of economic and social life towards initiatives and innovative business models.

Efficient waste management aids the circular economy extremely well. Through recycling raw materials and important energy resources can be saved. This is the reason a synthetic indicator has been created, which follows the efficiency of material consumption through comparing tons of waste generated within the economy with internal material consumption, the smaller the value of this ratio, the better the performance.

For Romania the analysis found a descendant trend for the indicator's value. Therefore, the 2024 forecasts see that only 3.81% of internal material use will end up as waste, so a superior performance.

In comparison, the European average's trend is ascendant—the 14.30% rate for the same year 2024 showing a reduced efficiency of material consumption. The value almost four times lower that Romania registered for the indicator compared with the European average shows us that—at least through its perspective—Romania's performance regarding responsible production and consumption is above the European average.

Selective collection of waste and recycling are key points in reducing pressure put upon the environment. Unfortunately, in Romania in the latter years of the period analysed—only a bit above 10% of total municipal waste has been recycled. The forecasts made after applying the econometric model shows the continuation of the sinuous evolution in the next period as well, without major progress, the recycling rate of municipal waste being forecasted in 2023 to be 11.60%.

The values already registered for the European average—over 4.5 times larger than Romania's, and increasing—shows that, to arrive at this level of performance, the other EU Member States have efficiently adopted and implemented the principles of selective collection and recycling. For the forecasted period the gap between the European average and the rate's value for Romania is increased against the background of maintaining the upward trend in the case of EU-27 and the projected values that do not exceed the value recorded in the last year of the data series available on Eurostat in the case of Romania.

Waste management in Romania had until 2021 been realised on the basis of Law no. 211/2011. Insufficient measures contained in this law and their poor implementation have led to the situation registered

in the period analysed. Furthermore, the fact that Romania has not transposed in its national legislation—before the established deadline—EU Directive 2018/851 of the European Parliament and of the Council from 30May 2018 for modifying Directive 2008/98/CE regarding waste, shows us that effort at national level must be intensified. In order to avoid sanctions following the non-application in time of the directive, the Romanian Government emitted Emergency Ordinance no. 92 regarding waste procedures on August 19, 2021, this new regulation leading in the future to the 2011 law's complete abrogation.

The low municipal waste recycling rate relative to the European average, without encouraging perspectives, shows us that an update of the legislative framework was needed—which included measures imposed at European level—which was realised through the aforementioned emergency ordinance. The effects of this first step will not be seen immediately, but we hope that in the future we can speak of a better performance registered by Romania in this key domain for the circular economy.

For Romania the monitoring framework for the circular economy established by the European Commission is the instrument through which we can form a clear image regarding the domains of interest of the circular economy where the largest offsets relative to the other EU Member States are registered, and where the measures implemented in the national legislation from the new European directives can in the future lead to their diminishing and to a better performance in the transition towards truly durable development.

The circular economy requires active participation not only at the public policy level, but also at the level of implementing this concept in the collective consciousness, through informing producers and consumers about the benefits of this model. Transitioning from a linear economic model to a circular one is a complex and lengthy process, and Romania—in contrast with other EU member states—is at the beginning.

1.6 IRELAND

The transition to a low-carbon, resource-efficient, and circular economy is of paramount importance for Ireland to ensure environmental protection but also to boost green growth, create new jobs, fight unemployment and support innovation in production, consumption, value chain of materials, sharing use methods and reduction, reuse, and recycling of waste, in order to extend the life circle of products and optimize the resources, water, and energy.

Like the digital and energy transition towards a climate-neutral Europe, the circular transition will take some time, since it requires - apart from the progressive implementation of its binding targets, such as increased recycling targets in waste management and the progressive reduction of the landfill by 2035 - the creation of new production and consumption patterns, but also a new “circular economy culture”, both at the level of local government, entrepreneurship, and civil society.

According to the respondents’ expressed views captured through the survey, there is a significant number of companies that have started including circular economy practices in their activities and realised to a significant extent the gradual transition to renewable resources, and recovery of the materials and products. The economic model of the Circular Economy as a regenerative ecosystem has definitely started gaining ground. What became evident from the results of this survey is that companies believe that high levels of sustainability can be achieved without diminishing their profitability. Finally, through the collected best practices it became evident that some circular business models have gained significant market share, but typically only in restricted economic niches, namely: sustainable resource sourcing, energy efficiency, construction, and waste management.

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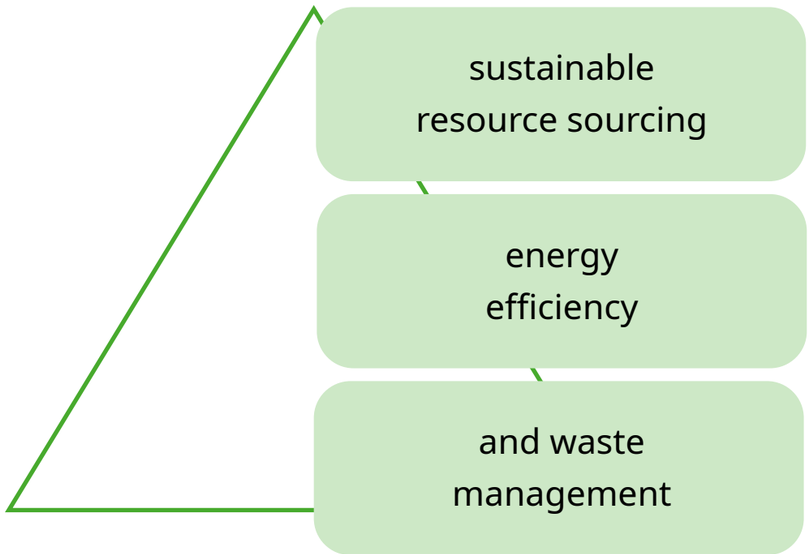
2.COMPILED CONCLUSION REPORT

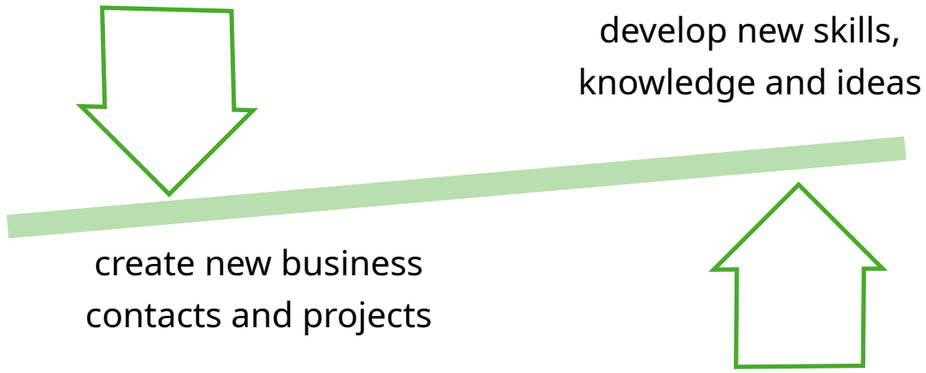
The survey data presented in the national reports of each partner country indicated that there is a significant number of organizations that have started including circular economy practices in their activities.

These organizations realised to a significant extent that the gradual transition towards renewable resources and the recovery of the materials and products have the potential to produce **high levels of sustainability without diminishing their profitability.**

It also became evident that some circular business models have gained significant market share than others, namely:



The personal stuff in the organizations considered themselves well informed about the Circular economy model and would be interested in participating in circular economy training activities in order to:



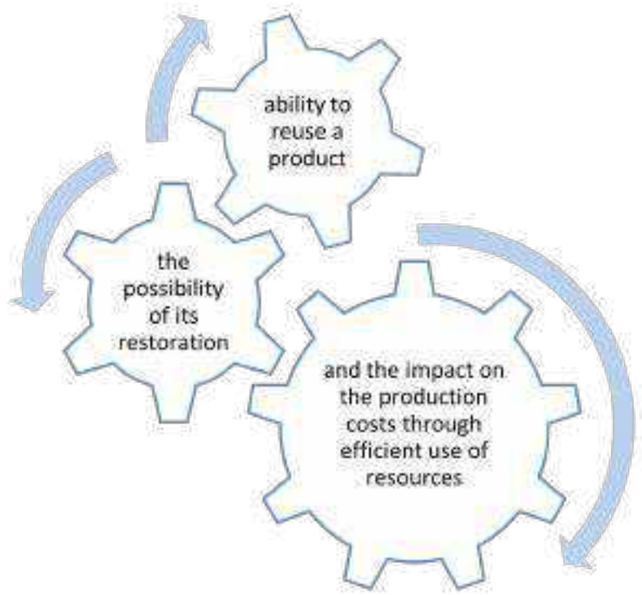
They believe that the prospects of Circular Economy practices in business will expand their applications after five years and as they tend to associate the Circular Economy model with the ideas of:

saving resources and energy

zero waste reconstruction

and resource recovery and recycling

They also consider as the most important aspects to facilitate the transition from a Linear to a Circular Economy. The:



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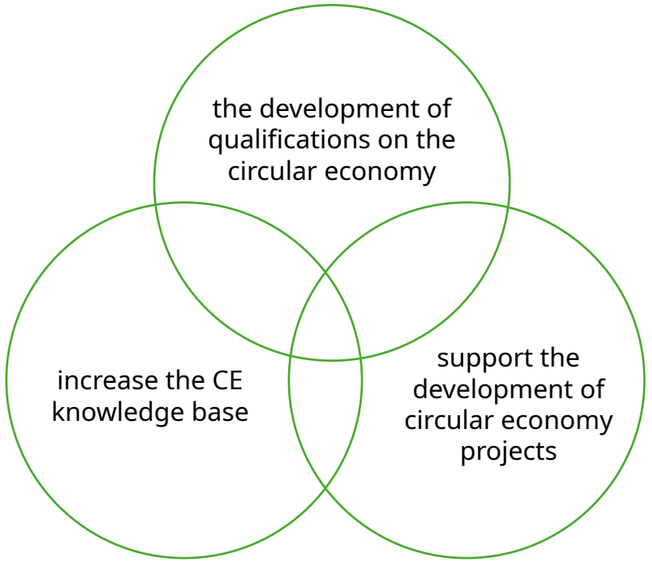
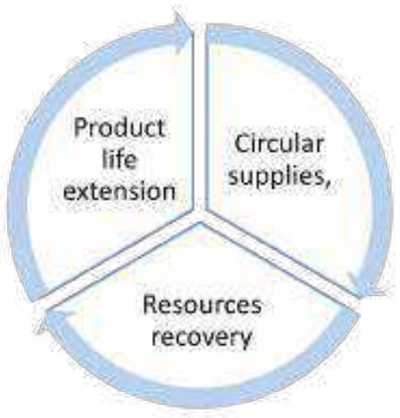
The policies that best promote the Circular Economy model among the personnel stuff are:



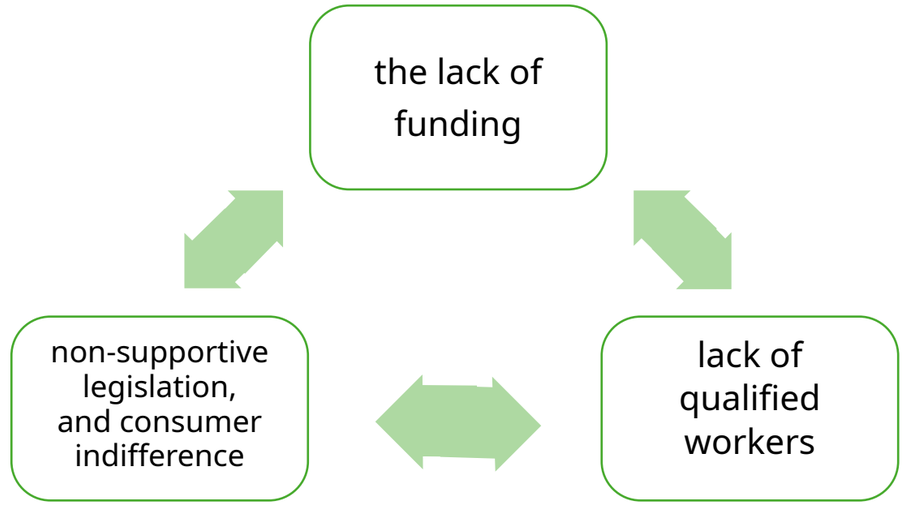
According to the practical applications of their organizations in the model of the circular economy most of them are using the circular economy model to a wider extend using the following as their main key Circular Economy business models:



Saving/using resources more effectively and Strategic sustainability are the most common incentives that led their company/organization to implement circular economy practices. Cost savings and increase

of innovative products and production processes are considered to provide the most important benefits of the Circular Economy model for their company/organization while

are the three areas which thy notice the better results from the implementation of Circular Economy practices. It also revealed some difficulties. Although organizations try to implement CE practices in their production processes,



seems to be the main obstacles/problems in the implementation of CE practices in the organizations operations and highlight the weak points of motivation tools

2.1 LIST OF BEST CE PRACTICES FROM ALL SURVEYED ORGANIZATIONS

CE best practices	Total N. of responds
Recycling of materials/products/energy	28
Resource recovery / Saving resources and energy	27
Product life extension	21
Purchase of products and raw materials with ecological certifications	20
Composting	17
Ecological product design	12
Disposal in special collection areas for transport to landfills	12
Restoration of physical capital	11
Recovery of valuable materials and reuse	9
Reuse of Waste as raw materials	7
Zero Waste	7
Compensation for the environmental impact	6
Reconstruction of useful products	6
Product life cycle analysis	6
Leasing-sharing procedures for final products by consumers	5
Distribution of raw material to other companies and industries	5

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2.2 CIRCULAR ECONOMY BEST SECTOR PRACTICES

(Construction, Furniture, Agri-Food)

Construction Sector		
Objectives	**Strategies**	**Practices**
Reduced resource consumption	Ecodesign	Recyclability
		Design for easier disassembly (DfD)
		Designing using Building Information Modeling (BIM)
		Sustainable resource sourcing
		Renewable energy and energy efficiency
		Usage of high-efficiency mechanical equipment in the utilization of material
		End-of-life of products management
		Eco-friendly architecture

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Process optimization	Prefabricating and modular construction	
	Just-in-time construction	
	Production, Stock and supply chain, Sales, Demand, Inventory and Distribution Planning	
	Strategic network management	
	Systematization of tools and optimization of costs	
	Life cycle and Spare parts management	
	Availability and capacity for commitment	
	Use of data and mathematical models	
Responsible consumption and procurement	Reducing transportation and footprint	
	Short supply chain	
		Logistics optimisation
		Artificial intelligence algorithms
		Inventory and surplus reduction
		Recycling
		Raw material flow management
		Reducing transportation and footprint
		Deconstruction
		Construction management software
		Sustainable packaging
Intensified product use		
Process optimization		Labour sharing
		Asset sharing
		Implementation of joint projects

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Extending life of products / components	Short-term renting	Sharing platforms
		Leasing-sharing procedures for final products by consumers
		Access rather than ownership
		Collaborative projects
		Equipment rental
		Involving the public in the tool rental process through different initiatives
	Donating and reselling	Donating unused assets
		Exchange of unused materials
		Cross-industry collaboration and sector networks Cooperation with other companies at the international level
		Re-use and exchange of resources
	Refurbishing	Flexible building core
		Adaptive reuse of existing buildings (land conservation)
		Future trend planning and corresponding action plan
		Product life extension
		Collection, refurbishing and reuse of bulky waste
	Performance economy	Product as a service
		Purchase of products and raw materials with ecological certifications

Giving resources new life

Design-build finance operate maintain (DBFOM) projects

Collection, refurbishing and reuse of bulky waste

Synergic business models

Industrial ecology

Materials made from materials recycled from other industries

Application of 3-D printing technology

Resource recovery

Water reuse

Textile recycled materials

Manufactured products from 100% recycled plastic

Bricks from demolition waste

Optimal maintenance plans

Recycling and composting

Designing of waste

Construction waste management

Use of biodegradable materials

Energy efficient deconstruction and recycling

Recycling of household waste

Green energy production and waste reduction

Conversion of organic Waste into compost

Energy recovery

Construction waste as fuel

Centralized heating systems

Building thermic isolation

Adaptation of buildings to green energy

Manufacture of biofuels

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Furniture Sector		
Objectives	**Strategies**	**Practices**
Reduced resource consumption	Ecodesign	Use of natural materials and textiles Disposal in special collection areas for transport to landfills / landfills Easier disassembly Recycling of materials/ products /energy End-of-life of products Tackling premature obsolescence Recyclability More effective use Pay-per-use model Single-material polyethylene products
	Process optimization	Inventory, Production, Strategic network, Stock and Supply chain, Event, life cycle Spare parts, Distribution, Sales and Demands planning and management Circular supplies Systematization of tools and optimization of costs Ecological product design Reconstruction of useful products Sustainable packaging Availability and capacity for commitment Use of data and mathematical models
	Responsible consumption and procurement	Recycling waste Raw material flow

management

Inventory and surplus reduction

Material flow analysis in the production process

Paper recycling

Sustainable packaging

Logistics optimisation

Artificial intelligence algorithms

Supply chain planning

Intensified product use

Sharing economy

Leasing-sharing procedures for final products by consumers

Distribution of raw material to other companies and industries

Sharing platforms accessible to all
Access rather than ownership

Extending life of products / components

Short-term renting

All types of furniture rental

Furniture rental

Donating and reselling

Re-use and exchange of resources

Donating unused assets

Exchange of unused materials

Refurbishing

Collection and reuse of bulky waste

Product life cycle analysis and extension when possible

Performance economy

Synergic business models

Purchase of products and raw materials with ecological certifications

Product as a service

Giving resources new life		
	Industrial ecology	Resource recovery
		Raw materials from waste
		Water reuse
		Biomethane from sewage sludge
		Optimal maintenance plans
	Recycling and composting	Green energy production and waste reduction
		Composting
		Designing of waste
		Recycling of household waste
	Energy recovery	Energy from waste
		Production from briquettes
		Electricity from waste (pellets)

Agri-food Sector		
Objectives	**Strategies**	**Practices**
Reduced resource consumption	Ecodesign	Recyclability
		Eco-material tools and products
		Impact free agriculture Recovery of valuable materials and reuse
		Usage of high-efficiency mechanical equipment in the utilization of materials
		Recycling of materials/ products /energy
		Disposal in special collection areas for transport to landfills / landfills
		Impact free agriculture
	Process optimization	Inventory, Production, Stock and supply, Spare parts, Distribution Demand, Sales, planning and management

Circular supplies

Systematization of tools and optimization of costs

Integrated business planning of sales and production

Increased use of manures (green and animal)

Use of crop rotations rather than inorganic fertilisers

Solar drying of crops

Appropriate use of pesticides

Increased use of manures (green and animal)

Availability and capacity for commitment

Intensified product use

Responsible consumption and procurement

Decrease consumption highly processed foods

Reduction in food waste
Decrease consumption of beef, sugar, and highly processed foods

Sustainable packaging

Logistics optimisation

Artificial intelligence algorithms

Raw material flow management

Inventory and surplus reduction

Short supply chain

Sharing economy

Access to lands rather than ownership

Sharing the harvest and seeds

Food sharing

Short-term renting

Equipment rental

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Extending life of products / components

Donating and reselling	Re-use and exchange of resources and tools Healthy food donation
Refurbishing	Collection and reuse of bulky waste Ensuring food and nutrition quality Re-use and exchange of resources and tools Healthy food donation
Performance economy	Purchase of products and raw materials with ecological certifications Synergic business models

Giving resources new life

Industrial ecology	Water reuse Biomethane from sewage sludge Animal-housing systems Full usage of raw agriculture products Process waste flows Produce energy using waste as fuel
Recycling and composting	Composting organic waste Recycle solid waste Designing of waste Recycling of household waste Green energy production and waste reduction Conversion of organic waste into compost
Energy recovery	Green energy production (solar and wind energy mostly) Biofuels from used vegetable oils Reduction in excessive and energy intensive packaging Biomethane from waste Electricity from the recovery of olive tree prunings

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3. C-ENTRY RESULT ONE - CE SECTORIAL ASSESSMENT METHODOLOGY

3.1 SUPPORTING ORGANIZATIONS IN THE DEVELOPMENT OF CE

Reducing the overall usage and consumption of finite resources is one of the key aspects of the circular economy. As a result, organizations must reconsider their business models in light of circularity. The foundation of a circular business model is how an organization develops, delivers, and collects value via closed material loops. In order to close the materials and products loop, organizations will need to fundamentally rethink their supply chains in addition to inventing circular goods and creating circular business models. More specifically organizations will need to:

- Reorganized supply chains to handle internet refunds
- Guarantee a consistent supply of recycled materials, invest in infrastructure.
- Enhance communication and information sharing with value chain partners by enabling transparency.
- Find new collaborators to create circular business models and products.

Some fundamental questions that organizations across sectors need

to ask while undergoing circular business model transformation are:

- How can we develop products that reduce waste in the production cycle?
- How can we plan for asset recovery during the production process, as well as post end-user consumption?
- How can we move towards reduced end-user consumption and greater sharing?
- How can we think about economic profitability without progressively greater consumption of finite resources?
- How can organizations apply design thinking and innovation to their business models to give better environmental outcomes?
- (Circular economy for a sustainable future , 2021)

The figures below in section 3.1.1 from (João, June 2020) and 3.1.2 (Union, n.d.) provide some useful tools and educational material alongside some financial support information that will equip young people with the necessary knowledge and skills to seek answers for

3.1.1 USEFUL TOOLS AND EDUCATIONAL MATERIAL

Useful tools and educational material

Title / Link	Link	Type	Author/Year	Summary
3 creative ways to fix fashion's waste problem	Link	Video - Ted talk	Amit Kalra • TED@Tommy 2016	Discusses ways to reuse and recycle unwanted clothes and how industry could make clothes more modular in their composition and use biodegradable materials. Interesting that video also talks about the use of harsh chemicals as garment dyes and how these dyes are affecting possible water supplies.
Ahealthy economy should be designed to thrive, not grow	Link	TED Talk	Kate Raworth, TEDTalk 2018	An important and interesting talk highlighting the issues with our current mass consumerist culture and critiques an economy built on endless growth. Unpicks the issues of GDP growth.
A short guide to the Circular Economy: The CEPS framework	Link	PowerPoint	Igor Taranic (CEPS -Centre for European Policy Studies) 2016	Presentation based on a report about the framework 'Circular Economy Progress for Stakeholders' with an overview of the key principles of the CE model and recommendations to European policy-makers on how best to support the transition towards a CE in the EU.

Circular Economy /Sustainable Materials Management	Link	Course taught online through videos, readings & quiz.	Lund University And seven other partners 2020	Free online course that looks at sustainability and the circular economy.
Circular Economy Business Worksheet	Link	Worksheets	Zero Waste Scotland 2019	Worksheets to help companies review their current practices and identify how they could incorporate the CE into their business.
Circular Economy Club	Link	Website	Circular Economy Club (CEC) 2012	CEC is the largest international network of CE professionals with 260 CEC local chapters in 110 countries. The website allows members from all over the world to share overviews and links to resources (articles, books, news, podcasts) about CE. Good source of links to interesting case studies and examples of circular products and systems. As there are members from all around the world, there are also sources with different languages.

Circular Economy General Resources Map (Ellen MacArthur Foundation)	Link	Web page	Ellen Mac-Arthur Foundation (EMF) Since 2010 & constantly updated	The interactive resource mind map is a collection of almost all educational resources that have been published, including videos, graphics, reports, case studies, articles, etc., providing an organised collection of all knowledge and educational materials published by EMF, starting from the introduction to Circular Economy to Business CaseStudies and CE Reports.
Circular Economy: An Introduction	Link	Online teaching course	edX, Delft University of Technology 2019	This course teaches how to contribute to a sustainable economic system by implementing novel business and design approaches, based on the circular economy. It is at an introductory level course under business & management subjects.
Dame Ellen MacArthur: food, health and the circular economy	Link	Youtube Video	Ellen Mac-Arthur at the 2015 EAT Food Forum 2015	An opportunity to listed to Ellen MacArthur, an inspirational speaker. She explains what is the CE and how CE can improve the entire economic system, reusing raw materials and flow them back into the economy, changing the whole system, not only the item itself.

Executive Summary on Waste to Wealth book by Peter Lacy & Jakob Rutqvist	Link	7-page online PFD document	Lacy & Rutqvist's Book published By Palgrave Macmillan; Executive Summary by Accenture 2015	This is published as an executive summary of the 2015 book "Waste to Wealth" by Peter Lacy & Jakob Rutqvist, introducing the circular economy, explaining the need for circular economy, five circular economy business models, ten disruptive technologies and how the businesses can achieve the circular advantages.
Sustainable Packaging in a Circular Economy	Link	Online course	TU Delft 2020	Free course available as MOOC. It's divided into six 'episodes', one per topic regarding different aspects of packaging. The episodes are presented by various instructors and each episode is followed by a case study and assessment sections.
The Circular Design Guide	Link	Website with lot of resources.	Collaboration between the Ellen MacArthur Foundation & IDEOS 2018	The Circular Design Guide is an online tool to help innovators rethink and redesign their design process in order to help create a more efficient CE. There are free, downloadable workshops, worksheets, and videos available, which all help to illustrate how transformative circular principles are for businesses.

The Circular Economy Podcast	Link	Podcast and script	Catherine Weetman, Rethink 2019	A podcast informing about CE and how different people use the circular approach, rethinking how we design, make and use everything. A different media of resource compared to the rest, and therefore an interesting change.
The Circular Economy Show Podcast	Link	Podcast	Ellen MacArthur Foundation 2022	The Ellen MacArthur Foundation welcomes you to The Circular Economy Show, a podcast about a new way to design, make, and use things, and how we can build an economy that's fit for the 21st century.
The Circular Economy: A Simple Explanation	Link	Video - TEDx talk	TEDx Talks, Cillian Lohan 2018	A very well-made TED talk about the circular economy, explained clearly with easy-to-understand language and applicable examples.

The Circularity Gap Reporting Initiative interactive Tool	Link	interactive web tool	Circle Economy 2020	Very useful, well made and interesting interactive tool to actually see how different countries around the world compare to each other and why they are different and what can be done to improve it. Very easy to use. It gives a good visualisation of the world needs to do to live sustainably, and provides information on how we can work towards a CE.
The Circularity Gap	Link	YouTube video linked to Circularity Gap website	Mark de Wit (Circularity Gap), TEDx 2018	Video addresses the issue of our world only being 9% circular - a 'gap' that must be fixed. Video presents 4 practical strategies to fill the 'gap': 1. Recycle more, 2. Optimise more, 3. Stop wasting, 4. Stop extracting. The video is clear and concise.
The Circulars Yearbooks	Link	Circulars Yearbooks	World Economic Forum Yearly since 2015	Reports showcase pioneering CE efforts, ranging from innovative, new and digitally disruptive enterprises and pioneering multinationals, to cities pushing established sustainability boundaries, to dedicated CE investors developing infrastructure to finance this growing movement.

Why we need to rethink how we build homes	Link	YouTube Video	Ged Finch; TEDxWellington 2019	Video is about how a CE model can fundamentally disrupt the way we build houses and the use of Modern Digital Fabrication. If construction can be done in an eco-friendly way, then we can ensure that the impact on environment by harmful infrastructure can be reduced.
The circular classroom	Link	Three modules with workbooks	The Circular Classroom, Finland 2018	The circular Classroom is a free high-quality toolkit designed for high school students and teachers to incorporate the principles of CE into their lives. It was co-created with the help of both teachers and students. It includes three modules each with a workbook and complimentary videos.
CICLO: New platform for the development of basic circular economy skills	Link	Educational Platform	CICLO-project 2020	Through its eight modules, the CICLO platform aims to upgrade, free of cost, the opportunities for up-skilling and re-skilling of long-term unemployed and low-skilled workers, in the field of the evolving circular economy market.

Quickscan Circular Business Model CBM	Link	Online Tool	Saxion 's Business Models Lectorate - The Business Model Lab 2022	With the Quickscan Circular Business Model CBM you gain insight into the possibilities of a circular business model for your company. You use a questionnaire to assess where you are now when it comes to sustainable and circular entrepreneurship. You then explore the possibilities for a more circular business model.
Circular Loop Designer	Link	Online tool	Saxion 's Business Models Lectorate - The Business Model Lab 2022	The Circular Loop Designer is an online tool to let you easily sketch a material loop yourself. The tool offers a unique library of symbols and arrows to draw your loops. Once drawn, you can easily save and share your sketches
Business Model Template	Link	Online Template	Saxion's Business Models Lectorate - The Business Model Lab 2021	The Business Model Template offers a practical structure for developing a sustainable business model. The template consists of ten building blocks divided into three phases: the Definition phase, the Design phase, and the Result phase.

3.1.2 FINANCIAL SUPPORT KNOWLEDGE

The European Union is subsidizing the transition to a circular economy through a number of financial initiatives, including the LIFE program, Horizon 2020, and European Structural and Investment Funds. Through the InvestEU Advisory Hub, the European Investment Bank (EIB) offers financing and guidance for projects promoting the circular economy.

Additionally, the private sector is becoming more interested in the potential presented by circular economy enterprises that help institutions build strong portfolios and contribute to the shift to a circular and climate-neutral economy. Redirecting capital flows toward sustainable investments is one of the requirements for assisting the shift to a circular economy. (Parliament, n.d.)

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EU FUNDING PROGRAMMES AND FINANCING SUPPORT

Horizon Europe

Horizon Europe is the biggest EU Research and Innovation programme ever with a budget of €95.5 billion. The research and innovation funding programme runs until 2027.

- How to apply for Horizon Europe funding
- Open and forthcoming Horizon Europe grants and tenders

Regional policy support for the circular economy:

These investments can contribute to: more recycling, improved waste management, resource and energy efficiency, strengthening the bio-economy, novel solutions in product design, new business models and the creation of green jobs.

- New cohesion policy
- 2021-2027 Technical Seminars
- 80 simplification measures is cohesion policy 2021-2027

LIFE programme

The LIFE programme is the EU's funding instrument for the environment and climate action created in 1992. The current funding period 2021-2027 has a budget of €5.4 billion.

- Nature and biodiversity
- Circular economy and quality of life
- Climate change mitigation and adaptation
- Clean energy transition

Global partnership: SWITCH Regional Programmes

SWITCH Regional Programmes: The 'Switch to Green' flagship initiative, built upon the EU Switch regional programmes, brings focus on inclusive green economy for EU and partners.

- Switch Africa
- Switch Asia
- Switch Mediterranean
- Switch to Green

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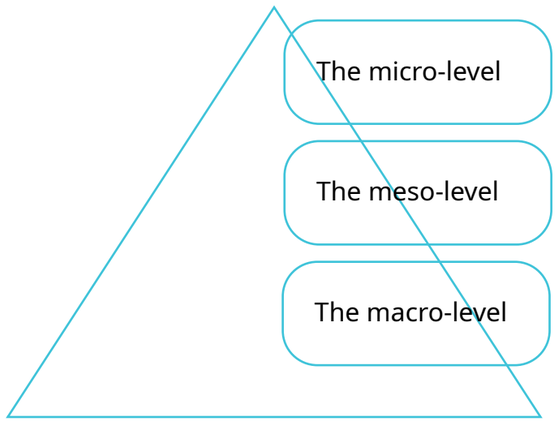
3.2 CRITERIA TO ASSESS AND EVALUATE THE LEVEL OF CIRCULARITY FOR ORGANIZATIONS BASED ON KEY ASPECTS OF THE CE - ANALYSIS OF EXISTING BUSINESS MODELS

The concept of circularity is extremely difficult to define and quantify. It covers every stage of the value chain and the production process, and it frequently touches on aspects like corporate practices. In the broadest sense, measuring circularity should show how far we have come from the linear economic paradigm, which depletes natural resources without compensating for lost jobs and generates waste that will pollute our planets for many centuries to come, and how close we are to a fully sustainable zero-waste and zero-pollution system. (Laura Bonacorsi, 2020)

It becomes very challenging to move from the aforementioned "distance" definition to an employable synthetic measure on how well we are doing at making the economy circular, by "closing" and "narrowing" the loop at the same time. This is due to the multifaceted nature of circularity, which encompasses the design of products, their disposal afterlife, and the length of the product's life itself. When talking about circularity, three levels of implementation can be considered:



- **The micro-level** is the one of the single firms (or consumer), which have specific characteristics and should be judging its achievements in circularity matters with respect to its particular sector and situation.
- **The meso-level** is the one of companies linked geographically and/ or by their specific businesses, constituting the potential for an "industrial symbiosis".
- **The macro-level** is achieved by zooming out and focusing on a specific geographical area (a city, a region, ultimately a country) mostly its connection to broader geographical areas

Measuring circularity is particularly challenging because it involves the synthesis of multiple aspects in a singular indicator. The following section reviews two relevant existing CE. organization and business – micro and meso-level indicators. (Laura Bonacorsi, 2020)

World Business Council for Sustainable Development (WBCSD)

The World Business Council for Sustainable Development (WBCSD) is a non-profit organisation dealing with sustainable development issues since 1992. It is formed by the CEOs of 200 important companies, many of which are multinationals, such as Nestlé, 3M, Danone and DuPont.

With particular regards to the circular economy, the goal of the organization is creating, both within and across different businesses, engagement so that new solutions towards a more sustainable economic paradigm could be achieved. The focus of the organisation is increasing resource efficiency, for instance via a proposed ten-fold

increase in the eco-efficiency of materials, in order to reach the target of a zero-waste world by 2050.

“Factor10” is a Circular Economy project that brings members together in order to re-design the production process: to be less dependent from virgin materials and to impact less on the planet via a strong waste reduction.

For facilitating the project, some circular metrics were proposed by WBCSD in collaboration with KPMG (2020): it is a set of 21 Circular Transition Indicators (CTISs) in order to help member companies as well as non-members answering to the following questions (WBCSD and KPMG, 2020):

1. How circular is my business?
2. How do we set targets for improvement?
3. How do we monitor improvements resulting from our circular activities?

As for the vast majority of indicators on the circular economy, the CTI metrics are based on

- material flows accounting combined with resource efficiency,
- resource efficacy
- and value value-added by the circular business.

The objective of these indicators is helping companies in their transition towards a more circular economy. In order to make the procedure user-friendly, an online tool has been implemented in order to support users in calculating their measures of circularity, according to the principles of simplicity, consistency, completeness, flexibility, complementarity and neutrality. The indicators can be classified into three families:

1) Close the loop:

% of circular inflow, assessing the total circularity of inflowing materials
% of circular outflow, assessing the total circularity of outflowing materials
% of water circularity, still to be defined and proposed by the working group responsible for the CTIs
% of renewable energy over total energy used in the production process

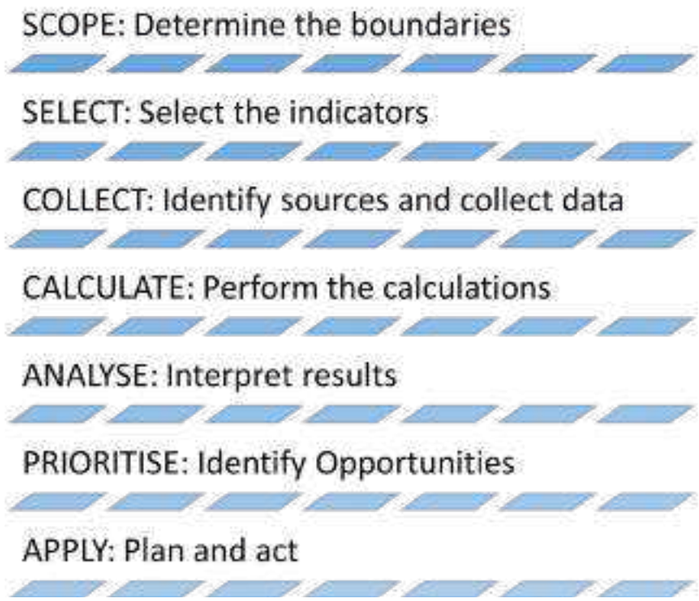
2) Optimise the loop:

% critical material over the total mass of linear inflows
% recovery type, indicating how materials can be reused (recycled, repaired, refurbished)

3) Value the loop:

circular material productivity: linking the material flow indicators with conventional financial firm-level metrics

The choice of the indicators on a company's part should follow the following logical scheme:

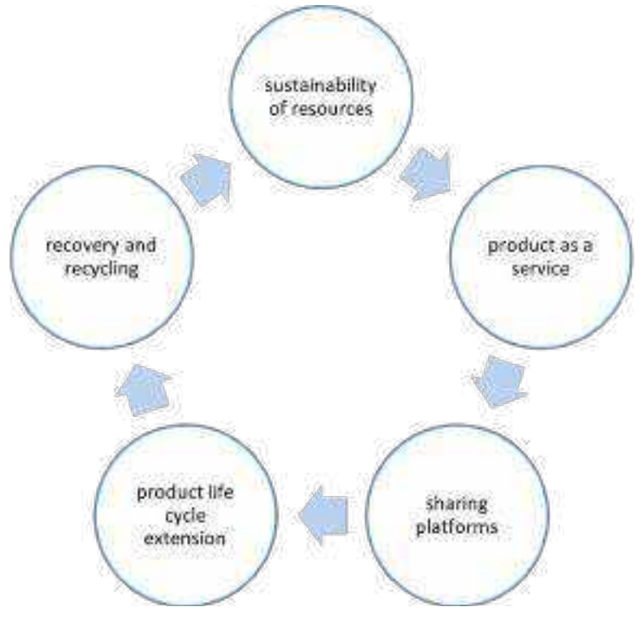


Enel X

Enel X belongs to the Enel group, and its aim is to provide services linked to energy transformation at the home, city and industrial level with a particular focus on sustainable development. Enel X created in 2019 an applied method for measuring the circularity level based on the CirculAbility© theorical framework according to the following five pillars:

1. Commitment by suppliers to comply with the principles of the Circular Economy during production
2. The presence of reusable elements which facilitate the circular consumption model, increasing the life cycle of the product
3. Dissemination of best practices to boost the efficiency of use of resources
4. Product end of life management using innovative and sustainable methods that encourage the reuse of materials
5. Supporting the development of environmental awareness by involving suppliers in virtuous mechanisms

These five dimensions are considered together with the five circularity business models:



Enel X then calculates the Circular Economy Score of its solutions, ranging from zero to a hundred, which informs its clients on the level of circularity embedded in its products and services.

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3.3 CIRCULAR ECONOMY SKILLS FOR YOUNG PEOPLE

The future generation has a responsibility to progress CE and contribute to the resolution of current environmental problems. And although this is crucial, their long-term range of abilities and competences will determine if they can tackle the challenges that lie ahead.

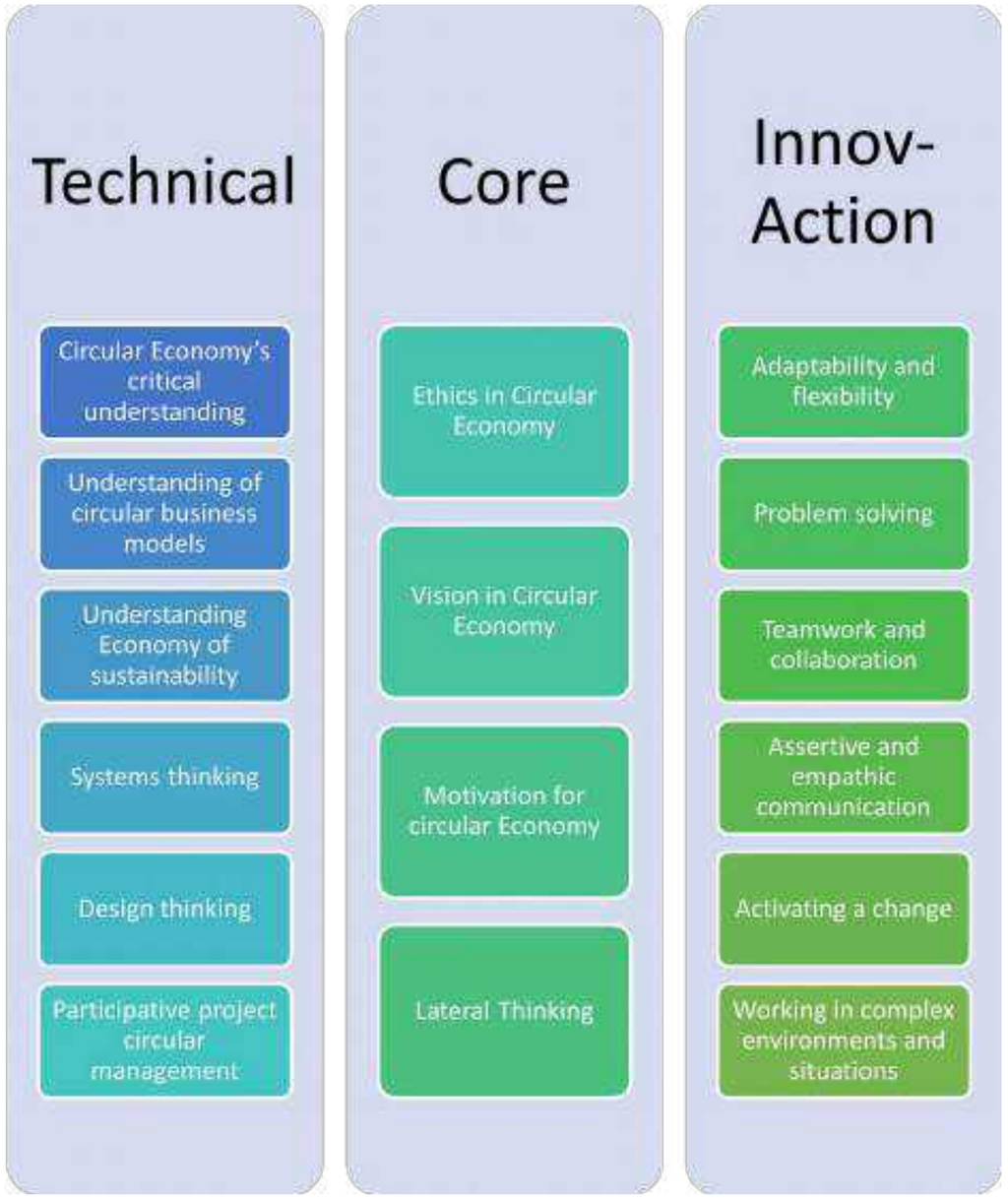
Young people must hold values and attitudes that promote environmental preservation, such as being in favour of resource reuse and recycling and against waste, among other things, in order to slow down climate change.

If they begin with these pillars, young people will be motivated to learn more about the Circular Economy and how it can promote a less polluted world by preventing waste of resources and materials. They might also be motivated to acquire the skills and knowledge necessary to take determined action to stop climate change.

By applying their knowledge and abilities, adopting supportive behaviours, and acting with the aim of influencing both themselves and the community, they can put their attitudes and values into practice.

The team behind CESCY (Circular Economy Sustainable Competences for Youth) has created a competence framework (REDU, 2022) to help identify these abilities and support young people as they design their paths to adopt new lifestyles and behaviours that are in line with the adoption of a Circular Economy perspective. The competency framework places a special emphasis on leadership and entrepreneurial skills to help young people contribute to the shaping of a more circular labour market. In the CESCY inventory three main areas of competences that young people may develop in relation to the Circular Economy have been identified:

- the **CORE** Competences: These are the ones that focus young people's attention on the circular economy, inspire them to learn more, and encourage them to live their daily lives in accordance with a particular set of values and attitudes.
- the **TECHNICAL** competences: These skills help young people comprehend CE systems and models in connection to ones from the linear economy. The technical field is filled with knowledge and abilities that help young people implement their CE values and attitudes.
- and the **INNOV-ACTION** competences: This area focuses on the competencies that encourage young people to employ cutting-edge methods and tools to act in accordance with their learned knowledge, skills, and values.



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Entrepreneurship education can have a big role on creating a common interest towards sustainable de¬velopment together with a proactive culture of innovation, and offering of the necessary skills. However, the following actions are necessary towards this direction:

- a closer link between creativity, curiosity, and openness to new experiences and ideas,
- a system thinking knowledge to go hand in hand with financial skills,
- a more inclusive definition of self-efficacy that encourages thoughts on quality of life (by incorporating ideas about the influence of communal, social, and environmental factors),
- a systemic view of innovation, that considers the benefits of resource efficiency.

In 2017, the EC Joint Research Centre developed the EntreComp Framework (Figure 4), in order to provide common guidance for the development of such entrepreneurial education pathways. It is predicated on a broad interpretation of entrepreneurship, which is defined as the capacity to act upon opportunities and ideas and transform them into value for others. (ACR+ and Zero Waste Scotland, 2019)

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3.4 CE APPROACHES OF THE SELECTED SECTORS (CONSTRUCTION, AGRI-FOOD, FURNITURE SECTOR) IN PRODUCT LIFE CYCLES

3.4.1 AGRI-FOOD SECTOR

Food demand will grow significantly as the world's population grows: feeding a world population of 9.1 billion in 2050 will require food production to increase by 70% from 2005 levels.1 The demand for animal-based products is also expected to grow by 70% by 2050. Yet, a third of all food produced globally is wasted each year, amounting to about 1.3 billion tonnes annually, enough to feed 3 billion people. Additionally, the agri-food industry is responsible for almost one quarter of global greenhouse gas emissions. (Institute, Agri-Food: Part Three of the Global Sector Best Practices Series , 2021)

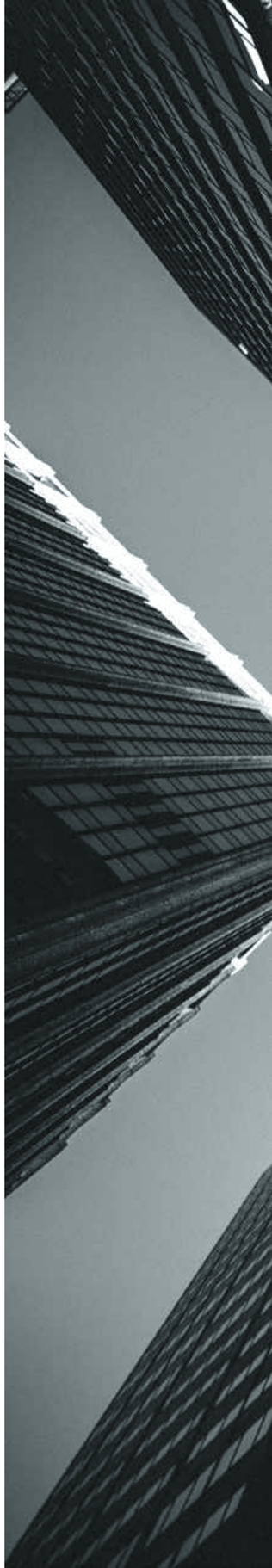
In Europe today, the value chain is said to be responsible for the loss of 31% of all food produced, including 46% of the edible mass of fruits and vegetables. This indicates considerable economic losses in the efficiency of agricultural production as well as in the food value addition and distribution processes, especially in light of the natural resources used for food production and the environmental consequences. To address these problems, regulatory strategies have been established:

- **The Bioeconomy Strategy and Action Plan**, adopted in 2018, addresses the sustainability of renewable bio-based resources.
- Food is regarded as one of the key product value chains where less waste and more value can be generated, according to the new **Circular Economy Action Plan**, which was adopted in March 2020 as one of the fundamental elements of the European Green Deal (EGD).
- The **Farm to Fork Strategy** and Biodiversity Strategy goals, both adopted in May 2020, will be achieved in large part by promoting circular approaches within the agri-food industry. (Bank, 2022)

To realize the full economic potential of the agri-food system, however, an integrated approach to circularity is required. The diverse producing locations, products, processing possibilities, length and types of value chains, as well as the various actors and functions within them, all contribute to the complexity of the agri-food sector and makes it challenging to quantify and to unravel some of its inherent circularity.

New business prospects in rural regions however could spark the transition to a circular economy for agri-food. Rural areas may have a comparative advantage in some aspects of the circular economy due to the potential cost of transporting low-value raw materials. To some extent, this advantage can even offset any economies of scale brought on by the centralization of higher value-added chain components. However, there are several obstacles, including:

- contradictory policy goals of ministries and departments,
- incompatible biowaste legislation and standards
- uncertainty regarding environmental effects,



- “one-size-fits-all” regulations,
- and a lack of attention for rural development-related goals.

The circular economy strategy would aid in achieving the post-2020 CAP targets. The circular economy would enable agri-food systems to perform better environmentally and by giving agricultural products new characteristics related to their sustainable production, it would also increase the value of those items. (Bank, 2022)

Practices related to the circular economy also offer a chance to increase local development and employment. They include a broad regulatory framework aimed at increase the understanding and innovation in:

- the transformation of natural resources, both renewable and non-renewable, to convert them into other products of higher added value,
- a more holistic approach to water management; action to efficiently reduce water consumption through its reuse, recycling, and replacement,
- integrated systems for wastewater treatment and nutrient recovery combining new technologies and processes that maximize the valorisation of high-value by-products for its reuse in agriculture
- the recovery and valorisation of agricultural residue and sub-products,
- the improvement of biomass supply

Each EU Member State has adopted circular economy strategies in a very different way. Several EU regions and cities have developed circular economy policies in addition to national strategic frameworks, roadmaps, or plans. A comprehensive review of existing circular economy approaches in the EU organized by the European Economic and Social Committee in 2019 found that the agri-food system is among the most frequently targeted given its high consumption of land, water and energy, as well as its large production of waste. (Bank, 2022)

C.E. APPROACHES IN AGRI-FOOD SECTOR

Primary Production:

- Regenerative production strategies (like precision agriculture) can assist in reducing excessive consumption while fostering positive environmental changes. Integrating those agricultural systems can also enhance soil health and biodiversity while facilitating nutrient recycling.
- In addition, waste, and by-products from primary production systems can be digested anaerobically to recover biomass for use in renewable energy sources while lowering emissions.

Food & Feed Processing:

- Food manufacturers can limit primary farmers' use of excessive inputs while fostering favourable environmental effects by incorporating eco-design into their agri-food products.
- Through bio-based industries, agri-food processors may valorise a variety of waste, residue, and by-product streams while using less external inputs and lowering environmental emissions.

Wholesale and Retail Trade:

- Food loss and waste can be reduced with the help of efficient supply chain management and consumer interaction by food retailers.
- Technology platforms can generate new options towards this while food donation systems can make it easier to reuse edible food.

Consumption:

- Diets with lower resource demands can limit overuse of inputs and other environmental pollution related to primary production systems.
- Consumer education about food loss and waste can also reduce needless resource use and environmental emissions.

Disposal:

- Municipal waste management systems can help recycle nutrients and recover energy from both bio-waste and human excreta but depend on effective quality assurance/control of waste streams.
- Treated urban wastewater can be reused for primary production activities.
- Insect production and processing can help revalorize organic waste generated across the agri-food chain.

3.4.2 CONSTRUCTION SECTOR

Within the next 40 years, there will likely be 230 billion square meters of new building. That would be the same as expanding the earth each week by the size of Paris. Up to 2040, €4.6 billion in infrastructure investment is anticipated to be made in order to achieve this.

The engineering and construction industry also consumes the rawest materials and other resources globally. 3 billion tonnes of raw materials are used, and over half of the steel produced worldwide is used there. Buildings and construction accounted for 39% of energy and process-related CO2 emissions in 2018 as well as 36% of total energy use. Since 2010, the total CO2 emissions from buildings have increased by about 1% annually, despite the fact that the building sector's energy intensity—its energy use per square meter—has been declining by 1.5% annually on average. This rate is outpaced by rising energy demand and expanding total global floor area. In addition, a third of the world's material consumption and trash output is accounted for by building construction and destruction. Only 20–30% of this garbage is recycled or used again, though.

Given the high rate of resource consumption, the construction industry has many potentials to apply circular economy principles and reduce its environmental impact. Despite being viewed as a conventional industry, the construction sector has recently shown its ability to minimize its negative environmental effects while simultaneously generating positive economic and social outcomes. As a result of the real estate industry's realization of this possibility, almost €175 billion was spent globally on energy-efficient building materials and services in 2018. (Institute, Construction: Part Four of the Global Sector Best Practices Series, 2021)

Given the size of the raw material intake in the building industry, many green strategies in this industry place a strong emphasis on REDUCED resource consumption, with eco-design practices.

- Buildings can be readily disassembled and their individual parts can be reused, preventing the need for destruction and landfilling.
- The use of modular and prefabricated buildings, which can minimize waste by optimizing material efficiency and factory construction are other process optimization approaches.
- Just-in-time construction is the practice of ordering and receiving materials as needed.
- Transportation time can be decreased among other things by practicing responsible consumption and purchase.
- Homes destined for demolition, for instance, can go through the unbuilding process, where elements are meticulously removed for use elsewhere.

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Other techniques in this field aim to intensify product usage in order to **OPTIMIZE** resource use.

- One strategy for doing this is to promote the sharing economy, which can be done through distributing resources like tools, materials, information, and various other assets.
- Offering short-term rentals is an additional option to accomplish this. For instance, renting equipment rather than buying it pushes the producer to maintain it better, extending the product's lifespan.
- Another tactic is to donate surplus items and resell them

The lifespan of a building can also be increased through renovation. An Austrian building company has created a blueprint for buildings that may serve practically any use, including residential, commercial, or workplace use, which limits their input requirements if the purpose of these rooms should change.

Finally, there are various ways to breathe new life into resources in the building industry.

- The building industry may turn waste created by other industries into practical construction materials by using material made from recycled components.
- Green insulation has also made some advancements, including insulating materials made from cork, cellulose from recycled paper, post-consumer textiles like cotton or denim, and feathers from the poultry industry, among other resources. (Institute, Construction: Part Four of the Global Sector Best Practices Series, 2021)

CE APPROACHES IN CONSTRUCTION SECTOR

MATERIALS AND MANUFACTURING

- In order to build circularly, the use of recyclable materials is indispensable. Digital platforms and tools are therefore emerging in various EU countries that promote the reuse of recycled materials through transparent data collection. To reuse materials from existing buildings or ensure high quality recyclable material flows, building logbooks that store information on the construction products and installations are essential.

PLANNING AND DESIGN

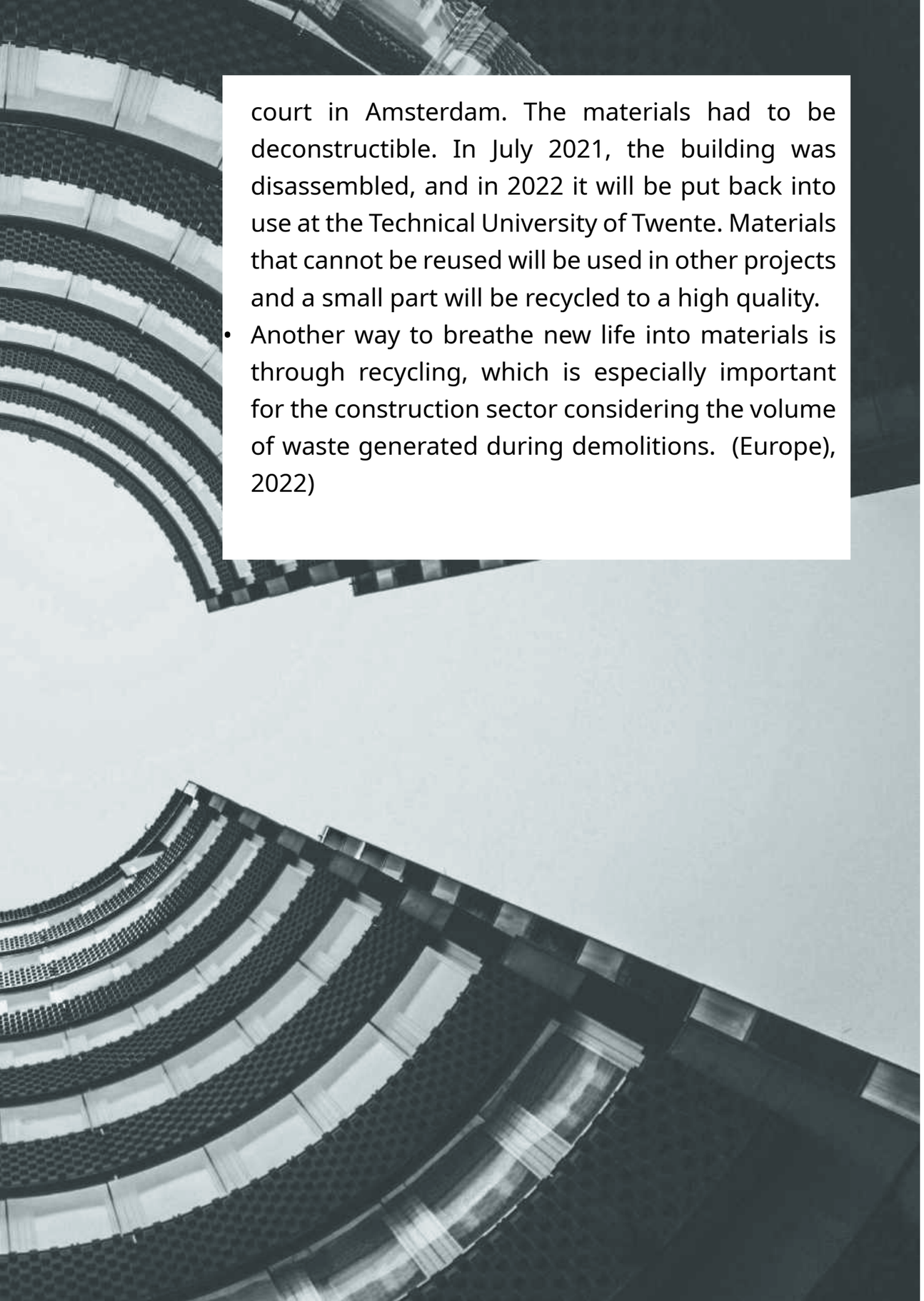
- Platforms such as Insert, Cycle-up and Loopfront require information on materials in buildings, for which Digital Building Logbooks can be a useful source of information.
- Governmental examples have been developed for building users and provide a comprehensive digital repository of information on energy efficiency, renovation measures, renewable energy and other data collected by different public authorities.

CONSTRUCTION AND MAINTENANCE

- Business models for serial renovation are gradually spreading throughout Europe. The underlying idea is that if enough is produced, the cost of prefabricated facades, roofs and other building components can be reduced. Moreover, such components can be quickly installed on site.

DECONSTRUCTION AND RECYCLING

- in 2015, the Dutch Real Estate Agency of the central government experimented for a temporary construction project for a



court in Amsterdam. The materials had to be deconstructible. In July 2021, the building was disassembled, and in 2022 it will be put back into use at the Technical University of Twente. Materials that cannot be reused will be used in other projects and a small part will be recycled to a high quality.

- Another way to breathe new life into materials is through recycling, which is especially important for the construction sector considering the volume of waste generated during demolitions. (Europe), 2022)

3.4.3 FURNITURE SECTOR

A fifth of the world's furniture is produced in the EU, which represents a market worth of €84 billion and an annual consumption of 10.5 million tonnes of furniture. This industry employs about 1 million people in Europe and is dominated by SMEs. (Ltd, 2017) The European furniture industry however must contend with a number of economic and legal obstacles, such as:

- the expansion of manufacturing in developing countries,
- complex logistics and trade barriers,
- rising demand for low-cost goods inside the EU,
- rising costs of raw materials and energy,
- growing demand for environmentally friendly products

While the Landfill Directive and associated diversion goals have helped to increase recycling rates in the EU, there is little activity in higher-value circular resource flows, with remanufacturing making up less than 2% of the EU manufacturing sector's total turnover. Even while furniture reuse is frequent, it typically takes place on a small scale and with local social aims in mind rather than on a wider scale with environmental and economic goals in mind. Each year, businesses and consumers in EU Member States discard 10 million tonnes of furniture, the majority of which is intended for either landfill or incineration. (Ltd, 2017)

Barriers to a circular furniture sector are wide ranging and have been identified through the course of this research, informed through stakeholder consultation and literature review, and include:

- Lower quality materials and poor design

- REACH Regulation (on Registration, Evaluation, Authorisation and Restriction of Chemicals)
- Poor consumer information and availability of spares
- Limited collection and reverse logistics infrastructure
- High cost of repair and refurbishment
- Weak demand for second-hand furniture
- Poor demand for recycled materials -
- Weak over-arching policy drivers

Interventions in the circular economy have the ability to counter these trends since they enable value recovery, economic expansion, and job creation in the European furniture sector while conserving resources and the environment. To promote those interventions across the industry, the adoption of suitable demand and supply chain levers will be necessary in order to realize these economic, environmental, and social benefits. (Confederation, 2020)

CE APPROACHES IN FURNITURE SECTOR

Circularity during Furniture Production:

- The transition from a traditional to a lifecycle product design is a key circularity factor. When circular product design is implemented in sustainable product policies, it provides the opportunity to prepare products for all aspects of the circular economy – reuse, refurbishment, remanufacturing, and recycling, prolonging the life of products and materials.
- An efficient use of materials, product design and the responsible use of chemicals are core elements to a circular product design approach.
- Furniture industry should be involved in creating the criteria and eco-design rules. Green Public Procurement is therefore an important tool to drive Ecodesign principles. All in all, it is imperative to address the differences in materials, to enhance the market for secondary materials and to promote the reduction of toxic substances.
- Support and promotion of business models based on upgraded, redesigned and remanufactured products is key, too, in order to achieve circularity in the furniture sector.

Circularity during Furniture Consumption:

- Improving the consumer awareness is a key factor to support circularity.
- In order to help consumers in comparing products and making informed choices, adequate information tools need to be put at

their disposal.

- An EU-level information strategy on the main characteristics of furniture products would allow consumers to compare different products on the market. Information to consumers must be useful, measurable, reliable, based on comparable parameters and harmonised on the basis of international/ EU definitions.
- Tools must have a pragmatic approach and only provide information that is important for a conscious consumer choice.
- Green Public Procurement is a powerful tool to boost circular economy principles in practice and public authorities should be encouraged to promote circular products and solutions.
- Lastly, legal requirements and compliance loopholes must be addressed in relation to second hand and repaired products, as well as packaging of reused/refurbished products.

Circularity during Waste management phase

- Waste rules across EU must be harmonised with the aim to close loops in an efficient way.
- Waste management and recycling infrastructures and facilities in EU countries must be encouraged.
- The use of waste as a resource must be accelerated.
- Higher levels of the waste hierarchy, such as preparation for reuse, refurbishment - including repair - and remanufacturing should be strongly supported and challenges surrounding these must be addressed.
- A harmonised Extended Producer Responsibility (EPR) strategy for furniture at EU level could have a major impact in addressing those challenges.
- A EPR strategy should establish requirements with clear rules and responsibilities for the actors involved, covering online trade, definitions of scope, reporting times and obligations, among others, taking a realistic long-term approach and a step-by-step view and promoting incentives for producers to take into account environmental considerations along the lifetime of products. (Confederation, 2020)

3.5 ORGANIZATIONS TRANSITION TOWARDS A CIRCULAR MODEL

The circular economy gives organizations financial advantages in addition to being useful to sustainability initiatives. In 2020, the Dutch multinational company Philips generated 71% of its total revenue from green products and solutions, while 15% came from circular economy products and solutions. With a growth of 6% from 2019 for green products and 15% for circular products and solutions, revenue in these two sectors has been increasing rapidly in recent years (circular products are those that meet specific circular economy requirements). (Circular economy for a sustainable future , 2021)

Additionally, customers are placing higher demands on businesses to engage in more sustainable business practices, and they expect their purchases to have a good impact on the environment.

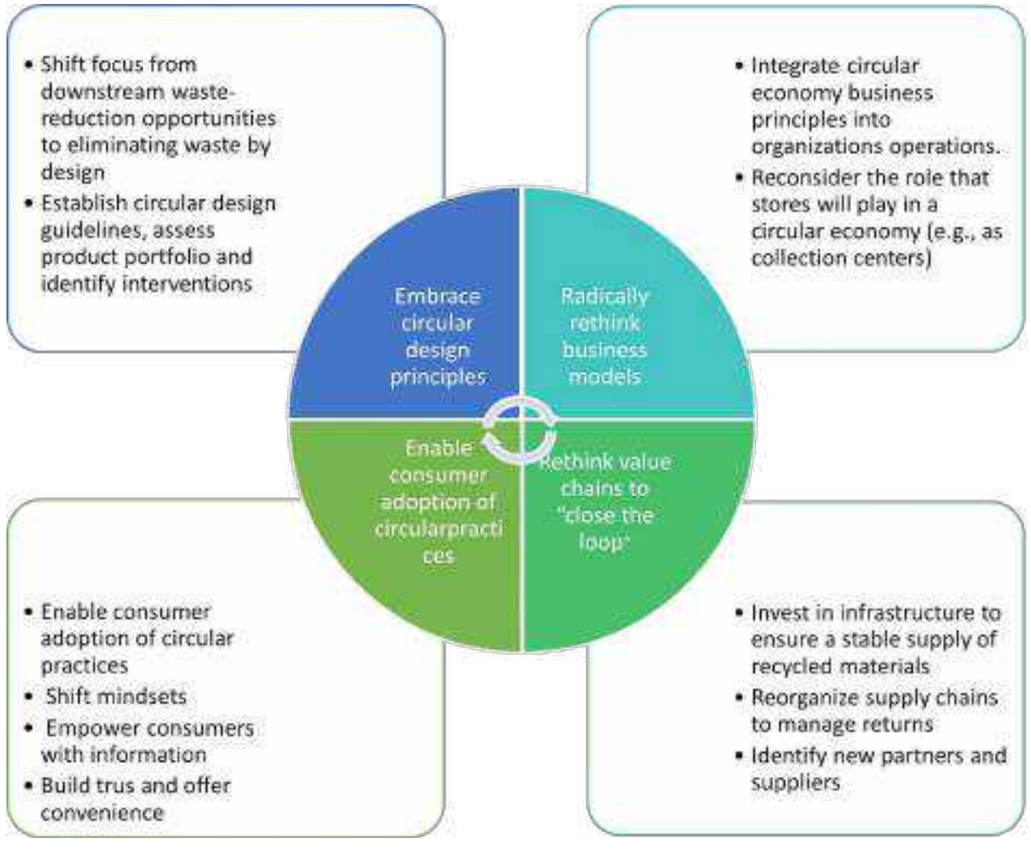
Wider customer adoption of circular products and behaviors is essential for the success of circular business models. Organizations will need to make a deliberate effort to

- raise customer awareness of the need for circularity,
- provide them with the knowledge they need to make wiser C.E. decisions,
- foster trust,
- and improve the convenience of circular activities.

The European Commission estimates that increased supply chain efficiency could reduce the requirement for additional raw materials by up to 24% by 2030, saving the European industry an estimated €630 billion annually.

When integrating circular economy activities into their business practices, organizations frequently concentrate on opportunities further down the supply chain, including recycling. Recycling can only help manage waste that has already been created, but an estimated 80% of the environmental impacts associated with a product are owing to decisions made at the design stage. (Circular economy for a sustainable future , 2021)

Below in “Figure 5” we have highlighted some crucial measures that organizations can take in order to establish and expand their circular economy practices based on our research, surveys, and literature study review.



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Establish organizational enablers
Shifts internal mindsets, build governance, mechanisms and adpot new metrics and KPIs to track progress

Leverage technology and data
Adopt technologies such as blockchain, AI, IoT to drive greater circularity

Collaborate to accelerate progress
Work with a wide ecosystem of partners - governments, designers, think tanks, academics, startups

3.6 PERSPECTIVES FOR THE CIRCULAR ECONOMY

The climate emergency and the need to adopt a systemic and global approach have been shaping the international agenda for decades and have highlighted the important of education as a key driver of a process of global political and socioeconomic transformation.
Manufacturing, product consumption, and food production account for about 45% of all global greenhouse gas emissions. This is a result of emissions being produced constantly throughout the life cycle of our products, from the resources and energy consumed in their production and shipping to the emissions produced when we discard them after we've finished using them.
According to the Circular Economy's Circularity Gap Report 2021, we could cut global greenhouse gas emissions by 30% by 2032 if circular economy concepts were to be adopted everywhere. Because of how resource-intensive our existing linear model is, it is obvious that it cannot be maintained.
By focusing more on recycling, repair, and remanufacturing methods instead of predominantly using virgin resources in manufacturing, a circular economy would eliminate the need to consume raw materials.
The circular economy concept emphasizes reducing natural resource use, which has the potential to reduce our usage of these resources by up to 70%.
International treaties, such as the Agenda2030 for Sustainable Development have set forth collective commitments for helping build the future.

- The European Green Deal,
- the Circular Economy Action Plan,
- the Habitat III New Urban Agenda,
- along with strategies and such as the National Climate Change Adaptation Plan 2021-2030

have drawn the battle lines for building a future that transitions from the current paradigm of linear production and consumption, towards an ethically responsible and post-materialist Circular Economy.

According to research by Accenture, the circular economy could spur innovation and job growth to increase global output by €4.28 trillion by 2030. According to their analysis, a variety of circular business models, including sharing platforms, products-as-a-service (PaaS), and remanufacturing services, to mention a few, are ready to seize this opportunity for growth. (Planet, n.d.)

Naturally, many of the economic advantages will accrue over time, so it's

crucial to approach these opportunities with a long-term perspective. We will start to understand the economic advantages more clearly as more companies and consumers adopt circular models and policies that encourage their adoption are put in place.

According to a 2018 estimate from the International Labour Organization, the globe might experience a net gain in jobs of 6 million by the year 2030 if it adopts a circular economy.

Opportunities in the historically linear economy-based industries will disappear, while new jobs in industries like recycling, repair, renting, and remanufacturing will emerge. These new positions, meanwhile, shouldn't be viewed as a direct substitute for the lost ones because they can be in different places and need for different qualifications. When creating regulations and distributing funds to support a fair transition and retrain workers for lucrative new occupations.

ANNEX 1 – NATIONAL REPORTS

The national reports developed by the six project countries can be found are available on the links below:

- **Cyprus**: https://drive.google.com/drive/folders/1VSlpsLdn-qFpB2BckDF2I0BgjkPWbmsP
- **Greece:** https://drive.google.com/drive/folders/19hRtIHkHWZP7Hw3eUUk7niEx5cszQun4
- **Ireland:** https://drive.google.com/drive/folders/1zZXHZ5y74IGSLTLxaIDATyWkQuQeJus0
- **Italy:** https://drive.google.com/drive/folders/1xhrOOjyCGurk810AJ9EkoiCjkehe0L6a
- **Lithuania:** https://drive.google.com/drive/folders/1473N-gXvAeA8KKw0j07S7sng-gszHjjZ
- **Romania:** https://drive.google.com/drive/folders/1AIDIEpJSFMbnfRZSbKqRWSx6Uu0R4ySP

BIBLIOGRAPHY

ACR+ and Zero Waste Scotland, A. (2019). *Circular Economy and Lifelong Learning Scenarios - Methodologies - In action.*

Alejandro Carbonell-Alcocer, J. R.-L.-R. (2022). *Educating for a sustainable future through the Circular Economy: Citizen involvement and social change.*

Bank, G. W. (2022). *Circular Economy for Sustainable Agri-Food in Europe.*

(2021). *Circular economy for a sustainable future . Capgemini research institute.*

Confederation, E. -E. (2020). *The furniture sector and circular economy 2.0 .*

Damjan Krajnc, D. K. (2022). *Youth Awareness and Attitudes towards a Circular Economy to Achieve the Green Deal Goals.*

Europe), B. (. (2022). *A life-cycle perspective on the building sector– Good practice in Europe.*

Florin-Constantin Mihai, S. G. (n.d.). *Plastic Pollution, Waste Management Issues, and Circular Economy Opportunities in Rural Communities. 2021.*

Institute, S. P. (2021). *Agri-Food: Part Three of the Global Sector Best Practices Series .*

Institute, S. P. (2021). *Construction: Part Four of the Global Sector Best Practices Series.*

João, E. (June 2020). *Bio-based strategies and roadmaps for enhanced rural: Educational materials on sustainability,circular economy and bioeconomy for schools, colleges and universities.*

Laura Bonacorsi, F. E. (2020). *Measuring circularity: a critical analysis of some relevant indicators.*

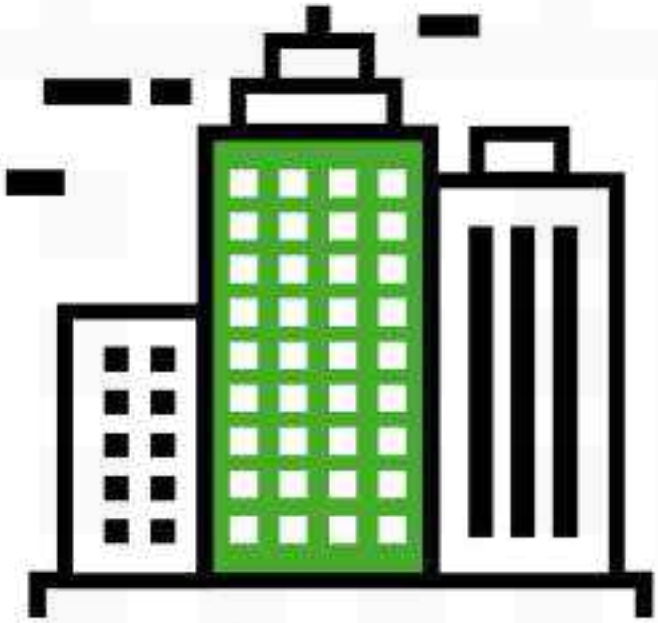
Ltd, E. R. (2017). *CIRCULAR ECONOMY OPPORTUNITIES IN THE FURNITURE SECTOR.*

Parliament, E. (n.d.). *circular-economy-definition-importance-and-benefits.* Retrieved from europarl.europa.eu: hhttps://www.europarl.europa.eu

Planet, F. (n.d.). *Future Planet*. Retrieved from 7 Benefits Of The Circular Economy: https://www.futureplanet.com/resources/7-benefits-of-the-circular-economy/

REDU, A. E. (2022). *A Circular Economy Competence Framework for Young People Circular economy sustainable competences for youth.*

Union, E. (n.d.). *circulareconomy.europa.eu/platform/en.* Retrieved from Financing the circular economy: https://circulareconomy.europa.eu/platform/en/financing-circular-economy



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