R3FRAME

Circular Economy strategy FRAMEwork for sustainable SMEs

IO3: Circular Economy Implementation Framework (CE Framework)

Task A1: State Analysis Assessment

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Contents

1 Introduction 1
2 Online Europe-wide Assessment Analysis 2
2.1 Survey design 2
2.2 Survey results 1
2.3 Conclusions 14
3 Circular Economy Experts' Interviews Analysis 15
3.1 Survey design 15
3.2 Survey results 16
3.2.1 Changes in consumers' demand for sustainability 16
3.2.2 Incorporation of CE in construction/manufacturing/crafts and other enterprises 16
3.2.3 Main drivers for CE initiatives 18
3.2.4 Main challenges and barriers in employing CE initiatives 19
3.2.5 Main benefits of CE initiatives 20
3.2.6 Main risks of CE initiatives 20
3.2.7 Company strategy and assignment of responsibilities for the implementation of CE principles 21
3.2.8 Important points for a company that wishes to start implementing CE 22
3.2.9 Establishment and needs of CE training programs 23
3.3 Conclusions 24
4 Concluding remarks 25
5 References 27
Appendix I - Online Europe-wide Assessment Questionnaire (English version) 28
Appendix II – CE Experts' Interview Questions (English version) 31

1 Introduction

The REFRAME - "CirculaR Economy strategy FRAMEwork for sustainable SMEs" is an Erasmus+ Project under the KA2 - Cooperation for innovation and the exchange of good practices / KA202 - Strategic Partnerships for vocational education and training.

REFRAME will create a CE Transition Framework specifically for small and medium businesses in the construction, manufacturing and crafts industry, to help them become friendlier to the environment. It will provide the EU construction & manufacturing SMEs and micro-enterprises' employees and future employees with practical knowledge on implementing CE transition in their business. A 'sizable, growing and active' REFRAME online community will be created, with the main objective of the Up-to-date insight into Circular Economy, the exchange of know-how and good practices among the participants and the successful implementation of a CE transition for all SMEs and micro-enterprises.

The IO3 will develop a comprehensive Circular Economy Implementation Framework (CE Framework), which will assist construction, crafts and manufacturing SMEs (with up to 100 employees) and micro-enterprises to incorporate a safe and effective set of CE processes and principles.

The CE Framework will be a step-by-step process for these SMEs and micro-enterprises that will show them how to scale up by understanding, utilising and investing in CE, how to manage resources more efficiently and be friendlier to the environment. The CE Framework will include a set of methodology concepts, tools and measurement instruments that guide the execution of CE strategy adoption.

This document provides the results of the first task of this IO, namely the State Analysis Assessment.

The Assessment consists of two main sub-activities, which will produce results for the next tasks of the IO, as follows:

a) Online Europe-wide Assessment with at least 100 SMEs representatives.
b) Circular Economy Experts' Interviews with 10 experts (2 interviews per project partner) in Circular Economy regarding the CE and its application in an SME/small company.

Towards conducting the Online Europe-wide Assessment, SIGMA developed a first draft questionnaire with general questions regarding the CE and special questions with respect to risks, opportunities and challenges, which are tailored to construction, crafts and manufacturing SMEs and micro-enterprises. This draft questionnaire was reviewed by the rest of project partners and after receiving comments and suggestions SIGMA prepared the final version of the questionnaire. The questionnaire was translated into the national languages of the project partners and was uploaded on Google forms.

As far as the Experts' interviews are concerned, NTUA prepared a set of questions to be used as guidance for the interviews and come up with a consistent and "homogeneous" report for

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the five partner countries. This first draft set of questions was reviewed by the partners. NTUA revised and finalised the interview questions after the feedback provided by the partners.

2 Online Europe-wide Assessment Analysis

2.1 Survey design

The Circular Economy Assessment is an Online Europe-wide questionnaire. Reframe partners shared the questionnaire through various channels (Website, Emails, Newsletters, Social Media, etc.) in order to collect at least 100 responses from SMEs' Managers, Environmental Managers or relevant employees and a representative sample to be acquired and utilized for producing firm conclusions on Circular Economy transition in EU.

The respondents dealt with general questions regarding the CE and special questions regarding risks, opportunities and challenges, which are tailored to their company. The questionnaire also included questions in relation to the maturity level of the respondents' company regarding the Circularity of business and disclosed their assessment on their level of knowledge regarding the ability of each company to adopt CE principles.

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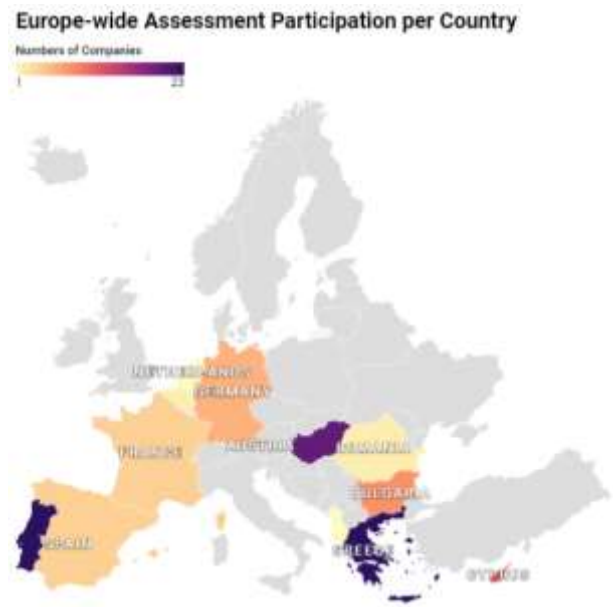
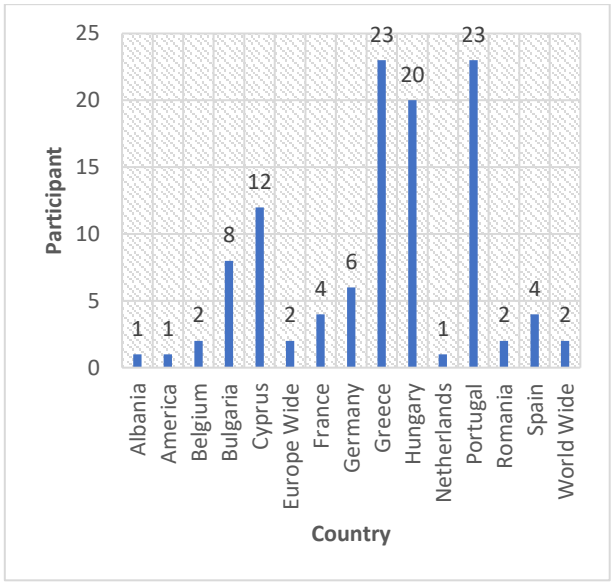
2.2 Survey results

Part A – General Info

ID	Question	Results from Respondents' Answers
A.1	In which country/countries currently does your company operate?	 

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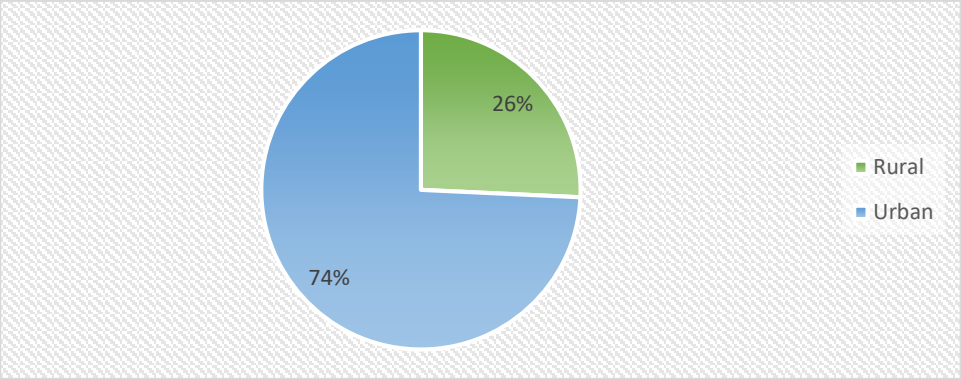
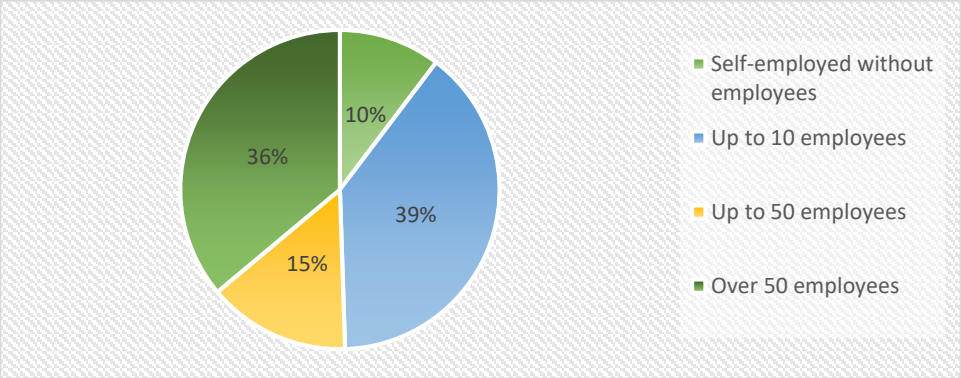
A.2	Is your company located in an urban or rural area?	
A.3	Please indicate the size of your company/organization	

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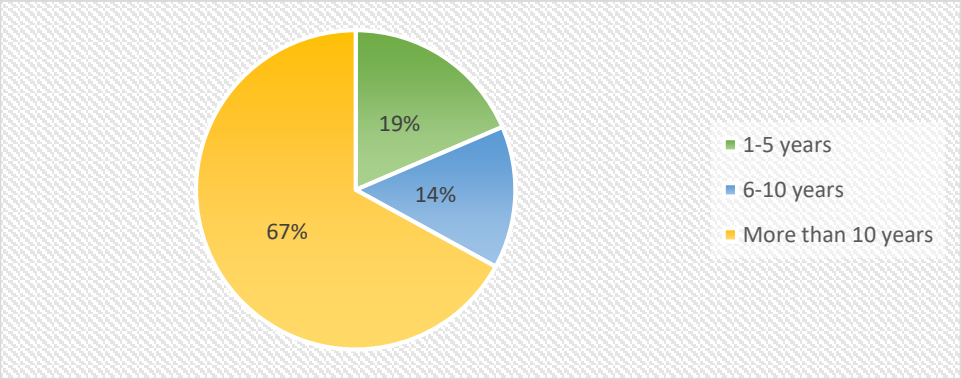
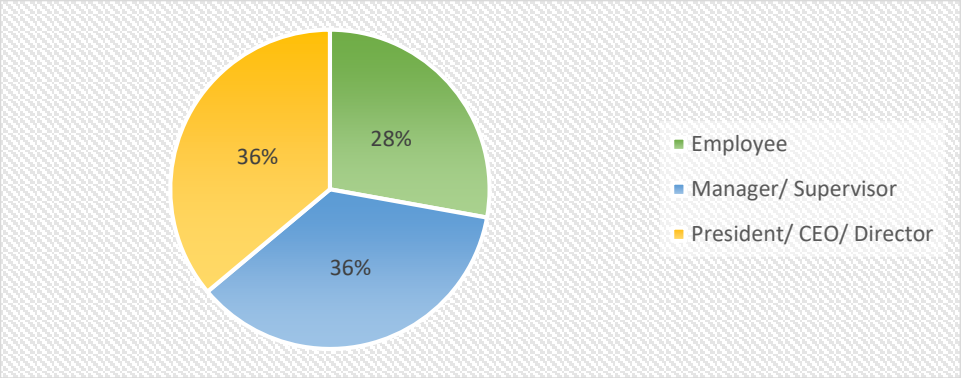
A.4	How many year(s) does your company/organization exist?	
A.5	What is your current position in the company?	

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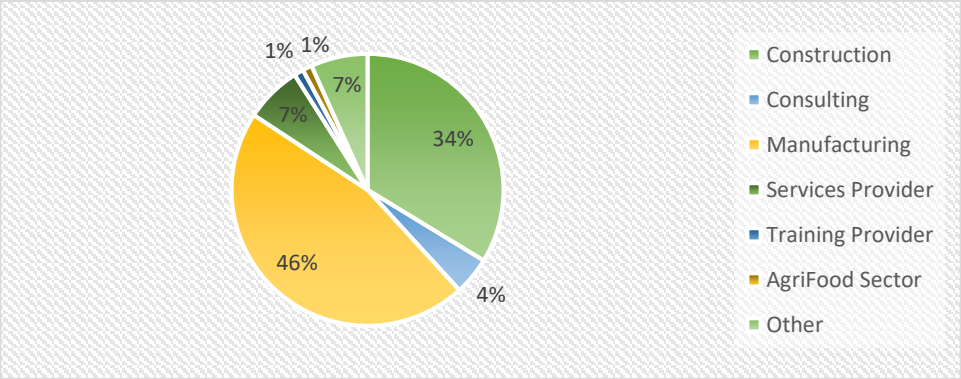
A.6	What is your company's sector of activity?	

Part B - Recycle

ID	Question	Results from Respondents' Answers

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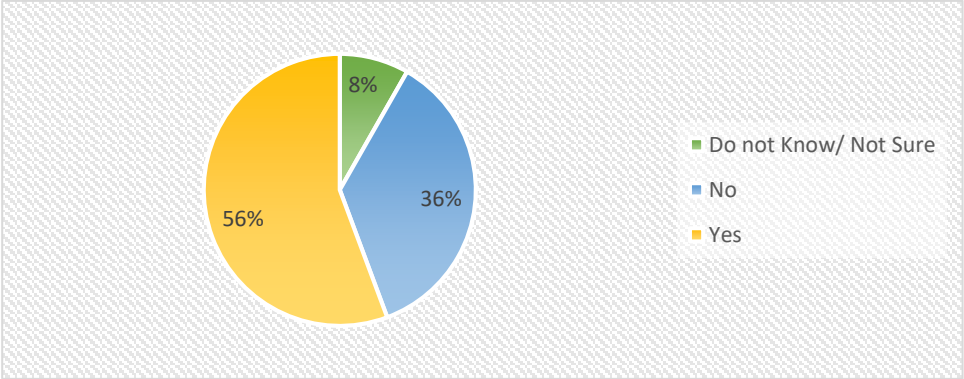
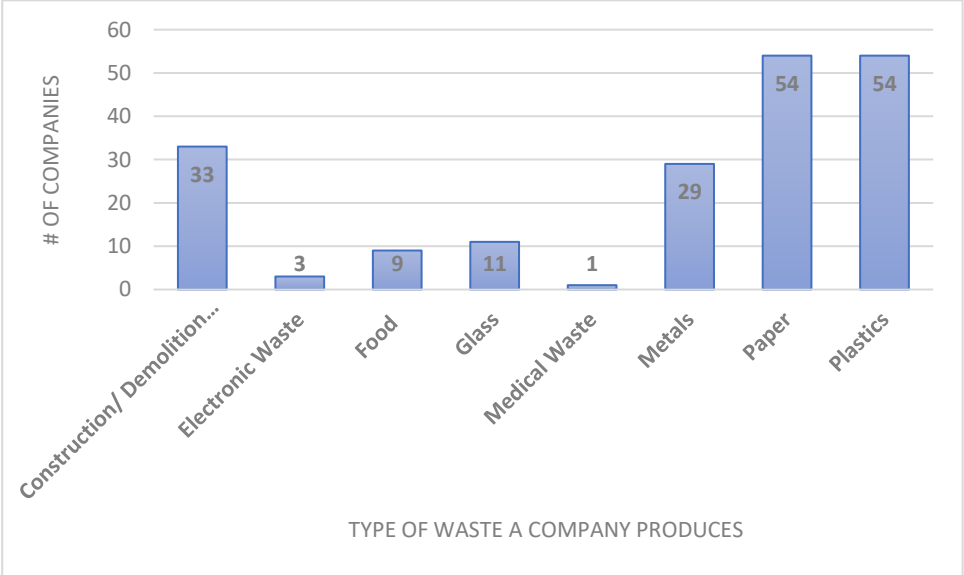
B.1	Does your company have in place a Management System or related Policies/ Procedures for Environment Protection?	
B.2	Which of the main waste types does your company generate?	

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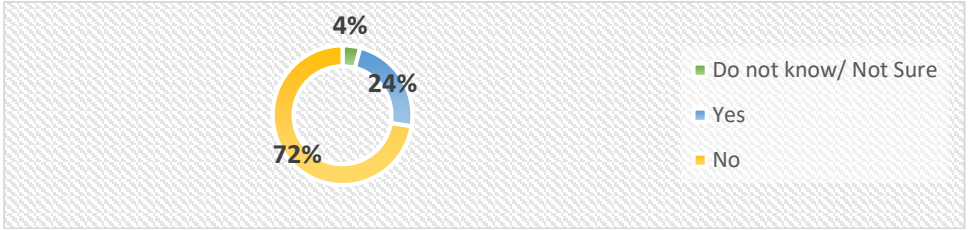
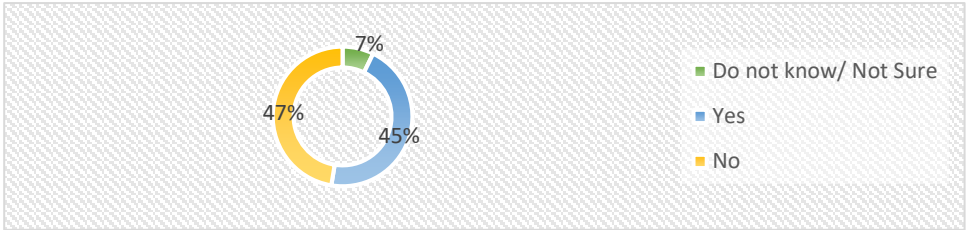
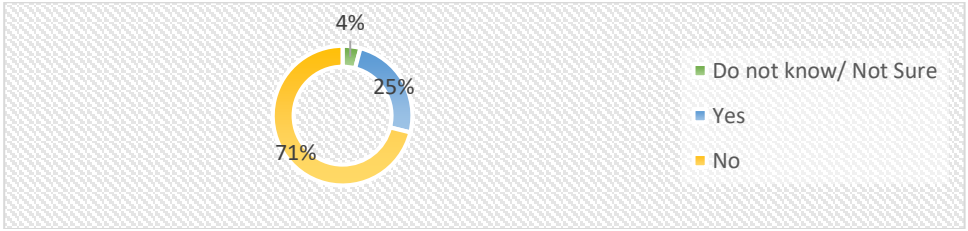
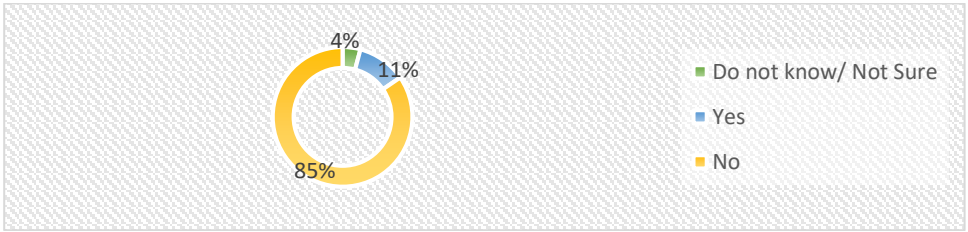
B.3	Does your company refurbish goods and/or parts?	
B.4	Does your company use recovered/ recycled material to produce new products?	
B.5	Does your company sell upcycled products?	
B.6	Does your company deliver product access with leasing or renting?	

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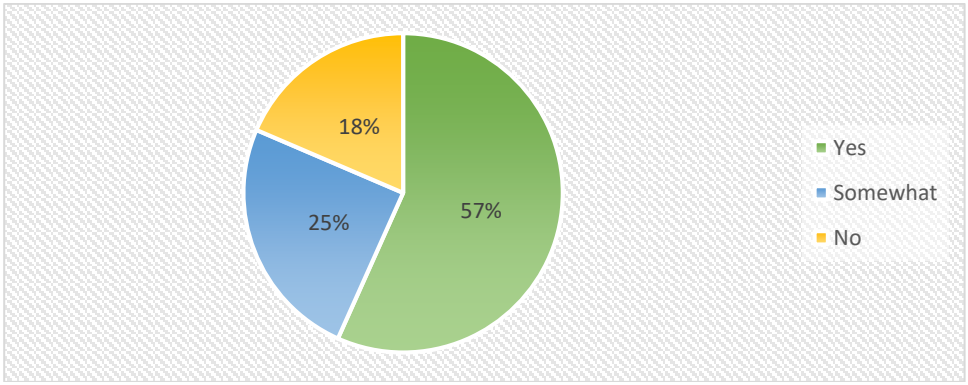
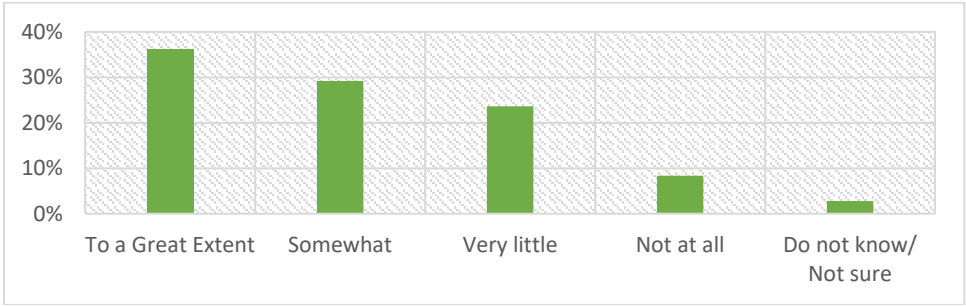
B.7	Are you aware of the Circular Economy approach?	

Part C – Circular Economy

ID	Question	Results from Respondents' Answers
C.1	Is the circular economy a priority on your company's agenda?	

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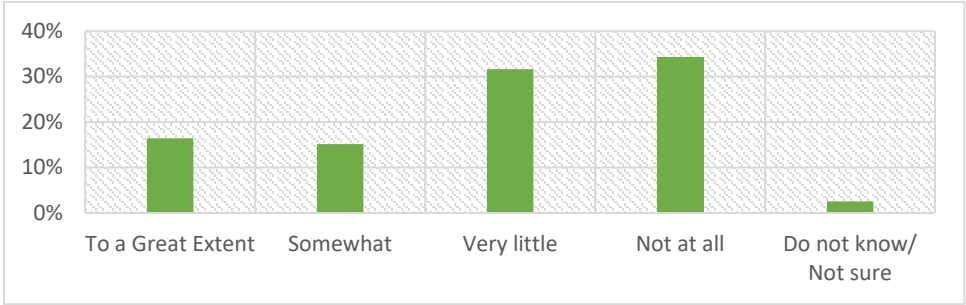
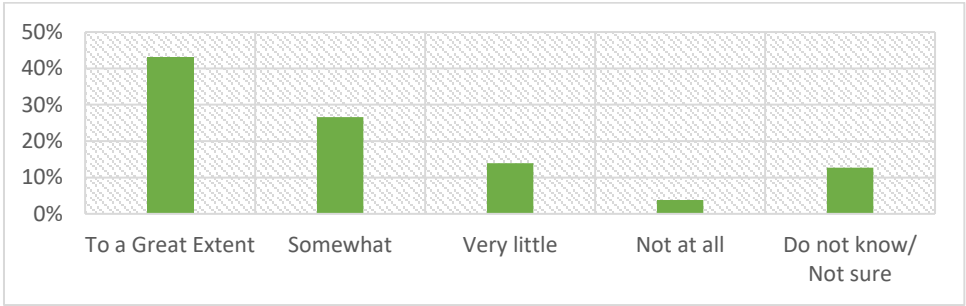
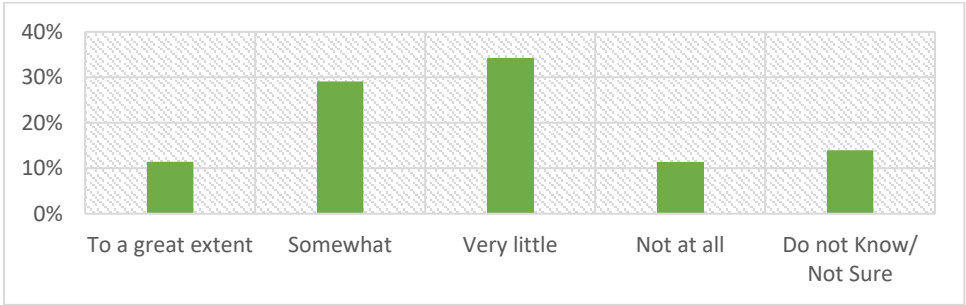
C.2	Does your company offer circular economy-related training to its employees?	
C.3	Do you think that your company would benefit from training in circular economy?	
C.4	Do you think that there is enough freely available and up-to-date information to assist you in the transition to the circular economy?	

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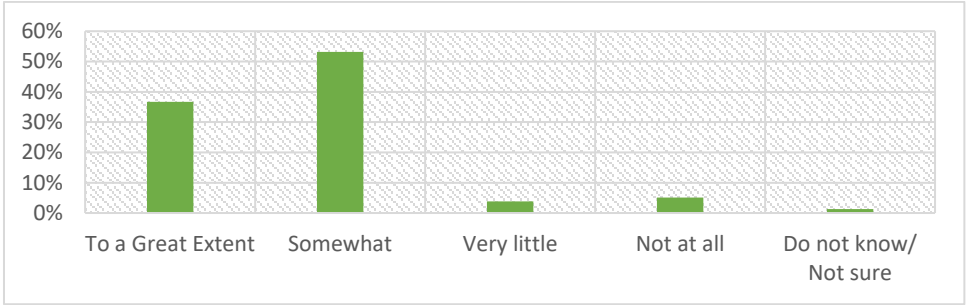
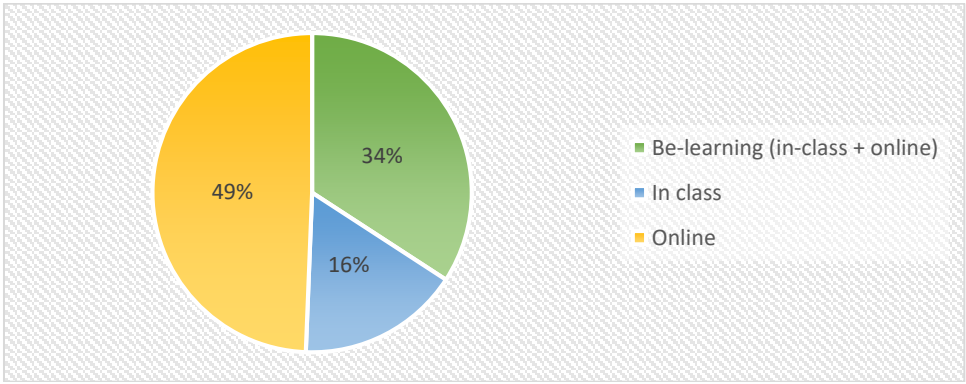
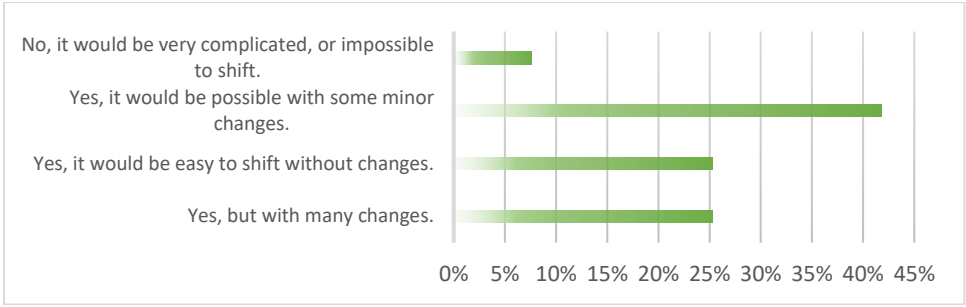
C.5	Do you think that you need more information, training, and awareness regarding circular economy principles?	
C.6	If you think your company would benefit from training in circular economy, what would be the most suitable type of training for you?	
C.7	Do you consider that your existing company's business model is easy and flexible to shift to a Circular Economy one?	

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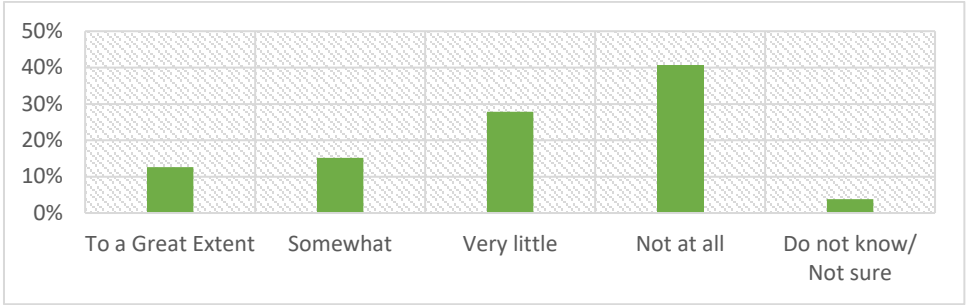
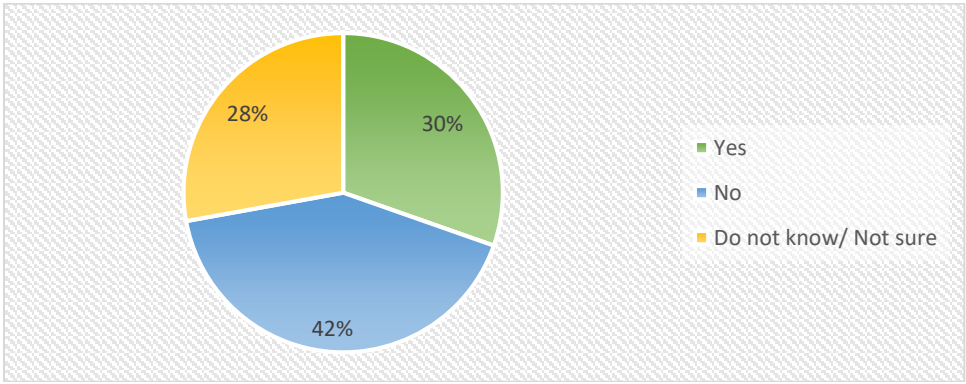
C.8	Does your company have a circular economy implementation plan?	
C.9	Does your company implement a Circular Economy transition?	
C.9a	If yes, what were the challenges faced during the transition?	○ Employees motivation ○ Lack of CE awareness ○ Costs for introducing and executing CE assessment ○ Lack of expertise, funds, and CE plan ○ Identifying companies that process plastics by-products and waste ○ Access to finance ○ Cooperation with stakeholders
C.9b	if no describe why and what obstacles you found?	○ Not prioritised ○ Not adequate knowledge in the upper management regarding CE ○ Top management not aware of CE

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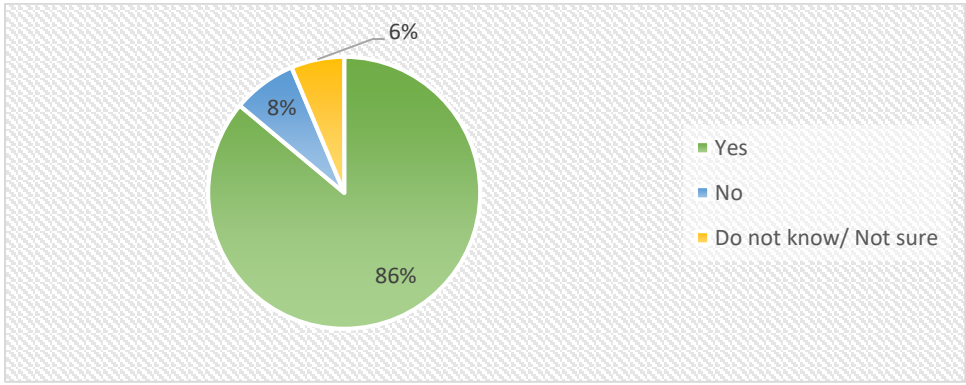
		○ Mindset related issues
C.10	What risks did you identify during the transition?	○ Low quality product, excess costs ○ Financial related risks ○ Controlling life cycles efficiently ○ Risks unintended adverse health effects ○ Not enough knowledge in the implementation of circular economy principles ○ No unified plan for CE transition in many industries ○ Lack of plastic by-product processing companies ○ Food safety risks may arise from improperly handled materials ○ Lack of CE processes standardization as many businesses are not able to implement it and they will incur other costs. This is a risk because it can put a business at a market disadvantage. ○ Risks related to EU-regulations ○ Lack of specialists in the field
C.11	Do you think that Circular Economy has business opportunities?	

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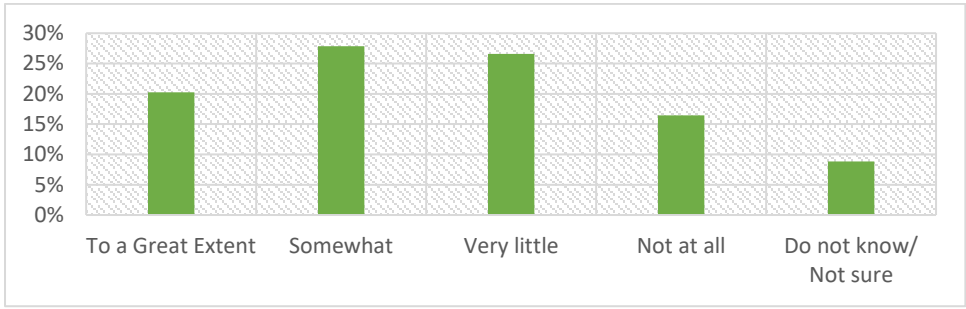
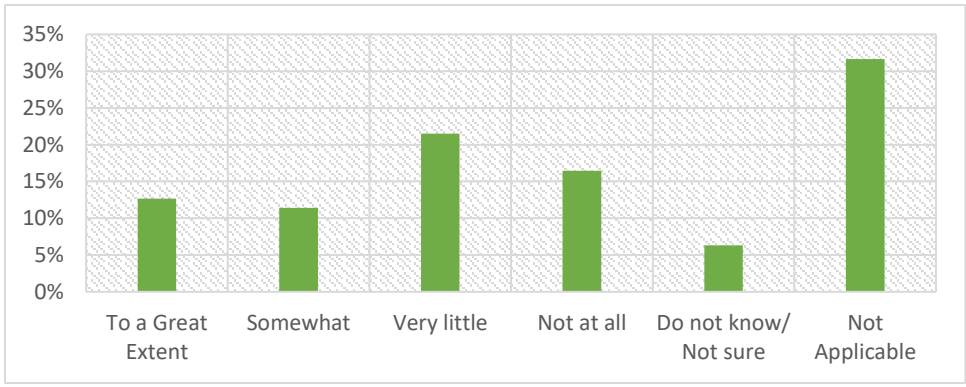
C.12	Does your company identify the interest of its customers in circular economy issues?	
C.13	Does your company provide incentives to its customers to return the products at end-of-life?	

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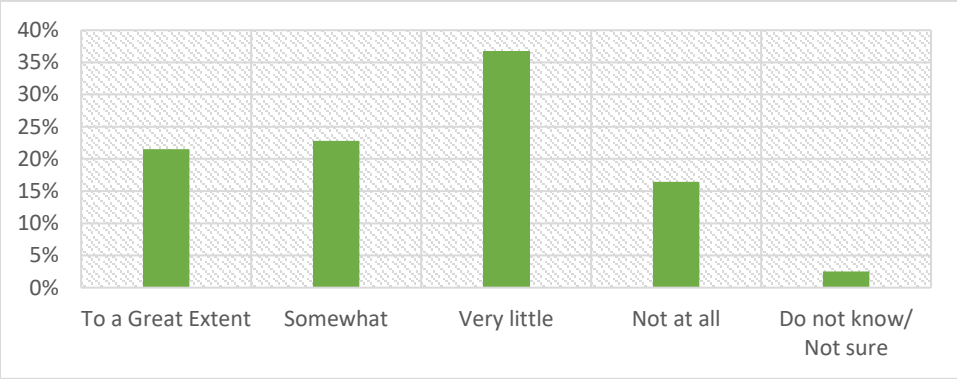
C.14	Does your company use alternative input (e.g., sustainably sourced renewable materials, renewable energy, etc.)?	

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2.3 Conclusions

- 102 respondents participated in the Europe-wide assessment that took place from the end of February to mid-April 2021. The majority of companies that participated in the survey are based in urban areas (74%), employ less than 50 persons (74%) and are relatively old in business with more than 10 years of operation (67%).
- 72% of respondents come from top management (President/ CEO/ Directors/ Managers/ Supervisors); which means that the validity of answers especially in part B and C is high as the top management is the main policy and strategy maker in the CE transition.
- According to survey statistics, 80% of the respondents represent the Construction and Manufacturing sectors; the same target group defined in the REFRAME project. More than half of the respondents (54%) appeared to consider seriously environmental protection with the adoption of an Environmental Management System (EMS) or related Policies and Procedures.
- Based on respondents' main business activities, more than 30 companies produce construction and demolition waste whereas plastic and paper ranked first among other waste categories with 54 organizations producing them.
- Even though a considerable number of companies have an EMS, very few companies refurbish goods and parts (24%), use recovered/ recycled materials to produce new products (45%), sell upcycled products (25%) and deliver product access with leasing or renting (11%). Despite that, 54% of them are aware of the CE approach but a smaller percentage (36%) see that CE is a priority on the company's agenda to a great extent.
- A not very encouraging figure is that two-thirds of the survey participants either do not offer CE training or offer very little to their employees although the majority (43%) recognizes that their company would benefit from it to a great extent. A potential reason for it might be the lack of freely available and up to date information.
- The vast majority (92%) of the respondents considered that their existing business model could be easily shifted to a circular one either with minor changes or many changes. 30% are currently implementing a CE transition and only 13% of the participants have a CE implementation plan in place.
- Ones succeeded the transition identified the following challenges:
    - Employees motivation
    - Lack of CE awareness
    - Costs for introducing and executing CE assessment
    - Lack of expertise, funds, and CE plan
    - Identifying companies that process plastics by-products and waste
    - Access to finance
    - Cooperation with stakeholders
- Ones that did not succeed with the transition identified the following preventing obstacles:
    - Not prioritized issue in comparison with others

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  - Not adequate knowledge in the upper management regarding CE
  - Mindset related issues
- In general, companies that tried to implement CE transition have identified the risks below:
  - Low-quality product, excess costs
  - Financial related risks
  - Controlling life cycles efficiently
  - Risks unintended adverse health effects
  - Not enough knowledge in the implementation of circular economy principles
  - No unified plan for CE transition in many industries
  - Lack of plastic by-product processing companies
  - Food safety risks may arise from improperly handled materials
  - Lack of CE processes standardization as many businesses are not able to implement it and they will incur other costs. This is a risk because it can put a business at a market disadvantage.
  - Risks related to EU-regulations
  - Lack of specialists in the field
- Despite risks, challenges and obstacles, 86% of the respondents think that CE has business opportunities.

3 Circular Economy Experts' Interviews Analysis

3.1 Survey design

The qualitative data regarding the perceptions, opinions, and beliefs of the Circular Economy (CE) Experts were collected via semi-structured interviews, which were held online due to the social distancing measures adopted to control the spread of COVID-19.

The semi-structured interviews included 12 questions (see Appendix II) and were conducted with experts from SMEs and large enterprises (mainly top-level and middle managers), research institutes/HEIs and non-governmental organisations and public entities. The interviews with the CE experts aimed to gain a more in-depth insight regarding the steps of the transition toward circular economy, the challenges/barriers and risks that SMEs face in employing circular economy initiatives, the main benefits of CE initiatives for SMEs, the training needs required for employees to acquire CE related knowledge, etc.

Each partner interviewed two CE experts (12 experts in total, namely 10 managers/CEOs and 2 researchers/academics). The interviewees have experience in sustainability/circular economy issues from 4 up to more than 20 years. The analysis, which is presented in Section 3.2, is conducted on an aggregated basis for anonymity reasons. Whenever required, however, differences between countries or organisations are highlighted.

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3.2 Survey results

3.2.1 Changes in consumers' demand for sustainability

It is widely accepted that SMEs, as well as larger enterprises, always try to adapt to changing consumer behaviour. The market and the consumers are expecting clear signs from the enterprises that they act in an environmentally responsible way. Therefore, the first issue that was discussed with the experts who were interviewed concerned consumers' demand for more sustainable products and/or services.

All the experts mentioned that over the last years, they have noticed a big change regarding the consumers' choices and habits indeed. Consumers show an ever-increasing interest in sustainability. They are more aware of what they consume and feel more responsible about the impacts of their behaviour on the environment they are living in. Some experts noticed also that consumers do not see sustainability only from an environmental point of view, i.e. they do not just look for "green" products with a low environmental footprint, but they also consider products' cost, quality, durability, etc.

In response to this change, companies make significant efforts to include sustainability issues in their strategy and way of thinking. For many enterprises, especially the large ones, it is a common practice to prepare sustainability reports and annual reports, whereas when required, information is provided through the development and publication of an Environmental Product Declaration (EPD) based on the relevant standards. Smaller enterprises communicate the sustainability information to the consumers through indication on the products/packages, through the product webpage and the corporate websites, with advertisements in the media (television, newspapers, and magazines) and the leaflets of each product. It was also mentioned that, at least in some situations, greening the production and/or supply chains brings also financial benefits to the companies, i.e. it reduces the production cost and provides a "win-win" solution.

EU initiatives have helped in this direction (e.g. regarding plastic packaging and all plastic products) because they motivate all kinds of companies – not only construction, crafts and manufacturing – to adopt principles that promote sustainability. Enterprises are trying to respond to these needs, taking smaller or larger steps, depending on the company's opportunities and intentions and consumers' understanding of sustainability is still at a surface level. In short, there has been an awareness and some evolution, but the process is slow.

3.2.2 Incorporation of CE in construction/manufacturing/crafts and other enterprises

Another topic that was discussed during the interviews referred to the implementation of CE principles by construction/manufacturing/crafts and other enterprises or the transition to CE. In general, the responses provided by the experts show that CE implementation is not well-

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established in construction/manufacturing/crafts enterprises. Nevertheless, there are differences between countries and across enterprises (concerning the size of the enterprise in particular).

More specifically, in Cyprus, CE in construction/manufacturing/crafts (and other) enterprises is in its infants. This is mainly attributed to the fact that the Cypriot Government has not helped in this direction and, thus, policies still have not significant effect and there are only very few initiatives. As a result, it is cheaper and more convenient for construction companies to throw away materials than designing and building with the CE principles. Nevertheless, some manufacturing and construction companies use recycled materials for their products or transform products they no longer need (or parts of products) into other useful materials or new products. The situation is more or less similar in Bulgaria. Reshaping a linear model to a circular one requires the involvement of many experts. The reason is that the transition to CE is a complicated process in terms of re-designing considering that each industry, e.g. textile, construction and plastic, is working with different models. For instance, the materials flow is an important starting point before moving to the production process, the industrial design, the supply chains, etc. This is a new eco-system where a lot of stakeholders are involved. Further, enterprises need also to start thinking about how to convert waste materials into useful products and materials that could be used in other industries, in the context of industrial symbiosis. This is a new process for the national industry. So far, there are companies offering solutions, mainly in the field of waste recycling or 'waste-to-energy' if the waste that is not suitable for recycling but has calorific value. In Hungary, the CE is at the beginning of growth and expansion. Some early adopters are proactive and are already taking steps in this direction knowing that this transition is in their best interest, both from an economic and environmental perspective. It is also argued that proactive enterprises will also gain market advantages because those who wait till the transition becomes obligatory through legislation will face higher costs, as they will not have sufficient time to adapt and come up with the best solution. In Greece, the experts reported that their companies are already implementing (at least some) CE principles. For instance, one of the experts mentioned that her/his company has already announced a series of goals to be achieved by 2025 (e.g. use of recyclable packaging at 100%, increased use of recycled plastic, creation of a special fund to finance actions for sustainability and CE, etc.). Another company reported that CE is an established procedure for more than two decades. The company utilises wastes from other industries such as slag, fly ash, industrial gypsum etc., which are incorporated in its products. Also, to meet part of its thermal needs, the company uses secondary fuels e.g. SRF/RDF used tires, biomass, etc. It is noted, however, that the Greek experts referred to large enterprises and the situation in SMEs is not the same. Finally, the Portuguese experts argued that CE as a practice is something that is mostly implemented in the industry. Industries try to reuse their sub-products in their processes. Looking at the pyramid, enterprises start by "refusing", "dematerializing" and "digitizing", and "Smart production", then go further down to "remanufacturing" and "reconditioning", making these processes more efficient (e.g. use less energy, produce less waste, etc.) and at the bottom of the pyramid, they send their waste to waste operators for reuse or recycling.

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Companies try to be more circular, mostly because the legal framework in Portugal supports the implementation of these circular models. For instance, in the construction industry, Construction and Demolition Waste Management Plans have long existed. Now, there is the New General Waste Management Regime, which came out at the end of last year and which will oblige construction companies to incorporate a minimum percentage of construction waste, either in construction products or in the construction site itself and then that minimum percentage increases over time. However, this process requires approval from regulatory bodies and in most cases the permission processes are not in accordance with contractual deadlines. The Portuguese Environment Agency, which is the National Authority for Waste Management in Portugal, also defines methodologies and rules – establishing procedures – and then assesses compliance with these legal requirements.

Another aspect that was examined through the semi-structured interviews concerned the CE initiatives (e.g. resource recovery, product sharing, circular supplies, etc.) that the construction/manufacturing/crafts sectors or other enterprises employ in their activities.

In general, all the experts referred to issues such as:

- proper waste management, i.e. collection of waste and transportation to recycling facilities (recycling)
- reduction in the use of raw materials through the reuse of obsolete products, waste, raw materials from different production steps, etc. (resource recovery)
- energy conservation or energy production from waste and/or renewable resources

Finally, some experts mentioned also that several enterprises provide nowadays a so-called Environmental Product Declaration (EPD), which is an improved version of the LCA, and have started designing their products according to the CE principles, i.e. to be reusable, easier to fix, and recyclable at the end of their life, adopting innovative processes and technologies (e.g. IoT, AI, etc.) in cooperation with HEIs and research centres.

3.2.3 Main drivers for CE initiatives

All the experts agreed that the potential economic benefits are probably the most important, although not the only driver towards the transition to CE because companies operate with economic considerations in mind. In this direction, it was also mentioned that the financial instruments are essential to enhance the application of circular models and the EU funds have helped towards CE initiatives (the “Green Deal” is an example of how the EU has taken the issue of green and climate transition as a priority, with the Member States adopting these strategies), although these publicly funded plans started in 2018, at least in some countries like Cyprus. Finally, from a financial perspective, another driver mentioned was the importance of closing the economic loop between raw materials, components and products, considering the supply chain disruption all over the world due to the Covid-19 pandemic as well as the fact that recent global economic crises made everyone think of innovative ways to survive.

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A second category reported by the experts is the compliance with the regulations and the related financial burden that the company may receive from sanctions due to non-operation in a circular economy. In connection with this driver, the experts also mentioned consumer pressure and the Social License to Operate (SLO). Also, the experts focused on Corporate Social Responsibility (CSR) towards integrating social and environmental concerns in the business operations in the context of CE. Many managers, for example, said that their companies try to shift from waste management to resource management, reduce fuel and raw material requirements and subsequent emissions and produce carbon-neutral footprint products.

Finally, another driver mentioned was the awareness of both the producers and the consumers about sustainability and CE as a means to accelerate CE processes. For instance, consumers should be informed about saving resources at home, reduce consumption and waste production, separate waste streams, etc. Companies, on the other hand, often move forward when they see "front-runners" be successful, i.e. companies follow and replicate best practices when the benefits are becoming evident through a bottom-up process (contrary to the top-down process, which takes place when European or national administrations highlight CE in their strategies). It is thus necessary for good practices to be promoted, probably through the Technological Interface Centres and Universities, and create collaborations that could bring mutual benefits.

3.2.4 Main challenges and barriers in employing CE initiatives

All the experts mentioned that the main challenges and barriers are related to legislative, financial, cultural and technological factors.

As far as legislative barriers are concerned, it was mentioned that in some countries (e.g. Cyprus) there is not a national strategy to promote CE or help the SMEs leading the way into a circular path. In other countries (e.g. Bulgaria), CE initiatives face difficulties due to lengthy legal procedures or lack of law enforcement regarding the compliance rules.

The financial barriers are associated with the administration costs which are oftentimes higher than the savings achieved (e.g. in construction companies even unused materials are thrown away as it is logistically costly to keep materials in storehouses until needed), the high processing cost in some instances (e.g. building rubble is cheaper to be landfilled than processed and turned into another material), and the lack of access to the funding required (especially for SMEs and microenterprises) to support the transition to CE (usually the investment cost is high and without subsidies, the payback period may be unacceptably high).

From a technological perspective, there are also barriers, e.g. in some cases, supply streams of materials are insufficient both in quality and quantity, there is a lack of supporting infrastructure, etc. Therefore, significant production transformations are needed (e.g. new equipment, pilot tests, R&D expenses, etc.) for a company to be circular. To this end, companies

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have to be informed and aware of European strategies and seek help from Local Administration, Business Associations, and Universities and Research Centres.

Important challenges and barriers are created by cultural factors. It is one thing to recycle or look for an alternative use for waste and a completely different thing to start from the top and, for example, convert products into services. Usually, no one is reluctant to change and companies (and their personnel) are mainly focused on the daily operation, i.e. "to put the product in the truck and to go to distribution". Although they feel the need for transition, very often, the ordinary pitfalls or difficulties are putting the CE topic to a low priority and this is especially true for the SMEs, which are struggling with everyday survival. Hence, any company needs to overcome the mentality of the world, and especially the internal one that concerns its employees and associates. The company needs to start by convincing its employees first and find a way to overcome perceptions, such as that something costs less if it is thrown away. Also, companies need to start communicating with each other. There are still many aspects related to mistrust and competition and this often prevents this important aspect, that is collaboration. Finally, another obstacle is the lack of qualified personnel with knowledge on the issues of CE. This is a gap that REFRAME aims to fill.

3.2.5 Main benefits of CE initiatives

The experts mentioned that multiple benefits are generated by the CE initiatives, i.e. social, environmental and economic, creating a win-win solution for the enterprises and the society. From an entrepreneurial perspective, CE initiatives can result in significant cost reductions relating to replacing traditional fuels and raw materials with alternative ones in the production process. Also, financial benefits may be generated from avoided costs associated with the management and disposal of waste. Finally, there are indirect financial benefits for the enterprises that have to do with CSR, customer satisfaction, positive publicity by both local and international stakeholders, minimisation of risks (e.g. avoidance of supply chain disruption, compliance with legislative requirements, increased competitiveness and flexibility, creation of new partnerships, etc.).

From an environmental point of view, the benefits are obvious. CE initiatives save valuable primary raw materials, reduce energy consumption, produce less waste, reduce GHG and pollutants emissions, etc.

Finally, from a social point of view, CE gives the chance to employees to improve their skills and become more educated in terms of circular models. Also, it offers benefits to society, in particular consumers, because products in the context of CE last longer and are easier to repair, minimising the life cycle cost. In the social benefits, one should also consider issues such as fewer health and other problems due to the minimisation of the environmental impacts.

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3.2.6 Main risks of CE initiatives

According to the experts, the main risks are very much associated with the principal barriers. It is thus risky to implement new or change existing business models without having conducted a complete assessment before, which should not be just economic. The assessment should analyse the impacts, both positive and negative, of CE business models, at the entire life cycle not only for the company but also for all its stakeholders. For example, a change in the existing process may be positive for the company in the short run but could be negative for a supplier and this could harm the company in the long run.

Other risks are related to legal issues. Changes in the legislation, and rules in general, e.g. in the case of raw materials, may result in price fluctuations. Further, many circularity models, like the industrial symbiosis, cannot be developed due to legal barriers. For example, a company cannot provide for free or sell waste directly to another company unless it declassifies the waste, and this is a very long process. Otherwise, the company that will receive the waste, must be registered as a waste management operator. Another risk factor is the pressure created by new laws more radical than those that a company can operate. Some companies are found themselves under pressure from trade unions in some industries, such as plastics, fertilizers, petrochemicals, etc., which have other priorities and other interests. It is also important to take into account and balance the guidelines promoted by Non-Profit Organizations (NGOs) and their interest in protecting the environment. This interest may also pose risks, if not implemented in a way that does not create major disruptions in the functioning of the market.

Designing and producing products using recycled materials or reusing raw materials may also have risks to consumers' health. Hence, there is a risk due to the lack of acceptance and support of the local community. A company must know which materials can be reused and how should be treated. Also, especially in large industries, the security of supply is very important. As circular economy initiatives are still experimental, large scale production cannot depend on recycled/reused materials. For instance, in the construction sector, all materials used in construction works need to be approved and tested. This is an issue related to standardisation. The CE is going to work with standardisation ISO 14009 regarding material circulation to achieve material efficiency. Some experts feel that there is a risk in this process for the enterprises (e.g. how they will move to this standard, who will assess their performance, etc.).

There are financial risks and considerations. For example, it will be pointless for a company to disassemble a cell phone if the process is very expensive and the materials produced cannot be sold at a reasonable price. Similarly, a separate collection system is costly, and thus it is important to identify the optimal point where the waste can be collected and sorted efficiently and economically.

Finally, there are also risks because many companies and their personnel do not have in-depth knowledge about how they can implement the CE transition, or they are having just partial knowledge, which is a hindering factor for the whole process. Lack of knowledge is certainly an

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issue that must be tackled and this is one of the top priorities and objectives of the REFRAME project.

3.2.7 Company strategy and assignment of responsibilities for the implementation of CE principles

The majority of the enterprises have an environmental policy, which includes the principles of CE. Fewer companies have established a specific strategy, e.g. a white paper, for the implementation of CE. This stands especially for SMEs and microenterprises, as large enterprises have developed and continuously evolve their corporate strategy that governs the application of the principles of CE (which is usually linked to tackling climate change), with specific short- and long-term targets on several occasions. SMEs usually seek help in universities and other scientific associations to prepare a CE strategy. This strategy is used as an action plan to move forward, step by step, and some experts also mentioned that these documents are certified by respectful organisations.

The responsibility of CE transition usually falls into the hands of top management. In SMEs, this is usually a personal responsibility (e.g. the owner of the company). In large enterprises, this is usually teamwork that involves people from the top management, the environmental department and even the corporate board. In some companies, the main responsibility lies with the CEO of the company and the Sustainability Manager who acts as an adjunct and informs the CEO on the progress of the action plan. There may be also a steering committee that implements and then monitors the action plan, which involves representatives from the associated departments. Nevertheless, it was mentioned that CE should not be the responsibility of a person or even a team. It should be embedded in all management practices, be part of the company's policy and be every employee's responsibility.

3.2.8 Important points for a company that wishes to start implementing CE

Almost all experts said that the first thing to be done is to search help and talk to other enterprises already implementing the principles of CE. This is particularly important in industrial areas because oftentimes businesses would have been able to exchange some resources and reduce waste (e.g. for production of insulation material etc.). Also, it was strongly advised to engage with the scientific community, such as Technological Centres, Interface Centres, Universities, as well as specialised consultants. Companies should be open to connect with different actors in the supply chain and try to build a new eco-system. As a first step, companies are suggested to analyse how important the CE is and how it will change the existing business model and the life cycle of its products.

A second point raised during the interviews is the necessity to have strong knowledge of environmental issues as well as management practices. Those who will be involved need to understand the core principles of CE and this is very important not just for the companies but

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also for the environment and society. Also, for the new relationships to be developed, those who will be involved need to be highly educated, with expertise in circular business models.

Finally, the experts believe that the commitment of management to the highest possible level, as well as the development of internal culture in terms of the benefits that the CE can offer to the viability of the company, are keys to its successful consolidation. CE should not only be seen as a means of saving money but as an opportunity to address and minimise environmental impacts and maximise social benefits in the context of CSR.

3.2.9 Establishment and needs of CE training programs

In general, the experts mentioned that CE training programs in enterprises, particularly SMEs, are practically non-existent. Indeed, only two large enterprises mentioned that they train their staff, as and where required, with appropriate training material. One of these companies offers three levels of education. The first stage is the Introductory and is received by all the employees of the company, especially the new ones, and is mandatory. It is offered online through an e-tool with five modules. It is a mixture of video, presentations, multiple-choice questions and assessments. The second level (Advanced) concerns people who have greater responsibilities in relation to CE and either work in CE and Sustainability departments or run a CE project. The third level of training concerns the Top Executives and aims to inform them about global developments, but also the main criteria by which they must make decisions taking into account the principles of the CE. Another expert mentioned an interesting initiative, namely a Council for Circular Economy, which involves the Bulgarian Chamber of Commerce that will support industries mainly from textile, plastic, and agro-sector. The initiative includes among other training and education, consultancy and participation in different projects.

All the experts, however, mentioned the importance of training and provided fruitful thoughts on the training needs and the potential topics of a training program in CE. More specifically, the experts reported the following topics, as important for the training program:

1. Introduction to CE: What exactly is the CE, benefits, risks, challenges, opportunities, etc.
2. Circular business models: circular supplies, recycle and reuse, extending the product's lifespan, sharing platforms, etc.
3. Regulatory Framework and Strategies: CE strategies make it possible to establish the SDGs and are very valid. Companies have to understand what legislation is being prepared and which will have to be complied with (for example, some of the directives that will emerge will involve precisely the construction sector).
4. Tools and methods to support CE transition and implementation: identification of toolkits (such as the "circular economy toolkit" or the "toolkit for industrial symbiosis"), use of the "Circular Canvas", new technologies at the service of CE (e.g. IoT, AI, additive manufacturing, etc.).

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5. Analysis of the viability of CE solutions: overview of financial sources for SMEs, financial analysis of investment projects, Life Cycle Assessment or similar tools.
6. Best practice examples: provide several case studies to the trainees so they can understand what CE looks like in similar SMEs and provide them with the opportunity to learn through the experience of others.
7. Specific issues (e.g. green purchasing, green public procurement, bio-waste management, etc. for trainees employed in public authorities).

It was also mentioned that it would be beneficial for the training program to include a visit to a company or to invite someone who comes from a company that already implements the CE principles to share her/his experiences.

As far as the target group is concerned, practically all the experts mentioned that the training program should be addressed to all staff categories, from the top manager to the worker who operates a machine or collects the waste. As mentioned, the successful implementation of the CE needs to help personnel understand "why" things must be done in a certain way and not just to be told, "it should be done in this way". As was characteristically reported, managers as leaders need to have the same level of knowledge as the technicians who work in the field because only in this way the CE practices can be sustained.

3.3 Conclusions

Based on the findings of the CE experts' interviews, the following conclusions are drawn:

- Consumers show an ever-increasing interest in sustainability, look for "green" products with a low environmental footprint and also consider products' cost, quality, durability, etc. As a response to the change in consumers' habits, SMEs and large companies make significant efforts to include sustainability issues in their strategy and way of thinking. EU initiatives have been proved useful in this direction.
- The implementation of CE principles is not well-established in construction, manufacturing and crafts enterprises. Nevertheless, there are differences between countries and across enterprises (concerning the size of the enterprise in particular). The main reason is that the transition to CE is a complicated process in terms of re-designing considering that each industry is working with different models. Companies try to be more circular, mostly because the legal framework supports the implementation of circular models.
- As far as CE initiatives (e.g. resource recovery, product sharing, circular supplies, etc.) are concerned, the construction, manufacturing and crafts sectors employ in their activities processes such as proper waste management, i.e. collection of waste and transportation to recycling facilities (recycling); reduction in the use of raw materials through the reuse of obsolete products, waste, raw materials from different production

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steps, etc. (resource recovery); and energy conservation or energy production from waste and/or renewable resources.

- The main drivers for the transition to CE are the potential economic benefits, the importance of closing the economic loop between raw materials, components and products, the compliance with the regulations and the related financial burden that the company may receive, the pressure from the consumers and the Social License to Operate (SLO) and the awareness of both the producers and the consumers about sustainability and CE.
- The main barriers are related to lack of appropriate strategies and legislation to promote CE, administration costs which are oftentimes higher than the savings achieved, lack of access to the funding required to support the transition to CE, the insufficient supply streams of materials both in terms of quality and quantity and cultural factors (e.g. no one is reluctant to change and companies and their personnel are mainly focused on the daily operation, i.e. "to put the product in the truck and to go to distribution").
- The benefits generated by the CE initiatives are social, environmental and economic, creating a win-win solution for the enterprises and the society. CE initiatives can result in significant cost reductions and indirect benefits that have to do with CSR, customer satisfaction, etc. CE initiatives save also valuable primary raw materials, reduce energy consumption, produce less waste, reduce GHG and pollutants emissions, etc. and, from a social point of view, give the chance to employees to improve their skills and provide products that last longer and are easier to repair.
- The main risks are very much associated with the principal barriers. It is risky to implement CE business models without having conducted a complete assessment before and not only from an economic perspective (e.g. a change in the existing process may be positive for the company in the short run but could be negative for a supplier and this could harm the company in the long run). Other risks are related to legal issues, lack of acceptance and support of the local community, or even risks to consumers' health from using recycled materials or reusing raw materials. Finally, there are also risks because many companies and their personnel do not have in-depth knowledge about how they can implement the CE transition.
- The majority of the enterprises have an environmental policy, which includes principles of CE. Nevertheless, fewer companies have established a specific strategy, e.g. a white paper, for the implementation of CE and this stands especially for SMEs and microenterprises.
- A company that wishes to start implementing CE should be in contact with other enterprises already implementing the principles of CE and the scientific community. Also, those who will be involved need to understand the core principles of CE. Finally, an important issue is the commitment of the management to the highest possible level.
- Regarding training programs in CE, the experts mentioned the importance of training but noted that today these programs, particularly in SMEs, are practically non-existent.

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As far as the target group is concerned, practically all the experts mentioned that the training program should be addressed to all staff categories, from the top manager to the worker who operates a machine or collects the waste.

4 Concluding remarks

Based on the Europe-wide survey and the experts' interviews a number of important findings were uncovered, the most important of which are discussed hereinafter.

The implementation of CE principles is not well-established in construction, manufacturing and crafts enterprises, even though a considerable number of companies have adopted an Environmental Management System (EMS) or related Policies and Procedures. For instance, according to the Europe-wide assessment about half of the participants are aware of the CE approach and just one-third consider CE as a priority on the company's agenda. Also, 30% are currently implementing a CE transition and only 13% of the participants have a CE implementation plan in place. On the other hand, it is quite encouraging that the vast majority of the respondents said that their existing business model could be easily shifted to a circular one either with minor or many changes.

As far as CE initiatives (e.g. resource recovery, product sharing, circular supplies, etc.) are concerned, construction, manufacturing and crafts companies employ in their activities processes related mainly to proper waste management and reduction in the use of raw materials. Very few companies refurbish goods and parts (about 25%), sell upcycled products (about25%) and deliver product access with leasing or renting (about 10%).

In general, companies that tried to implement CE transition identified financial risks, low quality of recycled products, lack of processing companies (e.g. for plastic by-products), lack of efficient control of life cycles, lack of CE processes standardisation, lack of unified CE transition plans in many industries, EU regulations-related industries and most importantly lack of specialists in the field and shortage of knowledge in the implementation of CE principles. Even the companies that successfully implemented the CE transition identified challenges such as employees' motivation, lack of CE awareness, high administration costs for introducing and executing CE assessment, lack of funds and access to funding, lack of expertise, insufficient cooperation with stakeholders. Despite risks, challenges and obstacles, however, 9 out of 10 of the respondents think that CE has business opportunities. The benefits generated by the CE initiatives are social, environmental and economic, creating a win-win solution for the enterprises and the society.

Last but not least, the experts mentioned CE education, particularly in SMEs, is practically non-existent. Similarly, two-thirds of the survey participants said that their companies either do not offer CE training or offer very little training to their employees. Therefore, the CE training programs should be addressed to all staff categories, from the top manager to the worker who

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operates a machine or collects the waste. To this end, the following training topics were identified:

1. **Introduction to CE:** What exactly is the CE, benefits, risks, challenges, opportunities, etc.
2. **Circular business models**: circular supplies, recycle and reuse, extending the product's lifespan, sharing platforms, etc.
3. **Regulatory Framework and Strategies**: CE strategies make it possible to establish the SDGs and are very valid. Companies have to understand what legislation is being prepared and which will have to be complied with (for example, some of the directives that will emerge will involve precisely the construction sector).
4. **Tools and methods to support CE transition and implementation:** identification of toolkits (such as the "circular economy toolkit" or the "toolkit for industrial symbiosis"), use of the "Circular Canvas", new technologies at the service of CE (e.g. IoT, AI, additive manufacturing, etc.).
5. **Analysis of the viability of CE solutions:** overview of financial sources for SMEs, financial analysis of investment projects, Life Cycle Assessment or similar tools.
6. **Best practice examples**: provide several case studies to the trainees so they can understand what CE looks like in similar SMEs and provide them with the opportunity to learn through the experience of others.
7. **Specific issues** (e.g. green purchasing, green public procurement, bio-waste management, etc. for trainees employed in public authorities).

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Appendix I - Online Europe-wide Assessment Questionnaire (English version)

Questions for CE Online Europe wide Assessment

Guidelines: *Thank you very much for your contribution on the Online Europe-wide Assessment for the Circular Economy. If there is a responsible individual for Environmental issues and/ or Circular Economy in your company, it's preferrable for our survey he/ she to complete the below questionnaire*.

GROUP A-GENERAL INFO
1. In which country/countries currently does your company operate in? Click or tap here to enter text. 2. Is your company located in an urban or rural area? ☐Urban ☐Rural 3. Please indicate the size of your company/organization? ☐Self-employed without employees ☐Up to 10 employees ☐Up to 50 employees ☐Over 50 employees 4. How many year(s) does your company/organization exist? ☐1-5 years ☐6-10 years ☐More than 10 years 5. What is your current position in the company? ☐President/ CEO/ Managing Director/ Manager ☐Employee 6. What is your company's sector of activity? ☐ Construction ☐ Manufacturing (please specify) ☐ Other (please specify)

GROUP B-RECYCLE
7. Does your company have in place a Management System or related Policies/ Procedures for Environment Protection? ☐Yes ☐No ☐Do not know/Not sure 8. Which of the main waste types does your company generate? ☐Paper ☐Glass ☐Plastics ☐Food ☐Metals ☐Construction/Demolition Waste ☐Other (please specify) 9. Does your company refurbish goods and/or parts?

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☐Yes ☐No ☐Do not know/Not sure

10. Does your company use recovered material to produce new products?

☐Yes ☐No ☐Do not know/Not sure

11. Does your company sell up-recycled products?

☐Yes ☐No ☐Do not know/Not sure

12. Does your company deliver product access with leasing or renting?

☐Yes ☐No ☐Do not know/Not sure

13. Are you aware of Circular Economy approach?

☐Yes ☐No (if No ☮end of Questionnaire) ☐Somewhat

GROUP C-CIRCULAR ECONOMY

14. Is circular economy a priority on your company's agenda?

☐To a Great Extent ☐ Somewhat ☐Very Little ☐Not at all ☐Do not know/Not sure

15. Does your company offer circular economy related training to its employees?

☐To a Great Extent ☐ Somewhat ☐Very Little ☐Not at all ☐Do not know/Not sure

16. Do you think that your company would benefit from a training in circular economy?

☐To a Great Extent ☐ Somewhat ☐Very Little ☐Not at all ☐Do not know/Not sure

17. Do you think that there is there enough freely available and up-to-date information to assist you in the transition to circular economy?

☐To a Great Extent ☐ Somewhat ☐Very Little ☐Not at all ☐Do not know/Not sure

18. Do you think that you need more information, training, and awareness regarding circular economy principles?

☐To a Great Extent ☐ Somewhat ☐Very Little ☐Not at all ☐Do not know/Not sure

19. If you think your company would benefit from a training in circular economy, what would be the most suitable type of training for you?

☐ In-class ☐ Online ☐ Be-learning (in-class + online)

20. Do you consider that your existing company's business model easy and flexible to shift to a Circular Economy one?

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☐Yes, it would be easy to shift without changes.

☐Yes, it would be possible with some minor changes.

☐Yes, but with many changes.

☐No, it would be very complicated, or impossible to shift.

21. Does your company have a circular economy implementation plan?

☐To a Great Extent ☐ Somewhat ☐Very Little ☐Not at all ☐Do not know/Not sure

22. Does your company implement a Circular Economy transition?

☐Yes – If yes, what were the challenges faced during transition?
Click or tap here to enter text.

☐No – if no describe why and what obstacles you found?
Click or tap here to enter text.

23. What risks did you identify during the transition?

Click or tap here to enter text.

24. Do you think that Circular Economy has business opportunities?

☐Yes – if yes, describe the biggest opportunities for your company Click or tap here to enter text.

☐No

25. In your opinion Circular Economy is only about the environment or there is a business case too?

Click or tap here to enter text.

26. Does your company explore the interest of its customers in circular economy issues?

☐To a Great Extent ☐ Somewhat ☐Very Little ☐Not at all ☐Do not know/Not sure

27. Does your company provide incentives to its customers to return the products at end-of-life?

☐To a Great Extent ☐ Somewhat ☐Very Little ☐Not at all ☐Do not know/Not sure ☐Not Applicable

28. Does your company use alternative input (e.g., sustainably sourced renewable materials, renewable energy, etc.)?

☐To a Great Extent ☐ Somewhat ☐Very Little ☐Not at all ☐Do not know/Not sure

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Appendix II – CE Experts' Interview Questions (English version)

1. Introduce yourself and your company: What is the core business of your company? How big is your company? How many employees are in your company?

Alternative framing for experts besides managers:

Introduce yourself: What's your professional/academic background? In which ways and for how long are you involved in CE projects/teaching/other…

2. During the years, do you experience a change in consumers' demand for sustainability in your products? Do you share your information about sustainability with your customers?

Alternative framing for experts besides managers:

During the years, do you experience a change in consumers' demand for sustainability?

3. Is the circular economy established in your company? If yes, could you tell about the shift? What were the steps of the transition toward circular economy?

Alternative framing for experts besides managers:

Is the circular economy established in construction/manufacturing/crafts companies? If yes, could you tell about the shift? What were the steps of the transition toward circular economy?

4. What best describes the type of circular economy initiatives (e.g. resource recovery, product sharing, circular supplies, etc.) your company is employing?

Alternative framing for experts besides managers:

What best describes the type of circular economy initiatives (e.g. resource recovery, product sharing, circular supplies, etc.) construction/manufacturing/crafts companies are employing?

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5. What are the main drivers for the circular economy initiatives your company is employing?

Alternative framing for experts besides managers:

What are the main drivers for the circular economy initiatives construction/ manufacturing/ crafts companies are employing?

6. What are the main challenges/barriers your company faces in employing circular economy initiatives?

Alternative framing for experts besides managers:

What are the main challenges/barriers construction/ manufacturing/crafts companies face in employing circular economy initiatives?

7. What are the main benefits of circular economy initiatives for your company?

Alternative framing for experts besides managers:

What are the main benefits of circular economy for construction/ manufacturing/crafts companies?

8. What are the main risks of circular economy initiatives for your company?

Alternative framing for experts besides managers:

What are the main risks of circular economy for construction/ manufacturing/crafts companies?

9. Who has the main responsibility that your company follows the circular economy principles?

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10. Do you have a company strategy for the implementation of CE principles?

11. Has your company established a training program for its employees train them in circular economy principles? If yes, what kind of training is it? What is your experience so far? What types of learning methods/trainings do you prefer? Which ones are the most efficient to acquire CE related knowledge in your opinion? Who should attend this type of training?

Alternative framing for experts besides managers:

In your perspective, what would be the most important training topics/subjects that companies should attend to moving towards CE? What types of learning methods/trainings do you prefer? Which ones are the most efficient to acquire CE related knowledge in your opinion? Who should attend this type of training? What is your experience so far?

12. What advice do you have for a company that is about to start or wishes to start implementing circular economy?

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