

Promoting circular economy transition: A study about perceptions and awareness by different stakeholders' groups

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Abstract

The interest into Circular Economy (CE), mainly emerged recently in response to climate change, environmental damage, and the limits of a linear economy, requires a deeper investigation on how the concept and its transition process are perceived in the society. In the present explorative study (questionnaire survey), we evaluate the perception and level of awareness of three stakeholder groups with a good knowledge on CE concept and governance of the transition process, specifically: Researchers, Economists, and Administrators. The three samples contain stakeholders from EU and non-EU countries.

We developed primarily a comprehensive literature review on CE perceptions and awareness useful for the design of the questionnaire, the comparison of the results and in overall for creating a wider framework of analysis and interpretation of the current CE transition. The questionnaire has been tested on one of the three samples (Researchers) and then replicated on the other two ones (Economists and Administrators). The results of the survey shows that the three groups perceive CE as a “zero waste economy” (Administrators) and in wider terms as a model for re-design our present state of economy and society in a more regenerative manner (Researchers and Economists). Administrators seem more focused on utilizing CE for economic growth and job creation while Researchers and Economists mainly expect receiving environmental benefits from the CE transition. The three groups share a common vision of CE at its initial stage of the transition process in agree with the relevant literature. In that, a more successful advance of CE depends on the governance of the process by key actors and instruments. Researchers emphasize a more holistic top-down approach while Economists and Administrators expect a bottom-up approach guided by the civil society (companies and citizens/consumers). However, these results complement each other's as all the actors are relevant for fostering CE and a mixed set of instruments is needed. Moreover, given that

1 implementation of CE is costly for consumers and companies, the political intervention has a leading
2 role in this initial phase also in disseminating a positive and sustainable image of CE concept and
3 model. At this regard the support of CE research to such intervention is highly important to develop
4 a CE path in line with all the three principles of sustainable development, the desired outcome of the
5 society and capable of facing the current unprecedented environmental challenges.
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8 **Keywords:** circular economy, perception, awareness, transition, questionnaire survey, information.
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1. Introduction

The Circular Economy (CE) transition is emerging as one of the most popular societal responses to environmental problems and in general to the achievement of a more sustainable development worldwide (D'Amato, 2021; Corvellec et al., 2020; Winans et al., 2017; Ghisellini et al., 2016; Su et al., 2013). The academic research in the field of CE is growing fast as is showed by the number of published papers that more than doubled from 2016 to 2020 (WEB of Science, 2021¹). Relevant European Union (EU) programs such as the EU Circular Economy Action Plan (2020a, 2015a, b), regulations and directives are being passed in the last decade (European Commission (EC), 2020b; 2009), leading to a much quicker adoption of CE practices and initiatives than before (Camilleri, 2020; Steliac and Steliac, 2019).

However, we are still in the pre-development stage of the transition to CE (Donner and de Vries, 2020; Ghisellini and Ulgiati, 2020a) and far from the goal of a full implementation of the CE both in the EU (Towa et al., 2021; Mayer et al., 2018) and at the global level (Haas et al., 2015). A transition (as the adoption of CE could be considered as) has been defined as “*a fundamental change in the structure, culture and practices of a societal (sub)system that is the result of a co-evolution of economic, technological, institutional, cultural and ecological developments at different scale levels*” (Bosman and Rotmans, 2016; Grin et al., 2010). According to this definition the transition results in a complex process that requires changes in all the societal subsystems and not only in the economic system. In this regard, the development of the concept of CE is part of a deep cultural movement (D'Amato, 2021) that, since the 1960's contested the economic system's concept of economic growth without limits (Boulding, 1966). According to this movement, change towards a more sustainable development pattern within the limits of the natural environment is necessary (World Commission on Environment and Development, 1987). The availability of cheap fossil energy contributed to the concept of unlimited economic growth while at the same time creating the emergence of an ecological crisis (Brown and Ulgiati, 2011). Combustion of fossil fuels generates large amounts of carbon dioxide (CO₂), one of the main contributors to global warming. Current natural absorption of CO₂ is insufficiently offsetting the large amount of CO₂ generated by human activities (Kiang, 2018).

Some authors evidence the potential of CE to contribute to tackle environmental challenges, as with the CE “we are in an epochal challenge” (Salvioni and Almici, 2020). The CE, in its transition process aims to achieve an overall societal system change (D'Amato, 2021; Zecca, 2021; Becerra et al., 2020; Iacovidu et al., 2020), involving a reduction of the use of finite resources (e.g., metals and minerals) and their reuse/recycling across production and consumption cycles, the production of bio-based materials that return (biodegradable) back into the environment at the end of their life, leaving away the fossil fuels and bringing in sight the achievement of a 100% renewables based economy at feasible economic, environmental and social costs (Brown et al., 2021; Lebre et al., 2020; Olabi, 2019). For this to happen the CE requires the adoption of new legislation and policies, new production models (both private and public) and the replacement/adaptation of the existing systems (Bianchini and Rossi, 2021; Klein et al., 2021; Re, Magnani and Zucchella, 2020; D'Adamo et al., 2020; Rosa et al., 2019; Urbinati et al., 2018; Masi et al., 2017; Rizos et al., 2015) across and within value chains (Walker et al., 2021; Ingrao et al., 2019), the implementation of complementary infrastructures, platforms and services for the CE (Markard et al., 2011), changes in consumption patterns and lifestyle and so on (Ghisellini and Ulgiati, 2020a; Comacho-Otero et al., 2018; Mugge et al., 2018). Currently, several barriers (e.g., political-legislative, cultural, financial, economic, operational, technological,

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¹ WEB of Science, Search throughout “All database” using as Keyword “circular economy” from 2010 to 2020, available: https://apps.webofknowledge.com/summary.do?product=UA&parentProduct=UA&search_mode=GeneralSearch&qid=1&SID=C1HAbbfEhSKyLBmVcaC&&page=1&action=sort&sortBy=PY.A;LD.A;SO.A;VL.A;PG.A;AU.A&showFirsPage=1&isCRHidden=false Last accessed: 28/04/2021.

1 informative) are hampering the CE transition (Garcia-Quevedo et al., 2020; Bressanelli et al., 2019;
2 Ceptureanu et al., 2018; Kirchherr et al., 2018; Korhonen et al., 2018; Ritzen and Sandström, 2017).
3 As a result, without the appropriate policies in place, a rapid adoption of CE is not likely to happen
4 (Ghisellini et al., 2021; Williams, 2019) and lock-in mechanisms could prevent further advances of
5 the CE to the current early stage (Ghisellini and Ulgiati, 2020a; Bosman and Rotmans, 2016).

6 In this view, the EU is committed to play a leading role in the transition. This was evidenced since
7 the First Circular Economy Action Plan (EC, 2015a, b). In fact, starting from 2015, the EU has
8 cemented its role with the New Circular Economy Action Plan (European Commission 2020). CE is
9 one of the main building blocks of the European Green Deal, forming the EU's new agenda for
10 achieving a more sustainable development (EC, Environment, 2020). Moreover, relevant external
11 drivers such as the worsening of environmental problems and an increased environmental awareness
12 amongst the public (Eurobarometer 2020; 2019a, b), showcased also by movements such as Fridays
13 for Future, are also contributing to suggest an acceleration of the societal shift towards a more
14 sustainable global society (IPCC, 2018).

15 Regarding the shift to a more sustainable society, as we will show in the next section 2, a few studies
16 in the literature assessed how people are aware or perceive the concept of the CE in a more general
17 and societal perspective (Hao et al., 2020; Przywojska et al., 2019; Smol et al., 2018; Guo et al.,
18 2017). International literature evaluating the perception of the CE and the transition of society (as
19 shown in detail in the next subsection) is mainly focused on single actors, e.g., on consumer attitude
20 and green purchasing decisions consistent with circular packaging (Testa et al., 2020; Boesen et al.,
21 2019), including perception, purchasing attitude towards remanufactured products (Muranko et al.,
22 2019; Onete et al., 2018; Wang et al., 2018; Hazen et al., 2017; Van Welden et al., 2016) or attitude
23 toward the purchasing of products with different End-of-life scenarios (Atlason et al., 2017).
24 Furthermore, the perception of companies, regarding the CE transition, is also analysed to both
25 understand how companies perceive or are aware of the concept of CE and how they are introducing
26 CE implementations in their organizations and the barriers that those firms are facing (Garcia-
27 Quevedo et al., 2020; Liakos et al., 2019; Masi et al., 2017).

28 In this study our main goal is to widen the knowledge of individual perceptions on CE applications
29 in practice (reuse, repair, remanufacturing, recycling) to increase the understanding of the
30 perception/awareness of researchers and policy makers on:

- 31 • The concept of sustainable development (SD). A concept relevant in the CE transition as CE
32 aims to promote a framework that integrates the three specific dimensions of sustainable
33 development: the environmental dimension and the reduction of the environmental impacts
34 of economic activities (e.g., by optimizing/reducing the use of natural finite resources and
35 their diversification by design, avoiding/reducing waste by design, unsafe landfilling and
36 incineration), the economic dimension (e.g., by focusing on more sustainable and circular
37 business models capable of reducing the external costs discharged to the society) and the
38 social dimension (e.g., promoting better well-living by improving employment opportunities
39 and job satisfaction, reducing the risks for human health by reducing the use of hazardous
40 materials, waste landfilling and dumping) (Silvestri et al., 2020)²;
- 41 • the concept of CE (meaning, features, implementations, and advantages) and how its
42 perception and level of awareness changes according to the group of respondents, depending
43 on the organization and field where respondents work;
- 44 • the process of transitioning to the CE in itself (current stage, main drivers and barriers) and
45 its governance. In that, we focus on the CE as a multiphase concept, shedding lights on
46 transitional phases and in particular on the pre-development phase where we are currently,
47 compared to the others such as take-off, acceleration and stabilization (Bosman and Rotmans,
48 2016).

59 ² The strict connection between CE and sustainable development is also emphasised in the first and current EU action
60 plan adopted last year 2020, available at: https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF. Last accessed: 03/05/2021.

1 The final goal is envisaging the future transition to a CE, based on the data collected from the
2 questionnaire survey and the literature review. Such framework specifically allows us to expand the
3 knowledge on the current stage of the transition with the purpose of providing a fruitful interpretative
4 framework and valuable feedback and recommendations to both researchers and policy makers for
5 fostering the CE transition beyond the current stage.

6 The structure of this study is as follows: Section 2 provides, through a literature review, an overview
7 of the previous studies evaluating the perception and awareness of the CE or transition to CE. Section
8 3 describes the main features of the methods used for collecting the data (literature review and
9 questionnaire survey). Section 4 summarizes the results that emerged from the questionnaire survey,
10 whereas section 5 discusses the main results of the survey and their significance compared to the
11 existing literature. Finally, section 6 outlines the main conclusions, directions for future research and
12 limits of the study.
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17 **2. Previous literature**

18 In this section we present the main results that emerge from the literature review carried out in this
19 study. A summary of the main results of each study included in the literature review is provided in
20 **Table 1** in the Appendix. The latter also classifies the studies on the basis of the type of respondent
21 in the surveys and CE focus. The method adopted in performing the literature review has been
22 described in the next section 3, Materials and Methods. **Figure 1** lists all the selected articles
23 contained within the literature review.
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27 **2.1 Surveys on civil society (citizens, institutions, non-profit organizations)**

28 In Europe, the survey by Smol et al., (2018) carried out in southern Poland (Malopolska region),
29 where there is a high potential of technical and social innovations, found that the public awareness of
30 the CE is high among the respondents. The concept of CE is mainly associated with raw materials
31 conservation and waste prevention measures. In the investigated sample, younger generations are
32 more familiar both on the concept and CE related behaviour such as waste differentiation and the
33 purchasing of recycled and remanufactured goods. The public awareness of the CE concept is also
34 positively correlated with level of education. The choice of buying CE products seems highly affected
35 by the price and the need of traceability, given that e.g., 45.6% of the respondents stated that they are
36 willing to buy such products only if they are cheaper and have a guarantee. With regard to the future
37 implementation of the CE, a large part of the sample (80%) agrees that the CE could be implemented
38 in the region in the future even if 29.3% of respondents think that it will take a long time and 30.2%
39 suggests there is need for proper financial support for a CE transition. The study also evidences the
40 some of the main actions adopted by the Polish Government for raising awareness on CE. These
41 include the sharing of educational materials to lecturers and students as well as to other targets
42 subjects such as children, youth, communities, entrepreneurs, and officials. Lakatos et al., (2016)
43 investigated in a survey in Romania (in four regions) the attitude towards the environment and the
44 awareness of its environmental effects including finite resources' concerns in a large sample of
45 mainly young Romanians as well as their attitudes towards sustainable production and circular
46 business models (reuse and recycling). The results evidence that the respondents have a high level of
47 awareness towards the environment and the environmental effects of the linear model as well as have
48 a high positive attitude towards sustainable production and circular business models. However, they
49 show a lower attitude towards the adoption of sustainable consumption practices (such as the use of
50 public transport or bike to go to work, separate collection of paper and used cooking oil, car sharing,
51 sending used batteries and light bulbs in collection centres). As a result, the authors suggest the
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1 adoption of measures aimed to increase the awareness of the respondents on CE. In another survey
2 in Poland, Przywojska et al (2019) investigated the perception of mayors (and their executive teams)
3 of 460 Polish municipalities regarding 11 possible policy/practice areas and interventions (including
4 CE Implementation) useful to tackle the current urban sustainability challenges of Polish cities. The
5 results reveal that the policy/practices areas related to traditional sectors such as the improvement of
6 infrastructure, stimulation of economic growth, revitalisation of degraded areas through building and
7 infrastructure modernisation and renovation are perceived as priority compared to new
8 policy/practices areas. This would entail those majors and their teams are still not aligned in favour
9 of a preventive approach to sustainability. CE is not yet perceived as a priority from these
10 Administrators and is not receiving great attention in their programs. Those initiatives in the frame
11 of the EU Urban Agenda (including e.g. the development of renewable energy and the low carbon
12 economy, intelligent transport systems, development of e-government, etc) are not yet carried out
13 systematically (Przywojska et al., 2019; Sikora-Fernandez, 2018). As a result, the authors suggest the
14 need for intensive information campaigns among local decision-makers for building a local capacity
15 able to promote the implementation of a more sustainable urban development also focused on CE
16 (Przywojska et al., 2019).

17 In the EU context, a very recent Eurobarometer (2019) survey, showed that 93% of the respondents
18 in the EU consider climate change a serious problem and agree that greenhouse gas emissions should
19 be reduced to a minimum to achieve the EU's goal of a climate-neutral economy by 2050 (EC, 2019).
20 Moreover, similarly high percentages declared to have taken at least one action to tackle climate
21 change such as reducing and recycling waste (75% of respondents) and cutting down on consumption
22 of disposable items whenever possible (62%) (EC, 2019). Another less recent survey by
23 Eurobarometer (2013) showed that, in EU member states, about 30% of the respondents have already
24 engaged in CE practices such as buying remanufactured products, leasing products or sharing
25 products. In some countries such practices are more common when compared to in other countries.
26 For example, in Germany and the United Kingdom remanufacturing has been adopted by almost the
27 half of the respondents whereas in Finland the sharing schemes have been used by 60% of the
28 respondents (European Commission, Circular economy indicators³).

29 Outside of the EU, Hao et al., (2020) explored the willingness to participate in the CE in Western
30 China (Sichuan Province and Chongqing City) finding as relevant factors: subjective norms such as
31 those related to the social context (e.g., membership of a group) of the individual, willingness to pay
32 more or sacrifice for the environment, and the perceived economic benefits largely influence the
33 citizens' participation to the CE. The authors suggest that policy makers should disseminate a positive
34 knowledge and image of the CE including its potential benefits (for the environment, society and
35 economic development) in the society (in communities, companies, schools and other places to first
36 reinforce some peoples' WP) by means of both communications channels (publicity, propaganda
37 materials, slogans on products and so on) as well as adopt economic tools for engaging citizens in the
38 CE (e.g. incentives to buy green products). A previous study by Guo et al., (2017) in Midong district
39 of Urumqi city (the capital of Xinjiang) performed in two times (year 2008 and year 2013), found in
40 2013 that the knowledge of the CE was still limited among the resident of such area as about 41% of
41 the respondents "had heard of CE concept" compared to other Chinese cities (Hengyang and Tianjin)
42 maybe due to lower educational level of the respondents and the current cultural approach
43 underpinning the initial stage of economic development of the city. Instead, the residents showed a
44 higher understanding of the concept of sustainable development and the importance of water savings
45 and the improvement of energy efficiency due to climate conditions of the survey area being the city
46 of Urumqi located in a semi-arid area of northwest China the policies of the Chinese Government
47 including the ban to the import and sales of incandescent lamps over 60w.

3 Circular economy indicators, societal behaviours, available at:
https://ec.europa.eu/environment/ecoap/indicators/societal-behaviours_en. Last accessed: 26/08/2020.

2.2 Surveys on companies

The concept of CE is also gaining momentum among EU companies, albeit this is distributed unevenly across sectors and countries. The transition to CE requires a rethink of the ways to create value in new visions consistent with all the three pillars of sustainable development.

Spyrkova et al. (2016) found through surveys that almost half of the interviewed companies, in the Slovakian industrial sector, declared to be available to adopt optimization strategies related to the internal waste and energy and material composition. There was still little involvement of the companies in the management of waste produced internally. In the EU, manufacturing firms are increasingly aware of the concept of CE as confirmed by the surveys of Liakos et al. (2019) and Masi et al. (2017), where in both studies more than 60% of the respondents declared to be familiar with/aware of the concept of CE. In Spain, in a more recent study on a sample of Small and Medium Enterprises (SMEs), Ormazabal et al. (2018) showed that almost half of the sample had some knowledge about CE, derived from internet, corporate media, academic sources, news, television or friends, whereas the main factors associated to a company's perception of the CE are related to material provisions, resource recovery, and cost-savings. The SMEs do not see the CE as a priority due to their limited resources, short-term vision, and lack of time in their daily activities. In the sample also emerged the weak diffusion (39%) of one or more environmental certifications (82% ISO 14001 and 7% EMAS), contrary to what evidences the previous and new EU Action Plans (2020 a; 2015a, b) and the results by Fonseca et al. (2018). In terms of drivers, the support from public institutions with "clear, strong and predicable policy frameworks" is considered relevant for adopting the CE initiatives by companies due to costs and risks barriers embedded in the implementation of such initiatives (e.g., adaptation of existing technologies to new inputs or development of product design) (Masi et al., 2017). Manufacturing companies (mainly SMEs) still perceive the CE too costly and risky for them (Cristoni and Tonelli, 2018) and the main driver of the transition to CE for companies is the economic attractiveness rather than the environmental driver. These results are also confirmed by another study in the Philippines by Gue et al., (2020) where the authors interviewed different stakeholders of companies (business owners, managers, design engineers, sales engineers, and maintenance engineers) working in industry and service sectors for understanding the most perceived drivers of CE transition. In that, economic attractiveness and consumer demand resulted the main drivers according to the respondents. In other studies, such as the survey by Fonseca et al., (2018), the main motivations underlying the implementation of CE by the respondents of the sample companies in Portugal resulted the improvement of profitability, value creation and environmental performance. The CE implementation is perceived in the adoption of its classical principles "Reduce, Reuse and Recycle" at company level with limited adoption of inter-firm collaboration with suppliers and customers. The results show how the CE implementation could be improved by the adoption of an Environmental Management System certification and more sustainable business models resulting in a significant driver on the level of CE adoption. The study also highlights the importance of a favourable institutional environment for the promotion of CE (fiscal, legal, organizational, political) and its further advance towards the adoption of other additional principles such as "repair and remanufacturing". Fortunately, in more recent studies the adoption of CE initiatives in SMEs starts to be perceived as a business opportunity and as an investment for differentiating the strategies of the companies in order to gain competitive advantage over the competitors rather than only as a cost (Mura et al., 2020). However, the image of CE and sustainability as carrier of higher cost is diffused as a result the authors suggest the need for more communication on the opportunities for companies coming from the transition to CE (Mura et al., 2020).

Interestingly, with regard to the barriers to CE, a large survey on SMEs carried out in 28 European countries by Garcia-Quevedo et al. (2020) revealed that regulatory related barriers (e.g., complex administrative procedures, costs of meeting regulations or standards) are perceived as highly important, along with the lack of human resources by companies engaged in the CE compared to companies that are not involved in the transition.

2.3 Surveys on workers and employees

Human resources are one of the most important factors affecting the image, operativity and productivity of an organization. In this framework, Singh and Singh (2018) analyse the role of human resources in the context of CE on a sample of bank employees in India investigating the interrelations between organizational justice (OJ), psychological empowerment and organizational citizenship behaviour (OCB) and their influence to job satisfaction (JS). Their results seem to confirm their initial working hypotheses that the well job satisfied employee is a key factor of success for CE business models in the context of a business organization. They pointed out that when employees perceive the work environment as fair and empowering, they tend to engage more on their organization and experience JS also increasing their productivity in the organization (Singh and Singh, 2018). Along these lines, a previous survey performed in Italy in a company dealing with waste disposal in the province of Bari (Southern Italy) (Poli et al., 2009) evaluated the hypotheses that a high involvement of the employees in the mission of the organization that operate in a key sector for the natural environment could translate into a high involvement and contribution of employees towards the goals of environmental protection. The results confirm such hypotheses and show that employees, working in an organization with a primary mission the environmental protection, have a particular perception or sensitivity and attitude to the environmental problems. The sharing of the goals and mission of an organization with their employees is correlated positively with employees' perception of the importance of a harmonious balance with the natural environment and its rights. Therefore, the work of the employees of such an organization will be carried out optimally because they feel themselves responsible and involved in the protection of the natural environment and are aware their contribution can be relevant in improving a change not only in waste management but also in the territory and in other sectors such as e.g., tourism (Poli et al., 2009).

2.4 Surveys on consumers

Citizens with their consumption choices and actions influence directly and indirectly the transition to CE. As a result, deepening on consumers' perception towards circular products and solutions (such as reduce, repair, reuse, remanufacturing, recycle) (Comacho-Otero et al., 2018), and on the factors that drive or prevent consumers to engage in the CE are central elements for CE development and key issues for policy in the perspective to guide citizens/consumers towards more environmentally conscious purchases (Hazen et al., 2017; Testa et al., 2020), behaviours and lifestyles (De Koch et al., 2020).

Comacho-Otero et al. (2018) reviewed the literature dealing with consumption in the CE classifying the main factors affecting the perception and acceptance by consumers of circular products and solutions into seven categories. The identified factors range from personal (materialism, need for uniqueness, or desire for change) and physiological characteristics (attitudes, values, habits, or ideologies) to other product related factors (quality, longevity, design, risks, or uncertainty) as well as related to their knowledge and understanding. The availability of the information related to product quality and potential benefits and costs is considered an essential factor for the consumers by many authors (De Koch et al., 2020; Hao et al., 2020; Comacho-Otero et al., 2018; Smol et al., 2018). In this view, specific and correct information is key in facilitating for example the use of food by-products (Cattaneo et al., 2018) or to convey the attention of consumers to particular elements of the products such as the packaging (Testa et al., 2020) and its environmental sustainability (Boesen et al., 2019).

Information acts as a means to align a consumer's personal attitude with the circular attributes of packaging (Testa et al., 2020)⁴. Consumers appreciate the provision of information the absence of

⁴ "Information seeking plays an important role in helping consumers to understand the circular features of packaging and to make purchasing decisions coherent with personal beliefs and past behaviours" (Testa et al., 2020).

1 which negatively affect their attitude towards the uses of new food by-products (Cattaneo et al.,
2 2018). In some cases, scientific information from researchers is required as there could be an
3 informative gap between the environmental quality perceived by the consumers and the real quality
4 of a product and its packaging. Boesen et al. (2019) compare the perception of Danish consumers
5 related to the environmental sustainability of five different kinds of packaging for liquid food (milk,
6 beer, soft drinks, olive oil and skinned tomatoes) and the scientific results of LCAs on such kind of
7 packaging. They also evaluate the understanding of Danish consumers of eco-labels of packaging.
8 The results evidence that consumers mainly perceive the sustainability of packaging depending on
9 the material type and on the environmental impacts at the disposal stage of the packaging disregarding
10 the previous life cycle stages of production and transport of packaging. Moreover, the investigated
11 consumers perceive as most environmentally sustainable for packaging the bio-based materials and
12 glass, while considering plastic as less sustainable. This is in contrast to the results of LCAs showing
13 plastic for soft drinks is one of the most environmentally friendly material for packaging (compared
14 to aluminium can, pet bottle, refillable glass bottle). Another gap occurs with re-filled glass and one-
15 way glass for beer which LCAs show very different environmental profiles but consumers are not
16 aware of such differences between the two kind of beer packaging.

17 Jaca et al. (2018) investigate the role of consumers' organizations in promoting environmental
18 sustainability as well as the environmental profile and awareness of a sample of Spanish-speaking
19 consumers⁵ towards environmentally friendly products or services. The results show that consumers
20 are aware of the CE and take into account the dimensions of the CE when they started to consume in
21 a sustainable way. The CE is also perceived as a driver for sustainable consumption. Finally, the
22 consumers' organizations by means of their website contents seem not yet aligned on the informative
23 expectations of green consumers in the sample and the actions adopted by the organizations seems
24 insufficient to capture the green consumers. Indeed, only a small fraction of consumers belongs to
25 consumers' organizations. De Koch et al., (2020) with regard to plastic pollution evidence that the
26 problem is still not handled properly due to misinformation, disempowerment, convenience and cost.
27 For example, "recycling" compared to "reduction" is gaining the higher attention in CE related
28 practices in South Africa and is perceived as the best solution for tackle the problem of plastic
29 pollution. Finally, the latter is still not perceived as a priority compared to other issues such as
30 unemployment, crime and climate change.

31 Besides information, Borrello et al. (2017) found that the provision of a sufficient economic reward
32 is, for the large part of respondents of a sample of Italian households, a necessary factor for
33 implementing CE, in particular in circular agri-food loops to reduce food waste. Interestingly, a minor
34 part of the sample was more willing to make personal efforts for the cause of a circular economy
35 transition and considered the monetary reward a less important driver for participation to CE.

36 Among the circular solutions, Diddi and Yan (2019) explored U.S. consumers' specific barriers and
37 motivations to engage in clothing repair and their likelihood to participate in clothes mending and
38 community mending events. Their results evidence for the U.S. context that the participation to
39 mending is lower compared to what was found by previous studies in other geographical contexts
40 (e.g., Norway) and that the main barriers to mending were high costs related to clothing repair, the
41 lack of necessary skills and the perception of mending as a time-consuming activity. However, the
42 results also indicated that participants seem more likely to mend if they were intending to reuse
43 clothes or give them to family/friends as well as that they perceive clothes mending as a pro-
44 environmental behaviour activity which signals the increased consumer awareness of the
45 environmental impacts of fashion industry.

46 With regard to WEEE sectors, Hazen et al. (2017) analyse if consumers are willing to switch to for
47 example remanufactured products compared to new products, and the factors that play an important

⁵ More than half of the respondents are over 35 years old, and 55% have a postgraduate degree. Nevertheless, almost a third earn less than 700V per month, and just 26% earn more than 2000V. The income issue is relevant because multiple authors claim that green consumers are usually willing to pay a premium for environmentally friendly products, especially when they are awarded with an eco-label (Bjørner et al., 2004; Konishi, 2011; Rubik et al., 2008).

1 role in orienting consumers towards remanufactured products including the policies that are more
2 effective.

3 Botelho et al. (2016), studied the perception and acceptability of consumers towards several take-
4 back alternative schemes for Waste Electrical and Electronic Equipment (WEEE or e-waste), by
5 means of a questionnaire survey in Portugal. The results pointed out that socio-demographic
6 (education, sex, and monthly income) and information factors largely affect the behaviour of the
7 respondents in returning their WEEE. Moreover, a high share of the respondents (68%) evidenced
8 the lack of informative campaigns and lack of adequate incentives for the recovery of WEEE whereas
9 82% of the respondents state the lack of information at the time of purchase of a new EEE product of
10 the processes related to the end of life of WEEE. Consequently, 54% of the sample reported the
11 storing at home of WEEE as they lack information and lack available collection points near their
12 homes. Muranko et al. (2019) investigated in a sample of industry and academic experts the influence
13 of the communication on the behavioural attitudes towards the purchase of remanufactured
14 refrigerated display cabinets. The production of the latter requires a high volume of material and
15 energy and therefore the adoption of CE solutions such as remanufacturing would be important as it
16 would increase the lifespan of these products from 5 years to 15-20 years (Bibalou et al., 2011). The
17 study found that persuasive communication has a positive effect on changing the behavioural
18 intentions of the respondents as well as on changing their behavioural attitudes and product
19 perceptions towards remanufacturing products, opening the possibility to convey the demand towards
20 such products. The authors also point out the double role of persuasive communication. On one side
21 the persuasion leads to a change of behavioural intentions in favour of remanufactured products
22 whereas the second function is the education related to the knowledge of the remanufacturing process
23 and its outcomes, contributing to affect the intentions towards the purchase of remanufactured
24 products. The contribution of marketing strategies and the use of persuasive communication is
25 suggested by the authors as a mean to overcome the barriers hindering the adoption of circular
26 solutions such as product-service systems, repairing, refurbishment, and remanufacturing.

27 Wang et al. (2018) further deepen on remanufactured products, evaluating the role of personality
28 ambiguity and consumer familiarity on consumers' attitude and purchase intention towards
29 remanufactured products. They found that both consumer familiarity and ambiguity tolerance (in
30 terms of propensity to accept the uncertainties related to remanufactured products) significantly affect
31 consumer attitude and intention of purchasing remanufactured products. However, the impact of
32 consumer familiarity on purchase intention is negative, whereas the impact of ambiguity tolerance is
33 positive. Moreover, there is a positive relationship between the intention to purchase and consumer
34 purchase behaviour. The author also evidence that the positive consumer attitude towards
35 remanufactured products is a relevant factor affecting the intention to purchase. As a result, they
36 underline the importance of creating a positive attitude of the consumer through joint initiatives of
37 remanufacturers and governments to build a positive image and view of remanufactured products
38 suggesting also by means of branding and marketing the change of the term into more attractive terms.
39 Moreover, the results suggest that consumer need to be educated about the characteristics of
40 remanufactured products as well as the need for a more transparency of the remanufacturing process
41 by promoting visits of the consumers in the remanufacturer's plants and the dissemination of detailed
42 information to consumers. The role of government is highlighted by means of policies, institutional
43 information, and subsidies to remanufacturers to support their development and incentives to
44 consumers, to improve the motivation to purchase remanufactured products.

45 Atlason et al. (2017) analysed the users' perception of three end of life scenarios (reuse, recycling,
46 and remanufacturing) and two disposal methods (door-to-door collection and delivery at point of
47 purchase) for eight household electrical and electronic products (e-products). The authors underline
48 that product developers can design products according to an environmentally friendly end of life
49 scenario but it is uncertain that such scenario will be the one adopted by the user. The results of their
50 Kano analysis evidence that in general users have a positive attitude and appreciate products with
51 more favourable end of life scenarios, in particular those related to reuse have emerged as the

1 treatment option more appreciated. Moreover, factors such as age, education and gender showed a
2 differentiation in the attitude of users towards the end-of-life scenarios. In particular, users with
3 medium and high education, and those older than 50 years, as well as females mostly appreciated the
4 integration of all end-of-life scenarios in product design and were also more willing to pay a premium
5 price for electronic-products with more environmentally friendly end of life scenarios.

6 Van Weelden et al. (2016), by means of in-depth interviews, explored the consumers' decision-
7 making process towards the purchase of refurbished mobile phones in the Dutch market, comparing
8 them with new mobile phones with the final goal of increasing the understanding on the factors
9 affecting consumers' acceptance of refurbished mobile phones. Their study analyses the different
10 stages (pre-purchase, orientation, evaluation, and post-purchase) that characterize the consumer
11 decision-making process towards the purchase decision. In the pre-purchase stage, their findings
12 reveal that interviewees were in general favourable towards refurbished mobile phones as well as that
13 they lack knowledge of such products. In the subsequent stage ("orientation") two main barriers
14 emerged related to the lack of awareness of refurbished mobile phones and presence of ambiguity
15 with the concept. These barriers were found to prevent the users to orient themselves for the purchase
16 of refurbished mobile phones. Moreover, further barriers were the lack of availability of refurbished
17 mobile phones in for example established retail channels and the lack of newness and enjoyment in
18 buying a refurbished mobile phone compared to new mobile phones. The evaluation stage, entailing
19 the balance between the benefits and costs, showed that the financial and environmental benefits were
20 the most mentioned benefits, whereas the risks considered were related to the performance and
21 financial risks of refurbished mobile phones.

22 Onete et al., (2018) investigated the behaviour of young Romanians towards the reuse of software or
23 hardware in case they replace the old devices. They found that the respondents easily adapt to new
24 versions of software when they change their phone or laptop. However, the results show that more
25 than the half of the respondents do not transfer their equipment with the software in case of equipment
26 alienation as well as that they prefer to buy a new computer with preinstalled software. Wieser and
27 Tröger (2017) investigated the factors explaining the replacement (including the average time), repair
28 and reuse of mobile phones by consumers, showing that mobile phones are mainly replaced
29 depending on the perceived obsolescence of the current mobiles in use rather than for the desire of a
30 new device. They found that the time of replacement depends on age and is lower for younger
31 respondents than for older respondents (those over 50 years old) due to the lower use, higher
32 carefulness, and lower dependence on new features. The older respondents perceive the phone mainly
33 as a means to an end, giving less importance to owning a specific phone compared to younger
34 respondents.

35 Milios and Mtsumoto (2019) analysed the level of knowledge of Swedish consumers about
36 remanufactured auto parts and their perception of benefits and risks associated to the purchasing of
37 remanufactured products. Their results reveal that consumers have a limited knowledge related to
38 remanufactured auto parts. The positive perception of the benefits of using remanufacturing products
39 compared to the risks of buying a remanufactured product seems not so relevant in affecting the
40 purchasing intention of consumers. Additionally, the consumers perceive as positive the adoption of
41 quality certification schemes for remanufactured auto parts and in particular show a higher level of
42 trust in remanufacturing industry associations, in particular, to develop a quality certification scheme
43 for remanufactured auto parts. The general positive reputation of a retailer or service provider by
44 OEMs may increase the confidence of consumers and enhance their willingness to pay for
45 remanufactured products.

57 *2.5 Drivers of and Barriers to Transitioning towards Circular Economy*

58 Droege et al. (2021) studied challenges to assessing CE implementation by the public sector, finding
59 there to be strong cultural barriers. They noted an absence of awareness for assessing CE as well as
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1 a lack of leadership commitment to that purpose. Furthermore, respondents feared that CE is merely
2 a fashion trend within sustainable development and will soon be replaced by a new trend. Laitala et
3 al., (2020) performed a survey with 1196 respondents. consumers in Norway, and 15 qualitative
4 interviews with actors in the Norwegian repair industry for household consumer goods. They found
5 that product repairs face significant barriers in cost as compared to buying replacement products, and
6 consumers are often not happy with the quality of repairs, in fact, for the most popular products to be
7 repaired, repairs failed more often than they succeeded. As drivers they noted that consumers should
8 have a larger awareness of consumers' complaint options and warranty rights. It also seems that
9 consumers are keener to repair products they perceive to be of a higher quality, assuming a repair
10 would significantly increase the lifespan with a low risk that another part would soon break down.
11 Salmenperä et al. (2021) interviewed 25 practitioners from pilots that promoted waste prevention and
12 recycling, spanning several industries, looking into encountered barriers and drivers. They found
13 there are a wide range of barriers that can be grouped as: Economic, market, technological,
14 information-related, institutional, regulatory, and sociocultural barriers. They also found that clear
15 business potential and economic benefits related to CE practices drive the transition. Also critical in
16 driving CE is sharing information on waste (streams) and promoting dialogue between stakeholders
17 in the entire value chain. Feng & Lam (2021) provided an overview of the transition to CE in China,
18 which started the transition as one of the first in 2009, and the researchers focused on the drivers for
19 Chinese policy makers as well as China's remaining challenges and barriers. China is driven by
20 resource security, realizing that material demand will increase eightfold in this century with CE
21 providing an opportunity to supply this demand. Furthermore, CE is seen as a method to prevent
22 pollution with less waste leaking into the environment if waste has another use and holds more
23 economic value. Finally, supporting CE can support Chinese business, for example by adhering to
24 international environmental standards (e.g., ISO standards) Chinese companies also gain better access
25 to foreign markets, while branding could be enhanced if companies are deemed to operate more
26 sustainable, and a sustainable company could better comply with stakeholders' requirements. The
27 barriers are categorized in four groups by Feng & Lam (2021), namely: technological, financial,
28 cultural, and regulatory barriers, a similar grouping to Salmenperä et al. (2021). In addition, they note
29 China as a whole face a barrier by its own immense growth, and weaker pre-existing environmental
30 framework as compared to more developed western countries. Bressanelli et al. (2019) performed a
31 systematic literature review to identify the challenges for companies implementing CE as well as on
32 the solutions that these companies could adopt to face the challenges. The solutions are also
33 investigated by means of four case studies of different types of companies (a start-up, a distributor of
34 spare parts, a self-service laundry designer, and a big manufacturer of household appliances). Besides
35 identifying and framing the challenges in a supply chain perspective (e.g., economic and financial,
36 market and competition, product characteristics, standard and regulation, supply chain management,
37 technology, and users' behaviour) and testing the results by means of case studies, the study allows
38 to grasp the relevance of each challenge depending on the type of company. In that, the "cultural issue
39 challenge" is generally very relevant for traditional manufacturers, contrary to start-ups that are
40 launched with the purpose of developing specific CE approaches and where financial risk is more
41 relevant.

42 Gusmerotti et al. (2019) explored how the CE is adopted in a large sample of traditional
43 manufacturing companies in Italy (by clustering them in different groups and related business
44 models). They found that most of such companies still lack awareness of the opportunities coming
45 from the CE. In general, the main driver guiding CE implementation is economic efficiency rather
46 than environmental concerns. Companies select environmental practices only when they generate
47 economic benefits. However, in the sample, the companies for which natural resources are key
48 factors, are more inclined to adopt the CE. The authors suggest the importance for managers to
49 implement the CE in a systematic manner, avoiding relegating the adoption of CE only to some
50 sectors of the company such as communication and marketing given that it could be perceived by the
51 markets as a greenwashing policy. Finally, they evidence that policy maker should support the

1 transition to CE by creating the favorable policy environment that, besides a mix of instruments (e.g.,
2 command and control, market-based instruments, and voluntary programs), shows to managers that
3 it “pays to be circular”, through information campaigns. Tura et al. (2019) reviewed literature and
4 analyzed case studies of Finnish companies, showing the dual role of factors affecting CE
5 implementation. The results point out that the way the CE is implemented, depends on the internal
6 and external context of the company. In that, the analysis of the most suitable context for designing
7 the CE strategy is crucial for a company. In this view, the external context, the social pressure driver
8 resulting from increasing awareness by customers/consumers has been identified by all the
9 companies. Other relevant drivers emerged by the regulation, legislation, and information technology
10 developments.

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Gottinger et al. (2020) looked specifically at barriers for transitioning to CE in the bioeconomy by
doing a systematic review of transition research and then classifying transition barriers by clustering
them into relevant barriers. Based on their review of studies, they categorized the barriers into the
following 7 groups: Policies and regulations (covered by 44 papers), technology and material
(covered by 26 papers), market and investment conditions (covered by 40 papers), social acceptance
(covered by 22 papers), knowledge and networks (covered by 48 papers), and sectoral routines and
structures (covered by 43 papers). The study notices that most research is concerned with issues of
engineering and other technical fields, while economic research and studies in the field of social
sciences are underrepresented.

The role of collaboration between CE stakeholders’ groups represents a further driving condition that
allows the CE to become a viable goal. In this view, the EC and European Economic and Social
Committee⁶ have promoted the European Circular Economy Networks / Platforms which support the
establishing and nourishing dialogue between different stakeholders, promoting new narratives,
orchestrating interests, exchanging knowledge and enabling innovation in the CE perspective.
Researches and initiatives have highlighted the key role of collaboration among universities, public
administrations, local communities, cooperatives and start-up companies (De Medici et al., 2018,
Madonna, 2020, Stahel, 2013; Buch et al 2020) to overcome the limits of the current linear
production/consumption model and become a lever for CE transition. Furthermore, in the analysis of
the barriers and drivers to the transition to the CE, the importance of the concept of organizational
culture must be considered. The latter refers to the interplay between individuals (consumers,
employees and citizens) and the organizations they work for (companies, public bodies, non-profit
organization, etc). In the process of developing perception and gaining knowledge the interaction
between the individual and his/her environment is of paramount importance, from the most immediate
physical aspects to the social, affective and work aspects. In this perspective, it emerges the influence
on the individual of the organizational culture which is defined by the top management of an
organization largely contributes to the achievement of an organizations’ goals. Schein (1990)
developed a seminal definition of organizational culture, according to which "culture means a set of
basic assumptions - invented, discovered or developed by a given group, which learns to deal with its
own problems of adaptation with the outside world and integration within it - which has proved so
functional that it is considered valid and, therefore, to be indicated to those who enter the organization
as the correct way to perceive, think and feel in relation to those problems". This concerns problems
and choices related to sustainability issues that can influence an individual’s sensitivity and
behaviours. For example, choices towards the exploration of new circular business models (Hofmann,
Jaeger-erben, 2020), choices on the environmental conditions of the workplace (Kim et al., 2020;
Pinzone et al., 2019; Poli et al., 2009), choices about ethical policy (Douglas et al, 2001), choices that
can support organizations to become more sustainable through cultural change (Linnenluecke,
Griffiths, 2010). Coherently we can assume that organizational culture is among the enabling or
hindering factors of the CE transition.

⁶<https://circulareconomy.europa.eu/platform/en>

2.6 Lessons learned from previous studies

This section provides an overall conclusion of the literature review summarizing the results based on the four groups considered.

A general conclusion that emerges is that the literature on perception of CE mainly focus on: a) the analysis on single actors (mainly consumers and companies) disregarding the perception of other actors in the society such as citizens, employees, policy makers and researchers and; b) the perception of the adoption of CE in practices rather than on the CE concept and the process of transition and its governance (These results can also be depicted by the **Figure 1** and the **Table 1** in the Appendix).

- As for the citizens/consumers many drivers emerge. Those that have a main weight are the availability of more correct information and communications about products characteristics along the whole life cycle and about the certification on used/remanufactured product. These drivers are consistently coupled with educational campaigns and climatic conditions pressures.
- For workers/employees CE drivers are a fair and empowering work environment (being drivers for job satisfaction and a productive behaviour) as well as the high involvement of employees in the mission of their organization that also includes environmental goals;
- Drivers for companies for transitioning to CE resulted the economic attractiveness of CE in manufacturing companies and a favourable institutional framework for the promotion of CE (fiscal, legal, organizational, political) or the adoption of an environmental management systems (e.g., ISO 14001 and EMAS III);
- Citizens' awareness on the CE is correlated with the level of education and the stage of economic development;
- Main barriers in the public sector related to the implementation of CE resulted to be cultural whereas for manufacturing companies (in particular SMEs) the costs embedded in CE adoption (e.g., adaptation of existing technologies to new inputs or development of product design) or related to meeting regulations and standards as well as lack of sense of urgency and lack of time. Barriers also depends on the type of company as e.g.; cultural barriers are less relevant for start-up companies.

3. Materials and Methods

This section presents the main features of the questionnaire used in the study for collecting data along with the literature review. The research work performed for the design and analysis of the questionnaire survey is also summarized in three main phases to provide an understanding of all the activities.

3.1 Composition of the questionnaire

The questionnaire used to collect the data for the survey is provided in the Appendix. It is divided into three sections. In the first section (A) (**Table 2, Appendix**) there are questions about personal details, such as age, gender, work position and level of education. The other two sections (B and C) are the core part of the questionnaire. Section B provides an overview of the perception/awareness on the circular economy whereas the section C explores the main barriers, drivers and policies for accelerating the transition to CE they perceive/are aware off. **Table 3** (Appendix) lists all the questions of the core part (section B and C) and our major aims in the inclusion of each question with

1 the purpose of rendering more transparent for the reader the design of the questionnaire. **Table 4**
2 (Appendix) shows the whole questionnaire in all its sections (A, B, C).
3 In the questionnaire (with section B) we shed light on both “Perception” and “Awareness” of the CE.
4 The literature on CE investigates both perception and awareness of the CE but rarely provides a
5 definition of perception and awareness. According to Veelaert et al. (2020), exploring the potential
6 perception of material qualities (newly recycled materials) by designers and materials engineers’
7 evidence that perception is something subjective and depends on context and on the previous
8 experiences of the individual. As a matter of fact, in the field of philosophy, “perception” is
9 considered as a complex cognitive act that unifies a set of sensations related to a current object. In
10 that, it is different from “sensation” as the latter is only a simple and subjective data that is not
11 transformed into the experience of objects, events as in the case of perception (Roth and Frisby, 1986).
12 The stimulus in the perception is integrated by sources of information such as previous knowledge
13 and experience of the world and based on this information, inferences are made about the real world
14 (Roth and Frisby, 1986). In turn, “*inference made unconsciously are defined as judgements made on*
15 *the basis of a limited amount of evidence or data and made without awareness*” (Reber and Reber,
16 2001). When talking about awareness, it can be understood as the state of being conscious of
17 something and is expressed in the ability of an individual to directly know and perceive specific
18 events. Alternatively, awareness can be considered the state by which an individual is aware of some
19 information when that information is directly available to bear in the direction of a wide range of
20 behavioural actions (Chalmers, 1997). Awareness can also be understood as the knowledge of the
21 meaning of certain CE related concepts (e.g., reverse logistics, eco-industrial parks and so on)
22 diffused in the CE narrative (Schöggl et al., 2020). Finally, awareness is also associated with
23 consciousness as the state of experience of a phenomenon. In this case, it is referred to as the
24 “awareness of experience” (Kokoszka, 2007).

25 In the CE context, the assessment of public awareness is considered a first step in understanding the
26 level of knowledge of the CE and an essential tool for better orienting CE policies (Guo et al., 2017).
27 Investigations on public awareness on CE explore the level of knowledge of the CE concept, the
28 application of CE practices (sharing economy, waste separation and food wastage), the attitude
29 towards buying recycled and remanufactured goods) and future implementations of the CE (Smol et
30 al., 2018). Moreover, in some cases (Guo et al., 2017) the surveys’ framework involve the
31 understanding of the CE concepts and sustainable development, attitude towards CE (waste
32 separation and recycling, water savings, and energy conservation) and CE related behaviour (waste
33 separation, reuse of shopping bags and wastewater, and use of energy-saving lamps).

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36 **3.2. The life cycle of the survey**

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38 The research work related to the survey developed into three main phases. In the following, we
39 summarize the research activities performed in each of the three phases in detail.

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42 **3.2.1 First phase**

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44 This phase involved the search for existing data useful for the preparation of the questionnaire by
45 means of the literature review as well as the selection of the three samples of the respondents for the
46 survey.

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49 **The Literature Review**

50 As a first step we performed the literature review. The main criteria for searching and selecting the
51 literature have been “by topic”. The latter was related to the goal of this study evidenced at the end

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1 of the introduction. We identified existing studies investigating the following topics:

- 1 2 1. the public perception/awareness of the CE concept and transition at societal level (among
2 3 citizens/consumers, companies, employees, and policy makers);
- 3 4 2. the main drivers, barriers and governance instruments in the CE transitions;

4 5 A first search has been conducted on Web of Science⁷ on November 2019 and repeated in August
5 6 2020 after the closure of the questionnaire surveys on two of the samples (Researchs and Economists
6 7 as detailed later). The search has been performed with the purpose of updating the previous literature
7 8 review. Both searches have been organized into three main steps:

- 8 9 1. Identification of the keywords and search of the literature on the basis of the above-mentioned
9 10 criteria “by topic”;
- 10 11 2. screening of the searched articles on the basis of the abstract and first selection;
- 11 12 3. in-deep analysis of the selected articles taking into account the whole content of each selected
12 13 article.

13 14 With regard to the keywords, we used the following combination of keywords on Web of science for
14 15 both searches (the results and selected articles are referred to the last search of August 2020):

- 15 16 1. “Circular economy” AND “transition” AND “questionnaire” (10 Results and 5 articles
16 17 selected);
- 17 18 2. “Circular economy” AND “perception” AND “questionnaire” (18 Results and 9 articles
18 19 selected)
- 19 20 3. “Circular economy” AND “perception” (108 Results and 15 articles selected);

20 21 It is important to point out that some articles resulted e.g., in more than one search and in this case,
21 22 they have been accounted for in the results but not in the count of selected articles. We also added
22 23 two studies (Guo et al., 2017; Lakatos et al., (2016) that did not result from the searches using our
23 24 keywords but instead from the reference list of one of the selected articles (Smol et al., 2018).
24 25 Furthermore, recent studies by Droege et al. (2021), Laitala et al. (2020), Salmenperä et al. (2021),
25 26 Feng & Lam (2021), and Gottinger et al. (2020), Bressanelli et al. (2019); Gusmerotti et al. (2019);
26 27 Pinzone et al. (2019); Tura et al. (2019) were added to provide an overview of recent research on
27 28 barriers and drivers in the transition to CE.
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29 30 *Selection of the three interviewed samples*

30 31 The respondents have been chosen on the basis of two criteria (good knowledge of the CE and sector
31 32 of the work position) useful to achieve our main research goal centred on widening the knowledge of
32 33 the CE concepts and on the process of CE transition and its governance. We considered particular
33 34 suitable for our survey to have respondents as researchers and policy makers. Consequently, the first
34 35 sample mainly consisted of early-stage researchers participating in a European Union project which
35 36 topic is related to the realization of the transition to CE.

36 37 The first sample that has been investigated, gave us the possibility to have a general initial idea of a
37 38 group of respondents who are aware about CE. Our aim was to pre-test the questionnaire survey and
38 39 check if questions and answers were appropriate to address the goals of the present study. Therefore,
39 40 the pilot questionnaire gave us the chance to understand if it was able to address the goals of the
40 41 present study as well as if it was replicable to a wider range of stakeholders. Indeed, we asked to
41 42 participants of the first sample⁸ to add comments to improve the questionnaire for a future use. In
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⁷ Web of Knowledge, available at:

https://apps.webofknowledge.com/Search.do?product=UA&SID=C2m3IWsxuWeMGOxrAKg&search_mode=GeneralSearch&prID=15c2b41a-407d-41cd-8812-2c4863da881a

⁸ We presented the pilot questionnaire to the first sample of respondents during a meeting on december 2019 of the EU project where the respondents are involved.

1 designing the questionnaire, we also taken into account of the legal and ethical issues. In that, the
2 questionnaire before the parts A, B and C (Appendix) was preceded by the required information
3 aimed to assure the respondents that their responses would have been anonymised and utilised only
4 for research purposes. Moreover, it was specified that the whole survey was designed in compliance
5 with the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016
6 on the protection of natural persons with regard to the processing of personal data and on the free
7 movement of such data⁹. Then, in order to compare the results obtained from the first sample with
8 other stakeholder groups deemed sensitive to the issue, the same questionnaire was submitted to other
9 two samples.

10 The second sample grouped academic professors and researchers of the Faculty of Economics (at the
11 Parthenope University of Naples). The latter faculty has been considered relevant in our survey given
12 that CE promotes a more sustainable society and a change of the relationships between the natural
13 environment, the economic system and society (Ghisellini, Cialani and Ulgiati, 2016).

14 The third sample was aimed to collect the opinions coming from policy makers. Both this group and
15 the second group are representative of the Municipality of Naples (Italy). Policy makers at the local
16 level have been chosen for their leading role in CE transition (Ghisellini et al., 2021; Klein et al.,
17 2021). The CE, by promoting more sustainable solutions and innovations, will not be able to replace
18 incumbents' linear models without changes guided by policies (Hofmann, 2019; Geels, 2011).

19 In short, the three samples were initially composed as follows:

20 **Sample 1:** 80 Participants of a European project studying the CE (hereinafter titled with
21 “Researchers”);

22 **Sample 2:** 114 Academics in different branch of Economics of Parthenope University of Naples¹⁰,
23 Italy, (economics, management, business economics, finance) hereinafter titled with “Economists”;

24 **Sample 3:** 141 Administrators of the Metropolitan City of Naples, Italy (hereinafter titled with
25 “Administrators”).

26 *3.2.2 Second phase*

27 In this phase, the survey has been performed practically by means of a web questionnaire survey
28 distributed to the three samples of respondents in different time periods between December 2019 and
29 December 2020. We delivered a total of 335 questionnaires reaching the following rates of responses:

30 **Sample 1:** Researchers: Number of questionnaires delivered= 80; Replies: 54 Rate of response: 68%,
31 time period of the survey: December 2019-February 2020;

32 **Sample 2:** Economists: Number of questionnaires=114; Replies: 31; Rate of response: 27.2%, time-
33 period of the survey: April-May, 2020;

34 **Sample 3:** Administrators: Number of questionnaires=141; Replies: 37; Rate of response: 26.2%,
35 time period of the survey: November-December 2020;

36 Unfortunately, the total non-response rate is high in the last two samples and this is known to increase
37 the variability of the estimates and may cause bias (see, e.g., Peytchev et al., 2009). To this end, it
38 was decided to avoid post-stratification methods (Little, 1993) and compare the results obtained in
39 the three samples in order to obtain an approximate picture of the phenomenon under study,
40 consistently with the explorative nature of this research. The indications provided are in any case

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61 ⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R0679>

62 ¹⁰ <https://www.uniparthenope.it/ricerca/dipartimenti/studi-aziendali-e-quantitativi>

1 useful for planning a future survey involving a larger number of respondents in any of the stakeholder
2 groups.
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5 **3.2.3 Third phase**

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7 This phase involved the processing and analysis of the data resulted from the survey as well as the
8 presentation of the main results in the current article. In this phase, also the discussion and conclusions
9 were finalised.
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12 **4. Results**

13 In this section the present study analyses the main results of the survey. The analysis is organised in
14 three main parts, dealing with the sample demographics (age, nationality, and work position),
15 perception/awareness about the CE, main drivers and barriers in the transition to a CE.
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23 **4.1 Characteristics of the three samples**

24 **Table 2** (in the Appendix) shows the main demographic information among the three samples as is
25 gathered from the first section of the questionnaire. Regarding the age, in the first sample
26 (Researchers) more than the half of the respondents were 20-30 years old whereas in the other two
27 samples the respondents were older. Economists were mainly in the range between 40 and 60 years
28 old, and all Administrators were over 30 years old.
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30 The sample of Researchers is highly diversified by nationality of respondents; the sample is composed
31 by researchers from within the EU and outside the EU. The three samples are less diverse in their
32 gender composition; a large part of the respondents are males. The gender imbalance is particularly
33 prevalent in the samples of Researchers (63% male, 35% female, and 1 person choose not to reply)
34 and Economists (75% male and 25% female). The Administrators of the Metropolitan City of Naples
35 had a more equal gender balance (55% male and 45% female).
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37 With regard to the area of work, half of the first sample consisted of PhD students and researchers,
38 60% of the second sample were professors, whereas the last sample had only Administrators. In
39 overall if we consider all the respondents (n.122), academics (researchers and professors of
40 economics) are the most representative, totalling 85, while second largest group is that of
41 Administrators of which we had 37 respondents.
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50 **4.2 Perception/Awareness of Circular Economy**

51 The second section (B) of the questionnaire investigates the awareness of the respondents regarding
52 Circular Economy and Sustainable Development. **Figure 2** shows that among the three groups there
53 is a general agreement on the concept of Sustainable Development, sharing a focus on the inter and
54 intra-generational goal as well as on the achievement of a development pattern compatible with the
55 three dimensions of sustainability (economic, environmental and social).
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60 When it comes to what CE means to the respondents, there is more of a difference between samples.
61 For Administrators, the CE mainly means: “Reduce, Reuse and Recycle” and a “zero waste
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1 economy". The other two groups are more oriented towards a concept of CE that routes between "an
2 economy able to regenerate itself" and "Reduce, Reuse and Recycle (**Figure 3**).
3 There is a notable difference between all groups when asked what the more important aspects in a
4 CE are. Half of the respondents in the Administrators group considers the "recycling stage" one of
5 the more important aspects along with "eco-industrial parks and smart cities" whereas the group of
6 Economists mainly distributes the replies among "sustainable supply chain" (30%), recycling phase
7 (30%) and "new business models" (25%). More than the half of the group of Researchers (51,8%)
8 consider "new business models" the most relevant aspect of CE along with "sustainable supply chain"
9 (38,8%) and "eco-industrial parks and smart cities" (20,3%) (**Figure 4**). In the optional open-answer
10 field, some suggest that a bottom-up initiative might encourage and introduce new lifestyle patterns
11 and another suggests researching a new model of understanding value and a new mode of
12 consumption. This seemingly indicates transition to the CE involves re-evaluating our present state
13 of economy and society.
14 The last two questions of the second section investigate the expectations that are most important to
15 the respondents of CE. A large part of the sample of Researchers agreed upon "environmental
16 benefits" (70%) while a smaller portion of this sample entails "new business opportunities",
17 "economic benefits" (33,3%) and "employment opportunities" (29,6%). In the open-answer field, we
18 received stimulating suggestion about: the possibility to reflect, respect the ecological pace, improve
19 social inclusiveness and well-being. The group of economics scholars of Parthenope mainly expect
20 that CE provides "environmental benefits" (85%) and "new business opportunities" (45%).
21 Interestingly, the Administrators see the CE a source of employment opportunities (40%) and
22 "economic benefits" (40%), while only 20% of Administrators expect environmental benefits or new
23 business opportunities (**Figure 5**).
24 The last question of this part addresses the timeline to CE by asking "How far are we from CE
25 implementation". The three samples are rather homogeneous on that, being most of the reply
26 concentrated in the answer "It is still far from the goal" for Researchers (68,5%), Economists (65%),
27 Administrators (80%). Moreover, in all the groups about 20% of the respondents think that CE will
28 always coexist with the linear economy (**Figure 6**).
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380 **4.3 Drivers, Barriers and Change**

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41 About the possible obstacles from engaging in CE, the barrier that got the most responses resulted
42 "resistance to change" with 60% of Researchers, 50% of Economists, and also 50% of
43 Administrators. For the latter group "low awareness and know how" received a slightly higher
44 response rate of 55% though. Other most selected possible barriers in this group have been "lack of
45 policies and regulations" and "current linear design of products" (**Table 5 in the Appendix**).
46 Some changes that should be done in the CE process, according to Researchers, are: "Promote
47 innovative, broad and long-run policies at national level (to overcome fear of instability)" (43%) and
48 to "Invest in suitable circular infrastructure (to promote easy transport, storage, marketing...)" (39%).
49 Three answers received the same rate of responses (28%) as having to change: "Unfavourable prices
50 (promote incentives such as decreased taxes and subsidies to recycled materials, etc)", "Invest in
51 research to promote circular innovation/technology" and "Promote research and implement a circular
52 design of products". Just 24% of respondents think that "Technical aspects (administrative,
53 production techniques, collection techniques, others...)" have to be change in the system. The creation
54 of networks, markets and of new finance tools is weighted as not so important to change (20%).
55 The Economists consider that things having to change. In the group most respondents considered
56 "Investments in research to promote circular innovation/technology" (55%) and to "Invest in suitable
57 circular infrastructure (to promote easy transport, storage, marketing...)" (40%). The Administrators
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1 think that the following measures should be changed: “Favouring the creation of recovery networks
2 and markets (e.g., new financial tools, ethical finance)” (41%), “Invest in suitable circular
3 infrastructure (to promote easy transport, storage, marketing...)” (40%), “Invest in research to
4 promote circular innovation/technology” (30%) and “Involve stakeholders and managers in decision
5 making, provide transparent data, to overcome resistance to change” (30%).

6 The last two questions deepened on the key actors and instruments that can switch the dynamo in the
7 transition to CE. We tried to understand which might be the main actors in taking the initiative
8 forward and the policy instruments and other measures needed for this pathway to the CE. With regard
9 to the most important actors, the Researchers’ group consider “Policy makers” with the highest share
10 of the responses (78%) followed by “Economic actors” (63%) whereas “Economic actors” and
11 “Citizens/consumers” received both 60% of the replies from Economists. In the public
12 administrator’s group “Economic actors” (50%) and “Citizens/consumers” (40%) received higher
13 responses rates than “Policy makers” (30%) and “Public administrators” (35%).

14 The policy instruments that are considered relevant to drive the transition to CE are “The regulatory
15 measures” (65%), “A cultural approach favouring waste prevention” (56%) and “Increasing
16 awareness of consumers” (52%) according to Researchers’ group. A received suggestion (in the open-
17 answer field) that might be considered as a common thread of this survey focused on: “increasing
18 awareness, sensitivity and care regarding nature and people”. This idea is constantly repeated during
19 the replies signalling a sense of urgency on the need for building a CE based on new values. Finally,
20 a long suggestion proposed changing the fundamental operative conditions of our financial system,
21 to avoid the possibility to implement CE and make with the same mistakes of the current system.

22 With regard to the other groups, the Economists mainly replied “Financial support to companies”
23 (55%) and “Increase awareness of consumers” (50%) whereas the Administrators considered as key
24 factors the “Regulatory measures” (64%) and “Selective tax system applied to consumption” (e.g.,
25 plastic tax) (60%).

35 5. Discussion

36 This section discusses the main results emerged from the survey, trying to highlight how the results
37 are aligned with the research objectives and help broaden the understanding of CE applications to
38 practice through increased perception/awareness of researchers and policy makers. This has been
39 performed taking into consideration the limitations of the method and the data collected (perception
40 of selected groups of respondents).

41 5.1 Perception of and awareness about sustainable development and CE

42 Results show that, concerning the meaning of the concept of sustainable development (SD), the three
43 groups of respondents distribute a balanced share of their replies among three dimensions (economic,
44 environmental and social) as well as a to a fourth intergenerational dimension addressing the SD
45 concept in terms of a development pattern that meets “*the needs of the present without compromising
46 the ability of future generations to meet their own needs*” (UNESCO, 2019; Lugaresi, 2008). In
47 particular, the Researchers’ group (compared to the other two groups) devoted the highest share of
48 the replies to the intergenerational dimension of the SD concept. This could result from the fact they
49 are mainly early-stage researchers (in the age between 20-30 years old) educated to be leaders in the
50 field of CE in the future. On the other hand, the Greta Tumberg Movement is spreading all over the

1 world a call for action to the young communities as well as the whole society to think about the future
2 and build a better society for the present and the generations to come (United Nations, Department
3 of Economic and Social Affairs, 2019).¹¹ These issues lead to a discussion about how the different
4 groups perceive the CE. Among the three groups there are interesting differences, about 50% of the
5 Researchers (first group) perceive the CE as “an economy able to regenerate itself” whereas the other
6 two groups and in particular the Administrators perceive the concept more focused on its practical
7 principles “Reduce, Reuse and Recycle” and on the “zero waste economy”. Administrators, in a
8 further question, perceives “the recycling phase” and “eco-industrial parks and smart cities” as the
9 most important aspects in the CE. In agreement with previous studies by Smol et al. (2018) and Guo
10 et al. (2017), the present study seems to confirm that the understanding of the CE is associated to the
11 educational level (significantly high in our samples, as more than the 50% in all the three groups have
12 a post-graduate education title). Unlike the results by Guo et al. (2017) where half of the respondents
13 have no understanding of the CE concept, in our samples the more educated respondents are all well
14 aware of the CE meaning, as showed by their replies, and attribute huge importance to CE related
15 concepts most often recurrent in the CE research narrative (Schöggl et al., 2020), such as “recycling”,
16 “business models”, “sustainable supply chains/reverse logistics”, “eco-industrial parks”.

17 In the investigated literature, since the early study by Rizos et al. (2015), we found that companies
18 are increasingly aware of the concept of CE in EU (Spain, Portugal, Italy and other countries,
19 according to Masi et al. (2017). The companies also show a level of improvement in both company
20 culture and implemented CE practices. Such an improvement incorporates a higher level of
21 innovation, including e.g., reduction of the material content in packaging and circular product design
22 or Life Cycle Assessment (Mura et al., 2020). The literature evidences, that consumers, are aware of
23 the concept of CE and its potential contribution to the environment (De Koch et al., 2020; Jaca et al.,
24 2018), considering CE a driver for sustainable consumption (Jaca et al., 2018). The perception of CE
25 in consumers is not only consisting of “recycling” practice (Koch et al., 2020) but also of
26 “remanufacturing” (Laitala et al., 2020) and “repair” (Diddi and Yan, 2019).

27 The current study, by grouping three different types of stakeholders, was also able to explore how the
28 level of CE awareness changes across the three groups. In fact, the investigated samples differ from
29 the previous literature where the sample of respondents was mainly composed by only one type of
30 stakeholders (e.g. consumers, companies, citizens or employees). As a consequence, the results seem
31 also suggest the hypothesis that (besides the level of education) the level of awareness on CE could
32 change among the three groups to reflect the context of the organization to which they belong and
33 then its organizational culture. Recalling and deepening on the definition of “perception”, it refers to
34 the: “*ways in which information is acquired from the external context through the sense organs and*
35 *is transformed into an experience of objects, events, sounds, tastes*” (Roth and Frisby, 1986). In the
36 process of perception and knowledge towards awareness the interaction between the individual and
37 his/her environment is of paramount importance, from the most immediate physical aspects to the
38 social, affective and work aspects. In this perspective, the influence of the so called “organizational
39 culture” on the individual emerges very clearly. Some authors have investigated in different ways the
40 influence of the organizational culture or the work environment on employees and their
41 perception/awareness of environmental problems or their environmental behaviour (Kim et al., 2020;
42 Pinzone et al., 2019; Poli et al., 2009). For example, as evidenced before in section 2, Poli et al.,
43 (2009) performed a survey in Italy, testing the hypotheses that a high involvement of the employees
44 in the mission of an organization could translate into a high contribution and responsibility of the
45 same employees towards environmental protection. This entails that a company’s organization having
46 environmental protection in its mission could translate into more environmentally conscious

¹¹ <https://www.un.org/development/desa/en/news/social/world-youth-report-2.html>

1 employees. Similarly, this also opens up the possibility that employees will better perform their work
2 (experimenting a better job satisfaction) because they feel themselves responsible in the protection of
3 the environment. In that, in such work environment employees become aware that their contribution
4 can be critical for determining a change in the organization (Poli et al., 2009) and beyond due to the
5 spill-over effects on the private domain of the employees (Pinzone et al., 2019; Klade et al., 2013)
6 and their societal context (Hao et al., 2020).
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10 *5.2 Expected outcomes and transition to CE*

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12 The fact that the interviewed group of Administrators considers CE as a source of economic and
13 social benefits rather than only environmental benefits allows to overcome the scepticism towards
14 the CE as a new business model. However, the fact that a low share (20%) of them expects to receive
15 environmental benefits from CE calls for the attention on further investigation on this topic. In fact,
16 new CE production and business opportunities should also be environmentally sustainable. The CE
17 is very much also championed as a vehicle for economic growth and job creation (Ellen Macarthur
18 Foundation, 2012), enabling growth in sight of the limits of an unsustainable linear economy.
19 However, neglecting the environmental and social dimensions of a CE transition poses the risk of
20 increasing any environmental and social damage done by our resource consumption, as is evidenced
21 by the rebound effect (Zink and Geyer, 2017). Depending on your goals as a society, it can very well
22 pay off to align policy makers more with the holistic considerations of Economists and especially of
23 Researchers. It should be noted that the EU is actively pushing the transition to a CE as part of its
24 climate policies, and policy makers within the EU (including at the local level) are expected to
25 implement the CE towards environmental purposes, most notable the reduction of CO₂ emissions
26 (European Commission, 2019b; 2020).

27
28 On the other hand, the difference between the expectations of Researchers and the Economists of
29 Parthenope University compared to the Administrators evidences the need to create dialogue and
30 collaboration between these subjects and the society for a wider and better CE implementation aligned
31 with the principles of SD and desired outcomes of the society (Inigo and Blok, 2019). In this
32 perspective, several studies show that the collaboration among universities, public administrations
33 and local communities in regeneration projects is a major catalyst for local environmental, social and
34 economic innovation and development (De Medici et al., 2018; Buch et al 2020). Indeed, innovative
35 projects based on the CE are also being developed in the waste management sector for the recycling
36 of some materials (e.g., plastics, WEEE materials), thanks to the initiatives of local communities
37 involving associations, cooperatives and small start-up companies, adopting innovative digital
38 technologies (Madonna, 2020). This provides the opportunity of overcoming the limits of the current
39 waste management and recycling systems based on big recycling plants, that in some cases are located
40 very far from the point of production and use, questioning their environmental and social
41 sustainability (Stahel, 2013). Moreover, Buck et al. (2020) show that a University driven partnership
42 with public, non-profit and private sectors have developed a strategy to provide solutions
43 development, community education and engagement as well as innovative entrepreneurship to build
44 a regional sustainable circular economy.

45 The above-mentioned experiences show that, by applying the CE at the local level, new production
46 models could be experimented yielding the chance of regenerating the urban context and redesigning
47 the concept of sustainability and well-being (Madonna, 2020) as evidenced in the **Figure 7**.
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1 Furthermore, from the present survey results, it emerged that in all the three investigated groups a
2 large share of the respondents perceives CE still far from its implementation as well as that “CE will
3 always coexist with the linear economy”. These results are in some way consistent with Smol et al.
4 (2018) where more than 80% of the respondents are aware that CE transition and implementation will
5 be possible, “but not in the near future” (according to 30% of them), being a long-term process and
6 needing a huge financial support.

7 Towards this end, of accelerating the transition towards CE and supporting long-term plans, the EU
8 has made CE a key part of its 2050 climate neutrality goal under the European Green Deal (European
9 Commission, 2019b; 2020). National governments are also starting to define their CE strategies and
10 set targets towards achieving CE (European and Social Economic Committee, 2019). For example,
11 the Netherlands going as far as being completely circular by 2050 as a part of Dutch policies towards
12 making the country climate neutral (Dutch Ministry of Infrastructure and Water Management, 2016).
13 However, there are doubts if complete circularity is possible, both according to our respondents; 20-
14 25% of them, stated that “CE will always coexist with linear economy” and literature, as evidenced
15 by general thermodynamic considerations (Korhonen et al., 2018), and by a specific policy analysis
16 on the plans of the Dutch government (mainly aimed at technological limitations in the Dutch context)
17 (Luscuere, 2018).

23 *5.3 Further understanding of Barriers and drivers*

26 The most relevant perceived barriers in the three groups resulted to be “Resistance to change”, the
27 “Low awareness and know how”, “Lack of policies/regulations”, and “current linear design of
28 products”. In particular, Administrators perceive, the “low awareness and know how” as the most
29 relevant barrier (55%) followed by the “resistance to change” (50%). These results are in line with
30 the ones from other studies where the most significant barriers were the lack of CE awareness, lack
31 of CE knowledge and lack of a sense of urgency for its implementation in both public (Droege et al.,
32 2021; Przywojska et al., 2019) and private sector (Kirchherr et al., 2018; Ormazabal et al., 2018; Masi
33 et al., 2017). For private companies it is important to point out that the barriers depend on the type of
34 company such as traditional versus start-ups (Bressanelli et al., 2019). The latter also born as a
35 response to local waste resource problems (e.g., abundance of agri-food by products) (De Angelis
36 and Feola, 2020) or social inclusion issues of people by providing new employment opportunities or
37 training programmes for new professional skills (Ghisellini and Ulgiati, 2020b) and for them the big
38 barriers are related to the misalignment between revenues and costs and financial and operational
39 risks (Bressanelli et al., 2019).

40 The other two groups in the present study perceive “resistance to change”, “lack of policies
41 regulations” and “current linear design of products” in the same order of importance more aligning
42 with Jesus and Mendonça (2018), Garcia-Quevedo et al. (2020) and Gottinger et al. (2020).

43 About the drivers, the respondents in our survey perceive as the most relevant the essential factors
44 for building the CE such as “the investments in research to promote circular innovation/technology”
45 and “the investments in suitable circular infrastructures (to promote easy transport, storage,
46 marketing...)”, “the creation of recovery networks and markets (new finance tools, ethical finance,
47 etc.)”, “the adoption of innovative broad and long-run policies at national level” and “the promotion
48 of research and implementation of circular design of products”. With regard to research investments
49 the promotion of the principles of Responsible Research and Innovation (RRI) mainly supported by
50 the European Commission (2012) is particular meaningful in CE transition (Inigo and Blok, 2019)
51 given that RRI aims to tackle the grand challenges and address sustainability (in particular social
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1 sustainability) in innovation processes (Blok and Lemmens, 2015; Lubberink et al., 2017; Von
2 Schomberg, 2013).
3 Instead, the last two questions highlighted on the issues related to the leading actor/s capable of
4 putting the CE towards the take up stage. The respondents of the Researchers' group considered
5 "Policy makers" as the leading actors whereas the economics scholars and the Administrators
6 indicated the "Economic actors" (companies and consumers). In terms of key policy instruments, the
7 main role has been devoted to the "Regulatory measures" by both respondents as Researchers and the
8 Administrators while the Economists considered the "Financial support" to companies as the key CE
9 instrument.
10
11 In the literature, regulatory measures and, more broadly, a "clear, strong and predicable policy
12 framework" (Preston, 2012) combining mixed policy instruments (e.g., command and control, market
13 based instruments and voluntary programs) (Gusmerotti et al., 2019) are essential for supporting the
14 investment decisions in favour of CE initiatives by the companies, due to costs and risks barriers
15 embedded in their implementation (e.g., adaptation of existing technologies to new inputs or
16 development of product design) (Grafstrom and Aasma, 2021; Cristoni and Tonelli, 2018; Masi et
17 al., 2018;). Moreover, communication of a better image of the CE as beneficial for companies is also
18 suggested due to the existence of a relevant informative gap preventing to see the implementation of
19 CE as a profitable business opportunity (Mura et al., 2020; Gusmerotti et al., 2019).
20
21 Recently, the Italian Ministry of Environment (Curcuruto et al., 2020) announced to devote, within
22 the next three years, financial resources to support the adoption of certification schemes by the
23 companies. The adoption of an Environmental Management System (EMAS III¹² or ISO14001¹³)
24 supports the continuous innovation oriented to CE in a systematic way while assure the compliance
25 to existing environmental legislation and in some cases anticipating it.
26
27 When comes to consumers, from the international literature emerges that they need to be both
28 incentivised (Borrello et al., 2017) and educated (Muranko et al., 2019; Botelho et al., 2016) to engage
29 into the CE practices such as to implement circular agri-food closed loops to reduce food waste
30 (Borrello et al., 2017). Information is a key tool for consumers in their purchasing behaviour
31 (Cattaneo et al., 2018), specifically to guide them towards more environmentally conscious purchases
32 (Testa et al., 2020a) or new food products (Cattaneo et al., 2018). Indeed, consumers continuously
33 search for information about products both at the supermarket and on-line (Testa et al., 2020b), also
34 by means of environmental labels or declarations such as the EPD (Environmental Product
35 Declaration). Consumers generally trust environmental labels and for most of them such tools deliver
36 credible and viable information (Testa et al., 2020b). Unfortunately, consumers are not yet fully aware
37 of the market power of their choices and demand (Hao et al., 2020). In such a perspective, the latter
38 authors (and others in the reviewed literature) stress the importance, at political level, of
39 disseminating information and positive opinions about CE, in order to improve the level of
40 awareness/willingness to participate of both consumers and citizens (Smol et al., 2018) as well as
41 companies (Gusmerotti et al., 2019). Traditional companies seem more hesitant in adopting CE in
42 their organizations compared to start-up companies (Bressanelli et al., 2019).
43
44 In turn, some authors also evidence the need for intensive information campaigns among local
45 decision-makers to build a local capacity promoting the implementation of a more sustainable urban
46 development, also focused on new areas such as the CE (Przywojska et al., 2019) and increase its
47 level of CE awareness (Droege et al., 2021). Not to mention that public administrations are also

12 EMAS: https://ec.europa.eu/environment/emas/emas_publications/publications_studies_en.htm

13 ISO 14001: 2015, Environmental management systems — Requirements with guidance for use, available at:
<https://www.iso.org/standard/60857.html>

1 consumers and by adopting Green Public Procurement can contribute to further CE transition (Klein
2 et al., 2021).

3 Finally, Researchers (contrary to the other two groups) also perceive as a key instrument “the
4 development of a cultural approach favouring waste prevention”. The adoption of the latter is
5 absolutely necessary for facing the current global environmental challenges, reduce consumption
6 footprint and double the circular material use rate in the near future (European Commission, 2020b;
7 Haas et al., 2015).

10 6. Concluding remarks

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14 This study evaluated how three groups of respondents that can be considered as “experts” of CE
15 perceive the CE concept itself, its transition process and governance. Two of these groups are more
16 homogeneous as they are mainly operative within the Metropolitan City of Naples (Italy), namely
17 Economists of the University of Napoli Parthenope and local Administrators, whereas one group
18 named Researchers consisted of diverse academic researchers of many nationalities from within and
19 outside the EU whose research is mainly focused on CE.

20
21 This study was mainly explorative in nature and focused on the perception of the CE of the
22 aforementioned groups of respondents. The exploration of both “perception” and “awareness” and
23 their levels could be considered as limits of this study compared to the evaluation of other variables.
24 However, we can claim that the three selected groups of respondents have a preliminary knowledge
25 on CE (even if not homogeneous) and thus their opinions could also be considered as representative
26 of their particular sector/organization and task. As a result, the feedbacks coming from this study
27 could be useful both for future research as well as for improving the existing measures.

28
29 The results evidence that the concept of sustainable development could be dependent on age being
30 mainly perceived by the younger respondents’ group (CE researchers), routed in the intergenerational
31 dimension side. The other two groups perceive the concept as more focused on the need for an
32 equilibrium between the three pillars of CE. The CE is perceived as “a more sustainable way to
33 produce and consume” with a more broad and preventive orientation (“sustainable supply
34 chain/reverse logistic”) among the Researchers and Economists, compared to the Administrators who
35 instead perceive CE as a set of practices, exemplified by their perception of CE as a “zero waste
36 economy” and mainly routed in the “recycling phase” of waste management. Besides the education
37 level, a possible influencing factor could be the sector of the work position and its “organizational
38 culture”. This aspect should be further investigated for its policy implications as e.g., the public
39 support to companies for financing their investment in circular innovation (including the adoption of
40 environmental management systems such as ISO 14001 or EMAS III) could have spillover effects on
41 the employees and by these on the society.

42
43 With regard to the transition to CE and its governance, all the three groups perceive the transition at
44 an early stage of its implementation process and challenged by several barriers. However, the policy
45 makers perceive it as socio-economic attractive, whereas the other two groups perceive it more as an
46 environmental opportunity. The main barriers resulted “resistance to change”, “lack of policies and
47 regulations” and “low awareness and know how” whereas the main drivers are focused on the aspects
48 that are essential for creating a favourable context to CE development such as “the promotion of
49 innovative and long run policies”, “investments in the research sector and the creation of the suitable
50 infrastructures for CE”. Deepening on the political intervention, the groups perceive as relevant for
51 further accelerating the transition: the adoption of “regulatory measures”, “the provision of financial
52 support to companies” and dedicated instruments useful to “increase the level of CE awareness on
53 consumers”. These results align with the reviewed literature, which also evidences the importance of

1 a political intervention that also includes information campaigns to companies (that operates in
2 particular in traditional sectors) and consumers as well as to local administrations for the purpose of
3 increasing the sense of urgency on CE and show that CE is not only a “fashion” and that “it pays to
4 be circular” in all the domains: environmental, economic and social. In this view, the use of life cycle
5 assessment and thinking has showed to be important for companies for evaluating and improving the
6 life cycle of products/process/activities in a systemic way as well as for better orienting consumers
7 choices.

8 The presented study also allowed us to further appreciate the role of Researchers and Universities as
9 key actors in the CE transition for developing the specific research base useful to implement the CE
10 in agree with sustainable development. Moreover, the CE research could take particular advantage
11 by including in its future framework the principles of responsible research and innovation given it
12 promotes innovation processes that are socially desirable and take into account the social implications
13 (Inigo and Blok, 2019).

14 Finally, in overall the assessment framework (literature review and questionnaire survey) proved to
15 be useful in creating a multi-stakeholder’s perspective (including researchers, academics, policy
16 makers, companies, workers, employees, consumers and others) widening the knowledge of the
17 perception/awareness of CE concept, practices and transition as well as on how such process could
18 be managed to go beyond the current early stage.

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17 **Figure captions:**
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 21 **Figure 1.** Summary of the selected articles considered in the literature review of the present study.
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 23 **Figure 2.** Distribution of the perception and awareness on the concept of sustainable development
 24 among the three groups (max 2 replies).
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 26 **Figure 3.** Distribution of the perception and awareness on the concept of circular economy among
 27 the three groups (max 2 replies).
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 29 **Figure 4.** Most important aspects characterising CE perceived by the respondents (max 2 replies).
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 31 **Figure 5.** Main important expectations from circular economy perceived by the three groups (max 2
 32 replies).
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 34 **Figure 6.** Perceived distance from the implementation of circular economy among the three groups
 35 (max 2 replies).
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 37 **Figure 7.** Evolution of the concept of sustainable development. Source: adapted from Madonna,
 38 2020.
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