



## Circular Economy and Social Sustainability: A Transdisciplinary Approach to the Basque Country's automotive sector

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### ARTICLE INFO

Article history:  
Received 21 March 2023  
Accepted 10 June 2023  
Available online 15 October 2023

JEL classification:  
M40  
M41  
Q56

Keywords:  
Circular economy  
Automotive sector  
Sustainability  
Social sustainability  
Multi-stakeholder study  
Transdisciplinarity

Códigos JEL:  
M40  
M41  
Q56

Palabras clave:  
Economía circular  
Sector de la automoción  
Sostenibilidad  
Sostenibilidad social  
Estudio de múltiples partes interesadas  
Transdisciplinariedad

### ABSTRACT

This paper contributes to the debate of the circular economy (CE) through understanding how this concept is constructed and linked to the sustainability triple-axis. We aim to observe if the way the term is defined by scholars is in line with the definitions and discourse emanating from the actors involved in our analysis. Based on the Responsible Research and Innovation framework, we held two meetings with stakeholders in the Basque Country's automotive sector. The results reflect that there is no single way of understanding the concept, either among the agents studied nor in the academic literature, since although many concordances exist, various discrepancies have emerged. However, we do observe a general pattern, in that the social axis of sustainability is cornered, while the environmental and economic axis are at the centre of CE concept.

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### Economía Circular y Sostenibilidad Social: Una aproximación transdisciplinar al sector de la automoción en el País Vasco

#### RESUMEN

Este artículo contribuye al debate sobre la economía circular (EC) a través de la comprensión de cómo este concepto se construye y se vincula al triple eje de la sostenibilidad. Pretendemos observar si la forma en que el término es definido por los académicos coincide con las definiciones y el discurso que emanan de los actores implicados en nuestro análisis. Basándonos en el marco de Investigación e Innovación Responsables, mantuvimos dos reuniones con actores del sector de la automoción del País Vasco. Los resultados reflejan que no existe una única forma de entender el concepto, ni entre los agentes estudiados ni en la literatura académica, ya que, aunque existen muchas concordancias, han surgido diversas discrepancias. Sin embargo, sí se observa un patrón general, en el sentido de que el eje social de la sostenibilidad se encuentra arrinconado, mientras que el eje medioambiental y económico se sitúan en el centro del concepto de EC.

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<https://www.doi.org/10.6018/rcsar.577681>

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### 1. Introduction

The current economic growth model, based on the intensive use of limited resources appears to be reaching its limits. This linear system (take-make-waste extractive industrial model) is promoting the depletion of natural resources and fossil fuels, both deepening poverty and accelerating ecological degradation (IPCC, 2023). In contrast, the circular economy (CE) aims to redefine growth as sustainable growth (EUSH, 2019), focusing on positive society-wide benefits (EMAF, 2012). Among scholars, politicians and practitioners, the term has become increasingly familiar and attractive (Gil-Lamata & Latorre-Martínez, 2022; Homrich et al., 2018; Kirchherr et al., 2018; Murray et al., 2017; Skene, 2018) since it embraces the critical integration of sustainability issues and business development (Ritzén & Sandström, 2017). However, although CE has been claimed to be the new paradigm to reach sustainability, previous research on CE evidences that the academy has not thus far taken this into account, only a few scholars have included in their works the three dimensions of sustainable development (SD): economic, environmental and social (Blum et al., 2020; Calisto Friant et al., 2020; Gil-Lamata & Latorre-Martínez, 2022; Kirchherr et al., 2018, Korhonen et al., 2018a, 2018b; Mies & Gold, 2021; Millar et al., 2019; Okorie et al., 2021; Padilla-Rivera et al., 2020; Scarpellini, 2022).

Kirchherr et al. (2018) reviewed various underpinning worldviews of CE and noted the conceptual confusion regarding this issue. Considering the three dimensions of sustainability (Meadows et al., 2006), social sustainability is the one that has least presence among the reviewed definitions. On the other hand, while the economic prosperity and environmental quality of CE are mentioned, their impact on social equity and future generations are rarely mentioned. Smol et al. (2018) noted that the concept is more related to environmental aspects, identifying CE with the protection of raw materials and waste management. The authors also found that social constructs such as sharing and collaborative economy practices are not especially popular although they claim that the “CE model is relatively understandable for the majority of responders” (p. 1044). Additionally, Lieder & Rashid (2016) through the revision of 158 papers summarize the highlights of academic research focused on CE from three perspectives: resource scarcity, environmental impact and a combination of both. Topics such as bioenergy development, clean and renewable energy, eco-industrial parks, biofilm reactors, municipal solid waste and waste management, biochemical and pharmaceutical industries, emissions, as well as governance for sustainable supply chains are included in an extensive list of research topics.

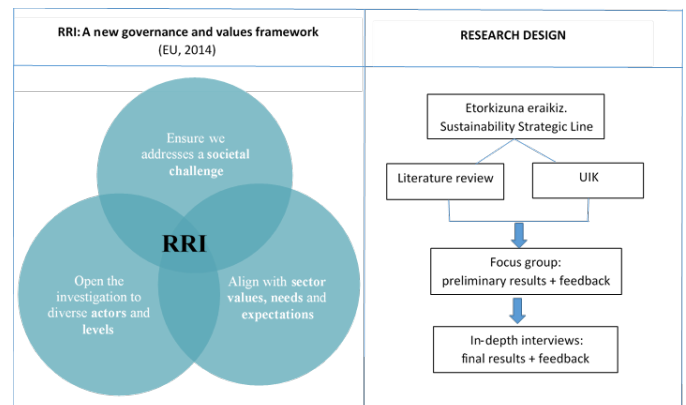
At the same time, it can be observed that scholars appears to focus mainly on technical issues, neglecting the social component of CE (Clube & Tennant, 2020). However, if the CE needs to lead us to a scenario of sustainability, it seems essential that changes in human behaviour are essential, which is closely linked to aspects other than technical improvements. In fact, the social aspects of CE are currently unexplored (Millar et al., 2019), as is its relation with the sustainability concept. The current lack of knowledge on how CE could improve social equity, social justice and at the same time propose the well-being of present and future generations, is still a challenge that must be faced to fulfil CE promises (Calisto Friant et al., 2020; Clube & Tennant, 2020).

Further, the way CE concept is understood will affect the processes and activities that society will generate to move towards circularity and to enable the transition to a more

sustainable scenario, which in turn, could improve reporting and informed decision-making concerning investments in circular activities and the relevant information disclosed by companies (Llena-Macarulla et al., 2023; Moneva et al., 2022; Scarpellini, 2020; Scarpellini et al., 2020). However, the dearth of current research highlights the state of infancy of both CE knowledge and practice (EEA, 2019; Kirchherr & van Santen, 2019; Korhonen et al., 2018a; 2018b).

Understanding current visions of CE and its links to sustainable development is a complex and ambiguous research challenge. Therefore, we apply a transdisciplinary approach (Goyal et al., 2021) and draw on the Responsible Research and Innovation –RRI- framework (EC, 2013), a key concept under Horizon 2020, the EU’s Framework Programme for Research and Innovation 2014-2020. It could be stated that RRI is about making science with society and for society, which means aligning the outcomes of research with the values of society (Smallman et al., 2015) and undertaking it in the public interest (Dai et al., 2018). To follow the European Commission’s RRI framework requires that societal actors (researchers, citizens, policymakers, businesses, third sector organisations, etc.) work together during the whole research and innovation process to better align both the process and its outcomes with the values, needs and expectations of society. Figure 1 summarises the research design.

Figure 1. Research objective and design related to RRI framework (EU, 2014 adaptation)



Above is the research framework of this exploratory study, a transdisciplinary approach to a community-based participatory research. Evidence is presented for the improvement of scientific knowledge about current shared values, meanings, and concepts of CE. In particular, and based on previous research (Korhonen et al., 2018a) this paper aims to analyse the visions of CE in the Basque Country’s automotive sector. The research then presents evidence on how these visions of CE are linked to sustainable development of economic, social and environmental dimensions, aspects that have not been previously dealt with by the literature.

This paper has been structured in the following way: a review of the literature from which the research proposals have been taken follows this introduction in section 2; in section 3, the methodology used to conduct the research is presented; in section 4, a synthesis and discussion of the empirical study results is included; and finally, section 5 contains the most relevant conclusions, and proposals for future research.

## 2. Literature review: origins and conceptualization of a contested paradigm

The leading idea is that the existing academic literature conceptualizes CE as a highly contested term (Dzhengiz et al., 2023; Calisto Friant et al., 2020; Genovese & Pansera, 2019). Scholars do not agree concerning CE origins. Some authors have pointed out that CE has largely emerged, at least in the Chinese context, from legislation and not from a group of academics (Murray et al., 2017). As stated by Hill (2015) the impulse given by the public administration, through regulations related to waste management and energy sources, have led to the framework where academic thinking on the subject has developed, especially in the case of the United Kingdom and in the European Union (EEA, 2019). However, in scientific production terms, China - the leading country in the number of publications produced per year, followed by European researchers - and EU regions are highly in tune with the policy developments with scientific research on CE being largely responsible for such developments (Türkeli et al., 2018). For Korhonen et al. (2018b) the CE approach has almost exclusively been developed and led by practitioners, policy-makers and business development agencies such as business consultants, associations and foundations, and is based on a fragmented collection of ideas derived from some scientific fields including emerging and semi-scientific concepts (Korhonen et al., 2018a).

The academic literature origins of CE can be traced back as far as Quesnay's 1758 "Tableau Economique" work and his assumptions on surplus value from a cyclical input (Murray et al., 2017; Reike et al., 2018). Ghisellini et al. (2016) highlighted Boulding's 1966 contribution to CE when proposing the economy as a circular system, a prerequisite for the maintenance of the sustainability of human life on Earth. In this way, three economic functions of nature have been identified: that of suppliers of raw materials and minerals, that of responsibility for the maintenance of life, and that of receiving the generated waste. Boulding's Spaceship Earth has become the dominant metaphor, a static equilibrium imaginary world, where Earth is a closed system and everything circulates eternally (Skene, 2018). Pearce and Turner described for the first time in western literature (1980s) the closed system of economy-environment co-dependency. As stated by Geissdoerfer et al. (2017) Pearce and Turner, inspired by Boulding's work, describe how natural resources influence the economy by providing inputs for production and consumption as well as serving as a sink for outputs in the form of waste, investigating the linear characteristics of contemporary economic systems.

The globalization of the world's economies has brought with it new dimensions in the markets and in the variety of goods produced, increasing the environmental and social impacts of these massive production and consumption processes. The global economy acceleration and solid waste management represent a new problematic challenge (Reike et al., 2018). "The limits to growth", also known as the Meadows Report, published in 1972 and commissioned by the Club of Rome, is the first document that alerts us to the existence of biophysical limits on the planet due to the excessive growth of socio-economic systems. Never before had the industrialization process, the human and environmental consequences of constant economic growth been questioned, and never before had they been quantified. The Meadows Report had the virtue of putting on the table a reality not considered in the processes of economic development (Club of Rome, 2009) and was probably decisive in introducing a

shift in CE thinking by the end of the 20<sup>th</sup> century (Reike et al., 2018).

Thus, CE has emerged as a possible solution to the degradation of the planet, and has gathered important attention in the consulted academic literature. Some influential backgrounds for CE thinking, in the EU and in the UK, include the contributions from: Walter Stahel and the Product Life Institute, the Industrial ecology, the cradle-to-cradle philosophy, the waste and resources action programme –WRAP-, and the Green Alliance and the CE task force, a UK-based think tank with a mission to promote political leadership in the environment (Hill, 2015). While recent approaches have made important sustainability scientific contributions covering, for example, industrial ecosystems, symbioses, cleaner production, product-service systems, biomimicry, the resilience of social-ecological systems, the performance economy or the concept of zero emissions (Reike et al., 2018), the most influential background concepts related to CE vision come from business actors who have created a cradle-to-cradle concept of eco-effectiveness and the industrial ecology concept (Korhonen et al., 2018b). However, as stated by Korhonen et al. (2018a) "ecological economics seems to be the proper place to start the scientific groundwork on CE" (p.39).

CE has gained ongoing attention, because as an emerging approach to industrial production and consumption models (Korhonen et al., 2018b), it is able to systematically cope with the contemporary ecological, economic and social challenges that humanity incurs, such as environmental and ecological issues, industrial negative externalities, soil erosion and degradation, climate change, reduction in air and water quality, energy insecurity, unemployment or health risks (Türkeli et al., 2018), denoting an alternative economic system that assures and affords new opportunities for innovation, growth and resilience, increases global competitiveness through resource and energy efficiency (Reike et al., 2018) and creates new job opportunities (EUSH, 2019). CE is seen also as a possible solution that fosters both environmental protection and social well-being by reducing the use of natural resources, and waste amounts, as well as decreasing greenhouse gas emissions and usage of hazardous substances thereby relieving pressure on the suppliers (Govindan & Hasanagic, 2018). Thus, CE restores any damage incurred in resource acquisition, while ensuring little waste is generated throughout the production and consumption processes (Murray et al., 2017).

The shift from linear to circular economic systems could create huge financial, social and environmental benefits to new business model structures where new holistic features, such as cooperation and collaboration, and a triple bottom line approach to performance (Scarpellini, 2020; Scarpellini et al., 2020; Moneva et al., 2022); or demand-driven implementation business models thereby potentially aiding organizations to adapt to sustainability (Lewandowski, 2016) and so the SDGs, enabling them to achieve equality, well-being and social inclusion (Clube & Tennant, 2020). Sauvé et al. (2016) pointed out that this increasing attention to the CE concept is due to its capacity to provide the basis for reconciling the problem of how to promote productivity while considering the externalities of the production process, the consumption of the products and the end-of-life impacts. This is accomplished by, in the author's words, closing loop material flows through integrating combinations of industrial activities acting synergistically to feed and be fed by one another. Finally, as stated in the European Commission's Package on the CE in 2015, CE should contribute, inter alia, to the reduction of EU emissions, resource dependency and waste; improve reuse, remanufacturing and recycling of products; and help

keep valuable materials in Europe (Hedberg et al., 2019), ensuring the long-term competitiveness of the EU and leaving no one behind (EC, 2020). Finally, since it is a sparsely explored area, scholars and practitioners view the concept in a neutral and apolitical fashion (Dzhengiz et al., 2023; Genovese & Pansera, 2019) and as a way for businesses to implement so-called sustainable development.

However, some voices dissent from this opinion. The existing CE scientific literature appears to have been mainly performed on the practical and technical levels of the actual physical flow of materials and energy in production-consumption systems led by academic research which has been very positive and optimistic (Korhonen et al., 2018b), though lacking a deep reflection on the fundamental assumptions regarding CE (Dzhengiz et al., 2023) when it comes to understand the role CE may play for both present and future generations and its links to sustainable development (Figge et al., 2023).

The academic literature revealed previous authors that focused on CE and its boundaries, and analyzed: the limits and challenges that belong to this circular economic growth model (Genovese & Pansera, 2019; Korhonen et al., 2018b; Skene, 2018); the barriers that influence the implementation of CE in the context of supply chains (Govidan & Hasanagic, 2018); the CE barriers identified by business, academia and government, in the context of the EU (Kirchherr et al., 2018); the institutional barriers to CE initiatives across China, the US, and Europe in manufacturing and integrator companies (Ranta et al., 2018); the organizational barriers to CE for traditional manufacturing firms having a product-oriented focus (Ritzén & Sandström, 2017); and the challenges and needs to implement SME CE business models, for the paper industry in Germany (Rizos et al., 2015).

Korhonen et al. (2018) find that definitions of CE, being a cultural and social build, represent one of the six limits and challenges the CE is currently facing. In this regard, the most well-known and employed definitions of CE, provided by the Ellen McArthur Foundation (EMAF, 2012, p.7), in their initial report 'Towards the circular economy': "[CE] is an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models". Thus, for the Ellen MacArthur Foundation CE is a system that uses narrower internal loops (e.g., maintenance rather than recycling) when possible, thus preserving more energy and other values. These systems also maximize the number of consecutive cycles and the time spent in each cycle, increasing the life of the products and optimizing reuse. Circular systems also promote the safe return and entry of biological nutrients into the biosphere, so that their decomposition results in more valuable materials for a new cycle (EMAF, 2012). But these approaches and models such as life-cycle, closed loops, re-manufacturing or waste management "have been developed and discussed without in-depth and critical discussions on the theoretical foundations and system boundary limitations" (Korhonen et al., 2018b, p.551) revealing a mainstream view of CE that does not take into consideration the limits of continuous economic growth.

Skene (2018) states that these antiquated worldviews suffuse modern sustainability thinking, and are thus linked to weak sustainability approaches. In contrast to Boulding's *Spaceship Earth* closed system, the earth is an open system (Skene, 2018) and industrial ecology extended the limits of

sustainability and CE knowledge by introducing a broader or different vision in academic research when it comes to analyzing industrial systems and their relationship with nature. Since, according to this school of thought, industry and ecology are part of the same ecosystem, they should be analyzed in conjunction. It is understood that industry has an effect on nature, and vice-versa (Geissdoerfer et al., 2017; Ghisellini et al., 2016; Lewandowski, 2016). Thus, according to Skene (2018) CE is something impossible to put into practice because CE "relies on tight loops, zero waste, extended lifetimes and closed systems [...] but these observations are a fantasy and can never deliver sustainability" (Skene, 2018).

Korhonen et al. (2018a) identify six challenges for the concept in terms of environmental sustainability; thermodynamic limits; system boundary limits; limits posed by the physical scale of the economy; limits posed by path-dependency and lock-in; limits of governance and management; as well as limits of social and cultural definitions. More precisely, and related to the latter challenge, Genovese & Pansera (2019) see the concept as very much aligned with a technocratic, eco-modernist agenda, that presents CE as a new apolitical version of market-oriented capitalism "that looks at industrial wastes and environmental degradation not as system failures but as an opportunity to relaunch a new season of sustainable and green economic growth" (p.4).

The relationship between the CE paradigm and the automotive sector has attracted important attention among scholars. The automotive sector combined with the heavy-duty and off-road vehicle industries are two industrial giants in Europe (Saidani et al., 2018). In 2015, the European Commission adopted an action plan to help accelerate Europe's transition to a CE, boost global competitiveness, promote sustainable economic growth and create new jobs (EC, 2015). Due to the focus of the Circular Economy Action Plan (EC, 2015) on issues such as product design and innovation, together with waste management, most scholars have focused research on the automotive sector analysing vehicles end-of-life management and recycling practices (Despeisse et al., 2015; Farel et al., 2013; Froelich et al., 2007; Millet et al., 2012; Reuter et al., 2006; Saidani et al., 2018; Simic, 2015; Yi & Park, 2015) or on product design (Schögl et al., 2017; Smol et al., 2018; Tukker & Cohen, 2004).

However, little research aimed at the analysis of the shared values, meanings, and concepts of CE, and its links to sustainable development has been carried out in the Basque Country's automotive sector, with the exception of Urain et al. (2022), who focused on the development and validation of a tool to integrate CE in industrial companies; Eguren, et al. (2018), focused on opportunities, challenges, drivers and barriers in re-manufacturing activities; and Ormazabal et al. (2018), who focused on opportunities and challenges of CE in small and medium enterprises (SME).

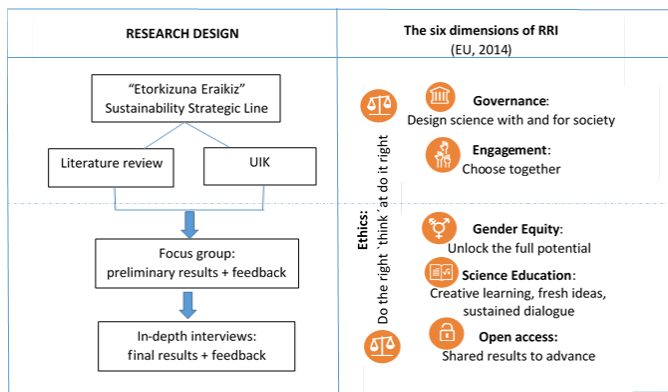
All in all, the academic world has observed that there is a clear consensus with regards to the primary focus of the CE being purely industrial, a fact that brings on virtuality to the paradigm due to its understanding by the productive fabric and for its integration into the dominant business logic. We consider this aspect to be the main argument that justifies the success that some agents have achieved when adopting the CE. However, some doubts arise among the authors of this work about the real impact of the adoption of CE in terms of alignment with the economic, social and ecological objectives of sustainability. Nevertheless, given that none of these studies has applied a transdisciplinary approach, this research intends to provide knowledge regarding the CE construct and its links to sustainable development triple-axis.

### 3. Research Methods: Stakeholders' data collection

The background to this paper lies in the “Etorkizuna Eraikiz” initiative. The objective of this initiative is to: collectively identify the challenges to be faced by the Basque region in the future; design methods of dealing with the problem; experiment through community-engagement; and, apply the insights into territorial policies. All of which would be through the application of a new model of governance, collaborative and participative of different social actors (DFG, 2020). The University of the Basque Country UPV/EHU collaborates in this initiative, which began in January 2020. A variety of strategic pathways were identified by the Gipuzkoa Provincial Council including sustainability challenges, and the need for a CE strategy.

The first step in our research project, and when applying the RRI framework, has been to identify which aspect of sustainable development would be of most interest. This perspective of grounding our research in societal needs and expectations led us to analyze academic literature and, at the same time, to design an initial workshop in the summer courses of the UPV/EHU (UIK). Both these activities help to define the objective of our research: to understand how a CE concept is constructed and linked to the sustainability triple-axis in the Basque Country's automotive sector.

Figure 2. Research sequence and methods, and their relationship to RRI framework



#### 3.1. Regional context

Spain is the second largest car manufacturer in Europe, the eighth largest in the world, and the principal European manufacturer of commercial vehicles and electric motorbikes. Leading automotive brands are established in Spain and one of the top three manufacturers of electric charging infrastructure are Spanish (Government of Spain, 2020). Our study is focused on the automotive sector of the Basque Country, a region situated in the north of Spain. Although currently the industrial sector has lost weight, it still accounts for a third of the total Gross Value Added (GVA) of the Basque Country (27.77% in 2019). Note that within this industrial sector, the automotive sector representing around 28% of GDP, and being a strategic sector (Government of the Basque Country, 2022).

This Basque region has a cluster that includes 300 companies, with only one vehicle manufacturing plant (in Vitoria-Gasteiz); the subsidiary of Daimler Benz-Chrysler (Mercedes). However, the remaining companies have specialised in the manufacture of components for the automotive industry becoming one of the Spanish regions with the highest concentration of companies manufacturing components for

the automotive sector, with a turnover of 15 billion euros and generates 36,000 jobs (Ihobe, 2018). This sector could be defined as “innovative, competitive and comprehensive” where “the management levels are similar to those of the most advanced countries in the world” and that accounts for “more than 45% of the production volume of the automobile industry in Spain” (Eguren et al., 2018, p. 256).

Considering the importance of the automotive sector in the Spanish economy, and the leading role played by the Basque Country, any decision taken by companies located within this region towards more circular practices could have a clear traction effect. Furthermore, the modernization and transformation of the economy, moving in a more sustainable direction is important (Ihobe, 2018), because, the transition towards more circular practices offers the Basque country s industrial sector significant opportunities.

To ensure that a CE economy transits towards a reality and that companies in the automotive sector and political authorities follow the proposed strategies, the seat of power to enable and enforce these changes must be clearly identified.

As mentioned above, the automotive sector of the Basque Country is characterised by satellite manufacturers of components. Another relevant characteristic of these companies is that they are principally small and medium enterprises. Among hard and human-based barriers faced by companies in the Basque region (Ormazabal et al., 2018) their dependency on the larger business groups -also known as Original Equipment Manufacturers (OEM)- may preclude them from decision-making. They must, therefore, offer products with the characteristics demanded by the OEMs. Ergo, if the OEMs demand circular products, the companies should transform their production to satisfy those requirements. An example of this method can be found in Eguren, et al. (2018), where they try to identify, for example, what opportunities, challenges, drivers and barriers exist in the Basque automotive re-manufacturing activities. The paper stated that although these activities are already in existence in the sector, their deployment is not expected to greatly increase in the future, principally due to lack of enforcement by the OEMs.

#### 3.2. Focus group

To identify the visions of CE and its links to sustainable development among the participants of the Basque automotive sector we dawn on the opinions of a focus group. According to the literature, the focus group is a qualitative simple and speedy method frequently used in research on sustainability issues, because of its potential to bring out differing ideas and opposing points of view (García, 2006; Ibáñez, 2000).

Thus, we investigate to various actors and levels (EU, 2014), observing whether domestication (Boiral, 2004) of the concept is being adopted by its use in the general debate, and whether there are differing definitions, which in some cases can even be antagonistic. Boiral (2004, p.115) stated that the sustainability concept, closely linked to CE, has suffered a “Babel Tower effect” i.e. that the aim to reconcile economic, social and environmental dimensions, sometimes incompatible with the sustainability concept, results in the generation of such a broad and poorly defined concept, that can be used to justify different actions and realities that are often at odds with each other (Boiral, 2004).

The focus group also allow us to meet different actors or stakeholders and co-create a collaborative method in understanding the CE concept. Specifically, we tried to observe how CE is understood in the concrete context of our study - the automotive sector in the Basque Country-. We pursue the

**Table 1. Organisations and type of participant in the focus group**

Participant type	Organisation	Main activity	Website
Automotive Industry	CIE Automotive	Producer of vehicle components	https://cieautomotive.com
Automotive Industry	IRIZAR S.Coop	Bus manufacturer	https://www.irizar.com
Automotive Industry	CIDITEC Energy Storage	Manufacturer of batteries for vehicles	https://www.cidetec.es
Auxiliary industry	AUTOBGS	Garage and dealer	https://www.autosbgsmotor.es
Auxiliary industry	–	Petrol station	–
Citizenst' association	KALAPIE	Cycling association	http://kalapie.org
Consumer	–	Consumer	–
Government	The Gipuzkoa Provincial Council	Regional government	https://www.gipuzkoa.eus/es/web/ingurumena
Research center	TECNALIA (transport unit)	Member of Basque Research and Technology Alliance	https://www.tecnalia.com
Research center	Circular Economy-company classroom	Circular economy unit	https://www.ehu.es/es/web/gipuzkoako-ingeniaritza-eskola/ekonomia-zirkularraren-gela
University	UIK	Summer courses	https://www.uik.eus
University	UPV/EHU	Faculty of economics and business	https://www.ehu.es/es/web/enpresa-donostia

Source: Own elaboration.

identification of beliefs and expectations in this context and observe whether they are in line with the results from academic literature. Based on the RRI framework, we include societal actors in our transdisciplinary study from the beginning.

Therefore, we have approached the focus group as an open dynamic with a double objective: to test the concordance of concepts that appear in academic literature with a wider audience (Bauwens et al., 2020); and to study the specific beliefs and expectations (Leder et al., 2020) within the sector and territory. This technique is chosen because, among other advantages, it allows us to easily ascertain the opinions and thoughts of a wide range of participants (Watson & Newby, 2012).

The focus group was held on November 16, 2020, in Donostia/San Sebastian, a city of 188,240 inhabitants in the Basque Country and brought together 12 participants related directly or indirectly to the automotive sector. Table 1 shows the participant type, the organisations from which they came, and the main activity of those organisations.

One of the requirements of the sample of this focus group was the widest heterogeneity in terms of age, gender, level of education and role within their organisation/the automotive sector. Thus, the lowest heterogeneity was achieved in the age variable with 75% of participants being between 40-60, 17% under 40 and only 8% over 60. Whereas in the level of education variable, 83.3% had a university or higher level of education, and only 16.7 % had intermediate-level studies. Gender was the most balanced variable and the role within their organization the major heterogeneity, as we identify seven different roles among the twelve participants.

#### 4. In depth interviews

We also used an in-depth interview method as a complement to that of the focus group, rendering more detailed perspectives the interviewees may have regarding the results that have emerged in the previous phase (García, 2006; Ibáñez, 2000), providing a space for reflection and free expression of ideas or concepts around CE. While several of these ideas or concepts were obtained in the focus group, space has also been given to possible ideas, terms or practices that the interviewees may consider important and that do not have emerged in the focus group. Ultimately, we seek to draw parallels between their values, needs and expectations (EU, 2014) of CE and any links to the sustainable development

triple axis.

**Table 2. Characteristics of the interviewees**

Participant type	Age	Gender	Professional activity
University	40-60	Male	Lecturer
Research centre	40-60	Female	Director of the Circular Economy classroom
Government	40-60	Female	Secretary of Environment
Citizenst' association	>60	Female	Associated (professionally retiree)
Automotive industry/Bus manufacturer	40-60	Female	Head of Environment
Automotive Industry/Manufacturer of batteries for vehicles	40-60	Male	Director
Auxiliar Industry/ Tire manufacturer (Michelin S.A.)	40-60	Female	Chemist in the quality control department

Source: Own elaboration.

Considering the sample we had available from the focus group, we tried to include as much heterogeneity as possible among the interviewees, as well as including a person who had not participated in the focus group as a control ensuring non-bias.

**Table 3. Interview Schedule**

Interviewee	Organisation	Chanel	Data	Duration
1	Faculty of eEconomics and Business UPV/EHU	In person	10/05/2021	17'
2	Cidetec Energy Storage	Online	14/05/2021	34'
3	Kalapie Urban Cyclists Association	In person	18/05/2021	45'
4	Irizar S.Coop.	In person	20/05/2021	50'
5	Circular Economy classroom Faculty of Engineering of EHU/UPV	Online	20/05/2021	60'
6	Michelin S.A.	In person	25/05/2021	15'
7	Provincial Council of Gipuzkoa	Online	02/06/2021	46'

Source: Own elaboration.

Table 3 summarizes the profile of the interviewees, the duration of each interview and whether it was conducted face-to-face or online (as a response to the COVID-19 pandemic). All interviews were recorded and transcribed. The entire research team participated in the coding of the responses obtained.

## 5. Results

### 5.1. Focus group

Firstly, we required the participants to respond to general and open questions relating to CE and sustainable development. The idea was not to slant their answers with our proposals. We also tried to capture the broader perception of each participant, thus, the results collected could be divided into responses or thoughts arising from a personal/individual perspective in addition to the professional sphere of each participant.

**Table 4. Level of Agreement on Terms Related to the General Concept of CE**

SUSTAINABILITY	4.75
WASTE	4.65
CLIMATE CHANGE	4.35
ECONOMIC EFFICIENCY	4.3
ENERGY EFFICIENCY	4.2
NATURAL ENVIRONMENT	3.85
BIODIVERSITY LOSS	3.65
SOCIAL JUSTICE	3.25

Source: Own elaboration.

Many terms relate to CE. Our task was to find some patterns in those responses. The terms: raw materials and resources, the environment and the importance of process and product design have appeared to a large extent irrespective of the perspective from which they approach the concept whether individual or professional. However, differences have been observed in the terms that participants related specifically to CE depending on the perspective from which they observed the concept. From the personal perspective, the participants mentioned sustainability – including responsible consumption, social equality and workers' welfare – terms that have a direct connection with CE; while from the professional perspective terms appeared such as regulation and administration, referring to their importance in CE achievement. Other terms that appear less frequently but that arise from both perspectives are 'innovation' as well as 'energy and resource efficiency'. Finally, there are less mentioned terms, emerging only from one of either perspective.

Also from personal perspectives, individuals mentioned the terms 'opportunity', 'holistic vision', 'participation', 'employment and talent', 'support different sectors', and 'close the life cycle of products'. When they take on the role of professionals' terms appeared such as 'mobility', 'networks', 'competitiveness', 'value retention' as well as 'transition costs'.

In the second step, we asked two further closed questions to discover to what extent the participants agree with the relationships previously observed in academic literature, therefore we asked two more closed questions. In both closed questions, we proposed some terms or practices that literature relates to CE, and we asked participants to value their level of agreement on a scale from 0 to 5; 0 if they consider that the term proposed has no relation with CE and 5 if they believe it is a hundred per cent related, focusing on the general concept of CE. The second question was related to the automotive sector in particular. Table 4 and Table 5 show the average score obtained for each of the terms or practices given in both questions.

Firstly, it can be observed that participants have agreed that 'economy efficiency' and 'energy efficiency' have a major relation to CE. They have argued that CE makes it possible to provide more goods and services to society with the

**Table 5. Level of agreement on practices related to the CE in the automotive sector**

ECONOMIC EFFICIENCY	4.2
ENERGY EFFICIENCY	4.15
WASTE/ POLLUTION	4.15
INNOVATION	4.15
REGULATORY COMPLIANCE	4.1
SOURCE OF OPPORTUNITIES	4.0
CLIMATE CHANGE	3.8
SUSTAINABILITY	3.75
MARKET/ CUSTOMER REQUIREMENTS	3.75
GREENWASHING	3.5
NATURAL ENVIRONMENT	3.3
MORAL IMPERATIVE	3.25
REQUIREMENT OF THE PARENT COMPANY/GROUP	3.15
RELOCATION OF COMPANIES	2.8
IMPACT ON BIODIVERSITY	2.75
SOCIAL JUSTICE	2.35

Source: Own elaboration.

same resources. They also have stated that to achieve this efficiency proper waste management is necessary and in controlling the pollution generated by its activity, both being practices of major importance in the automotive sector.

Secondly, terms such as sustainability or climate change are seen as key aspects related to the general CE concept, but the participants believed that the impact that their professional activities may have on those processes is less relevant than that performed by other actors or sectors. They do relate their sector with CE more strongly through the innovation practices that are carried out such as the production of hybrid or electric cars.

Thirdly, if we focus on the reasons why CE activities are being applied in the automotive sector, or the reasons that would lead to their adoption to a greater extent, the participants pointed out that regulatory compliance is the more relevant. This is closely followed by CE being a source of opportunity for the sector, and less related to market or customer requirements.

Next, we analyse terms or practices less connected with CE according to sector agents/stakeholders. Related to biodiversity aspects the participants do not perceive that the activities carried out in the automotive sector in relation to CE are closely related to biodiversity loss, but they do find a closer link to the impact that CE in general may have on biodiversity loss. Regarding our relation with the natural environment, the participants believed that it has more to do with CE than biodiversity aspects have, but as in previous issues, they find a closer relationship between the natural environment and CE in the general plane and not so much in the activities carried out in the sector. Specifically, and regarding the influence that the CE paradigm may have and will have in the future on a company's choice of place, that is, the transfer of production centres where the cost of labour is cheaper or where there are tax advantages, participants generally believed that the issue of CE was unrelated.

Finally, of note is that the visions of participants vary if they look at the concept from a general perspective rather than the automotive sector specifically. Terms such as 'economic' and 'energy efficiency' were more widely used from a professional perspective whereas the term 'sustainability' less so. It should be also noted that the participants see a still lesser relationship between social justice and CE.

Table 6. Results of the Focus Group

FOCUS GROUP								
RRI FRAMEWORK: Open investigation to different actors and levels / Align with sector values needs and expectation								
1 <sup>st</sup> step: broader conception				2 <sup>nd</sup> step: literature agreement				
				Term/concept from literature review	Level of agreement			
CE related terms	More mentioned	Both perspectives		<ul style="list-style-type: none"> <li>• Economy efficiency</li> <li>• Energy efficiency</li> <li>• Sustainability</li> <li>• Social justice</li> <li>• Future generations</li> <li>• Climate change</li> <li>• Innovation practices</li> <li>• Biodiversity loss</li> <li>• Regulatory compliance lead to CE</li> <li>• Market or customer requirements lead to CE</li> <li>• CE is a source of opportunity</li> <li>• Company's relocation because of CE</li> </ul>	General	Sector		
		<ul style="list-style-type: none"> <li>• Raw materials</li> <li>• Resources</li> <li>• The environment</li> <li>• Process and product design</li> </ul>				vV	vV	
		Individual perspective			Professional perspective		vV	v
		<ul style="list-style-type: none"> <li>• Sustainability, including:                             <ul style="list-style-type: none"> <li>✓ responsible consumption</li> <li>✓ social equality</li> <li>✓ workers' welfare</li> </ul> </li> </ul>			<ul style="list-style-type: none"> <li>• Regulation and administration</li> </ul>		X	X
	Less mentioned	Both perspectives						
		<ul style="list-style-type: none"> <li>• Innovation</li> <li>• Energy and resource efficiency</li> </ul>						
		Individual perspective			Professional perspective		v	v
		<ul style="list-style-type: none"> <li>• Opportunity</li> <li>• Holistic vision</li> <li>• Participation</li> <li>• Employment and talent</li> <li>• Support different sectors</li> <li>• Close the life cycle of products</li> </ul>			<ul style="list-style-type: none"> <li>• Mobility</li> <li>• Networks</li> <li>• Competitiveness</li> <li>• Value retention</li> <li>• Transition costs</li> </ul>		vV	vV
				X	X			

vV: full agreement  
v: partial agreement  
X: no agreement

Source: Own elaboration.

5.2. In-depth interviews

Most of the interviewees relate CE to the reduction of environmental impacts; the reintroduction of end-of-life products back into the value chain, increasing the useful life of products; the use of the 3Rs at all scales; eco-design; resource and process efficiency. A noteworthy contribution of one of the participants, states that CE should not only lead to less negative impacts but should also encourage the creation of activities with a positive impact. As a summary, in Table 7, we present the level of concordance between interviewees' responses related to different issues discussed during the interviews.

All interviewees agreed on the vision of CE as a tool in reaching sustainable development, or at least, in promoting it. Noting that all interviewees related CE to sustainability, we delve into their understanding of the concept of sustainability, to observe whether they really have such an agreement on that point.

It appears that all the interviewees agreed on the importance of analysing sustainability through its three pillars: economic, social and environmental. All of them stated that sustainability means leaving future generations a planet that will enable them to meet all their needs, and it requires us, to reduce the current consumption of natural resources. More specific ideas several interviewees identify with sustainability were: a) the importance of the local production, both in relation to consumption habits, i.e. km0 consumption, as well as to the generation of employment at a local level; and b)

Table 7. In-depth interviews results

INDEPTH INTERVIEWS	
RRI FRAMEWORK: Open investigation to different actors and levels / Align with sector values, needs and expectation	
Strongest agreement among interviewees:	
<ul style="list-style-type: none"> <li>• <b>Main benefit:</b> CE can help to improve the employment situation in the territory (job creation and different employment opportunities).</li> <li>• <b>Lack of awareness:</b> Society is not sufficiently aware and prepared to implement the necessary change to pursue the circularity paradigm</li> <li>• <b>Essential driver:</b> The great importance of the government's support</li> </ul>	
Relative agreement:	
<ul style="list-style-type: none"> <li>• <b>Sustainability concept:</b> CE enables sustainability. However, discrepancies can be observed</li> <li>• <b>Social dimension:</b> Only few interviewees claim CE promotes the social dimension of sustainability.</li> </ul>	
Lowest agreement:	
<ul style="list-style-type: none"> <li>• <b>CE limits:</b> No single limit on which all interviewees agreed</li> <li>• <b>Economic growth.</b> Contradictory visions:                             <ul style="list-style-type: none"> <li>◦ CE allow us to continue growing, albeit in a more sustainable way.</li> <li>◦ Global growth is incompatible with the reduction in consumption required by the CE</li> </ul> </li> </ul>	
A reflection worth mentioning:	
<ul style="list-style-type: none"> <li>• <b>CE MUST</b> encourage the creation of activities with a <b>positive impact</b></li> </ul>	

Source: Own elaboration.

citizen participation - a key aspect of sustainability for one of the participants.

Regarding the relationship between visions of CE and sus-



tainability, it is observed that, while one of the interviewees refers to the relationship of CE and the three axis of sustainability, another interviewee states clearly that CE is only related to the environmental axis. Other interviewees believe that the concept is mainly related to environmental and economic aspects, and less to the social aspects. Finally, some others are unclear on this issue. Therefore, all agreed on the existence of this relationship between CE and sustainability though not in the same way.

Related to the opportunities, benefits, challenges or limits CE may have, the responses highlight that the interviewees see more opportunities than challenges. The opportunity most commonly mentioned is that CE can improve the employment rates in the territory, as it leads to the creation of various employment opportunities within the automotive sector. As this has been the most frequently repeated benefit, we decided to analyse what relationship the interviewees believe CE can have with economic growth. The majority response was that the two concepts are closely linked i.e. that CE would be a tool that will allow us to continue growing, albeit in a more sustainable way than we have so far. However, one of the interviewees states just the opposite; that these are contradictory concepts. He points out that a region such as the EU could indeed continue growing in the medium term because it has found a market niche in CE where companies can be more competitive. But in the long-term, global growth is seen as incompatible with the reduction of production and consumption required by a sustainable development approach.

Another widely mentioned benefit is that CE will improve society's level of education, and citizens will be more aware of their consumption patterns and of their individual capacity to generate an impact on reduction of the global linear production and consumption model. The impact CE could have on improving companies' information transparency has been also mentioned. Finally, of interest is/was that one of the interviewees affirms that this system may counteract the relocation of companies and the problems thereof, both on the society of origin and destination.

With regard to the limits, there is no single limit on which all interviewees agreed: physical limits for recycling and reusing waste, the fact that the final prices of products using recycled materials are more expensive, or that certain products from distant sources are cheaper than local ones, have been mentioned. The difficulty of the concept itself, which covers several variables and fields and may lead to confusion, is also mentioned as a limit for the development and the implementation of CE.

Another aspect the CE paradigm may have is the limits that it should impose on our society and that we should all accept. It was commented that activities that produce 100% non-recyclable or non-reusable waste should not be produced or carried out and that consequently, effort should be focused on transforming linear processes to natural cycles.

This last idea of imposing some limits on society leads us to observe the power that citizen action and engagement can have in driving us towards a more circular scenario. The interviewees claim that the power of citizens will be the driving force that will make it possible. However, they clearly state that they do not believe that society is currently sufficiently aware and prepared to implement the necessary changes in order to pursue the circularity paradigm. They noted that citizens are very reluctant to abandon their current habits in favour of more circular ones. Nevertheless, they do consider that public awareness has improved in general in recent years. Related specifically to Basque Country, they con-

sidered public awareness is above average when compared to the worldwide population.

One of the keys to this greater awareness may be due to the involvement of local government in promoting and supporting activities, which they consider part of the CE. The majority of the interviewees knew of projects promoted by the government related to recycling and on a professional level, the majority of respondents stated they work closely with the local government on waste recovery activities, recycling, research projects, protecting the condition of the coast or sustainable mobility. Thus, the interviewees have positively valued the efforts made by the local government, although, in their opinion, to date it has not been enough.

## 6. Discussion

The relation between current modes of production and consumption and their impacts on the economy, society and nature are both complex and multi-dimensional. A renewed interest currently exists in mitigating the effects the economic model has on the triple axis of sustainability, which very importantly includes CE (Kirchherr and van Santen, 2019) and its role in the achievement of a model of production and consumption that may be sustainable and that takes into account the needs of present and future generations.

In order for CE to be able to reach its full potential it is necessary to know what is meant by CE and how it can become the lever towards a more equitable future, fair and harmonious with nature. The study of this phenomena is sparse in previous academic literature and fails to present any clear image concerning the values associated with CE and the role it has and may yet play to lead us to a scenario of sustainability.

Therefore, the objective of this paper is to analyse the shared values, meanings and concepts of CE and its links to the sustainable development triple axis. In order to address this complex research objective, this exploratory work is focused from a transdisciplinary perspective using the RRI framework and community-based participatory research. This has been possible thanks to the interest from the Basque Public Administration in promoting spaces for research and multistakeholder participation which has led to the identification of challenges that we face as a society.

The results obtained confirm that economic and ecological sustainability are closely linked to the values of CE, whereas that of social sustainability is cornered. From the results obtained from the focus group, values and concepts such as raw materials and resources, the environment and the importance of process and product design stand out, as well as highlighting role of public administration as a lever for the achievement of an innovative and efficient model of resource consumption. This work also provides evidence concerning the values of CE most aligned with social sustainability (Korhonen et al., 2018a; Padilla-Rivera et al., 2020), though in smaller measure. Values of CE such as responsible consumption (which is also linked to the ecological axis of sustainability) social equality and workers' welfare were highlighted by study participants. Other values that are linked with social sustainability and that also surface among the focus group are participation, employment and talent as well as networks.

The in-depth interviews permit us to enrich the results obtained from the focus group to analyze CE in greater detail and its links to sustainable development. This also results in concepts more aligned with the economic and ecological axis of sustainability. The environmental impacts, the use and re-use of end-of-life products and their reintroduction back into

the value chain, the use of 3Rs at all scales, eco-design, resource and process efficiency are the most highlighted values of CE by the interviewees in line with previous academic works.

The instrumental perception of CE as a tool for reaching sustainable development is also a much-shared vision (Clube & Tennant, 2020), although some interviewees recognized that they did not clearly understand the link between CE and the paradigm of sustainable development. So that CE can achieve its maximum contribution to sustainable development some interviewees highlighted the importance of education, the participation of citizens and the support of public administrations.

Finally, in relation to the limits that CE may have in the future no interviewee refers to the thermodynamic nor system boundary limits, nor those imposed by the physical scale of the economy, nor limits posed by path-dependency and lock-in of limits of governance and management (Korhonen et. al, 2018a) although some interviewees do express their concern about the limits that a lack of knowledge concerning the nature of CE may lead to in the future.

## 7. Conclusions

Currently, the circular economy is generating a very significant interest among public agencies on the part of scholars as well as practitioners. In academic literature, the growth of related papers is notable, influenced by the publication of the report "Towards the Circular Economy" by the Ellen McArthur foundation in 2012; and by the "Action Plan on Circular Economy" from the European Commission in 2015. However, in spite of this enthusiasm little remains known concerning what CE represents conceptually and consequently, about its potential and its links with the objectives of sustainable development.

The aim of this paper is to present evidence for the improvement of knowledge concerning the CE paradigm, and is focused on the values of CE and its links to sustainable development triple axis. With this objective in mind, we focus on a specific sector and territory, the Basque automotive sector, and we apply a transdisciplinary approach based on RRI framework and on community-based participatory research.

Our research evidences the values of CE and the different levels of concordance or dissonance between CE and those concepts or values associated with the three dimensions of sustainability. Results revealed herein re-enforce those obtained from previous academic works regarding aspects related to the three axis of sustainability: economic, social and ecological. Therefore this research work confirms that CE is associated with values and concepts related to the economic and environmental sustainability in greater measure whereas, with social sustainability in a lesser or very small measure.

Secondly, this exploratory study is focused on a transdisciplinary approach, novel in the study of the values of CE and its links to sustainable development. Based on community-engagement research this work contributes evidence such as competitiveness, value retention, economic efficiency, energy efficiency, these being the most frequently linked to CE. It also appears that CE and economic growth are closely linked. Other values emerge from this link of a social nature e.g. improvement of employment rates, social equality and workers-welfare. However, neither the interviewees nor stakeholders mention social justice or future generations among values of CE. Therefore, the results of this exploratory work confirm the economic axis followed by the ecological axis as the two

dimensions that prevail in the relationship that CE has with the objectives of sustainable development (Kristensen & Mosgaard, 2020). We also provide evidence that the social axis is cornered. These results reveal a soft orientation of the nature of CE and what it may become in the field of sustainable development.

This research, which is innovative in the sense that it is the first work geared towards analyzing the values of CE and its links to sustainable development in the Basque Country's automotive sector, offers three contributions. Firstly, it applies transdisciplinarity to a new context, namely CE values and their links to the three dimensions of sustainability. Secondly, it provides the area of CE with knowledge relating to the values of CE and how these values are related to the triple axis of sustainable development. Finally, it provides knowledge of how values of CE might undermine the role and opportunities of CE in achieving the objectives of sustainable development.

Based on the RRI framework and on a community-engagement research a main limitation of this work is that the study has been carried out in a specific sector of a specific region and that the empirical research is small-N. A further limitation relates to how primary data has been obtained. These aspects limit the possibility of generalizing the results obtained, so further research will be necessary in the field of CE. Therefore, the research could be extended by substantiating this factor. Finally, the work could also be extended with a case study, a methodology which would give greater insight into the values of CE and its link to sustainable development triple axis.

## Acknowledgements

The authors thanks the participants in the EMAN Europe 2022: Towards a new accounting/management for Circular Economy congress, for their feedbacks. We also thanks Professor Iñaki Heras-Saizarbitoria and Professor Igor Alvarez for their helpful advice. We want to thank the reviewers for their constructive critics to this manuscript.

## Funding

This work was supported by the Spanish Ministry of Science, Innovation and Universities (Ref: PID2019-107822RB-I00), the Basque Government (Ref: IT1679-22), and the Vice-rector of the UPV/EHU-Gipuzkoa Campus/ Provincial Government of Gipuzkoa (Ref: P7-L4).

## Conflict of interests

The authors declare no conflict of interests.

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