EXPLORING AND EVALUATING BUSINESS SHOWCASES FROM THE CIRCULAR ECONOMY INDUSTRY PLATFORM

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Abstract: The concept of circular economy has gained momentum in the political, scientific and economic debate in the last few years as a means to promote more sustainable production and consumption patterns in a growing economy. With the Circular Economy Package, the European Union has released an ambitious program that aims to guide the European economy towards a more circular economic system. However, concerns have been raised that circularity in itself does not guarantee environmentally sustainable outcomes. Therefore, in this research 131 projects from the Circular Economy Industry Platform (CEIP) are evaluated regarding their contribution to circular economy from both a scientific and political perspective. Content analysis was applied to derive qualitative and quantitative information from company statements on the platform. This was supplemented by qualitative, semi-structured interviews with company representatives on selected projects. Results showed a diverse approach to circularity across the sample projects, thereby partly expanding the sectoral focus of the circular economy package. Furthermore, eco-design, eco-innovation and business models acted as strong enablers for circular actions in the sample, reflecting respective EU policies. At the same time, sample projects heavily relied on recycling while missing out on potentially more efficient circular principles such as reduction or reuse. High diversity was found regarding the evaluation of overall environmental impacts, with some projects using purely qualitative assessment methods, while other projects presented elaborate quantitative environmental evaluations, including significant positive impact potential. Regulatory challenges were specifically reported regarding the introduction of sound circularity quotas and targets, regarding definitional ambiguities, as well as regarding issues around unknown material compositions that currently impede recirculation.

1 Introduction

The concept of circular economy (CE) has gained momentum in the political, scientific and economic debate in recent years as a means to promote more sustainable production and consumption patterns in a growing economy (Ellen Macarthur Foundation, 2012). In Europe, the circular economy package (CEP) from the policy side aims at (i) increasing economic growth and innovation, (ii) self-sufficiency and security, and job creation as well as (iii) more sustainable production and consumption patterns, thereby addressing the three pillars of sustainability in an indirect way (European Commission, 2015). However, among the scientific community, concerns have been raised regarding the intrinsic advantages of a CE in terms of sustainability. Examples can be found in Geissdoerfer et al. (2017), Korhonen et al. (2018a, 2018b) and Fellner et al. (2017). To gain a holistic perspective of the systemic nature of CE, cross-disciplinary analysis was proposed when approaching CE (Murray et al., 2017; Sauvé et al., 2016). The contribution of business efforts towards a CE needs to be evaluated thoroughly at an organizational, a qualitative, and, finally, a quantitative level in order to cover aspects that lead to an efficient and purpose-driven CE. Therefore, in the present study 131 circular projects from the Circular

Economy Industry Platform (CEIP) were analyzed from a political and scientific point of view, including CE levels (micro, meso, macro), principles (namely reduce, reuse, recycle, remanufacture, redesign, recover), enablers (business models, collaborative consumption, extended producer responsibility, product-service-systems, eco-design, and eco-innovation), as well as impact assessment (including widely applied assessment methods, specific circularity indicators, as well as indicator sets).

The research framework, including the different spheres, is depicted in Figure 1. For the evaluation, content analysis was applied and semi-structured expert interviews with five exemplary project representatives were conducted. Analysis included an inductive and a deductive component.

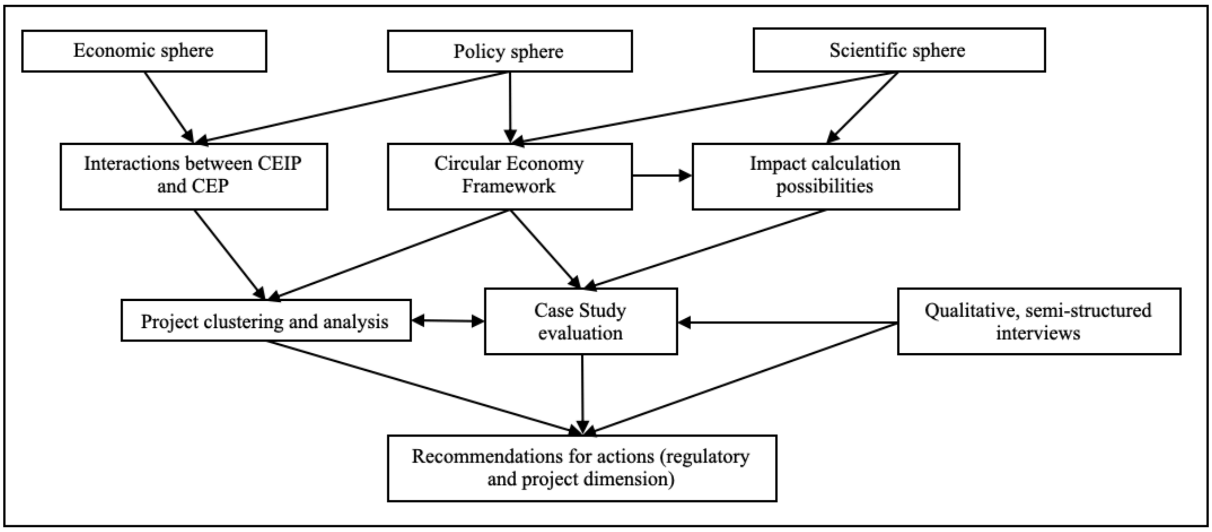

Figure 1: Research framework

2 General analysis

Altogether, 131 projects were analyzed in this work. Projects were spread across various sectors (20 plus 'Other'), life cycle stages (from design to waste management), and nations (25 plus 'EU' and 'Global'). In all cases multiple allocation was possible.

Regarding sector, a strong representation of the textile sector was especially noticeable, which has not yet reached the center of attention in European policy making. Other strong sectors in the sample included easy-to-recycle materials (such as the construction sector or mining, metals and minerals), traditional sectors (such as chemicals and forest and bio-based industries), as well as sectors in which circularity issues are increasingly important (such as plastics). On the other hand, from the CEP perspective, the food sector and the area of critical raw materials were underrepresented in the sample.

Country performance in the sample was normalized using the respective countries' GDPs to calculate relative over- or underperformance in the sample. Results showed that especially economically smaller EU member states exceeded their target values, whereas some of the economically stronger member states (Germany and Italy in particular) underperformed relative to their relative economic power. Some member states' (most notably from Ireland, Portugal, and Romania) companies did not provide any examples until the cut-off date (25 June 2018).

2.1 CE levels, principles, and enablers in the sample

Levels: Projects were subdivided according to three different levels: micro level projects occur at the company, product, or process level (Banaité, 2016; Su et al., 2013). In the sample, 112 projects could

Table 1: Correlation between principles and enablers in the sample

CE element	Business Model		Eco-innov.		Eco-design		EPR		PSS		Coll. Cons.		Reman.		Redesign		Reuse		Reduce		Recover		Recycle	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Business Model (77)	25	32,47	31	40,26	21	27,27	11	14,29	6	7,79	3	3,9	10	12,99	11	14,29	15	19,48	10	12,99	32	41,56	49	63,64
Eco-innovation (58)	31	53,45	17	29,31	17	29,31	2	3,45	1	1,72	2	3,45	0	0	9	15,52	8	13,79	9	15,52	31	53,45	31	53,45
Eco-design(50)	21	42	17	34	18	36	5	10	2	4	0	0	3	6	14	28	9	18	12	24	10	20	38	76
Ext. Prod. Resp. (20)	11	55	2	10	5	25	7	35	3	15	0	0	7	35	3	15	8	40	2	10	2	10	14	70
Prod-serv-syst. (7)	6	85,71	1	14,29	2	28,57	3	42,86	0	0	0	0	3	42,86	2	28,57	4	57,14	2	28,57	0	0	5	71,43
Collab. consumpt. (3)	3	100	2	66,67	0	0	0	0	0	0	0	0	0	0	1	33,33	0	0	2	66,67	2	66,67	0	0
Reman. (12)	10	83,33	0	0	3	25	7	58,33	3	25	0	0	5	41,67	2	16,67	5	41,67	1	8,33	0	0	5	41,67
Redesign (15)	11	73,33	9	60	14	93,33	3	20	2	13,33	1	6,67	2	13,33	1	6,67	6	40	5	33,33	6	40	8	53,33
Reduce (21)	10	47,62	9	42,86	12	57,14	2	9,52	2	9,52	2	9,52	1	4,76	5	23,81	3	14,29	8	38,1	4	19,05	11	52,38
Reuse (22)	15	68,18	8	36,36	9	40,91	8	36,36	4	18,18	0	0	5	22,73	6	27,27	0	0	3	13,64	8	36,36	16	72,73
Recover (46)	32	69,57	31	67,39	10	21,74	2	4,35	0	0	2	4,35	0	0	6	13,04	8	17,39	4	8,7	20	43,48	18	39,13
Recycle (85)	49	57,65	31	36,47	38	44,71	14	16,47	5	5,88	0	0	5	5,88	8	9,41	16	18,82	11	12,94	18	21,18	46	54,12

be assigned to this level. Meso level projects take an interorganizational perspective and improve material and resource flows within different organizational entities (Naustdalslid, 2014; Saidani et al., 2017; Yuan et al., 2006). This level accounted for 25 projects (again, multiple assignments were possible). The macro level considers circularity at city, regional, national, or societal level (mostly a spatial entity) (Guo et al., 2017), with the biggest macro level at the EU level being the EU itself. In the CEIP, this level was not represented. The relatively high representation of meso level projects is recognizable since the CEP focuses rather on the micro level. Strong representation of sectors was found for chemicals, forest and bio-based industries, and the construction sector. Moreover, the cement industry (four of six projects) as well as plastics and rubber and the mining sectors were represented strongly. At the same time, 17 of 25 meso- level projects were assigned to a single sector, indicating minor cross-sectoral cooperation projects in the sample.

Enablers: For this research, six CE enablers were chosen to capacitate circular change: business models (Lewandowski, 2016) as a method to incorporate circularity within business considerations, eco-innovation and eco-design (Ghisellini et al., 2016; Preston, 2012) as widely accepted concepts amongst politicians and academics, product-service-systems as an important part of the 'leasing' or 'sharing' economy (Hobson and Lynch, 2016) together with collaborative consumption (Lazarevic and Valve, 2017) and, lastly, extended producer responsibility (Gu et al., 2017; Lazarevic et al., 2010) as an increasingly recognized concept amongst politicians for the purpose of shifting circular considerations to earlier product life cycle stages.

Table 1 displays how enablers and principles are connected with each other in the CEIP projects. Therefore, each CE enabler and CE principle is displayed in a row and a column, which enables connections of enablers and principles within the projects to be highlighted. The level of connection is given absolutely and relatively. For example, the table shows that business models were the most frequently applied enabler by the sample companies, which can be interpreted as a signal that companies see circularity as a business case. The columns of Table 2 depict how the projects including a specific CE element incorporated other CE enablers and principles. For example, projects including remanufacturing, redesign, reuse, and recover seem specifically dependent on new business models (column below Business Model), while at the same time, reduce is noticeably more loosely connected to business models.

The popularity of eco-design and eco-innovation was explained with respective policy programs (European Commission, 2016a, 2011). However, there are also policy programs targeting collaborative consumption (European Commission, 2016b), which is not reflected in increasing uptake of such issues in the sample. The development of such platforms is more perceived as originating from citizens rather than companies.

Principles: Parallel to the enablers, Table 1 shows how the projects made use of six selected CE principles, including the 3 Rs (reduce, reuse, recycle) (Reike et al., 2017), as well as remanufacture, recover, and redesign, forming a set of 6 Rs in total (Jawahir and Bradley, 2016). It can be seen that recycling is by far the most frequently applied principle in the project sample. This finding is consistent with the popularity of this principle and its easy-to-implement nature in specific sectors (such as steel or aluminum, where recycling is traditionally applied due to its economic benefits. Furthermore, high concentration of the recycling principle in the sample reflects the political focus – for example, in the CEP (European Commission, 2015), the concept of recycling was mentioned 77 times (followed by reuse and remanufacture with 26 and 19 references, respectively). However, at the same time, recycling is rather seen as a weak circular principle due to many recycling activities being classified as downcycling activities (McDonough and Braungart, 2002) owing to material impurities and / or more low-quality applications (Ghisellini et al., 2016), which is also reflected in the European waste hierarchy (European Commission, 2010). At the same time, Table 1 reveals the considerable importance of recovery of different kinds (materials as well as substances) in the sample. The principle played a higher role than in the CEP, which might be due to the numerous meso level projects in the sample (including some projects that were classified as occurring at the micro level while in fact taking place in a meso level environment). Uptake of the remaining four principles (reuse, reduce, redesign, remanufacture) was less extensive in the sample. Especially reuse, reduce, and redesign were perceived as 'strong' circular economy principles (Geng et al., 2012; Kalmykova et al., 2017; Preston, 2012) requiring more in-depth systemic intervention. At the same time, remanufacturing was intended to spread to sectors where it has not been applied so far (European Commission, 2015), with very limited results in the sample.

Regarding connectivity between enablers and principles, Table 1 shows that the two strongest principles - recycling and recovery - were also strong stand-alone principles: For recycling (recovery), 54,12% (43,48%) of the projects were solely based on the respective CE principle (excluding enablers) – this is the highest rate for both enablers and principles. This result indicates that some 'weaker' CE principles also showed less interrelation or integration with other CE principles.

2.2 Evaluation of self-assessment of the projects

Sample projects were further analyzed according to their environmental self-assessment. In doing so, two layers were subdivided in terms of three types of data provision: general provision of quantitative data (e.g. a specific amount of material is remanufactured yearly), provision of specific quantitative data (e.g. CO_2 eq. emission savings), and provision of qualitative data. Furthermore, the three sustainability pillars (social, economic, environmental) were included, whereas projects could be assigned to more than one category and data provision level. The results are depicted in Figure 2, including a further layer on categories of environmental and specific quantitative self-assessment. Data for Figure 2 was solely extracted from the CEIP. Consequently, even if companies conducted detailed environmental assessments without mentioning this on the platform, this information was not accounted for. Even though it was assumed that environmental added values – if calculated – would be communicated by the company officials, this is a possible source for inconsistencies.

This research set a focus on environmental self-assessment. Consequently, the following paragraphs refer to this part of the analysis, if not indicated otherwise.

Qualitative analysis: Figure 2 shows that 28 projects in the sample reported environmental added value only on a qualitative basis. Those projects are a cross-section of all projects in the sample, including all enablers and principles. Hence, it could not be concluded that projects considering a specific principle were more likely to deliver quantitative impact values. As possible reasons, the high costs of third-party LCAs, the guideline delivered via the European waste hierarchy, and other policy recommendations were mentioned. This qualitative approach to environmental analysis has been investigated (Veleva et al., 2017). However, it was argued that by following such guidelines without questioning the levels or calculating environmental benefits, trade-offs and alternative scenarios will not be assessed appropriately and improvement options may remain unrealized (Geissdoerfer et al., 2017; Saidani et al., 2017).

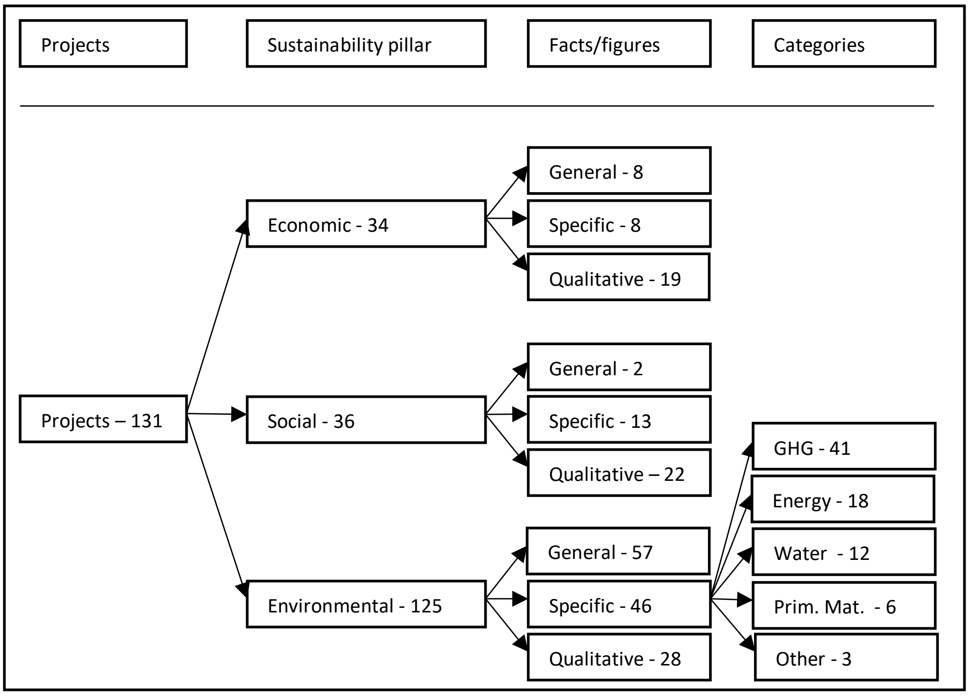

Figure 2: Distribution of project self-evaluation in the sample

General quantitative analysis: 57 sample projects published general quantitative values. General quantitative information was considered to be high-level information or information that is rather a precondition for further analysis. For example, data on saved material quantities require further analysis (e.g. through LCA) in order to determine actual environmental impacts. This general quantitative data is part of traditional MFA or resource efficiency metrics and also a prerequisite for some circularity indicators (see next paragraph). In line with the focus of the EU on resource efficiency, data on material savings, recycled material use over time or recycled content determine those added value sections.

Specific quantitative analysis: Delivering life-cycle specific data was the most common method for project assessment (see Figure 2). This matches findings from other authors. At the same time, within this, a focus on GHG emissions as a category for measuring environmental impact is observable throughout the projects in the CEIP. In total, of the 46 projects that have provided specific quantitative environmental data, 41 provide information related to the emission of CO_2eqs. Among those, 15 solely mention this indicator without communicating any other impact category. It is possible that companies do not upload all information they have on the CEIP, hence the number of projects calculating the global warming potential (GWP) as a single impact category might be smaller. Next to CO_2 emissions and GWP, energy related indicators (cumulative energy demand, primary energy reduction, etc.) were mentioned frequently (18 projects), followed by water (water footprint, water savings) (twelve) and reduction in resource depletion or primary material use (six). The field 'other' in Figure 10 refers to other LCA impact categories, which were only marginally represented: Information on eutrophication/acidification, a cumulated environmental footprint, and land use change were uploaded by one project each.

For other assessment methods, such as specific circularity indicators (Saidani et al., forthcoming) or indicator sets for connecting circular, environmental and social assessment (e.g. Pauliuk, 2018), little evidence was found (zero and one project, respectively). Practical relevance, at least in the sample, was therefore negligible.

Methodological issues: Apart from the variations in data provision, several methodological issues were found in the sample. Three aspects will be mentioned briefly in the following:

1) *Centrality and suitability of CE aspect in project:* A number of projects focused on circular aspects that only contribute to a very small extent to the overall environmental aspect of the product.
2) *The question of system boundaries:* For some projects, the origin and calculation of the environmental added values was not transparent (e.g. if not done by an external organization such as universities or research institutes). Hence, central questions, for example regarding the system boundaries and potential rebound effects of projects, remained unaddressed and possibly lead to publication of misleading figures regarding e.g. emission savings. The issue of system boundaries in environmental impact calculation has also been mentioned by other authors (Kjaer et al., 2016; Peters, 2016). Furthermore, strong potential rebound effects of product-service systems as well as collaborative consumption schemes have already been addressed in the literature (Korhonen et al., 2018b; Pagoropoulos et al., 2017).
3) *The difference of data accuracy in communication:* Some projects with a similar focus (e.g. post-industrial textile scrap recovery and recycling) differed in the provision of information regarding their environmental added value. It was found that with higher data accuracy levels, trade-offs as well as the strengths and weaknesses of a technology become clearer, while at the same time communication of those results becomes more complex. Also, formulations such as *"fully sustainable"* production processes had to be qualified in that context.

2.3 The CEIP projects in the policy environment

Apart from an analysis of the sample projects from a scientific CE perspective, company efforts were also looked at in terms of policy. While uptake of policy ideas regarding CE levels, enablers and principles was already discussed in the previous chapter, this chapter focuses on sectoral representation as well as regulatory challenges.

Sectors and focal areas: The CEP defines five focal areas (plastics, food waste, critical raw materials, construction and demolition, biomass & bio-based products) for a transition towards a more circular economy. Additionally, three sectors are mentioned frequently (chemicals, fertilizer, electrical and electronic equipment).

For the focal areas, results indicate that especially the construction and demolition sector in the sample is performing well with respect to the intention of the CEP. Moreover, the plastics sector seems – according to the sample – to reflect European policy intentions, albeit with a big focus on recycling. This is especially relevant in the light of the EU's directive on the reduction of the impact of certain plastic products on the environment (European Commission, 2018). Also, the biomass & bio-based industries were represented frequently in the sample, with a dichotomous approach to circularity including either the replacement of fossil materials (the core aspect in the CEP, which was found in two projects) or improvements on process efficiencies and inter-organizational circularity. On the other hand, inclusion of critical raw materials and food waste is underrepresented in the sample.

In terms of sectors, the following results can be compiled: The projects reported by the fertilizer industry are divided into two categories (increasing production efficiency of existing, mostly mineral, fertilizers and fertilizers based on bio-based materials, as well as waste), which corresponds to the inclusion of the sector in the CEP. On the other hand, the chemicals industry approached circularity mainly through increasing process efficiency but did not address the focus it was given in the CEP. Furthermore, for electric and electronical equipment it was found that the sample in certain respects reflects the CEP's intention (e.g. the strong inclusion of remanufacturing), while others (e.g. improved or re-design) are absent in the sample. At the same time, the textile sector contributes decisively to the CEIP. However, the sector has not been addressed centrally in the CEP and is hence not yet in the focus of policy considerations on CE.

Regulatory challenges: When submitting projects to the CEIP, companies had the opportunity to mention challenges they face during the transition to a more circular economy. Those barriers included, among others, cultural barriers, regulatory barriers and technological barriers. Due to the focus of this research, the three most important regulatory barriers were extracted and analyzed in more detail for this analysis. Results are depicted in Table 2. Three central aspects were identified: First, companies called for establishing legislative activities that aim at increasing knowledge on the material composition of products to enable recycling efforts across companies and supply chains. This was mentioned e.g. in the textile sector, but also in meso level projects. Second, projects faced significant issues using secondary raw materials due to definitional restrictions. This was found to be a central issue among the sample, also leading to or at least supporting the emergence of other barriers, e.g. difficulties in cross-country waste shipment. Third, a lack of quotas was perceived as a hindrance or disincentive affecting company behavior. At the same time, some projects stated that for the remanufacturing of waste electric and electronic equipment, those quotas already exist on national or regional levels.

Table 2: Regulatory challenges as mentioned in the sample

Barrier (# projects)	Sectors (# projects)	Specification
Missing definitions and/or standards (52)	Chemicals (10); plastics and rubber (8); waste management (8)	- Definitional issues (waste, by-products, SRMs) impede recirculation - Cross-border shipment (e.g. difficulties to import remanufactured spare parts) - Missing legislative inclusion of gas recovery and lacking access to funding - Call for more standardised product declarations for more security regarding material composition (relevant for recirculation) - Stronger standardisation of legal perspective and assessment
Lack of government enforcement and cooperation (45)	Absolute: Textiles (13); Chemicals (7); Waste management (7) Relative: cement (4 of 5); steel (4 of 6)	- Demand for stronger government and EU actions to push textile companies towards circular practices - Incentives to support expensive recycling activities - Lack of willingness of national or regional governments to enforce EU legislation - Recognition of environmental performance in Green Public Procurement
Lack of harmoni-sation in EU legislation (30)	Forest and bio-based industries (6); plastics and rubber (5); ICT (5)	- Relatively high importance in ICT (5 of 9 projects) - EU WEEE directive (European Parliament and the Council, 2012) lacks support of other principles than recycling → such targets can be found in Spain and the Belgian region of Flanders - European measures decreasing landfilling of cartridges demanded

3 Discussion

In the following, some central findings are considered for further discussion and set in correlation.

The systemic nature of CE transition: CE is described as requiring a systemic reconsideration of production and consumption processes (Ellen Macarthur Foundation, 2012; European Commission, 2015), including a change in company behavior. However, while business models in the CEIP sample are the strongest enabler, it is argued that the intended systemic shift has just begun for practitioners.

This might be due to the weak incorporation of enablers that tackle the contemporary economic structure into those BMs, such as product-service systems, which are believed to enable the creation of better end-of-life options for goods, as well as longer product lifetimes (Gnoni et al., 2017).

Furthermore, the incorporation of CE principles that are believed to be central for achieving circular patterns beyond resource efficiency – such as redesign (Murray et al., 2017) – is underrepresented in the sample (with the construction sector being an exception). Furthermore, the reduce and reuse principles (as the highest principles of the waste hierarchy) have not found their way into the center of the CEIP's circular business-making considerations (see also the next paragraph). At the same time, the strong inclusion of eco-design and eco-innovation in circular projects (which was partly related to the respective European policy strategies) show that the shift of circular considerations towards the design and sourcing phases, as suggested by Murray et al. (2017) and Reike et al. (2017), is taking place.

Principles and focus on recycling: Findings show that the sample projects were heavily relying on the recycling principle, which reflects the current policy and scientific focus (Castellani et al., 2015; Ghisellini et al., 2016; see also chapter 2.1). However, this focus is also perceived critically since the idea of CE is more systemic and more systematic (see previous paragraph), and since recycling (referring to both closed-loop and open-loop recycling) in general is seen as a rather inefficient circular strategy (Castellani et al., 2015). Hence, potential environmental benefits might be undermined (Geng et al., 2012), which is also reflected in the waste hierarchy, where the recycling principle is ranked third. Also, the danger of downcycling through material contamination has been raised by Scharff (2016) as well as McDonough and Braungart (2013). Consequently, a push towards more active support and consideration of other CE principles was proposed, and schools of thought shaping the conception of CE propose frameworks going beyond recycling (Ellen Macarthur Foundation, 2012; McDonough and Braungart, 2013). It should be noted that the unidimensional and exclusive consideration of recycling strategies is reflected here, and that recycling is not seen as a subordinate principle as such.

Self-assessment of projects: The variety of data and the absence of quantitative data for a considerable number of projects (see Figure 2) only allows for very limited statements regarding the projects' contributions towards more sustainable production and consumption patterns in the EU. In total, some projects were deemed to be of high potential for CE development in Europe, while for some projects doubts regarding impact potential or centrality arose (e.g. due to the definition of system boundaries). In general, for some projects data availability was also low due to the novelty of the projects (e.g. if companies focus more on ex post instead of both ex ante and ex post analysis) or data was not submitted due to competitiveness concerns. Nevertheless, the variety of data provision shows that the current approach to measuring impacts of CE efforts is non-uniform and not standardized. Moreover, a mismatch between the EU's micro level focus on CE implementation and macro-level focus on CE assessment is said to contribute to this structure and to entail significant risks of a CE rebound (Zink and Geyer, 2017).

The regulatory side: The regulatory side is seen as establishing the framework for a successful CE transition. According to Reike et al. (2017), CE is currently in an organizational implementation phase, hence the momentum of introducing CE regulations is given. Furthermore, public interest in these issues (or at least sub-issues) is growing (Chertow, 2008; Lacy and Rutqvist, 2015). The most relevant regulatory barriers in the sample are harmonization of EU and national legislation, lack of government enforcement and cooperation, as well as missing definitions and standards. It is argued that a coherent and diverse policy mix could push companies towards a more diverse inclusion of CE principles. For example, the introduction of reduction targets on certain single-use plastic products as proposed in the European directive on the reduction of the impact of certain plastic products on the environment (European Commission, 2018) is an example of the possible expansion of targets to push certain CE principles. Such measures, in their most radical form including market restrictions (e.g. on single-use plastic cutlery, plates, stirrers, and straws), are argued to be necessary in cases such as plastics, where the high functionality of the material, the increasing consumption due to e.g. a trend towards more convenience, and the low cost of virgin materials decelerate market-driven circulation. Parallel to such efforts, support for achieving cleaner material cycles (e.g. through funding or material declaration requirements) could enable companies to actively engage in more circular practices.

4 Conclusions

The analysis of the business showcases of the Circular Economy Industry Platform lead to the following general conclusions and recommendations:

- Policies can establish a level-playing field for companies to address CE in a holistic manner. Therefore, stronger standardization and a coherent policy mix for cleaner material cycles is needed (including, among others, funding mechanisms and extended producer responsibility schemes). In addition, a more holistic incorporation of CE principles is encouraged, including prohibitions as a last resort mechanism.
- Sample projects are starting to embrace CE as a design concept and partly initiated the systemic transition. However, if CE is to decisively contribute to SDG 12 (sustainable production and consumption patterns), more radical embracement of far-reaching principles and enablers by all societal actors will be necessary. Moreover, a more standardized assessment procedure is required in order to determine the best possible options due to the ambiguities regarding environmental performance of a CE.
- An overarching sectoral view is to be implemented in the policy sphere. For example, the CEP so far has not focused on the textile industry, leading to a perceived lack of governmental support from textile companies
- The current phase of CE requires a holistic inclusion of actors. Therefore, it is encouraged that the role of society be revised. Societal and public acceptance (license to operate) of company behavior is seen as an important driver. However, research on the topic is very limited so far. In contrast, societal acceptance of circular approaches is generally perceived as low, and hence regarded as a barrier. Research to acquire more detailed knowledge of those mechanisms influencing societal behavior and acceptance is encouraged in order to exploit windows of opportunity for action-taking.

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