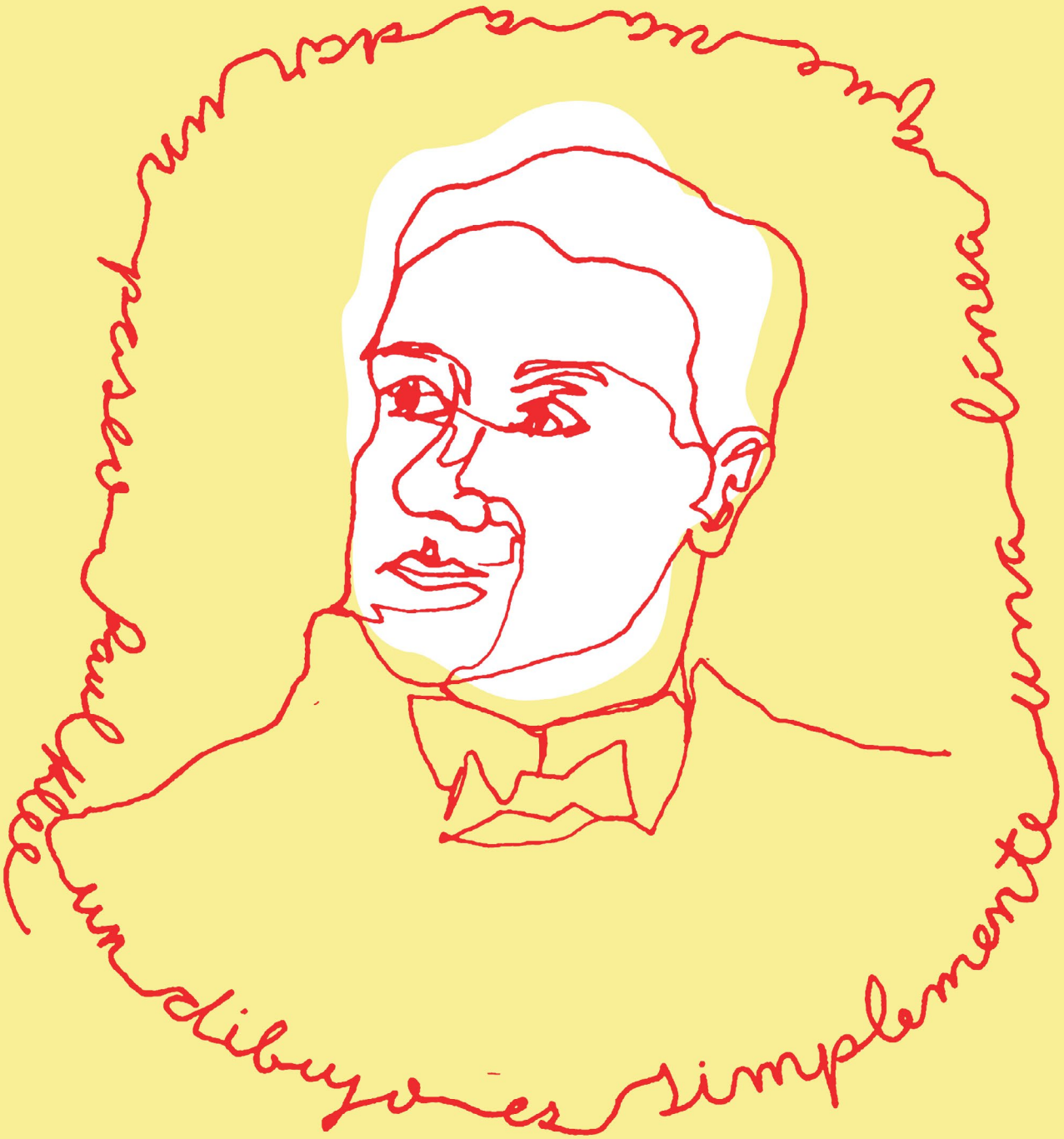

Un dibujo es simplemente una línea que va a dar un paseo.

Paul Klee

Ilustración | Andrea Herrera

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Futures Studies & the Circular Economy: an Interdisciplinary Approach to Sustainable Development

Futures Studies & the Circular Economy: an Interdisciplinary Approach to Sustainable Development

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Resumen

Aunque la Economía Circular (EC) está ganando importancia como paradigma económico para suplantar a la economía lineal, no ha desarrollado todavía el cómo transitar del presente al futuro. ¿Y si el futuro es diferente al que EC espera? Nosotros argumentamos que la EC no puede contestar a esta pregunta adecuadamente y por lo tanto no es capaz de desarrollar este entendimiento sola. Para abordar dicha carencia proponemos Estudios de Futuros (EF) como la disciplina complementaria a EC, ya que le ofrece lo que necesita, métodos para explorar los futuros alternativos. Mientras ambas comunidades están enfocadas en el mismo objetivo—un futuro sustentable—han interactuado muy poco hasta ahora. Esta investigación representa el primer paso para incorporar de manera realista a EF dentro del debate de la EC, y revisa el marco teórico y literatura de ambas disciplinas, para resaltar sinergias potenciales y trazar un camino hacia dónde ir y cómo empezar.

Palabras clave | Economía Circular, Estudios de Futuros, desarrollo sostenible.

Los Estudios del Futuro y la Economía Circular: un enfoque interdisciplinario para el desarrollo sostenible

Abstract

While the Circular Economy (CE) is gaining traction as a new economic paradigm to overcome the linear economy, it has not yet developed an understanding on how to transition from the present into the future. What if the future is different from what the CE expects? We argue that the CE cannot answer this question adequately and therefore is not capable of developing this understanding alone. To address this shortcoming, we propose Futures Studies (FS) as a complementary discipline because it offers exactly what CE lacks: methods to explore alternative futures. Whilst both communities are working towards the same goal —a sustainable tomorrow— until now they show little to no interaction. This research represents a first step towards embedding realistic considerations of futures into the CE debate: it reviews literature in both fields and their theoretical background to highlight potential synergies, and lay a path on where and how to start.

Keywords | Circular Economy, Futures Studies, sustainable development.

Circular Economy (CE) as a new economic and development paradigm has gained momentum in the past decade. Nonetheless this concept still needs to be critically questioned (Korhonen, Nuur, Feldmann & Birkie, 2018) in order to prove its ambition to become the most appropriate paradigm to accelerate the transition to a sustainable development (Pomponi & Moncaster, 2017). While the CE operates in the present it also sets a clear vision for a sustainable future. However, existing guidance on and research into CE just promotes a partial vision—only one story—of how transformation should and will take place (Lazarevic & Valve, 2017). What if the future is different from what CE anticipates? This discipline alone cannot adequately answer this question. This is the operating field of Futures Studies (FS). It is, therefore, essential that both disciplines—whilst working towards the same goal of a sustainable tomorrow—start communicating to each other.

Against this background, this paper has two research objectives. Objective one is to give evidence of the existing gap between CE and FS communities, using a bibliometric review and snowballing technique. Objective two is to provide an initial approach that integrates CE principles and FS methods as a preliminary model for CE to address the future thoroughly. We argue that FS could function as a complementary discipline for CE where visions created in synergy are put into action systematically and then pursued to be sustained. To our knowledge this research is the first of its kind by considering FS into the CE debate.

The remainder paper is organised as follows. Next section provides an examination of the existing studies related to the disciplines of CE and FS and their application in the built environment, followed by a brief introduction to FS, its methods and a generic framework. Section 3 elaborates on a synopsis that shows the lack of interaction between both disciplines and gives recommendations on how this untapped potential could be accessed. Last section elaborates on where the synergy between CE and FS sits, suggests a combined initial methodological framework and concludes the paper.

Existing studies

CE has been defined in numerous ways (Ruiz-Real, Uribe-Toril, Valenciano & Gázquez-Abad, 2018) yet, no single definition of or consensus about what CE means has been achieved so far (Kirchherr, Reike & Hekkert, 2017; Merli, Preziosi & Acampora, 2018). However, it is important to delimitate and clarify what definition is considered most precise for the purpose of this research when referring to CE. We align ourselves with the definition proposed by Kirchherr y cols. who describes it as:

> An economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations (Kirchherr, Reike & Hekkert, 2017, p. 224).

This CE definition is helpful for the following reasons. It clarifies that CE is an economic system, not a design technique, a framework or a movement. It includes different levels of operation; micro, meso and macro, which help within the scope of this research as it focuses on the macro-level, particularly cities. It also defines the aim of CE, which is to accomplish sustainable development, unlike other definitions that seem to only stress perpetuating cycles of materials and components as much as possible. Lastly, it makes clear that to operate within CE implies not just seeking environmental quality, but that it is equally important to accomplish economic prosperity and social equity for the current and future generations. This is also relevant as most of the studies reviewed do not equally stress the importance of these three pillars and especially social equity is often left behind (Ruiz-Real et al., 2018; Hobson & Lynch, 2016).

As for Futures Studies, more consensus is found on the definition of this evolving discipline. FS is understood as the systematic study of possible, probable and preferable futures including the worldviews and myths that underlie each future (Inayatullah, 2008). An extended explanation on FS is given in section 2.2.

Moreover, we believe that both fields (CE and FS) explicitly require key contributions from the creative economy as they recognise the relevance of the cultural and creative sectors to produce innovate solutions for a sustainable development, in both our contemporary reality and collective futures.

Circular Economy

It was emphasised by Pomponi and Moncaster (2017) that CE must take a future oriented and multidisciplinary approach within cities. However, CE is currently very limited and there is still great room for conceptual improvements and for being more receptive to other research fields (D'Amato, et al., 2017; Geissdoerfer, Savaget, Bocken & Hultink, 2017). Most of the academic and practitioner literature appears to be too optimistic and approbatory (Gregson, Crang, Fuller & Holmes, 2015; Leising, Quist & Bocken, 2018). Recent studies (Lazarevic & Valve, 2017; Petit-Boix & Leipold, 2018) argue that CE must be subjected to deeper examination to avoid leading policy-makers erroneously. A consequence of these limitations within CE is that even opposite conclusions have been found in recent publications, particularly regarding the concept of decoupling growth at the micro and macro level (Kjaer, Pigosso, Niero, Bech & McAloone, 2018; Mayer, Haas, Wiedenhofer, Krausmann, Nuss & Blengini, 2018; Ward, Sutton, Werner, Costanza, Mohr & Simmons, 2016). For example, while CE as an economic system promises to decouple economic growth from environmental impacts and resource extraction, Ward et al. (2016) did not find any historical evidence showing that this could be achieved in absolute terms.

The leading Think-tank on CE, the Ellen MacArthur Foundation, predicts that by 2030 a full adoption of CE could produce better welfare, environmental and social outcomes than the current economic model. Interestingly, it was found by Lazarevic and Valve (2017) that this forecast is highly optimistic compared to other studies, especially because it presupposes that innovation will have a higher pace than what has been observed in the past. A similar approach has been followed by the World Business Council for Sustainable Development (Thelen et al., 2017), leading strategic design studios specialised in CE (Dourma et al., 2017) and journal publications such as Kuzmina, Prendeville, Walker & Charnley (2018) and Mont, Neuvonen & Lähteenoja (2014). Suggestions from these publications are highly approbatory and uncritical of CE. In addition, when they make reference to possible futures, they do so without an explanation on what the process followed to arrive to those scenarios was. The very few publications that have explained how they modelled the future (Neuvonen et al., 2014; Sinclair, Sheldrick, Moreno & Dewberry, 2018) ended building highly optimistic versions that do not seem to reflect realistic global considerations of where the interconnected world is heading to.

For example, when Neuvonen et al. (2014) developed four low-carbon scenarios they forecasted that a considerable increase on fossil fuel prices would persuade people to transition to renewable energies without a substantial conflict. However, current events in France have proven this assumption to be inaccurate as a 20% increase in the price of diesel have caused a significant and violent social mobilisation to fight against this policy since it was implemented seven months ago.

The evidence demonstrates a CE community not being proactively engaged in learning how to study the future and being closed-minded on accepting the possibilities of alternative futures (Dufva et al., 2016). CE also needs to be monitored from a systems perspective to avoid that incoherent CE actions take place that do not contribute to sustainable development (Pauliuk, 2018). CE's lack of a tailored, systemic and detailed focus on the built environment has also been

highlighted by Pomponi and Moncaster (2019) in their review and critique of the BS8001, the world's first standard on circular economy. As a consequence of these limitations, it has become common practice among CE practitioners' publications to encourage cities' managers to learn by doing, to ask them to experiment in order to know how a circular economy really works and at the same time to encourage them to lead in the transition to circular economy. This is evident from a passage of one of the works reviewed for this article:

As of yet, no one has a complete view of the consequences and which actions have to be taken in the long term. Learning by doing and the formation of valuable networks are good first steps. However, we need to step up our efforts to make scaling up to the next phase possible. The transition to the next phase of the circular economy requires the Municipality to act —where necessary—to give direction, to be involved as a network partner and to work together with various stakeholders, in value chains, in sectors and at various scales (Dourma et al., 2017).

This approach could prove to be effective if the context is relatively simple or if it is focused on short-term perspectives. However, clearly this is not the case with the problems the CE is trying to solve which are highly complex and usually require a systems perspective, especially at the macro level.

Ken Webster made evident the absence of a developed approach to the future from the CE discipline. "A linear economy has no real future. But, a circular economy is assumed to be a long-term proposition; it makes a positive assumption about the future: well, simply that there will be one!" (2013, p. 547). Webster's work came as a seminal milestone to avoid wasting time and effort in developing a theoretical framework for the CE from scratch, for he provided a compelling argument for all the things we do know already and acknowledged the vast theoretical basis, primarily on systems thinking, that is available to progress the CE. Yet, he also recognised the major lack of an operational tool (Webster 2013).

Bearing in mind all these limitations for a more circular economy, we aim to contribute to the ongoing debate by questioning CE from a different but complementary angle. Even though CE operates in the here and now it is orientated to what is yet to happen. Since what is yet to happen is not easily perceptible, CE is lacking a methodological tool that systematically evaluates if its approach towards the future is accurate or not. This is highly relevant because CE is not just suggesting significant changes on the macro-scale, it also articulates a radical win-win shift for people and the planet (Lazarevic & Valve, 2017).

The CE community and its thought leaders should take responsibility to cover the open space currently neglected about the future and fix a systemic failure in its underlying principles: to consider the future as unknowable. Current practitioners and researchers on CE have to understand and address the implications that the change of paradigm —from linear to circular economy— involves, as completely as possible. Considering that CE tries to make the old model obsolete, it should not make the same mistake of not developing a foresight capacity in the same way as the linear model did. How could CE avoid making this mistake? This opens the possibility to look for other disciplines that have both the theoretical framework and suitable methodologies for CE to elaborate and integrate the study of the future. The underlying hypothesis behind this research is that without an interdisciplinary approach that integrates FS principles and methodologies in the CE as a system, collective efforts towards achieving a sustainable development would be ineffectively or incompletely addressed by CE.

Futures Studies

The consequences of the industrial period have progressively limited the planet's capacity to support ourselves. Global warming is now the world's biggest concern for policy-makers according to a recent global survey (Rosane, 2019). World problems such as global warming, ocean pollution, land degradation and loss of biodiversity are accelerating at a faster pace than the human ability to solve them (Rockström et al., 2014; Rockström et al., 2016) and they grow in complexity

without really being challenged with transformative alternatives for the future. As Tonkinwise argues, "the futures we are getting hardly seem like the ones we explicitly decide on; they are more like the messed-up ones we are drifting unwittingly and implacably into" (2016, p. 570). The current approaches towards the future have proven to be ineffective to face global challenges and overcome them. Similarly, simply waiting to see what would happen without human beings' positive intervention could prove catastrophic.

The purpose of Futures Studies is to maintain or improve the welfare and freedom of humans, as well as the welfare of all living beings, plants and earth's biosphere for their own sake (Valciukas, 2003). FS has been recognised by Slaughter (1998) as an evolving discipline with the most suitable tools to negotiate the turbulent conditions ahead. In principle, FS believes, as Derbyshire (2016) discusses, that human actions to build the future are partially limited by determinism, but nevertheless have agency to construct a preferable future rather than being passive responders. The great value of FS, as Vásquez (1999) suggests, is in its willingness to transform the present for a better future.

FS has been adopted by organizations and institutions throughout the world to support strategic thinking, organizational development and policy design (Habegger, 2010; van der Steen & van Twist, 2013). The governments of Canada, Finland, Japan, Singapore, South Korea, United Kingdom and United States, among others, have carried out structured approaches that incorporate FS methods, aiming to produce, implement, and execute strategies towards economic growth, technological advancement and a more resilient future (Dawson, 2019). However, FS should not be confused with the same task as planning. FS usually challenges the orthodox future and approaches longer horizons, from ten to fifty, and even to a hundred years (Inayatullah, 2008; Meissner, 2012). Actually, the most frequently cited future markers nowadays have been 2050 and 2100 (Scolozzi & Geneletti, 2017) which corresponds to the same timeframes CE often makes projections about. Other important differences between FS and planning are that FS

practitioners are committed to building scenarios that contrast to each other and take unpopular perspectives, rather than having minor deviations from the conventional. Within FS' scenarios multiple interpretations of realities exist. Lastly, FS is highly action-oriented, that is, concerned with creating the most preferable futures and then taking them to action to avoid less preferred or dystopic futures.

FS has been criticised mainly for not having an objective knowledge of reality (Vásquez, 1999). Still, this discipline has grown recently as it has proven its capacity of coping with and deepening our understanding of uncertainty (Nováky, Hiderg & Tóthné, 2016; Ladu & Quitzow, 2017; Vecchiato, 2012), its renewed methodologies to understand unstable situations, and the tools implemented to bring community and scientists together towards accepted future alternatives (Meissner, 2012). Vásquez (1999) argues that the main task of FS would primarily be not just the study but also the assessment of visions of the future. We agree with Medina when he considers that "no matter how better, attractive or participating the image of the future produced through the settings method might be, if it is not effectively shared by a society, transformed into a vision, and put into practice in a systematic and sustained way by means of a set of projects, these huge institutional and methodological efforts might lose their power" (Vásquez, 1999, p. 339). This is where we believe that a synergy with CE also contributes to FS, by making this discipline best known, implemented and proved accurate. It is more reasonable to expect that by cooperatively creating and implementing constructed futures with FS methods and CE principles a better future for cities could be reached.

This is why it is so relevant for humanity that these two communities start to interact as soon as possible and maintain and open and productive collaboration in transitioning towards a sustainable society.

It was discussed CE' system principle to consider the future as unknowable in Section 2.1. We consider this characteristic to be a reactive approach towards the future because CE principles are put into action as a response

to events occurring in the present or in the past. By contrast, FS is anticipatory, because its systemic principle is considering the possible futures to be known. When FS methods are used, the aim is to pull the future into the present. CE, instead, is currently mainly pushing the present into the future. At least theoretically, a strong and evident potential exists.

While it is not the purpose of this research to deep dive into FS methods, we include a brief introduction. FS is equipped with more than 40 methods and they are classified in four categories: Qualitative or Quantitative, and Normative or Exploratory (Glenn, 2001). The latter two categories refer to how the method approaches the future. It is normative when the future is addressed asking the question: what future do we want? In contrast, exploratory methods address the future asking what is possible regardless of what is desirable. A special place within FS is reserved to the scenarios method because scenarios are also the end product of futures research, as a way of summarising the results of each and every method used by a futurist (Valciukas, 2003). Four examples of scenarios are inductive, deductive, incremental and normative (Wilkinson & Eidinow, 2003) and each could be implemented according to the challenge and the desired purpose.

In Figure 1 below we include the Generic Foresight Process Framework (GFPF) from Voros (2003) to show the six key elements (inputs, analysis, interpretation, prospection, outputs and strategy) to follow in order to integrate the study of the alternative potential futures. This generic framework includes some of the FS methods in its corresponding recommended stage (Delphi and Strategic Intelligence Unit for Inputs, Emerging Issues and Cross Impact for the Analysis, and so forth). This framework could be a starting point to be used by CE in the built environment at different stages and as we explain in Figure 3, it is suitable with CE principles along the process.

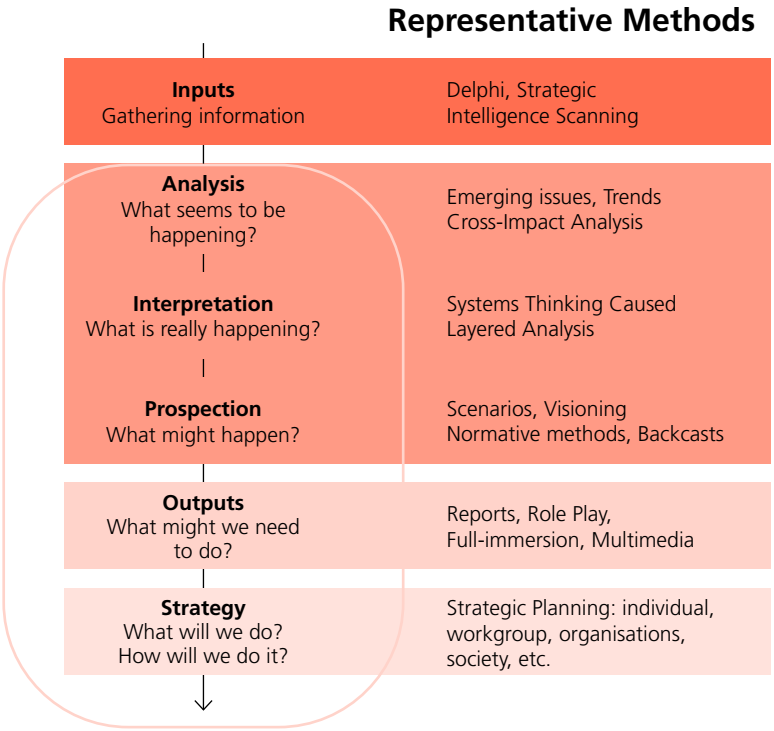

Figure 1
Generic Foresight Process Framework (GFPF)
Source | Voros (2003).

Synopsis

The first method we used to gather information was a bibliometric review. The software used for this purpose was Dimensions due to its dynamic research data platform to explore connections and develop meaningful data. We searched for the keywords 'circular economy', 'futures studies' and 'built environment'. Data collected for this study was last updated in April 12th 2019. When these three keywords were searched for on titles and abstracts we found just one relevant paper out of four overall results. Seidel, Barquet, Seliger & Kohl (2017) discussed FS and recommended to use its methods particularly for a transition from traditional business models to sustainable ones, specifically when applied to the manufacturing field. They did not discuss any application to the macro level of CE. To sum up, no previous research, to the best of our knowledge has considered FS for the purpose of incorporating it as an operational tool for the CE in the built environment.

A snowballing approach (Jalali & Wohlin, 2012) was adopted as a further step from our bibliometric analysis for a more in-depth assessment. One hundred publications including books, journals and consultancy publications were analysed using this approach. The aim was first to identify the publications that described, discussed and/or implemented Circular Economy or Futures Studies in

Table 1. Publications on Circular Economy and Futures Studies from 2010 to 2018.

Year	CE	FS
2018	1226	1712
2017	621	1322
2016	339	1097
2015	165	1156
2014	147	1374
2013	181	1237
2012	85	859
2011	133	751
2010	100	497

Source | Own elaboration

the built environment while at the same time we assessed whether these publications mentioned the other discipline (CE mentioning FS or viceversa). To do this a scan of titles and abstract was conducted followed by an examination of the full content of the relevant publications. Our findings suggest that no publication yet exists that discusses CE implementation in the built environment using FS methods. Still, it is worth noting that a handful of the publications referring to CE have started to use FS methods especially at the micro level (Kuzmina et al., 2019; Seidel et al., 2017; Sinclair et al, 2018).

The number of journal publications from each discipline in Table 1 above, retrieved from Dimensions software, show that publications in both disciplines increased steadily over the last three years and that the gap between publications from CE and FS has been reduced progressively from 2015 onwards.

In Table 2, the top 10 journals that each discipline publishes more frequently in are shown historically. Although there is a substantial difference in the number of publications from each discipline, this table is useful to indicate that, except for the Journal of Applied Mechanics and Materials (which is the only one that appear in both academic communities top five journals), both disciplines

Table 2. Most used journal publications for Futures Studies and Circular Economy historically.

CE rank	Journal	Publications
1	Journal of Cleaner Production	246
2	Sustainability	123
3	Resour Conserv Recy	104
4	Procedia CIRP	74
5	Appl Mech and Mater	53
6	Waste Management	49
7	Journal of Industrial Ecology	46
8	Energy Procedia	42
9	Waste Manag & Res	32
10	Science of the Total Environment	26

FS rank	Journal	Publications
1	Proceedings of SPIE	1748
2	Appl Mech and Mater	1662
3	PLoS ONE	1565
4	Renew Sust Energ Rev	1554
5	Lecture Notes in Computer Science	1378
6	Journal of Cleaner Production	1311
7	Sustainability	1247
8	Energy Policy	1105
9	Energy Procedia	1082
10	Procedia - Social and Behavioral Sci	969

Source | Own elaboration

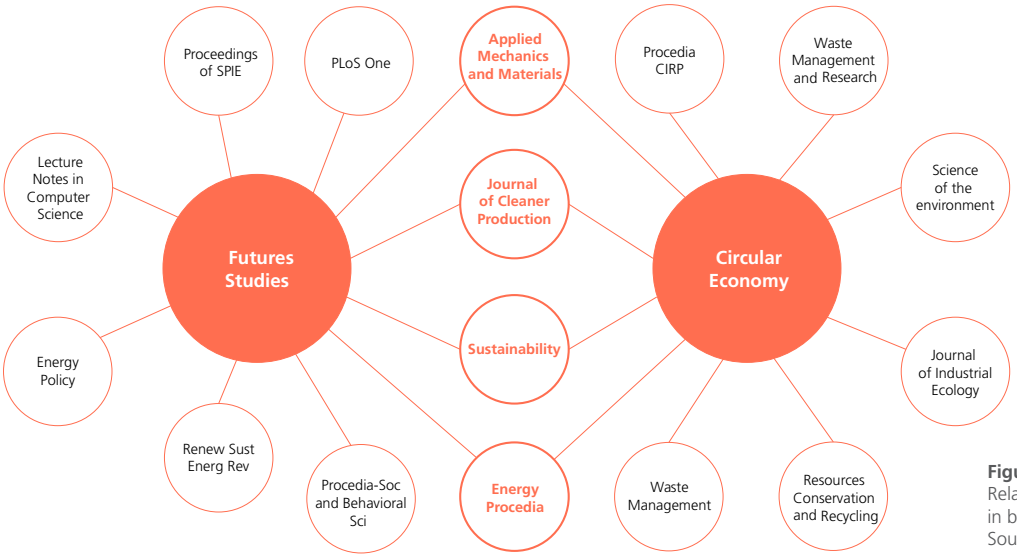

Figure 2
Relationship between journal publications in both disciplines.
Source | Own elaboration

mainly publish in different peer reviewed journals. In consequence, it is probable that both disciplines have different reading communities. Even if the information is available in these publications some people may not be able to access it because they are not the intended audience. This could be a useful reference for further interdisciplinary studies between CE and FS. Journals such as Applied Mechanics and Materials (ranked 5th and 2nd respectively), Journal of Cleaner Production (1st and 6th), Sustainability (2nd and 7th) and Energy Procedia (8th and 9th) seem to have readerships suitable for CE and FS researchers to collaborate, as highlighted in Figure 2. We also believe that the mainstream FS journals such as Journal of Futures Studies and The World Future Review are good platforms to disseminate collaborative research for crossover and cross-fertilisation of research ideas from both communities.

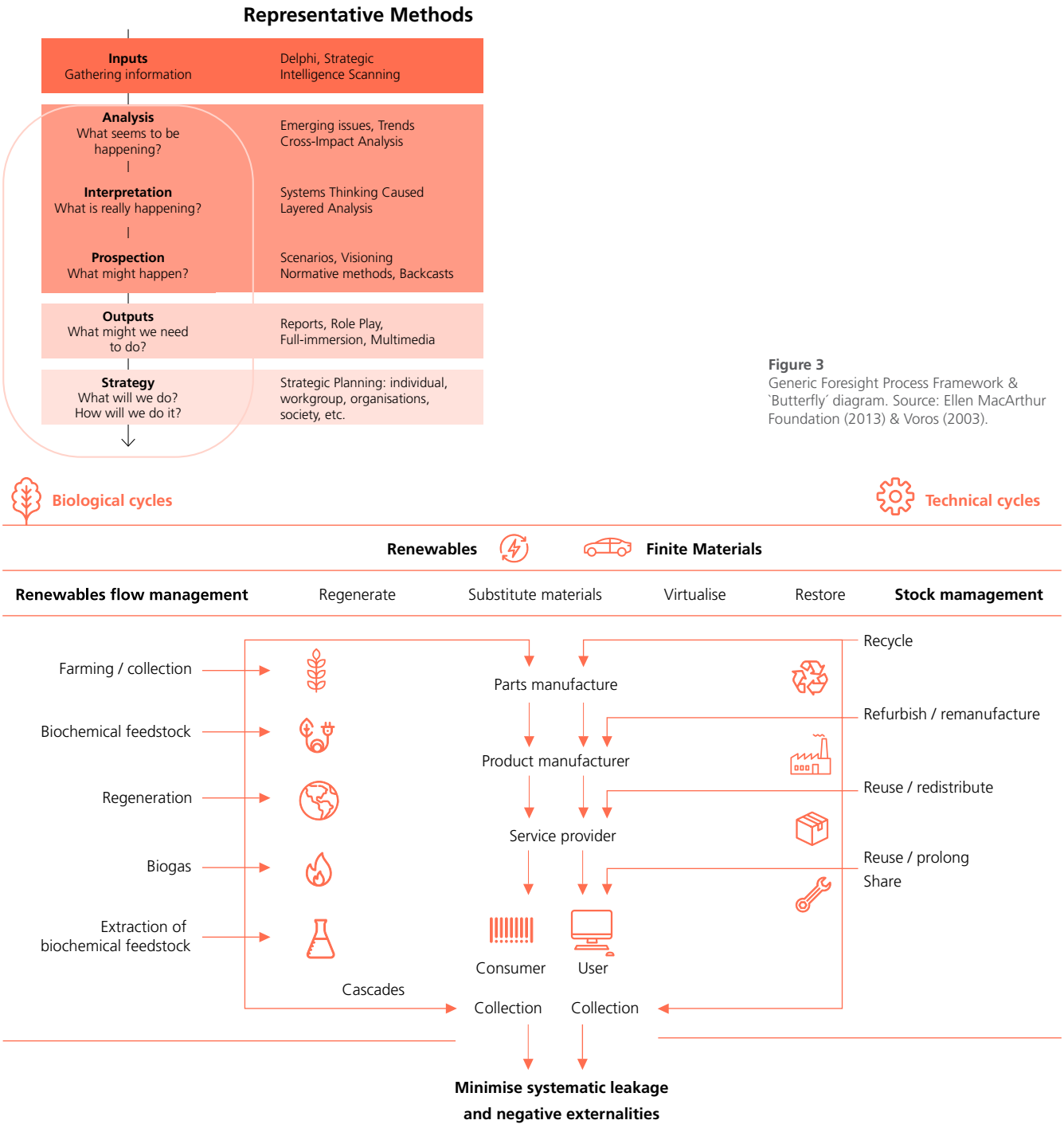

Figure 3
Generic Foresight Process Framework & `Butterfly´ diagram. Source: Ellen MacArthur Foundation (2013) & Voros (2003).

In Figure 3 above we have included on the top side the Generic Foresight Process Framework (GFPF) from Voros (2003) because it contributes to sustainable development with its long-term strategic foresight capacity as we explained in section 2.2. On the bottom side we have included the 'Butterfly' Diagram from the Ellen MacArthur Foundation (2013). We have kept all the attributes from this diagram to indicate that CE contributes to sustainable development with its predominant set of three principles, which are, 1. Preserve and enhance

natural capital. 2. Optimise resource yields and 3. Foster system effectiveness. We have placed both, the GFPF and the 'Butterfly' Diagram next to each other to symbolise interdependence. In sum, we conceptualise the GFPF as being a continuous activity that informs strategic thinking and is the basis for actions to be taken in the present by CE. We believe that with this combined approach FS will enable CE to have a more mature approach towards possible futures and to integrate that knowledge into existing work, research and action towards sustainable futures.

Concluding remarks, limitations and further research

Increasing attention has been paid to CE as a new paradigm to accomplish a sustainable tomorrow. However, this concept still needs to be critically questioned since from a scholarly position CE is still an evolving discipline. This research contributes towards this questioning by highlighting a systemic failure within this discipline, which is to consider the future as unknowable, and proposes FS as a complementary discipline for CE to address the future more thoroughly. Our main purpose with this paper has been to challenge the research and practitioner in the CE community to elaborate and integrate FS methods for a better and more actionable methodology for policy makers in cities. The FS community could, on their part, evaluate whether existing methods are fully suitable for CE research or if new developments or refinements are required.

With this point of departure, for research objective one, validated by a bibliometric review and a snowballing approach, we have demonstrated the gap between Circular Economy (CE) and Futures Studies (FS) disciplines in general and particularly at the macro level. We also have provided an initial understanding of where the synergy sits and some recommendations on where to start. For research objective two, we provided an initial approach that integrates CE principles and FS methods to have a more mature approach towards the future.

It is important to bear in mind the limitations of this research. Our bibliometric review and snowballing approach might have missed out on some literature that still falls within the scope. Such limitation is due, on one hand, to the query construction for our bibliometric review approach. As we selected publications based on the literal use of the concepts 'circular economy' and 'futures studies' by using these exact keywords, without a wildcard (e.g. circular econom*) we may have missed publications containing terms semantically different but with the same meaning, e.g. circular economic, circular-economy, etc. (Türkeli, Kemp, Huang, Bleishwitz & McDowall, 2018). Also, the snowballing approach is inevitably affected by our subjective judgments.

Despite these limitations, this paper has highlighted a substantial gap that we feel is extremely worth of being filled. As such we recommend as further research a systematic and comprehensive review of the methods and methodologies available within FS and how to integrate them in CE. It is also recommended to systematically create and test frameworks that consider alternative possible, plausible, probable and preferable futures with CE principles and FS methods. With the aim of stimulating discussion and further dialogue between these two disciplines we invite researchers and practitioners from CE and FS to collaborate on addressing the role of FS and its integration within CE for a sustainable future. We are keen and open to foster these topics collaboratively.

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