EXPLORING PLAUSIBLE CIRCULAR FUTURES

D1.1 Techniques of Futuring: Portfolio of techniques and critical reflections

Date: 30th June 2023

Document identifier: D1.1

Version: V.1.0

Leading partner: UVigo

Dissemination status: Public

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Funded by the European Union

Grant agreement nº: 101086465

Project acronym: ExPliCit

Project title: Exploring Plausible Circular Futures

Funding Scheme: HORIZON-MSCA-2021-SE-01-01

Project Duration: 01/01/2023 – 31/12/2025

Coordinator: UNIVERSITA DEGLI STUDI DI NAPOLI PARTHENOPE - UNIPARTH

Associated Beneficiaries:

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- THE UNIVERSITY OF SHEFFIELD - USFD

Acknowledgements

This project has received funding from the European Union under the Horizon Europe Marie Skłodowska-Curie Staff Exchange scheme (HORIZON-MSCA-2021-SE-01-01), grant agreement No. 101086465 (ExPliciT), and from the UKRI Horizon Guarantee programme [grant number EP/X039676/1].

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1. Introduction

"The only thing that makes life possible is permanent, intolerable uncertainty; not knowing what comes next." – (Ursula K Le Guin)

Uncertainty is an inherent part of life. No one can predict with absolute certainty what the future holds. This can be both frightening and exhilarating, but this can also make life worth living. By acknowledging that the future is uncertain, individuals and societies can develop the resilience, adaptability, and creativity needed to navigate and shape the future.

The future is not predetermined, but rather it is shaped by the decisions, actions, and visions of individuals and societies today. In this sense, the future is built upon the ideas and imaginations of the present. The way we imagine the world and its possibilities today sets the stage for what is to come. Innovations, discoveries, and breakthroughs begin with a spark of imagination, a vision of what could be, and foster expectations (Beckert, 2013). These ideas are then tested, refined, and brought to fruition over time, ultimately shaping the future. Therefore, it is essential to foster a culture of imagination and creativity, where new ideas and possibilities can be explored and developed.

Futuring techniques can help us realise the full potential of our imaginations and build a future that reflects our values and aspirations. By systematically exploring and analysing potential future scenarios, futuring techniques can help individuals and organisations identify emerging trends, challenges, and opportunities. This, in turn, can stimulate creative thinking and generate new ideas and possibilities for the future. Futuring techniques can also help individuals and organisations develop a shared vision of the future, which can serve as a guiding compass for decision-making and action. By leveraging the insights and knowledge generated through futuring techniques, individuals and organisations can proactively shape the future they want to see, rather than simply reacting to it.

Imagining the future is particularly important in the context of the circular economy (CE). Exploring plausible circular futures and understanding how to navigate the most desirable ones is one of the key questions in the Explicit project. The CE is an idea that aims to reshape the consumption and production systems to minimize the material footprint in the economy (Pearce & Turner, 1990). While CE is usually addressed as a positive and necessary transition, it might reinforce particular social structures that could conflict with sustainability. Futuring techniques can be valuable in this context, as they can, for example, help identify emerging trends, opportunities, and areas of concern regarding specific CE initiatives. By leveraging the insights generated through futuring techniques, individuals, organisations, communities and societies can develop strategies to move towards the most desired futures.

In this report, we create a portfolio of futuring techniques that we hope can support research on futuring to identify how preferred CE futures can be envisioned and studied. To this end, we conducted a review of Techniques of Futuring (ToFs), particularly searching for existing reviews on the topic. As futuring techniques have been used since the mid-20th century,[1] there is much work that has already been done in the field so far. Our goal is to summarise all this work in a comprehensible way and generate a report that enables practitioners and researchers to tackle the challenging task of imagining the future in a systematic and organised manner. Besides, the current report will support the task of applying futuring techniques in the context of the CE. This is a fundamental step for the Explicit project, in which this deliverable is framed.

2. Futuring and ToFs

2.1 What is the purpose of futuring

Future studies aim to provide an academic approach to understanding the future. Dator (2019) describes futures studies as an approach that should not aim to predict the future, as “the future” cannot be predicted because it does not exist. However, preferred futures can and should be envisioned, invented, implemented, continuously evaluated, revised, and re-envisioned (Dator 2019). Therefore, futures studies analyse how the preferred futures are idealised or envisioned through what are usually called “images of the future” (Dator 2019).

Many commercial organisations and public bodies developed techniques to gain insight into the future in the last fifty years (Hines et al, 2019; Monda, 2018). In the corporate sphere, US and European firms developed techniques to develop strategic foresight on the future in order to assist corporate decision-makers, but also to actively plan and shape the future (Vecchiato, 2012). One common academic approach to the future is through the use of macroeconomic forecasts and technological foresight to project normative futures (Beckert, 2016; Beckert & Bronk, 2018). Such forecasting techniques work as instruments to create fictional expectations and fulfil a coordinating, performative, inventive, and political role in how society is organised (Beckert, 2016). Forecasts aim to generate probabilistic foreknowledge of the future to orient actors seeking to act rationally in the face of an unknowable future, whereas economic theories play a role in building expectations of the future because they draw causal relationships and measure the suitability of different paths to achieving desired goals (Beckert, 2016). Together, theories and forecasting techniques work as a technique of futuring by projecting existing practices and the existing status quo in an imagined non-transformative future.

Over time, the discipline of futures studies evolved from aiming to foresee the future by using a set of limited approaches and methods with a focus on probability to research possible futures and explore alternatives towards socially desired outcomes (Monda, 2018). A shift from a normative approach to the future towards a more open and exploratory approach may subvert established economic practices by constructing counterfactual futures. Such new

[1] Some authors refer to Herman Kahn as one of the earliest pioneers of futuring techniques since he developed a range of scenario planning methods for exploring future possibilities in the military context in the U.S. Air Force (Bishop et al., 2007; von der Gracht, 2008)

imagined futures can enable new horizons towards critical societal issues such as climate change or social justice (Fitzgerald and Davies, 2022; Milkoreit, 2017; Hajer & Versteeg, 2019). The impact of such futures is not merely the construction of new imaginaries, but they can also become socially performative through the enactment of expectations (Beckert, 2013) or through social practices (Oomen et al, 2022), influencing social actions and the future that is ultimately built.

To study the imaginations of the future, Hajer and Versteeg (2019) propose the use of 'techniques of futuring' (ToFs). Such techniques consist of transdisciplinary experiments from different contexts that enable the envisioning of alternative models of economic and social development, hence, suggesting alternative imaginations of the future (Hajer and Versteeg, 2019). Hajer and Pelzer (2018, p. 222) define 'techniques of futuring' as '*practices bringing together actors around one or more imagined futures and through which actors come to share particular orientations for action, to get a grip on the actual acts of futuring*'.

2.2 How ToFs can impact the future of the CE

As Hajer and Pelzer (2018) claim, a world that aims to address the environmental and climate crisis needs to give more attention to how academic knowledge can be mobilised for the development of 'desired futures'. Other scholars such as Lowe and Genovese (2022) and Bauwens et al. (2020) also raised the need to explore plausible and desirable circular futures to build a new vision of the future that is able to respond to the environmental and climate emergency.

Despite the need to understand how CE futures can be built, there is relatively little academic work that deepens what the CE can look like. Some scholars that developed on the literature on the CE futures are Bauwens et al. (2020), Calisto-Friant et al. (2020), Fauré et al. (2019), and Svenfelt et al. (2019). Bauwens et al. (2020) explored possible CE scenarios by building a matrix based on the level of centralisation of governance structures and the nature of the innovations that build the CE transition. Calisto-Friant (2020) adopted a similar scenario-based approach to Bauwens et al., (2020), looking at the level of segmentation of social, economic, environmental and political considerations and the level of optimism towards decoupling economic growth from environmental impact. Finally, Fauré et al. (2019) and Svenfelt et al. (2019) explored different backcasting scenarios to understand how Sweden can lead towards an ambitious economic transformation to meet certain climate and environmental goals by dropping GDP growth ambitions.

The existing literature shows how the future of the CE has been developed only by using scenarios built by experts. Yet, there is a broader spectrum of ToFs beyond scenarios that is unexplored by the CE literature. To address this gap, this report aims to provide an extensive portfolio of ToFs to enable the identification and creation of desirable CE futures.

3. Identification of the ToFs

The report is based on a literature review that focuses on ToFs. The objective of this review is to gain a comprehensive understanding of the existing techniques, their nature, and their applicability in conducting futuring research. Specifically, we are interested in exploring how these techniques can be effectively utilized in the context of the CE. To guide the review, the following key questions were formulated: What are the current techniques available for engaging in futuring exercises? What are the primary typologies or categories of these techniques? What are the strengths and weaknesses associated with these techniques? How can these techniques contribute to the realization of tangible and desirable futures? Given the substantial body of work on futuring,[2] the review focused specifically on literature reviews[3] that addressed futuring techniques. Finally, we examined the literature on futuring techniques to develop a taxonomy that facilitated the exploration of critical questions in this field.

Initially, a comprehensive literature search was conducted to identify articles that provided an extensive overview of various techniques employed in futuring research. Four highly relevant articles were identified: Bishop et al. (2007), Wright et al. (2012), Hines et al. (2019), and Oomen et al. (2022). These articles provided valuable insights into the analysis conducted and the range of techniques used in futuring research. Building on this foundation, a list of keywords was developed to capture the complexity of the subject and encompass related terminology. The final list consisted of 18 keywords, presented in Table 1.

Using the Scopus database, a search was performed using these keywords, resulting in an initial pool of 621 documents. After removing duplicates and limiting the list to English documents, a refined list of 532 articles was obtained. The search query employed in Scopus was as follows: TITLE-ABS-KEY ("futuring" OR "scenario construction" OR "scenario design" OR "scenario development" OR "scenario exercis*" OR "scenario logics" OR "scenario method*" OR "scenario planning" OR "scenario techniqu*" OR "scenario thinking" OR "scenario typ*" OR "horizon scan*" OR "developing scenarios" OR "method* of scenario*" OR "strateg* foresight*" OR "foresight techniqu*" OR "foresight method*" OR "foresight exercis*") AND (LIMIT-TO (DOCTYPE, "re")) AND (LIMIT-TO (LANGUAGE, "English")). Subsequently, a rigorous selection process was undertaken to include only those articles that addressed the research questions and met the criteria. Specifically, applications of futuring techniques to specific case studies, trend analysis, and medical contexts were excluded. The selection process involved evaluating the titles and abstracts of the papers, resulting in a final list of 41 documents for detailed reading and analysis.

The inductive interpretative methodology was then employed to create a taxonomy of the different futuring techniques using the identified literature. This approach involved a systematic analysis of the selected articles to identify patterns, themes, and commonalities among the techniques used in futuring research. Through a careful examination of the content, key concepts, methodologies, and terminology associated with each technique were identified and categorised. The information was identified, coded and organised, with the taxonomy continuously refined and revised as new insights emerged to avoid duplications in the dataset. This inductive interpretative methodology ultimately yielded a comprehensive framework that

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[2] On the 15th of March 2023, we conducted a review on Scopus that yielded 11759 documents.

[3] Official Scopus definition of “Document type: Review”: Significant review of original research, also includes conference papers. Characteristics: Reviews typically have an extensive bibliography. Educational items that review specific issues within the literature are also considered to be reviews. As non-original articles, reviews lack the most typical sections of original articles such as materials & methods and results.

categorised the different techniques into distinct categories, providing a structured understanding of their characteristics, applications, and relationships within the field of futuring research. This was done by identifying what categorisations already existed in the literature and critically reviewing these categories to avoid inconsistencies and duplications. As a result, we collected 43 different ToFs and we classified them into 4 relevant categories. The list of ToFs can be consulted in the Appendix, including their name, their definition, and the sources where these ToFs were identified.

Table 1. Keywords used for the literature review.

Keywords	Hits per keyword	Reviews
developing scenarios	357	11
foresight exercis*	252	25
foresight method*	385	17
foresight techniqu*	43	4
futuring	203	17
horizon scan*	737	133
method* of scenario*	238	5
scenario construction	395	21
scenario design	995	35
scenario development	1490	57
scenario exercis*	169	6
scenario logics	20	1
scenario method*	2415	93
scenario planning	2408	128
scenario techniqu*	368	14
scenario thinking	122	7
scenario typ*	720	20
strateg* foresight*	442	27
Total	11759	621

It is important to mention that the list presented below includes multiple overlapping ToFs. Before delving into the analysis, it is worth highlighting three major groups of techniques from which multiple techniques emerge, subsequently included in the final list in this report: Scenario techniques, Foresight techniques, and Horizon Scanning. All of them are used in the field of futures studies with the aim of understanding and anticipating the future. However, there are significant differences in terms of their focus.

Scenario techniques concentrate on developing plausible alternative futures. They are used to create a series of plausible scenarios that describe different combinations of events, trends, and future conditions. On the other hand, foresight techniques focus on identifying and analysing current trends and patterns to predict future events and conditions. These techniques rely on existing data, mathematical models, statistical analysis, and extrapolation methods to estimate how the future will unfold based on current trends. Lastly, horizon scanning techniques complement the previous two approaches by primarily emphasizing the identification and systematic analysis of early signals of emerging changes and trends that could have a significant impact on the future. Instead of solely analysing existing trends and data, horizon scanning seeks to identify weak signals or incipient indications that may indicate disruptive changes or significant future events.

Overall, the existing ToFs are very diverse. While many of the techniques included in this report share similarities, it is important to note that none of them completely overlap with one another. The intention of this report is not to generate a definitive or exhaustive list of techniques but rather to identify some of the primary techniques that can be useful in exploring plausible circular futures. Indeed, ToFs have be revealed to possess greater power when they are integrated together (Wrigth et al., 2012). Therefore, a correct reading of this report demands an understanding of the complementary nature of the different techniques, rather than approaching the list as if the techniques are mutually exclusive.

4. Classification of the ToFs

Existing taxonomies either adapt to a specific concern or aim to address the ToFs from a general perspective. As our aim is to understand the potentiality of these techniques to explore plausible circular futures, we consider it important to create a new taxonomy that might help us in this future task.

To end up with a taxonomy of the ToFs, we first conducted a review of how the existing literature classifies existing ToFs. After completing the review, we assigned various techniques to the different categories that emerged from the review. Then, we grouped together the categories we considered relevant and disregarded those that did not add value to our task. Finally, we derived four overarching categories from which to create a taxonomy of the existing techniques: paradigm shift, method, control, and participation. Table 2 presents the four categories used here to classify the ToFs, as well as the different options within each category. Below, we describe the four categories used in this report.

One of the key features of ToFs is their ability to envision and/or promote futures in an evolutionary or revolutionary manner. This characteristic is encompassed within the concept of *Paradigm shift*. *Paradigm shift* refers to the extent to which ToFs enable us to envision evolutionary or revolutionary futures. If a technique is limited to reproducing visions that predominantly evolve from existing political frameworks and trends, it indicates a low *paradigm shift*. An example of such a technique is Trend Impact Analysis, which primarily extrapolates future impacts of current phenomena without questioning the socio-political paradigm (Aaltonen and Sanders, 2006; Gibson et al., 2018; Bishop et al., 2007). On the contrary, if a technique adopts a revolutionary approach and allows us to imagine futures beyond the current status quo, we argue that it signifies a high *paradigm shift* (Aaltonen and Sanders, 2006; Gavigan and Scapolo, 1999; Fontela, 2000; Bishop et al., 2007; Cook et al., 2014). Fictive Narratives and Design Fiction, for instance, fall into this category as they facilitate the creation of new imaginaries that actively challenge the existing paradigm (Pedret, 2019). For techniques that initially enable us to envision scenarios beyond the business-as-usual but where the level of change that can be achieved is unclear, we define a medium level of *paradigm shift*. Examples of such techniques include Genius forecasting and Causal layered analysis (Aaltonen and Sanders, 2006; Inayatullah, 2003; Ractliffe, 2020).

Table 2. Categories used to classify the ToFs.

Category	Options	Techniques that…
Paradigm shift	Low	Allow us to envision the probable evolution of business-as-usual
	Medium	Allow us to envision scenarios beyond business as usual but it is not clear their capacity to reach revolutionary scenarios
	High	Allow us to explore scenarios beyond the business-as-usual trajectory in a revolutionary fashion
Method	Quantitative	Use quantitative methods
	Mixed	Either use numbers to enable qualitative discussions or use qualitative discussions to reach numerical outcomes
	Qualitative	Use qualitative methods
Control	Low	Aim to adapt to the future
	Medium	Aim to adapt to future events but also change that future to some extent
	High	Aim to act to shape how the future will look like
Participation	Expert-driven	Only involve experts/academics
	Stakeholders	Might involve stakeholders
	Public participation	Might involve public participation

Another significant characteristic in the classification of ToFs is the type of information utilized for envisioning the future. The category of *Method* pertains to this attribute. *Method* is classified as quantitative when it constructs visions of the future based on mathematical models and numerical trends. An example of a quantitative technique is Computerised Scenario Comparisons (Smith and Saritas, 2011). Conversely, Method is labelled as qualitative when the process of futuring relies on textual information and qualitative discussions (Fahling et al., 2012; Bishop et al., 2007). SWOT analysis and backcasting technique serve as examples of qualitative methods (Ratcliffe, 2020; Gibson et al., 2018; Smith & Saritas, 2011). It is worth noting that numerical methods often involve some form of qualitative discussion, and qualitative methods may incorporate the quantification of certain potential trends. However, we argue that quantitative techniques heavily rely on numbers to achieve desired outcomes, whereas qualitative techniques can be predominantly developed without incorporating quantification. For those techniques that do not neatly fit into either category, we also consider the possibility of mixed methods. In this context, mixed methods refer to approaches that either employ numbers to facilitate qualitative discussions or utilize qualitative discussions to derive numerical outcomes. We contend that mixed methods strike a balance between qualitative and quantitative processes to a similar degree. Cross-Impact Analysis and Morphological Analysis (Aaltonen and Sanders, 2006; Fontela, 2000; Bishop et al., 2007) are examples of such techniques, combining numerical elements and qualitative discussions to explore various aspects of the future.

A third crucial aspect of these techniques is referred to as *Control*, which pertains to the objective of the technique. If a technique aims to explore various elements of the future in order to adapt to them, we classify it as a low control technique. Many of the existing ToFs, such as Visualization and Role-Playing techniques, fall into this category as they primarily focus on envisioning futures and adapting to them (Bishop et al., 2007). On the other hand, if a technique aims to explore ways to actively shape the future, we classify it as a high control technique. High control techniques involve examining economic, social, and political actions to shape the future (Vecchiato, 2012). Backcasting and the Horizon Mission methodology, for example, fall under this category as they seek to identify the necessary steps, whether technological, social, or political, that would enable a specific future scenario (Gibson et al., 2018; Smith and Saritas, 2011; Bishop et al., 2007). In some cases, ToFs can be used for both adaptation and shaping purposes. For these mixed methods, we have assigned the label of medium-level *Control*. Scenario-based planning is an example of such a technique, as it aims to explore alternative future scenarios while establishing pathways that can guide societies towards their realization, involving relevant stakeholders in the process (Smith & Saritas, 2011).

The fourth significant aspect to consider is Participation, which refers to the level of inclusivity of ToFs towards different societal actors. Essentially, techniques can either allow limited participation from experts and dominant actors or be more inclusive and accommodate the involvement of wider audiences, ranging from relevant stakeholders to public participation in general (Fitzgerald & Davies, 2022; Cook et al., 2014). Trend extrapolation serves as an example of a technique that is typically conducted exclusively by experts (Bishop et al., 2007). Conversely, techniques like Interactive Scenarios often open up the process of futuring to broader audiences, typically involving stakeholders (Aaltonen and Irene Sanders, 2006; Khakee, 1999). Fictive narrative techniques, for instance, enable the participation of the public, aiming to create narratives that depict life in future scenarios in a way that allows the public to envision such scenarios (Pedret, 2019). It is important to highlight that we have classified the techniques based on their typical usage according to the documents reviewed. This means that a technique classified as Stakeholders does not imply that it cannot involve a broader audience, but according to the reviewed documents, it is typically used to engage stakeholders. Similarly, if a technique is labelled as Stakeholders, it does not mean that it is always used exclusively with stakeholders, but it can also be utilized with only experts and dominant actors.

5. Mapping of the existing ToFs

We applied the taxonomy presented in the previous section to the list of ToFs included in this report. Table 3 presents the list of techniques classified according to the four categories selected. It is important to highlight that the techniques have been classified solely based on the reviewed works in this report. Therefore, the classification is not intended to be definitive or exhaustive but rather to serve as a foundation for discussing the potential use of different techniques in the pursuit of plausible circular futures. In other words, even though a technique may be classified in a specific way in this report, the technique could be modified and adapted for multiple purposes.

Table 3. Classification of the list of techniques included in this report.

Techniques of futuring	Paradigm shift	Method	Control	Participation
Delphi	Low	Mixed	Low	Expert driven
Trend impact analysis	Low	Quantitative	Low	Expert driven
Cross-impact analysis	Low	Mixed	Low	Stakeholders
Morphological analysis	Low	Mixed	Low	Expert driven
Field anomaly relaxation	Low	Mixed	Low	Expert driven
Probability trees	Low	Mixed	Low	Stakeholders
Sociovision	Low	Mixed	Low	Stakeholders
Genius forecasting	Medium	Qualitative	Medium	Expert driven
Causal layered analysis	Medium	Qualitative	Medium	Expert driven
Critical/ key technologies	Low	Qualitative	Low	Expert driven
SWOT analysis	Low	Qualitative	Low	Expert driven
Horizon scanning	Low	Qualitative	Low	Expert driven
Scenario-based planning	High	Qualitative	Medium	Stakeholders
Innovation system mapping	Low	Mixed	Low	Expert driven
Technology emergence pathways	Low	Mixed	Low	Expert driven
Computerized scenario comparisons	Low	Quantitative	Low	Expert driven
Dynamic variable simulations	Low	Quantitative	Low	Expert driven
Normative thematic design	Medium	Qualitative	Medium	Expert driven
Backcasting	High	Qualitative	High	Stakeholders
Interactive scenarios	High	Qualitative	Medium	Stakeholders
Visualization	High	Qualitative	Low	Stakeholders
Role playing	High	Qualitative	Low	Stakeholders
Coates and Jarratt technique	High	Qualitative	Low	Expert driven
Trend extrapolation	Low	Mixed	Low	Expert driven

Techniques of futuring	Paradigm shift	Method	Control	Participation
Manoa technique	Low	Qualitative	Low	Expert driven
Systems scenarios	Low	Qualitative	Low	Expert driven
Incasting	High	Qualitative	Low	Stakeholders
Stanford Research Institute	High	Qualitative	Low	Stakeholders
Divergence mapping	High	Qualitative	High	Expert driven
Horizon mission methodology	High	Qualitative	High	Expert driven
Impact of Future Technologies	High	Qualitative	High	Expert driven
Future mapping	High	Qualitative	Medium	Stakeholders
GBN matrix	Medium	Qualitative	Low	Stakeholders
Option Development and Option Evaluation	Low	Quantitative	Low	Expert driven
MORPHOL	Low	Quantitative	Low	Expert driven
SMIC PROF-EXPERT	Low	Quantitative	Low	Expert driven
Interactive Future Simulation	Low	Quantitative	Low	Expert driven
Sensitivity analysis	Low	Quantitative	Low	Expert driven
Dynamic scenarios technique (scenario technique)	Low	Quantitative	Low	Expert driven
Impact/Probability Matrix	Low	Quantitative	Low	Expert driven
Fictive narratives	High	Qualitative	Low	Public participation
Design fiction	High	Qualitative	Low	Stakeholders
Stakeholder Analysis / System maps	Low	Qualitative	Low	Expert driven

To enhance our comprehension of the list of techniques, we conducted an evaluation by cross-referencing various categories. This enabled us to observe and compare the characteristics of the ToFs. Specifically, we examined the different categories of ToFs in terms of their capacity to envision a paradigm shift. We positioned the paradigm shift category at the core of our analysis, as it exemplifies the project's objective of exploring plausible circular futures beyond the business as usual. Below, we present the findings of this analysis.

Firstly, we conducted a comparison between the *Paradigm shift* and *Method* categories (Table 4). In general, quantitative methods often fall short when it comes to envisioning scenarios beyond the business as usual. Even mixed methods have limitations in exploring revolutionary future scenarios. This is primarily because these methods rely on quantifying existing events or leveraging current knowledge to navigate uncertainty in the future. On the other hand, qualitative methods encompass all three levels of paradigm shift, with more than half of the reviewed techniques undoubtedly enabling a high level of paradigm shift. Scenario building techniques, in particular, allow for the exploration of various scenarios, including those that surpass the boundaries of the business as usual.

Table 4. Distribution of the ToFs in relation to their approach to paradigm shift (in rows) and methods (in columns) involved.

Paradigm shift/Method	Quantitative	Mixed	Qualitative
Low	10	9	6
Medium			4
High			14
Grand Total	**10**	**9**	**24**

Secondly, we conducted a comparison between the *Paradigm shift* and *Control* categories (Table 5). The results reveal a significant correlation between the level of Paradigm shift permitted by the ToFs and the level of Control. The majority of existing ToFs exhibit relatively low control, as their primary objective is to generate future visions and adapt to them. Only a few techniques aim to actively shape the future. Interestingly, techniques that allow for low Paradigm shift are typically associated with low-control approaches. This can be attributed to the fact that techniques focusing solely on envisioning scenarios that stem from the evolution of the business as usual often lack the intention to transform the future but rather aim to adapt to it. In contrast, ToFs that enable the envisioning of alternative futures beyond the business as usual can be associated with low, medium, and high-control techniques, as envisioning revolutionary futures can serve both the purpose of adaptation and shaping. It is also noteworthy that high-control techniques strongly correlate with high-paradigm shift techniques. This indicates that the intention to shape the future is often motivated by the exploration of alternative futures beyond the business as usual.

Table 5. Distribution of the ToFs in relation to their approach to paradigm shift (in rows) and level of control (in columns) involved.

Paradigm shift/Control	Low	Medium	High
Low	25		
Medium	1	3	
High	7	3	4
Grand Total	**33**	**6**	**4**

Thirdly, we conducted a comparison between the *Paradigm shift* and *Participation* categories (Table 6). The level of participation and actor involvement during the development of different ToFs can vary significantly. However, the results indicate that most techniques typically involve only experts and dominant actors. These expert-driven techniques primarily aim to envision future trends and, thus, predominantly fall into the low-paradigm shift category.

Nevertheless, some expert-driven techniques also demonstrate medium and high levels of paradigm shift. Interestingly, the involvement of stakeholders is often associated with the exploration of ground-breaking scenarios. The findings also reveal that only one technique typically involves the participation of the public, namely the Fictive narratives technique. Therefore, there appears to be a clear trend towards opening up techniques to a broader audience, particularly when the objective is to envision scenarios beyond the business as usual.

Table 6. Distribution of the ToFs in relation to their approach to paradigm shift (in rows) and level of control (in columns) involved.

Paradigm shift/Participation	Expert-driven	Stakeholders	Public participation
Low	22	3	
Medium	3	1	
High	4	9	1
Grand Total	**29**	**13**	**1**

In summary, we have extracted some general findings from the analysis conducted. Firstly, quantitative methods are typically associated with the exploration of scenarios that evolve from the business as usual. Secondly, methods that only allow for the exploration of low-paradigm shift scenarios are characterized by a low level of control, meaning their main focus is to adapt to the evolution of the business as usual. Thirdly, techniques that aim to shape future scenarios often enable the exploration of scenarios beyond the business as usual. Fourthly, techniques that encourage the participation of a wider audience usually seek to explore scenarios with a medium or high paradigm shift. Fifthly, quantitative techniques only allow the participation of experts. Finally, the techniques available for shaping the future are primarily qualitative, while when the need is to adapt to future scenarios, both quantitative and qualitative techniques can be found.

6. Critical reflections

In this report, we have examined the most commonly employed techniques in the field of futures studies. Specifically, we have curated a portfolio of techniques and categorized them based on four key attributes: (i) their capacity to envision futures in line with or beyond the business as usual, (ii) the utilization of qualitative or quantitative methods, (iii) their objective in terms of adapting to or transforming the future, and (iv) the audience involved in their application, encompassing both expert-driven techniques and those that engage the general population. The review and analysis of these 43 techniques provide a robust foundation for understanding the ability of ToFs to explore plausible circular futures, which forms the fundamental basis of this report.

Overall, we confirm that ToFs are valuable tools for enabling new visions of circularity in the future. While some techniques are focused on exploring different possibilities, others actively and purposefully facilitate a reimagining of how the future is envisioned and brought to life.

This includes techniques that support political action in shaping the future and guiding societies towards the most desirable scenarios. It is important to emphasize that the list of techniques examined in this report is not intended to be exhaustive or definitive, but rather aims to provide support for the task of imagining and shaping desirable circular futures. It is also worth mentioning that the list of techniques does not encompass all existing techniques, that there may be overlaps among them, and that there could be other techniques that combine elements of the proposed ones. This in no way diminishes the significance of the findings. In fact, the review and analysis of the various ToFs offer valuable insights that can inform future applications of these techniques in exploring plausible circular futures.

To conclude the report, we would like to present a couple of critical reflections that can aid future research in this field. One of the key insights drawn from the results is that quantitative methods are valuable for comprehending current trends and adapting to them, but they are severely limited in their capacity to explore and shape alternative future scenarios. While this limitation is primarily methodological, as numerical data can only be derived from observations of reality, the findings also provoke contemplation on the prominence of positivism in shaping contemporary societies. The prevalence of expert-driven quantitative techniques appears to surpass that of qualitative techniques involving diverse societal actors. However, the exploration of plausible circular futures necessitates the adoption and implementation of qualitative techniques that engage a wider range of individuals. Consequently, there remains substantial work to be done in the realm of futures studies and the availability of suitable techniques for this purpose. Secondly, it is crucial to acknowledge the need for these techniques, if they are to be employed for exploring circular futures and steering societies towards more desirable futures, to possess the ability to guide the understanding of various scenarios towards political action. In essence, it is imperative to identify, refine, or develop new techniques that not only facilitate the exploration of scenarios beyond business as usual but also empower these techniques to direct political action and involve the general populace in the decision-making process.

These lessons can help future scholars to understand the potential and limitations of the futures studies and the ToFs to address critical societal aspects, such as social justice or the environmental crisis. For instance, authors such as Bauwens et al., (2020) and Calisto-Friant et al., (2020) engaged with the CE literature and explored its potential futures. However, this engagement between the CE and the futures literature has been limited to the reproduction of scenarios from an exclusively expert-driven perspective and only through the development of hypothetical scenarios. Yet, the use of ToFs has a much broader potential to explore the futures of the CE by engaging with stakeholders and the public. Therefore, the portfolio of ToFs provided in this report can become a valuable tool to critically rethink how future scholars engage with the future through a better understanding of the futures studies' theory, and through a critical review of the existing ToFs.

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Appendix: Portfolio of Techniques

Techniques of futuring	Description	Source
Delphi	The Delphi method gathers and analyses expert opinions to reach a consensus. It involves iterative rounds where experts respond to a questionnaire. The goal is consensus through diverse perspectives. Experts interact virtually, sharing opinions. Rounds vary based on the desired consensus. The process is essentially qualitative, although results might be analysed qualitatively and quantitatively. Dissenting opinions are encouraged. Delphi assumes collective consensus is reliable. Results provide insights into timelines, barriers, and importance.	Aaltonen and Irene Sanders (2006); Gavigan and Scapolo (1999); Gibson et al. (2018); Smith and Saritas (2011)
Trend impact analysis	Trend impact analysis (TIA) adjusts baseline trends in response to potential future events. It identifies a trend and an event that disrupts its trajectory. Key impact points are determined: when the trend deviates, reaches maximum deviation, and stabilizes. The magnitude of impacts is estimated. A new trend line is calculated and compared to the original. TIA aids understanding of event effects and informs decision-making. Used by organizations like FAA, FBI, and NSF, TIA is a valuable tool for anticipating and evaluating event impact on trends.	Aaltonen and Irene Sanders (2006); Gibson (2018); Bishop et al. (2007)
Cross-impact analysis	Cross-impact analysis is a method that aims to establish consensus among observers by examining the interdependencies and conditional probabilities between different future events. By organizing events in a matrix and adjusting probabilities based on conditional relationships, this method generates a distribution of probabilities for each event. This approach allows for quantitative estimation of the likelihood of events given the possible occurrence of other events. The method provides a valuable tool for understanding complex systems and assessing the probabilities of future outcomes.	Aaltonen and Irene Sanders (2006); Fontela (2000); Bishop et al. (2007)
Morphological analysis	Relevance trees and morphological analysis (MA) are normative methods used in system analysis. Relevance trees analyse complex situations with hierarchical levels, identifying problems, solutions, and technical performance requirements. MA deals with uncertainties and multiple alternative states. It creates scenario logic by selecting alternatives from each uncertainty dimension. These methods offer a comprehensive approach to capturing future uncertainties and are valuable tools for analysis.	Aaltonen and Sanders (2006); Gavigan and Scapolo (1999); Fontela (2000); Bishop et al. (2007)
Field anomaly relaxation	Field Anomaly Relaxation (FAR) is a method similar to morphological analysis (MA) that deals with uncertainties. FAR allows for any number of uncertainties and alternative states. It represents uncertainties as columns, with each column representing a dimension and containing multiple alternatives. By selecting one alternative from each column, scenario logic is created. However, generating scenarios can be complex due to the vast number of possibilities. FAR overcomes the limitation of capturing future uncertainties in just two dimensions, making it a valuable technique in futuring research.	Aaltonen and Irene Sanders (2006); Bishop et al. (2007)

Techniques of futuring	Description	Source
Probability trees	Probability Trees is a risk management method used to assess the probability of multiple risks occurring simultaneously. Similar to decision trees, it involves mapping out different branches representing decisions made at each stage. The tree ends with various future conditions, and by multiplying the probabilities of the branches taken, the likelihood of reaching a specific final state can be determined. Probability Trees are useful for evaluating and managing risks, especially when considering multiple factors.	Bishop et al. (2007)
Sociovision	Sociovision is a method that starts with a probability tree and identifies branches that share common characteristics. These branches may have lower likelihoods, higher preferences, or be influenced by specific stakeholders or conditions. By grouping these branches together, a coherent scenario emerges, providing a narrative of how the future could unfold. The probability tree serves as an input that unveils macro themes and insights that may not have been initially evident to the participants. Sociovision facilitates a deeper understanding of the future by combining probabilistic analysis with the identification of significant trends and events.	Bishop et al. (2007)
Genius forecasting	Genius forecasting is an approach that taps into the visionary and intuitive abilities of individuals to anticipate and envision future possibilities. It involves seeking insights and predictions from exceptional individuals who possess unique perspectives, creative thinking, and a deep understanding of the subject matter. This method recognizes that certain individuals have a heightened ability to perceive trends, patterns, and emerging developments that may not be immediately evident to others. By harnessing their visionary thinking and intuitive insights, genius forecasting aims to uncover novel ideas, innovative solutions, and unconventional perspectives that can shape future outcomes and guide decision-making processes.	Aaltonen and Irene Sanders (2006); Bishop et al. (2007)
Causal layered analysis	Causal Layered Analysis (CLA) is a method employed in the interpretation of information within a strategic foresight process. It involves uncovering and exploring the impact of uncertainties and assumptions, while also considering various potential future scenarios and establishing a shared vision for the desired future outcome. CLA delves deeper into the underlying causes and structures of issues, examining the cultural, social, and ideological dimensions. By examining these layers, CLA enables the exploration of the consequences of decisions and actions that could bring about the desired change. In summary, CLA is a multi-dimensional approach that facilitates a comprehensive understanding of complex issues, their causes, and the potential implications of alternative decisions.	Aaltonen and Irene Sanders (2006); Inayatullah (2003); Ractliffe (2020)

Techniques of futuring	Description	Source
Critical/Key technologies	The Critical/Key technologies method involves the identification of technologies based on specific criteria to assess their importance or criticality. This approach typically entails conducting interviews with industry experts to gather insights on forecasted technologies. Additionally, benchmarking analysis may be performed to compare the technological landscape with other countries or regions. The resulting lists can be oriented towards technology-push/supply or driven by industrial demands, depending on whether the focus is on future options or addressing emerging industry needs. Such exercises are often motivated by the desire to define research and development priorities and industrial policies in specific technological areas, particularly where the country in question possesses strengths and competitive advantages.	Gavigan and Scapolo (1999)
SWOT analysis	The SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis method is a valuable technique employed in the initial stage of strategic foresight, known as "Framing the question." It involves systematically assessing and evaluating the internal strengths and weaknesses of an organization or situation, as well as the external opportunities and threats it faces. By identifying and analysing these factors, SWOT analysis helps to gain a comprehensive understanding of the current state and potential future scenarios. The method enables decision-makers to capitalize on strengths, address weaknesses, exploit opportunities, and mitigate threats, thereby informing strategic planning and decision-making processes.	Gibson et al. (2018); Smith and Saritas (2011); Ratcliffe (2020)
Horizon scanning	The Horizon Scanning method involves the systematic examination of potential threats, opportunities, and future developments, including those that lie beyond current thinking and planning. It encompasses a broad range of information sources to detect early signs of significant developments. While it often focuses on the early stages of technology adoption before market introduction, it can also encompass broader trends, challenges, and opportunities. Horizon scanning aims to proactively identify emerging issues and trends, enabling organizations to anticipate and adapt to potential changes and capitalize on future opportunities. It is a dynamic and forward-looking approach that helps inform strategic decision-making and proactive planning.	Palomino (2012); Smith and Saritas (2011); Hines et al. (2019); Acosta et al. (2022)
Scenario-based planning	Scenario-based planning involves creating multiple scenarios to explore and understand future possibilities. These scenarios combine creativity with analytical methods to provide diverse perspectives. Constructing four to eight scenarios is typically recommended for a manageable yet comprehensive set. Approaches like axial matrix or theme/technology focus can be used to script scenarios. Scenario-based planning helps decision-makers navigate uncertainty, explore alternative futures, and develop adaptable strategies.	Smith and Saritas (2011)

Techniques of futuring	Description	Source
Innovation system mapping	Innovation System Mapping (ISM) involves analysing the dynamics and interactions within an innovation system to enhance foresight capabilities. It offers valuable insights into innovation processes and future trajectories, complementing other tools and methodologies. Ongoing research and advancements, especially in software development, are shaping ISM's potential for combining with other foresight tools. These developments hold promise for improving foresight practices and enabling more effective strategic decision-making.	Smith and Saritas (2011)
Technology emergence pathways	The Technology Emergence Pathways (TEP) method complements other foresight tools like scenarios and Delphi, showcasing the dependencies and relationships among emerging technologies. TEP provides valuable insights into market utilization and serves as background knowledge for scenarios and innovation system mapping. It enhances strategic decision-making by understanding the evolving landscape of science and technology and exploring future possibilities.	Smith and Saritas (2011)
Computerized scenario comparisons	Computerized Scenario Comparisons (CSC) method utilizes computer-based tools to compare and analyse scenarios and associated variables. It expands the range of future possibilities and complements traditional foresight techniques. However, effectively integrating CSC with other tools requires wisdom that comes with experience and there is currently limited guidance in this area. Challenges such as high costs, lack of practice standards, and limited accessibility hinder its full potential. As costs decrease and practices mature, CSC is expected to unlock its full foresight capabilities.	Smith and Saritas (2011)
Dynamic variable simulations	Dynamic Variable Simulations (DVS), such as the Crisis Technology Game (CTG), enable participants to navigate an uncertain future by exploring various scenarios and their consequences (e.g., critical thinking game). It complements other foresight tools and fosters strategic decision-making. DVS requires active engagement and helps participants anticipate and respond to future challenges, enhancing their readiness and agility.	Smith and Saritas (2011)
Normative thematic design	Normative Thematic Design (NTD) method is valuable for focusing the efforts of a foresight team on gaining support and inspiration from stakeholders. Effective communication management is vital, and NTD helps shape outcomes and choices from scenario-based solutions. NTD serves as a benchmark, setting a high standard for other tools in terms of perceived value. By employing NTD, practitioners align efforts, engage stakeholders, and generate meaningful insights and strategic directions.	Smith and Saritas (2011)

Techniques of futuring	Description	Source
Backcasting	The Backcasting method is a type of scenario technique that involves envisioning a future state at a specific time horizon. This future state can range from plausible to fantastical, preferred to catastrophic. By establishing this future state as a reference point or "beachhead," it becomes easier to trace a path from the present to the future or vice versa, rather than trying to predict the events leading to an unknown future. Backcasting allows for a more systematic and strategic approach to planning and decision-making, as it helps identify the necessary steps and actions required to reach the desired future state. It draws on the definition provided by Robinson (1990) and is considered a valuable tool in the strategic foresight process.	Gibson et al. (2018); Smith and Saritas (2011); Bishop et al. (2007)
Interactive scenarios	The interactive scenario method is an approach that goes beyond traditional scenario exploration by actively involving stakeholders in the scenario development process. It is a collaborative and participatory method that aims to generate insights, facilitate dialogue, and foster shared understanding among stakeholders. It allows for a diversity of perspectives and encourages participants to challenge assumptions, explore different possibilities, and consider the implications of various scenarios.	Aaltonen and Sanders (2006); Khakee (1999)
Visualization	The Visualization method uses relaxation techniques to access intuitive images of the future. Through calming narratives, individuals are guided towards a state of relaxation, allowing exploration of different future aspects. It was developed in the 1970s and practised at the University of Houston-Clear Lake. Visualization taps into intuition and provides unique insights for foresight capabilities.	Bishop et al. (2007)
Role-playing	The Role-Playing method involves group participation in simulated future situations, where individuals assume specific roles and make decisions accordingly. Originating from war games in the 1950s, it is now used in diverse domains like emergency preparedness and high-risk technical missions. By immersing participants in realistic scenarios, role-playing enhances understanding of future dynamics and decision-making processes, facilitating strategic thinking and preparedness.	Bishop et al. (2007)
Coates and Jarratt technique	The Coates and Jarratt Technique is a method that combines elements of formal techniques with judgmental forecasting to create more complex future projections. The process involves several steps, including defining the domain and time frame, identifying relevant conditions or variables within that domain, generating four to six scenario themes that represent significant potential future developments, estimating the values of these conditions or variables for each scenario theme, and ultimately writing the scenario narrative. This technique, as outlined by Coates in 2000, allows for a comprehensive exploration of different future possibilities and facilitates a deeper understanding of the potential impacts of various conditions or variables.	Bishop et al. (2007)

Techniques of futuring	Description	Source
Trend extrapolation	The mode of this technique is simply to measure existing trends and extrapolate their effects into the future. One can do this by judgment or, if empirical data is available, by mathematical techniques. Next to pure judgment, trend extrapolation is the most common scenario technique. Though surprises are perhaps inevitable, most trends will describe most of the future into the medium or even the long term.	Bishop et al. (2007)
Manoa technique	The Manoa Technique is a futures technique that combines trend extrapolation and analysis to explore the implications and interconnections among trends. It involves working with three strong and nearly indisputable trends, elaborating on their implications individually using a futures wheel, and examining their interactions using a qualitative cross-impact matrix. This technique allows individuals or groups to generate a wealth of information that can be used to answer specific questions about the future or even create complete scenarios.	Bishop et al. (2007)
Systems scenarios	The Systems Scenario Technique is a variation of the Manoa technique developed by Burchsted and Crews. It utilizes a causal model to depict the dynamic interactions and relationships among the implications of different trends, rather than using a cross-impact matrix. This approach enables a deeper understanding of the complex dynamics within a system, facilitating the development of comprehensive scenarios.	Bishop et al. (2007)
Incasting	Incasting is a method where participants form small groups and read a paragraph describing an extreme version of a potential future, such as a green future or a high-tech one. They then discuss and describe the impacts of this scenario on various domains like law, politics, family life, entertainment, education, and work. An interesting twist is that participants may not be aware of the underlying scenario and are tasked with guessing it based on its effects. Incasting is a useful technique to demonstrate how the world could be different based on different paths it could take, highlighting alternative futures and fostering creative thinking.	Bishop et al. (2007)
Stanford Research Institute	The Stanford Research Institute (SRI) method, also known as the SRI matrix, is an early scenario technique developed at the Stanford Research Institute. Instead of using paragraphs, the SRI method utilizes a matrix format with a fixed number of scenarios, typically four. Each scenario is represented by a column title, such as the expected future, worst case, best case, or a highly different alternative. The dimensions of the world, such as population, environment, technology, etc., are listed as rows in the matrix. Participants then populate the cells with the state of each domain in each scenario, allowing for a comprehensive exploration of the scenarios and the differences across domains. The SRI method provides a structured framework to analyse and compare alternative futures based on different combinations of factors.	Bishop et al. (2007)

Techniques of futuring	Description	Source
Divergence mapping	Divergence mapping involves brainstorming a set of events that have the potential to shape the future. These events are organized in a fan-like structure with four arcs, representing different time horizons. The events from earlier time horizons are then connected to those in later horizons, forming a plausible sequence that creates the storyline of a scenario. The method allows for flexibility in the number of events and encourages the exploration of alternative futures.	Bishop et al. (2007)
Horizon mission methodology	The Horizon Mission Methodology (HMM) is a backcasting technique developed by John Anderson at NASA to help engineers break free from incremental thinking and explore breakthrough research pathways. Engineers are first asked to envision a fantastical mission that is currently infeasible, such as a one-day trip to Jupiter. They then decompose this mission into its component parts and further decompose each component, identifying the required technologies. By working backwards from the fantastical mission to the present, engineers discover near-term research and development opportunities that may not lead to the exact mission but can generate significant breakthroughs in space exploration. HMM allows engineers to transcend current limitations and envision a future with transformative possibilities.	Bishop et al. (2007)
Impact of Future Technologies	The Impact of Future Technologies (IoFT) method, developed by IBM, involves starting with elaborated future scenarios and working backwards to identify signposts of scientific or technological breakthroughs required for those scenarios. Rather than actively pursuing these breakthroughs, IBM recommends monitoring for their occurrence and deploying a contingent strategy to exploit their capabilities during a subsequent window of opportunity.	Bishop et al. (2007)
Future mapping	Future Mapping, developed by David Mason, is a variant of the pre-defined scenario technique that goes beyond defining only the end-states of the future. In this method, pre-defined events leading up to each end-state are also provided. Participant teams then have the task of selecting and arranging these events in a way that leads to each specific future outcome. Future Mapping allows participants to explore the intricate interactions between events and gain a deeper understanding of how different end-states can emerge from the same set of events. It offers a valuable perspective on the dynamics of the future and enables a comprehensive exploration of alternative futures.	Bishop et al. (2007)
GBN matrix	The GBN matrix is a scenario technique that uses two dimensions of uncertainty to create a matrix with four cells. Each cell represents a different combination of uncertainties and offers a plausible future scenario with its own internal logic. These scenarios are then further developed and discussed to understand their implications for the focal issue or decision at hand. The GBN matrix is widely utilized for exploring alternative futures and their potential impact.	Bishop et al. (2007); Di Giulio et al. (2018)

Techniques of futuring	Description	Source
Option Development and Option Evaluation	Option Development and Option Evaluation (OS/OE) is a methodology used in decision-making and strategic analysis. In OS, the dimensions of uncertainty and the associated alternative options are identified and defined. This process helps to systematically explore different possibilities and potential courses of action. In OE, a compatibility matrix is created to assess the consistency of each combination of alternatives. By evaluating the compatibility of options, rankings can be generated to guide decision-makers in selecting the most consistent and feasible choices. OS/OE provides a structured approach to analysing and evaluating options, aiding in effective decision-making and strategy development.	Bishop et al. (2007)
MORPHOL	MORPHOL is a computer program designed to facilitate morphological analysis, a method used in foresight and decision-making processes. Developed by Michel Godet, MORPHOL helps manage the complexity of analysis by reducing the number of combinations based on user-defined exclusions and preferences. It allows users to define impossible combinations and prioritize more likely ones. Additionally, MORPHOL provides an indicator of the probability of each scenario and compares it to the average probability of all scenario sets. By utilizing MORPHOL, users can streamline the analysis process, make informed decisions, and assess the likelihood of different scenarios.	Bishop et al. (2007)
SMIC PROF-EXPERT	SMIC PROF-EXPERT is a cross-impact analysis method developed by Michel Godet that adjusts experts' probabilities to conform to the laws of probability. It ranks scenarios based on their probability and allows for the visualization of scenario and expert clusters. It provides a structured approach to analysing scenarios and expert perspectives, enhancing the reliability of the analysis.	Bishop et al. (2007)
Interactive Future Simulation	Interactive Future Simulation (IFS) is a method developed by the Battelle Memorial Institute for calculating quantitative conditions associated with various scenarios. Unlike other techniques, IFS focuses on important variables called Descriptors rather than events or binary conditions. These variables are divided into high, medium, and low alternatives, each assigned an initial probability. A cross-impact matrix is then created to measure the influence of each alternative on the others. Through Monte Carlo simulation, different combinations of scenarios are generated, and the final probabilities of each alternative are calculated based on their frequency of occurrence. IFS provides a systematic approach to understanding and evaluating future possibilities.	Bishop et al. (2007)

Techniques of futuring	Description	Source
Sensitivity analysis	Sensitivity Analysis is a modelling technique that involves varying different components of a systems model to understand their impact on the overall outcomes. This technique allows for the adjustment of exogenous variables, parameters that define the relationships between variables, and the variables within the model itself. By systematically altering these elements, analysts can assess how changes in each component influence the model's behaviour and results. Sensitivity analysis helps in identifying the most influential factors and understanding their effects, providing insights into the robustness and sensitivity of the model.	Bishop et al. (2007)
Dynamic scenarios technique	The Dynamic Scenario Technique is a modelling approach that combines scenario development with systems analysis. It involves clustering events into scenario themes and mapping them using causal models. A meta-model is created to capture the variables that appear across multiple models, representing the entire domain. Each scenario theme is then elaborated by assigning different values to the uncertainties within the models. This technique allows for a comprehensive exploration of possible futures by integrating scenario thinking with detailed systems analysis, enabling a deeper understanding of the dynamics and interactions within complex systems.	Bishop et al. (2007)
Impact/Probability Matrix	The Impact/Probability Matrix is a futurist technique that involves assessing and comparing potential scenarios based on their impact and probability. Impact refers to the level of disruption a trend could cause, ranging from mild adjustments to significant changes in business strategy. Probability measures the likelihood of a scenario occurring and considers the events necessary for its realization. By evaluating scenarios on both impact and probability dimensions, this matrix helps in identifying and prioritizing future possibilities based on their potential significance and likelihood.	Garland (2006)
Fictive narratives	Fictive Narratives is a method that combines imagination and reality to explore and evaluate future possibilities. It involves creating narratives that depict life in future scenarios, using collected data and trends as a basis. These narratives serve as a tool for empathizing with the experiences, emotions, and social dynamics of individuals in the envisioned future society. By crafting textual or visual representations, such as zines, drawings, or storyboards, fictive narratives provide a means to assess the coherence of a scenario and offer tangible visualizations of the potential impact of abstract quantitative data and trends.	Pedret (2019)
Design fiction	Design Fiction is a creative approach that involves the conceptualization of imaginary objects and events within a fictional future setting. It is a form of playful speculation that breaks free from the constraints of designing for practical market purposes. Design fiction serves as a means of both creating artefacts and gaining insights, offering a method to explore the implications and outcomes of various choices and values. By envisioning alternative scenarios and possibilities, design fiction encourages new perspectives and deeper understanding.	Pedret (2019)

Techniques of futuring	Description	Source
Stakeholder Analysis/System Maps	Stakeholder Analysis/System maps is a method used in strategic foresight to define the boundaries and scope of a system under consideration. It involves identifying and analysing the key stakeholders involved in the system, as well as the important issues and factors affecting it. This analysis helps determine the actors who should be involved in the foresight process, ensuring that a comprehensive and inclusive approach is taken. By mapping out the stakeholders and their relationships, the method provides valuable insights into the broader context and dynamics surrounding the system, enabling a more informed and collaborative foresight approach.	Cook et al. (2014)