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Participatory policy design in system innovation

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ABSTRACT

Governments are affected by an unprecedented technological acceleration that is transforming societies. Most technologies unfold in complex and unpredictable ways. Unfolding technologies have been both a source of societal and environmental challenges as well as a possible response to address them. This complexity challenges the ability of policy makers to recognize the systemic dimension of innovation and to learn from stakeholders engagement. For these reasons, sustainable transitions have progressively become a policy discourse on how to guide innovation trajectories. In this paper, we argue that a system innovation approach has great potential for governments to improve their policy design for sustainable transitions. This participatory approach requires a more systemic understanding of technological change and a better organization of stakeholder engagement than most traditional practices (e.g. an evidence-driven, technocratic or an idealistic, consensus approach) can offer. How can a participatory policy design tool with a strong emphasis on sustainable transitions be developed? In this paper, we applied a reflexive understanding of knowledge creation in stakeholder networks to develop such a tool in accordance with a system innovation approach.

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stakeholder engagement;
serious gaming; policy
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1. Introduction

European environmental policies have delivered significant benefits over the past decades and national, regional and local governments have been key partners in realizing the substantial benefits. Still, Europe is facing persistent sustainability challenges in areas such as energy, climate change, mobility and environmental risks to health and well-being (EEA 2020). Global megatrends including geopolitical power shifts, resource scarcity, urbanization and demographic change are intensifying many environmental challenges, while rapid technological change brings new risks and uncertainties. This process fundamentally changes government's relationships with their key stakeholders and requires a transformation in the design and delivery of policies and services (OECD 2019).

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This is due to the nature of the current sustainable development challenges with two contrasting tendencies. On the one hand, there is a tendency of increasing intelligence in the technological, economic, social and ecological systems. On the other hand, there is a tendency toward dissolving certainties about the problems and solutions policy makers are facing. The limits of consensus-based approaches to policy design are well known (McGuire and Agranoff 2011). Consulting stakeholders and simply adding more knowledge does not always mean more certainty about how to act rationally. On the contrary, advances in behavioral sciences show that humans are not purely rational beings (Kahneman 2011). Stakeholders and policymakers tend to focus on a limited amount of evidence that matches their preexisting beliefs. Although fragmented and sometimes even misleading; if it's resonates with their worldview, they may accept it without much objection (Mair et al. 2019). It is important to acknowledge these insights.

Policymakers need to find ways to interact differently with stakeholders, especially by moving away from seeking a predictable single future toward the possibility of multiple transition pathways with associated adaptability to rapid change. The paper's reasoning unfolds in four steps. It first explains why system innovation can be an interesting approach for participatory policy design. This participatory approach requires integrated knowledge creation and problem solving by engaging with key stakeholders across society. In a second step, the paper offers insight into how reflexivity as a methodology can provide a more comprehensive and explicit account of knowledge creation in stakeholder networks via defining a Narrative framework for Policy Design. In a third step, we use this framework developed from our reflexive inquiry as design guidelines for a transition dynamics serious gaming tool. In a fourth and final step, we discuss some preliminary observations from testing the transition dynamics serious game as a form of participatory policy design. Because our focus is on policy design, we do not set out here the outcome of the gaming sessions but rather highlight how the serious game can be used by governments. Finally, we conclude that design issues can positively (e.g. an explicit designed system innovation approach) or negatively (e.g. an implicit technocratic or consensus approach) impact participatory policy design to stimulate innovation in itself along more sustainable pathways.

2. Participatory policy design and system innovation

Participatory policy design has received interest from governments to improve decision-making. It includes the conscious and deliberate effort that involves activities such as acquiring knowledge about the effectiveness of policy interventions to address societal challenges and analyzing their relevance to socio-economic transformations (Howlett 2019). The push for this participatory process can be from top to bottom: i.e. a government initiating participatory approaches to policy making; or bottom-up i.e. certain stakeholders seeking to influence a specific policy. The practice of participatory policy design is more of a general approach than a specific tool, since the overall goal is to facilitate the participation of individuals or groups in policy design through advisory or participatory means to increase accountability, transparency and active involvement (McIntyre-Mills 2004).

The successful implementation of participatory policy design is not straightforward. Different knowledge claims compete, and their legitimacy and validity need to be negotiated in the policy design process. The participatory process can also create conflicts between different stakeholder groups by expressing opposing views and exposing underlying tensions. In addition, failure to involve other groups who believe they should have been consulted could lead to conflict and opposition. Expert knowledge, whether excellent or striking, is never a substitute for stakeholder engagement. Therefore, instead of being fragmented or disconnected from formal decision-making, such participatory policy processes must be carefully integrated into policy design (De Smedt et al. 2008).

System innovation can be understood as a transformative change in the structure of a socio-economic system. Such changes require a reorganization of the connections of technology and knowledge flows within the system and go beyond optimizing specific elements. When knowledge is not shared, it hinders the capacity to exploit novel ideas and experimenting expertise. An example of a system innovation is 3D printing. It qualifies as a system innovation because it is a reorganizing of the whole manufacturing system that will lead to that system exhibiting new products, dynamics and behaviors that are different to the way it was done in the past (Scapolo et al. 2014). Due to the sustainability potential, there is an increasing interest from policy makers, civil society organizations and large private companies in managing sustainable transitions (Raskin et al. 2002; Geels 2005; Loorbach 2010; Endovitsky and Popkova 2018). However, there is a large difference between a technical approach and a more systemic approach to innovation. The many interlinkages within and between socio-economic systems mean that there are often major barriers to achieving the transformative change that is needed to achieve long-term sustainability objectives. Designing governance systems that simultaneously produce high levels of collective knowledge creation, learning and testing often means overriding basic system features such as path dependency (Duit and Galaz 2008).

Governments are adapting, but progress is often fragmented, reactive rather than intentional, and sporadic rather than systemic. Governmental organizations appear to see public participation as an opportunity to gain trust for a predetermined approach, rather than to rethink their policies and practices (Macnaghten and Chilvers 2014). Hence, despite a generally forward trend, the public sector has not yet taken the next step: a commitment to ensure that system innovation is a consistent and reliable resource that can be used to give governments the options they need (OECD 2019). In the next sections, we explain how our approach of developing a transition dynamic serious game tool can support policymakers in their participatory policy design for sustainable transitions.

3. Knowledge creation in policy design

According to Howlett (2019), a subset of policy studies focuses on policy design, emphasizing both the importance of outcome and process. What seems to be missing is a discourse on the contextual nature of knowledge creation. Knowledge is never neutral, largely because of the transformation possibilities it allows. Knowledge does not

acquire meaning through an inherent quality, but rather through its construction. Applying the concept of reflexivity provides an interesting heuristic to better understand and makes it more explicit how knowledge is being constructed within policy design. Reflexive inquiry draws on a social constructionist view of the world and provides insights how we constitute knowledge and realities in our thinking (Cunliffe 2003). Reflexivity as a methodology (Alvesson and Sköldberg 2000) questions knowledge representation by suggesting that we are constantly constructing meaning and social realities as we interact with others and talk about our experience. In the context of this paper, we applied reflexivity to better understand the complex value issues of scientific rigor, knowledge co-creation, power, policy effectiveness and discourse within policy design.

3.1. Narratives and values as building blocks

Knowledge and evidence are perceived and used in different ways. Some policy design initiatives use quantitative or qualitative research, while others reconstruct and analyze political discourse or establish citizen forums. Inspired by Mayer, van Daalen, and Bots (2018) we introduce six interacting styles or narratives within the domain of policy design. In the context of this paper, we use the concept of a narrative as an account of an explicit perspective used to support policy design practice. The narrative highlights a sense of purpose and the underlying assumptions including quality claims. It is not our intention to adopt a normative standpoint on what should be the most preferable narrative.

3.1.1. Evidence driven narrative

The increasing emphasis on the need for evidence-based policy indicates the continuing influence of the modernist belief in progress informed by reason (Sanderson 2002). The evidence driven narrative is formed by assumptions about knowledge and uncertainty: it is assumed that the world is to a large extent empirically knowable and often measurable. This narrative is in line with the rationale style (Mayer, van Daalen, and Bots 2018). Knowledge used for policy must be able to withstand scientific standards. Policies are positively shaped by evidence, i.e. a better understanding of causes, consequences, nature and scale leads to better policy.

3.1.2. Argumentative narrative

Policy initiatives are conducted in the context of debates about issues, solution choices and (political) agendas. The argumentative narrative assumes that it can make the structure and progress of the discourse transparent. It is often based on interpretative and qualitative methods and techniques to illustrate the content and quality of the arguments and to make judgments based on criteria such as justification, logic and richness. In this way, it can help identify gaps in the debate or look for arguments and positions that can bridge between opponents.

3.1.3. Strategic narrative

The strategic narrative is based on assumptions that policy making occurs in a complex and rather chaotic arena. There are numerous players, with different interests and strategies. Therefore, it is essential to gain insight in the various objectives and means of the actors involved. To be effective, interventions must be targeted and implemented on the right scale.

3.1.4. Participation narrative

Certain groups of stakeholders are often excluded from the political debate. This is called the technocratic criticism (Fischer 1990). The participatory policy style assumes that citizens, and not only experts, can have a voice and are sufficiently interested and competent to deliberate on difficult issues. The policy analyst can take on a facilitating role in such a debate by promoting inclusion and openness.

3.1.5. Negotiation narrative

Stakeholders who participate in policy making display strategic behavior in pursuing their own objectives. Within a negotiation narrative, opponents most often substantiate their case on controversial and complex issues with conflicting research reports. Procedural aspects include the organization of decision-making or the way in which parties jointly search for solutions to a problem. To this end, agreements can be made through negotiation.

3.1.6. Co-creation narrative

The co-creation narrative has a strong socio-constructive foundation. Different views of reality can be valid at the same time. In an interactive style, target groups and stakeholders are invited to structure problems or come up with solutions in structured work meetings (Brandsen, Steen, and Verschuere 2018). Participants learn about their own views and values in relation to those of others and can refine those views. This is under the assumption of a single shared cultural basis for these beliefs (Borch and Merida 2013).

3.2. Constructing the framework

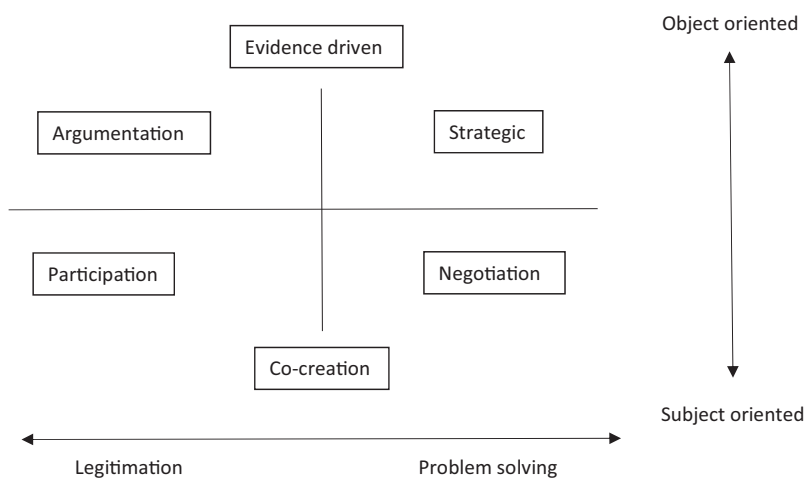
In accordance with Cunliffe (2003) and to be consistent with reflexive inquiry, we first deconstructed policy design from a knowledge value viewpoint. In order to do so, six complementary narratives are conceptualized using six value questions. The six narratives represent a specific perspective linking narratives with quality criteria (Table 1). The values determine in what way a policy analyst or stakeholder will view the quality and the criteria that will be applied to design or evaluate it. Note that these narratives should not be understood as overarching blueprints by which policies are conceived.

3.3. Narrative framework for policy design

The narratives provide a more comprehensive and explicit account of knowledge creation and stakeholder engagement. We used these narratives to define a Narrative

Table 1. Overview of Policy Design narratives and the related value and quality criteria.

Narrative	Assessment question	Value	Policy Design Quality Criteria
Evidence driven	Are the policy insights evidence-based?	Scientific rigor	Accuracy: the quality or condition of exact or precise in informing
Strategic	Is the intervention logic coherent?	Policy effectiveness	Feasibility: the quality or state of being effective
Negotiation	Do the interventions receive broad social support?	Policy relevance	Saliency: the quality to be successful in gaining support
Argumentation	Are the argumentations balanced and comprehensive?	Discourse	Consistency: the quality of being just and rich in argumentation
Participation	Are the relevant stakeholders involved?	Democratic	Legitimacy: the quality of equal access and influence on the policy process
Co-creation	Are the policy insights co-developed in an interactive learning process?	Construction-ism	Experiential learning: the quality of being constructed and interpreted through interaction

**Figure 1.** Narrative framework for Policy Design (NaP).

framework for Policy Design (NaP). To do so, we introduce two dimensions to map the six narratives: (a) an object versus subject orientation of the related values; and (b) legitimation versus problem solving (Figure 1).

3.3.1. Object versus subject orientation

In Figure 1, we visualize that the narratives in the top half are primarily object oriented: a policy assessment, an intervention logic, an argumentative analysis. The narratives at the bottom are subject-oriented. They focus primarily on the interaction between policy makers, experts, stakeholders and citizens. While the activities of the top half are usually captured in a product, e.g. a report, an action plan; the effects of the activities of the bottom half are usually captured in the quality of the process itself: increased support, mutual understanding, learning. The distinction between object and

subject translates into the types of evaluation criteria to be applied. Object-oriented policy analysts assess the quality of a Policy Design project for scientific accuracy or the substantive insights it has generated. Subjective policy analysts base their judgment on the contribution of stakeholder interaction to the decision-making process.

3.3.2. Legitimation versus problem solving dimension

Figure 1 also shows that the activities on the left-hand side are judged by idealistic criteria for Policy Design, such as inclusion, transparency and legitimation. The activities on the right-hand side are judged by pragmatic, problem solving criteria such as policy effectiveness and relevance. The turning point between legitimation versus problem solving lies within the “Evidence driven” and “Co-creation” narratives. The values behind these narratives are often characterized with a balanced design including problem solving as legitimation feature.

4. Developing and testing a transition dynamics serious gaming tool

A transition, or transformative change, refers to the fundamental system-wide change in the structure and functioning of a system. As prototype team, we developed the serious game tool as a form of participatory policy design tool in three iterative sprints within a total time span of three months. The potential for prototyping depends on whether the tool development is understood as creative, contingent and emergent (Kimbell and Bailey 2017). Our team could build on experience in system thinking, design, serious game development, innovation systems, foresight and behavioral insights. Since the development in 2018, the current version of the gaming tool has been tested in training and workshop sessions.

4.1. Design principles inspired by policy design narratives

In the context of this paper, we use design principles as conditions that facilitate compliance with the responding policy narratives. As starting point, we desired to go beyond the most common traditional practices ranging from a evidence driven, technocratic scope versus an idealistic, visionary approach. Hence, how could we develop a participatory policy design tool with a strong emphasis on experimental learning? Using the NaP framework, we could focus on creating a stakeholder experience that is in line with the co-creation, negotiation and strategic narratives (Figure 2).

In addition, we prototyped a transition dynamics serious gaming tool inspired by Geels (2005) and Meadows (1999). As a prototype, TransDyn is a simple experimental model of a proposed solution used to test or validate ideas, design assumptions and other aspects of its conceptualization quickly and resource-friendly. This approach allowed us to make appropriate refinements or possible changes. Table 2 provides an overview of the design principles. Prototyping the tool followed a process of several iterative sprints linking narratives to design principles.

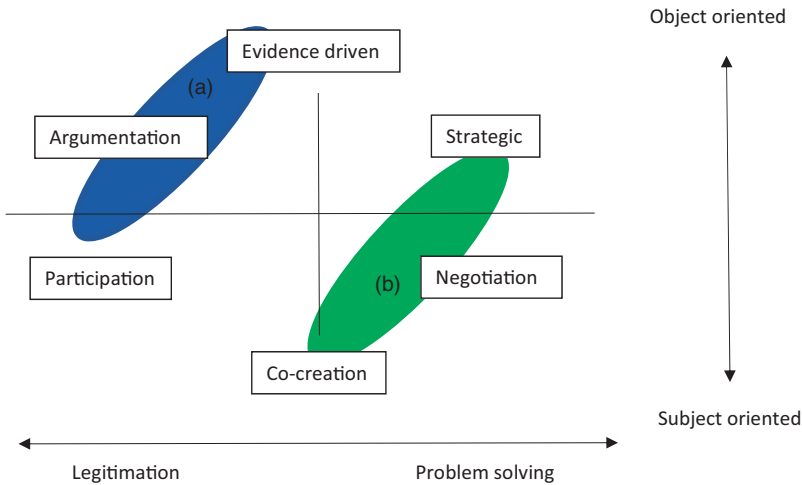


Figure 2. NaP mapping of (a) frequent used project design for transition projects and (b) transition dynamics serious gaming tool.

Table 2. Overview of the design principles for prototyping TransDyn.

- ✓ Provide an experience that go beyond informing
- ✓ Focus on co-creation of effective actions
- ✓ Ensure meaningful and inclusive interaction with a focus on policy relevance
- ✓ Challenge participants' understanding of the current solutions

4.2. Overview of the serious gaming tool TransDyn

TransDyn is the materialization of our iterative sprints. The prototyping included an explicit consideration of how policy narratives shape the interactions between knowledge, system innovation, agency and governance. Prototyping is an integral part of design thinking and user experience design in general because it allows to test ideas quickly and improve them in timely manner. In Table 3, we provide an overview of the design principles and the TransDyn tool specifications. An overview of TransDyn tool material is presented in Figure 3.

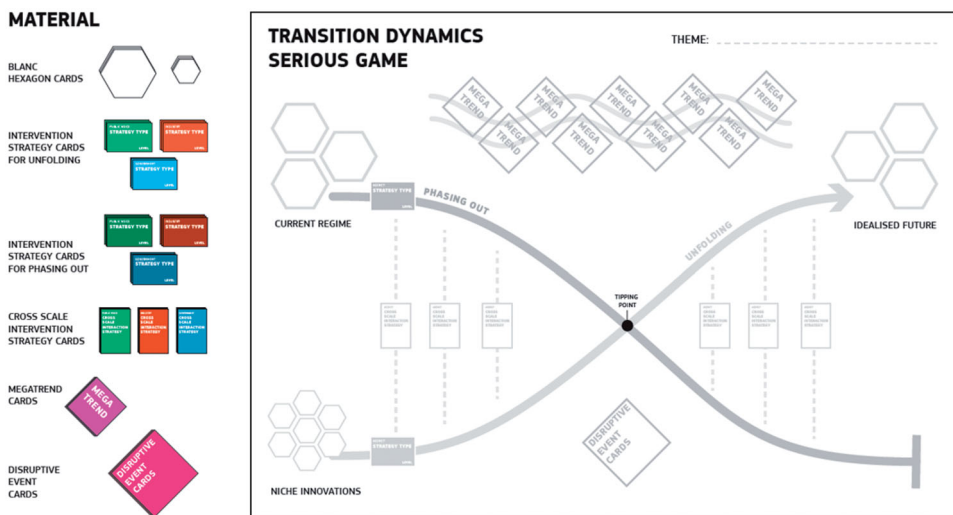
4.3. Insights from testing TransDyn

Innovation at system level requires key stakeholders to align their services and strategies with long-term sustainability visions in a systemic way. Since most organizations do not have the capability on their own to change the entire socio-economic system, it is crucial to collaborate. This includes exploring alternative innovation pathways to overcome current barriers and identifying short-term opportunities that allow stakeholders to actively take part in change toward system innovation.

A session with TransDyn starts in step 1 with **co-creating of an idealized future** for example: “The inner-city will be car-free in 2025. Teleworking is well established in the urban community and the city is designed to support citizens with accessible, attractive and carbon-free mobility.” This future vision can help clarify differences and

Table 3. Design principles, related narratives and TransDyn tool specifications.

Design principle	Scope formulation using NaP	TransDyn tool specifications
Provide an experience that goes beyond informing	Look for subject oriented narratives	<ul style="list-style-type: none"> Use a serious game approach
Focus on co-creation of effective actions	Look for problem solving Include strategic narrative	<ul style="list-style-type: none"> Unfolding and phase out intervention strategy cards Serious game tool to refine most effective scale of intervention
Ensure meaningful and inclusive interaction with focus on policy relevance	Include negotiation narrative	<ul style="list-style-type: none"> Agency identification cards Serious game tool to ensure participation of relevant stakeholders
Challenge participants understanding of current solutions	Include co-creation narrative	<ul style="list-style-type: none"> Transition dynamics canvas including challenge cards (mega trends and disruptions)

**Figure 3.** Overview of the TransDyn tool material including the boardgame canvas and related cards.

similarities about specific development needs and can support a common understanding of complex, misunderstood or even controversial issues.

The participants continue to work together to **identify niche innovation**, e.g. new ways of doing things that are still in an embryonic state, but that can strongly support the future vision (step 2). Involving newcomers, such as startups, researchers, investors, local governments, can contribute to effective and creative **problem solving**. A session with TransDyn will help them generate various transformative ideas.

A TransDyn session proceeds to explore future collaboration for **unfolding** the niche innovations (e.g. *mobility as a service*) and scaling-up (step 3). In addition, the game design also encourages participants to negotiate about strategies to **phase-out** current practice (e.g. *fossil based economy*) (step 4). Finally, participants are involved in a **shared reflection** on using the strength of the old system to foster the new (step 5). An example of a TransDyn session flow is included in Annex.

5. Test observations of applying TransDyn

Political and social theorists have long identified the connections between knowledge, agency and power, a tension that persists within contemporary efforts to connect science with policy and practice (van Kerkhoff and Lebel 2015). The variety and multifaceted nature of policy design makes it clear that there is no single, let alone one best way. The discipline of policy design consists of many different schools, approaches, roles and methods. The most common traditional innovation policy practices e.g. an evidence-driven, technocratic and an idealistic, consensus approach are not (always) fit for purpose. A technocratic approach entails the risk of supporting a technology that lacks transparency and societal support and could lead to a lock-in situation. In contrast a consensus approach may lead to a long and fussy policy process lacking the essential investment decisions and leading to only marginal reform.

Whilst policy making implicitly is a design activity, it is yet to be explicitly discussed in design terms (Mintrom and Luetjens 2016). The use of the NaP framework for developing the policy design tool makes the intentional selection of design principles more explicit. Because our focus is on policy design, we do not set out here the outcome of the gaming sessions but rather highlight how TransDyn can support governments to manage sustainable transitions. Based on our testing experience, we see two promising benefits. First, by using TransDyn, governments can improve stakeholder engagement through well-designed strategic conversations, ensuring societal buy-in but avoiding technocratic lock-in. Second, government actors participating in the serious game sessions can engage in a learning process and build anticipatory capacity to better understand and manage system innovation. In addition, we also reflect on remaining challenges of using the serious game beyond our preliminary test sessions.

5.1. Engage stakeholders in strategic conversation

Addressing complex interlinked problems requires a strong emphasis on the social relationships and stakeholder perceptions. Our preliminary insights illustrate that there are usually tradeoffs between different unfolding technologies, but also between different stakeholder groups. For relatively large socio-economic systems (e.g. energy system), structural change implies an uncertain transition phase including high investment risks. This uncertainty will often predetermine the inertia and opposition to structural changes (Endovitsky and Popkova 2018). It is therefore necessary to explore the differences in both the innovation capacity and risk perception among the key stakeholders in the serious game session. Companies and organizations that are aware of the implications of sustainability risks for their business will have an incentive to mitigate them by identifying new technological and organizational innovation opportunities. In addition, governmental actors should also envision how to facilitate risk-investments and phasing-out mechanisms for unsustainable systems.

5.2. Strengthen anticipation capabilities

Many of the long-term challenges faced by policy makers involve deep levels of uncertainty. Technology and social innovations evolve rapidly and go beyond the linear

projections used to map the future. Change takes place in complex interactions that cannot be predicted. It is impossible to know the future, but formulating robust long-term policies requires some level of knowledge about the future (Van der Steen 2017). Incorporating participatory policy design initiatives can enhance a government's ability to recognize multiple transformations and address diverging perspectives to achieve system innovation for sustainable socio-economic systems. The serious game also enables governments to explore national or regional innovation capacities and refine the most effective intervention scale. This experience and the practical skills acquired by those involved in implementing the process will be supportive to better anticipate change and to ensure that system innovation is indeed a reliable resource for shaping future societies.

5.3. Critical reflections

Based on our preliminary testing experience, we see a potential of the gaming tool to strengthen policy design in terms of stakeholder engagement and anticipation capabilities. Stakeholders involved in testing of TransDyn provided a variety of relevant insights (e.g. relevant knowledge, interpretations, priorities and perspectives), not only about what works, but also about what is worthwhile and meaningful. These insights underline the value of a policy narrative framework as part of the design. Using the framework also draws attention to the co-evolutionary relationships between knowledge, system innovation, agency and governance. As mentioned, these narratives should be understood as guidelines for policy design tools (e.g. design principles) and not as overarching blueprints.

The operational challenge for governments to integrate TransDyn into formal policy initiatives needs to be further explored and evaluated. For example, what diversity of stakeholder knowledge is needed to assess the potential for transformative change? How can strategic conversations help assess future system needs? How can we better anticipate the dynamics of unfolding technologies? What types of strategic interventions are likely to be most effective, and on what scale? Questions like these highlight the need for further research and testing of TransDyn as a policy design tool.

We also want to acknowledge the limits of our analysis based on the preliminary testing of the serious game. We used a specific framework to select design principles based on our experience. This reframing of knowledge creation in stakeholder networks focuses on the process of policy design through an explicit consideration of different policy narratives. Although design principles offer ideals to work toward, the relational perspective of co-production in the test sessions also reflects the limitations of the serious game with regard to the diversity of knowledge (e.g. variety and number of stakeholders involved) and the focus of knowledge creation (e.g. scope and number of sessions). Many barriers are in place that obstruct co-creation practices in policy making. Our finding should be seen as a small contribution to the debate on how governments can use participatory policy design tools to support sustainable transitions. Clearly, innovation systems are more complex and dynamic than a limited number of serious game test sessions.

6. Conclusions

Policy initiatives are often developed on the assumption that strategic actions can be understood through analysis of simple cause-and-effect mechanisms (Ferguson, Brown, and Deletic 2013). A system innovation approach offers promising opportunities for governments to improve their policy design by moving away from seeking a predictable single future toward the possibility of multiple transition pathways. In this paper we explain how system innovation and design thinking can be integrated into participatory policy design. We applied a reflexive understanding of knowledge creation in stakeholder networks to differentiate six policy narratives. These narratives provide important but different values to knowledge creation within participatory policy design. In addition we used the policy narratives framework (NaP) as guidance for developing TransDyn, a transition dynamics serious gaming tool. This is reflected in the design principles from the serious game which are in line with a subset of the policy narratives (e.g. co-creation, negotiation and strategic policy narrative). The use of the NaP framework makes the intentional selection of design principles more explicit.

Based on our preliminary observations, we see a potential of the serious gaming tool to strengthen policy design in terms of stakeholder engagement and anticipation capabilities. Policy design issues can (implicitly) contribute to lacking innovative solutions for orienting innovation along more sustainable paths. System innovation highlights the need for knowledge co-creation situated across the boundaries of science, policy and practice. This includes exploring alternative innovation pathways to overcome current barriers and identifying short-term opportunities that enable stakeholders to actively participate in transformative change. Stakeholders may provide a variety of experience and therefore a diversity of relevant insights (e.g. relevant knowledge, interpretations, priorities, and perspectives), not only about what works but also about what is worthwhile and meaningful. Hence, it is important to integrate system innovation and technological diversity within policy design as an important means of promoting more sustainable forms of societal transformation.

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No potential conflict of interest was reported by the author(s).

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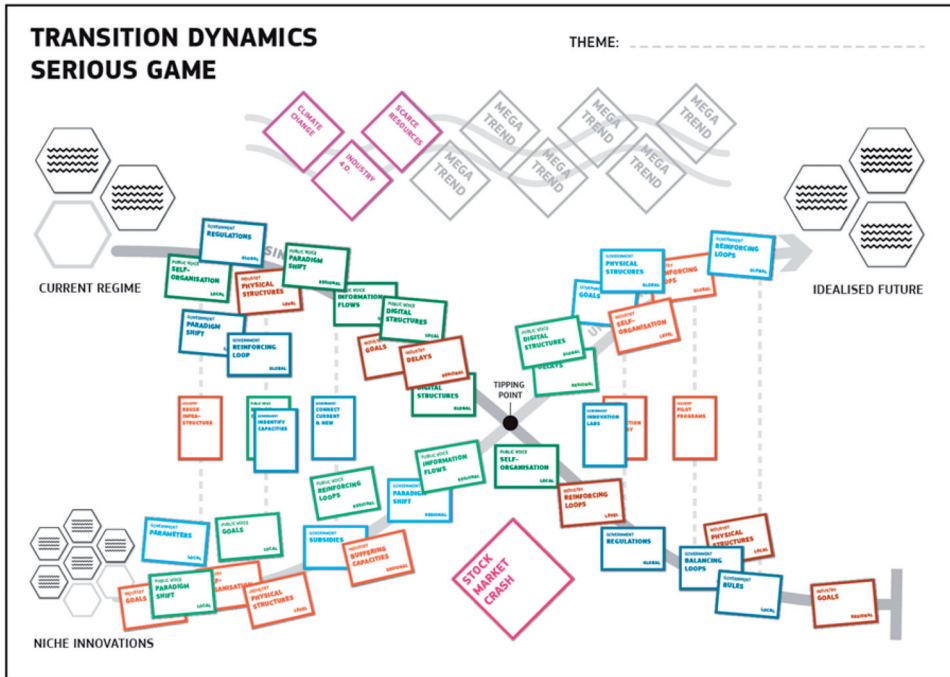
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Annex.

TransDyn session process flow

Step 1	(10')	Imagining idealized future, in writing or drawing (e.g. bio-based economy)
Step 2	(10')	Identifying current new ways of doing in embryonic state <i>Material: blanc hexagonal cards</i>
Step 3	(15')	Reflecting about unfolding the new ways through a variety of interventions. Using agency to strengthen multiple lenses (e.g. public voice, industry, government) <i>Material: intervention strategy cards for unfolding</i>
Step 4	(10')	Reflecting about strategies to phase out current practice (e.g. fossil based economy) <i>Material: intervention strategy cards for unfolding</i>
Step 5	(10')	Linking both and using the strength of the old system to foster the new <i>Material: cross scale interaction strategy cards</i>
Step 6	(15')	Introducing new, external elements to stretch the thinking and future proof (e.g. introduce landscape developments (mega trends) and extra pressure from disruptive event. <i>Material: megatrend cards and disruptive event cards</i>

Image of serious game canvas after an interactive stakeholder session.



PLAYING THE GAME