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Gaming for the energy transition. Experimenting and learning in co-designing a serious game prototype

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ABSTRACT

Experimenting and learning are increasingly considered as means to innovate governance approaches for pursuing a more sustainable society. Learning and experimenting can unfold in different formats, such as games or co-design processes. This paper investigates an experimental co-design process conducted in the Dutch Province of Groningen to collaboratively design a serious game called the 'Energy Safari'. Serious games can mimic real-world issues and thus provide a safe and open environment that is inviting for exploring, experimenting and learning. Co-designing games is recognized for its capacity to support the integration of 'real world' components in games, which is also our first ambition with the experimental co-design process of the 'Energy Safari'. Little attention has been paid, however, to the role of the game-co-design process itself to instigate civic learning events. Our second ambition targets this research gap. The analysis illustrates that co-designers are very well capable to experiment with serious game components in a way that creates a meaningful and recognizable regional narrative that deeply embeds regional challenges. Linked to playful game prototyping learning events also occurred during the co-design practises and the debriefing cover a wide range of learning activities, ranging from single loop to triple loop learning. Ambiguity and procedural gaps forced the co-designers to question practises and institutions by confronting them with their real-world experience. Our analysis suggests, that prototypes thus need a nuanced balance between generic and specific to generate an open experimentation and learning space that is however deeply rooted in a regional narrative. Doing so can subsequently trigger a rich variety of civic learning activities. Nevertheless, it is also clear that the promotion of more inquisitive triple loop learning effects will not easily emerge and likely require active promotion.

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1. Introduction

Experimenting and learning recently gained increased attention for being central elements within many novel governance approaches (e.g. [Bulkeley and Castan Broto, 2013](#); [Nevens et al., 2013](#)). Serious games provide environments for civic learning and experimentation ([Gee, 2003](#); [Raphael et al., 2010](#)). By mimicking 'real world' situations, they allow players to engage with these situations in an experiential, explorative and inquisitive fashion with the advantage to experience different possible responses but no 'real-world' consequences. As such, serious games provide an interesting environment for exploring ambiguous and contested societal

challenges, such as the pursuit of a sustainable energy system in the region of Groningen (NL). Serious games allow for experimentation that can trigger shared knowledge, the finding of common ground, conflict resolution and to experiment with institutions or motivate goal achievement ([Bluemink et al., 2010](#); [Devisch et al., 2016](#); [Guzzetti et al., 1993](#); [Hämäläinen, 2011](#); [Poplin, 2014](#); [Tan, 2014](#)). For living up to the expectations placed, it is crucial that serious games are reflecting 'real-world' situations and their particular context. Collaborative and participatory design approaches are potentially helpful for developing serious games that are well embedded in such real world situations. They can help expressing and translating existing narratives, social conflicts and institutional responses into a game context. Although the benefits are recognized in literature, various scholars stress that collaborative and participatory design approaches for the development of serious games has still attracted only limited academic attention yet (e.g. [Dörner et al., 2016](#); [Khaled and Vasalou, 2014](#); [Mildner and Mueller,](#)

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2016). We address this gap in our research, by reflecting on using a co-design approach for the development of a serious-game called the 'Energy Safari'.

Our first goal is to explore how co-design supported the embeddedness of the game in its specific regional context and notably, if co-design helped produce a game considered meaningful for future players in reflecting a broad variety of regional challenges and conflicts. Our second ambition moves beyond an investigation upon how co-design influenced the development of the game. Co-design activities can themselves be environments that encourage collaborative civic learning processes (Gee, 2003; Raphael et al., 2010). Hence, our second question is, whether the process of co-designing serious games is *itself* already showing evidence of a process of consolidated civic learning. Notably, we are interested in how civic learning through co-design helps illuminate social conflicts and the experimenting with spatial and institutional practices.

The 'Energy Safari' targets the pursuit of a sustainable energy system in the northern Dutch province of Groningen. This pursuit to a systole energy system provides an attractive arena for our investigation as this pursuit is not only characterized as urgent, but it is also contested and showing a process of institutional experimentation. Urgency is perceived on different levels of authority. The European Union Climate and Energy targets that have set the share of renewables in the Union's energy mix at 20% in the year 2020 (CEC, 2010). This has in a Dutch context been translated in a shift from a 5% share of renewables in 2013 to a 16% share in 2023 (SER, 2013). The province of Groningen is considered as one of the key arenas in which this pursuit will become manifested (e.g. Spijkerboer et al., 2016; Zuidema and de Boer, 2017). Historically, the producing of natural gas in the large Groningen gas field has propelled the region as the 'energy valley' of the Netherlands. The same gas production has, however, also triggered the occurrence of earthquakes resulting in serious property damages, pressures on the livability of rural villages and social controversy. In this volatile social and political context, the pursuit of a sustainable energy system seems to be both, welcomed and contested. Moving beyond fossil fuels and natural gas is a widely accepted ambition in the region, but the integration of renewable technologies in the regional landscape is debated (e.g. de Boer and Zuidema, 2015). Controversies can easily emerge as renewables such as wind, solar or hydropower are above the ground, highly visible and require vast amounts of space as compared to a fossil fuel based energy system and are often perceived as visual disturbance (e.g. Pasqualetti, 2012; Stremke and Koh, 2011). Furthermore, renewables can also create externalities such as noise and odor pollution produced by wind farms and bio-digesters (e.g. de Boer and Zuidema, 2015). With renewables becoming an increasingly common element in our landscapes, it is all but surprising that they are attracting considerable social resistance (e.g. Cass et al., 2010; Jones and Richard Eiser, 2010; Walker et al., 2010; Wüstenhagen et al., 2007). The integration of renewable energy systems into our spatial and socio-economic landscapes is therefore both a necessary and contested process (e.g. de Boer and Zuidema, 2016), which in Groningen seems even more prompt. Hence, regionally embedding the 'Energy Safari' is crucial to ensure it captures and illuminates the richness of the existing social conflicts for the game to be considered a realistic game context.

In the meantime, responding to the controversies related to renewable energy generation is not yet a widely institutionalized practice. The current energy system and the institutional rules involved are largely adjusted to accommodate energy generation based on fossil fuels (Farla et al., 2012; Simmie, 2012; Verbong and Loorbach, 2012). Responding to the spatial and social implications of developing a multitude of decentralized production units is not a

common part of this system. Consequently, the pursuit of a more sustainable energy system takes place in a physical, social and institutional context, ill-adapted to accommodate such a pursuit. Institutional barriers such as spatial zoning plans, energy laws and regulations, contracts between producers and consumers and the organization and functioning of electricity grids are among the examples of the hurdles that renewable energy projects can easily face (e.g. Beaulieu et al., 2016). Hence, also the development and implementation of renewable energy projects is an iterative process of exploring, pioneering, innovating, learning and adapting (e.g. Cumming et al., 2012; Foxon et al., 2009; Loorbach, 2010; Loorbach and Rotmans, 2010). Such exploration and experimentation might occur unconstrained by lengthy 'real world' procedures and actual 'real world' consequences, due to the safe environment serious game provide. They and also contribute to the illumination of social conflicts, institutional experimentation and civic learning. Although we are also after such civic learning, we also question if not only a finalized serious game, but already the process of co-design itself, might be an arena for civic learning and experimentation. Our hypothesis is that co-design processes can rather benefit from freeform, ambiguous sets of rules than finalized, fixed rule sets that are guiding the co-designers behaviour. We therefore aim to establish whether this allows for creatively and collectively negotiating and experimenting with alternative social perspectives, alternative narratives and institutional responses. We thus also chose to target more informed individuals for the co-design so as to gain the capacity for critical reflection and the (re)design of existing social and institutional practices.

The current context of institutional experimentation and searching that surround energy transitions within the volatile real-world context of Groningen makes the 'Energy Safari' a promising context for pursuing our ambitions. To better understand these ambitions, section two will introduce the academic debates about how co-designing serious games can create the kind of environment that generates our desired learning. In section three we introduce the 'Energy Safari', the process of co-design used in its development and our research methodology. Section four contains the main results, findings and the analysis of them. Finally, in section five we come back to our main ambitions in the conclusion. It is there we will suggest that the process of co-design itself can indeed trigger civic learning, while using an ambiguous rule set in the game prototype seems a key-accommodating factor.

2. Co-designing games as learning and experimentation environments

Games, digital and gamified environments and tools have been put forward in a broad variety of sectors. These range from gamified learning, health, urban and community planning, transport to energy related issues (Berger et al., 2013; Devisch et al., 2016; Kleinhans et al., 2015; Mohammed and Pruyt, 2014; Poplin, 2014; Tan, 2014). Games are artificial environments where learning and experimenting is activated through gameful (rule-based) and playful (free-form) activities (Deterding et al., 2011). Games support the development of improved cognitive and social learning (Erhel and Jamet, 2013; Gee, 2005; Hamari et al., 2016; Prensky, 2006). Thus, as 'serious' learning technologies, games are expected to increase literacy, raise awareness, build up skills, create coalitions and strategies, and provide immediate feedback on the decisions taken and experience the consequences of those decisions (Crookall, 2010). The safe game environment supports experimentation, taking risks and exploring extreme pathways without facing the 'real' consequences of failing or causing damages (Devisch et al., 2015; Juul, 2016; Raphael et al., 2010). They are thus exploration environments to improve system understanding and

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