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Regional design ateliers on ‘energy and space’: systemic transition arenas in energy transition processes

Annet Kempenaar ^a, Emma Puerari^a, Marcel Pleijte^b and Michael van Buuren^b

^aFaculty of Spatial Sciences, University of Groningen, Groningen, the Netherlands; ^bWageningen Environmental Research, Wageningen, the Netherlands

ABSTRACT

In light of the challenges imposed by climate change, many countries are ‘planning’ for energy transition. Interactions between different actors in transition arenas, help shift the current complex socio-technological energy system towards a new sustainable one. A critical issue is integrating the new energy system with other land-uses and spatial issues. In the Netherlands, regional design ateliers were organized to explore and address these challenges. We conceptualized the regional design ateliers on energy and space as systemic transition arenas in planning for energy transition and analysed their contribution to the regional energy transition process. The design ateliers played an important role in creating insights into regional energy transition and its spatial implications. This raised awareness and affected the perspectives of several stakeholders on energy transition. Our study also showed that some important (spatial) aspects, such as smart combinations with other land-uses and the transport and storage of energy, received little attention during the ateliers, leading to unfinished conversations. We argue that regional design ateliers should also be organized in the upcoming stages of ‘planning’ for energy transition to further fuel the transition process and fully exploit the benefits of regional design ateliers as systemic transition arenas.

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Introduction

The challenges imposed by climate change and the 2015 Paris Agreement have urged countries to steer their current fossil-based energy system towards a sustainable, low or zero carbon system. Many of them have therefore started to develop strategies and plans for energy transition towards a fossil free sustainable energy system. This is not an easy process as there is no well-defined and clear pathway on how to transform the current energy system into a sustainable one.

A critical aspect in planning for energy transition is accommodating and integrating the implications of energy transition with other land-uses and spatial issues (De Boer and Zuidema 2015; Oudes and Stremke 2018; Pasqualetti and Stremke 2018). Recent studies

CONTACT Annet Kempenaar  j.kempenaar@rug.nl  Faculty of Spatial Sciences, University of Groningen, PO Box 800, Groningen 9700 AV, the Netherlands

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have shown the immense impact that energy transition will have on the existing landscape (Sijmons et al. 2017; Kuijers et al. 2018; Stremke and Schöbel 2019) through the installation of wind turbines, solar panels, other renewable energy sources, the development of new infrastructures and distribution networks, energy storage facilities, and the refurbishment of existing buildings. Guiding this energy transition goes beyond the 'simple' allocation of new spatial developments. It calls for policy changes, new institutional structures and arrangements and smart combinations with other land-uses.

Planning for energy transition thus involves at least two major challenges. The first challenge refers to the careful integration of vast amounts of new energy elements and their land use into our rural and urban landscapes (Pasqualetti and Stremke 2018). The second challenge is that of stimulating and developing institutional and societal innovations that enable mainstreaming promising technical innovations and solutions, as well as their spatial accommodation and integration.

In the Netherlands, regions are considered the crucial geographical scale required in order to address the challenges related to planning for energy transition (SER 2018; Rijksoverheid and Unie van Waterschappen 2018). Next to experiments and investments in various renewable energy sources, and other much needed measures, the Dutch National Climate Agreement (SER 2018) foresees the development of Regional Energy Strategies (RES) in 30 regions that together cover the Netherlands. Leading up to regional debates and in preparation of the RES, multiple regions have organized regional design ateliers on 'Energy and Space' in order to explore the spatial implications of energy transition, which in turn contributes to the regional discourse on energy transition.

Within Dutch planning, regional design ateliers have become an established practice for envisioning alternative futures for regional development in strategic spatial planning (De Zwart 2015; Kempenaar 2020). Examples of these processes are the Restructuring of the Sandy Soil Areas (De Jonge 2009), Atelier IJmeer (De Zwart 2015), and BrabantStad (IABR 2014). The ateliers are used to generate, in close collaboration with regional stakeholders, integrative, appealing, and persuasive images of possible future situations, and as such contribute to exploring alternatives and enable informed decision-making about the future.

In transition processes, however, (possible, desirable) future situations cannot be fully known or envisioned, due to the complexity, openness and nonlinear behaviour that renders the outcomes of these processes fundamentally uncertain (e.g. Holland 1995; Rotmans and Loorbach 2009). The focus of 'planning' for (energy) transition differs on this point from more 'traditional' (strategic) spatial planning (e.g. Albrechts 2004; Albrechts and Balducci 2013; Kunzmann 2013), in which visions and perspectives of possible and desirable future situations can be developed with a certain amount of accuracy. The question then arises what can regional design ateliers add to the 'planning' for socio-technical transitions, such as energy transition. We studied eleven regional design ateliers on 'Energy and Space' that were held in 2016 and 2017 in the Netherlands to study their contribution to the regional energy transition process, and, as such, to dealing with the challenges that are encountered in 'planning' for energy transition.

Regional design ateliers as systemic transition arenas

A transition is a shift from one state to another in a complex socio-technical system and implies a radical and fundamental change to the system (Rotmans, Kemp, and van Asselt

2001; Rotmans 2006; Hölscher, Wittmayer, and Loorbach 2018). Complex socio-technical systems, such as the energy system, are open and dynamic systems that evolve over time, behave in a non-linear way, and are influenced by other (sub)systems (e.g. Holland 1995; Kauffman 1995; Rotmans and Loorbach 2009), meaning they can behave in an unpredictable and unknown manner. Although they appear stable, complex systems are in a state of dynamic equilibrium. They are continuously influenced and affected by their context. Internal and external pressures to the system can create a status of chaos and change, which, in turn, leads to a new stable state. Such structural changes are of course never fully predictable or manageable. However, understanding, as much as possible, the mechanisms at work during transitions enables options to manage or at least affect the direction and pace of a transition, and opens up the possibility to ‘plan’ for a transition like the energy transition.

The transition management framework (Kemp, Loorbach, and Rotmans 2007; Loorbach 2010; Rotmans, Kemp, and van Asselt 2001) distinguishes between dynamics on the macro level or the wider ‘social-technical landscape’, the meso or ‘regime’ level that guides decision-making, and the micro level consisting of projects, programmes, activities and actions (Geels 2005; Holtz, Brugnach, and Pahl-Wostl 2008; Kemp and Loorbach 2006). Based on this framework, transition processes concern ‘the interaction between changes and innovations at these different levels; slowly changing trends lead to new ways of thinking (paradigms) that lead to innovation and vice versa’ (Kemp and Loorbach 2006, 108).

In order to affect transition processes, transition arenas are created to enable and facilitate interaction between various actors involved in the transition process (Loorbach 2010; Hyysalo et al. 2019). Transition arenas are environments in which people, often frontrunners, with different backgrounds, expertise and purposes come together to explore future pathways towards possible and desirable future situations. Participants of transition arenas should have certain competences to make the arena successful, which Loorbach (2010, 174) indicates the following: (1) ability to consider complex problems at a high level of abstraction, (2) ability to look beyond the limits of their own discipline and background, (3) enjoy a certain level of authority within various networks, (4) ability to establish and explain visions of sustainable development within their own networks, (5) willingness to think together, and (6) open for innovation instead of already having specific solutions in mind.

This study conceptualizes the regional design ateliers held in the Netherlands in the context of regional energy-transition processes as a particular type of transition arena. Regional design roots in landscape architecture and urban design (Neuman 2000), and envisions the possible and desirable future arrangement of land uses in a region, their relationships, their aesthetic appearance, and how it can be realized in the future (Kempenaar et al. 2016, 21). It is often employed in the context of strategic spatial planning processes through using a participative design process with ‘regional design ateliers’ to interact with, and organize interaction between stakeholders (Kempenaar and van den Brink 2018; Kempenaar 2020). Designers and regional stakeholders engage with each other in these atelier sessions in a structured conversation about the issues at hand, their possible solutions and how to come to these solutions. As such, a regional design atelier can be considered a temporary structure that enables planning actors to develop agency for creating the institutional and physical change needed to accomplish the envisioned new situation.

Taking into consideration the work of Kivimaa et al. (2019), regional design ateliers can be framed as *systemic* transition arenas, as the ateliers instigate and foster interaction between multiple regime-based actors and interests. Within a region, the tasks and responsibilities for land use and spatial developments (infrastructure, housing, energy provision, water-management, agriculture, nature conservation, etc.) are distributed between multiple actors and organizations, who generally act from a dominant regime perspective and follow institutionalized processes. To instigate, direct and speed up transition processes, these regime-based actors need to develop agency for fuelling the desired transition.

The participation of regime based actors in regional design ateliers is guided by designers, who act as intermediaries or boundary spanners (see also: Van den Brink et al. 2019) in the regional design ateliers. Intermediaries facilitate and speed up change in transition processes (e.g. Van Lente et al. 2003; Hodson, Marvin, and Bulkeley 2013). They bridge differences, connect or link actors, activities, skills and resources, and they facilitate interaction between and within different scale levels in transition processes. Based on a systemic review of literature on intermediaries in sustainability transitions, Kivimaa et al. (2019) define intermediaries as actors that:

positively influence sustainability transition processes by linking actors and activities, and their related skills and resources, or by connecting transition visions and demands of networks of actors with existing regimes in order to create momentum for socio-technical system change, to create new collaborations within and across niche technologies, ideas and markets, and to disrupt dominant unsustainable socio-technical configurations. (1072)

Regional design ateliers, as systemic transition arenas, could contribute to transition processes in several ways. Research on regional designs highlights that it has different purposes and roles (De Zwart 2015). It has been observed to have a determining character, for example in establishing the common denominators in a region; a problem-defining and agenda-setting character, when it addresses new challenges and issues; a proposing character, e.g. when it supports decision-making with multiple options; or a composing character, for instance in the situation where it connects stakeholders with actions.

These purposes and roles fit different phases of the transition process (see, e.g. Kemp and Loorbach 2006). Articulating (societal) needs, or formulating the agenda, together with identifying possible stakeholders and making options visible is the function of systemic intermediaries in the 'predevelopment' phase of transitions (Van Lente et al. 2003). The engagement of stakeholders for developing new ideas and identifying promising niches is considered an important function in the 'take off' phase, as is the alignment of various perspectives and activities in the acceleration phase (Van Lente et al. 2003). In our study, we explored the contribution of regional design ateliers as systemic transition arenas to the regional energy transition process in the Netherlands, and we took a look at what happened during the regional design ateliers to gain insights into the mechanisms and critical factors in the emergence of this contribution.

Methods and materials

In spring 2016, the Deal Pilots Regionale Energiestrategieën (Deal Pilots Regional Energy Strategies) was drawn up between various governmental organizations in the Netherlands. A group of five regions were selected out of a group of twelve as pilot regions for the

development of a RES. The focus of the RES was to have an energy neutral region by the year 2050. Energy neutrality refers to ‘the extent to which a district [...] can supply itself with sustainable energy generated within the boundaries of that district’ (Joblonska et al. 2010, 1).

Part of the funding to develop a RES was set aside for organizing regional design ateliers. A particular goal within the deal was to employ spatial design to explore and research the spatial dimensions of regional energy transition. This resulted in the organization of regional design ateliers in all five pilot regions.

Parallel to the five pilot regions, six other regions organized energy transition oriented regional design ateliers that were also included in our study. Two regions ‘hooked on’ to the process of the RES-deal, with their interest being in learning and gaining experience about the ins and outs of regional energy transition. Four other regions organized regional design ateliers on energy transition as part of their own (spatial) planning and development processes. [Table 1](#) provides an overview of these regions and [Figure 1](#) indicates the location of the regions in the Netherlands.

In line with the five pilot regions, all regional design ateliers on ‘Energy and Space’ took regional energy neutrality in 2050 (or earlier) as a starting point. Furthermore, they all focussed on formulating and reifying the regional challenges in reaching energy neutrality, identifying its spatial impact and opportunities and the translation of ideas into possible strategies and projects.

To study the contribution of the regional design ateliers to the regional energy transition process, the researchers studied intermediate and final documents on the regional design ateliers and the regional energy transition process, interviewed several key actors in regional energy transition in the Netherlands, and organized a focus group meeting with three sessions. This combination of data sources enabled to gain broad insights in what the ateliers contributed, and the mechanisms and factors at work.

The study analysed intermediate and final documents on the regional design ateliers, which were gathered via websites of organizing and participating organizations, the RES websites, via contact persons mentioned on the websites, and via personal contacts of the researchers. For each regional design atelier multiple documents were studied varying from starting documents, newsletters, intermediate reports, minutes and final reports. For each regional design atelier, at least one starting or intermediate report, and the (draft) final report were included in the study. In addition, other relevant documents, such as the RES documents, were read and analysed.

Table 1. The regions included in the study on energy transition focussed regional design ateliers.

Category	Regions
Pilot regions <i>Regions that took part in the ‘Deal Pilots Regional Energy Strategies’. Organizing regional design ateliers was part of the deal.</i>	Drechtsteden Friesland Hart van Brabant Midden Holland West Brabant
‘Hooked on’ regions <i>Regions that later hooked onto the process of the ‘Deal Pilots Regional Energy Strategies’, but are no formal part of it. They were particularly interested in the regional design ateliers.</i>	Metropoolregio Eindhoven (MRE) Noord Veluwe
Other regions <i>Regions that organized regional design ateliers on energy transition, as part of other (strategic) planning and development processes.</i>	Goeree Overflakkee Hart van Holland Metropoolregio Amsterdam (MRA) IJsselmeergebied

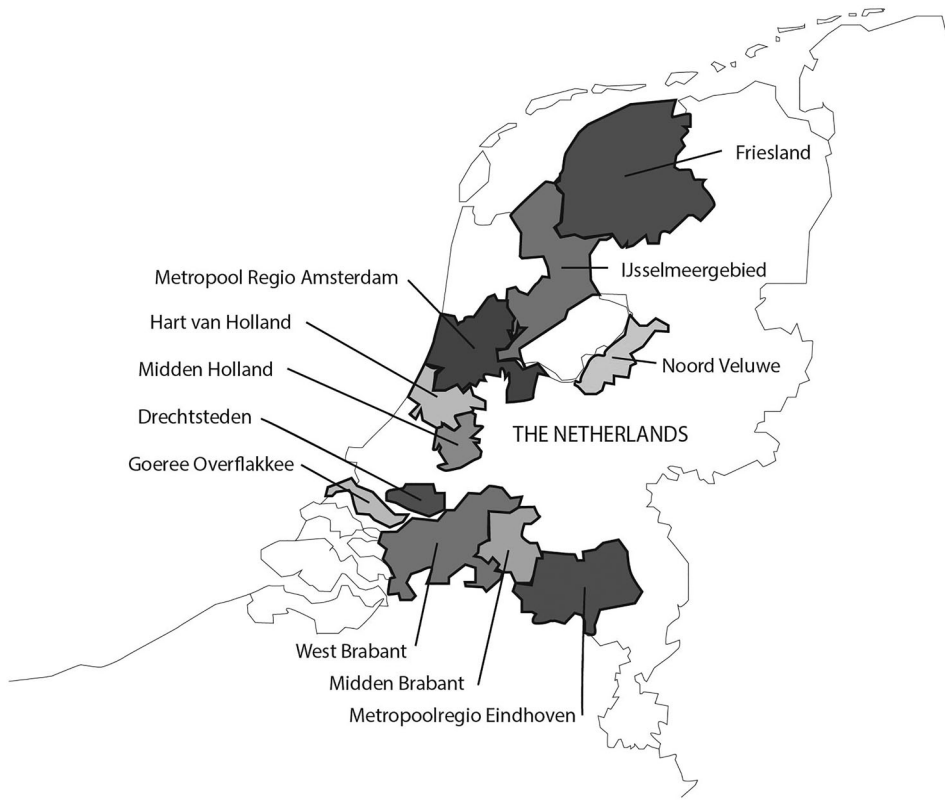


Figure 1. Locations of the regions in the Netherlands that were included in the study.

Documents, and particularly formal end reports, tend to contain dense information with a focus on output and little detail on the interactions and discussions that lead to the results. The starting documents and newsletters gave some information on how atelier processes were organized and what happened in various atelier sessions. Furthermore, in this study the researchers were able to study minutes, flip-over sheets, and sketches made during the sessions in five of the eleven studied regional design ateliers. This gave further insight in what was actually discussed during several of the atelier-sessions. Unfortunately, such detailed information was not available for all of the studied regional design ateliers. However, the aim of this study was not to determine the specific contribution of each regional design atelier to the regional energy transition process, but to explore more in general what regional design ateliers can contribute to ‘planning’ for (energy) transition processes.

To supplement these findings on what happened during the regional design ateliers, and to triangulate the findings from the document analysis, six interviews were held. The interviewees were selected via an analysis of who was involved in the organization of the regional design ateliers in the eleven regions, and in consultation with the commissioners of the research. The selection was based on the background of the interviewees (designer/consultant and (governmental) stakeholder), and their involvement in multiple of the studied regional design ateliers. The interviews enabled to gain information on (experienced) critical similarities and differences between various regional design ateliers, besides more details on interactions and discussions during the ateliers.

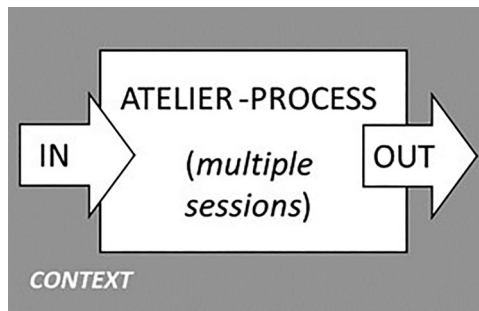


Figure 2. Framework for analysing the regional design ateliers.

All documents and interviews were analysed with regard to four aspects of the regional design ateliers, namely (1) the input for the design sessions (IN), (2) the process or institutional design of the regional design atelier (ATELIER-PROCESS), (3) the outcome of the design atelier (OUT), and (4) the context of the regional design atelier (CONTEXT). This is visualized in Figure 2. During the analysis process, the researchers were going back and forth between the documents to align and refine the analysis of all eleven regional design atelier processes.

As a final step in the research process, the findings from the document and interview analysis were discussed with a focus group composed of 16 experts from various organizations involved in the development of Regional Energy Strategies. The focus group discussion was divided into three sessions, which addressed three different topics: (1) the input used in the regional design ateliers, (2) the institutional design of the atelier process, and (3) the usefulness of the output of the regional design ateliers in their context. The focus group discussions refined and nuanced the findings of the document and interview analysis, and enabled their proper interpretation.

The regional design ateliers on 'energy and space'

Although all eleven regional design ateliers were different and specific, we derived from the analysis that they all had several appreciated outcomes and effects. Various maps and outcomes of the design ateliers were employed in the development of a regional energy strategy for the respected regions. This was depicted by the use of multiple maps, images and texts, which were produced in the regional design ateliers, in the RES documents.

Furthermore, several interviewees and focus group participants reported that the ateliers sparked communication and interaction, instigated learning leading to insights on the regional specifics and spatial implications of energy transition, created awareness, and changed the perspective on energy transition in the region. The creation of maps as input for the regional design ateliers and discussion on these maps, as well as other discussions on energy transition during the atelier sessions were seen as the main contributors to the creation of these insights and awareness. The participation of stakeholders in both the regional design ateliers and the broader energy transition or spatial planning discourse was given as a logical explanation of the transfer of these insights and awareness from the ateliers to the context, to the broader discourse on energy transition in the region.

Following our analytical framework we first describe the input that was created for all regional design ateliers: calculations and maps on energy transition in the region. This is followed by the findings on the atelier processes: on the organization and structure of the regional design ateliers and the discussions during the atelier sessions. Next, the main outcome of the regional design ateliers is described, the insights and awareness on regional energy transition. Finally, we discuss several limitations of the studied regional design ateliers that we encountered in our research.

Calculations and maps on energy transition in the region

As input for the regional design ateliers, calculations on the current energy usage in the region, the expected future energy use, the potential for energy reduction, the existing regional renewable energy production, and the potential for renewable energy sources in the region. These calculations differentiated between gas, heat, electricity and other types of energy, and between the different sectors demanding energy, such as industry, housing, transport, agriculture and offices.

In addition to the calculations, the use, the expected use and particularly the expected regional potential for renewable energy was translated into spatial dimensions and mapped out for the region in ten of the eleven studied regional design ateliers. The potential for wind-energy was, for example, translated into the number of wind turbines of a certain height, as was the solar-energy potential translated into hectares of solar-parks. These were then placed on a map of the region, clearly indicating the spatial footprint needed for producing enough energy from renewable sources to meet the regional energy demand (as regional energy neutrality was the starting point of all design ateliers).

During the mapping, specific regional situations were considered. For example, obstacles or restrictions related to certain land-uses, or protected sites (e.g. nature reserves) were included in the maps. Moreover, the opportunities for using residual heat were explored, capitalizing on the proximity of housing near heat producing industries.

The regional design atelier process

The eleven regional design ateliers on 'Energy and Space' were all organized differently and adjusted to the specifics of their respective region as was derived from the document analysis, the interviews and confirmed in the focus group discussion. The common denominator was that the ateliers focussed on regional energy transition, and consisted of multiple atelier sessions, varying from two to seven sessions. Most ateliers followed a three-stage structure:

- The session(s) of the first stage generally focussed on getting a collective grip on the issues related to regional energy transition based on calculations and maps indicating the current energy use in the region, the expected future use in 2050 including 25% energy reduction, the potential in the region for various forms of renewable energy production and their spatial impact.
- The atelier session(s) in the second stage built on the outcomes of the first session(s) and centred on the exploration of and reflection on multiple options for future development based on the current state of knowledge.

- The third stage sessions elaborated and reflected on an integrated direction for regional energy transition based on the discussions in the second stage, which prompted a more in-depth conversation and reflection.

Various regions organized multiple more or less parallel sessions during the second stage by focussing on different parts of the region or different types of renewable energy sources.

The regional design sessions were prepared, organized and facilitated by a contracted (spatial) design firm, who in most cases collaborated with energy experts and process facilitators. The designers all had a background in landscape architecture and/or urban planning and design. In particular, one spatial design firm stood out. They are specialized in energy transition, and were involved in seven of the eleven analysed regional design ateliers.

In close collaboration with their client, the designer(s) structured and prepared the atelier sessions, for instance by making maps and visualizations, and by summarizing and visualizing the ideas of the previous session. They had an active role in blending information and different perspectives into coherent sets of ideas, particularly in the time between the various atelier sessions. They had to do the ‘homework’ and prepare the next atelier session. Furthermore, they advised their commissioners on whom to invite to participate in the regional design ateliers.

The participants of the regional design ateliers predominantly stemmed from the regime actors in the energy and the spatial planning domain. Next to representatives from different parts of governmental organizations, actors from businesses and companies involved in (renewable) energy production, energy network corporations, civil energy initiatives, energy experts, and multiple NGO’s (nature conservation, environmental organizations, agricultural organizations, etc.) took part. The total number of participants varied between the regional design ateliers. Some involved around 20–30 people, others were eventually attended by over 100 participants during the final session.

In several interviews, the composition of the participants of the regional design ateliers was criticized. The absence of representatives from certain domains, such as the regional economy, transport and the building sector, was seen as a lost chance to involve them in the regional discussion on energy transition. Moreover, some comments were made on the strong focus on proponents and advocates of energy transition and the exclusion of the more critical voices.

Furthermore, separate sessions were organized in several regions for politicians with the argumentation that their involvement in the regular atelier sessions could hinder the openness of the discussion. In other regions, council members were invited to participate, but were requested to leave their immediate political interest out of the discussion. A few regions also organized separate informative meetings for inhabitants with the argument, as derived from the interviews and discussed in the focus group, that inhabitants can dominate a discussion with a strong opinion and, as such, can hinder an open dialogue and obstruct the open exploration of issues and solutions.

Furthermore, we found that the diversity in knowledge of energy and of spatial planning amongst the various participants hindered an in-depth conversation in all regional design ateliers. Several participants, particularly those from the energy domain, had a solid basic knowledge on energy systems, energy transition and what it entailed. They,

however, had to learn about spatial planning dimensions and institutions. For other participants, predominantly from the spatial domain, the ateliers functioned as a pressure-cooker for learning on energy, the energy system, and energy transition. This learning or balancing of the knowledge base of all participants took up quite some time. A moderately levelled knowledge base of both energy and spatial planning, turned out to be a precondition for starting a dialogue in which understanding, insights and ideas could develop.

During the regional design ateliers, the visualizations, and particularly the ones revealing the spatial footprint of different renewable energy sources, triggered a lot of discussions serving as boundary objects, as was referred to in the interviews and during the focus group discussions. Talking about percentages and peta joules (a unit to indicate the amount of energy) seemed to have kept the discussions rather abstract up till then. Drawing and mapping the implications of generating all energy within the boundaries of the region through renewable sources made such a regional ambition concrete and foreseeable. This further revealed the radical impact of energy transition on the existing regional landscape and spatial situation. It was stressed in several interviews and the focus group discussions, particularly by the designers, that this visualizing and mapping should be done carefully, as maps and visuals can easily trigger discussions on side-topics, or deviate the conversation from the main issue.

Insights and awareness on regional energy transition

All eleven regional design ateliers on 'Energy and Space' created insights into the nature, the implications and the regional dimensions of energy transition and its spatial implications. The ateliers, for example, made the stakeholders aware of various uncertainties and unknowns related to energy transition. Geothermal energy, for example, is seen as a promising sustainable energy source. However, its potential depends on the specific geomorphological/geological situation in a region. Detailed mapping of this situation is only available for a few areas in the Netherlands making it hard to incorporate feasible estimations of geothermal energy in the future energy mix of the region. This also accounted for innovations and niche developments of promising new technologies.

The discussions in the design ateliers also showed it was possible to look at energy transition from multiple perspectives, and the ateliers produced initial insights into what could be obvious or 'no regret' choices. Furthermore, it became (more) clear what aspects and ideas need more knowledge, exploration, consideration and deliberation. Finally, the design ateliers initiated ideas on the specific potentials of the region, considering the regional qualities and characteristics as was derived from the final reports on the regional design ateliers.

The multiple insights developed during the regional design ateliers also created awareness of what energy transition encompasses. In the interviews and the focus group discussions it was stressed that the majority of stakeholders participating in the design atelier had no clue beforehand of what the actual regional energy use was, nor an idea of what the future energy use would be, nor what regional carbon neutrality implies. Several stakeholders were startled, and although they indicated they were still not in favour of such changes, they developed a sense of the impact and urgency of energy transition.

Furthermore, the regional design ateliers changed the perspective on energy transition in multiple regions, at least amongst the participants of the ateliers. For example, in the

region Noord-Veluwe carbon neutrality was perceived as an extreme perspective at the beginning of the process. During the sessions, this perspective slowly altered and at the end they were starting to explore the options of an energy producing region. In another region, Metropoolregio Eindhoven, one of the outcomes of the ateliers was that energy would be treated equally and similarly to water or traffic in the new regional spatial vision, recognizing it as a major spatial challenge for the region in the years to come.

Unfinished conversations

Despite the extensive mapping and visualization of the spatial implications of energy transition in the regional design ateliers, not all dimensions were fully addressed and explored. Whereas the spatial footprint of renewable energy sources received attention in all ateliers, only a few touched upon the issue of adjusting and renewing the infrastructure for transport of energy. Moreover, neither storage facilities for the surplus of produced energy, nor the spatial dimension of reducing energy use were extensively addressed and explored. Each of these topics, depending on future developments and choices, has specific spatial implications and land-use demands, and is critical in planning for energy transition.

Furthermore, in most of the regional-design ateliers, the relationship of energy transitions with other spatial issues, challenges and developments was not properly addressed. Energy transition, as any other major transformation in the spatial domain, leads to opportunities and obstacles for other existing and future land-uses, with potential synergies and trade-offs. One region, namely the Drechtsteden, did incorporate a first exploration of the relationships of energy transition with economic developments and the revitalization and renewal of neighbourhoods. However, this only scratched the surface, and other land-uses and spatial issues such as agriculture and flood-protection were left untouched.

All eleven regional design ateliers were region-focussed and the discussions were guided by the idea of regional energy neutrality. This led to questions in all ateliers on the delineation of regional energy transition: what should be taken into account and what should be left out? What should be done for example with national and international transport, both over land, water and by air, related to the inhabitants and businesses in the region? Also, questions arose in some ateliers on how to tackle other sources of greenhouse gasses (e.g. agriculture or peat oxidation), should these also be included in the regional strategy? Each region took a pragmatic stance on this and clearly indicated what was considered and what not.

The relationship between the regional and both the local and (inter)national scale was also addressed in the majority of the design ateliers. Although the discussions took place at a regional level, implementation of ideas and concrete actions would have to take place at a local level. In addition, some of the investments needed in the future, particularly where new infrastructure is concerned, cannot be decided on or financed by the region itself. This calls for participation and action from the national government and actors operating on a (inter) national scale.

Finally, in a few regions the discussion also turned towards other, neighbouring regions. For example, as described before, the Noord-Veluwe had discovered during the atelier-sessions that it probably would be able to cover its own future energy demand quite easily with renewable sources, considering the available space in the region. This opened up the

exploration of the idea of becoming an energy-supplying region for other regions. However, most regions had not (yet) reached the point to address their relationship with other regions in relation to energy transition.

The above described findings on the regional design ateliers on Energy and Space in the 11 regions give the impression that most conversations on the spatial implications of energy transition had just started and were far from finished. The main focus was on creating first insights, and sharing and discussing the spatial footprint of renewable energy production, the future energy use and future energy mix in the region.

The seemingly limited scope of the conversations in the regional design ateliers can be explained in several ways. Firstly, energy neutrality within the region was more or less the fixed starting point for the design ateliers and the development of the regional energy strategy. This perspective automatically turns the focus inwards to the region itself and less to (possible) relationships with other regions or the local and (inter)national scales.

Secondly, energy transition is a relatively new topic in the spatial realm, meaning that stakeholders rooted in this domain are yet to familiarize themselves with the ins and outs of the energy system and future options. This is also the case for all other stakeholders from outside the energy domain. In turn, the stakeholders from the energy domain had to become familiar with integral perspective and ways of working common to the spatial realm. A lot of 'getting to know' and learning took place in the ateliers in order to have a good conversation on the central issue addressed: the spatial implications of energy transition in the region.

Third and finally, energy transition is surrounded by many uncertainties and unknowns. Although many feel a sense of urgency, it is unclear what the best way to go is. For example, certain techniques are quite well-developed, such as wind turbines and solar panels, whereas others, such as geothermics and hydrogen, are promising but underdeveloped and unsure. These unknowns and uncertainties inevitably will change in the future because new ideas will open up but similarly other options and possibilities will closing down.

Discussion and conclusion

Participation in the regional design ateliers created multiple insights on regional energy transition, and raised awareness on its spatial impact amongst the participating regime actors. This learning is an important element in transitions processes (Van Lente et al. 2003; Kemp, Loorbach, and Rotmans 2007), and counts as one of the main contribution of the regional design ateliers to the regional energy transition processes. The ateliers, however, were inconclusive due to their limited scope and multiple important issues that were left untouched, which calls for a continuation of the dialogue organized in the regional design ateliers in the upcoming stages and phases of regional energy transition processes.

Transitions go through different phases, from pre-development, to take-off to acceleration, to stabilization (Kemp and Loorbach 2006). The findings of this study suggest that the regional energy transition process in the Netherlands was at the time still in its predevelopment phase. The discussion of and reflection on the existing and future energy use, energy reduction and the potential for renewable energy production, were core elements in the ateliers, indicating the predevelopment phase in which the articulation of needs and

development of an agenda takes centre stage (Van Lente et al. 2003; Kivimaa et al. 2019). Furthermore, not all spatial dimensions of regional energy transition were fully addressed, such as smart combinations with other spatial developments or land-uses, (re)new(al) of infrastructure networks and the need for large storage facilities, implying that the articulation of needs and development of an agenda even needs further attention before the transition process can move to the next phase.

Regional design ateliers can function as valuable systemic transition arenas in other phases of transition processes. Mobilization of relevant (regime) actors, vision development, network alignment, and strategy development are several of the activities and goals in the management of other phases of transition processes (Van Lente et al. 2003). These all fit with the observed capacities of regional design (De Jonge 2009; De Zwart 2015; Kempenaar et al. 2016; Neuman and Zonneveld 2018). Case studies or experiments with regional design ateliers in the upcoming phases in regional energy transition could illuminate if this bears out in practice. Further research is also needed to explore the usefulness of regional design ateliers in transition processes focussed on other transitions or transformations (e.g. circular agriculture, climate change adaptation).

A striking finding in our study was that quite some time and energy was taken up in the ateliers on levelling the knowledge base of participating actors. This is an important precondition for creating true dialogue during atelier sessions (De Jonge 2009). The stakeholders involved in the regional design ateliers predominantly came from energy- or spatial planning-related organizations and had little knowledge on each other's realms. In future regional design ateliers, levelling the knowledge base should carefully be taken into account, particularly when other important regime actors, e.g. from the building sector, regional economy, or transport, who were not represented in the analysed ateliers, join the transition arena. A trick could be to organize a specific 'knowledge atelier', focused on sharing knowledge on all relevant themes to spread out the knowledge base between all participating actors.

Our study further revealed that the selection and invitation of participants was predominantly based on their professional background and involvement in either energy transition or spatial planning. Other criteria for the selection of participants, such as the competences for participants in a transition arena as described by Loorbach (2010), seemed to have not been used explicitly. For example, no references were encountered to criteria such as 'the ability to look beyond the limits of their own discipline and background', 'willingness to think together', and 'openness towards innovation instead of already having specific solutions in mind' (Loorbach 2010, 174). The separate sessions for politicians and/or inhabitants in several of the studied regional design ateliers, though, displayed some (implicit) ideas on using these type of criteria, and on when, how and why certain stakeholders should be involved. The main argument being that both politicians and inhabitants, each in their own way, could hinder the openness of a discussion.

However, we do recommend to consider to include more varying perspectives in the upcoming regional design ateliers on Energy and Space, including opposing ones. Knowledge from other domains (e.g. transition management theory, innovation research) could provide a theoretical base for further developing criteria and guidelines for the involvement of different stakeholders and actors in the various stages and phases of 'planning' for transitions. In addition, further research into influential regional design atelier processes, or on

comparable processes, such as design-charrettes in the US (Condon 2008; Lennertz and Lutzenhiser 2014) could highlight critical criteria for the selection of participants in participatory spatial design processes, such as regional design ateliers. Spatial designers, who had an influential advisory role in regard to whom should be invited to the regional design ateliers in our study, have mainly developed their insights into who should participate predominantly in practice (Kempenaar and van den Brink 2018). They lack a theoretical knowledge base on this aspect of participatory designing. Further research that illuminates who could best be invited to participate in which stage of a planning or transition process, would improve the usefulness and effectiveness of regional design ateliers in both transition processes and 'regular' strategic spatial planning.

Furthermore, the regional design ateliers under study in our research were not the only events being organized in the regional energy transition processes. Multiple other developments and interactions concerning energy transition took place in the regions, as well as at the (inter)national and local levels. In almost all regional design ateliers, an awareness of the relationships with (inter)national and local scale-levels, as well as between regions, was present. However, it was not clear how ideas, information, and agreements would or could flow from one scale level to another, or how they were going to be addressed by the appropriate actors, or organizations. It illustrates the 'wickedness' and complexity of energy transition. We think clarity on the position of transition arenas, in our case the regional design ateliers, within the ecology of energy transition related actions, activities and transition arenas is needed to provide clear insights into where and how issues outside the scope of the ateliers could best be addressed, and how such issues and ideas can 'travel' to the appropriate place.

In line with other studies on spatial design contributions to planning processes (e.g. Meijsmans 2010; Kempenaar et al. 2016), this study showed how visualizations, and particularly maps, triggered communication and interaction in the design ateliers. Using maps as boundary objects enabled different stakeholders to connect. Maps and visualizations made ideas literally foreseeable, and added a level of precision that deepened the conversation (see also: Kempenaar and van den Brink 2018). Visualization of the (spatial) impact of energy transition and the envisioning of possible solutions is described by various other scholars as an important contribution of spatial designers to local and regional conversations on how to deal with climate change and energy transition (e.g. Nassauer 2012; Aragón, Buxton, and Hamin Infield 2019). Visualizing is often seen to support decision-making processes and helpful in the engagement of various actors.

Although visualization and mapping by designers played an undeniably important part in overcoming the tensions arising in the space of interaction (Puerari et al. 2017) during the regional design ateliers, we argue that the role and contribution of design and designers goes beyond this. During design ateliers, and in other participatory settings, designers are intermediaries who actively bridge differences between interests, ideas, values, disciplines people and organizations. A recent study on the landscape architect as a boundary spanner in Dutch river management (Van den Brink et al. 2019) revealed that they can and do take up the role of boundary spanners in various ways. Our findings tend to support this idea. However, additional research is needed to fully substantiate this and to grasp a complete understanding on this capacity of spatial design(ers). Many dimensions of the mediating or boundary spanning role of spatial design, designing and designers as well as their potential in planning for transitions and transformations still need to be explored.

To conclude, the study of 11 regional design ateliers showed the value of ateliers in regional energy transition processes. They contributed to the discourse on the spatial integration of energy transition, as well as on developing ideas on the social and institutional innovations needed to accomplish energy transition. Our analysis also revealed that the potential of regional design ateliers has not yet been fully exploited because the dialogues in the ateliers were far from finished. Consequently, we recommend that the organization of regional design ateliers as transition arenas in the energy transition process of Dutch regions is continued. Since there is not much known on (regional) design ateliers as systemic transition arenas in transition processes, we see a need to further explore, investigate and experiment with the role, position and potential of (regional) designing in transformative planning practices.

In organizing energy transition-oriented regional design ateliers, one needs to acknowledge that the atelier process is only one of the activities within the energy transition process. Research, technical innovations, experiments, implementation projects etc. are all needed and make essential contributions. All activities should be well-embedded in the overall structure or ecology of a transition process, to ensure that they can mutually benefit each other and maximize their use and effect. This will hopefully lead to the sufficient acceleration of the energy transition process, allowing us to achieve, on time, the goals of the 2015 Paris Agreement.

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ORCID

Annet Kempenaar  <http://orcid.org/0000-0001-5977-1692>

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