An area-based research approach to energy transition

de Boer, Jessica

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7 DISCUSSION AND RECOMMENDATIONS

This chapter reflects on the thesis and discusses the overall research findings. The chapter starts with a discussion of the implications of this research for spatial planning and public policy. The chapter includes a discussion of the research methods and findings and provides suggestions for follow-up research. This discussion and recommendations place the research in a broader context and shed light on the wider relevance of the thesis both for academia and practice.

7.1 Implications for spatial planning and public policy

There are three reasons why the findings of this thesis are valuable for spatial planners and policymakers who aim to pursue energy transition. Firstly, the findings inform the design of spatial plans and policies that aim to stimulate the spread and upscaling of area-based energy practices. Secondly, the findings inform the design of spatial plans and policies that anticipate the changing relationship between energy and space due to the uptake of renewables and the swift rise of local energy initiatives. Thirdly, the findings illustrate the importance of ongoing learning and adaptive approaches for spatial planning and policymaking in the context of energy transition. The following subsections address these three points, including a suggestion for institutional design supporting energy transition based on common grounds.

7.1.1 Implications for the spreading and upscaling area-based energy practices

In the last decade, European and Dutch energy transition policies have mainly targeted increasing the share of renewable energy in the total energy mix, energy conservation and low carbon technologies (European Commission, 2014; SER, 2013). To reach these goals, various policy instruments are being used, among which subsidies and fiscal incentives can be considered major components. However, this research shows that the pursuit of energy transition not only concerns innovation in the energy system, but also about innovations in many other sectors and domains, such as agriculture, the economy, in the role of citizen, and the government. For innovative technologies and initiatives to spread and upscale, they need to be embedded in society and linked to various human and natural processes in the landscape (**Chapter 3**). Low carbon innovations without links to other sectors on multiple scales may remain isolated. Such innovation cannot make use of activated links to spread and upscale throughout society (**Chapter 4**). This research provides an argument for energy transition policies to stimulate system interaction starting from the local scale in order to engender co-evolutionary processes and energy transition. It also suggests that to promote new system interactions, more integrated and area-based approaches towards energy transition policy would be beneficial.

The findings of this research indicate that energy transition would benefit from the integration of energy transition policy with other policy fields in order to improve the effectiveness of energy transition policy and to facilitate system interaction. Energy transition policy goals could well be intertwined with sustainability goals in other policy fields. These findings support the recommendations of De Roo (2003) and Zuidema (2017), who argued that in order to achieve integration: 1) integrated approaches are needed, for which policy fields and departments should develop coordinated policies, 2) spatial interventions and planning strategies need to be considered in their contexts and spatial surroundings, and 3) in addition to general, centralised policies, area-based site-specific policies need to be developed. One policy example that intends to comply with these recommendations and which could prove beneficial for energy transition is the new Dutch Environmental and Planning Act (*Omgevingswet*), which aims to simplify and combine sevral environmental laws (Ministerie van Infrastructuur en Milieu, 2017). From 2021 on, this law will provide an integrated policy framework for spatial projects, with the aim to give certainty to initiatives and project developers, while leaving space for local infill of the policy conditions.

7.1.2 Implications for connecting energy and space

Energy production and consumption relate to the characteristics of an area, such as the natural resource mix and local communities. The interdependence between energy and space is changing due to the uptake of renewables and the swift rise of low carbon energy initiatives, but it is still rather uncertain how this interdependence will evolve. The research findings suggest that the design of area-based plans and policies should allow for adaptation to shifting interdependences between energy and space.

The findings of the desk research into historical and emerging energy transitions illustrate two recurring changes in the relationship between energy and space in the energy landscape: (1) the interaction of the energy system with other physical and social systems changes and (2) the predominant scale at which the energy system is in an interdependent relationship with its contexts also changes (**Chapter 3**). Desk research indicates that in the pre-industrial energy landscape, energy resources such as wind, water and wood were mostly used close to the location of harvest through windmills, watermills and fire stoves. By contrast, in fossil fuel-based energy landscapes, energy resources such as oil and gas are often transported over large distances before they are used. In emerging low carbon energy landscapes, energy resources such as wind, biomass and solar will again be harvested and used more according to characteristics of the local context. Thus, the area-based research approach highlights that a shift in the energy system changes the interaction paths within contextual systems, such as the bio-physical system (land uses), economic system (socioeconomic relationships) and governance system (e.g. community, market or state-oriented), as well as the predominance of the local scale for the co-evolutionary development of the energy system in an interdependent relationship with the contextual systems.

These findings illustrate that the design of area-based plans and policies should allow for adaptation to shifts in the interdependences between energy and space. In the context of energy use and production, spatial plans and policies could allow for changes in, for example, land use (e.g. mixed land use that include solar PV panels), socioeconomic relationships (e.g. community resource exchange) and governance approaches (e.g. local self-governance). Policies that allow for such changes could help to foster innovative area-based low carbon practices and, by doing so, stimulate energy transition.

7.1.3 Implications for connecting energy and institutions

Finally, the findings of this research show that monitoring and ongoing learning from innovative energy practices can inform policy innovation that supports energy transition (**Chapter 5**). To do so successfully, this research argues that adaptive approaches that are both flexible and robust are needed. The following develops this argument in more detail.

Observing the developments in Dutch energy practice over the years of this research project, several developments became apparent that could be well supported by spatial planning and policy innovation. The initiatives were creating institutional networks that supported new initiatives to become viable and that helped to mainstream area-based energy practices. One example of these institutional networks is the national platform called Hier Opgewekt, which also monitors initiatives (Hier Opgewekt, 2016b). This platform shares best practices, and various energy initiatives support each other in overcoming project hurdles. These networks are even branching out to an international scale, with the Cooperatives Europe being a good example of a European platform for best practices (Cooperatives Europe, 2015). Other examples in the Netherlands that demonstrate institutional networks on various spatial scales include, on a local scale, the conventional energy distribution company Enexis which is supporting local energy initiatives with their Buurkracht programme (Enexis Group, 2017). In addition, the municipality of Groningen is cooperating with the local energy initiative Grunneger Power to develop a solar PV field next to the motorway (Grunneger Power, 2017). On a regional scale, various initiatives are creating regional umbrella organisations to support new local energy initiatives to become viable, and regional energy companies to supply renewable energy to regional members, such as GrEK and Energie VanOns (Energie VanOns, 2018; GrEK, 2018).

Furthermore, the Province of Groningen, which used to be reluctant to approve wind park projects, is now supporting the development of many kinds of bottom-up wind initiatives that build upon synergies within their local contexts (RTV Noord, 2017). Often, these institutional contributions to low carbon innovation remain unnoticed in policy reports and only the relatively small contributions of local energy initiatives to energy transition in terms of kWh and MW are mentioned. However, this thesis argues that the development of institutional networks that support the use of new interaction pathways is paramount for mainstreaming low carbon energy practices. The challenge is to link these developments to spatial planning and policymaking in order to support the mainstreaming of area-based energy practices.

To achieve this, this research argues that more adaptive planning and policy approaches that are able to adapt to contextual changes (flexibility) and able to remain a coherent whole (robustness) (De Roo, 2012) are needed. Approaches that are both flexible and robust can support innovative energy practices to become viable, which will be beneficial to energy transition (see also **Chapter 2**). Continuity in planning and policy conditions, which refers to robustness, makes the risks for initiatives and developers smaller and, therefore, can facilitate the spread and upscaling of low carbon energy practices. Continuity also implies that the directions of low carbon developments become more apparent. However, in the Netherlands, some energy policies are too robust and inhibit innovation, such as the Gas and Electricity Law – although recently some promising changes were made (Van Santen & Van der Walle, 2018) – while certain energy transition policies do not provide sufficient continuity for longer term projects, such as the SDE+, which constrains biomass projects due to its annual adjustments in the funding scheme's coverage (Meijer, 2008; Smink, Negro, Niesten, & Hekkert, 2015). In general, energy transition policies tend to change rather frequently, which constrains the spreading and upscaling of best practices (**Chapter 5**). A well-known exception is the feed-in tariff for renewable energy generation in Germany. This provides long-term continuity for initiatives, allowing them to prosper, although the policy may not refrain the energy system from a lock-in situation in the long run (Nordensvärd & Urban, 2015).

In addition to robustness, flexibility in spatial plans and policies is also important for innovative energy practices to become viable and mainstream. For example, by removing policy conditions that constrain innovative energy practices or by extending coverage in order to include new practices, these can become viable and in the long run also engender a new transition pathway. By monitoring and learning from initiatives, the design of spatial plans and policies could become increasingly based on low carbon practices that have proven to be viable and successfully embedded in their surroundings. In recent policy innovation concerning energy transition, several initiatives have been involved, including the adaptation of the new postcode-rose regulation (PCR) to some extent to area-based practices (see **Chapter 5**). Such flexibility in the policy design can be met if spatial planners and policymakers are in tune with the needs of innovative practices. Thus, the challenge for spatial planners and policymakers is to monitor upcoming trends and learn from innovative practices, in order to be able to support promising transition pathways with spatial plans and policies. It is in such energy transitions that the energy system evolves, with the governance system co-evolving alongside.

7.1.4 Implications for supporting area-based institutional networks

A promising direction in which innovative practices, spatial planning and public policy may co-evolve might be the following. The institutional networks that initiatives develop (see Section 7.1.3 above), start to show some area-based institutional capacity to accommodate renewable energy based on common grounds. These area-based institutional networks enhance citizens' agency in relation to energy as a common good and can contribute to regional resilience. In this context, regional resilience refers to the capacity of a region to adapt to the pressure of integrating renewable energy into the physical and socioeconomic landscape while retaining liveability and a sense of regional identity. At the same time it also refers to a region's capacity to seize the opportunities renewable energy offers to transform the region, thereby increasing liveability and regional identity (Zuidema & de Boer, 2017). Nevertheless, to guide a region towards resilience in the long term, the informal structures of area-based institutional networks may need some support from democratic institutional structures in order to legitimise area-based energy governance.

This concerns the question of how the area-based institutional networks might be anchored to a democratic institutional structure, such as the municipality, province or the Dutch Water Authorities. The latter serve as a good example, since they are democratically chosen, area-based government bodies charged with managing and monitoring waterways, water levels, water quality, dykes, wastewater treatment, and climate change adaptation in their respective regions and in close cooperation with other actors (Unie van Waterschappen, 2018). As in this case of water, the energy issue requires long-term attention and sensitivity. It requires a community of experts who can manage and monitor the energy landscape and operate in close cooperation with other actors. With experimental structures such as 'urban transition labs' and 'urban living labs' (Nevens et al., 2013; Voytenko, McCormick, Evans, & Schliwa, 2016), legitimacy may be more at risk. Arguably, energy transition can learn from the experience of the Dutch Water Authorities in dealing with area-based challenges democratically.

Area-based institutional structures also represent a decentralised approach to energy transition that can complement the national energy strategy. This approach explicitly fits with present explorations of what are called 'regional energy strategies' by the Association of Dutch Municipalities in collaboration with three Ministries, the Dutch Water Authorities and the Association of Dutch Provinces (VNG, 2018). This exploration already allowed the drawing of lessons from successful regions and identified common needs within energy regions (Schuurs & Schwencke, 2017). These lessons, and also this thesis, might help to kick-start the institutional design of democratic area-based institutional structures that support the integration of innovative low carbon practices within the energy landscape and, by doing so, generate integrated energy landscapes

7.2 Discussion of methods and findings

This section discusses the methods and findings of this research, which was introduced in **Chapter 1** as an interpretive qualitative inquiry of multiple case studies. The section discusses the area-based research approach we developed for this interpretive inquiry and then considers the benefits and limitations of this inquiry. Section 7.3 completes this reflection with suggestions for follow-up research.

The area-based research approach developed for this study adds a spatial dimension to the study of energy transition phenomena. The area-based approach facilitated the operationalisation and contextualisation of some rather abstract concepts from transitions research, such as 'niche' and 'co-evolution'. In **Chapter 3**, the area-based research approach facilitated the contextualisation of co-evolution by studying three generations of energy landscapes from a more global time perspective. In **Chapters 2 and 4** the approach facilitated the contextualisation of niche innovation and it spread and upscaling by analysing local energy initiatives in their spatial contexts at one moment in time. In **Chapter 5**, the area-based research approach helped to contextualise co-adaptation by identifying how energy transition policy adapts to area-based energy practices. While theories and perspectives are meant to provide coherent explanations for observed phenomena, the operationalisation of the concepts should facilitate finding evidence for assumptions and hypotheses that follow from these theories and perspectives (Thagard 2004). Indeed, the area-based research approach allowed us to gather empirical evidence that facilitated the interpretation of energy transition phenomena. More specifically, the approach facilitated the interpretation of the contribution of local energy initiatives to energy transition by relating the links of the initiatives to their spatial contexts at one moment of time within the longer time frame of energy transition over years or decades of time.

The findings may have been more significant if it had been possible, within the time frame of this research, to conduct a longitudinal analysis of local energy initiatives, as well as a longitudinal analysis of actors and artefacts in their contexts. This could have provided evidence for the contribution of initiatives to energy transition from both a temporal and area-based perspective. For the present, the historical development of only two cases was analysed in preparing the research for **Chapter 4**. This analysis showed how the cases of Grunneger Power and Windvogel, which have activated additional links in their area-based niche over the years, spread and upscaled in the energy landscape over time. Both initiatives enlarged the scope of their initiative (the number of low carbon activities increased) and they also developed institutionally (their practices are embedded in policies and in other initiatives), while Windvogel also spread geographically. This longitudinal perspective provides evidence for the impact of the initiatives on the context, and thus shows that the initiatives contributed to energy transition by generating transition dynamics. While this thesis interpreted the contribution of the initiatives' links and interaction pathways to energy transition, a longitudinal analysis could have provided detailed evidence of how the links and interaction pathways impact on their contexts and contribute to transition.

The multiple case studies for this research were selected within the territory of the Netherlands. Consequently, the case studies provide examples of energy initiatives in rather densely populated peri-urban and urban areas, in which energy transition is progressing rather slowly (the share of renewables in the total energy mix in the Netherlands is at the bottom of the list of EU countries; Eurostat, 2016). The Dutch case studies differ in many respects, such as organisational form, location and renewable energy sources in order to cover a wide variety of energy initiatives. In order to verify whether local energy initiatives in other countries, including remote areas, are also linking with actors and artefacts in area-based niches, we conducted an international scan of local energy initiatives. This scan showed that all these initiatives create physical and socioeconomic synergies with their contexts, indicating that initiatives in different spatial contexts are also activating area-based niches. This finding enhances the transferability of research findings to spatial contexts other than the densely populated Netherlands.

The operationalisation of the energy landscape into six systems and four scales facilitated the interpretation of the impact of the initiatives on their contexts. Figure 16 above shows how the classification resulted in obvious differences between the aggregated artefact-actor network figures – each initiative links differently with its context. Possibly, a classification into more than six systems might have provided evidence for additional differences between the network figures of the initiatives; for example, by differentiating within the (bio)physical system between water, agriculture and ecology. The advantage of doing this would depend on the goal of the research. For this research, the level of detail might have obscured the identification of interaction pathways.

Other existing operationalisations of the energy landscape focus more on the physical aspects. For example, the concept has already been used to describe landscapes physically imprinted by the energy system, such as an energy landscape dominated by wind farms, or an energy landscape where coal, fossil oil or natural gas are extracted from the physical landscape (Bridge et al., 2013; Pasqualetti, 2011; Thayer & Freeman, 1987).[15] Other extended conceptualisations of energy landscapes can be found in the work of, for example, Stoeglehner et al. (2016) and Stremke and Van den Dobbelsteen (2012). In this research project, the energy landscape concept was enriched further with our perspective on the landscape as a complex system. The landscape provides us with a lens to see how the energy system is intertwined and interacts with many alternative systems.

The methods of data processing with the analysis software ATLAS.ti and the mapping of the initiatives' artefact-actor networks onto abstract representations of energy landscapes helped to make the interpretation of data both transparent and reproducible. Interview transcripts were coded manually in ATLAS.ti on the basis of a system of codes that was generated specifically for this research. The links with actors and artefacts that were identified, were classified according to the six systems and four scales of the energy landscape that this research distinguished. While other researchers might interpret the way the actors and artefacts fit in the categories slightly differently, the classification does generate evidence for the linking of initiatives with their spatial contexts, which contributes to the robustness of the findings. Our innovative research methods helped to find evidence of a relationship between renewable energy practices and spatial contexts; of the kind of links initiatives have with artefacts and actors; and of the type of interaction pathways that can help to engender energy transition.

7.3 Recommendations for follow-up research

While designing the research, many research designs passed the review; based on this research, the following suggestions are regarded valuable for follow-up research.

Firstly, it may be fruitful to conduct a longitudinal study of local energy initiatives and their contexts, as mentioned in the previous section. A longitudinal study allows for an analysis of the impact of the initiatives on their contexts and their contribution to the transformation of the energy landscape. This may provide additional insight into the upscaling and spread of initiatives, and into the question of whether initiatives become transformative agents in the sense that the theory advocates (Berkes, 2009; Nevens et al., 2013; Westley et al., 2013). However, as this thesis developed the research framework and conceptual model for studying these initiatives, a longitudinal study was not feasible. For a long-term analysis of the role of initiatives in historical and emerging energy transitions, the study by Hölsgens (2016) might be used as a starting point. This study conducted a

[15] In geography, the first appearance of the concept of 'energy landscape' was arguably the wind energy landscape by Thayer and Freeman (1987). Outside the field of geography, the concept was first used to describe the effect of shade from horticulture, in terms of high- or low-energy landscapes, on conserving energy in homes (Buffington, 1979). Since the 1980s, it has been used in protein physics to describe the energetics of protein folding as an energy landscape (Bryngelson et al., 1995).

thorough long-term analysis of the sustainability challenges and economic vulnerabilities of energy systems in history.

Secondly, for a more precise interpretation of the relative contribution of local low carbon energy initiatives to energy transition, alongside to contributions by other energy initiatives and other energy practices, an international comparison of local energy initiatives with other initiatives and organisations seems promising. To do so, the artefact-actor network mapping research method would help to compare the interaction paths that the initiatives and organisations create in the energy landscape and thereby allow the interpretation of their relative adverse contribution to energy transition. An adverse contribution might be the absence of new interaction paths and/or interaction paths in which the energy system predominates at a certain scale.

Thirdly, to shed light on the relative importance of contextual conditions on the development of local energy initiatives, a comparison of local energy initiatives from different countries and a comparison of initiatives in different time periods would be beneficial. Countries and time periods have different (bio)physical, socioeconomic and institutional conditions, which help to clarify the relative importance of contextual conditions.

Fourthly, the research findings could be strengthened by a quantitative analysis of data from databases on low carbon energy projects by energy initiatives, such as that of the Hier Opgewekt platform, with data on citizen collectives, and of Dutch Ministries, with data on subsidies to various kinds of energy initiatives. If there is data on the location, size and participants in the low carbon energy projects of the energy initiatives, the share of energy initiatives activating area-based niches could be inferred. If there is data on the actors and artefacts involved in enabling the low carbon energy projects of the energy initiatives, the links of the energy initiatives with their contexts could be mapped onto the systems and scales of the energy landscape and compared. A comparison of the linkage patterns in different categories of initiatives could enable an inference of the kind of system interaction a certain category of initiative would trigger. For example, bio-energy initiatives could show a linkage pattern activating strong system interaction between the bio-physical and economic systems, while a citizen solar collective might trigger strong interaction between the community and governance systems. Such quantitative analyses would help to enrich the research findings of this thesis with statistically supported inferences.

Finally, it may be worthwhile to improve the operationalisation of co-adaptation for transitions research. In such research, the process of co-adaptation tends to be overlooked and societal dynamics are analysed in terms of co-evolution. This research indicated that some transition phenomena (such as policy adaptation to niche practices in **Chapter 5**) can be very well studied in terms of co-adaptation rather than co-evolution. The focus on co-evolution may stem from the fact that the evolution of physical systems, such as ecosystems, have been studied as isolated small-scale systems which can reach tipping points easily and transform rapidly (e.g. Marten Scheffer, Carpenter, Dakos, & van Nes, 2015). Theory on such transformation processes has inspired scholars to apply the concept of co-evolution to social systems as an analogy, but the concept appears to be applied rather loosely. Possibly, transitions research could be informed by rather recent developments in evolutionary biology (see e.g. Jablonka and Lamb (2005) and Odling Smee et al. (2003)).

The suggestions for follow-up research show that this thesis has provided useful insights and starting points to further improve transitions research. The innovative methods developed can be applied in subsequent empirical research. The area-based research approach to energy transition revealed that the interdependence between low carbon practices (such as those of local energy initiatives) and their spatial contexts contributes to energy transition – the kind of links and interaction pathways that initiatives activate in the energy landscape can engender transition. Spatial planners and policymakers may benefit from these insights in their fostering of energy transition.

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