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Lammers, I.; Hoppe, Thomas; Arentsen, M.j.; Heldeweg, A.M.

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Institutional Settings of Local Renewable Energy Planning: A Systematic Literature Review

I. Lammers[1]*, T.Hoppe[2], M.J. Arentsen[1], M.A. Heldeweg[1]

[1] Department of Governance and Technology for Sustainable Development (CSTM), Institute for Innovation and Governance Studies (IGS), Faculty of Behavioural, Management and Social Sciences (BMS), University of Twente, P.O. Box 217, Enschede 7500 AE, The Netherlands

[2] Policy, Organisation, Law & Gaming (POLG), Department of Multi-Actor Systems (MAS), Faculty of Technology, Policy & Management (TPM), Delft University of Technology, Jaffalaan 5, 2628 BX Delft, The Netherlands

* Corresponding author: i.lammers@utwente.nl, + 31534894540.

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Abstract:

A paradigm shift has taken place in energy markets and energy policy. Developments like diffusion of renewable energy technologies and institutional restructuring have made local energy planning in Europe more complex and call for new forms of governance for energy provision at the local level. Through a systematic literature review we addressed the question: Which institutional settings of local renewable energy planning in the post-liberalization area has prior research identified? For this systematic analysis we combined the analytic concept 'action situation' (as developed by Elinor Ostrom) with concepts from the policy studies discipline. The literature review was conducted in two cycles: a systematic database search and snowballing. Four clusters of search terms were used to search two databases (Scopus and Web of Science), and additionally three selection criteria were applied to screen titles, abstracts and in turn the full text of international, refereed journal articles. The selected articles were coded using Atlas.ti, with the help of codes that mainly derived from the policy-oriented operationalization of the 'action situation'. Based on this coding, an in-depth qualitative analysis in the form of a narrative review was undertaken, and supplemented by a range of descriptive statistics. While a gap in the academic literature was, strictly speaking, not retrieved, our analysis shed more light on the institutional settings present in the dispersed amount of relevant academic articles. Local energy planning was found to be undertaken in a diversity of ways after the liberalization of the EU's energy markets. Actors and positions (mainly ownership and financial policy instruments), inadequate information (on policy instruments, rules, regulations and costs), control in form of coalitions as well as uncertainty about costs and benefits are found to be decisive factors for decision-making on the implementation of renewable energy technologies. In spite of, or rather due to this variety in institutional settings, stakeholders can learn from the experiences of decision-makers in other countries. Therefore, we deem the results of this study relevant to both practitioners and policy makers as it can help actors uncover which possibilities or limitations exist in the changed level playing field of local energy provision, i.e. regarding the introduction of (smart) renewable energy technologies.

1. Introduction: A paradigm shift in energy provision

In recent years, concerns for climate change and for renewable energy in particular have become more prominent. Helm (2007, p. 32) states that "together, the change in the underlying [supply-demand] balance, the [energy] price increases, and the new policy priorities of security of supply and climate change amount to a paradigm shift in energy policy, albeit an evolutionary one, rather than a radical discontinuity". This paradigm shift specifically took place in the institutional and technological domain of the energy sector and includes the liberalization of the European Union's (EU) energy markets, an increasing political concern for renewable energy, the rise of a local renewable energy initiatives, and linked to this an increase in distributed generation (DG) of renewable energy. These developments will be explained in the following.

With the liberalization of the EU member states' energy markets in the 1990s, institutional restructuring in the forms of liberalization, privatisation and deregulation are happening throughout Europe. To give an example from the institutional setting in the Netherlands, until 1989 "electricity generation and distribution was well organized in small-scale monopolies, with clearly defined positions and legally authorized tasks […]" (Arentsen, Fabius, & Künneke, 2001, pp. 152-153). With the liberalization of the EU energy markets, the monopolized position of Dutch municipalities ceased to exist (Arentsen et al., 2001; de Jong, 2006), municipalities became shareholders in profit-oriented energy companies (Menkveld, Burger, Kaal, & Coenen, 2001)[1] and when Distribution System Operators (DSOs) became separate entities[2] many municipalities sold their stocks in their production and supply companies (Kist et al., 2008). Additionally, new actors are emerging in the field of energy, especially community initiatives for renewable energy (Arentsen & Bellekom, 2014; Hoppe, Graf, Warbroek, Lammers, & Lepping, 2015; Oteman, Wiering, & Helderman, 2014); the local arena has become polycentric (Lammers & Arentsen, 2016).

Next to the institutional setting, several changes are taking place in the technological environment of local energy provision. The supply of energy from intermittent renewable sources is increasing due to the implementation of technologies such as solar PV panels (Blumsack & Fernandez, 2012; El-Khattam & Salama, 2004; Pepermans, Driesen, Haeseldonckx, Belmans, & D'haeseleer, 2005; Smit, Kokkeler, Bakker, Bosman, & Molderink, 2010). At the same time demand for energy is rising, caused for example by the electrification of transport (Eising, Van Onna, & Alkemade, 2014). This bi-directional flow of energy poses a challenge to the electricity grid and requires a change to the current energy grid infrastructure, for example in form of smart grids (IEA, 2011).

Changes in the institutional and technological domains have led to a paradigm shift in the field of energy and call for new forms of governance for energy provision at the local level (Kern & Bulkeley, 2009). Energy provision used to be task of a few dedicated actors, but more actors have entered the

[1] Municipalities became shareholders in profit-oriented energy companies, which changed their role in a threefold way. First, municipalities have to keep the energy companies' need for profit in mind when trying to influence the companies' decisions. Secondly, through mergers and increases in scale, energy companies are increasing in size, which decreases the relative control of municipalities. Thirdly, due to a less intensive cooperation, municipalities lost their good access to energy consumers, as well as expertise in the area of consumer information provision (Menkveld et al., 2001).

[2] The Dutch Act on Independent Network Management Administration (Wet Onafhankelijk Netbeheer, commonly known as 'division law'/Splitsingswet in Dutch), made Distribution System Operators separate entities.

stage and decision-making processes have changed. “The emergence of new actors and actor constellations in the dissemination of sustainable energy technologies has made local energy policy and planning more complex” (Elle et al., 2002, p. 54). The effects of this complexity and paradigm shift on local energy planning practices in Europe are however underexplored. Bulkeley and Kern (2006) distinguish four modes of governing climate protection, but do so from the perspective of local governments. Similarly, Walker and Cass (2007) identify five different modes of renewable energy implementation in the UK, but mainly focus on the role of ‘the public’. However, an analysis of the entire local institutional setting appears missing, i.e. of all stakeholders involved in decision making at the local level. Hoppe and Van Bueren (2015, p. 8) identify this lack of research on institutional settings in regard to low carbon energy transitions in cities and propose a research agenda that, inter alia, addresses “institutional conditions in multi-stakeholder configurations, looking into positions, ownership, institutional rules and policies”.

In this paper we explore to which extent and in which ways prior research has addressed the institutional settings of local energy planning practices that emerged after this institutional and technological paradigm shift. More precisely, we analyze how the institutional setting of local decision-making processes in various countries looks like in view of the liberalization of energy markets and the emergence of renewable energy technologies. The focus lies on identifying the institutional settings that characterize the decision-making process, including the involvement of certain actors the roles they play and the strategies they use. The main research question of this paper is: Which institutional settings of local renewable energy planning in the post-liberalization area has prior research identified?

To answer this research question a systematic, structured literature review will be conducted. This approach allows to identify and evaluate systematically in how far prior research has dealt with this research question, and to “[map] out areas of uncertainty, and [identify] where little or no relevant research has been done, but where new studies are needed” (Petticrew & Roberts, 2006, p. 2). Next to this scientific aim, the research is of relevance to practitioners and policy makers as it can help actors to uncover which possibilities or limits exist in the changed level playing field of local energy provision, i.e. in regard to the introduction of (smart) renewable energy technologies. For this systematic analysis we apply the analytic concept ‘action situation’ that was developed in Elinor Ostrom’s Institutional Analysis and Development (IAD) Framework (2011). As our analysis focuses on relevant literature from the discipline of policy studies, we operationalize the seven components of the ‘action situation’ and complement these with concepts from the policy studies discipline.

This paper is structured as follows. After this introduction on the paradigm shift in energy provision, the next section describes the theoretical lens and the conceptual model that we developed. Section three depicts the method of the structured literature review in detail. The fourth section explains the results of the qualitative research synthesis, followed by the discussion and conclusion in section five.

2. Theory: The IAD Framework and policy studies

To explore how institutional settings of local energy planning look like in various countries, we want to elucidate local decision-making processes in Europe. While a systematic literature review does not allow for an in-depth analysis of specific cases, it does make it possible to focus on general

interpretation of the institutional setting surrounding decision-making processes. This is the main objective of this paper.

2.1. The IAD Framework: action situation

To analyze institutional settings, we draw on Elinor Ostrom's Institutional Analysis and Development Framework (2011). The main reason for choosing the IAD Framework over similar theoretical frameworks or theories[3] is that it not only facilitates the analysis and the design of institutional settings, but also allows for making comparisons between institutional settings. We specifically apply the IAD's analytic concept of the 'action situation'. In the IAD Framework, "action situations are the social spaces where individuals interact, exchange goods and services, solve problems, dominate one another, or fight […]" (E. Ostrom, 2011, p. 11). In this research the action situation of interest is the local energy planning process, where decisions about the energy infrastructure in residential areas are taken. Figure 1 depicts all elements inside an action situation – actors, positions, actions and their linkage to outcomes, information, control, net costs and benefits, potential outcomes – and shows how these are influenced by the independent variable 'rules-in-use'.

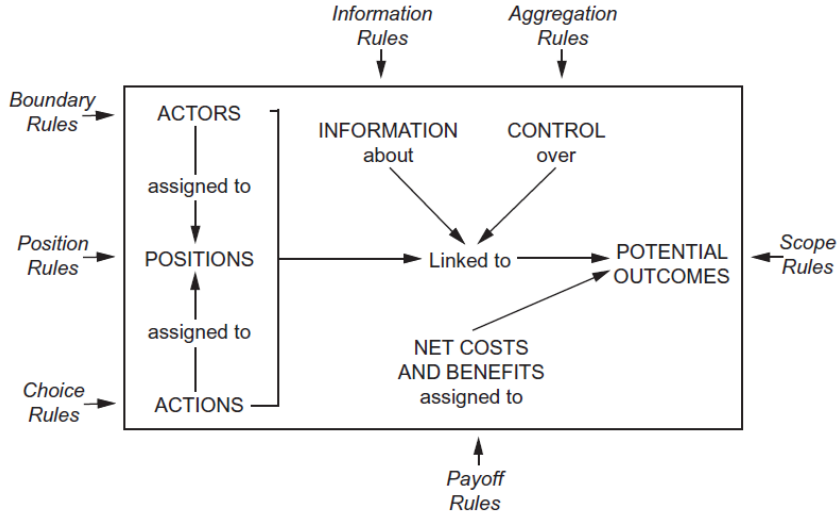


Figure 1: The action situation, including rules-in-use

Source: E. Ostrom (2011)

Next to 'rules-in-use', the elements in the action situation are influenced by two other external factors: 'community attributes' and 'biophysical conditions'. As the focus of this paper lies with the institutional setting of the decision-making process, we focus on the elements inside the action situation. To give an example, we do not analyse how actors became part of the decision-making process, but we map which actors are part of this process, which positions they hold, etc.

2.1.1. Using the IAD Framework in the realm of the policy studies discipline

As our data collection focuses on literature from the discipline of policy studies, we conceptualized the seven components of the action situation with concepts from the policy studies discipline (see

[3] Examples of these are the Actor-Centered Institutionalism Framework developed by Renate Mayntz and Fritz Scharpf, the Actor-system-dynamics by Burns and Baumgartner, the Contextual Interaction Theory developed by Bressers, the Advocacy Coalition Framework from Sabatier, and the Policy Arrangements Approach by Arts and Tatenhove.

Table 1). This step was needed in order to be able to identify what the concepts of the action situation mean in the discussion of policy issues. Our conceptualization drew inspiration from Hoppe, Coenen, and van den Berg's (2016) illustration of the use of concepts from the discipline of policy studies in energy research. The conceptualization in Table 1 is the core for the coding scheme that was applied to the final selection of articles (see methods section for details).

Elements of the action situation	Questions based on E. Ostrom (2007, 2011)	Conceptualization through policy studies (including main authors)
Actors	Which actors are involved in the local energy planning process?	Actors that participate in the decision-making process. E.g. from municipality, DSO, housing association, construction company, tenants, member of a citizen energy association, project developer.
Positions	Which positions do actors hold in the local energy planning process?	Policy entrepreneur (Kingdon, 1984; Mintrom, 1997), Strategic Niche Management (Schot & Geels, 2008), network management (Kickert, Klijn, & Koppenjan, 1997; Meier & O'Toole, 2005).
Actions	Which actions can/have been taken? Which (legal) possibilities exist for collaboration?	Agenda-setting (Kingdon, 1984; McCombs, 2005), policy instruments used, initiating actor, laws and regulations.
Information	How much information do appropriators have about the technology, about costs and benefits, and about the outcomes that their actions will lead to?	Information available to actors (about technology, policies, meetings, websites, costs- and benefits), framing (Hajer, 1995), boundary spanning (Bressers & Lulofs, 2010).
Control	Do appropriators take the above actions on their own initiative, or do they confer with others?	Individual action/monocentricity (V. Ostrom, Tiebout, & Warren, 1961), coalitions (e.g. advocacy coalition, discourse coalition) (Hajer, 1995; Sabatier, 1988), co-creation (Elmore, 1979), co-production (Brandsen & Pestoff, 2006).
Net costs and benefits	How costly are various actions to each type of actor, and what kinds of benefits can be achieved as a result of various group outcomes?	Costs of project, pack-back time, distribution of costs and benefits among actors.
(Potential) outcomes	What geographic region and what events in that region are affected by actors? What chain of events links actions to outcomes?	Evaluation and implementation research (deLeon & deLeon, 2002; Hill & Hupe, 2002), goals versus achieved outcome

Table 1: The action situation and the policy studies discipline

3. Methods

To answer the main research question we chose to conduct a literature review in two cycles: a systematic database search and snowballing. This section provides details on our methodological choices, including the case selection (3.1), search cycles (3.2.), data preparation and analysis (3.3).

3.1. Case selection and conceptualization

We did not limit our search to specific countries, but we did exclude countries that did not undergo the European Union's energy market liberalization that started in the 1990s. This led to the selection of the following fifteen countries that were a member of the European Union when the first and second liberalization directives were adopted in 1996/1998 and 2003 respectively: Germany, France, Belgium, Netherlands, Luxembourg, Italy, Denmark, Ireland, United Kingdom, Greece, Portugal, Spain, Austria, Finland and Sweden.

In order to be able to develop clusters of search terms and selection criteria for our analysis, it is important to have a precise conceptualization of our unit of analysis. As mentioned previously, we want to investigate the institutional setting of local renewable energy planning. To be more precise, we are interested in decision-making processes that consider a change to the local energy infrastructure. Whether this goal was accomplished or not is not relevant for our analysis.

Our spatial focus was residential areas, i.e. at district level. As we were most interested in the implementation of renewable energy technologies, which are often implemented during large-scale housing renovation or construction projects, studies were likely to address these aspects. Due to our interest in the institutional setting of the decision-making processes, i.e. the seven elements of the action situation, empirical case studies were believed to be the best sources for our explorative analysis.

3.2. Literature search and selection criteria

The literature review was conducted in two cycles, in which a different search strategy was used for each of the two cycles. Firstly, a systematic database search was undertaken (Kitchenham, 2004; Petticrew & Roberts, 2006), and based on this, secondly, the snowballing method was applied.

3.2.1. Search strategy cycle 1: Systematic Database Search

We performed a systematic literature review, which are "reviews that adhere closely to a set of scientific methods that explicitly aim to limit systematic error (bias), mainly by attempting to identify, appraise and synthesize all relevant studies (of whatever design) in order to answer a particular question (or set of questions)" (Petticrew & Roberts, 2006, p. 9). Using this method allows to shed light on the uncertainty that currently exists in regard to the institutional setting of energy planning at the local level.

During the systematic database search, four clusters of search terms were used to screen titles, abstracts and in turn the full text of international, refereed journal articles. For the identification of relevant articles[4], the following four clusters of search terms – reflecting the main research question – were created: 1.) search terms related to energy; 2.) search terms describing the planning process;

[4] We decided not to include books or book chapters but focus on peer-reviewed journal articles.

3.) search terms focusing on an object of change; and 4.) search terms indicating location/scale (see Table 2). The database search was performed in July and August 2016 and included two databases relevant to the field of interest (Scopus and Web of Science[5]). During this search the four clusters of search terms were connected with Boolean operators.

	Cluster	**Search terms**
		Case study
#1	Energy	Renewable energy technologies, energy, electricity, energy efficiency, low carbon
#2	Planning process	spatial, planning, decision-making, policy, process, governance, stakeholders, management, climate policy, project
#3	Object of change	construction, implementation, renovation, buildings, infrastructure, utility, development
#4	Location/scale	Neighbor(u)rhood, residential, local, municipal/ity, urban, housing, district, city

Table 2: Clusters of search terms

3.2.2. Search strategy cycle 2: Snowballing

To identify additional relevant articles we applied the snowballing technique (Jalali & Wohlin, 2012). Both backward (from the reference list of the selected articles) and forward snowballing (identifying papers that the selected articles are cited by) were used. The four clusters of search terms were hereby applied in a non-systematic way. During the snowballing we did not include references that led back to one of the 11 articles from the first search cycle.

3.2.3. Selection criteria

The following three inclusion criteria were subsequently applied during both search cycles. Firstly, the article focusses on an a case study of an empirical situation; hence methods like life-cycle assessments, modelling and simulations were excluded. Secondly, articles were published between 1999[6] and August 2016 and cover case studies that took place after 1999. Thirdly, the content entails renewable energy infrastructure at the residential level. This energy infrastructure thus excludes energy sources like fossil fuels and wind[7]. Additionally, during our search we did not include other types of infrastructures (e.g. road/traffic[8], railroads), as well as excluded measures that only focus on energetic measures inside individual houses (i.e. thermal insulation). Systematic reviews and meta-analyzes were excluded in all search cycles.

[5] The search in Scopus included title and abstract. In Web of Science abstracts cannot be searched and we therefore decided to search by topic. Due to the fact that the snowballing method is applied as well, this drawback is remedied to a large extent.

[6] The first liberalisation directive for electricity (96/92/EC) was adopted in 1996 and should be transposed into the legal systems of all EU Member States by 1998. Therefore, our literature review focussed on the period of 1998 and onwards (Commission, 2012).

[7] It was decided to exclude wind energy from the beginning on, as wind technology is mostly connected to the high voltage grid and domestic micro wind turbines are still a minor phenomenon or have even failed as a niche in some countries (Smith, 2003).

[8] We did not exclude the search term 'transport', in order to not eliminate electric vehicles from our search.

The literature search of cycle 1 and 2 can be found in Figure 2. This figure shows that during the first cycle 324 articles were screened by title, in turn 79 by abstract and 39 by full text. Based on the selection criteria, articles were first of all excluded during the screening when they investigated a country that fell outside of our case selection. Remaining articles had to be eliminated as they focussed on a different technology (e.g. marine renewable energy installations, carbon capture and storage, light bulbs of traffic lights), a different unit of analysis (e.g. industrial parks, tall buildings, industrial economy in port cities, bicycling sustainable maps), a different (energy) source (fire, air quality, indoor thermal comfort, noise pollution), or entailed a different approach (algorithms, GIS, micro-grid reliability assessment, building energy performance). Topics like energy-saving and refurbishment/renovation where initially not excluded as definitions and details on these measures can differ. Only during the screening of full texts it could be evaluated whether these projects did or did not include renewable energy technologies, or merely the insulation of an individual house.

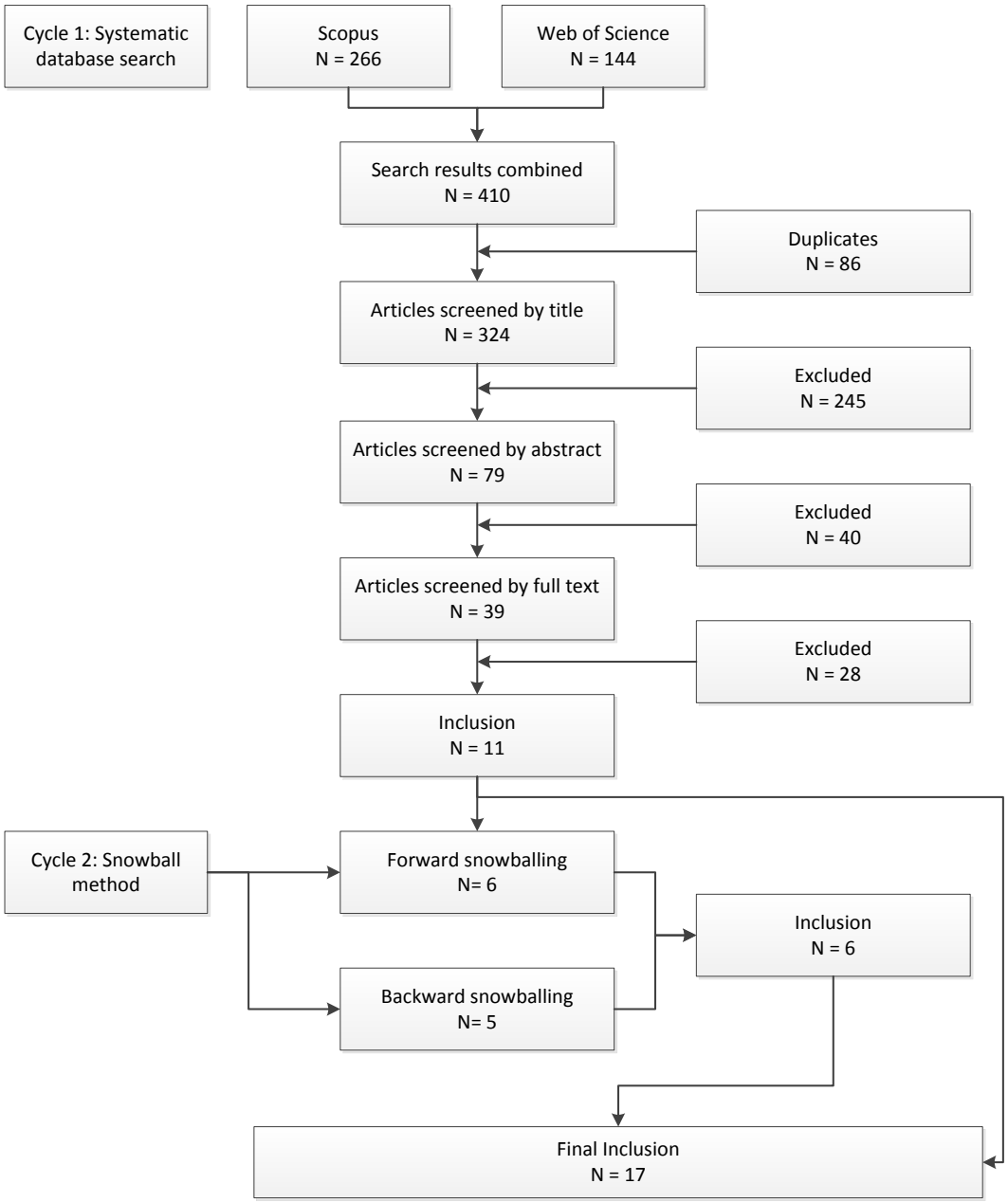


Figure 2: Prisma Flow diagram literature search cycle 1 and 2

3.3. Data preparation and analysis

The selected articles were coded using Atlas.ti, with the help of a coding scheme which is based on the seven elements of the action situation, as conceptualized in the theoretical section of this paper. We added the two external variables 'bio-physical conditions' and 'attributes of community' of the IAD Framework to our coding scheme. To be able to not only identify institutional settings of local renewable energy planning, but also to evaluate their role in the decision-making process, we as well coded for barriers and enabling conditions. Additionally, during coding the researchers were open to the emergence of new codes. Where such codes were found, these were added to the coding scheme and retrospectively applied to all previously coded articles. The categories in the coding scheme are non-exhaustive. The final coding scheme can be found in Appendix 1.

Based on this coding, an in-depth qualitative analysis in the form of a narrative review was undertaken. This approach is especially suitable for answering the research question which is interested in the institutional setting of the process that takes place, a concept that can best be captured qualitatively. To introduce and supplement the qualitative analysis, a range of descriptive statistics will be presented in the beginning of the results section.

4. Results

This section starts with an overview of the selected articles (see Appendix 2), followed by the in-depth qualitative results of our analysis.

4.1. Introducing the selected articles and cases

As reported, seventeen articles were selected for analysis. This section briefly introduces these articles, thereby providing background information for the next part of our analysis.

4.1.1. Articles by year and journal

The analysis revealed that the topic of local decision-making on renewable energy planning is only recently emerging in the academic literature (see Figure 3). In the period from 1998 to 2011 only four articles have been published in a different year each (2002, 2003, 2008, 2010). From 2012 on attention seems to have risen, with five articles published in 2015.

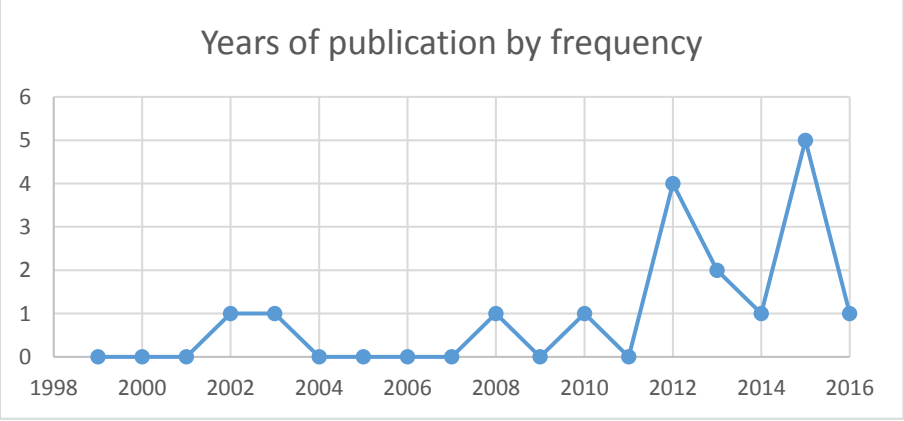


Figure 3: Articles by year of publication[9]

[9] The data for 2016 only include the period up to August. The data for 2016 therefore has to be considered with caution.

The articles were published in a wide range of journals (see Appendix 3). Only three journals published more than one article (Local Environment, n=2; Energy, Sustainability and Society, n=2; Energy Policy, n=2).

4.1.2. Countries and studied cases

In the selected articles, we retrieved cases being studied in seven different countries (see Figure 4): Germany (n=5), Denmark (n=4), Netherlands (n=3), Sweden (n=3), Austria (n=2), the UK (n=2) and Norway (n=1). This does not come as a surprise when taking into account that these countries are known for their progressive policy measures on renewable energy and have a strong tradition of publishing in English.

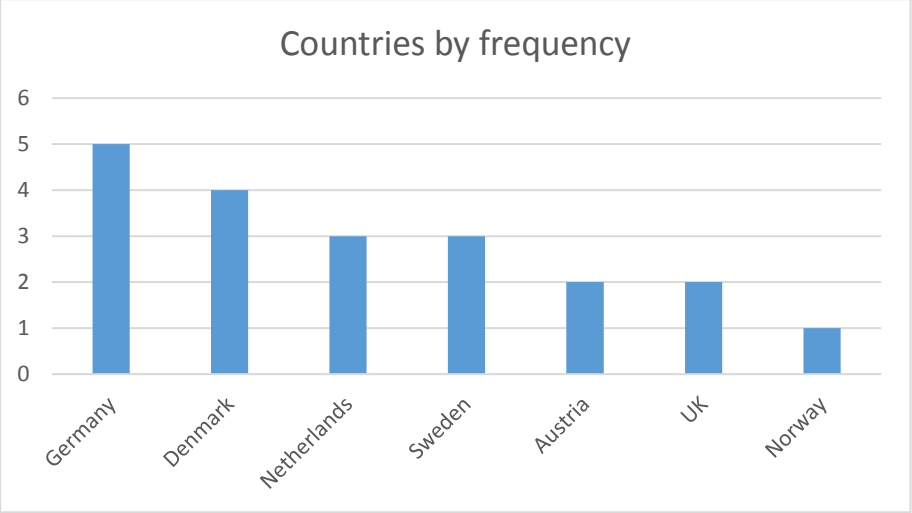


Figure 4: Countries studied by frequency

Eleven of the articles concerned single case studies, whereas six analysed multiple case studies, ranging from two to seven cases. Here, it should be noted that the majority of cases (n= 26) entailed the implementation of renewable energy technologies during housing renovation projects, vis-à-vis during the construction of houses (n= 6)[10].

4.1.3. Bio-physical conditions

As regards location, in three cases projects took place on a (former) industrial terrain located outside the city centre, whereby in Gansmo (2012) the terrain was co-owned by public partners (state, county and regional hospital), and in Williams (2012) municipal ownership was the case. Projects led by housing associations often focused on dwellings that were 'bleeding energy', e.g. poor isolation, bad ventilation and leaky facades (e.g. see Gustavsson and Elander, 2016; or Jensen and Maslesa, 2015).

Two aspects of bio-physical conditions were reported to have a negative influence on project outcomes. First, limited roof space (Muying, 2015) and sub-optimal roof-orientation for solar PV panels (Hoppe, 2012; Schroepfer and Hee, 2008), and secondly, inadequate existing infrastructure (i.e. pipes) for the installation of solar thermal systems (Hoppe, 2012). For example, the existence of district heating grid infrastructure was considered a barrier, as well as an enabling condition. In Viétor

[10] Information on whether a project entailed construction or renovation was not given in four articles.

et al. (2015) the existing heating grid, as well as its operators, complicated the emergence of small-scale, renewable district heating grids. As regards the enabling capability, the existing infrastructure once led to the formulation of ambitious goals (Hoppe, 2012) and another time made it easier to choose for district heating (Van Der Waals et al., 2003).

4.1.4. Attributes of Community

Attributes of Community were not always addressed in detail, but four aspects stand out. Firstly, socio-economic status. Residents in projects led by social housing associations have a low-socio economic status; for example Gustavsson and Elander (2016, p. 5) studied a project that took place in "a stigmatized neighbourhood insulated from the rest of the city, with a high percent of unemployment, and ridden by many related social problems". However, socio-economic status is not necessarily linked to the attitude of residents towards renewable energy; Williams (2012) analysed that residents in her German case had low, medium and high income levels and were active 'energy citizens', whereas the project she studied in Sweden involved rich, but passive consumers.

Secondly, gender has been pointed out by Muyingo (2015): members of the boards of tenant-owner cooperatives were often older, wealthier, well-educated males; in total "fifty-five percent of the inhabitants in tenant-owner cooperatives are women, 66 percent of the members of the executive boards and 80 percent of the chairpersons are men" (Muyingo, 2015, p. 3658).

Thirdly, trust has been mentioned in two regards. On the one hand when participants of local projects in the UK were from within the same community, trust among stakeholders was reported to be higher (Dewine-Wright and Wiersma, 2013). On the other hand, previous experiences can have established mistrust in citizens towards local authorities (see Dewine-Wright and Wiersma, 2013), or towards housing association and energy suppliers (see Hoppe, 2012).

Fourthly, similar to mistrust, a conservative attitude towards energy efficiency technologies can be a hindrance. Quitzau et al. (2013, p. 143) explain that this conservatism was present for building companies, developers and households.

4.2. Results of the qualitative analysis

Through applying our policy-oriented conceptualization of the action situation, we were able to analyse which institutional settings of local renewable energy planning prior research has identified. In addition, our results show which role each institutional aspect played, i.e. whether it was hindering of enabling the decision-making process. The results for each element of the action situation are explained in the following, whereby overlaps between sections are self-evident due to the interrelation of elements.

4.2.1. Actors

A multitude of different actors were involved in the local energy planning processes. Figure 5[11] provides an overview of the stakeholders that were reported in the case studies. While we analysed

[11] The data was collected for all cases mentioned, i.e. in the seventeen selected articles 38 case studies were analyzed. These findings however have to be treated with caution, especially due to the following two reasons. Firstly, it is not possible for us to validate whether all stakeholders have been reported for each case. Secondly,

which stakeholders initiated projects in the category of 'actions', it is most interesting to report these results here together with the data on participants.

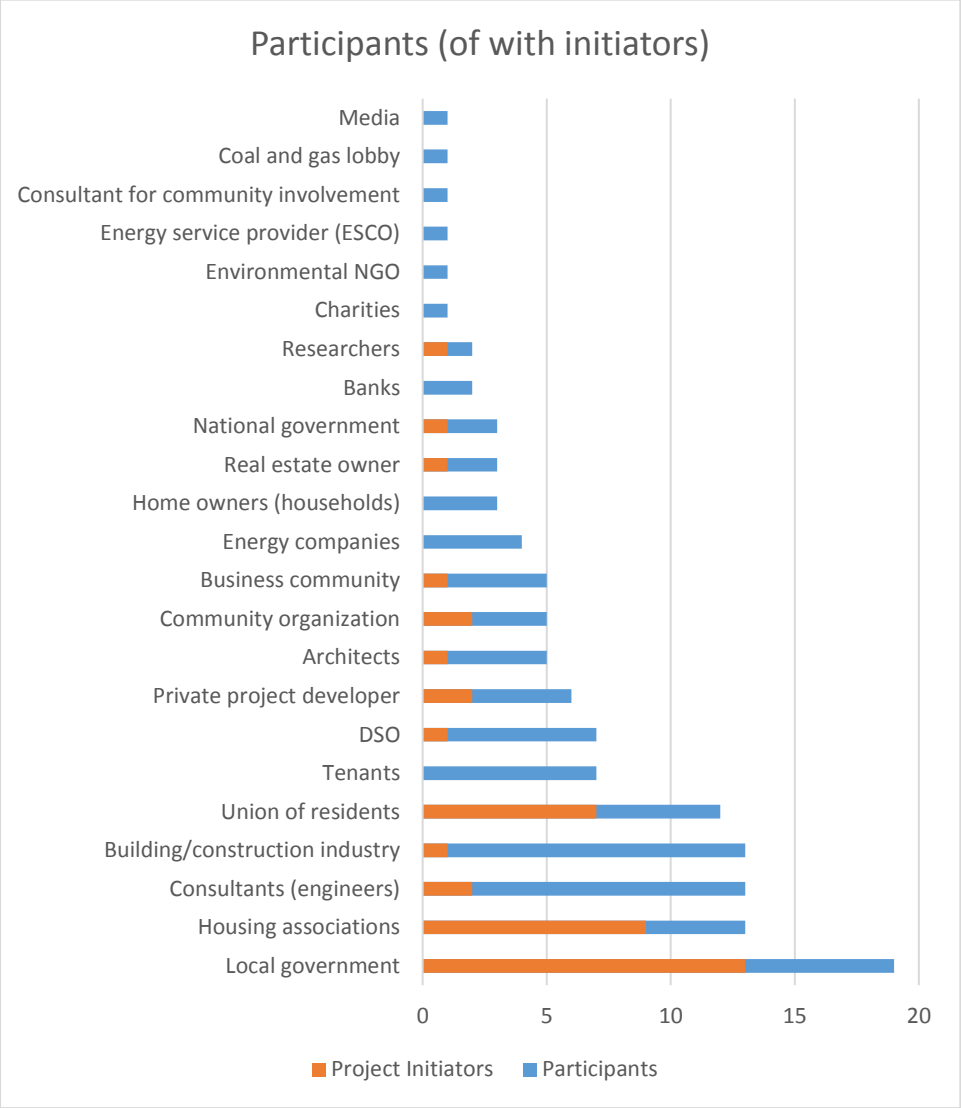


Figure 5: Number of participants and project initiators

Local governments & land owners

Local governments, i.e. municipalities, were most frequently reported to not only have been involved in the projects (n=19), but also to have initiated these (n= 13). The problem hereby is that municipalities often establish climate policies, but mostly do not own possible project locations when it comes to the residential sector. Quitzau et. al (2012) explain that the local authority in Denmark had to purchase a whole building side in order to be able to impose legally binding energy efficiency requirement; an investment risk. This is confirmed by Williams (2012, p. 136) for a German case where "municipal ownership of the site provided the city council with the leverage it needed to demand higher energy standards in buildings".

in a few articles (Dewine-Wright and Wiersma, 2013; Williams, 2010 and 2012) stakeholders were aggregated, e.g. only referred to as 3rd sector or private sector actors. These aggregated actors have not been included in Figure 5, as we are interested in the specific actors involved.

In order to achieve its ambitious targets, local governments are dependent on actors who do own land. Hereby it is easier for municipalities to address housing association that can implement measures in a large number of houses, than to approach a multitude of home owners individually. This is reflected in the minor involvement of private project developers (n=6), large private real estate owners (n=3) and (potential) individual home owners (n=3). Nevertheless, Van Der Waals et al. (2003) also provide three cases in which municipalities had created targets for CO_2 reduction but despite this "did not play a stimulating role in the investigated [social housing] projects. This is remarkable given the presence of formal policy plans that formulate quantified targets for CO2-reduction" (p.421).

Housing associations & tenants

Being in possession of a large number of properties, housing associations were very often involved (n=13) and initiating (n=9) projects. Housing associations are however dependent on the collaboration of their tenants. Union of residents – which include tenants' associations and owners' associations in our definition – have been involved from the start in many cases (n=12, of which n=7 as initiators). This stands in contrast to the involvement of individual tenants (n=7), who were only consulted later on. This contrast between involving unions and residents is related to agenda-setting, as is pointed out in a Swedish case: "in practice, few members turn up at general meetings and most of the decisions are left in the hands of the board [of the union of tenants] which has the liberty to choose the issues it wishes to put to a general vote" (Muyingo, 2015, p. 3642). A similar situation is reported by Van Der Waals et al. (2003) for The Netherlands, where associations of home owners often function badly.

Actors for project design and execution

Consultants, mainly in form of engineers with expertise in renewable energy technologies (n=13) were often involved in the design phase, followed by building and construction companies (n=13) in the execution phase. In some new building projects architects (n= 5) were involved as well.

Distribution System Operators

What stands out is that distribution system operators only participated in seven projects, and only were involved from the beginning on in one project. In this project did not concern the electricity grid, but the extension of a district heating grid – a potentially profitable investment for a district heating grid operator (for details see Van Der Waals et al., 2003). Many projects considered the installation of distributed generation technologies – mainly in form of solar PV panels – that are to be connected to the electricity grid. The feed-in from a high quantity of solar PV panels can present a technical challenge to the distribution grid, and thereby to the core responsibility of the DSO. An example of this is the situation in the Dutch province of Groningen (Volkskrant, 2016). Through involving DSOs at the outset of large-scale projects, such challenges could be prevented as DSOs might emphasize 'smarter' solutions in form of balancing supply and demand (via ICT).

4.2.2. Positions

Positions (a concept used in relevant theoretical frameworks, such as policy entrepreneurship, Strategic Niche Management, and Network Management) is an element of the action situation that has not been addressed extensively by the selected articles. In our analysis a policy entrepreneur was only identified in three articles. Once this entrepreneur was considered to have had a general positive

influence on renewable energy implementation (i.e., company Solarcomplex AG, in Fuchs and Hinderer, 2014). In the other two cases the policy entrepreneur was campaigning for furthering his/her own interests (Moss et al., 2015) and was found to deliberately not involve certain actors, i.e.: "The planning team, however, was reluctant to involve representatives from the local construction industry in this early stage mainly due to the strong regulation of public procurement, but also due to the fear of being held back by negative feedback from an industry known to be very conservative" (Gansmo, 2012, p.496). Strategic Niche Management (SNM) was only directly referred to in the article by Quitzau et al. (2012) who applied the theory of Strategic Niche Management. As positions have generally not been described in detail, identifying the concept of SNM in other articles was difficult, or impossible. Network Management on the other hand was easier to assess, likely due to its broader definition. In five cases (Gansmo, 2012; Gustavsson and Elander, 2016; Hoppe, 2012; Quitzau et al., 2012; Quitzau et al., 2013) Network Management was undertaken by external actors, e.g. a company or project manager, who had experience in other projects and access to a network of experts. Hoppe (2012) explained that project managers were additionally highly motivated and pro-active in sourcing more funding.

Next to the three specific positions of policy entrepreneur, niche -, and network- manager, one additional position stood out during the analysis: While local governments participate in and initiate the largest amount of projects (see 4.2.1. above), eventually they only hold the position of observer. Except for a few projects (Gansmo, 2012; Williams, 2012) municipalities do not own land, and cannot demand energy efficiency standards to be implemented.

4.2.3. Actions

We specified actions into 'possible actions', 'initiating actors', 'laws and regulations', 'policy-instruments' and 'agenda-setting'. While these aspects are very specific for each individual actor and dependent on the project taking place, a synthesis of the findings is possible.

Initiating actors

The stakeholders that were involved in initiating local projects were already reported above in section 4.2.1.. Important to add is that actors do not necessarily remain in the driving seat during the entire period a project takes place. Hoppe (2012, p. 799) gives an example in which "local authorities have an 'initiating role' in refurbishment projects that support the adoption of [innovative energy systems]. However, as time passes by they tend to lose influence (while housing associations gain influence)." Another example is reported in Williams (2012), where the local governing coalition changed, and with it the municipality's strategy towards the project. In general, initiating actors are considered to enable the projects, as they provided leadership and sought financial support. Additionally, initiating actors were mostly a coalition of stakeholders, and only in some cases individual entities (see 4.2.5. for details).

Possible actions

While possible actions are very specific to each project, four commonalities can be found. First of all, possible actions are related to the technology at hand, e.g. when residents want to (not) allow remote-control of in-house appliances, or export electricity to other communities. Secondly, in cases that involved housing associations and tenants, voting was required, which limited the room of manoeuvre for the associations. Thirdly, possible actions constituted a barrier in cases where incumbent actors

felt that their positions were threatened: this ranged from a conservative attitude (e.g., by the energy and mining union; Moss et al., 2015), over modest proposals to rejection, e.g. when the building industry wants to maintain well-known standards (Quitzau et al., 2012). Several possible actions are also closely related to control and often to municipalities, e.g. "the municipality exercised its right to restrict further development or sale of the site while it prepared a master plan" (Gansmo, 2012, p. 496). Ownership (see point 4.2.1. for details and consequences) was a fourth factor that determined which actions were possible, e.g. owner-occupants, housing association-tenant dilemmas, or a building side owned by one actor (e.g., by local government, Williams, 2012). Important to note is that possible actions might be the same for a certain type of stakeholder, but how this stakeholder executes its possibilities can vary strongly. In four Dutch case studies Van Der Waals et al. (2003) noticed that the "role of energy-distribution companies varied from proactive (Utrecht-Noordwest), to carefully stimulating (Flatstrook Groenewoud), absent (Millinxbuurt), or unconstructive (Malburgen)" (p. 422).

Laws and regulations

Laws and regulations included legal permits, planning regulations, energy standards, legally binding covenants, and purchase agreements. These laws and regulations were consistently reported to present a barrier for the projects, either because their did not allow for certain measures (e.g. too strict, demanding or forced upon others), because the procedures related to them were too time-consuming, or because no standardized procedure existed at all. Additionally, a lack of information about laws and regulations was reported in Williams (2010).

Policy instruments

Policy instruments mainly included public financial support, which was always considered an important enabling condition. This financial support came from all levels of government (local, regional, national and EU), and mainly in form of subsidies (mentioned in eight articles). These subsidies were reported to have a big influence on pay-back time and related to this on the one hand on considerations to embark on project, and on the other hand on the project's success. However, at the same time two main barriers existed. Firstly, uncertainties about conditions and information about policy instruments, and secondly, especially local governments' limited financial means to provide (continuous) sufficient support.

Agenda-setting

Agenda-setting took place either by initiating actors (e.g. a municipality or housing association), or by actors with technical expertise. Van Der Waals et al. (2003) mention a professional consultancy agency, and Muyingo (2015) explains that the decisions were made by the board of a housing corporation, which had two members that were engineers – while few general members actually attend those meetings. Hoppe (2012, p. 797) reported that agenda-setting constituted a barrier in one case, where the "housing association complained that the local authority insisted that expensive renewable energy measures be adopted", and all costs be financed solely by the housing associations.

4.2.4. Information

Framing and boundary spanning

Framing and boundary spanning could only be traced in a few articles. Framing of the planning process was undertaken by several stakeholders in regard to a.) the different characterizations of the process;

b.) the role of consultant (Jensen and Masleser, 2015); c.) the goal of the overall project (Fuchs and Hinderer, 2014); and d.) to further the own interests of a certain actor, i.e. an installation contractor (Hoppe, 2012). Boundary spanning was reported once by a task force which exchanged experiences between several local projects (Hoppe, 2012) and once by the media (Gansmo, 20112). In both cases boundary spanning was considered an enabling factor. However, in the latter case the municipality would have preferred to take the role as boundary spanner itself, instead of leaving it to the media; but lack of financial means prevented this.

Information available to actors

The role of information has been discussed extensively in the articles that were analysed, and was reported to both limit and enable projects. The main barriers can be summarized in four ways. Firstly, it was considered a vulnerability when knowledge was in the hands of a specific, single actor, as this knowledge would be lost once this expert leaves the project group (as was the case in Gansmo, 2012). A second, prominent barrier is the lack of information about policy instruments and rules and regulations, as reported above. Thirdly, lack of information on costs was in many cases a barrier, albeit sometimes "this concern related to impressions of costs at face value, rather than any consideration of the actual costs and benefits" (van der Waals et al., 2003, p. 417). The fourth barrier of information is related to knowledge and expertise about the technology itself, its installation and maintenance. Despite these barriers, information was also considered an enabling condition in several projects. It included the involvement of researchers in the project, knowledge sharing about success stories (e.g. pilot projects) and inside organisations (e.g. municipality), participation in international networks or regional covenants, as well as information meetings for participants. In one case information was considered very important as "the Mayor also invested in appropriate training for local authority planners, councillors, house-builders, built environment professionals" (Williams, 2010, p. 7612).

4.2.5. Control

Individual action

Individual action took place in a few projects and was considered disadvantageous for the process. In two articles the local government alone pushed for the direction of the project (Quitzau et al., 2012 and Williams, 2012). In six Swedish cases (see Muyingo, 2015) it was the unions of tenants who initiated projects on the implementation of renewable energy technologies on their own. In three of the successful cases additional stakeholders joined the project group, in the three cases where no solar PV panels were applied the entire decision-making process involved the individual action of the union of tenants. The disadvantages of individual action were reported to derive from the exclusion of end-users and possible opponents from the decision-making process, i.e. residents (Williams, 2012 and Gansmo, 2012) and powerful stakeholders like incumbent network operators and city government (Moss et al. 2015). Often individual action turned at one point into collaboration.

Coalitions

Coalitions of all shapes and sizes existed. Coalitions involved actors at different levels (mainly local and regional) and included private, public, semi-public and civic actors. Collaboration was mostly formalized, e.g., via covenants, working and steering groups, or through public-private partnerships. Only in one case a problem was reported in regard to coalitions: severe project delays had a negative influence on the relationship between a local authority and a housing corporation, due to which the

municipality left the project and in consequence no renewable energy systems were implemented (Hoppe, 2012).

Co-creation and co-production

In contrast to the individual actions described above, with co-creation (potential) residents and the community as a whole were involved in the planning process. Additionally, developers and those delivering infrastructure were in Stockholm involved from the beginning on (Williams, 2012). The involvement of these actors and a continuous dialogue between all stakeholders are hereby considered enabling factors. However, two major drawbacks of co-creation were identified as well. Firstly, lay-persons do not have professional knowledge. Muyingo (2015) explains that, "the reasons behind the choice to adopt [building applied photovoltaics] and how the process to install [them] is organized by the executive board, appear to be rational but suboptimal and inefficient […]" (p.3660). Secondly, involving a large number of actors can be resource intensive, as it slows down the project and increases overall costs (Williams, 2012). Co-production was directly mentioned in three articles and mainly refers to the role of utilities (Moss et al., 2015; Fuchs and Hinderer, 2014) and the private sector for delivering the infrastructure and technologies needed (Williams, 2010). This co-production however was indicated as an unwelcome dependency by Williams (2010), as actors in the private sector only undertake action once sufficient market demand is present.

4.2.6. Net costs and benefits

Costs and benefits of projects

The codes 'costs of project' and 'benefits of project' aimed to identify which exact financial costs and benefits certain stakeholder incurred, i.e. how costs and benefits were distributed. However, specific numbers were only mentioned in two articles concerning costs made (total investment cost reported by Gustavsson and Elander, 2016; total project costs and rent increases in Jensen and Masleser, 2015). Hoppe (2012) explained that in one case a housing association's board required external budget to be found and in another case cost overruns in a previous project led to deciding against innovative renewable energy systems. Financial benefits were not mentioned in the reviewed articles.

Pay-back time

Unlike costs and benefits, considerations about the pay-back time of investments were mentioned in most of the articles that we analysed. Pay-back time co-occurs in seven articles with the code 'policy instruments', as subsidies played a major role in most projects (see above). Where such subsidies were absent or considered insufficient, pay-back time was always seen as one of the main barriers to starting and/or succeeding with the project, i.e. achieving the desired outcome. This is in line with the general perception of pay-back time: an obstacle to the project. These obstacles include the price of technology vis-à-vis economic returns[12], the investment risk caused by (unproven) new technologies, the length of the pay-back time, or the height of the investment incurred by one sole stakeholder. In several cases pay-back time was negatively influenced by the bio-physical conditions, e.g. "installing the system meant that the energy infrastructure system (pipes) in the house would have to be

[12] PLUS The public were also deterred from installing individual systems by high transaction costs (connection, sourcing technologies, obtaining planning permission, finding companies to maintain systems) and low economic returns (source: interviews with ESCOs).= Williams, 2010

changed. This involved additional costs" (Hoppe, 2012, p. 796). These barriers were worsened by the fact that stakeholders felt that little specific information was available about pay-back times.

Goals & outcomes

As regards technologies, the main goals reported in the articles were the installation of solar PV panels, followed by solar thermal technologies, and to a lesser extent by heat pumps, small-scale CHP, and district heating (in combination with biomass). Mostly, the installation for these technologies was mentioned in combination with reducing energy demand – while reducing CO_2 was barely mentioned explicitly.

While all projects' goals were stated, not all outcomes were reported (n= 11; see figure 6). Where outcomes were reported, these were split almost evenly between 'goals achieved' (n =13) and 'goals not achieved' (n= 14). Information on these outcomes was however only present at general level, e.g. no data on installed generation capacity or CO_2 reduction was provided. Secondary outcomes like co-benefits on employment opportunities were not mentioned.

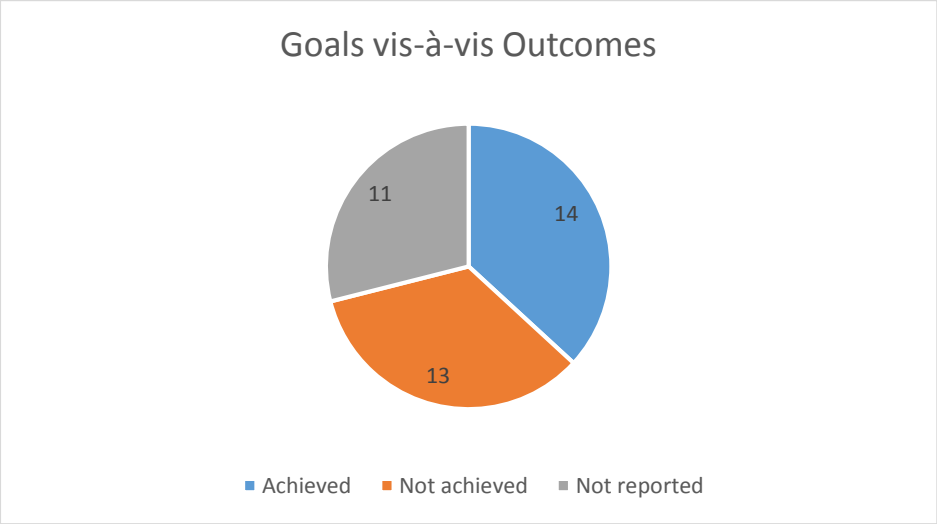


Figure 6: Goals vis-à-vis Outcomes

Where a project's goals were not achieved, more modest, or even conventional measures were implemented instead. Hoppe (2012) for example explained that in one of the studied cases "nonconventional measures were not adopted due to the already high costs of refurbishing the apartments" (p. 795). High costs also led to the outcome that the construction of a gas grid was chosen over CHP in a Dutch municipality (Van Der Waals et al., 2012). While we could identify general barriers in the projects' institutional settings, the authors often did not mention why a certain goal has not been achieved. An example is Williams (2012), who only states that "both buildings and the community energy system under-performed in respect to the CO_2 emission reduction targets" (p. 140). Therefore, we were not able to find information on 'implementation and evaluation' research, one of the codes we applied.

5. Discussion and Conclusion

Our research revealed that local energy planning is indeed highly complex, as Elle et al. (2002) stated, and undertaken in a diversity of ways after the liberalization of the EU's energy markets. Addressing

the research question of 'which institutional settings of local renewable energy planning in the post-liberalization area has prior research identified?' allowed us to shed more light on this diversity. Especially our policy-oriented conceptualization of the 'action situation' was hereby of added value for the analysis of institutional setting described in articles from the policy studies literature.

Based on the systematic literature review and data analysis that we performed, we can conclude that the topic of institutional settings of local renewable energy planning in the post-liberalization area is a newly emerging topic in the academic literature, and focusses mainly on a few countries located in North-Western Europe (with the exception of Austria). Variation in institutional settings hereby not only exists between countries, but also within countries. Despite this, our theoretical approach (i.e. our conceptualization of the action situation) makes it possible to compare these settings and to identify general barriers and enabling factors for local decision-making processes. An overview of our results per element of the action situation can be found in Appendix 4; in this section we summarize and discuss the significance of each identified aspect of the action situation.

Decision-making processes and outcomes are influenced by bio-physical conditions and attributes of community, two aspects that have to be taken into account from the start of a project. On the one hand technological options might be impossible or too expensive to realize due to the current infrastructure. On the other hand involving only certain individuals (i.e. highly-educated males), does not guarantee that desired outcomes will be achieved, especially in cases of housing association-tenants dilemmas (actors/actions). Next to involving residents, the involvement of land owners is paramount (actors/actions); especially in cases where municipalities have ambitious goals for energy efficiency but are not in a position to demand these due to lack of ownership (position). It stood out as well that DSOs were not involved in many projects, and thereby the consequences of DG on the electricity grid were underexposed (actors). Overall, individual actions were considered disadvantageous, while forming coalitions and undertaking co-creation and co-production can enable projects (control). We found that financial policy instruments (actions) have a positive influence on pay-back times (net costs and benefits) and thereby on starting and realizing projects (outcomes). But, relying on public money limits the upscaling of projects; business cases need to be developed and costs and benefits need to be shared between stakeholders (actions/net costs and benefits). Unfortunately, lack of information about policy instruments, about costs and benefits, and about laws and regulations is considered to inhibit project success (information). Boundary spanning (information) between cases can help stakeholders to learn from the experiences and best practices in decision-making processes in other projects and other countries.

Several concepts that we identified (e.g. strategic niche management) turned out to be difficult to pinpoint through our secondary data analysis. However, this does not take away from their relevance. An additional limitation was the fact that only few articles explicitly mentioned the theoretical and methodological approach used, which made it impossible for us to directly assess the quality of the selected articles. However, this limitation is minor as all scientific articles have previously undergone peer-review and were screened with caution.

We want to conclude this article by recommending two areas for further research. Firstly, we recommend to conduct multiple case studies and to directly analyse these with the help of the coding scheme that we developed in this article. Our systematic literature review showed the benefits of

applying the policy-oriented concept of the ‘action situation’, but was of course based on secondary data, which made it difficult to identify several elements. Especially ‘positions’ were mostly not mentioned explicitly, while also ‘net costs- and benefits’, as well as ‘outcomes’ were underreported. Analysing primary data allows to capture these elements and to analyse them in detail. Secondly, we are convinced that using the method of qualitative comparative analysis (QCA), can shed more light on the goals and outcomes of the studied cases. Our qualitative findings can be used to develop specific propositions in regard to which combination of factors led to whether a project’s goals were achieved or not. In the articles that we studied, proficient data on 27 cases is available and these cases can thus be analysed with QCA.

Appendix 1: Coding scheme

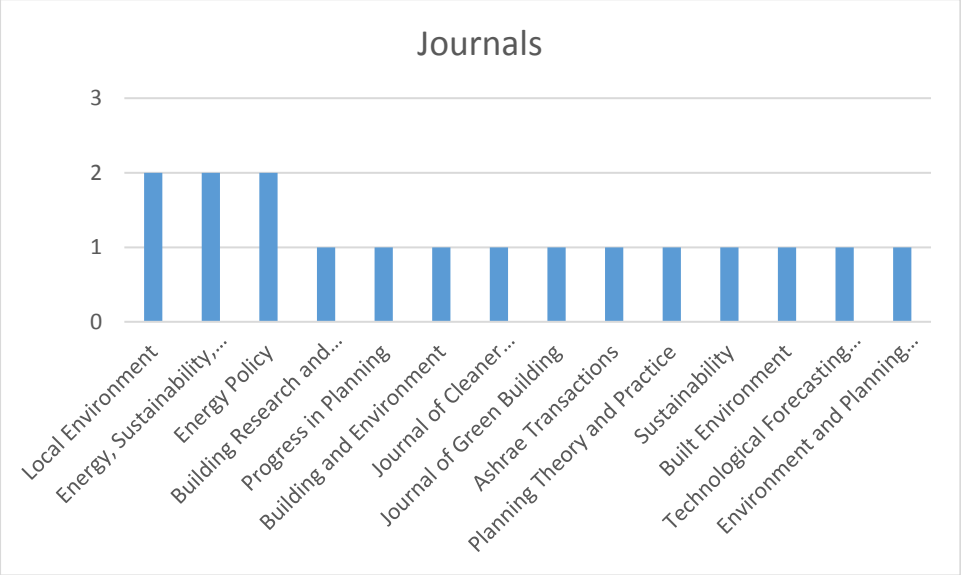
Categories	Codes
Actors	Actors
Positions	- Policy entrepreneur - Strategic niche management - Network management
Actions	- Possible actions - Initiating actor - Laws and regulations - Agenda-setting - Policy instruments
Information	- Information available to actors - Framing - Boundary spanning
Control	- Individual action/monocentricity - Coalitions (e.g. advocacy coalition, discourse coalition) - Co-creation - Co-production
Net costs and benefits	- Costs of project incurred - Pack-back time (potential costs) - Benefits of project incurred
(Potential) outcomes	- Goal - Outcome - Evaluation and implementation research
Bio-physical conditions	Physical and material conditions
Attributes of community	Attributes of Community
Barrier	Barrier
Enabling condition	Enabling condition

Appendix 2: Selected Articles (in alphabetical order)

1. Devine-Wright and Wiersma (2013)
2. Elle et al. (2002)
3. Fuchs and Hinderer (2014)
4. Gansmo (2012)
5. Gustavsson and Elander (2016)
6. Hoppe (2012)
7. Jensen and Maslesa (2015)
8. Moss, Becker, and Naumann (2015)
9. Muyingo (2015)
10. Quitzau, Hoffmann, and Elle (2012)
11. Quitzau, Jensen, Elle, and Hoffmann (2013)
12. Schroepfer and Hee (2008)

13. Strasser (2015)
14. Van Der Waals, Vermeulen, and Glasbergen (2003)
15. Viétor, Hoppe, and Clancy (2015)
16. Williams (2010)
17. Williams (2012)

Appendix 3: Selected Articles by Journal



Appendix 4: Results per element of the action situation

Element of the Action Situation	Results
Actors	Involvement of land owners, involvement of residents early on, involvement of DSOs
Positions	Be aware of policy entrepreneurs' goals, network management beneficial, municipalities only observers and dependent on others
Actions	actions can change (e.g. municipal election, loss of interest), housing association dependent on tenants' votes, conservative actions by incumbent stakeholders, ownership determines possible actions, laws and regulations hinder actions, financial policy instruments facilitate projects, agenda-setting not inclusive
Information	Framing of information to further own interests, boundary spanning between projects, information (about policy instruments, rules and regulation, costs and technology) limited, information needed in hands of several actors
Control	Individual actions disadvantageous, problems can harm relationship of coalition partners, co-creation and co-production beneficial when professional knowledge and sufficient resources are available
Net costs and benefits	Costs and benefits need to be discussed and shared, external financing needed, pay-back time only positive when subsidies present, high investment risks
Outcomes	Outcomes need to be measured, equal amount of projects achieved and did not achieve their goals

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