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Review

Analysing the Institutional Setting of Local Renewable Energy Planning and Implementation in the EU: A Systematic Literature Review

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Abstract: Due to the liberalisation of the European Union's (EU) electricity sector, stakeholders' roles and responsibilities in local energy planning and implementation are not well-defined in legislation anymore. To investigate what local energy planning and implementation processes look like in the post-liberalisation era we conduct a systematic literature review by addressing the question '*which institutional settings of local renewable energy planning and implementation in the EU's post-liberalisation area has prior empirical research identified?*' For this systematic analysis we conceptualised the analytic concept 'action situation' (as developed by Elinor Ostrom), from an energy governance and energy policy perspective. 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. The selected articles were coded using Atlas.ti. Our in-depth qualitative analysis revealed the institutional arrangements used in the reported local energy planning processes were found to not be ideal for the introduction of renewable energy technologies. No type of actor group seems actively to support the realisation of renewable energy projects. Moreover, a high dependence on financial subsidies was found. These results are useful for practitioners and policy-makers as they show which possibilities and limitations stakeholders encounter in the changed level playing field of local energy planning. The article also presents propositions for future research.

Keywords: local energy planning; implementation; local governance; renewable energy; renewable energy technologies; systematic literature review; liberalisation; electricity market; institutions

1. Introduction

The European Union's (EU) energy market reforms in the 1990s changed the organisational set-up of the European electricity sector through liberalisation of, and privatisation in electricity markets. To give an example, until 1989 electricity generation and distribution in The Netherlands were largely organised in public monopolies "with clearly defined positions and legally authorized*[sic]* tasks [. . .]" [1] (p. 152–153). Following liberalisation, the monopolised position of Dutch municipalities ceased to exist [1,2]: Municipalities became shareholders in profit-oriented energy companies [3], and when Distribution System Operators (DSOs) became separate entities many municipalities sold their stocks in their production and supply companies [4]. Additionally, with the increased production of renewable-based electricity, new actors started to emerge in the electricity sector, for instance individuals (e.g., prosumers), community energy initiatives, ICT companies, energy service companies (ESCOs), aggregators and research centres.

Consequently, while electricity provision and planning used to be the task of formally legitimated organisations with clear roles and responsibilities, the liberalisation of the electricity market, stakeholders' roles and responsibilities were not well-defined anymore. This lack of clarity on roles and responsibilities is particularly problematic for decision-making on the introduction of renewable energy technologies at the local level. On the one hand, disagreements are likely to emerge on the distribution of roles and responsibilities [5], and additionally, on the other hand, the increase in the number of potentially involved actors makes local energy planning more complex [6].

What local energy planning and implementation practices exactly look like after the liberalisation of the EU's electricity markets, however, remains underexplored. Bulkeley and Kern [7] distinguish four modes of climate (mitigation) governing, but do so only from the perspective of local governments. Similarly, Walker and Cass [8] identify five different modes of renewable energy implementation in the United Kingdom (UK), yet mainly focus on the role of 'the public'. An analysis is missing of which roles and responsibilities stakeholders in local energy planning and implementation take on in the post-liberalisation era. In other words, no overview exists of the institutional settings that are prevalent in decision-making on the introduction of renewable energy technologies. Researching current energy planning and implementation practices in Europe is important because it allows to identify which possibilities and limitations stakeholders encounter in the changed level playing fields at the local level.

Hoppe and Van Bueren [9] address a lack of research on institutional settings in regard to low carbon energy transitions in cities. They propose a research agenda that, *inter alia*, addresses "institutional conditions in multi-stakeholder configurations, looking into positions, ownership, institutional rules and policies" (p. 8). In this article, we follow upon this suggestion by conducting a systematic review of literature that reports empirical research on urban governance practices related to the introduction of renewable energy technologies in several European Union countries. In this article the main research question is, '*Which institutional settings of local renewable energy planning and implementation in the EU's post-liberalisation area has prior empirical research identified?*'

A systematic, structured literature review will be conducted as 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 was conducted prior, but where new studies are needed" [10] (p. 2). While a systematic literature review does not allow for an in-depth analysis of specific cases, it does allow to obtain a general interpretation of the institutional settings surrounding local decision-making processes. Next to this scientific purpose, the research is relevant to practitioners and policy makers as it can help them uncover which possibilities or limits exist in the changed level playing field of local energy planning, i.e., for the introduction of (smart) renewable energy technologies. For this systematic analysis we use the analytic concept 'action situation' that was developed in Elinor Ostrom's Institutional Analysis and Development (IAD) framework [11]. As our analysis focuses on relevant literatures related to local energy planning and implementation practices, we complement the seven elements of the 'action situation' with concepts used by scholars working on energy governance as well as energy policy studies.

This article is structured as follows. Section 2 describes the theoretical lens and the conceptual model that we developed for performing the systematic literature review. Section 3 depicts the method of the structured literature review in detail. Section 4 explains the results of the analysis, and is followed by the discussion (Section 5), including a set of propositions, and conclusion with suggestions for future research (Section 6).

2. Conceptualizing the Action Arena

To identify and describe the institutional settings of local energy planning and implementation in the EU energy sector's post-liberalisation era, we draw on Elinor Ostrom's Institutional Analysis and Development framework [11]. The main reason we chose the IAD framework, over similar theoretical frameworks or theories, is that it allows to decompose complex action situations into individual components [12,13], and, as a result, facilitates the analysis of institutional settings as well as making comparisons between institutional settings. We therefore use the IAD's analytic concept of the 'action situation' (see Figure 1) for the research conducted in this article.

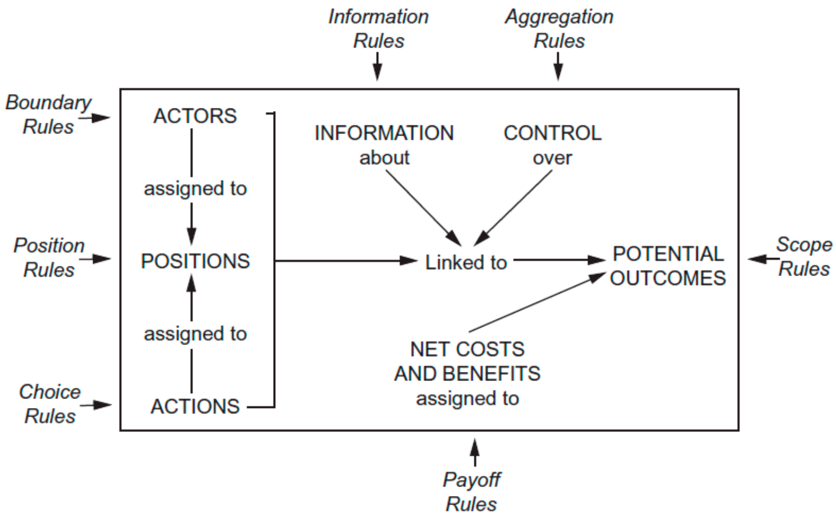

Figure 1. The action situation, including rules-in-use. Source: Ostrom [11].

In the IAD framework, "action situations are the social spaces where individuals interact, exchange goods and services, solve problems, dominate one another, or fight [. . .]" [11] (p. 11). In the research presented in this article, the action situation of interest is the local energy planning process where decisions about the introduction of renewable energy technologies in local settings are taken. Figure 1 depicts all seven elements inside an action situation—actors, positions, actions, information, control, net costs and benefits, potential outcomes—and shows how these are influenced by seven 'rules-in-use'. Next to 'rules-in-use', the elements in the action situation are influenced by two other external factors—'community attributes' and 'biophysical conditions'. As this article is concerned with mapping the institutional setting (action situation) of local energy planning and implementation, we focus on the elements inside the action situation, including, among other aspects, which actors are part of this process, which positions they hold, and the actions that they can take.

Due to the fact that the data collection concentrates on literature related to local energy planning and implementation practices, we conceptualised the seven components of the action situation based on literature by Elinor Ostrom [11,14] as well as concepts used in energy governance and policy studies (see Table 1).

Table 1. Conceptualisation of the action situation, and mentioning of academic disciplinary literatures they stem from.

Action Situation Elements	Conceptualisation
Actors	Actors that participate in the decision-making process—e.g., a municipality, Distribution System Operators (DSO), housing association, tenants, community energy initiative, project developer.
Positions	Positions that actors hold in the decision-making processes—e.g., a policy entrepreneur [15,16], niche manager [17], network manager [18,19].
Actions	Actions that can/have been taken. The (legal) possibilities that exist for collaboration—e.g., possible actions, laws and regulations, or policy instruments.
Information	Information available to actors. Including information about technology, policies, meetings, websites, costs and benefits and the outcomes of one's own actions—e.g., framing debates [20], spanning boundaries between policy different domains [21].

Table 1. *Cont.*

Control	Whether actors take actions on their own initiative, or whether they confer with others—e.g., individual action, collective action, or in coalitions (e.g., advocacy or discourse coalitions) [20,22], co-creation [23], co-production [24].
Action Situation Elements	**Conceptualisation**
Net costs and benefits	The costs of various actions to each type of actor and the kinds of benefits to be achieved as a result of various group outcomes—e.g., costs of project, pay-back time, distribution of costs and benefits among actors.
(Potential) outcomes	The geographic regions and events in that region that are affected. The chain of events that links actions to outcomes—e.g., evaluation and implementation research [25–27].

This conceptualisation is required to enable us to identify what the concepts of the action situation mean in debates regarding energy planning processes. Energy governance is often discussed for the global level [28–30]; energy governance at the city district level is specifically referred to as urban energy governance. The notion of urban energy governance is "used broadly to capture the multitude of ways in which urban actors engage with energy systems, flows and infrastructures in order to meet particular collective goals and needs, as framed or expressed in policymaking processes, but also in debates, contestations and conflicts over policy orientations, resources and outcomes" [31] (p. 174). In line with this policy-making focus, we additionally draw inspiration from Hoppe, Coenen, and van den Berg's [32] illustration of the use of concepts from the discipline of policy studies in energy research. The conceptualisation in Table 1 is the core for the coding scheme that was applied to the final selection of articles (see methods Section 3 for details).

3. Research Design and Methodology

To address the research question that guides this article, we chose to conduct a literature review in two cycles: A systematic database search and snowballing. This section provides details on the selected method, including case selection (Section 3.1), search cycles and selection criteria (Section 3.2), as well as data preparation and analysis (Section 3.3).

3.1. Case Selection and Conceptualisation

In this analysis only included countries that were subject to the European Union's electricity market liberalisation, which started in the 1990s. This focus was chosen in order to have a long time frame, because of an anticipated delay between the moment a project takes place, and the publication about such project in the scientific literature; i.e., a project that takes place from 1995 to 2000 might only be reported on in a peer-reviewed journal in 2001 or later. This led to the selection of the following fifteen countries that were a member of the European Union when the first and second liberalisation directives were adopted, in 1996/1998 and 2003, respectively: Germany, France, Belgium, The 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 the analysis, it is important to have a precise conceptualisation of the unit of analysis. As mentioned previously, we wanted to investigate the institutional setting of local renewable energy planning and implementation. To be more precise, we were interested in decision-making processes that focused on the introduction of renewable energy technologies in local projects.

The spatial focus was local, more precisely residential areas (city districts). Furthermore, as distributed renewable energy technologies are often implemented during large-scale housing renovation or construction projects in city districts, studies were likely to address these aspects.

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, following Petticrew and Roberts [10], a systematic database search was performed, and, based on this, secondly, 'snowballing' was applied.

3.2.1. Search strategy Cycle 1: Systematic Database Search

The first search cycle entailed a systematic database review, that is, a review that adheres "closely to a set of scientific methods that explicitly aim to limit systematic error (bias), mainly by attempting to identify, appraise and synthesize*[sic]* all relevant studies (of whatever design) in order to answer a particular question (or set of questions)" [10] (p. 9). Using this method allows to systematically identify literature, and, as a result, to bridge the knowledge gap that currently exists regarding the institutional settings of energy planning and implementation 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 (see Table 2). These clusters reflect the main research question and the concepts commonly used to study governance practices related to the introduction of renewable energy technologies. That is, the search terms in each cluster take into account the different synonyms used to describe the same concept, and were specified after test searches and the reading of sample papers. For examples of this approach see References [33–35]. This resulted in the creation of the following four clusters of search terms for the identification of relevant peer-reviewed journal articles: (1) Search terms related to energy; (2) search terms describing the planning process; (3) search terms focusing on an object of change; and (4) search terms indicating location/scale. Furthermore, all articles evidently had to report empirical case study findings.

Table 2. Clusters of search terms used in the database research.

No.	Cluster	Search Terms
		Empirical 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	Neighbourhood, residential, local, municipal/ity, urban, housing, district, city

The database search was performed in July and August 2016, as well as again in July 2018 to cover the period from September 2016 to July 2018. Two databases relevant to the research field of interest were searched: Scopus and Web of Science. The search in Scopus included title and abstract, however Web of Science abstracts could not be searched, therefore we decided to search by topic. Due to the fact that the snowballing method is applied, this drawback was remedied to a large extent. During this search, the four clusters of search terms were connected with Boolean operators.

3.2.2. Search Strategy Cycle 2: Snowballing

To identify additional relevant articles we applied the snowballing technique [36]. Both backward (from the reference list of the selected articles) and forward snowballing (identifying articles that cite the selected articles) were used. During the snowballing we did not include references that led back to one of the original articles from the first search cycle. A diagram of the literature search of Cycle 1 and 2 can be found in Figure 2.

3.2.3. Selection Criteria

In combination with the clusters of search terms, the following three inclusion criteria were subsequently applied during both search cycles. Firstly, the article focusses on a case study of an empirical situation; hence methods such as life-cycle assessments, modelling and simulations were excluded. Secondly, articles were published between 1999 and July 2018 and cover case studies that took place after 1999. It should be noted that 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, the literature review focussed on the period of 1998 and onwards. Thirdly, the content of the publication deals with (smart) renewable energy infrastructure in local settings, that is at the city district level. This selection criterion 'local (renewable) energy infrastructure' therefore excludes energy sources like fossil fuels (i.e., non-renewable) and large-scale wind turbines (i.e., not installed in city districts). Additionally, during the search we did not include other types of infrastructures (e.g., railroads, road/traffic), as well as excluded measures that only focus on energetic measures inside individual houses (e.g., thermal insulation). Systematic reviews and meta-analyses were also excluded in all search cycles.

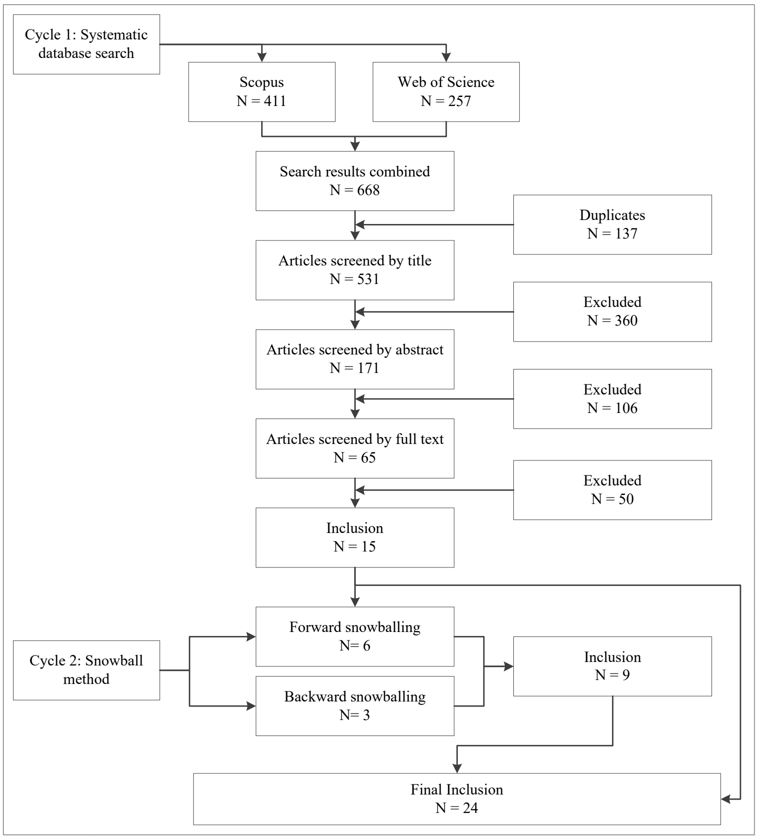

Figure 2. Prisma Flow diagram literature search Cycle 1 and 2.

Figure 2 shows that during the first cycle 531 articles were screened by title, in turn 171 by abstract and 65 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 method (algorithms, GIS, micro-grid reliability assessment, building energy performance).

Topics such as energy-saving and refurbishment of buildings 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 e.g., merely the insulation of individual buildings.

The systematic search and application of selection criteria led to the identification of 24 relevant articles for analysis, as presented in Table 3.

Table 3. List of references of literature used in the systematic literature analysis.

Literature used in the Systematic Literature Analysis	Number in Reference List
Chmutina, Wiersma, Goodier, & Devine-Wright, 2014;	[37]
Devine-Wright & Wiersma, 2013;	[38]
Elle et al., 2002;	[6]
Frances & Stevenson, 2018;	[39]
Fuchs & Hinderer, 2014;	[40]
Gansmo, 2012;	[41]
Gustavsson & Elander, 2016;	[42]
Hoppe, 2012;	[43]
Jensen & Maslesa, 2015;	[44]
Klein Woolthuis, Hooimeijer, Bossink, Mulder, & Brouwer, 2013;	[45]
Lammers & Heldeweg, 2016;	[46]
Moss, Becker, & Naumann, 2015;	[47]
Muyingo, 2015;	[48]
Parks, 2018;	[49]
Quitzau, Hoffmann, & Elle, 2012;	[50]
Quitzau, Jense, Elle, & Hoffmann, 2013;	[51]
Schroepfer & Hee, 2008;	[52]
Smedby & Quitzau, 2016;	[53]
Strasser, 2015;	[54]
Van Der Waals, Vermeulen, & Glasbergen, 2003;	[55]
Van Doren, Driessen, Runhaar, & Giezen, 2018;	[56]
Viétor, Hoppe, & Clancy, 2015;	[57]
Williams, 2010;	[58]
Williams, 2012.	[59]

3.3. Data Preparation and Analysis

The 24 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 conceptualised in Section 2. Furthermore, we added the two external variables 'bio-physical conditions' and 'attributes of community' of the IAD framework to our coding scheme. Additionally, during coding we were open to the emergence of new codes. The final coding scheme can be found Appendix A.

Based on this coding, an in-depth qualitative analysis in the form of a narrative review was undertaken. This approach is especially suitable for addressing this article's research question on the institutional settings of decision-making processes, as these concepts 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, in Section 4.1 (see References [6,37–59], as well as Table 3 above, for the full list of selected articles), followed by the in-depth qualitative results of the analysis, in Section 4.2.

4.1. Introducing the Selected Articles

This section briefly introduces the set of articles selected to provide background information for the analysis.

4.1.1. Articles by Year and Journal

The analysis revealed that empirical research on institutional settings of local renewable energy planning and implementation is only recently emerging in the academic literature (see Figure 3).

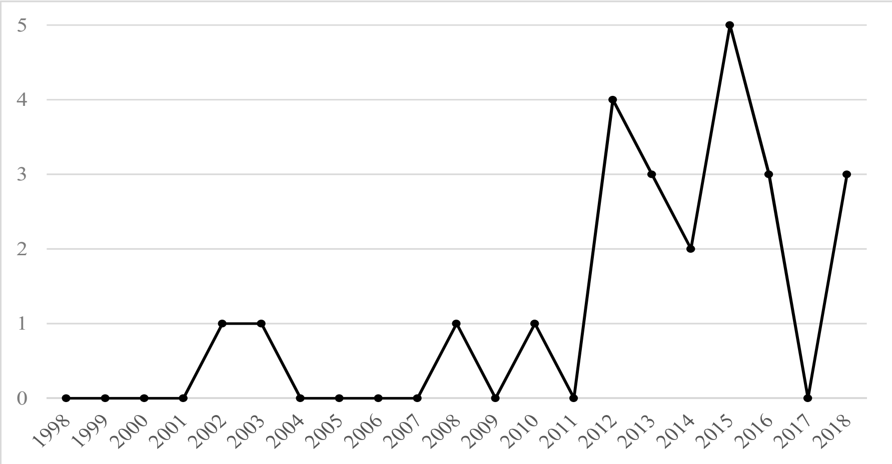

Figure 3. Articles by year of publication.

In the period from 1998 to 2011 only four articles were published and in different years (2002, 2003, 2008, 2010). From 2012 on attention seems to have risen, with five articles published in 2015; note that for the year 2018 data collection only covered the first six months.

The articles were published in a wide range of journals (see Appendix B). Only in five journals more than one article had been published. The journal publishing most articles was 'Energy, Sustainability and Society' with four. Others concern 'Local Environment' (*n* = 2); 'Journal of Cleaner Production' (*n* = 2); 'Energy Policy' (*n* = 2); and 'Building Research and Information' (*n* = 2).

4.1.2. Countries and Studied Cases

In the selected articles, we retrieved cases being studied in seven out of the fifteen countries whose electricity markets were liberalised in the 1990s and early 2000s (see Figure 4). Those countries are: The Netherlands (*n* = 7), Germany (*n* = 6), Sweden (*n* = 6), Denmark (*n* = 5), UK (*n* = 3), Austria (*n* = 2) and Norway (*n* = 2). This does not come as a surprise when considering that these countries are known for their progressive policy measures on renewable energy, and mostly have a strong tradition of publishing in English. Thirteen of the articles concerned single case studies, while eleven analysed multiple case studies, ranging from two to twelve cases; making it a total of 65 empirical case studies.

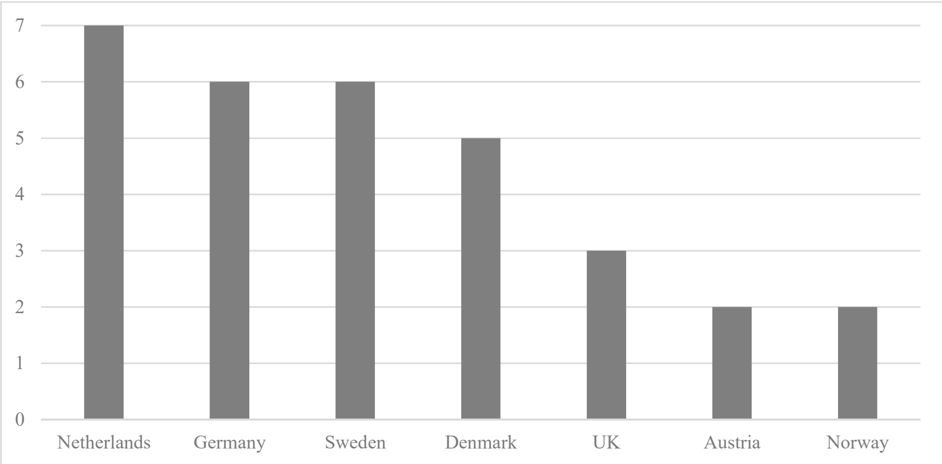

Figure 4. Countries studied by frequency.

As regards use of technology in reported projects, the main ones 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 together with the goal of reducing energy demand—while reducing CO_2 emissions was barely mentioned explicitly.

While all 65 projects' goals were stated, not all outcomes were reported ($n = 16$). In the majority of projects analysed ($n = 35$), the pre-established goals had been achieved, and only in a smaller number of projects ($n = 14$) this was not the case. However, information on outcome was only present at general level, for instance, no data on installed generation capacity or CO_2 emissions reduction was provided. Secondary outcomes, such as co-benefits on employment opportunities, were not mentioned.

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; Gansmo [41] disclosed that the terrain was co-owned by public partners (the state, county and regional hospital), in the empirical research conducted by Williams [59] the terrain was owned by the municipality. Projects led by housing associations often focused on dwellings that were 'bleeding energy'; e.g., they suffered from poor isolation, bad ventilation or 'leaky facades' (for examples, see [42,44]). Bio-physical conditions were at times hindering projects. For instance, for reason of limited roof space [48] or suboptimal roof-orientation for solar PV panels [43,52], inadequate (existing) infrastructure for the installation of solar thermal systems [43], or unsuitability of a rural area to be connected to a district heating grid [53].

4.1.4. Attributes of the Community

Attributes of community were not always addressed in detail, but two aspects stand out. The first is socio-economic status. Evidently, in projects led by social housing associations residents have a low-socio economic status; for instance "with a high percent of unemployment, and ridden by many related social problems" [42] (p. 5). However, socio-economic status is not necessarily linked to the attitude of householders towards renewable energy. Williams [59] analysed that residents in her German case had low, medium, and high income levels, and were all active 'energy citizens'. Whereas, the project she studied in Sweden involved rich, but passive consumers. Secondly, the role of gender has been pointed out by Muyingo [48], who found that 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 were women, while 66 percent of the members of the executive boards and 80 percent of the chairpersons are men" [48] (p. 3658).

4.2. Results of the Qualitative Analysis

Through the systematic literature review we were able to analyse which institutional settings of local renewable energy planning and implementation have been identified by prior empirical research. The results for each element of the action situation are explained in the following; overlaps between sections are self-evident due to the interrelation of elements. The element '(potential) outcome' is not discussed separately, as the selected articles mostly did not address this aspect, and particularly not the reasons for (non-)achievement of certain outcomes.

4.2.1. Actors

A multitude of different actors were participating in each described local energy planning process (see Figure 5). In the 24 selected articles, 65 case studies were analysed in total. The information provided on the participating stakeholders, however, has to be treated with caution, especially due to the following two reasons: (1) It is not possible for us to validate whether all stakeholders have been reported for each case; (2) in a few articles [38,49,59] stakeholders were aggregated—e.g., only referred to as third sector or private sector actors. These aggregated actors have not been included in Figure 5. This sub-section provides an overview of the stakeholders involved most frequently, as well as an overview of type of which stakeholders initiated projects. The results show that initiating actors mostly concerned a coalition of stakeholders, and only in some cases individual entities. An important remark here, is that actors who initiated projects, or were in powerful positions of projects, do not necessarily remain 'in the driving seat' during the entire period a project takes place.

Local governments, namely municipalities, were most frequently reported to not only have been involved in the projects ($n = 28$), but also to have initiated these ($n = 15$). A problem with municipalities was that they often established climate policies, but mostly did not own possible project locations when it comes to the residential sector. Quitzau et al. [50] explain that the local authority in Denmark had to purchase a whole building site in order to be able to impose legally binding energy efficiency requirements; this was considered an investment risk. This situation also occurred in the German project studied by Williams [59] (p. 136) where "municipal ownership of the site provided the city council with the leverage it needed to demand higher energy standards in buildings".

To achieve their ambitious targets, local governments are dependent on actors who do own project locations. In regard to this, it is easier for municipalities to address housing associations that can implement measures in a large number of houses, than to approach a multitude of home owners individually. The findings reveal that housing associations were very often involved in ($n = 16$) and initiating ($n = 9$) local energy projects. Stakeholders from the building and construction industry ($n = 17$) and consultants from engineering companies ($n = 16$) were involved in many projects as well, which is explained by the expertise and resources that they hold. However, these experts mainly joined projects that had already started instead of initiating these themselves.

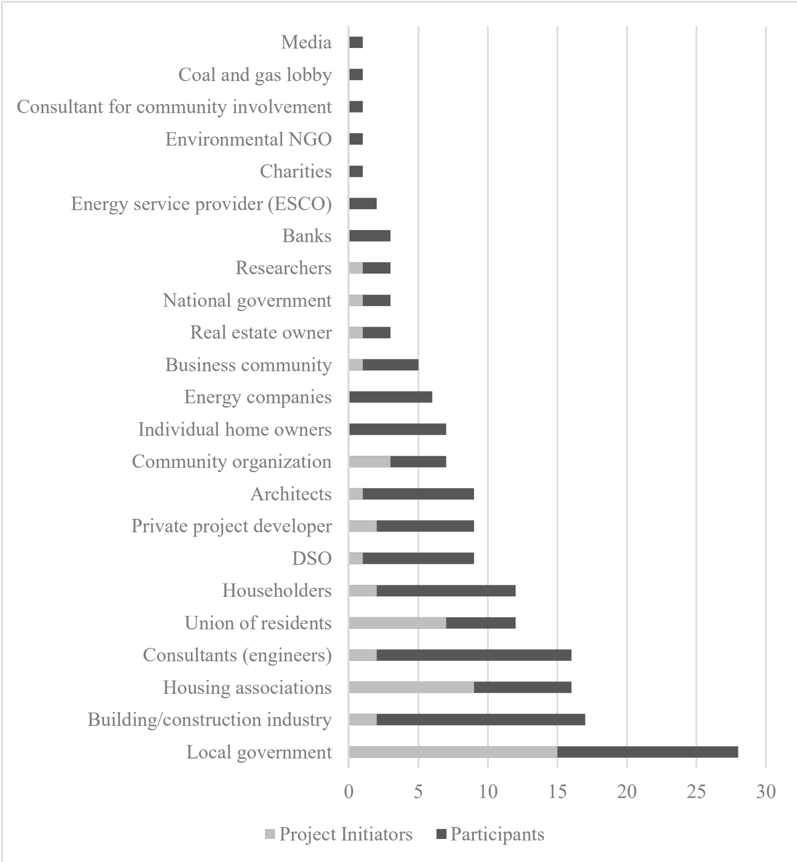

Figure 5. Number of participants and project initiators.

In several cases (*n* = 12, of which *n* = 7 as initiators) unions of residents (which include both tenants' associations and owners' associations) have been involved from the start of the projects. This is equal to the involvement of householders (*n* = 12), while we have to bear in mind that the number of possible householders (i.e., residents) that can join is comparatively seen much higher than the possible number of residents' unions. Furthermore, householders were often only consulted in later stages of a project.

What stands out is that distribution system operators participated in only nine projects, and only were involved from the beginning on in one project. This one project did not concern the electricity grid, but the extension of a district heating grid (for details see [55]). Many projects considered the installation of distributed generation technologies, mainly in the form of solar PV panels, that are to be connected to the electricity grid. The feed-in from these PV panels, as well as changing electricity demand patters could present a technical challenge to the distribution grid, and hence to the core responsibility of the DSO.

4.2.2. Positions

Positions is an element of the action situation that has not been addressed extensively by the selected articles, but three conclusions can be drawn. Firstly, while local governments participate in and initiate the largest number of projects (see Section 4.2.1 above), eventually they often only hold the position of observer. This is explained by the fact that local governments mostly impose requirements for local energy projects, but expect other actors to realise such projects. Secondly, in the analysis a policy entrepreneur was only identified in three articles. In one case, this entrepreneur was considered to have had a general positive influence on the realisation of renewable energy solutions (i.e., the company 'Solarcomplex AG' in [40]), whereas in the other two cases he or she was campaigning for furthering his or her own interests [47] and was found to deliberately not involve certain actors out of fear of being held back by them [41]. Thirdly, Network Management could be traced in five cases, often being undertaken by a company or project manager with experience in other projects and access to a network of experts [41–43,50,51].

4.2.3. (Possible) Actions

While the actions that should and could have been taken are very specific for each individual actor and dependent on the project taking place, a synthesis of the findings is possible.

Laws and regulations discussed included legal permits, planning regulations, energy standards, legally binding covenants, and purchase agreements. These laws and regulations were mostly reported to be too strict, conservative or would demand too many measures to be taken. For instance, a "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" [43] (p. 797). In addition, laws and regulations were considered entailing too time-consuming (and non-standardised) procedures. In addition, a lack of information about laws and regulations was reported (e.g., in [58]). An exception to the negative view on laws and regulations is the 'Hyllie Environmental Programme' [49] that stated that renewable energy should be considered early on in spatial planning and building processes.

The policy instruments applicable in the studied cases were mainly governmental financial support measures. Financial support came from all levels of government (local, regional, national and EU), and mainly in the form of subsidies (mentioned in eight articles). These subsidies were reported to have a positive 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, uncertainties about conditions and information about policy instruments existed (e.g., reported by [56]), and especially local governments had limited financial means to provide (continuous) sufficient support.

Furthermore, ownership (as discussed in detail under point Section 4.2.1) often determined which actions were possible, and which were not; c.f., owner-occupants/housing association-tenant dilemmas (and voting requirements), or the location where a building site was owned by one single actor (e.g., by local government [59]).

4.2.4. Information

The element information has been discussed extensively in the articles that were analysed. Firstly, it was considered a vulnerability when knowledge was in the hands of one specific actor, as this knowledge would be lost once this expert were to leave the project consortium (as was the case in [41]). Secondly, a lack of information was often reported; for instance (a) on policy instruments and rules and regulations; (b) on the technology itself, its installation and maintenance; and (c) on the costs of projects, albeit sometimes "this concern related to impressions of costs at face value, rather than any consideration of the actual costs and benefits" [55] (p. 417). Thirdly, information was found to be enabling projects when information meetings for participants were organised, when researchers were involved in a project, and when knowledge was shared about success stories and good practices (e.g., from pilot projects, or through the participation in international or regional networks) or inside organisations (e.g., municipalities).

Framing and boundary spanning could only be traced in a few articles. Framing of planning and implementation processes was undertaken by several stakeholders in regard to: (a) How positively or negatively they judged collaboration with other stakeholders; (b) the role of a consultant [44]; (c) the goal of the overall project [40]; and (d) to further the interests of a certain organisation, for instance, of an installation contractor [43]. Boundary spanning was reported once by a task force which exchanged experiences among several local projects [43] and once by the media [41]. In the latter case the municipality would have preferred to take on the role as boundary spanner itself, instead of leaving it to the media, but lack of financial means prevented it from doing this.

4.2.5. Control

In brief, control refers to individual compared to collective action. Individual action took place in a few projects, for instance, when the local government alone pushed for the direction of the project [50,59]. Such individual actions were reported to be undesirable due to the exclusion of end-users and possible opponents of the project plans in the decision-making process, in particular residents [41,59], as well as powerful stakeholders such as incumbent network operators or city government [47]. Often individual action turned at one point into collaboration.

The literature review revealed that coalitions of all shapes and sizes occurred. Coalitions involved actors at different levels (mainly local and regional) and included both private, public, semi-public and civic actors. Collaboration was mostly formalised, 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 government and a housing corporation, due to which the former left the project, did not influence decision making anymore, indirectly resulting into no renewable energy systems being installed anymore [43].

With co-creation (potential) residents, the community as a whole, developers and those delivering infrastructure were a few times involved in the planning process. The involvement of these actors and a continuous dialogue between all stakeholders were considered to be enabling factors in the project. However, two major drawbacks of co-creation were identified as well. Firstly, lay-persons do not have professional knowledge, which can lead to suboptimal decisions and higher costs (see [39,48]. Secondly, involving a large number of actors was reported to be resource intensive, as it slows down the project and increases overall costs [59].

Co-production was explicitly discussed in three articles and mainly refers to the role of utilities [40,47] and the private sector for delivering the infrastructure and technologies needed [58]. This co-production however was identified as an unwelcome dependency by Williams [58], as actors in the private sector only undertook action once sufficient market demand was present.

4.2.6. Net Costs and Benefits

Strikingly, in none of the articles the costs of various actions nor their benefits were reported. Specific numbers on the distribution of costs (not of the benefits) were only mentioned in two articles (total investment cost reported by [42]; total project costs and rent increases in [44]).

Considerations about the pay-back time of investments on the other hand were mentioned in most of the articles. In seven articles the code 'pay-back time' co-occurred with the code 'policy instruments', as subsidies played a major role in facilitating projects (see Section 4.2.3 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. These obstacles include the price of technology vis-à-vis economic returns, 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. Moreover, it was reported that stakeholders felt that little specific information was available about pay-back times and that "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" [58] (p. 7610).

5. Discussion

This study contributed to growing body of knowledge pertaining social science in energy issues and energy research [60]. Within this field it is part of a similarly growing scholarly attention to the importance of institutions in emergent energy issues (i.e., References [46,61,62]), like climate change mitigation (i.e., meeting the Paris Agreement targets), low carbon energy transition, emerging technologies like smart grids, and issues regarding energy justice. Although many of these publications present conceptualisation of institutions in energy settings, illustrate them or present new conceptual frameworks, as to date a systematic overview of action arenas and the institutional rules they entail in empirical studies was missing. With the results of the systematic literature study presented in this article we tried to show the importance of the use of these concepts in empirical research, and elicit the meaning of 'action arena' and 'institutional rules' in actual real-life empirical case studies. As such, not only do the results of the study contribute as another field of application to Ostrom's IAD framework [12], showing how and in which ways institutional rules influence decision-making in action arenas, but also does it contribute to research agendas that seek to highlight "institutional conditions in multi-stakeholder configurations, looking into positions, ownership, institutional rules and policies" vis-à-vis transformation of energy systems [9] (p. 8). To merit academic elaboration from the systematic literature study we draw lessons from the empirical studies analysed, clustering them as per institutional rule, and presenting propositions for each of them, in the hope that they will guide avenues of future research.

5.1. Propositions

5.1.1. Institutional Rules Cluster 1: Actors

Proposition 1. *Local governments often initiate local energy projects, but having limited resources available depend to a great extent on other local stakeholders (e.g., housing associations, DSOs, home owners) to implement projects. As such, the influence (hence 'role') of local government in local energy projects diminishes as the project progresses.*

Proposition 2. *As householders (home owners and tenants) are often only involved late in the projects, project management runs the risk that householders feel underappreciated, and will try to influence project implementation decision-making, using blocking power resources at their disposal.*

Proposition 3. *If key actors in the project, like local government or a housing association, has ownership of property that will be subjected to energy performance enhancement activities in the project, this will likely lower complexity, and hence, ease decision-making in the project.*

5.1.2. Institutional Rules Cluster 2: Positions

Proposition 4. *The presence of a 'policy entrepreneur' (or 'project entrepreneur at project level') has a positive influence on the realisation of renewable energy solutions in a local project, given that he/she does not only pursue individual interests.*

Proposition 5. *Similarly, the use of network management has a positive influence on the realisation of renewable energy solutions in a local project, given that experienced managers are involved having access to expert networks. Network management might also entail deliberately (not) involving certain actors.*

5.1.3. Institutional Rules Cluster 3: (Possible) Actions

Proposition 6. *When (formal) regulations are too strict, too much stipulating actions that should (or should not) be undertaken by actors (often following detailed, time consuming procedures), they will negatively influence the realisation of renewable energy solutions in local projects.*

Proposition 7. *While subsidies (or other financial supportive policy instruments) are generally seen to positively influence business cases of local projects and realisation of renewable energy technologies, they will only be* *successful if there are not too many uncertainties about them, which create confusion and uncertainties among project actors.*

5.1.4. Institutional Rules Cluster 4: Information

Proposition 8. *If knowledge is fairly shared among project actors, this will likely positively influence interaction between those actors. However, often key information resides with one specific actor, eventually creating problems to the project consortium as a whole.*

Proposition 9. *Involving knowledge brokers, or organizing information meetings in which knowledge is shared among actors, will have a positive influence on inter-actor dynamics, and the overall progress of the project.*

Proposition 10. *Involving a process manager in the project may enhance inter-actor dynamics (using 'framing' and 'boundary spanning' strategies) or attract involvement of stakeholders who are not yet involved in the project (and gain access to their resources).*

5.1.5. Institutional Rules Cluster 5: Control

Proposition 11. *Individual action undertaken by actors seeking to gain control of decision-making (power) in a local energy project, is considered undesirable to meeting collective project goals.*

Proposition 12. *Inter-actor collaboration in local energy projects is more successful once it is formalised (e.g., in a formal partnership, a covenant or other form of multilateral agreement).*

Proposition 13. *Involving community members (e.g., residents or tenants) in project decision-making (or at least involving them in a continuous dialogue with project management) is considered an enabling factor to successfully attainment of project goals, given that community members participating are well-informed (or are supported to become well-informed) and that project management makes sufficient resources available to support community involvement.*

Proposition 14. *Too much dependency on private sector utilities is bound to delay local energy projects.*

5.1.6. Institutional Rules Cluster 6: Net Costs and Benefits

Proposition 15. *Local energy projects often entail actors perceiving major financial uncertainties and the risks that go along with them. Pay-back time is considered a key barrier to both starting up and (successfully) realizing of local energy projects. Investors generally fear high transaction cost and low economic return.*

6. Conclusions

After the liberalisation of the EU's electricity markets, stakeholders' roles and responsibilities in local energy planning and implementation were not well-defined in legislation anymore. This lack of clarity is problematic for decision-making on the introduction of renewable energy technologies. Due to the fact that an overview is missing of the local energy planning and implementation practices used in the post-liberalisation era, we conducted a research synthesis of literature that reports empirical findings on governance practices used in local energy planning and implementation processes. Specifically, this article addressed the research question *'which institutional settings of local renewable energy planning and implementation in the EU's post-liberalisation area has prior empirical research* *identified?'* To analyse as well as compare the institutional settings in the selected articles, we chose to conceptualise the seven elements of the 'action situation' [11] from an energy governance and energy policy perspective.

We conclude that the topic of institutional settings of local renewable energy planning in the post-liberalisation area is a newly emerging topic in the academic literature in English, and focusses mainly on a few countries located in North-Western Europe (with the exception of Austria, located in Central Europe). Overall, no standard governance arrangements have emerged, but institutional settings vary between countries, as well as for cases within the same country. Our research revealed that local energy planning and implementation is indeed highly complex, as Elle, Van Hoorn, Moss, Slob, Vermeulen and Van Der Waals [6] stated, and is undertaken in a diversity of ways. The systematic literature review showed that four main characteristics are prominent in the reported institutional settings in the post-liberalisation area.

Firstly, local governments (actors) are involved in the majority of projects, and in many cases actually initiate them. However, the role that local governments take on in these projects, however, is mostly that of a passive observer, or becomes this after the initial start of a project (position). Local governments often establish ambitious climate policies and energy efficiency targets (possible actions—rules and regulations), but expect other actors to engage in actions and make investments in order to attain these targets. This is also related to the fact that the local governments often do not own project locations in residential areas (possible actions—ownership). Consequently, local governments need other (local) actors for the realisation of their low carbon or renewable energy projects in the built environment.

Yet, secondly, whereas the institutional arrangements consisted of coalitions of all shapes and sizes in the cases that were studied (control—coalition), the absence of householders and DSOs (actors) in these coalitions stood out. When householders were actively involved in a project, this mostly involved their consultation in late stages of a project. Due to the lack of participation of DSOs in most projects the consequences of the installation of renewable energy technologies for the electricity grid are likely to be underexposed.

Thirdly, the analysis revealed that financial policy instruments in the form of governmental subsidies (possible actions—subsidies) have a positive influence on pay-back time (net costs and benefits—pay-back time) and as a result on starting and realizing projects. But, relying on public money (i.e., public decision-making on granting subsidies to support installation of low carbon technology in building and renovation projects) limits the progress of projects and the upscaling of good practices from those projects. The latter requires viable business cases to be developed, and costs and benefits need to be shared among stakeholders (actions/net costs and benefits), also in the absence of public authorities providing financial support.

Lastly, the analysis showed that the role of information (information), and more precisely the lack thereof, was prominent for all institutional arrangements. The lack of information applied to stakeholders across the board being poorly informed about policy instruments, laws and regulations, technology, and also on costs and benefits. Where knowledge on these aspects was available, it was at times only in the hands of a single actor.

In sum, the institutional arrangements occurring in local energy planning and implementation on the introduction of renewable energy technologies after the liberalisation of the EU's electricity markets are important to understand, because they entail rules leading to situations that often impede or slow down local energy planning and implementation practices (and therefore, local energy projects). Currently, the initiation of renewable energy projects is largely dependent on financial subsidies and on the influence of local governments who expect others actors to realise projects once they have been initiated, while the costs and benefits are not fairly shared between those actors. Yet, while non-governmental actors (i.e., housing associations, DSOs, home owners, or project developers) are required (by local government) to take on an initiating and active role in local energy projects, this is currently not the case (in particular, home owners, tenants and DSOs are barely involved) and the information needed to succeed in realizing project goals is absent. Overall, these findings are useful for practitioners and policy-makers because they reveal determinants of social and institutional problems that influence decision-making in local energy planning and implementation. Our results can be used by stakeholders to reflect on the institutional arrangements used in ongoing projects as well as to learn which aspects are important to take into account as regards roles and responsibilities in future projects. This may help to illuminate institutional problems, where room for improvement exists in the changed level playing field at the local level.

As regards further research, elaboration and testing of the proposition presented in Section 5 is of foremost importance. In order to do this, two avenues of research are suggested. The first concerns conducting empirical case studies of what local energy planning and implementation practices look like in light of the low carbon and renewable energy transition. Whereas, the systematic literature review showed the benefits of applying the energy governance and policy-oriented conceptualisation of the 'action situation', it was based on secondary data which made it difficult to obtain in-depth insights. For example, the selected articles only reported little information on 'positions', 'net costs- and benefits', as well as 'outcomes'. Collecting and analysing primary data on the governance in local energy projects allows to identify these (and additional) elements as well as to analyse them in detail. Secondly, we recommend to analyse case study data with the help of the Institutional Analysis and Development framework. This article has shown that the IAD framework is suitable for decomposing complex action situations into individual elements, as already emphasised by Ostrom [12] and confirmed by scholars such as Aligica and Boettke [63] and Iychettira et al. [13]. Decomposing actions situations into individual elements allows to analyse action situations in detail as well as to make comparisons between institutional settings. In addition to the analysis of the seven elements of an action situation, the IAD framework can be used to study which external variables, and in particular which rules-in-use, influence these elements.

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Appendix A. Coding Scheme

Categories	**Codes**
Actors	Actors
Positions	- Policy entrepreneur - Strategic niche management - Network management
Actions	- Possible actions - Laws and regulations - 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 - Pay-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 Enabling condition

Appendix B

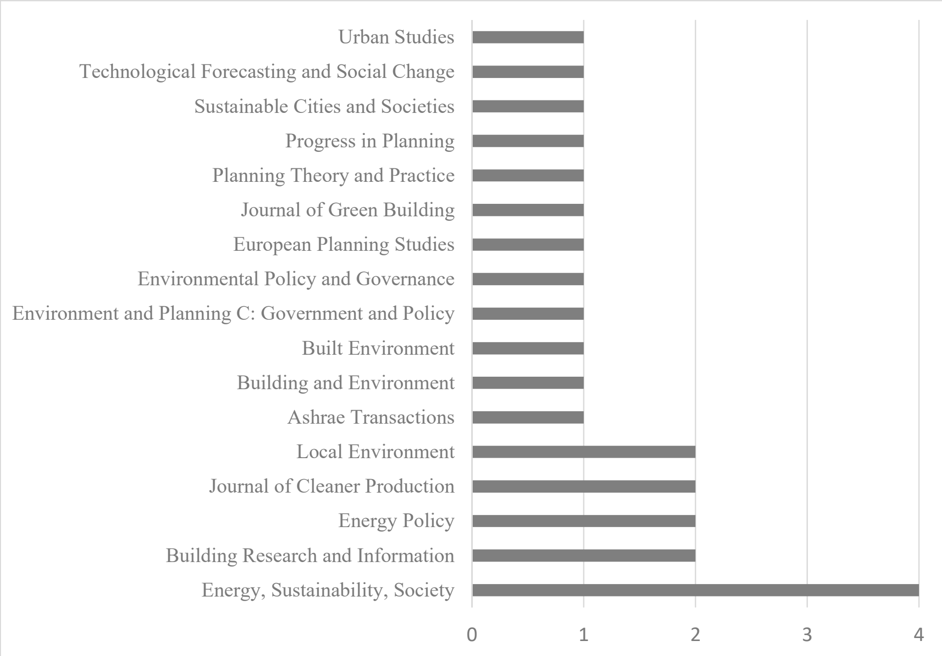

Figure A1. Selected Articles of Literature Review by Journal.

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