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Illustrating the use of concepts from the discipline of policy studies in energy research: An explorative literature review



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ABSTRACT

With the increasing challenges the energy sector faces, energy policy strategies and instruments are becoming ever more relevant. The discipline of policy studies might offer relevant concepts to enrich multidisciplinary energy research. The main research question of this article is: How can policy studies contribute to multidisciplinary energy research, and in how far does research on energy policy actually use the concepts of policy studies? The article presents key theoretical concepts from the discipline of policy studies and shows how they can be of use in multidisciplinary energy research. This is illustrated by presenting the results of a systematic review of academic literature on the use of policy studies concepts in academic literature on energy policy in The Netherlands. Results reveal the main theoretical concepts that were used as well as the identification of major research clusters. Results also show that many concepts from policy studies were actually integrated into eclectic theoretical frameworks.

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1. Introduction

Energy is essential to our society as it is one of the main drivers of human development [1]. All economic sectors require constant supplies of energy. People cannot and do not want to live without access to energy. Energy must be available at all times, it must be affordable, and it must be produced, distributed and consumed in sustainable, clean ways. Hence, the energy supply deserves constant attention and care from citizens, business, and government.

In a recent publication in *Nature* Benjamin Sovacool claimed that energy issues and energy research more than ever are in need of social sciences research [2]. First, a call was made for more research into social aspects related to energy consumption, and second, for more research into the demand side of energy markets. The two are badly needed, because energy issues, thus far, have been researched rather one-sidedly (technical and economic research emphasizing the supply side of energy markets). Moreover, it is typically this type of research that is published in the most prominent energy journals (e.g., *Energy*, *Applied Energy*, *Energy Policy*). Grand societal

energy issues (such as the transition to decentralized sustainable energy systems), however, call for research that also pays attention to the social and demand side related aspects of energy markets. Multi-disciplinary research into socio-technical, behavioural, institutional, governance and policy aspects of energy markets seems of imminent importance, especially because policy makers are in need of valid and reliable information that supports evidence-based decisions in policy-making on energy (transition) issues. Sovacool calls for more attention to the latter, which he mentions ‘institutions and energy governance’; issues that request collective action into solving energy problems [3].

With the globally increasing demands for energy, and the recent Paris COP21 climate summit agreement, the policy aspects of energy are becoming ever more relevant. Where energy markets fail, and do not solve negative externalities, governments are expected to intervene and regulate the markets. All aspects having to do with energy consumption, energy distribution and energy production are to a large extent determined by government policy [4]. For instance, in some countries energy consumption is heavily taxed, energy distribution is only permitted to grid operators, and energy production and supply are subject to severe environmental policy requirements.

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Energy policy can be defined in different ways and energy policy varies by country. In the U.S. energy policy addresses the issues of energy production, distribution, and consumption. Energy policies are basically formulated to combat energy problems. The U.S. energy policy Act ensures that there is secure, affordable and reliable energy for the future. Energy policy may include measures and instruments like legislation, international treaties, subsidies, incentives, tax incentives and other policy instruments [5]. The European Union uses energy policy to make sure that three objectives are met: (i) to safeguard secure energy supplies to ensure reliable provision of energy; (ii) to ensure that energy providers operate in a competitive environment that ensures affordable prices for consumers; and (iii) to stimulate sustainable energy consumption, and to lower greenhouse gas emissions, pollution and fossil fuel dependence [6]. In The Netherlands energy policy is defined as “the entire set of policy measures and instruments to assure reliable, affordable and clean supply of energy carriers, on the short run and the long run, to spur sustainable, economic development of economies on both the macro, meso and micro level” ([4]: 17). Some of the objectives of energy policy in the three examples mentioned appear value driven and may be contested. In sum, energy policy concerns the set of policy instruments that are used to ensure reliable, affordable, clean energy provision, and spur economic development. Given the importance energy policy has for the functioning of economies and society, it might be expected that energy policy would attract considerable academic attention. For academic journals such as *Energy Policy* this is most certainly true. However, one might wonder whether this also applies to social science disciplines studying the very government interventions in the energy domain.

It is here that we argue that the academic discipline of policy studies has much to offer to energy studies. Given recent academic attention to issues like energy transition, renewable energy and low carbon strategies, scholars of policy studies would potentially have lots to study, analysing (different forms of) energy policies and their implications for energy markets, and providing advice to policy-makers on how to (re-) design energy policies. In such studies, they can make use of the abundant theories of the policy process¹ addressing issues such as agenda-setting, policy implementation, and capacity building. We argue that this would enrich interdisciplinary energy research. We feel that policy studies can add something new providing advice to policy makers on designing energy policies and analysis of the impact and effects of energy policies that have been implemented. In a preliminary exploration we noticed that although a journal like *Energy Policy* indeed includes articles addressing studies in which the authors used concepts related to theories of the policy process (e.g. [7–12]). Inspection of the journal's published articles however suggests that the majority of articles published are economic in nature, using quantitative models to establish the impacts of energy policies (both *ex ante* and *ex post*), with little room for the use and elaboration of theories of the policy process and theories of governance.²

This article originates from a debate in an academic energy policy research network,³ in which the authors participate. During the debate the question was raised what theoretical concepts of the policy studies' discipline can contribute to multidisciplinary energy research. In addition the idea was launched to conduct a systematic literature study to explore the ways in which policy studies'

concepts are actually used in the energy literature. In taking up the idea the main research question of this article is: *How can policy studies contribute to multidisciplinary energy studies' research, and in how far does research on energy policy actually use the concepts of policy studies?*

In the following section we address the potential of policy studies for multidisciplinary energy research and argue which policy studies concepts might be useful to energy research (Section 2). In Section 3 research methods are addressed. In Section 4 the results of an exploratory literature review to illustrate the use of concepts from policy studies in energy research are addressed. In Section 5 these results are discussed. We conclude the paper in Section 6, where we also suggest how to further the (international) academic research agenda on the use of policy studies research in the energy domain.

2. Introduction to policy studies

In order to explore the potential of policy studies for the multidisciplinary study of energy we first introduce policy studies as an academic field. Sovacool's claim that social science related disciplines, methods, concepts, and topics remain underutilized and perhaps underappreciated in contemporary energy studies research [3] might also apply to the discipline of policy studies. We think that energy, and in particular energy markets (as heavily regulated sectors full with policy incentives), form a domain to which concepts from policy studies can be applied with a good fit. The discipline is an untapped source for energy research. In this section the basic principles of the policy studies discipline are presented together with a set of disciplinary concepts and research questions that could be of great relevance when applied to the energy domain. Although policy studies covers a few sub-disciplines it goes beyond the scope of this study to address them in length.⁴

2.1. The academic discipline of policy studies

Policy studies is an independent academic field of study with academic journals and conferences of its own. It addresses the content, processes and effects of government policy in its political and societal environment [13]. The basis of a need for policy studies goes back many centuries. It concerns the need policy makers have to be provided with valid and reliable (evidence-based) knowledge on how to design policy and how to decide when one has to choose between policy alternatives. However, it is only since World War II that systematic academic interest into a discipline of policy studies has manifested [13], and a book on 'policy sciences' [14] was published. The latter called for systematic research into the policy phenomenon, and professionalization and institutionalization of policy sciences. In the 1950s and 1960s the academic discipline evolved (e.g., following the work of Dahl, Laswell and Lindblom). During this period it was given different names; e.g., 'policy science', 'policy research' and 'policy analysis'. By the 1970s three perspectives co-existed: policy analysis (cf. making the best decision when choosing between policy alternatives); mega/master policy (cf. creating the 'right' conditions and guidelines that policy designs should meet); and meta policy (cf. policy on how to design (sectoral) policy; e.g., basic policy requirements that a

¹ Here we refer to a broad set of theories relevant to understanding the policy process. Weible and Sabatier (Eds.) (2014) provide an overview of key theories of the policy process. However, this is far from complete. Hill and Hupe [22] for instance, show that studies of policy implementation alone already contain an abundance of theories.

² See also Section 3.3 of this article for more evidence on this phenomenon.

³ The research colloquium on “Energy and climate governance” of The Netherlands Institute of Government Studies.

⁴ Sub-disciplines within policy studies relate to: policy making and policy process oriented studies (explaining policy change or termination), implementation studies (addressing implementation and effectiveness of policy), governance studies (addressing the wider governance context in which policies are formulated and implemented). Additionally the field is divided between constructivist researchers that focus on meanings of policy phenomena on the one hand and researchers focusing on quantitative oriented explanatory studies on the other hand (e.g., explaining policy output or –outcome).

given policy – like energy policy – should meet) [15]. Based on these perspectives a clear distinction was made between policy analysis as (a) “analysis FOR policy” (typically economic or econometric studies informing policy makers which policy alternative to choose, and policy analysis as (b) “analysis OF policy” (perceiving policy itself as the locus of research; paying more attention to policy phases, –processes, etcetera [16]). In the 1970s the discipline experienced increased attention towards (often critical) empirical research into how policies work in practice, in particular when implemented (cf. Wildavsky’s “Speaking truth to power” [17]). As a consequence, many theoretical concepts and frameworks on policy implementation were drafted, leading to a “cornucopia of (independent) variables” explaining policy outcome [18].

Since the 1980s and 1990s a great deal of theoretical attention is awarded to theories (and theoretical frameworks) trying to explain policy change; for instance the ‘streams model’ [19] which predicts that the gathering of problem-, solution- and political streams will offer ‘windows of opportunity’ which can entail breakthroughs in policymaking, and result in policy change. Other well-known theoretical frameworks in the field are Punctuated Equilibrium (which claims that punctuations result in policy change; [20]) and the Advocacy Coalition Framework [21]. In addition, policy implementation (in predicting policy outcomes) has many theories of its own [22], that are useful in understanding how certain policy outcomes came about, some of these theories claiming that certain policy network conditions and management of complex policy networks (cf. [23]) would result in increased policy making quality and better (supported) policy outcomes [24].

2.2. The relevance of policy studies to energy research

There are many policy studies’ concepts that might be useful to energy policy research. Questions on agenda-setting, policy making, implementation, monitoring and evaluation are without doubt useful to energy studies. A few examples are: What factors explain energy policy change or –termination? What factors explain sudden change in energy policy domains? What types of governance model prevail in the energy domain? Which set of policy and measures is successful in furthering adoption of renewable energy innovations? What public private collaboration and network configurations can be considered when striving to manage energy infrastructure differently? How to design feasible energy policy taking into account stakeholders’/target group interests? How is public service delivery organized in the energy domain? To what extent is a governance system suitable to foster energy transition? How do policy strategies cope with multi-actor complexity in the energy domain? And to what extent do scientists influence policy making in the energy domain (and vice versa)?

An overview of policy frameworks that can help in analyzing and answering these questions is presented in Table 1. We argue that these frameworks will support energy research in a way that goes beyond the econometric and economic oriented studies that are more commonly used. As compared to the latter the frameworks and concepts presented in Table 1 incorporate the human and institutional factors that are of great importance if one wants to understand the feasibility and effectiveness of energy policy.

2.3. How can policy studies’ concepts contribute to multidisciplinary energy studies and the practice of energy policy?

Policy studies can contribute to energy studies in many way, so we cluster the contributions in three phases of the policy process: i) policy making; ii) policy implementation; and iii) monitoring and evaluation.

2.3.1. Contributions to energy policy making and studies on making energy policy

When designing energy policy, policy studies can offer insights into meta policy design and heuristics on how to design policies and programs. It can help to distinguish between energy policy visions, goals, sub goals, policy instruments and incentives. Moreover, it can help to develop logical goals-means structures to reveal how certain means (instruments and incentives) contribute to attaining particular policy goals. This is also referred to as drafting what are called ‘policy trees’ [16], which is a heuristic used to design robust policies and programs. In addition, policy studies have many new analytical methods to offer that can help policy makers to design policy alternatives, taking account of the multi-actor, multi-sectoral, multi-level and multi-disciplinary aspects of particular energy domains. Examples include constructive technology assessment, (cf [44]), and serious gaming, in which policy makers involve stakeholders to engage interactively with policy, and use advanced methodology and analytics to identify feasible (also in terms of social and political support) policies that can be considered for implementation. This is important because administrations still encounter societal resistance when implementing energy policy. For instance, wind energy policy is still contested because decision-making on the siting of wind parks still excludes local stakeholders (despite the fact that knowledge of this particular policy failure has been available since the 1990s; [7]). Another example is the flawed implementation of smart meters roll-out in The Netherlands, in which the industry dominated policy making, excluding the main target group of citizens, who later obstructed policy implementation by filing successful legal claims based on privacy legislation, a notion that had been neglected during the policy making process [45].

Policy studies can also assist policy makers by stressing the importance of ‘backward mapping’ [34], i.e. stressing the importance of the participation of target groups and key stakeholders in policy making processes, and viewing policy from their perspective, not only those of the policy makers and economists. When engaging with participants policy makers can learn from policy studies, and use techniques for ‘framing debates’, process management [46], and network management [23,24] to arrive at informed and supported policy designs. To cope with problems of the involvement of actors from numerous sectors, ‘boundary spanners’ can be used to bridge cross-sectoral misunderstanding and facilitate communication [43]. Last but not least, policy studies can help policy makers (and researchers supporting them) to use available knowledge in the best way possible. Concepts on ‘boundary work’ [42,47,48] can be deployed to see on how actors from science and policy making institutes can best engage with each other. In addition, policy makers are typically interested in ‘evidence based policy’ and might want to ensure to that policies that have proven best elsewhere might also be applicable in their own jurisdiction. Policies on novel energy technologies can be tailored according to the principles of responsible innovations in innovative policy [49]. When addressing energy infrastructures and the involvement of public and private actors therein, policy makers might want to use the knowledge of public private partnerships (PPPs), which has been intensively studied by students of policy studies, e.g. [50–52].

2.3.2. Contributions to implementation of energy policy

In policy studies ‘implementation studies’ comprise a large, widely divergent field [22]. Such studies offer a wide array of conceptual and analytical approaches that are relevant to energy studies in terms of organization, management and implementation of programs and projects on energy issues. The discipline offers techniques and methods to manage and operate such programs effectively and efficiently, while ensuring that public values are safeguarded. A branch of implementation studies focuses on

Table 1

Examples of relevant research questions to the energy domain using policy studies' concepts.

Research question	Theoretical concept	Meaning	Key authors
How is energy policy formulated and which factors are of most influence to policy formulation? What is the role of leadership/policy entrepreneurs in energy policy making?	Streams model, Policy entrepreneurs	Entrepreneurs who, from outside the formal positions of government, introduce, translate, and help to implement new ideas into policy making and public practice.	Kingdon [19]; Mintrom [25]
What are the roles and influences of (actor) coalitions in formulation of energy policies? To what extent do advocacy coalition influence policy-making in the energy domain?	Policy coalitions	A coalition contains, 'people from a variety of positions (elected and agency officials, interest group leaders, researchers) who share a particular belief system' (advocacy coalitions; Sabatier) or 'discourse' (discourse coalition; Hajer), and 'who show a non-trivial degree of coordinated activity over time'.	Sabatier [21]; Hajer [26]
Which policy innovations have occurred in the energy domain and how were they established and diffused? Which innovative policy models can be used in the energy domain?	Public policy innovation	Public policy innovation relate to: invention of new forms of policy, diffusion of novel policy, and effects of novel policies.	Jordan and Huitema [27,28]
What levels of government are involved in the energy domain? What can local, regional and supranational governments contribute to state government policy in spurring energy transition?	Multilevel governance	Multi-level, polycentric, and multi-layered governance emphasize the dispersion of decision making from the local to the global level.	Hooghe and Marks [29]
What types of governance systems prevail in the energy domain? How does the governance context of energy policy look like and what impact does it have on policy outcomes?	Governance	Public governance occurs: through networks involving public-private partnerships (PPP) or with the collaboration of community organisations; through the use of market mechanisms whereby market principles of competition serve to allocate resources while operating under government regulation; and through top-down methods that primarily involve governments and the state bureaucracy. There are different sets of governance arrangements.	Peters and Pierre [30]; Bressers et al. [31,32]
What is the role of policy networks and network governance arrangements in policy-making and –implementation in the energy domain?	Policy networks and network management	Policy networks are sets of formal institutional and informal linkages between governmental and other actors structured around shared negotiated beliefs and interests in public policy making and implementation. Networks enhance the avenues for coping with complex problems that require cooperation among (public and private) actors. Managing networks could increase the network's cohesion, which would lead to better policy making quality or improved (joint) public service delivery.	Meier and 'O Toole [33]; Kickert et al. [24]
To what extent is energy policy the result of backward mapping and co-creation (taking a bottom-up perspective on policy making)? How can stakeholders contribute to policy making on energy issues?	Backward mapping; co-creation	During policy-making processes policy makers also pay sufficient attention to the norms beliefs and interests of key stakeholders and target groups.	Elmore [34]
Which modes of stakeholder involvement in energy policy implementation can be used?	Co-production	Delivering public services or making policy in an equal and reciprocal relationship between professionals and citizens.	Brandsen and Pestoff [35]
How is public service delivery organized in the energy domain and to which extent are new public management principles practiced in doing so?	Public management in public service delivery	Management arrangements in public service delivery. For example, management of government agencies like business firms emphasizing professionalization, optimization of operations and performance, efficiency, and competitiveness.	Ferlie et al. [36]
How are energy problems and issues framed in policy debates?	Framing	Framing is a cognitive process in which the message affects how policy makers weigh existing considerations (i.e., political orientations and relevant attitudes/beliefs) to make a judgment/decision.	Hajer [26]
How do policy strategies cope with multi-actor and institutional complexity in the energy domain?	Multi-actor complexity and actor-centered institutionalism	An approach for research on the problem of governance and self-organization on the level of entire social fields', in particular in fields related to state intervention. The basic assumption underlying actor-centered institutionalism is that an analysis of structures without reference to actors is as handicapped as an analysis of actor's behavior without reference to structures. Special attention is paid to institutional rules that influence decision-making in so-called action arenas.	Scharpf [37]; Ostrom [38]
To which extent are energy policies implemented effectively to meet pre-set policy targets?	Evaluation and implementation research	Assessment and examination of policy implementation as an explanation of "what happens". "What happens between policy expectations and (perceived) policy results" (De Leon, 1999).	Hill and Hupe [22]; DeLeon [39]
Under what conditions can energy policy be drafted that copes with the problem of spanning between multi-sectoral domains, and bridging the gap between science and policy making?	Policy integration; Boundary work/spanning.	The integration of one policy domain's objectives into other Policy sectors. This entails a fundamental recognition that one sector alone will not be able to secure (e.g., environmental) objectives, and that each sector must therefore take on board integrated policy objectives if these are to be achieved. This also entails that sectoral and science vs. policy making boundaries must be bridged.	Lenschow [40]; Lafferty [41]; Hoppe [42]; Bressers & Lulofs [43]

performance management (c.f. [53]), and is applicable to energy studies when information is needed on how to be established on how to best manage and incentivize energy service delivery (typically focussing on organizations). In other approaches the institutional setting addresses the area within which multiple actors with diverging agendas operate, while taking account of the 'rules of the game' and the policies, incentives and regulations that apply [38]. Besides focusing on traditional hierarchical modes of governance (a government governing a given target group) policy studies' researchers focus on governance coordination mechanisms that also pay attention to horizontal modes of governance. For instance, governments can incentivize groups of citizens to engage in public service delivery, as when producing energy locally from renewable sources (a form of 'co-production'), or being enabled to manage a decentralized energy system autonomously (e.g. at district level). In policy studies there is a body of knowledge on co-production as an alternative to the more commonly accepted forms of government policy. It addresses the pros and cons of this approach and describes the conditions under which it can be implemented effectively. Citizens delivering energy services can also be viewed as service delivery "at arm's length from government" [54–57]. Another approach, commonly found in studies on low carbon cities and environmental policy, involves capacity building, i.e. creating conditions regarding budgeting, appointment of staff, leadership, staff training, contracting, knowledge management, human resources and networking, which smooths the implementation of (energy) policy and forms a safeguard for the longer term effectiveness of policy implementation [58–60]. Finally, policy studies' researchers conduct comparative research in which the implementation of policies is analyzed across jurisdictions (e.g., [56,61]). The knowledge that is established during this process is imperative for establishing the empirical basis of evidence based policy that can be used to improve policy implementation processes elsewhere.

2.3.3. Contributions to monitoring and evaluation of energy policy

When energy policy is implemented, policy makers and agencies are interested in their progress, effects and whether policy implementation is in line with achieving pre-set policy goals. If monitoring data inform them that it is not they want to find out how to intensify the policy. Researchers in policy studies and policy analysts can help them out on such matters. However, besides focusing on the typical mono-dimensional outcome variables, and collecting (quantitative) data on these (as policy analysts and economist do), qualitative issues typically also matter when explaining whether policy implementation trajectories are heading in the right direction, or when policy implementation has failed. Policy studies' researchers also take political, societal, organisational conditions and macro events into account when evaluating policies. Moreover, in practice monitoring is often inhibited due to budgetary constraints. In such cases there are no quantitative data available that can be used to evaluate of policy. Therefore, qualitative policy evaluations are carried out, for instance on the effectiveness of policy targeting energy performance improvements in individually owned housing (i.e. [12,61,62]). Moreover, when serious barriers obstruct policy implementation, and problems and solutions are not clear, analysis of the problem's structuring is necessary. Further, problems that are rather abstract and have long term goals (such as establishing a low carbon energy transition by 2030) and might be difficult to grasp, go beyond technical and economic dimensions, and have a 'wicked' character, which requires deeper problem structuring and governance assessment (i.e. [32,63,64]).

2.3.4. Contributions to multidisciplinary energy studies

Recently, research programs on energy have come increasingly to focus on the implementation of energy innovations or contribute

to ongoing energy policies. In programs like Horizon 2020 by the European Union, but also in national energy research programs this has become increasingly manifest. Whereas such programs typically focus on innovation and diffusion of promising energy technologies (e.g. smart grids, energy storage technologies or near-energy-zero housing), the focus is no longer entirely on technology and economy. In fact, the programs emphasize niche market development to foster the wider diffusion of these technologies. In order to do so, one also needs to focus on setting the pre-conditions to make sure that diffusion processes prosper. And this means coping with social acceptance, demand creation, capacity building, governance mechanisms, and fine tuning of innovation policies. And this is where policy studies become relevant to these programs. Policy studies offer concepts and analytical tools that can contribute to policy making (getting particular energy innovations on the policy agenda so that the institutional and societal conditions are offered that allow for further innovation and diffusion), implementation of policy to support innovation and diffusion (helping out with management and operational issues regarding implementation of policy to support innovation and diffusion), and monitoring and evaluation of policy to support innovation and diffusion (offering insights into progress on goal attainment and side effects, and using these data to evaluate energy policies that are implemented, and re-intensify these policies).

Although it looks like policy studies have much to offer to multidisciplinary energy research evidence is required to support this claim. In the following sections we seek to provide the evidence by presenting an illustrative case.

3. Methods

To explore the potential of policy studies for multidisciplinary energy research an explorative literature study was conducted. The literature study was sub-divided into two parts: a pre-analysis of 159 articles (which we call 'Study A') and an in-depth analysis of 42 articles that were considered particularly relevant from the view of analysis of policy (which we call 'Study B'). Articles were considered relevant to 'Study B' when the focus of research was policy (or policy processes; "analysis OF policy") and when particular theoretical concepts from the discipline of policy studies were used.

3.1. Case selection

The literature study addressed journal articles on energy policy in The Netherlands. There are several arguments for selecting this country. Albeit small in size, and without an abundance of energy sources (excluding natural gas) the country uses a relative large amount of energy. The Netherlands has a rich history of energy policy and energy sub-system dynamics (see, e.g. [2]). Moreover, the country is home to some of the main energy companies in the World (e.g., Shell), and is a frontrunner in gas technology. For a long time the country was seen as pioneer in supporting the use of renewable energy (albeit not anymore). In addition, The Netherlands experimented with many innovative policies (e.g. with long term multilateral agreements stimulating industries to use energy in efficient ways or to decrease Greenhouse Gas emissions [10,65]). Despite some of its unique characteristics in terms of the Dutch energy markets' profile and energy policies there are reasons to believe to that The Netherlands is not a unique case and has characteristics in common with other European countries. For instance, the country is subjected to supranational EU energy policy (and hence implements EU energy directives), its energy market is heavily regulated and closely connected to other energy markets in Europe [66]. Moreover, having an economy that is mostly based on Post-industrial service markets The Netherlands is relative

comparable to many other small and medium-sized countries having a comparable economic profile. In the past energy policy has received plentiful attention in the academic literature, in particular policies such as the Dutch energy transition program (2000–2011; [67–72]). However, at the time (especially during the 1990s) The Netherlands was viewed as having progressive policy, and served as a role model to other countries. The same applied roughly to a broader set of environmental policies and programs that were implemented [73]. Since the 1970s a rich body of policies and institutions in the energy domain had come into existence. Not surprisingly, a vast body of knowledge on the matter emerged. The latter can be used for secondary analysis of the policy strategies and instruments used. It is for these reasons that we deem it right to select The Netherlands as a case study for the explorative literature study.

3.2. Study A: pre-analysis of 159 articles

Data collection for the systematic literature review was done by searching relevant refereed international academic journal articles (in English⁵) available through the online Scopus database. Selection criteria were the presence of a combination of keywords covering the field of energy policy in The Netherlands (see Appendix C). In analysing an article's focus, a range of keywords (e.g. policy, policies, government, governance, implementation, and regulation to cover "policy") were checked in the article's title, abstract and keywords. 180 journal articles were gathered. However, following an in-depth check 21 were excluded as they did not qualify by matching our selection criteria (e.g. using only "policy" and "Netherlands" and not having "energy" in the title, abstract and keywords combination). After this second selection, a final dataset of 159 journal articles was established (See Appendix A). They were treated using a pre-defined coding scheme (Appendix D).

Key texts from of the journal articles (cf. titles, abstracts, key words) were coded based on a tentative list of ten clusters. The codes covered a wide range of an article's characteristics to permit a thorough analysis to identify phenomena and trends of academic interest. The coding was an iterative process. New codes were added during the coding phase and these were also implemented retroactively as we also checked how previous journal articles in the dataset "scored" on the newly added code. To analyse the assigned codes a dataset was established using MS Excel. Next, the dataset was exported to allow statistical analysis using SPSS. This resulted in a binary data matrix (with journal articles in rows and codes in columns). Data analysis consisted of descriptive statistics per coding cluster, in particular raw and relative frequencies.

3.3. Study B: analysis of the sub-set of 42 articles relevant to policy studies

After analysing the 159 articles, a selection of articles with high relevance to the policy studies' literature was made. For many of the articles this meant analysing the articles in extensor to determine its suitability for the discipline of policy studies. A journal article was considered "relevant to studies on the analysis OF policy" when its focus concerned policy and when it used concepts from the academic discipline of policy studies. More generally, attributing this code to an article was deemed appropriate when

the article could be viewed as contributing to ongoing debates in the academic discipline of policy studies. This resulted in a final selection of 42 articles that were considered suitable for further in-depth analysis. Having identified 42 articles as "relevant to studies on the analysis of policy", this meant that 116 journal articles (73%) were viewed as studies with another disciplinary background (most of them having a disciplinary background in economics, econometrics or engineering).

42 articles (titles, abstracts, keywords, and key remarks concerning conceptual and methodological content) were coded. In addition, further room was needed for conceptual insights, and hence the addition of codes to the pre-established list to permit a more detailed coding of data than the process adopted in the first part of our research. In this sense we used elements from the "method of constant comparison" [74] to support the analysis until a strong theoretical understanding of the phenomenon "policy in the energy domain" had emerged. Compared to the first part of the research, content related issues, theory and methodology were emphasised. For 'study B' two clusters of codes were added originating from the policy studies' discipline: (i) "phase of the policy process" (agenda-setting, policy-making, implementation, monitoring and evaluation); and (ii) "policy analysis type" ("analysis OF policy", and "analysis FOR policy"). The list of codes used for the analysis of Study B (as well as the coding frequencies) is presented in Annex 2.

After the coding process a "mixed methods" research approach was used to support the identification of key topical, theoretical and methodological issues and clusters. QDA Miner 4.1.15 [75] was used for data analysis. This included coding frequencies and cluster analysis. These two analyses were deemed necessary to cope with the complexity of analysing texts from 42 articles, and to establish clusters and patterns. Coding frequencies addressed the use of a given code per text file (hence we did not analyse how often particular codes were mentioned in single texts). In order to identify clusters (topical, theoretical or methodological), we analysed code co-occurrences. A "co-occurrence" is said to occur when two codes appear in the same document. First, cluster analysis was conducted to analyse code co-occurrence of topical codes only. Second, this was done for both topical codes and theoretical codes. Third, this was done for theoretical and methodological codes. Finally, this was done for all codes. The main reason for analysing clusters using different subsets of codes was the ambition to seek confirmatory evidence, and hence the robustness of clusters. Besides analysing code co-occurrence, we also analysed case similarity, i.e., similarity of articles in terms of the distribution of codes that were assigned. 'Similarity' is represented by Jaccard's coefficient, which is calculated from a fourfold table as $a/(a+b+c)$, where a represents cases where both items occur, and b and c represent cases where one item is found but not the other. The more similar the two cases are in terms of the distribution of codes, the higher this coefficient will be [76].

4. Results

This section presents the results of the systematic literature review of Dutch journal publications to see in how far the main trends in the research on energy policy actual uses concepts of policy studies? It addresses in how far energy policy research in energy studies actually use concepts of policy studies in energy studies research?

4.1. Results of the pre-analysis of 159 articles ('Study A')

4.1.1. Key characteristics of the set of articles

Fig. 1 shows how the publication of journal articles has evolved over time. A steep increase between the late 1990s and the 2010s

⁵ Initially, inclusion of Dutch academic journal articles on energy policy was also envisaged (with the restriction that only academic journal articles were to be reviewed). However, not many were retrieved. A related problematic issue was that key Dutch academic articles did not have their repositories available (e.g. the journal of 'Bestuurskunde'). Only very recent volumes were made available which restricted the search for articles.

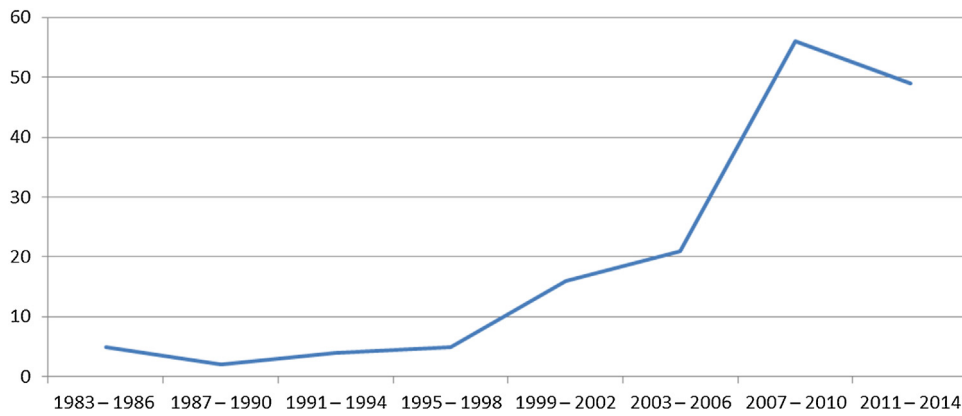


Fig. 1. Year of publication (in three-year intervals).

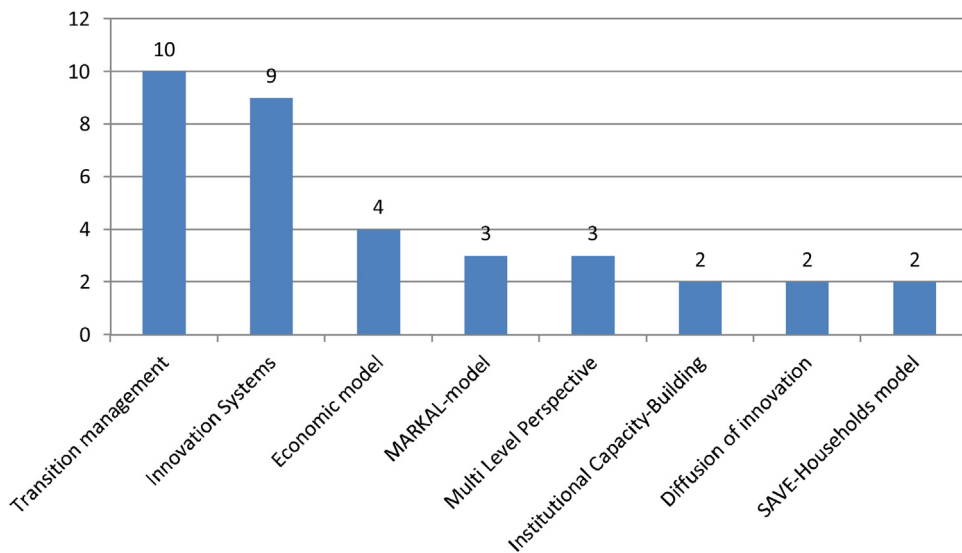


Fig. 2. Overview of theoretical approaches.

Table 2
Academic journals with most frequent publication.

Academic journal	Number of journal articles
Energy Policy	44
Biomass and Bioenergy	6
Journal of Cleaner Production	6
Ecological Economics	4
Energy	4
Energy Economics	4
International Journal of Greenhouse Gas Control	4

was observed, in particular between 2003 and 2010. More recently, this increase appears to have stabilised. Publications peaked in the 2007–2010 period, with 56 journal articles published. This means for the contributions of policy studies to multidisciplinary energy research that much of the contribution is relatively recent.

The majority of academic journal articles retrieved through Scopus were published in the international academic journal *Energy Policy* (44 of 159; 28% of all publications). Table 2 presents the Top 7 most frequently observed journals of the articles that were retrieved. In total, the 159 journal articles have been published in 68 different journals. The impression from Table 2 is that *Energy Policy* is the key academic journal in which journal articles on energy policy in The Netherlands have been published. Only 11 articles were published in academic journals that can be classified as typical policy Studies journals: *Environmental Politics* (3); *Journal of*

Environmental Policy & Planning (3); *Policy Sciences* (2); *Environment and Planning C: Government and Policy* (1); *Policy and Society* (1); and *Public Administration* (1). This means that studies on energy policy are weakly visible in policy specific journals, and are found mostly in multidisciplinary journals and applied (energy) journals.

4.1.2. Theoretical perspectives used

In 50 journal articles (32% of the total set of 159 articles) no clear theoretical frameworks were actually used. The most frequently used theoretical perspectives were: Transition Management (10 counts; 6% of the total population) and Innovation Systems (nine counts; 6%). Both should be seen as theoretical frameworks from the discipline of Transition Studies. Apart from these multidisciplinary frameworks commonly used theoretical frameworks in policy studies or such as the Advocacy Coalition Framework [21], Institutional Analysis Design Framework [38] or Punctuated Equilibrium [20], were not observed.⁶ All in all, except for the Transition Studies frameworks (Transition Management, Innovation Systems, Multilevel Perspective, Strategic Niche Management), few theoretical frameworks were used more than once (Fig. 2).

⁶ In addition, political science and legal sciences were hardly observed among the articles.

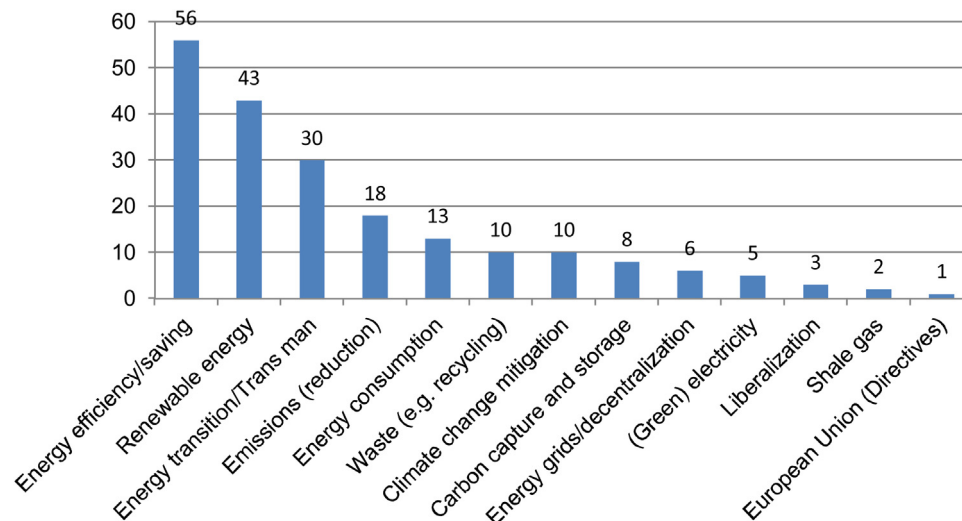


Fig. 3. Overview of topical foci.

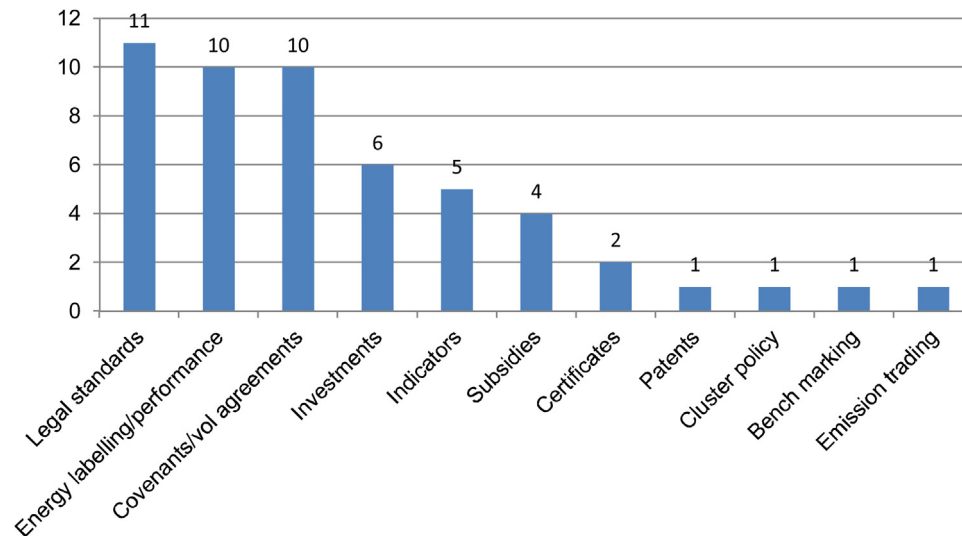


Fig. 4. Overview of instrumental foci.

4.1.3. Topical foci used

Another aspect how policy studies concepts relate to the policy studies' discipline are the issues these studies focus on. Thirteen policy issues were established on which the 159 studies focused (see Fig. 3). These issues range from renewable energy, decentralisation, liberalisation, waste, shale gas, to carbon capture and storage (see Table 2). Most frequently observed topical issues were energy efficiency (55 counts; 35% of the total population), renewable energy (42 counts; 27%) and energy transition (30 counts; 19%). Climate change mitigation was covered by only 10 journal articles. In many of these policy issues questions on agenda-setting, policy making, implementation, monitoring and evaluation are relevant.

4.1.4. Instrumental foci used

An important aspect of the extent that policy studies concepts are actually used in Dutch energy studies research is the role of policy instruments. The policy instrument most frequently addressed in the reviewed journal articles was legal standards – or regulation more generally – with eleven counts (7% of the articles that were reviewed). Second are both covenants/voluntary agreements and energy labelling. Each of the two instruments categories had been addressed in 10 journal articles (about 6%) (Fig. 4).

4.1.5. Outcome indicators

Another important aspect on how policy studies concepts relate to the policy studies' discipline is the focus of the results of these studies. For instance, whether the results presented in of the journal articles (potentially) contribute to agenda-setting, policy making, implementation, monitoring and evaluation? The outcomes in most of the reviewed journal articles relate to policy making; e.g. many cases are finalized by mentioning advice for potential adoption in policy making. The most frequently observed classification of results concern the effects of (a given) policy (51 counts; 32%), attempts to explain the differences in the implementation of a policy issue in a certain context (e.g. regional or national levels) (41 counts; 26%), or the advice for or against a particular policy (37 counts; 11%). In the case of the differences in implementation, this was typically done using a comparative research design (Fig. 5).

4.1.6. Sectoral foci used

Another aspect how policy studies concepts relate to the policy studies' discipline are the sectors these studies focus on. For this study both economic sectors (e.g. agriculture, energy, transport), as well as households (this also includes the individual level), and the public sector or “government” were addressed (see also Table 2).

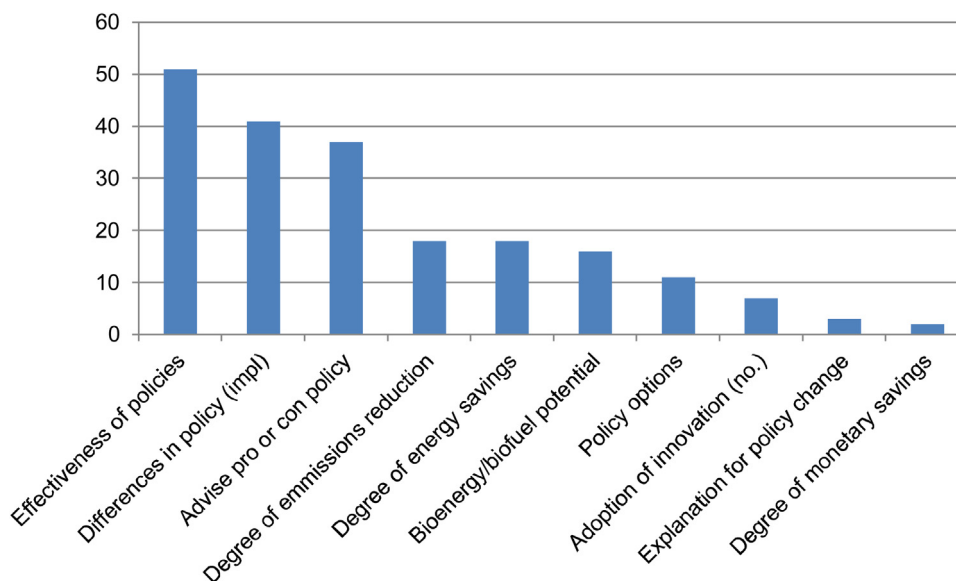


Fig. 5. Overview of the outcome indicators.

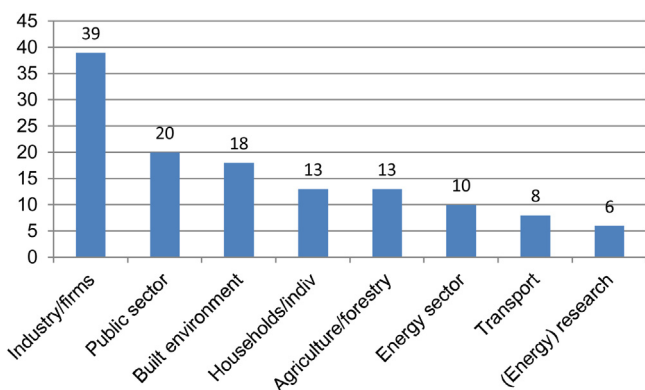


Fig. 6. Overview of sectoral foci.

The analysis revealed that the journal articles mostly focused on industry which also included firms at the meso level (39 counts; 25% of the total population), the public sector (20 counts; 13%) and the built environment (17 counts; 11%). Households (13 counts) however, can also be credited to the built environment (hence, built environment accumulates to 30 counts or 19% of the total population).

4.2. Results of the in-depth analysis of 42 articles ('Study B')

The in-depth study sheds more light at the questions how the journal articles contribute to multidisciplinary energy studies research and how they relate to the policy studies discipline. The results are presented for coding frequencies, code co-occurrence clusters, and case (article) similarity clusters. The codes mentioned most frequently are presented in Appendix B.

The results of the cluster analysis for coding co-occurrences are presented in Fig. 6. How do the policy studies relate to the policy studies' discipline? The analysis discerned six clusters (four large clusters, two small clusters):

i *Cluster I* (Bordeaux red) typically addressing policy implementation (with assessment of policy instruments), governance structures, energy efficiency situated in the built environment or industry (e.g., [77,10,12]);

- ii *Cluster II* (yellow) addressing explorative studies on local and regional studies addressing climate change mitigation and issues of capacity building (e.g., [59]);
- iii *Cluster III* (green) addressing policy making processes in energy transition (e.g. [68–70]);
- iv *Cluster IV* (dark blue) addressing liberalisation, energy infrastructure and green electricity (e.g., [78,79]);
- v *Cluster V* (purple) addressing social acceptance and institutional structures that have to do with the construction of wind parks (e.g., [80,9]); and;
- vi *Cluster VI* (pink) addressing interpretative studies on framing or 'boundary work' as a nexus between science and policy, and applied to the environmental dimension of energy policy, such as shale gas production (e.g. [47,48]) (Fig. 7).

Information on the results of the analysis on structural similarities between articles is presented in Appendix E.

4.3. Main lessons concerning the use of policy studies concepts in energy research

The results reveal that although there has been an increase in energy policy studies across the years only a small part concerns studies that are actually analysing policy (cf. meaning "analysis OF policy"). Surprisingly, it is rather researchers from other disciplines – in particular transition studies, economic modellers and environmental scientists – who were active in this field. Moreover, the way in which insights of the policy studies discipline were used, reveal a broad variety in terms of theory and concepts used. Phases of the policy process mostly addressed in the articles were concerned the policy making and the implementation phases. Relatively little attention was awarded to agenda setting. Attention to implementation and evaluation of policy meant a focus on policy instruments, in particular regulation, economic incentives and multilateral agreements. Roughly one fourth of the (entire set of 159) articles had the objective to advise policy makers on policy alternatives.

Theoretical frameworks from the policy studies discipline were only sparsely used. The ones most used actually derive from STS and transition studies (respectively Transition Management and Innovation Systems). Perhaps surprisingly, hardly any of the major policy studies theoretical frameworks were used. Some of the theoretical policy frameworks that were used (but only sparsely)

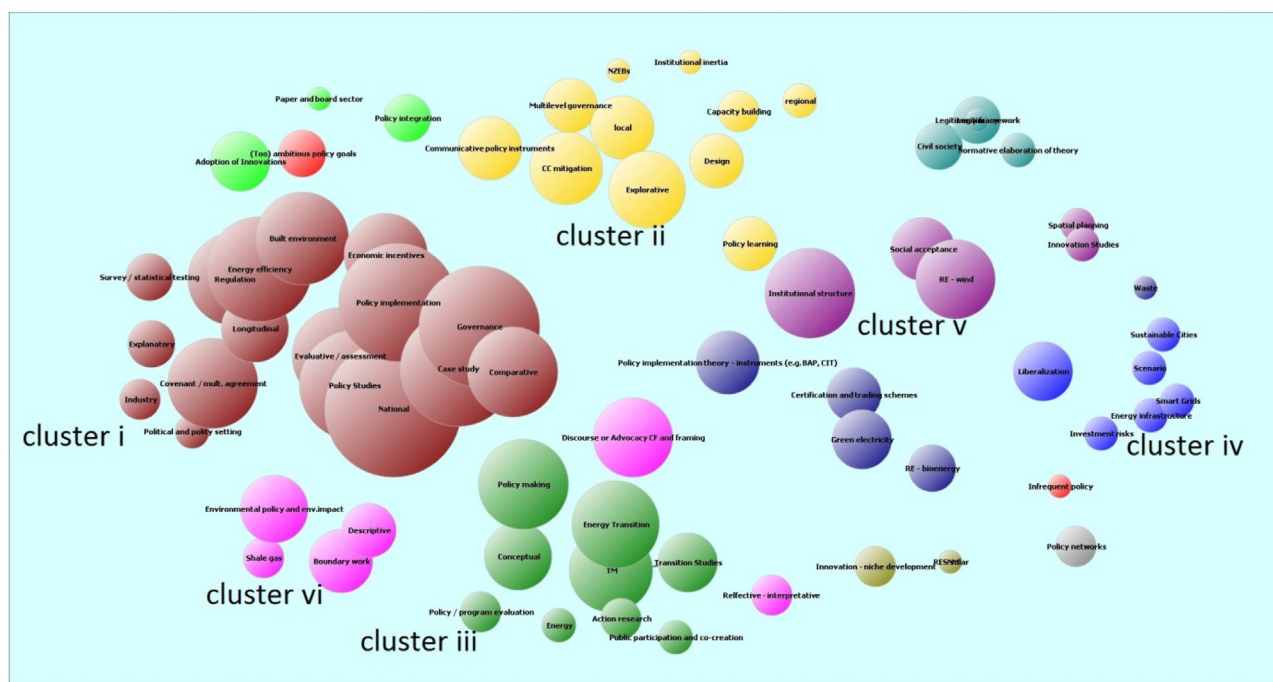


Fig. 7. Graphical display of clusters for co-occurrences using all codes (clusters are distinguished by colour).

concern: boundary work [42], contextual interaction theory [31], the policy arrangements framework [81], policy networks [24], and capacity building [82]. Many eclectic—often ‘standalone’- frameworks were found though, using one or more of the theoretical concepts deriving from policy studies. Some of these concepts, like ‘multilevel governance’, appear in studies that have been classified as belonging to other disciplines. These governance and policy concepts appear to have been ‘borrowed’ or incorporated into integrated theoretical frameworks, in particular transition management frameworks, cf. [83].

The analysis revealed four major research clusters, each having a different focus on conceptual and topical issues: i) a cluster addressing policy implementation (with assessment of policy instruments), governance structures, energy efficiency situated in the built environment or and industry; ii) a cluster addressing policy making processes on energy transition; iii) a cluster addressing social acceptance and institutional structures that have to do with wind energy; and iv) a cluster concerning interpretative studies on framing and ‘boundary work’ applied to the environmental dimension of energy policy.

Finally, only 11 out of 159 articles were published in typical policy and governance journals indicating somewhat of a lack of disciplinary involvement. Articles were more often published in applied (energy) journals.

5. Discussion

Given the results, one may wonder why policy studies concepts are only used to a limited extent in the energy domain. There may be possible reasons for this ‘neglect’ by scholars of policy studies.⁷ What the analysis revealed was that many of these concepts were

eventually embedded or integrated into more holistic theoretical frameworks; on the one hand in eclectic frameworks, and on the other hand in integrated frameworks originating from STS and transition studies (cf. transition management⁸ [67], and technology specific innovation studies⁹[84]). Although policy studies’ concepts have added value (see Section 2), from a more disciplinary standpoint one can wonder whether such concepts necessarily need to end up integrated into (another) holistic framework. This would also point to the issue of why disciplinary concepts are hardly ever applied in their pure (original) form in the energy domain. We wonder why this happens since we argue that policy studies offer many new concepts from which energy research might potentially benefit, even when applied in pure form (cf. not merged or integrated into holistic frameworks).

In answering the question “How far does research on energy policy actually use concepts of policy studies?” we need to connect some of the empirically identified research clusters to theoretical concepts from policy studies. A first cluster (*cluster i* in Section 4.2) focuses mostly on policy implementation. Researchers in this cluster might want to consider using theoretical frameworks from the field of implementation studies. In addition, they might want to consider assessing the governance systems surrounding the policies that are implemented. For instance by using contextual interaction theory [31], the governance assessment tool [32], public management [36], or explore other useful theories in implementation studies (cf. [22]). A second cluster (*cluster ii* in Section 4.2) presents research on policy making in energy transition issues. Besides transition management, one could also consider using some of the theoretical frameworks on policy making (e.g. discourse coalition framework, advocacy coalition framework, punctuated equilib-

⁷ For instance, policy studies’ researchers might want to stick with the issues and domains in which research is traditionally conducted, such as health, environmental hazards, water governance, education and safety. Another reason might be that scholar of policy studies feel that the energy domain traditionally falls outside their scope of research as they perceive energy more as the domain of economists and natural scientists.

⁸ Transition Management uses concepts from policy studies, e.g., the ‘phases model’ of policy making, ‘wicked problems’, Process Management, Network Management, interactive policy making, multilevel governance, multi-actor complexity, framing of policy debates (authors’ own observation in [67,12–16]).

⁹ Negro et al. used and integrated notions from Sabatier’s Advocacy Coalition Framework in their conceptual framework on Technology Specific Innovation Systems (TSIS) [84].

rium, or Allison's streams model). A third cluster (*cluster v* in Section 4.2) might benefit from using theories on backward mapping, co-creation of wind park project policy plans and perhaps discourse analysis (in order to map the arguments different actors have for and against the establishment of wind parks). A fourth cluster (*cluster vi* in Section 4.2) might benefit from using theories explaining policy making processes, such as discourse or advocacy coalitions. In addition 'boundary work' can be used, stressing the relation between scientists and policy makers. In some of the articles that are part of this cluster, this was in fact already done (e.g. [48]).

The four clusters present ways in which policy studies' concepts have been used, but *could* also be of use in multidisciplinary energy research. These concepts were used to further our understanding of: policy making in energy transition issues on both the local and national level (also addressing the relationship between knowledge institutes and policy makers); and managerial issues and evaluation of energy policy implementation. This is important to address the societal and institutional reasons why (often overly ambitious) energy policies fail, and identify the particular reasons why this happened in particular ways. Based on these insights new multidisciplinary research agendas on the implementation and 'roll out' of energy innovations can be developed, benefitting from the insights from policy studies, to prevent and learn from shortcomings that were experienced in the past. Experience, however, shows that this still does not happen, as illustrated by the current NIMBY-problems faced by the Dutch on-shore wind energy policy, indicating that policy makers did not learn from the failed (but well documented) approaches in the 1990s (cf. [7]).

6. Conclusion

In following Sovacool's call to use more social science studies in energy research [2,3], this article set out to explore the potential added value of the policy studies discipline to multidisciplinary energy research. The central research question was: How can policy studies contribute to multidisciplinary energy studies research, and in which ways has this been done thus far?

The discipline of policy studies offers a wide array of concepts, heuristics and methods that can be of help to assist energy researchers and energy policy makers in their endeavours. Currently, an increasing number of energy studies no longer focus only on energy technology and energy economy but also on issues like the implementation of energy innovations in society or establishing an 'energy transition' in a certain jurisdiction. Given the importance of energy as a resource, and the geographical, social and institutional conditions to which energy value chains are subjected, decision- and policy making on energy issues are typically highly politicized. Political, social and institutional condition must also be taken into account if one is to understand the impact and side effects of energy policy. In the same vein, in energy policy making—which is traditionally the domain of engineers, economists and policy analysts, knowledge of these issues is also increasingly required, since the society in which energy policies are to be implemented becomes ever more complex, and energy policy has to acknowledge the interests and agendas of multiple stakeholders in society, and safeguard public interests. Energy researchers and policy makers are looking for models and meta policies that provide guidelines on how to do this. And this is where policy studies are relevant for multidisciplinary energy studies. Another relevant issue for energy researchers is the diffusion and scaling of energy innovations, which typically call for particular workable governance modes, programs and policies that are required to implement those innovations successfully in society. Policy studies, in that regard, have a lot to offer, in particular regarding knowledge (and research agendas) on policy diffusion, evidence-based policy, and responsible innovation policy. In addition,

it has a lot to offer in terms of methods, concepts and tools that can be used to orchestrate, frame, and support policy making processes. Table 1 presents research questions that researchers and practitioners of energy policy might consider relevant, and where the discipline of policy studies offers theoretical concepts that can help answer those research questions. More generally, these questions address issues like the design of feasible policy, analysis of the impact and effects of policy, co-creation with stakeholders in energy policy making, the relation between science and policy in policy making, and analysis of governance models and sets of policy measures in the energy domain (also in addressing what works where and how?).

The relevance of concepts from the discipline of policy studies to (multidisciplinary) energy studies was illustrated by the results of a literature study of the use of policy studies concepts in the case of energy policy research in The Netherlands. First, only a small part of the research on energy policy (27%) was identified as studies from the discipline of policy studies (or rather: analysis of policy). Second, a wide array of empirical and theoretical approaches were used. Attention was on both policy making, implementation and the evaluation of policies, and involved a broad set of policy instruments and strategies. Theoretical frameworks from the policy studies discipline were, however, only sparsely used in a mono-theoretical sense. Many eclectic models and integrated frameworks (also falling under the scope of transition studies) were retrieved, using one or more of the theoretical concepts originally derived from policy studies. The analysis also revealed four major clusters on analysis of policy: i) a cluster addressing policy implementation (with assessment of instruments in energy policy), governance structures, focusing on energy efficiency in the built environment and industry; ii) a cluster addressing policy making processes on energy transition at state level; iii) a cluster on social acceptance and institutional structures that have to do with wind energy; and iv) a cluster of interpretative studies on framing or 'boundary work' applied to the environmental dimension of energy policy.

Finally, as compared to other disciplines in the social sciences, like economics and transition studies, it appears that policy studies researchers have failed to pay attention in empirical work to the domain of energy as compared to other domains (such as health care). We feel that there is more potential in this regard. The results provide space for a debate among researchers of energy policy on how an agenda for future research on policy aspects of energy systems can be developed further. Given the results of the analysis, it can be argued that although interesting disciplinary contributions were found, more attention to the domain of energy policy would be welcome from the academic discipline of policy studies.

For reasons of its economic, geopolitical profile, its experience with innovations in energy policy (i.e., energy transition), as well as the availability of a body of literature on energy policy and the presence of energy policy researchers, we argue that lessons from the Dutch case are also important to research agendas on energy policy in other countries. To conclude, we want to stress that conducting systematic literature reviews, such as the one presented here, would also be useful when conducted in other countries. Besides learning from the results within a given country, this would have the benefit of building a data set that would permit comparative studies to be conducted and find out whether the patterns and concepts discerned in the analysis of the Dutch case also appear in other countries.

Acknowledgments

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Appendix A. Overview of the reviewed literature

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Appendix B. Coding list of the in-depth analysis of 42 articles

Category	Code	Cases	% Cases
Scale	National	31	73.8%
Scale	Local	6	14.3%
Scale	Regional	2	4.8%
Discipline	Governance	22	52.4%
Discipline	Policy Studies	19	45.2%
Discipline	Transition Studies	6	14.3%
Discipline	Innovation Studies	2	4.8%
Policy focus	Covenant/multi agreement	8	19.0%
Policy focus	Economic incentives	10	23.8%
Policy focus	Regulation	11	26.2%
Policy focus	Effects	18	42.9%
Policy focus	Policy implementation	20	47.6%
Policy focus	Policy making	13	31.0%
Policy focus	Policy integration	4	9.5%
Policy focus	Policy learning	4	9.5%
Policy focus	Certification and trading schemes	5	11.9%
Policy focus	Multilevel governance	4	9.5%
Policy focus	Communicative policy instruments	5	11.9%
Methods	Case study	23	54.8%
Methods	Survey/statistical testing	4	9.5%
Methods	Comparative	10	23.8%
Methods	Scenario	2	4.8%
Methods	Policy/program evaluation	3	7.1%
Methods	Longitudinal	8	19.0%
Methods	Action research	3	7.1%
Issue	RE–wind	6	14.3%
Issue	RE–solar	1	2.4%
Issue	RE–bioenergy	3	7.1%
Issue	Energy efficiency	14	33.3%
Issue	CC mitigation	5	11.9%
Issue	Energy infrastructure	2	4.8%
Issue	Liberalization	5	11.9%
Issue	Energy Transition	11	26.2%
Issue	Legitimacy	1	2.4%
Issue	Social acceptance	6	14.3%
Issue	Institutional structure	10	23.8%
Issue	Spatial planning	2	4.8%
Issue	Sustainable Cities	1	2.4%
Issue	Green electricity	5	11.9%
Issue	Institutional inertia	1	2.4%
Issue	Innovation—niche development	3	7.1%
Issue	Shale gas	2	4.8%
Issue	Environmental policy and env.impact	7	16.7%
Issue	Political and polity setting	2	4.8%
Issue	Civil society	2	4.8%
Issue	NZEBs	1	2.4%
Issue	Smart Grids	1	2.4%
Issue	Investment risks	2	4.8%
Issue	Infrequent policy	1	2.4%
Issue	(Too) ambitious policy goals	3	7.1%
Purpose of study	Descriptive	5	11.9%
Purpose of study	Evaluative/assessment	15	35.7%
Purpose of study	Explorative	10	23.8%
Purpose of study	Explanatory	4	9.5%
Purpose of study	Normative elaboration of theory	2	4.8%
Purpose of study	Design	4	9.5%
Purpose of study	Public participation and co-creation	1	2.4%
Purpose of study	Conceptual	8	19.0%
Purpose of study	Reflective—interpretative	3	7.1%
Economic sector	Energy	2	4.8%
Economic sector	Built environment	10	23.8%

Economic sector	Industry	3	7.1%
Economic sector	Paper and board sector	1	2.4%
Economic sector	Waste	1	2.4%
Theoretical framework	SNM	1	2.4%
Theoretical framework	TM	7	16.7%
Theoretical framework	Policy networks	1	2.4%
Theoretical framework	Discourse or Advocacy CF and framing	7	16.7%
Theoretical framework	Adoption of Innovations	4	9.5%
Theoretical framework	Eclectic framework	6	14.3%
Theoretical framework	Capacity building	3	7.1%
Theoretical framework	Policy implementation theory—instruments (e.g. BAP, CIT)	6	14.3%
Theoretical framework	Boundary work	4	9.5%
Theoretical framework	Legitimacy framework	1	2.4%
Results	Main result	36	85.7%
Results	Recommendations	16	38.1%
Stage of policy process	Agenda-setting	5	11.9%
Stage of policy process	Policy-making	25	59.5%
Stage of policy process	Implementation	24	57.1%
Stage of policy process	Monitoring and evaluation	13	31.0%
Policy analysis type	Analysis for policy	8	19.0%
Policy analysis type	Analysis of policy	41	97.6%

Appendix C. Keywords used for searching relevant journal articles

Geographic scope	Discipline	Subject
Netherlands	Policy	Energy
Dutch	Policies	(Climate change)
	Government	mitigation
	Governance	
	Implementation	
	Regulation	

Appendix D. Coding scheme (characteristics of articles for which codes were established)

Cluster	Code
1. Analytical level	Comparative analysis (between countries), National, Regional, Local, City, Rural.
2. Relevant to studies on the analysis of policy?	Yes/no.
3. Theoretical approach	Transition management, Innovation Systems, Eclectic model, Economic modelling, Multi-Level Perspective (transition studies), others.
4. Methodological study design	(Policy) simulation, Qualitative (case study), Quantitative (survey, statistics), Comparative, Exploring of meanings (discourses, framing, etc.), Stakeholder analysis, Scenario analysis, Literature review, Monitoring/assessment, Modelling.
5. Policy issue	Renewable energy (wind, biomass, hydro, etc.), Energy efficiency (saving), Climate change mitigation, Energy grids, Liberalization, European Union (Directives), Energy consumption, Energy transition/Transition management, Emissions (reduction), Waste (e.g. recycling), (Green) electricity, Shale gas, Carbon capture and storage (CCS), Legitimacy.
6. Instrumental focus	Investments, Covenants/voluntary agreements, Subsidies (including feed-in tariff), Legal standards (regulation), (Green/white) Certificates, Indicators, Patents, Energy labelling/Energy performance, Cluster policy, Bench marking, Emission trading.
7. Purpose of the study	Descriptive, Evaluative, Explorative, Normative, Design oriented, Public participation, Policy advice, Theoretical elaboration (hypothesis testing), Research agenda-setting.
8. Results of the study	Differences in policy/implementation, Bioenergy/biofuel potential, Degree of energy savings (potential), Degree of monetary savings, Degree of CO2/emissions reduction (potential), Adoption of innovation (no. of households or firms), Explanation for policy change, Advice pro or con policy/policy advice, Effectiveness of policies (instruments), Policy options.
9. Sectoral focus	Agriculture/forestry/horticulture, Energy sector (gas, electricity), (Energy) research, Built environment, Industry/firms, Transport, Households/individuals, Government/public sector, ICT.
10. Institute of author	University of Twente, Radboud University, TU Delft, TU Eindhoven, Utrecht University, Erasmus University, Wageningen University, VU Amsterdam, SPRU University of Sussex, Other university, Non-university research, Consultancy/firm/other.

Appendix E. Results of the analysis of structural similarities between articles

The results of the cluster analysis of case similarities are presented in Fig. 8. The results of the case similarity cluster analysis partly discern clusters that resemble the code co-occurrence clusters. *Cluster I* is identified, but looks smaller compared to the co-occurrence plot in the previous sub-section (featuring articles e.g., [10,77,12]). *Cluster II* is more difficult to observe in Fig. 8, but might represent the yellow cluster featuring studies like [85,11] addressing local climate change mitigation policy and capacity building. *Cluster III* on energy transition and policy making is

located in the lower left corner; e.g., [86,69,72,87]. *Cluster IV* represents only two articles, and can be observed as a very small tie between the nodes (articles) of [79,78]. Whether it can be discerned as a separate cluster is doubtful. *Cluster V* on social acceptance and institutional aspects of wind park construction is clearly observed on the upper bound of the graph (e.g., [80,9,88]). *Cluster VI* (on framing and boundary work) is also clearly observed in Fig. 8 (in the left part of the graph; e.g., [89,90,48,91]).

Further analysis, using only the topical and theoretical codes helps to show the structural proximities between five 'grand' clusters more clearly (Fig. 9). The difference from the case similarity cluster analysis using all codes is that Clusters I and II seem to be

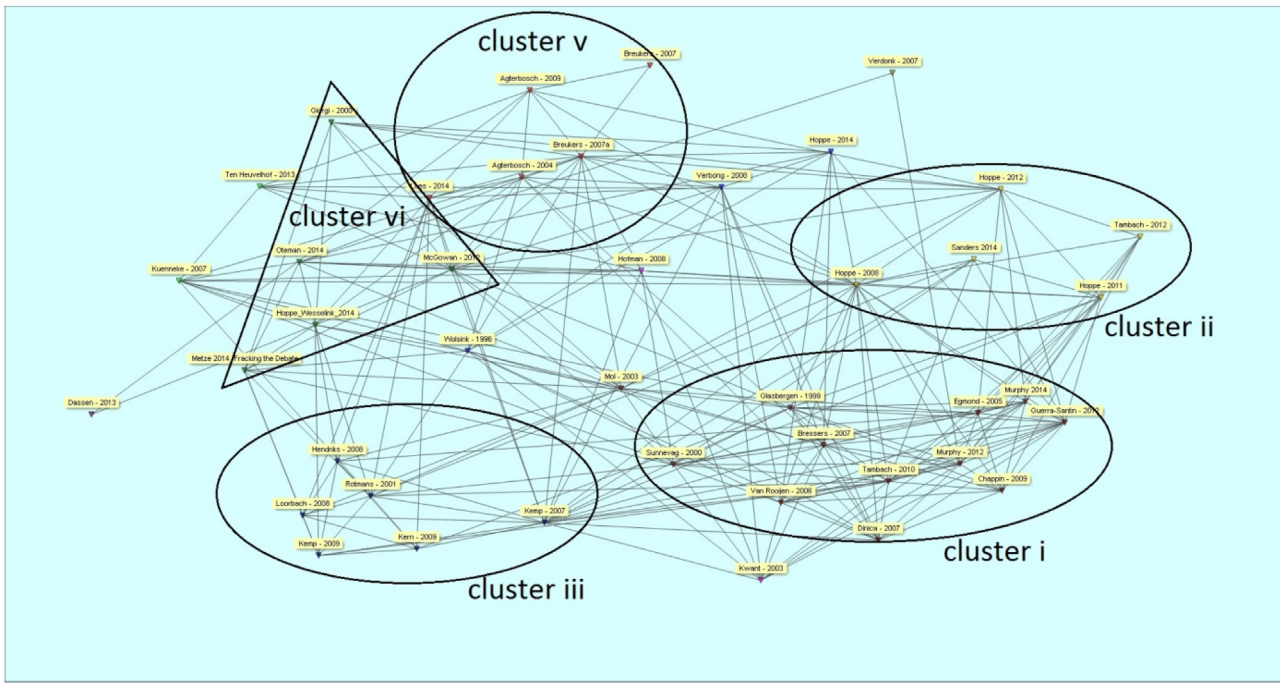


Fig. 8. Graphical display of clusters for case similarities of all articles, using all codes.

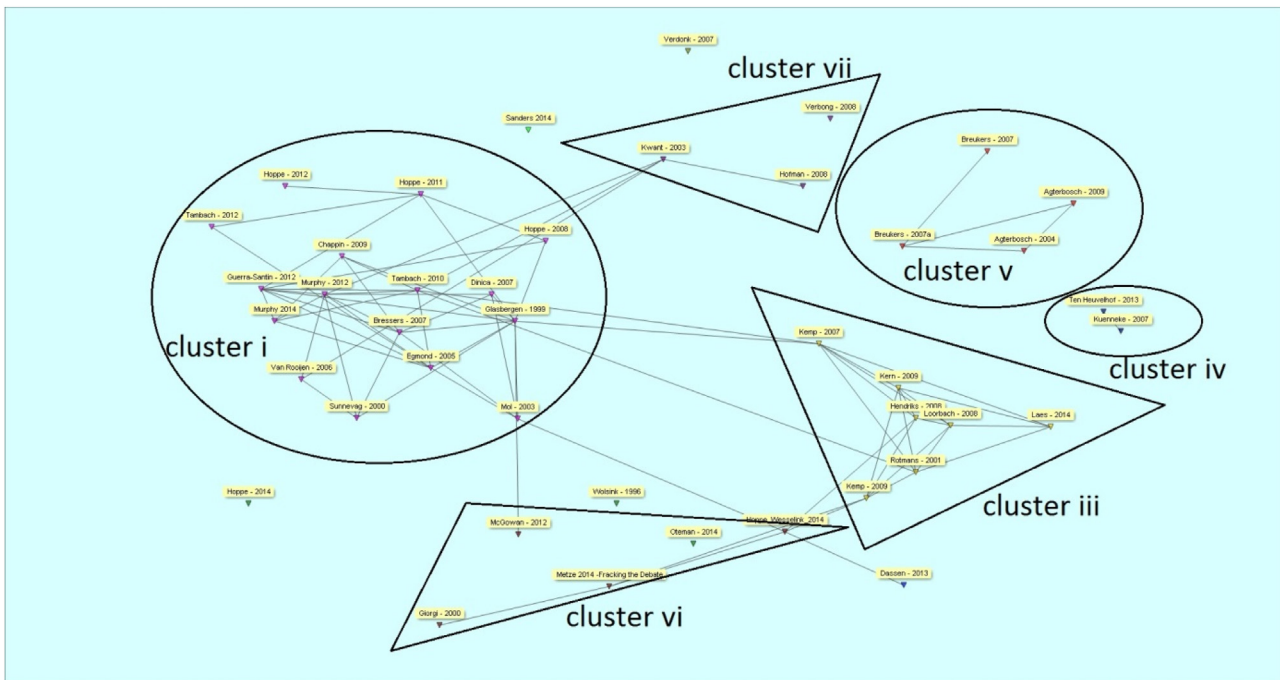


Fig. 9. Graphical display of clusters for cases similarities using only topical and theoretical codes.

inter-related structurally, and therefore can arguably be merged. In that sense, local climate change policies and local capacity building seem to have become part of a larger cluster on the assessment and impact of energy policy (focusing on energy efficiency).

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