

Normative diversity, conflict and transition: shale gas in the Netherlands

Cuppen, Eefje; Pesch, Udo; Remmerswaal, S; Taanman, Mattijs

DOI

[10.1016/j.techfore.2016.11.004](https://doi.org/10.1016/j.techfore.2016.11.004)

Publication date

2016

Document Version

Accepted author manuscript

Published in

Technological Forecasting and Social Change

Citation (APA)

Cuppen, E., Pesch, U., Remmerswaal, S., & Taanman, M. (2016). Normative diversity, conflict and transition: shale gas in the Netherlands. *Technological Forecasting and Social Change*, 145 (2019), 165-175 . <https://doi.org/10.1016/j.techfore.2016.11.004>

Important note

To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

Normative diversity, conflict and transition: shale gas in the Netherlands

Eefje Cuppen¹
Udo Pesch²
Mattijs Taanman³
Sanne Remmerswaal¹

¹ Delft University of Technology, Faculty of Technology, Policy and Management, Department of Multi Actor Systems

² Delft University of Technology, Faculty of Technology, Policy and Management, Department of Values Technology and Innovation

³ Independent researcher and consultant at Studio Wolfpack

Corresponding author:

Dr. ir. E. Cuppen
Delft University of Technology
Faculty of Technology, Policy & Management
Department of Multi Actor Systems
P.O. Box 5015
2600 GA Delft
+31 15 27 86583
The Netherlands
Email: e.h.j.w.cuppen@tudelft.nl

1: Delft University of Technology, Faculty of Technology, Policy & Management, Department of Multi Actor Systems, P.O. Box 5015, 2600 GA Delft
The Netherlands

2: Delft University of Technology, Faculty of Technology, Policy & Management, Department of Values Technology and Innovation, P.O. Box 5015, 2600 GA Delft
The Netherlands

3: Van Oosterzeestraat 30b, 3022XN, Rotterdam, www.studiowolfpack.com

Abstract

Few people disagree on the need for sustainable development, but ideas about what it exactly means and how to pursue it diverge considerably. Although such normative conflicts are key to sustainability transitions, attention to such conflicts is lacking in transition studies. In this paper we understand societal conflict as an informal assessment of sustainable transition pathways with the potential for learning about normative ideas about the direction, speed and means of transitions. We analyse the Dutch societal conflict on the plans for shale gas exploration between 2010 and 2013, based on a media-analysis and interviews, in order to identify the normative conflicts and to find out to which extent these normative conflicts resulted in higher-order learning. The two main normative conflicts in the case firstly concern the role of gas in the energy transition, and secondly the balance between local and national interests in defining the public interest. With that, the societal conflict challenges two key elements of the Dutch welfare state. We conclude that there has been higher-order learning as regards the first conflict, but not as regards the second.

Keywords:

Societal conflict, controversy, normative conflict, sustainability transitions, shale gas, learning

1. Introduction

A ‘sustainability transition’ is a radical, structural change of society that is the result of a coevolution of economic, cultural, technological, ecological, and institutional developments allowing for sustainable development. Sustainable development suggests a social consensus on norms of what we consider to be unsustainable and what constitutes progress [1]. Yet, although hardly anyone disagrees with the ambition to develop society in a sustainable way, ideas about what to achieve exactly, how, and how fast, diverge considerably [2]. Such ideas strongly depend on the, often conflicting, perspectives and interests of different actors and play out differently on different geographical and time scales. As such, sustainability transitions give rise to normative conflicts. Since normative conflicts are part and parcel to sustainability transitions, we argue that they should be more central in transition studies.

Firstly, to the extent that normative conflict is addressed in transition theories, it usually concerns conflict between regimes and niches [3-5]. This understanding builds on the dominant theoretical framework in transition studies, the multi-level perspective [6, 7], which describes the change of dominant, socio-technical regimes as a result of both emerging niches and changing landscape developments. Studies on sustainability transitions usually define their niches around (in some aspects) more sustainable technologies and position them against a dominant, change averse and unsustainable regime. Examples include studies of renewable energy niches versus fossil energy regimes [8], sustainable health care models versus the health care regime [9], or sustainable food versus the food regime [10, 11]. This distinction is often implicitly self-referential, in the sense that the niche is assumed to provide the solution for the problem that is produced by the regime. The multi-level perspective thus suggests that conflicts arise between a (problematic) regime and

a (desirable) niche; the niche is contested by the regime and the other way around. This does not concur however with the empirical reality of normative conflicts. First, niches (e.g. renewable energy niches) are usually not only contested by actors that act within the corresponding regime (e.g. the fossil energy regime), but also by citizens, NGOs or governmental levels or departments that are not part of this regime [12, 13]. Think of municipal spatial planning conflicts over wind parks or neighbours protesting against a biogas installation. Second, regimes are not always change averse and many actors from the incumbent regimes also pursue a transition [14, 15]. Think for instance of innovations developed by regime actors such as district heating, smart energy meters to influence consumer behaviour and carbon capture and storage (CCS). Such initiatives cannot always be regarded as incremental, maintaining the status quo and therefore ultimately as barriers to sustainability transitions [16]. In all these cases the multi-level perspective does not offer the analytical framework to research and understand the conflicts that result from normative diversity and its influence on transitions.

Secondly, as Stirling [2] notes, transition studies have not yet engaged into the study of normative diversity. Normative conflicts are treated as contingent hurdles that need to be overcome to allow the final ‘closing down’ of the modalities for particular transitions, rather than as entrance points for the ‘opening up’ of divergent possibilities for societal transformation [17, 18]. This is reflected in many of the governance approaches advocated in transition studies, such as the use of transition arenas that focus on collaborative and consensus-oriented efforts by leading stakeholders. With that, transition theory has the tendency to neglect the way that conflicting societal visions are played out in political arena’s and in society [19]. Shove and Walker advocate that many socio-technical configurations are not unproblematic desirable elements in an equally consensual, equally unproblematic interpretation of sustainability [20]. To an increasing extent,

these issues are being recognised in transition theory [21-24]. However, frameworks that support the detailed empirical and conceptual analysis of the socio-political dynamics influencing transitions still need to be developed [3, 10, 15, 25, 26].

We contribute to the analysis and conceptualization of normative conflict in transition studies by focusing on *societal conflict*. Societal conflict concerns the socio-political dynamics by which contending normative perspectives regarding a new technology are articulated. Societal conflict both builds on and reveals different normative appraisals regarding a specific sociotechnical future and can therefore be regarded as a form of informal assessment [65]. “Controversies provide partly conflicting assessments of technologies or of the impacts of proposed or actual projects, that are further articulated and consolidated in the course of a controversy. Thus, informal technology assessment occurs” [65, p350]. ‘Informal’ means that the assessment is not formalized through institutionalized procedures for technology assessment, such as is the case for e.g. environmental impact assessment and social cost-benefit analysis. While the assessment can be characterized as informal, it is shaped strongly by formal procedures and institutions. One example is the recurring finding that citizens oppose new technology because they consider the formal procedures for public consultation not adequate or fair [27, 28].

The understanding of social conflict as informal technology assessment suggests that societal conflict creates a potential for higher-order learning [e.g. 29, 30]. After all, the articulated normative conflicts can result in scrutinizing underlying presumptions and changed problem definitions. Higher-order learning is considered prerequisite for sustainable transformation of technology-based systems [31-34], and more generally for system innovation, policy change and socio-technical transitions [35-37]. Higher-order learning is defined here as a change in the

meaning that is collectively attached to a technology and/or the socio-technical system of which it is part. Ideally, the informal assessment that takes place in societal conflicts creates such change and, by that, facilitates more democratic, robust or effective governance of transitions.

The objective of this paper is to contribute to transition studies by empirically exploring how the study of societal conflict can reveal insight into normative diversity and higher-order learning in transitions. For this we use the case of shale gas in the Netherlands. We answer the question:

Which normative conflicts can be identified in this case and to what extent did these normative conflicts result in higher-order learning?

The case of shale gas in the period 2010-2013 is chosen for two reasons. First, shale gas in the Netherlands is a typical case in which conflicts abound [28, 38] but where the multi-level perspective is problematic. The introduction of shale gas is contested, *not* by the incumbent regime, but by NGOs and local actors. The companies starting shale gas exploration are small newcomers on the (established) gas market, resembling a niche, but these companies have strong ties and are backed by the regime. Furthermore, the desirability of shale gas itself is ambiguous and contested [28, 38]. For actors from the energy sector that have vested interests, natural gas including shale gas is an attractive transition fuel that allows the use of current infrastructures of energy exploration and distribution. Furthermore, it can be used as a buffer for intermittent solar and wind energy while its environmental impact is much lower than that of coal. From a global perspective, there are still many reserves. Thus, analysis of the introduction of shale gas as a conflict between a (problematic) regime and a (desirable) niche (the common multi-level perspective application) is clearly problematic and unproductive.

Second, and in line with the theme for this special issue, shale gas is linked to the broader discussion on transitions in the welfare state. The Dutch welfare state is intrinsically connected to the production of natural gas. Since 1980, 5 to 15 billion euros were generated by gas production each year – amounting to 5 to 10% of the total income of the Dutch government [39]. This additional income has allowed the Dutch state to invest in infrastructure, knowledge, innovation, and socioeconomic policy. As the gas fields are quickly depleting, we see a variety of governmental activities that are aimed to keep up the role of the Netherlands as a key player in the production and/or distribution of natural gas in Europe, including, at the time of our study, shale gas activities [28, 40]. In addition, governance issues in the energy and environmental domain are illustrative for wider governance issues in the socio-economic welfare state. While the welfare state traditionally provides equal access to public goods such as health care and education, counteracts market failures and redistributes incomes and (mis-) fortunes, it has been transformed immensely due to the privatization of the public sector, including the energy sector [41, 42]. The natural gas sector has become a patchwork of organizations that are scattered over the public and private domain, leading to many questions about the ownership and management of the industry. Increasingly, the welfare state sees the legitimacy of state interventions contested by society. Traditionally, collective decisions in the Netherlands were taken upon the basis of a broad consultation between government, industry and NGOs [43-45]. To a large extent, this ‘pillarised’ model guaranteed public consent. This is no longer the case. Traditional, opaque, forms of decision-making meet with widespread discontent. This new public mentality has manifested itself in relation to the gas sector in a very salient manner: the production of the main gas field, in the Northern province of Groningen, has not only been reduced because of depletion but also, and predominantly, as a reaction to protests of local residents that arose after a series of intensifying earthquakes.

In the next section (2), we explain the method used for our analysis. Our approach consists of two main parts: a detailed chronological storyline of the societal conflict on shale gas and longitudinal thematic cluster analysis with the help of the software package T-Lab. The storyline of the conflict is presented in Section 3, and the thematic cluster analysis in Section 4. Based on these results, two main normative conflicts are identified and discussed in Section 5. These normative conflicts arise from divergent answers to the following questions: ‘What is the role of gas in the energy transition?’ and ‘How to balance local and national interests in defining the public interest?’. Conclusions and ideas for further research are presented in Section 6.

2. Method

We used an exploratory approach to analyse the socio-political dynamics of the societal conflict on shale gas. First, we constructed a detailed chronological storyline of the controversy based on media analysis and interviews. This storyline is used to identify the normative conflicts. Second, we did a longitudinal thematic cluster analysis of newspaper articles with the help of the software package T-Lab. This analysis was used to explore higher-order learning, which is defined as a change in the meaning that is collectively attached to a technology and/or the socio-technical system of which it is part, the unit of analysis is the collective level of decision-making regarding shale gas. With the thematic cluster analysis we are able to analyse higher-order learning, operationalized as changes in discourse structures, problem definitions and policy objectives. Newspapers reflect societal discourse and are as such a useful source for analysing societal conflict. The analysis furthermore involves interpretative work, which we tried to validate as much as possible by building on existing studies [46, 47] and interviews (see 2.1). We first

explain how data were gathered (2.1). Then we explain how the storyline of the controversy was constructed (2.2) and, finally, how we conducted the thematic cluster analysis (2.3).

2.1 Data

A dataset was set up with newspaper articles from national and regional journals and newspapers by searching on the word '*schaliegas*' (Dutch word for shale gas) in the database LexisNexis.

Sources included: 1) 14 national newspapers; 2) 18 local and regional newspapers; 3) four professional journals; and 4) four magazines. The search was limited to a period of 30 months:

November 2010 to April 2013. This period was chosen for practical reasons: the software package used for the thematic cluster analysis (explained below) is not able to assign more than 30 different labels per variable. Therefore, it cannot analyse more than 30 months at once. The articles were labelled with the variables ID-number, newspaper, year, month, and day.

Furthermore, semi- structured interviews were conducted with ten experts who were considered knowledgeable on the Dutch societal debate on shale gas. These experts included a civil servant from the Ministry of Economic Affairs, an employee of Cuadrilla, a mediator of a consultancy firm involved in the process, four academics, and three journalists¹. They were asked about what they considered meaningful events in the shale gas debate, the role of other actors, their own role, and the thematic scope of the shale gas debate. They were also questioned about the role of the media. The goal of the semi-structured interviews was to validate and supplement the results, to identify potential relations between actors, discourses and events and to aid in a critical reflection on media analyses. This way, the interviews helped us to interpret the media analysis. Interview data were coded.

¹ Unfortunately we were not able to interview an expert from civil society.

2.2 Constructing the storyline

Based on the data from the LexisNexis database, first a **frequency analysis** was carried out to get an impression of the development of the controversy over time. Second, a (simplified) **event history analysis** was used. As part of this analysis, a list of events was created and the events were coded. We distinguished between i) events that could be attributed to one or multiple actors, and ii) external events such as natural events, economic events and events from abroad. We furthermore analysed whether events were used to argue in favour of, or against, shale gas exploration and production in The Netherlands. This resulted in a so-called bit-map [based on 48]. Events were then analysed in terms of their duration and frequency of occurrence. Based on this, key events were identified that were in a later stage supplemented and validated by the interviews and the elementary context analysis (explained below) and previous analyses of the Dutch shale gas debate [46, 47].

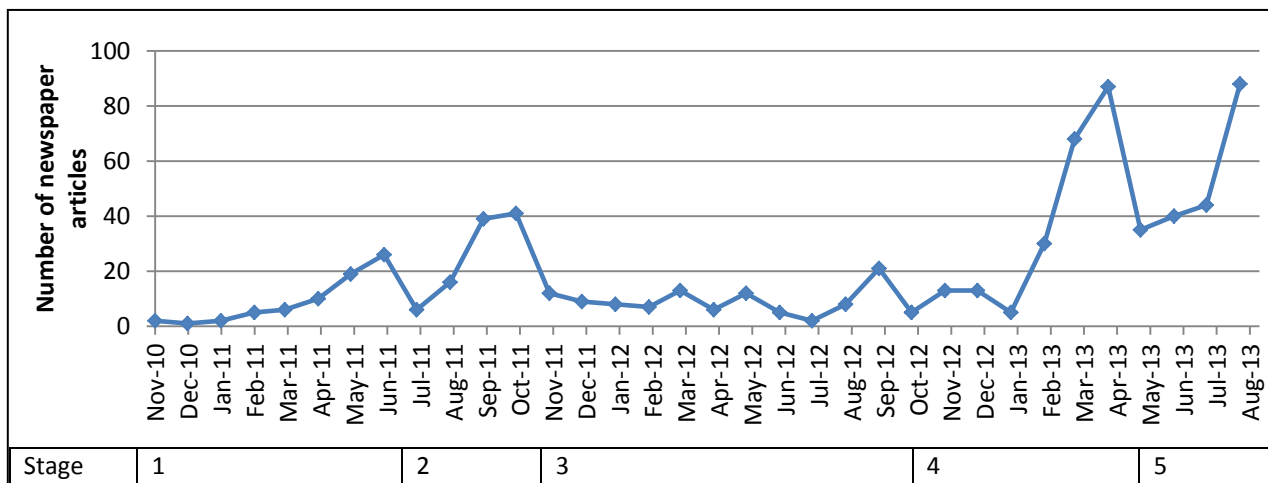


Figure 1 Frequency analysis newspaper articles (including the 5 stages used for constructing the storyline)

Based on the results of the frequency analysis (Figure 1) and key events identified in the storyline, we split up the full period (Nov 2010 – Apr 2013) into nine time periods. Peak publication periods were separated from periods with lower publication levels. A peak was defined as a period of increasing publication level and a minimum publication level of 19. In case of an increase larger than 200% the requirement on number of publications was omitted. This way all time periods could fulfil the T-lab requirements (see 2.3). Based on qualitative analysis, the nine periods were condensed into five consecutive stages that together form the storyline (Section 3).

2.3 Longitudinal thematic cluster analysis

The software package T-lab was used to thematically cluster the available media data. This was done both for the full dataset, i.e. the full research period, as well as for the nine time periods to explore discursive change over time. T-lab uses linguistic and statistical tools to analyse texts [49]. T-lab assists the researcher in finding meaningful patterns in text files in a systematic, and, moreover, ‘bottom-up’ way. This means that analysis is based on structures that emerge from the data rather than on predefined categories or coding schemes. Furthermore, it makes it possible to analyse a larger dataset of texts which gives statistically better, and therefore more representative, results.

T-lab makes a distinction between context units and lexical units. Context units are chunks of text of comparable length or paragraphs (in this case approximately 50 words) used to divide the newspaper articles. Lexical units are the words themselves. Occurrence (lexical unit x context unit) and co-occurrence (lexical unit x lexical unit) matrices are created, which together serve as the basis for all T-Labs operations [50]. These matrices are used to characterise each chunk of text (context unit) with the lexical units that occur in it and each lexical unit (word) is

characterised by the other lexical units it often occurs together with. Then a statistical clustering technique (bisecting K-means) is used to find thematic clusters within the text consisting of contexts that show high similarity in words and word sequence. T-lab places the clusters in a multi-dimensional graph, which can be used for interpretation of the clusters. The software provides a list of context units that are typical to a cluster. These were used for analysis and interpretation of the discourse structures of the thematic clusters. Since the K-means technique uses hierarchical clustering methods (it starts off with one cluster), it can be studied which cluster is the parent and which is the offspring, thereby enabling analysis of similarity between clusters. A thematic cluster analysis was performed for the first eight subsets of data that were distinguished based on the frequency analysis and event history analysis (the ninth period was not included in our original research plan but added later in the analysis of newspaper articles and interviews as it seemed interesting to include). The analyses were performed multiple times to test reliability.

The thematic clusters that were found for the eight separate time periods were analysed and the elementary contexts appointed by T-lab were interpreted to qualitatively attach meaning to each cluster. To analyse relative dominance of each cluster, a frequency analysis was carried out on the number of elementary contexts per theme (over time). The longitudinal development of thematic clusters was analysed and interpreted based on the analysis of events and storyline explained above. The cluster analysis showed three thematic clusters, which we labelled as: 1) safety and environment, 2) utility and necessity, and 3) procedural justice. These will be discussed in section 4.

3. Results (1): storyline of the shale gas controversy

In this section the storyline is presented in five stages. Stage 5 (May to August 2013) was not analysed with T-lab as it was not part of our original research plan, but was included later in the analysis of newspaper articles and interviews as it proved interesting to do so. The description of each stage starts with a figure showing the frequency of newspaper articles and the events that characterise this stage. In the text references are added to the numbered events in the figures as to help the reader to understand the figures.

3.1 Stage 1: Rising societal unrest

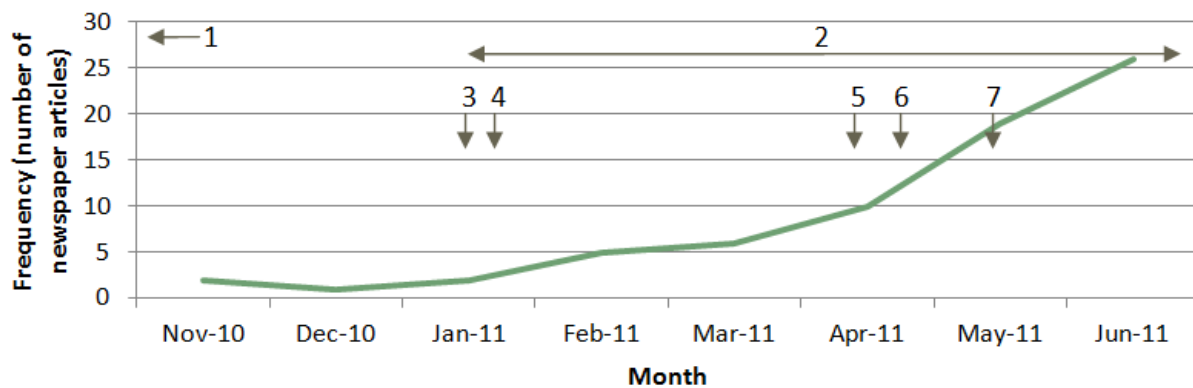


Figure 2 Frequency analysis and events in the first and second period of the societal debate: Cuadrilla receives permit (1), Gasland documentary (2), information meeting Haaren (3), Rabobank expresses concerns (4), Earthquakes in Blackpool (5), Brabant Water expresses concerns (6), National political parties visit information meeting in Bostel (7).

Shale gas was introduced in the Netherlands when Cuadrilla requested permits for the province of Noord-Brabant and for the Noordoostpolder area. In August 2009, Cuadrilla was granted an exploration permit for hydrocarbons for an area in the province of Noord-Brabant and in June 2010 for the Noordoostpolder (1) [51, 52]. Concurrently, EBN, a state-owned organization that supports the Dutch energy sector by facilitating investment and providing information, reported positively on the expectations for the potential of shale gas available in the Netherlands [53].

After receiving a permit for Noord-Brabant, Cuadrilla started investigating suitable locations and started a dialogue with the municipalities of these locations; the municipalities of Boxtel and Haaren. Cuadrilla requested location specific permits at these municipalities (September 2010 and June 2010 respectively) and both agreed to deviate from their zoning plan temporarily. Boxtel² informed the community and organised two information meetings and a city council meeting (3). After setting several conditions for shale gas exploration they granted Cuadrilla the permit (January 2011). At this point the newspapers started writing about the plans in Boxtel and Haaren, and citizens started searching for information on the Internet. They found several studies performed in the US on air and water pollution in relation to shale gas exploration and production. A documentary on the impact of shale gas exploration and production in the US, ‘Gasland’, played an important role in triggering public debate (2). In the most influential scene of the documentary, someone holds a lighter to a tap to show that running water can be set on fire due to gas leakage. The protests in the Netherlands became more organised when the protest group ‘Schaliegasvrij Haaren’ (Shale Gas Free Haaren) was founded and started an online petition. Following this, a provincial environmental NGO (Brabantse Milieu Federatie), and later also another environmental NGO (Milieudefensie) got involved. Also people in Boxtel started to organise their protest after Gasland was shown in Boxtel at an information meeting. Boxtel defined a strategy against shale gas and ‘Schaliegasvrij Boxtel’ (Shale Gas Free Boxtel) was founded. A regional newspaper, Brabants Dagblad, used the Dutch law on public access to governmental information (Wet Openbaarheid Bestuur) to find out what chemicals are used for fracking. Objections also arose from a bank (Rabobank) and a water company (Brabant Water), with Rabobank arguing that tremors caused by shale gas exploration could damage their nearby

² Wherever we write ‘Boxtel’ or ‘Haaren’ we refer to the local governments of those municipalities.

data centre (4). Rabobank filed an official complaint. Brabant Water was worried about aquifer contamination but was too late for official complaints (6). These protests resulted in interest from national newspapers.

Meanwhile, local and regional governments got concerned. An alderman from Haaren investigated what could be done by the municipality to block shale gas exploration. In Boxtel an information meeting was organised with representatives of the national political parties Green Left and the Labour Party (7). The provincial parliament of Noord-Brabant got concerned and sent a letter, together with the municipality of Boxtel, to the Minister of Economic Affairs to ask for a moratorium and an independent study on the pros and cons of shale gas exploration and production. The Minister, in response, believed the legislation and experience within the Netherlands to be sufficient and turned down the request. When negative responses continued however, he requested Cuadrilla to perform more studies.

The end of this period is marked with developments abroad, e.g. several newspapers reported on Poland, being positive about shale gas developments because it would make the country less dependent on Russia. Also, the newspapers reported that the Dutch gas reserves (mainly the large natural gas deposit in Groningen) are declining, and that the Netherlands would become more and more dependent on imported natural gas from, amongst others, Russia. At the same time, newspapers reported on earthquakes in Blackpool (UK) that were caused by fracking activities in a shale gas well operated by Cuadrilla (5). This event became important during the next periods of investigation.

3.2 Stage 2: The road to a moratorium

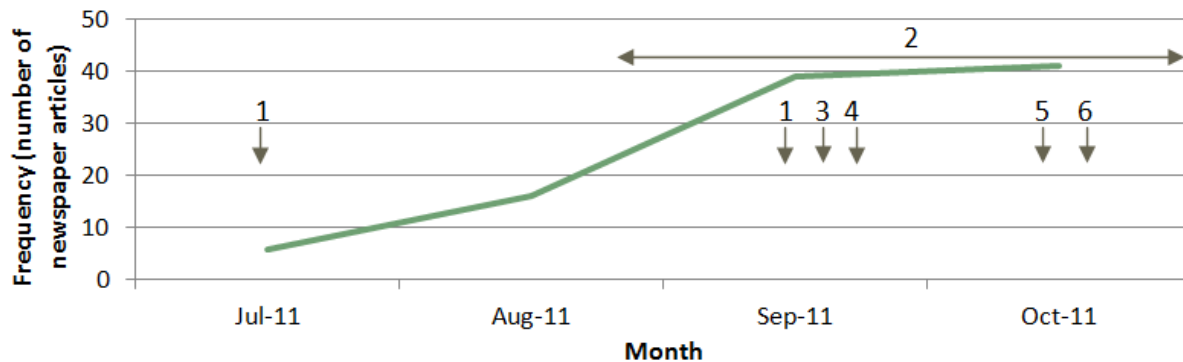


Figure 3 Frequency analysis and events in the third and fourth period:

Water company Vitens expresses concerns (1), 'Shale gas free' declarations (2), Documentary Gasland on Dutch television (3), Hearing in the Parliament (4), Verdict of the administrative court (5), Announcement of a moratorium and an independent investigation (6).

More requests for shale gas exploration permits came in; in the province of Limburg by Hutton and Gallic Energy and in the province of Gelderland by BNK General Partner. In response to this, the environmental NGOs Milieudefensie and those from the provinces of Noord-Brabant and Gelderland asked several municipalities to declare themselves 'shale gas free' (2). According to Milieudefensie a range of municipalities did so, beginning with the municipality of Tholen in August 2011 [54]. When the areas of interest started overlapping with the operating area of water company Vitens, this company (together with Brabant Water) warned about water pollution as well (mainly in July and September 2011) (1). The debate gained even more attention when Gasland was broadcasted on Dutch national television (September 2011) (3). Meanwhile, the Rabobank's procedures in court continued. This gave the Minister of Economic Affairs direct reason to organise a hearing for the Parliament (4). At this hearing in September, several experts

and stakeholders explained the situation to the Parliament and answered questions. Many of these questions referred to the earlier mentioned earthquakes in Blackpool.

Protests continued and more and more stakeholders were asking for a moratorium. The Dutch administrative court decided in October 2011 that Boxtel did not follow the right procedures (5).

The argumentation was that if exploration would show that natural resources were to be economically producible, a production permit could be granted for the production of the gas.

Therefore, shale gas exploration was not considered a temporary activity, which was the premise of the exploration permit, resulting in Cuadrilla's permit being withdrawn. Two days later, at a Parliament debate, the Minister answered the worries and requests of municipalities and announced an independent study into the risk of shale gas and coal-bed methane exploration and production (6). Until the research would be completed, no exploration wells would be drilled, and no new permit applications would be considered.

3.3 Stage 3: The research performed

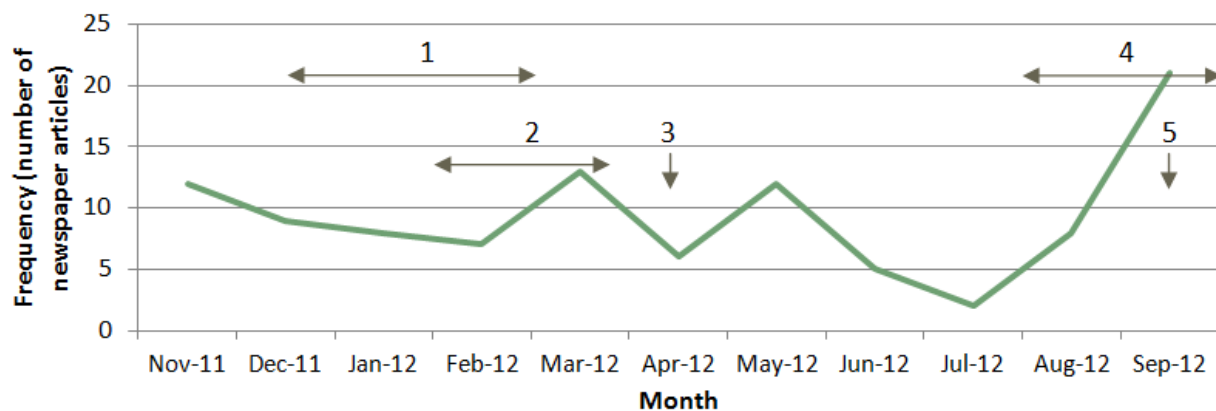


Figure 4 Frequency analysis and events in fifth and sixth period: Consultation rounds for the research of Economic Affairs (1), 'Shale gas free' declarations Haaren and Boxtel (2), foundation 'Schaliegasvrij Nederland' (3), Declining gas prices in the US (4), Doubts on the research of engineering firm W+B (5).

After the announcement of an independent study, media attention decreased. Protest groups asked the Minister to broaden the research on safety and environment as to include the utility and necessity of shale gas but the Minister responded that these are political matters that do not fit within this research (November 2011). The Minister did promise to consult multiple stakeholders for setting up the research questions [55], which led to a broad range of questions that could not all be answered in the time available for the study (1). Economic Affairs set up a ‘Feedback group’ (‘Klankbordgroep’) for the research. The research however kept raising discussion. Further delay was caused by the consultation rounds and a European tender, which was won by a consortium consisting of engineering firms Witteveen + Bos (W+B), Arcadis and Fugro. Protest groups questioned the independence of this consortium (5). Several actors also complained about the so-called ‘independent’ expert who was involved in the ‘Feedback group’, because he was a known critic of ‘climate change theory’.

Meanwhile, the municipality of Haaren rejected Cuadrilla’s permit request (January 2012). Haaren and Boxtel (and other municipalities) joined the ‘shale gas free’ campaign of Milieudefensie (2), although the town board of Boxtel kept shale gas development as a possibility. After the campaign the shale gas debate became more national. In April 2012, a national shale gas free NGO (‘Schaliegasvrij Nederland’) was founded by local communities and environmental organisations (Milieudefensie, Noord-Brabant and Gelderland environmental NGOS, and Greenpeace) (3). The protest groups continued with several protest actions and actively reported their ideas on shale gas developments: they reported that waste water regulations were changed [56], they explained how earthquakes in the province of Groningen are related to gas production in the area [57], and they performed a study on ways for municipalities to block shale gas development [58].

In May 2012 the International Energy Agency (IEA) provided estimates of the global shale gas reserves and spoke of the potential of a Golden Era for Gas [59]. But in the summer of 2012 declining gas prices in the US made several companies depreciate their shale gas investments and the size and benefits of estimated shale gas reserves were questioned again (4). This development contributed to a bigger role in the societal debate for discussions on utility and necessity of shale gas development.

3.4 Stage 4: The societal debate reaches its climax

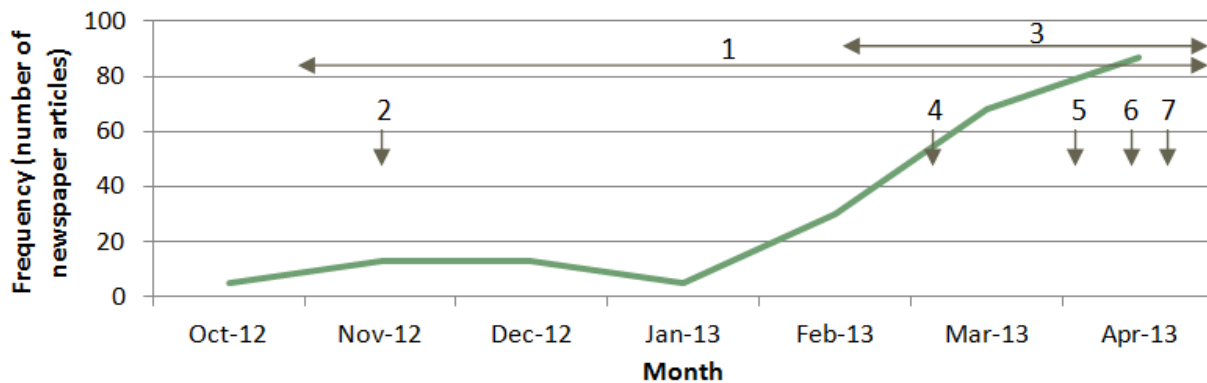


Figure 5 Frequency analysis and events in seventh and eight period:

Coal export to Europe (1), energy-intensive industry complaints about the economic situation (2), earthquakes Groningen (3), Cuadrilla announces locations in the Noordoostpolder (4), doubts on the research of W+B (5), beer brewers express concerns (6), Labour Party changes its stance (7).

Developments in the US kept influencing the Dutch societal debate. The high production level of shale gas in the US led to a surplus of American gas, declining fossil fuel prices, and cheap coal exported to Europe where CO₂ emissions were rising (1). In this context, Shell pointed out that energy producers are increasingly using coal instead of gas. Together with the failing emissions trading scheme (ETS), cheap coal was given as the reason for increasing CO₂ emissions. Shell claimed that shale gas would provide a more sustainable solution whereas others argued that less

would be invested in sustainable energy technologies if shale gas was exploited, and therefore shale gas would only delay the transition to a sustainable energy supply.

Dutch-based energy-intensive industries complained that declining gas prices in the US damaged their competitive position (November 2012) (2). Some companies even said they would make their future investments in the US. Others claimed the revolution in the US was just a temporary development and they explained the ‘bubble’ would soon burst.

The geopolitical discourse became more dominant in the newspapers. The Hague Centre for Strategic Studies (HCSS) introduced the theme of geopolitics at several conferences. In March 2013, after HCSS had been subject of a news program on national television, this theme was discussed more and more in the newspapers and this development would continue.

At the beginning of the year 2013, earthquakes in Groningen measuring 3.7 on the Richter scale, resulting from gas production by the Nederlandse Aardolie Maatschappij (NAM) exceeded the expected maximum of 3.0 (3). Although Schaliegasvrij Nederland already linked (small) tremors in Groningen to gas production in August 2012, in February 2013 more actors started raising questions about the risk of earthquakes caused by fracking. The earthquakes in Blackpool were brought up again and in the political domain more questions about soil subsidence were asked. Suddenly, not only earthquakes were mentioned but soil subsidence was also mentioned as a cause for these earthquakes.

At the same time, a large media publication peak occurred on the topic of shale gas. The research of Economic Affairs was coming to its end and some important events occurred that drew attention. First, Cuadrilla announced the locations of interest for shale gas exploration in another part of the Netherlands (the Noordoostpolder) (4). The television programme ‘Een Vandaag’ showed a surprised farmer on whose land exploration would take place but who had not been informed. The announcement and the information meeting organised by Cuadrilla received a lot

of attention. It caused large societal unrest in the Noordoostpolder. In a week a new protest group was founded; ‘Schaliegasvrij Noordoostpolder.’ Local unrest caused the previously positive municipality to declare itself ‘shale gas free’; shale gas exploration and production was considered to be incompatible with the municipality’s sustainability ambitions. Second, the Feedback group reported on their critiques of the W+B study a second and third time (5). Concerned with groundwater contamination, beer brewers and beverage manufacturers became critical towards shale gas as well (6). The social-democratic Labour Party suddenly became more positive towards shale gas. The party that held a crucial vote in the Dutch Parliament, changed its position on shale gas exploration from ‘negative unless it can be done safely’ to ‘positive as long as it can be done safely’ (7). The opposition in Parliament responded surprised. In May 2011, at the information meeting in Boxtel, the party expressed a negative stance towards shale gas exploration. Members of the Labour Party were surprised as well. At local level, most members of the Labour Party were against shale gas exploration. The national party reacted quickly and promised to consult their members. As a consequence, the Labour Party eventually announced it would vote against shale gas exploration.

3.5 Stage 5: The societal debate continues

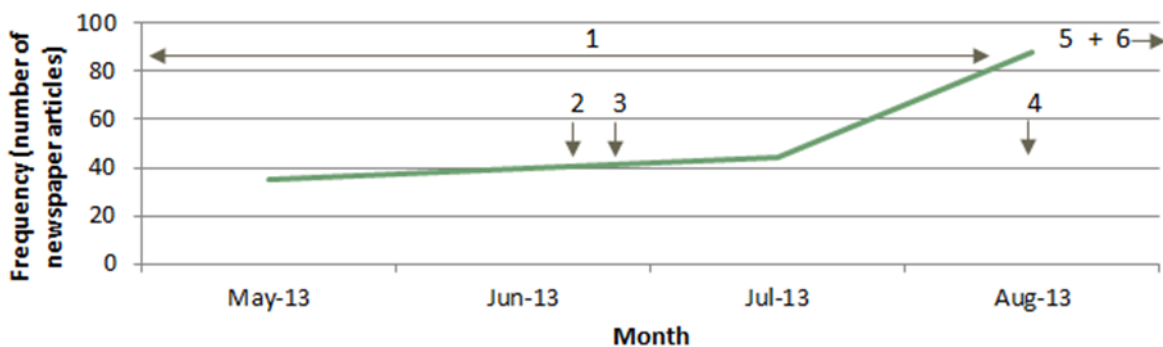


Figure 6 Frequency analysis and events in the ninth period: Criticism on the study of W+B (1), manifest professors (2), Economic Affairs asks Feedback group to sign confidentiality agreement (3), research report published (4), the EIA committee gives advice to Economic Affairs (5), Economic Affairs announces an additional investigation (6).

The public debate around the research of engineering firm W+B continued (1). The environmental NGO Milieudefensie and Boxtel complained that the research was just a literature study and the EIA committee criticised the research for not being complete. The Minister of Economic Affairs responded to the press releases of the Feedback group by asking them to sign a confidentiality agreement (3). The research report was finished, but the Ministry wanted to have some time to study it before coming out with its policy plans. Several members of the Feedback group refused to sign and claimed that the Minister was trying to cover up the results.

Concurrently, a group of influential professors criticised shale gas developments (2). Their main criticism was that policymakers had not strategically considered the impact of shale gas production on the transition to a sustainable energy supply. More actors spoke out against shale gas. The Rabobank did not grant loans to (US) farmers that participated in shale gas projects anymore. Vitens again warned against water contamination and produced a map that showed where shale gas and water zones overlap. The media organisation RTL claimed to have a copy of the research report and said that the Minister would conclude that shale gas exploration and production could be done safely. NOGEPA urged the Minister to calm the societal unrest and advised the Minister to gain public support by being more transparent.

Then, the Minister of Economic Affairs published the research on shale gas exploration and production and concluded that the risks were low and could be mitigated (4). He emphasised that no decisions would be taken until the EIA committee had the chance to assess the research. Eventually, the EIA committee assessed the research as being too narrow as it focused too much on underground effects. The committee concluded amongst others that the current regulation was not sufficient to cover the risks of shale gas exploration and production and advised the Minister to use a governmental spatial planning procedure (the so called

‘Rijksstructuurvisie’) to cover both underground and above ground impacts of shale gas developments (5). Such a particular study was said to broaden the scope to the role of shale gas in the light of the energy transition as well as to participation of local governments and communities [60]. The Minister decided to postpone his decision and announced a new study that would focus on all potential interesting locations so that local interests could be involved as well (6). The so-called ‘Rijksstructuurvisie’ would be used together with an environmental impact assessment (plan-MER) to find out which locations within the Netherlands were most promising and easiest to mitigate risks. The Minister also announced that he wanted to involve local policy makers and the local communities of the potential locations. Moreover, the research would be used to investigate the technical options for risk mitigation together with water companies and the mining industry. The moratorium was prolonged so for the time being no important decisions would be taken [61]. This abated the shale gas debate.

Meanwhile, developments abroad influenced the public debate. Disappointing results were reason to argue that shale gas exploration and production was not as promising as expected. At the same time, the UK found more shale gas than expected. Because of the many other interesting events at that time, the developments in the UK received little attention. Furthermore, the economic and sustainability themes received more attention as a response to a radio debate on news radio BNR. One of the arguments used was that shale gas might get the Netherlands out of the economic crisis; an argument that later returned in newspapers. Other arguments focused on the previously introduced sustainability arguments: shale gas was either perceived as a potential supplement to other energy technologies or as a delaying factor in the transition to a sustainable energy supply. In September 2013, after the Minister of Economic Affairs tried to calm down the debate, the ‘Shale gas free’ campaign of Milieudefensie continued and the provinces of Noord-Brabant, Noord-Holland and Groningen declared themselves ‘Shale gas free’. The municipality of Boxtel

even declared to be ‘fossil-free’ and the province of Noord-Brabant rejected a geothermal energy project because it was not clear whether fracking would be used.

Meanwhile, the earthquakes in Groningen continued. The decision of the Ministry of Economic Affairs to continue with gas production in Groningen raised debate, as did the compensation given to the local community. In October a former employee of NAM accused the NAM of withholding information from the community of Groningen. The NAM, Royal Dutch Meteorological Institute (KNMI), State Supervision of Mines and the Ministry of Economic Affairs were accused of ignoring risks for too long. Next to the risks of earthquakes, compensation became more important in the debate. In this context, Cuadrilla was accused of being financially unable to compensate local communities when damage occurs.

In the calm period after the announcement of an additional investigation, developments abroad became important again. The US became the largest oil and gas producing country (overtaking Russia) and giving rise to discussions about the geopolitical consequences. Moreover, the German energy policy was widely debated in the Dutch newspapers. In this context, Germany was either mentioned as an example to show that the transition to more sustainable energy could be reached in only a few years, or as an example of an unsuccessful energy transition as the German ‘Energiewende’ from nuclear to wind energy would have led to a huge increase of energy prices.

4. Results (2): discursive development of the shale gas controversy

Table 1 Three thematic clusters

Safety and Environment	Utility and Necessity	Procedural Justice
Water pollution and water use Spatial impact Traffic Visual pollution Noise House prices Earthquakes Air Pollution	Economy Estimates of stocks Public treasury Affordability of gas Competitive position Creation of jobs Sustainability CO ₂ emission Transition to sustainable energy technologies Resource depletion Geopolitics Security of supply Independence from other countries	Regulation and inspection Distribution of costs and benefits Decision-making process Openness and quality of information Independence and quality of research Public support Decision power of EA Involvement

The thematic analysis of the full set of newspaper articles and interviews results in three thematic clusters that played a role in the shale gas controversy. Table 1 shows the three thematic clusters ‘safety and environment’, ‘utility and necessity’ and ‘procedural justice’, as well as the themes that constituted these clusters.

Figure 7 shows the dominance of these clusters over time according to our T-Lab analysis. This shows that the ‘procedural justice’ cluster was most dominant over time. Yet, interviewees indicated that the debate was mainly about ‘safety & environment’. This may be explained by the relative unremitting presence of the ‘safety & environment cluster’. It may also be explained by a strategic use of procedural arguments for getting safety and environmental issues on the agenda. Interestingly, the relative decrease in dominance of the ‘procedural justice’ cluster goes together with a relative increase in the ‘utility & necessity’ cluster. This is in line with our findings in the previous section that the debate started locally with protests against the legitimacy of the procedures around the Boxtel/Haaren project, to shift to a national debate on the role of shale gas in the energy transitions. The ‘utility & necessity’ cluster starts off with sustainability and

geopolitics topics, but, in a later stage, economy becomes important as well. The ‘procedural justice’ cluster is most dominant at ‘peak publication periods’, which are, not surprisingly, times at which important decisions have to be taken. On the one hand the ‘procedural justice’ cluster involves proponents, who point out that the Dutch laws on regulation and inspection assure safe exploration and production of shale gas. On the other hand, opponents are in this cluster to point out that the decision-making process was not fair.

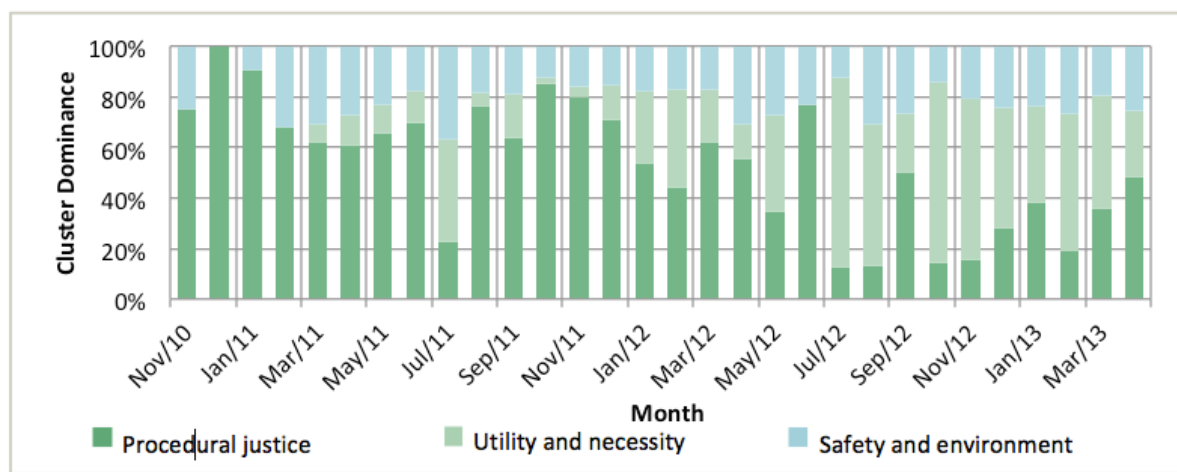


Figure 7 Dominance of thematic clusters over time

5. Two main normative conflicts

From the above it appears that normative conflicts revolve around two questions that are critical for the direction of the energy transition in the Netherlands: 1) What should be the role of gas in the energy transition? and; 2) How to balance local and national interests in defining the public interest?

5.1 What should be the role of gas in the energy transition?

In the first stage of the constructed timeline, shale gas came on the agenda as part of a natural gas discourse, fitting in nicely with the policy of the Dutch government to exploit smaller gas fields in anticipation of the declining reserves of the (large) Groningen field. This is exemplified by the way that EBN refers to shalegas as ‘natural gas from shale’ rather than ‘shalegas’, emphasizing the business-as-usual character of the resource [62]. The approach taken was also business-as-usual: after Cuadrilla received the exploration permits from the national government and Cuadrilla identified suitable locations for exploration drillings, the local governments of Boxtel and Haaren received requests for location specific permits. The role of natural gas in the Netherlands seems to have been, at least for the national government and EBN, so taken-for-granted, that there was no reason to deviate from a business-as-usual procedure. This means that permitting for the proposed exploration project was dealt with on a local level, drawing upon regular procedures for the development of industrial activities in municipalities. As a result of this, the debate took place on a local level, and the concerns expressed mainly referred to local nuisances (tremors, water pollution, traffic, etc.). The debate was dominated by a ‘safety and environment’ and a ‘procedural justice’ discourse (see Figure 7) and no explicit references were made to normative diversity in terms of the preferred role of gas in the energy mix. In the subsequent stages however, the ‘utility and necessity’ cluster gained dominance in the debate (Figure 7), influenced by geopolitical developments and discussions about sustainability. The debate shifted attention more and more to the question what the role of shale gas in the Dutch energy transition should be. With this, the taken-for-granted position of gas in the Dutch energy mix was gradually and increasingly questioned. This was further reinforced by the earthquakes in the province of Groningen due to natural gas extraction.

In the societal debate different normative orientations can be identified. On the one end of the spectrum there are people who see natural gas as a fossil, and hence unsustainable, fuel that deserves no role in the future energy mix. On the other end of the spectrum are people who see natural gas as a relatively clean fuel that can serve the transition to a sustainable energy system where gas (methane, hydrogen, etc) and the gas infrastructure play a key role to balance energy demand and supply.

5.2 How to balance local and national interests in defining the public interest?

The second main normative conflict addresses how institutions create space for articulation of energy policy interests at different policy making levels. At the start of the process, the Ministry of Economic Affairs found the exploration of shale gas to be in the public interest. They based this on considerations such as the revenues shale gas could bring to the state, the position of the Netherlands as a gas-country and the ambition to become a gas-hub. When the Ministry decided to grant the general exploration permits, the procedure at the national level ended and continued on the local level. Here, local governments considered giving a local exploration permit based on factors such as local economic opportunities and local nuisances and risks. When the debate shifted to the utility and necessity of shale gas (Figure 7), a normative conflict was articulated with regard to the question which actors are responsible for, or even allowed to be concerned with, public interests. In this case, the national government defined the public interest of shale gas exploration based on national interests such as the Netherlands being a gas-country, revenues to the state, and the ambition to become a gas-hub. However, in the second phase of the debate other public interests were articulated such as the mitigation of climate change and the transition

to an energy system based on renewables. The local arena was however not effective for discussing the public interest of shale gas. This discussion rather took place in a national arena, including national-level actors. For example, when the debate shifted towards a discussion on the role of shale gas in the energy system, environmental organisations and local municipalities (who had already developed *local* anti-shale gas movements) founded a *national* anti-shale gas NGO. Local actors thus faced difficulties putting issues of public interests on the agenda; they had to find ways to become part of the arena in which the public interest was being discussed. At the same time one may argue that the discursive shift to utility and necessity of shale gas provided local actors strategic leverage to enact their anti-shale gas position.

The normative conflict thus arises from a *de facto* conflation between the general *public* interest of energy and the national interest. While the national interest is to be protected by the *national* government, *local* government, on the other hand, oversees the *local* interests of energy projects. The pre-structuring of interests at different levels creates difficulties for local stakeholders to raise concerns about the public interest.

In essence, the ‘public interest’ is an intangible phenomenon [63-65], as there is no way to unequivocally decide what is the preference of society as a whole. In democratic welfare states this intangible public interest gets a concrete expression by the workings of an extensive institutional apparatus that is usually taken for granted [66]. Law, formal assessment, customary forms of consultation, parliamentary consent, and so on, present a system that accounts for the legitimacy of collectively binding decisions. Our analysis shows how shale gas became a source for questioning this taken-for-granted institutional structuring of defining the public interest. It leads to the question to what extent institutional structures for decision-making on energy projects fit the dynamic nature and normative complexity of the energy transitions.

6. Conclusion and discussion

We have conceptualized societal conflict as informal assessment that has the potential for normative learning as regards the direction, speed and means of transition. We argued that transition studies should capitalize on this value of societal conflict for analysis of transitions. Such analysis is critical to transition studies that are to address the governance implications of divergent normative perspectives [2].

The results show the complex socio-political dynamics of the societal conflict on shale gas. From these, two main normative conflicts were identified: firstly relating to the role of gas in the energy transition, and; secondly relating to the balance of local and national interests in the definition of the public interest. The informal assessment that took place in this social conflict articulates not only different appraisals of shale gas and gas in a wider sense, but also of institutions and policy procedures in place to serve diverse public interests. The societal conflict thus challenges two key elements of the Dutch welfare state, i.e. the role of natural gas on the one hand and the allocation of who is allowed to formulate the public interest on the other hand.

The second part of our research question was to what extent the normative conflicts led to learning. We conclude that there has been learning about the role of shale gas in the Dutch energy transition. Our analysis shows the discursive shift from shale gas as a local safety and risk issue within a business-as-usual framing of ‘natural gas from shale’, towards a national debate on the utility and necessity of shale gas. Shale gas, along with other developments like the failure to introduce carbon capture and storage (which also relies largely on the gas regime), a series of earthquakes and the consequent reduction of natural gas production, challenged and changed the

hitherto dominant discourse of the Netherlands as a ‘gas country’, in which gas will play a continuing role as the ‘transition fuel’. With regard to the normative conflict on the question how to balance local and national interests in defining the public interest, however, we conclude that hardly any higher-order learning has been taking place. Higher-order learning with regard to this normative conflict would mean that there would have been an institutional restructuring of defining the public interest. In other words, if higher-order learning took place, the *de facto* institutional merging of national and public interests would have been reconsidered or even restructured. We do not observe any such changes however. This leads us to conclude that little learning took place with regard to this conflict.

The objective of our paper was to empirically explore how the study of societal conflict can reveal insight into normative diversity and higher-order learning in transitions. Our study shows that controversy figures as an entry point to analyse the normative dimensions of the direction that a transition should take and the speed and means by which it should be achieved. In order to bring this line of inquiry further, more empirical and conceptual work is needed. Empirically, the transition dynamics that are created by societal conflict need further attention. Our case showed how a project, that was initially approached in a business-as-usual way, dealt with as any industrial activity, evolved into a fierce national debate over how we want the energy transition to take shape in the Netherlands. An example of the system dynamics from the shale gas case concerns the role of polarisation. Polarisation in itself is not productive in terms of articulating diversity or learning, because pro- and opponents are stuck in a deadlock. In the case of shale gas though, polarisation had an agenda setting function, as it increased media attention, mobilised people and resources. Polarisation may thus not only be hard to avoid, it may prove, counter-intuitively, an important mechanism for learning through societal conflict [also see 67]. Such

mechanisms need to be empirically investigated in further research (a similar effect of polarisation has been observed in a shale gas controversy in New York [see 68]. Since societal conflicts are enacted increasingly on digital platforms and social media, it would be interesting to compare and complement traditional media-analysis with online analysis [e.g. 69] and aim for better understanding of the role of media in societal conflict.

Further research could focus on conceptualizing the socio-political dynamics of societal conflict within transition studies frameworks. We argued that the multi-level perspective has its limitations for studying normative conflicts in transitions as it brings to light some issues but obscures others [19,20]. Whereas the multi-level perspective assumes conflict between a (desirable) niche and a (problematic) regime, the categories of niche and regime are not instrumental for understanding and conceptualizing conflict in this case. The companies starting shale gas exploration are small newcomers on the (established) gas market, resembling a niche, but these companies have strong ties and are backed by the regime. The introduction of shale gas is contested, *not* by the incumbent regime, but by NGOs and local actors. And importantly, the desirability of shale gas itself is ambiguous and contested. The typical way in which the multi-level perspective is applied is of limited value for analysing societal conflict, especially in cases such as this one, where normative diversity does not coincide with boundaries of socio-technical niches.. At the same time, we did observe interactions between hierarchical and nested levels that resemble familiar transition patterns. For example, aggregated expectations and institutions can emerge from a series of small, local conflicts, i.e. niches [cf. 70]. Another example is the interplay between niches (local conflicts), landscape developments (like the Gasland documentary and international shale gas experience) and a defensive institutional regime of planning energy projects, that in many ways resembles transition patterns described by Geels and

Schot [71], or De Haan and Rotmans [9]. This suggests that a way forward in conceptualizing the socio-political dynamics of societal conflict within transition studies frameworks would require taking a different unit of analysis than is common in transition studies. For the study of normative conflicts in transitions it seems interesting to shift focus and use the societal conflict as a unit of analysis within a multi-level framework rather than a specific innovation/socio-technical system (wind, biogas, shale gas) as is common. Theoretically, it may help transition researchers to draw upon wider political science literature [72-74]. After all, further conceptualization of societal conflicts is needed since sustainability transitions not only imply new (socially embedded) technologies but also new normative imperatives for thinking about progress and change.

7. Acknowledgements

The authors the authors would like to thank the organisers of the NWO/JSPS seminar ‘Studying Sustainability Transitions in Welfare States: a research agenda for Japan and the Netherlands’ for the opportunity to present our initial ideas on which this manuscript is based, as well as for the opportunity to develop them into a full paper as part of this special issue. We are grateful to three anonymous reviewers for their constructive comments on an earlier version of this paper. We thank Donna Mehos for her valuable editing of this paper. This work is part of the research programme RESPONSE with project number 313-99-303, which is (partly) financed by the Netherlands Organisation for Scientific Research (NWO), and co-financed by RoyalHaskoningDHV, Arcadis, NOGEPA, Berenschot, Alliander, N.V. Nederlandse Gasunie, Eneco Wind B.V. and CE Delft. Data has been gathered as part of an MSc internship by the third author at EBN BV.

8. References

- [1] R. Kemp, P. Martens, Sustainable development: how to manage something that is subjective and never can be achieved, *Sustainability: Science, Practice, & Policy*, 3 (2007) 5-14.
- [2] A. Stirling, Pluralising progress: From integrative transitions to transformative diversity, *Environmental Innovation and Societal Transitions*, 1 (2011) 82-88.
- [3] J. Meadowcroft, What about the politics? Sustainable development, transition management, and long term energy transitions, *Policy Sciences*, 42 (2009) 323-340.
- [4] A. Smith, F. Kern, The transitions storyline in Dutch environmental policy, *Environmental Politics*, 18 (2009) 78-98.
- [5] U. Pesch, Tracing discursive space: Agency and change in sustainability transitions, *Technological Forecasting and Social Change*, 90, Part B (2015) 379-388.
- [6] F.W. Geels, Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study, *Research Policy*, 31 (2002) 1257-1274.
- [7] A. Smith, J.-P. Voß, J. Grin, Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges, *Research Policy*, 39 (2010) 435-448.
- [8] R. Raven, Niche accumulation and hybridisation strategies in transition processes towards a sustainable energy system: An assessment of differences and pitfalls, *Energy Policy*, 35 (2007) 2390-2400.
- [9] F.J. De Haan, J. Rotmans, Patterns in transitions: Understanding complex chains of change, *Technological Forecasting and Social Change*, 78 (2011) 90-102.
- [10] M. Lawhon, J.T. Murphy, Socio-technical regimes and sustainability transitions: Insights from political ecology, *Progress in Human Geography*, 36 (2012) 354-378.
- [11] A. Smith, Green niches in sustainable development: the case of organic food in the United Kingdom, *Environment and Planning C: Government and Policy*, 24 (2006) 439-458.
- [12] E. Cuppen, S. Brunsting, U. Pesch, Y. Feenstra, How stakeholder interactions can reduce space for moral considerations in decision making: A contested CCS project in the Netherlands, *Environment and Planning A*, 47 (2015) 1963-1978.
- [13] S. Breukers, M. Wolsink, Wind power implementation in changing institutional landscapes: An international comparison, *Energy Policy*, 35 (2007) 2737-2750.
- [14] B. Pel, F. Boons, Transition through subsystem innovation? The case of traffic management, *Technological Forecasting and Social Change*, 77 (2010) 1249-1259.
- [15] C.M. Hendriks, On inclusion and network governance: The democratic disconnect of Dutch Energy Transitions, *Public Administration*, 86 (2008) 1009-1031.
- [16] J. Meadowcroft, Engaging with the politics of sustainability transitions, *Environmental Innovation and Societal Transitions*, 1 (2011) 70-75.
- [17] A. Stirling, "Opening Up" and "Closing Down" Power, Participation, and Pluralism in the Social Appraisal of Technology, *Science, Technology & Human Values*, 33 (2008) 262-294.
- [18] M. Leach, I. Scoones, A. Stirling, *Dynamic sustainabilities: technology, environment, social justice*, Earthscan, 2010.
- [19] U. Jørgensen, Mapping and navigating transitions—The multi-level perspective compared with arenas of development, *Research Policy*, 41 (2012) 996-1010.
- [20] E. Shove, G. Walker, CAUTION! Transitions ahead: politics, practice, and sustainable transition management, *Environment and Planning A*, 39 (2007) 763-770.
- [21] F.W. Geels, The multi-level perspective on sustainability transitions: Responses to seven criticisms, *Environmental Innovation and Societal Transitions*, 1 (2011) 24-40.

- [22] F. Avelino, J. Rotmans, A dynamic conceptualization of power for sustainability research, *Journal of Cleaner Production*, 19 (2011) 796-804.
- [23] F. Avelino, J. Rotmans, Power in Transition: An Interdisciplinary Framework to Study Power in Relation to Structural Change, *European Journal of Social Theory*, 12 (2009) 543-569.
- [24] F.W. Geels, Regime Resistance against Low-Carbon Transitions: Introducing Politics and Power into the Multi-Level Perspective, *Theory, Culture & Society*, 31 (2014) 21-40.
- [25] J.P. Bergen, On the Role of Government in Transition Management. Three Different Discourses and their Validation with Dutch Energy Transition Project Professionals, in: *Technology, Policy & Management*, Delft University of Technology, Delft, 2012.
- [26] J.-P. Voß, A. Smith, J. Grin, Designing long-term policy: rethinking transition management, *Policy Sciences*, 42 (2009) 275-302.
- [27] B.W. Terwel, E. ter Mors, D.D. Daamen, It's not only about safety: Beliefs and attitudes of 811 local residents regarding a CCS project in Barendrecht, *International Journal of Greenhouse Gas Control*, 9 (2012) 41-51.
- [28] M. Dignum, A. Correljé, E. Cuppen, U. Pesch, B. Taebi, Contested Technologies and Design for Values: The Case of Shale Gas, *Science and Engineering Ethics*, 22 (2016) 1171-1191.
- [29] C. Argyris, D. Schon, *Organizational learning: A theory of action approach*, Reading, MA: Addison Wesley, (1978).
- [30] P.A. Sabatier, C. Weible, *Theories of the policy process*, Westview Press, 2014.
- [31] M. Van de Kerkhof, A. Wieczorek, Learning and stakeholder participation in transition processes towards sustainability: Methodological considerations, *Technological Forecasting and Social Change*, 72 (2005) 733-747.
- [32] J. Grin, J. Rotmans, J.W. Schot, F.W. Geels, D. Loorbach, *Transitions to sustainable development: new directions in the study of long term transformative change*, Routledge New York, 2010.
- [33] D. Loorbach, Transition management for sustainable development: A prescriptive, complexity-based governance framework, *Governance*, 23 (2010) 161-183.
- [34] J. Quist, A. Tukker, Knowledge collaboration and learning for sustainable innovation and consumption: introduction to the ERSCP portion of this special volume, *Journal of Cleaner Production*, 48 (2013) 167-175.
- [35] J. Quist, *Backcasting for a sustainable future : the impact after 10 years*, Eburon, Delft, 2007.
- [36] H.S. Brown, P.J. Vergragt, K. Green, L. Berchicci, Learning for Sustainability Transition through Bounded Socio-technical Experiments in Personal Mobility, *Technology Analysis & Strategic Management*, 15 (2003) 291-315.
- [37] S. Breukers, M. Hisschemöller, E. Cuppen, R. Suurs, Analysing the past and exploring the future of sustainable biomass. Participatory stakeholder dialogue and technological innovation systems research, *Technological Forecasting and Social Change*, 81 (2014) 227-235.
- [38] T. Metze, Fracking the Debate: Frame Shifts and Boundary Work in Dutch Decision Making on Shale Gas, *Journal of Environmental Policy & Planning*, (2014) 1-18.
- [39] M.o.E. Affairs, G.D.N. TNO, <http://www.nlog.nl/nl/home/NLOGPortal.html>, in, 2016.
- [40] W. Veeneman, W. Dicke, M. De Bruijne, From clouds to hailstorms: a policy and administrative science perspective on safeguarding public values in networked infrastructures, *International Journal of Public Policy*, 4 (2009) 414-434.
- [41] U. Pesch, Sustainable development and institutional boundaries, *Journal of Integrative Environmental Sciences*, 11 (2014) 39-54.
- [42] A.F. Correljé, C. Van der Linde, T. Westerwoudt, *Natural Gas in the Netherlands. From Cooperation to Competition?*, (2003).
- [43] A. Lijphart, *The politics of accommodation: Pluralism and democracy in the Netherlands*, Univ of California Press, 1975.

- [44] J. Visser, A. Hemerijck, *A Dutch miracle: Job growth, welfare reform and corporatism in the Netherlands*, Amsterdam University Press, Amsterdam, 1997.
- [45] M. Hisschemöller, Participation as knowledge production and the limits of democracy, in: S. Maasen, P. Weingart (Eds.) *Democratization of Expertise? Exploring novel forms of scientific advice in political decision-making* Springer, Dordrecht, 2005, pp. 189-208.
- [46] T. Metze, What the Frack? Development of the Controversy About Hydraulic Fracking for Shale Gas in the Netherlands, *Development of the Controversy About Hydraulic Fracking for Shale Gas in the Netherlands* (June 27, 2013), (2013).
- [47] E. Pikaar, Stakeholder engagement in a shale exploration project: Supporting societal embedding, in: *Faculty of Technology, Policy and Management, Delft University of Technology, Delft*, 2011.
- [48] A.H. Van de Ven, M.S. Poole, Methods for studying innovation development in the Minnesota Innovation Research Program, *Organization science*, 1 (1990) 313-335.
- [49] T.-L.d.L. Franco, T-lab tools for text analysis, in, 2008.
- [50] F. Sengers, R.P. Raven, A. Van Venrooij, From riches to rags: Biofuels, media discourses, and resistance to sustainable energy technologies, *Energy Policy*, 38 (2010) 5013-5027.
- [51] Staatscourant, Opsporingsvergunning koolwaterstoffen Noordoostpolder, in, 2010.
- [52] Staatscourant, Besluit opsporingsvergunning Noord-Brabant, in, 2009.
- [53] P. Klok, Nederlandse bodem zit nog vol gas, in: *De Volkskrant*, 2009.
- [54] Milieudefensie, Factsheet schaliegasvrije gemeenten, in, 2013.
- [55] E.L.I., Brief Ministerie ELI, in, 2011.
- [56] S. Nederland, Heeft Nederland ook een Halliburton loophole, in, 2012, pp. 6 October 2012.
- [57] S. Nederland, Aardbevingen door gaswinning n Groningen, in, 2012.
- [58] G.S.v. Noord-Brabant, Brief proefboringen naar schaliegas in Noord Brabant, in, 2011.
- [59] I.E. Agency, *World Energy Outlook; Special report on unconventional gas; Golden rules for a golden age of gas*, in, 2012.
- [60] C. MER, Brede afweging schaliegas mist nog, in, 2013.
- [61] E.L.I., Brief aan de Tweede Kamer - Vervolgstep schaliegas, in, 2013.
- [62] EBN, https://www.ebn.nl/wp-content/uploads/2014/11/130826_Leeswijzer_conceptueel-veldontwikkelingsplan-schaliegaswinning-in-Noord-Brabant.pdf, in, 2013.
- [63] G. Schubert, *The Public Interest. A Critique of the Theory of a Political Concept.*, The Free Press, Glencoe, 1960.
- [64] U. Pesch, *The Predicaments of Publicness. An Inquiry into the Conceptual Ambiguity of Public Administration.*, Eburon, Delft, 2005.
- [65] U. Pesch, The Publicness of Public Administration, *Administration & Society*, 40 (2008) 170-193.
- [66] J. Habermas, *The Structural Transformation of the Public Sphere. An Inquiry into a Category of Bourgeois Society*, MIT Press, Cambridge, 1999.
- [67] A.J. Hoffman, W. Ocasio, Not all events are attended equally: Toward a middle-range theory of industry attention to external events, *Organization science*, 12 (2001) 414-434.
- [68] J. Dodge, J. Lee, Framing dynamics and political gridlock: The curious case of hydraulic fracturing in New York, *Journal of Environmental Policy & Planning*, (2015) 1-21.
- [69] C.M. Hendriks, S. Duus, E.S. A., Performing environmental politics online: the dramaturgy of a coal seam gas controversy, in: *Australian Political Studies Association, Canberra*, 2015.
- [70] F.W. Geels, R. Raven, Non-linearity and Expectations in Niche-Development Trajectories: Ups and Downs in Dutch Biogas Development (1973–2003), *Technology Analysis & Strategic Management*, 18 (2006) 375-392.
- [71] F.W. Geels, J.W. Schot, Typology of sociotechnical transition pathways, *Research Policy*, 36 (2007) 399-417.

[72] P.A. Hall, Policy paradigms, social learning, and the state: the case of economic policymaking in Britain, *Comparative politics*, (1993) 275-296.

[73] M.A. Hajer, *The Politics of Environmental Discourse. Ecological Modernization and the Policy Process.*, Clarendon Press, Oxford, 1994.

[74] P.A. Sabatier, An advocacy coalition framework of policy change and the role of policy-oriented learning therein, *Policy Sciences*, 21 (1988) 129-168.