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Original research article

Energy security and human security in a Dutch gasquake context: A case of localized performative politics

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ABSTRACT

From the late 1980s, the natural gas extraction in the Netherlands has experienced an increasing number of ever stronger gasquakes (induced earthquakes due to gas extraction). This paper offers a security analysis of the accompanying debate on the material consequences and organization of the gas extraction between the threatened local population, the knowledge institutes analyzing the gasquakes, and the government and extraction industry. This paper studies how these parties make sense of the gasquakes through a combination of securitization theory and the flat relationality offered by new materialism, which forces the two conflicting securitization claims to be analyzed in their local sociotechnical and material context. The resulting analysis shows how the gas debate is structured by a shared security of supply understanding. An understanding which for a long time has been questioned by the local population on its safety and cost implications. However, it took 25 years until their claims were accepted and the security of supply understanding shifted to a focus on minimal extraction volumes. An acceptance that can only be explained through a self-reinforcing combination of security claims, actual material events, increasing measurements (following security calls), shifting value judgements and increasing audience acceptance (creating additional speech actors).

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1. Introduction

The Netherlands has been developing natural gas fields since the discovery of a large field in the region of Groningen in the 1950s. By 2015, this has resulted in 275 billion euro of state revenue as well as an infrastructure that connects almost all of the Dutch households to these gas fields for heating and cooking purposes. Simultaneously, the Groningen gas field is drained to roughly one-third of its original low calorific reserves (680 of its original 2800 billion m³). Unfortunately, from the mid-1980s onwards the areas above the fields have experienced light earthquakes, which have been increasing in magnitude and frequency (Fig. 1). For local residents, the everyday experience and (potential deadly) consequences of these earthquakes are conflicting with the long-standing national economic and security of supply concerns of the Dutch government and European energy markets. For a long time, the concerns for earthquakes remained limited to a small number of Groningen inhabitants. This changed with the 2012 Huizinge earthquake,

which, as the strongest and most heavily experienced earthquake in the Groningen area to date, led to a large public debate and a string of reports on all aspects of the Dutch natural gas extraction and ultimately to a cap on extraction as of 2014. Consequently, the question is, why, after years of neglect, the security concerns of an initially small number of local residents suddenly superseded the energy security concerns of policy makers and energy scholars working on the Dutch gas and energy supplies. In other words, this paper studies the security politics behind an understanding of energy security.

Within the literature, energy security has been described as a 'slippery', 'fuzzy' and 'multidimensional' concept [1,2]. Definitions vary widely, but simultaneously often share common points of interest building around notions of security of supply, vital systems, and environmental and economic energy (in)security concerns [3,4]. As such 'the energy security concept nicely weaves together disparate policy issues into one basket ([5] p. 152).' Consequentially, the discussion on how energy security is used and defined seems ultimately a context bound one [1,6]. As Pasqualetti ([7] p. 278) remarks in his reflection on a two-day meeting of 40 energy security experts: 'Any discussion of energy security must recognize that it varies from one place and one culture to another, especially at the household level'. This is resolved in multiple ways. More traditional historical and geopolitical policy analyses draw conclusions

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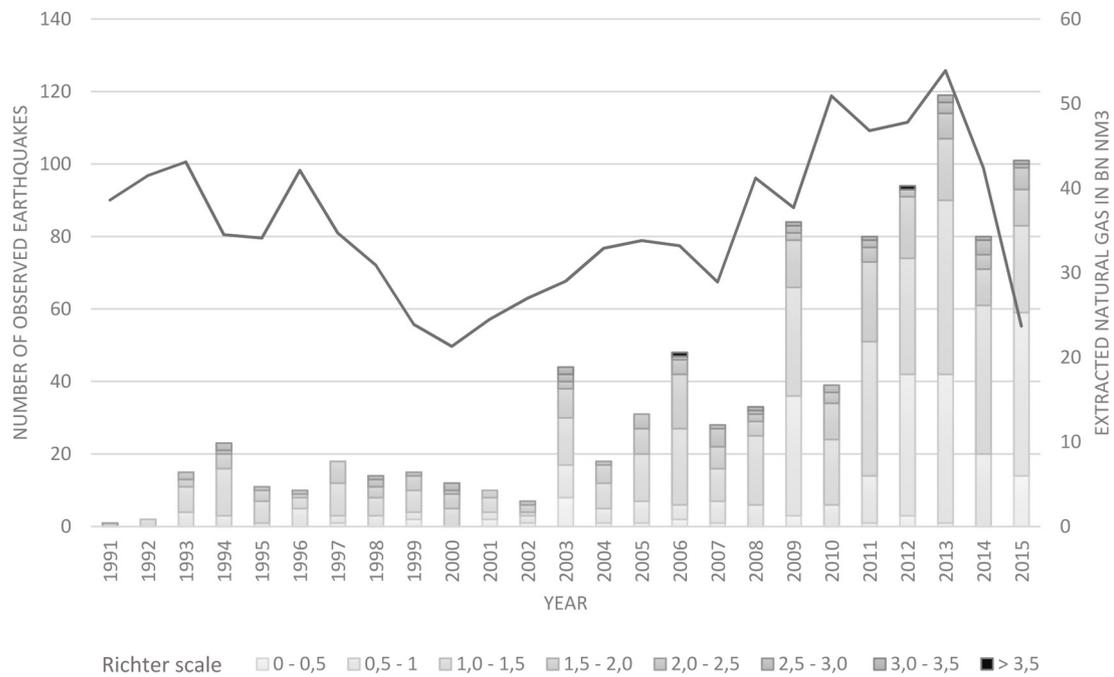


Fig. 1. Groningen Earthquakes and Extraction Volume until October 2015.

Source: After NAM [39,50], with data from KNMI [40] and NAM [39,50]

from the debates they describe [8,9]. Another prevalent approach is to map and develop the range of indicators and metrics used to analyze energy security [3,10,11]. In a similar line, Cherp and Jewell ([6] p. 334), two strong proponents of a contextual approach, confirm the importance of ‘social reality in shaping perceptions of truth’ and identify a range of story lines about energy security, which they then categorize into a framework that can be used for further analysis.

Elsewhere, they argue that ‘energy security is an instance of security in general’ ([84] p. 415) and thus needs to inquire about the often taken for granted values and assumptions behind energy security. This paper follows the notion that energy security, whether defined by scholars or as a shared understanding of participants, is part of a wider political spectrum. However, instead of defining what energy security is, it approaches the context bound nature of energy security by studying *how* it works. How one of its elements, in this case security of supply, becomes what those involved understand it to be, how it changes over time and how it shapes debates about energy production, transport and consumption in the meantime. ‘The need for empirical investigation into the ramifications of using (...) energy security [claims], for what purpose and by whom ([5] p. 153)’ is not a new question, but due to its relatively small sample size remains an imperative one. Within the energy security literature it is studied mainly from a constructivist perspective on language and discourse [12,13] or from Securitization Theory [5,14–18].

The discussion below builds on these studies in two ways. First, the gasquake debate offers an analysis of a central energy security concept, security of supply, in its broader societal context [15]. As such, it does not study competing understandings of energy security [5] or the linguistic construction of a specific energy security understanding [12,17]. Instead it shows how the Dutch security of supply understanding is influencing the debate and in turn is shaped by the resistance it faces coming from the safety concerns of the local population. This repetitive interaction between these two security concerns builds on a broader relational understanding that is at the heart of this paper. It is a relationality that, second, extends the discursive focus above by incorporating ideas of securi-

tization into the flat relationality offered by New Materialist studies [19–21], in particular Actor-Network Theory [22,23]. A flat relationality puts the shared understandings of security of supply and safety on an equal footing to the materiality of the earthquakes and the models used by the knowledge institutes. In other words, it reduces the analytical importance of the security claims by forcing the observer to study the security claims as part of their wider constantly changing context.

The analysis itself builds on media coverage, news briefs, (court) statements and a number of reports, among them the 2015 report by the Dutch Safety Board (DSB) on the decision-making process behind the Dutch natural gas extraction from 1959 until 2014 [24]. Although the debate is still ongoing, this paper focusses specifically on the period following the Huizinge earthquake in 2012 up to the autumn of 2015, as by then most of the major policy changes had taken place, including the decision to cap the extraction volume [25].

This paper continues in Section 2 with an explication of the theory and subsequent contribution of this paper. Section 3 introduces the Huizinge earthquake and its consequences. Besides a discussion of the gasquake itself, this section touches in particular on a report from the main regulatory body, the State Supervision of Mines (SSM), which studied the Huizinge earthquake and shows how it is this report that actually shifted the value judgement behind the assessments of the decision-makers. Section 4 discusses the internationally encapsulated position of the gas-industrial complex, while Section 5 looks more closely at the safety and security claims of the locals. Section 6 moves on to discuss the knowledge politics behind the earthquakes in order to highlight the struggle over the uncertainty behind the scientific models and how security considerations play a role in this process. The reflection brings these lines together.

2. Contextualizing security as part of a situated and flat performative relationality

This paper and the gasquake debate offers four main additions to the literature mentioned above. First, it completely conflates

the distinction between security and politics. Second, it offers a long-term illustration that enforces a dynamic securitization analysis. Third, by placing security of supply in opposition to safety arguments, this debate not only studies two competing securitization processes but also places the resistance against current energy extraction practices in a Western context (contrary to insights from development studies on mining in Latin-America or Africa [26]) with an immediacy and geographical focus that is not always present when energy security is for example studied in relation to climate security. Lastly, the debate studies this immediacy itself and how it increased overtime by analyzing the security claims in relation to the actual gasquakes and the scientific knowledge about them. The reinforcing interaction between these elements and the actual material presence of the gasquakes (Sections 3 and 6) supports the theoretical argument that security should be placed in a flat relationality.²

First, during the review of this article, the question was raised whether the below offered a discussion of energy security or instead was about energy politics.³ The relation between security and politics has in fact long been a core issue within critical security studies, and one that is gaining traction once again [27,28]. It stands at the center of Securitization Theory, developed in the 1990s, which sees security as a category separate from regular political and non-political issues ([14] pp. 23–24). In this theory, security is reserved for those extraordinary issues, like war, where an existential threat is believed to exist and extraordinary action are taken without concern for other social parties (e.g. outside normal political and economic routines) ([14] p. 26). Energy security does not often fall in that category and if it does it is subject to economic, climate, or military security ([14], [15] pp. 509–510; [17] p. 74). In this sense a discussion on energy security (contributing to its concepts and theories) as removed from a discussion on energy politics makes little sense as the former is always part of the latter and – as per the question above – the interaction itself deserves closer study.

This is reflected in other security theories, where the distinction is more conflated. For instance, in Foucault's biopolitics [29] or the security practices literature [30] security is not taken as a separate exceptionality but as a thoroughly routinized political process closely linked to knowledge practices (the ways people try to gain knowledge of the world) and the exercise of power. While these three theories approach the relation between security and politics differently, all share the view that security acts as a call for urgency based on distinctions between friend and enemy, safe and unsafe, risk and no risk, insecurity and security [31]. They also share an understanding that threat images are performative. First, because the wording of these threats help shape the world we live in by defining an event (in doing so not only defining the event or enemy, but also oneself and the (referent) object in need of security). And second, because people act in the present to prevent these imagined future realities and through these acts materialize an alternative future.⁴ On a political level, this implies that policy makers, scholars and other actors are not only responsible for a failure to counter threats, but also for the threats that they propose themselves: for the distinctions between friend/enemy, the choice of what to protect, and for the resources drawn from other areas in terms of actual resources and agenda setting ([32]p. xiii).

Second, this paper also moves beyond the static nature of Securitization Theory with its implicit focus on a security claim made by a speech actor towards a single audience [33,34]. With its focus on the speech act, the moment when a (securitizing) actor identifies and presents a future event as a threat and subsequently asks the audience for support to counter it, the theory is predicated to single acts from the perspective of the speech actor. While it would be fairly simple to write the Groningen gasquake debate solely in terms of the local population securitizing their safety concerns, it would offer a description of one actor (a representative of the local population) who calls for the threat (future consequences of more gasquakes) in the hope to convince the respective audience (decision maker). However, the illustration below shows how both the speech actor and the audience were not single entities and that they constantly evolved, as the growing audience acceptance of the gasquake threat subsequently meant a growing mass of speech actors, each calling for the gasquake threats in their own way and wording (see Section 5).

Third, even though a more dynamic long term reading of Securitization Theory would pick up on this, it would still only focus on one event and its accompanying security claim (the threat of future gasquakes). While there is some work done on conflicting energy security claims and interpretations [16] and competing security claims are one of the main reasons for issues to lose their urgency [35], most of the work done on how energy security relates to other concerns sees energy security as subject to military and economic concerns (above) or involves negotiations in line with the energy trilemma [36]. In contrast, the gasquake debate offers a case with two active security processes. A case where the securitization of the safety concerns interacts with the (institutionalized) security of supply concerns that dominate the debate.⁵ For even though security of supply considerations often remained implicit, as the debate primarily focused on safety concerns, compensation and extraction volumes, it was central to it. For the governing bodies and gas industry, for whom security of supply was one of the core reasons to continue with business as usual. And subsequently, it was also central to the local population, for whom security of supply presented the boundary of what they could achieve. Irrespective popular calls for a complete halt of extraction, on a political and legal level the argument revolved around safe extraction and a minimalization of volumes (see Section 5). In doing so, the negotiations and subsequent actions of the actors involved reproduced security of supply as a central motif, but with a redefined understanding of what it meant. In contrast to an earlier shift in the meaning of security of supply from its initial unlimited extraction to the strategic 'small gas field policy', which resulted in equal measure from economic and security of supply reasoning (Section 4), this redefined understanding stems primarily from a security debate. A debate that resulted in an adaptation of the Dutch security of supply understanding away from economic gain towards a focus on the minimal extraction necessary for a continuation of energy demand within the existing sociotechnical infrastructure.

Lastly, the debate nuances the discursive nature of security, something that comes across most strongly in the idea in Securitization Theory that security is 'a self-referential practice' ([14] p. 24) and that threats are always imaginary (as they have not happened yet) and hence have no material standing. As Van Wijk and Fischhendler ([37] p. 22 quoting Adam and Van Loon, 2000) argue

² This comes with a strong moral responsibility for the observer, as it is s/he who decides what to study as part of this relationality or network [85].

³ Many thanks to an anonymous reviewer for bringing this up.

⁴ These insights are related to a performative reading of energy security (see also [86]), where actors are seen to be directed in how they approach the world by earlier practices and understandings, and subsequently, when acting (re)produce those or other new social and material practices and effects.

⁵ This can be read as implying that safety concerns about energy production are not part of energy security itself, which I would argue against in line with the focus on the social/environmental acceptability of vital energy systems. Here, however, I make an analytical distinction to better contrast the positions of the two parties (which together with the choice for specific spokespersons is another analytical choice to simplify the debate).

in relation to risk: ‘the question of whether risk is genuine or not is irrelevant. What matters instead is the actualisation of risk in policy processes in general . . .’ Yet even when agreeing that threats are imaginary, the gasquake debate also offers two ways in which material elements played an active role. On the one hand, the support for the safety claims of the local population grew with the tangible experience of ever more and stronger gasquakes. In time it was accepted that the gasquakes threatened local lives and livelihoods (a clear sharable referent object even with those not directly threatened), that a reduction of extraction volumes was an effective (if not the only) solution, and most of all that the causal relationship between extraction, gasquakes and increasing damage was undisputable ([17] p. 74). On the other hand, the security of supply understanding has always been closely related to the existing gas infrastructure in the Netherlands. It is the existing infrastructure, including the conversion and extraction capacity and the gas fired boilers (with resulting demand for gas), and the expected rate of change of that infrastructure, which offers the boundaries of minimum extraction capacity and thereby the current boundary of the local safety claim.

In other words, the debate highlights the need for security scholars to focus on the interaction between threat images, material events and especially the knowledge practices that mediate between these two. Contrary to the facilitating conditions that Securitization Theory offers, where material elements are subject to security ([14][14] p. 33), this paper places them in a flat relational ontology that equalizes them to security images. Such a flat relational ontology is proposed in the field which by lack of a better term is called ‘new materialism’ [19–21]. Scholars in this broad field have long been uneasy with a sole focus on linguistic explanations in constructivist work, while not willing to refer back to more traditional realist and objectivist approaches as these lose the performative insight that our shared social understandings of the world help shape it. While I prefer the work of Barad and Foucault, for simplicity’s sake and the intent of this special issue I will use the indicative and very popular relational alternative offered by Actor-Network Theory (ANT) [22,23]. This theory depicts the world to exist out of networks of nodes, which themselves are networks, and so on. These networks are irreducible and flat, meaning that one should not and cannot prefer one element over another. Whether that element is a social explanation (energy security), something material (a gas well), a law or a newspaper article, all these elements together form our current world. Importantly, as each node exists out of their own networks, theoretically, if any of these nodes is missing, the world is not the same. In other words, security claims and images are only one element out of many and they only have their specific meaning as part of a broader ‘security apparatus’ ([29]; c.f. [38]). As Latour summarizes the goal of ANT: ‘It simply means not to impose a priori some spurious asymmetry among human intentional action and a material world of causal relations ([22] p. 76).’ Instead of assuming who acts (the speech actor) the idea is to actually study who acts by observing the traces that are left when relations change (the damage after an gasquake, a changed interpretation in reports, a new scientific model, etc.). Luckily, the core assumption is that networks are constantly changing and that stability is actually a product of hard work. In this sense, a security argument is the associative work done to create some semblance of stability in an ever-changing environment.

The reading below shows how the local inhabitants, the *Gruningers* in their dialect, here represented by the *Groninger Bodem Beweging* (GBB, which translates as Groningen Ground Movement), have been increasingly successful in securitizing the gasquakes as a threat to their livelihood. They have managed to put the induced earthquakes on the political agenda with a sense of urgency, while achieving a reduction in gas extraction and an increase in monetary compensation. The lesson however is that they were not

believed until the number of measurements increased – which only occurred after repeated security claims – nor granted their urgency until the materiality of the gasquakes became visible through those measurements and material effects. Just calling for the threat of the gasquakes had little effect, as shown by the duration of the debate, but including the scientific uncertainty in those safety arguments ultimately did. Especially, as the uncertainty led to more seismographs, which led to more measured gasquakes, thereby strengthening the claims of the local population. Simultaneously, one can witness within government and industry a debate geared towards the weighing of the benefits of natural gas extraction and the risk and consequences of these earthquakes. For these institutions, the debate itself hardly changed so much as the numbers and valuation behind them. Consequently, these assessments (the weighing of security of supply, safety and profit) and the uncertainty behind the scientific knowledge over these tremors lie at the core of the struggle between the local population and the gas-industrial complex (*het Gasgebouw*)⁶: the small and closely connected group of companies and institutions in charge of Dutch natural gas extraction.⁷

3. The Huizinge earthquake and subsequent reactions

With a score of 3.6 on the Richter scale, the Huizinge earthquake of 16 August 2012 was the strongest ever experienced in the Groningen area.⁸ To understand its impact, it is necessary to place it in the ongoing debate on the potential relation between gas extraction and earthquakes. This includes the history that the Gruningers have with an increasing number of such earthquakes, which also have been of steadily higher magnitude (see Fig. 1), and their struggle for acknowledgement of these quakes. Moreover, it includes the public pressure that resulted a year later from the news that 2013 turned out to be a record year. Both in terms of an exceptionally high extraction volume (up to 54 billion Nm³: [39]), with subsequent revenues, and a record number of 119 tremors of which about 20 could be felt by inhabitants (out of 133 total in the Netherlands: [40]). Within the debate on the gasquakes in Groningen, the Huizinge earthquake thus acts as a turning point.

⁶ All translations from Dutch are by the author, but I am grateful to the editors and reviewers for offering a better translation of this term.

⁷ The Netherlands has a framework that distributes the legal ownership, extraction rights and profit sharing between the Dutch state and the companies involved, through a range of legal entities and subsidiaries, which nowadays is bundled under the heading *het Gasgebouw* (see for example [87]). In this tight network, Shell and ExxonMobil have the license to operate the Groningen natural gas field through their ownership of the Nederlandse Aardolie Maatschappij (NAM). Both also own shares of GasTerra, the company responsible for the sale of the natural gas. The Dutch state (read the Ministry of Economic Affairs) pulls its weight through a legal entity called EBN. The NAM and EBN both cooperate in and own the Maatschap Groningen, which is responsible for the actual exploitation of the natural gas fields. The Dutch state also owns shares of GasTerra both directly (via the Ministry of Finance) and indirectly (through EBN). All in all, the Dutch Safety Board ([21] p. 8, 75, 88) concludes that, through these constructions and the close personal connections between the boards of GasTerra and the Maatschap Groningen, the decision-making on Dutch natural gas is made in a closed system that is effectively owned by Shell, ExxonMobil and the Dutch State: a system devoid of opposition and ruled by ten persons at most.

⁸ Although not the strongest ever experienced in the Netherlands (a natural earthquake in Roermond 1992), and not nearly close to the magnitude of some of the recent US shale gas induced earthquakes. The Richter scale is logarithmic and with its magnitude highlights the energy released. Everything below 3 on the Richter scale is hardly perceptible. That said, the actual experienced magnitude depends on multiple factors (energy released, wave speed, ground conditions, force, duration, depth, and so on), not all of which relate one on one to the earthquakes in Groningen. In particular, the minimal depth between 1 and 3 km, the ground conditions (clay, high ground water levels) and the fast speed of the ground waves mean that people experience them earlier than the Richter scale would indicate. Other complicating factors are the uncertainty within the Richter scale itself (+– 0.1) and the delay of about a year between the gas extraction and the earthquakes.

Not only because its magnitude and subsequent public attention made the *Grunnigers* start to protest in earnest (while allowing them a media platform), but also because it turned out to be the event that made officials acknowledge the need for a shift in their values. In this respect, the unsolicited report of the State Supervision of Mines (SSM) in response to the Huizinge earthquake [41] turned out especially important.

As the official supervisory body, the SSM is responsible to ensure that any mining activities in the Netherlands are in accordance with the mining law [42]. Even though the Huizinge earthquake fell below the maximum of 3.9 on the Richter scale that was calculated in earlier risk assessments, the SSM initiated a study in response to the growing unrest under the local population ([41]; see also [24] p. 66; [43]). In this unsolicited report, the SSM, until 2015 still part of the Ministry of Economic Affairs (and thus part of the gas-industrial complex), openly and strongly questions the constant adjustments and increases in the maximum magnitude that risk assessments have put forward since the early 1990s. The SSM combined this with earlier discussions on methodological uncertainties (see Section 6), and, for the first time, put these uncertainties upfront. Subsequently, it concluded that it is impossible to estimate a possible maximum magnitude for the induced earthquakes in Groningen, even going so far as to take a magnitude of 5.0 as a valid possibility. To prevent this, it advised the Minister of Economic Affairs to reduce the output of the Groningen gas field as quickly and drastically as possible.

The SSM's shift came as a surprise for the other parties within the gas-industrial complex ([24] p. 77) and its advice was not immediately accepted by the Ministry of Economic Affairs. Instead the Minister called for more research on the relation and effects of the earthquakes and the gas extraction (15 different studies in total, among them one on the minimal level needed to uphold security of supply, see: [44]). He did this, even though he acknowledged the chance for higher magnitude quakes and agreed with the NAM on a sum of 100 million euros for preventive construction measures [45–48]. The SSM report meanwhile influenced the sub-national Province of Groningen to initiate its own study, which repeated the main conclusions of the SSM and thereby confirmed the local concerns. The local population, in turn, used these reports in their protests [45,49].

Late 2013 the debate heated up once more following the range of reports requested by the Minister, which confirmed many of the concerns voiced up to that moment, as well as the news that 2013 turned out to be a record year [39,40,50–52]. This time the government heeded the concerns and decided on a range of issues. These included, among others, the organization of an open dialogue among all affected private and public parties [53]. The government also tasked the NAM to conduct a full-scale below ground survey (which was missing so far) and to reduce the extraction in the most effected clusters (while making up for the losses in other clusters). Simultaneously, it increased construction standards and preventive measures, while also improving the administrative procedures behind the compensation claims. And it offered the region an overall package to improve its economic and employment perspectives [54]. These measures were reinforced in the winter of 2014–2015, at which point the Minister of Economic Affairs initiated a first provisional cap on the total gas extraction from the Groningen field, which has since been extended [55,56].

4. Balancing security of supply, profits and the impacts of gasquakes

Even though the Ministry of Economic Affairs reduced production at specific clusters and initiated a cap on the total extracted volume, there remains a strong political debate about the installa-

tion of permanent extraction quotas. Currently, the safety concerns of the *Grunnigers* are acknowledged. However, the parties responsible for gas extraction are arguing that they are bound to produce whatever is needed in response to contractual and seasonal demand from the Dutch consumers and the European countries that have bought Groningen gas on long term contracts, and as such cannot limit themselves by installing a definite extraction cap [25,56].

For instance, in its 2013 reaction to the reports from the SSM and other institutes on the Huizinge Earthquake the ministry argued that:

In the near future, the Groningen gas extraction cannot be substituted by gas imports or other measures. A diminished availability of the Groningen natural gas will have serious consequences for the Dutch society and the societies in our surrounding countries ([46] p. 4).

Likewise in 2015, after the initial decision to cap the volume, the ministry stated that:

The consequences of long term gas extraction in Groningen have become increasingly clear in recent years. . . . Simultaneously, the gas extraction is of essential importance for the energy supply in the Netherlands. Both the mixture of the gas and the fact that the gas from Groningen, due to its size, can be used flexibly, makes that a reduction from the Groningen gas field could lead to problems with the heating of buildings or other usages. In addition, for multiple decades the gas extraction is an important source of income for the Dutch state ([57] p. 4).

This position has since been confirmed – but simultaneously limited – with a ruling from the highest administrative court in the Netherlands [58,59]. In its ruling, the court argued that in the assessment of the balance between the safety of the local population and security of supply (which the court defines as the low-calorific natural gas needed to comply with the demand for this type of gas) the Minister had not explained why he chose the demand from a harsh winter scenario that Gasunie Transport Services B.V. (GTS) calculated as the benchmark for the minimal supply needed [44]. As such, the court considered that the lowest minimal production was not 30 bn. Nm³ as favored by Economic Affairs, but that it should follow a more average scenario of 27 bn. Nm³ (with upward allowances for harsh winters).

This debate can be placed in an energy security context where the role of gas is already shifting for the Netherlands. Before the 1960s, the Dutch did not experience gas insecurity, simply because the level of gas consumption was minimal. Nowadays, the Netherlands is highly gas dependent, but not seen as gas insecure because most of its gas is extracted domestically. With the draining of the Groningen gas field and other Dutch natural gas reserves this is expected to change. In the near future, the Dutch will be gas insecure precisely because they have come to rely on it. Similarly, while the Netherlands is one of the least dependent European countries on Russian gas, it does import Russian gas and expects to increase its imports in the future to balance the reduction (and capping) of its emptying domestic fields – negatively influencing its security of supply position. To counter this position in the post-gas era, the Dutch state has launched an ambitious strategy to become the “gas roundabout” of North-Western Europe, combining its central position and the empty gas fields as its natural storage facilities [60]. This gas roundabout idea aims to profit from the material (empty gas fields, pipelines and pumping and conversion capacity), legal (national and European long-term contract law and other regulations) and social (knowledgeable and influential gas elites) infrastructure that supports current gas extraction practices.

It is especially the latter social framework and the practices resulting from it that the Dutch Safety Board describes as encumbering the incorporation of the everyday safety of individual citizens in the gas extraction decisions. The board describes the everyday decision-making of these organizations as driven by three main paradigms: (1) maximum profits and winnings, (2) an optimal and strategic use of the natural resources, and (3) a continuity of Dutch gas supplies for both citizens and industry ([24] pp. 70–71; comparable: [51] p. 4). All three are captured in the 1974 *small fields policy* that replaced the initial unstructured pumping of gas in the early 1960s with a more strategic and economic long term vision, based on an optimal development of new small gas fields by giving those fields priority on the Dutch gas market while using the Groningen field more sparingly as a swing field to fulfill the rest of demand [61]. In addition, the board also concludes that ‘all efforts within the gas-industrial complex are aimed towards an imperceptible extraction of natural gas’ ([24] p. 74). Together these four maxims for a long time structured the everyday practices within the gas-industrial complex towards the Groningen natural gas field. Importantly, they exclude the safety and insecurity concerns of the locals, except as a condition to be met for the other goals ([24] p. 71; [62]). This, in turn, preconditioned the initial response from the organizations to claims of insecurity by locals, and it explains why these responses, for a long time, have been soothing instead of informative and why they only followed the scientific updates of the magnitude – without repeating the mentioned uncertainties and knowledge gaps ([24] pp. 81–82, 86).

Up until the debate following the SSM report, the gasquakes were considered an externality of the gas extraction, to be paid off through damage payments. Security of supply arguments simply meant business as usual and an optimal utilization of the Dutch gas fields. With the SSM report and the increasing pressure of the Gruningers, media and other parties (like local governments, safety regions, environmental groupings, and so on), the discussion for the gas-industrial complex shifted to more extensive compensatory measures and mitigation practices, while opening up the question when precisely the Netherlands would be gas secure? Looking back, the gasquake protests and subsequent shift from the SSM and other knowledge institutes forced the government to look closer at its understanding of security of supply. In doing so, it renewed its security of supply considerations that structure the energy debates in the Netherlands, but this time interpreted it no longer in economic or strategic terms, but in terms of a minimal gas extraction. The minimal extraction that is required to fulfill expected demand within the current sociotechnical gas infrastructure including the technical capacity to deliver this through alternative means.

5. Calling on safety concerns and scientific uncertainty to securitize the gasquakes

The local inhabitants above the Groningen gas field do not primarily deal with energy security concerns, contractual obligations and other risk assessments. Instead, they deal with a steady increase in frequency and magnitude of induced earthquakes caused by the natural gas extraction, a reluctant acknowledgement of the causality between extraction, quakes and damages, the difficulties in getting their direct and indirect earthquake damages reimbursed, decreasing house prices, a soothing communication by the gas-industrial complex and the perceived unequal distribution of the gas benefits ([63–65], [66] pp. 7–9). These grievances and concerns are being voiced through media channels, legal procedures and letters of complaint to official institutions both regionally (like the safety region of Groningen and municipalities which in turn also started to petition) and nationally (the SSM, parliament, the Minister of Economic Affairs, and other regulatory and polit-

ical institutions). In addition, the street protests grew in number and size to gatherings of hundreds of people late 2014 [67]. These protests mainly focused on three claims. First, an overall demand for more attention and acceptance of the urgency of their problems with banners like ‘Groningen a ticking time bomb’ [68]. Second, especially later in the debate, showcasing their distrust towards the gas-industrial complex and in particular the NAM and the Minister of Economic Affairs with banners like ‘Groningen tremors, but The Hague will quiver’ [69]. And of course, the need to prevent further gasquakes by calling for a reduction of gas extraction, with banners reading ‘Kamp Gas Terug Nu’, calling on Kamp, the minister of Economic Affairs, to take his foot of the gas throttle [70].

Obviously, some Gruningers have been aware of the gasquakes since the early 1990s and have tried to make themselves heard over time, either as individuals (see [71] on Van der Sluis; or more recent [72]) or through well-organized associations like the Groninger Ground Movement [63,73] or the more activist Shocking Groningen [74]. Looking back earlier into the debate it is illustrative that it took 7 years and a large interdisciplinary study after the first earthquake in 1986 for the government and the NAM to officially acknowledge that the quakes were directly linked to the gas extraction [75]. Until that study in 1993, the NAM ridiculed any claims from individuals and organizations that proposed such a link [71]. Once recognized, it took another 20 years for the official parties to start taking the risks and potential consequences of these induced earthquakes serious enough to adapt their extraction volumes. In those 20 years, every couple of years NAM, government and knowledge institutes have been forced to increase their estimates on the frequency and magnitude of potential quakes.

This eventful material reality and the decades of uncertain knowledge claims that accompany it (only reinforced by the slow response and delaying tactics of the gas-industrial complex since the Huizinge earthquake [76]) have led to feelings of insecurity and distrust [66]. That it took until 2013 for the uncertainty behind the earthquakes to become widespread public knowledge, can be explained, so the argument goes, by the idea that the Gruningers were loyal and felt a sense of pride for helping the country to develop as whole ([45] p. 21). Something that slowly changed in time with the constant adjustment of the risk analyses and maximum magnitude of the earthquakes. In their search for answers, ever more people started to read the actual reports. They called on the uncertainty itself – in depth – in their letters of complaint to official institutions, for example to parliament (see [77]). The SSM report can be described as a turning point in this respect as well, as it not only informed the gas-industrial complex on the uncertainty in the analyses used so far, but also supported and legitimized earlier readings of the Gruningers. As Van der Voort & Vanclay argue: ‘[t]he publication of the SSM report was an impact in itself with people becoming more anxious about what will happen to them (2015, p. 8).’ With the report and the media attention following it, a broader group of people learned that there was no certainty in store for them. What is more, the subsequent decision of the Minister of Economic Affairs to not directly follow the advice from the SSM gave the local population further ammunition and a clear focus for their grievances.

One of the largest and most organized interest groups is the GBB, which is actively lobbying, securitizing and litigating against the gas-industrial complex. In terms of security of supply, the GBB has constantly maintained that ‘the extraction is reduced or halted until independent research shows at what level extraction can take place safely and securely ([78] p. 4).’ More important, ‘if “safe extraction” is technical impossible, the GBB demands a total halt to the gas extraction ([63] p. 1)’. The GBB, together with other interested parties, made this tangible in their appeal to the highest administrative court in the Netherlands [79]. Building on their earlier call that the Minister was not acting, here they argued that Economic Affairs had

not sufficiently substantiated the decision to cap the gas extraction. It based its decisions on the certainties it had (the budgetary necessity of the gas benefits and security of supply), as opposed to the many uncertainties that accompany the gas extraction ([62] p. 7). During the hearing, they called for a preferred reduction to 12 bn. Nm³, which the SSM in 2013 argued was a safe extraction level [43], only accepting 21 bn. Nm³ if practical circumstances (read minimal security of supply and international contractual obligations) dictated otherwise in line with the bottom bandwidth of the GTS [44] report. Although they were unhappy with the legal ruling which confirmed the prevalence of security of supply concerns and set the level at 27 bn. Nm³ [80], the second options shows that the GBB is forced to accept security of supply as a primary consideration in the debate. In other words, while the local population does not primarily discuss the gasquakes in terms of security of supply, the governments' security of supply considerations are a constant absent presence in their claims for recognition, safety and a reduction of natural gas extraction.

6. The politics behind the gasquake science

Behind the debate on the minimal extraction volume, lies the lack of knowledge over the tremors; both in terms of the availability of seismographs to actually monitor them and in terms of the uncertainty of the scientific models that are used to analyze and predict the gasquakes. In this respect, the Groningen gas debate shows (1) that what is not monitored and measured cannot be known, (2) that researchers had little incentives to work on the uncertainties in their models, especially (3) when the institutions using and sponsoring the results are happy with the outcomes. For the argument of this paper, the debate shows that the decision to monitor is just as political as the decision to cap the extraction. Meaning that these decisions are heavily influenced by the interests and (energy) security positions of the parties involved, while simultaneously the parties feel justified in their positions by the subsequent outcomes of the studies.

The only reason why the 1986 earthquake near Assen, a town just below the Province of Groningen with its own small gas field, was identified as an earthquake, contrary to other orally reported "air" tremors [65], was because it was strong enough to be picked up by the sensors of the Royal Netherlands Meteorological Institution (KNMI) in the middle of the country. One of the main results of the debate that followed was that the Dutch Parliament influenced the Minister of Economic Affairs to order the KNMI – for which the earthquake was unexplainable as it lacked any data – to install a number of seismographs around the Assen field in 1989 and around the Groningen field in 1992 [45,64,65,81]. This brings up the question whether the start of Fig. 1 resulted from the first true Groninger gasquake or was actually a result of the capacity to monitor them.

Either way, new waves of attention and research followed, among others in 1993, 1995, 1997, 2000, 2003, 2004, 2006 and 2009 due to both earthquakes and regulatory changes. Of these, 2004 is of interest on two accounts. First, because the NAM for the first time publicly acknowledged that the maximum magnitude could be corrected if necessary, thereby implying that these cannot be estimated upfront. And second, because the 2004 KNMI report not only increased the maximum magnitude to 3.9 after an update of its database, but also acknowledged that it was using static models for a situation that was not static (as the earthquakes result from shifting levels of gas extraction). However, it stated that it simply lacked the tools and sub-surface information to cope with the fluctuating gas extraction and its relation with the induced earthquakes ([82]; see also [83]; for a similar study after the Huizinge earthquake; or the [75] report for a predecessor).

It took until the Huizinge earthquake and the report by the SSM for the number of studies to increase dramatically (as did the number of seismographs and thereby the number of previously undetected gasquakes). Many of these reports were commissioned as part of the large interdisciplinary study on the gas chain by the Ministry of Economic Affairs, which was receiving conflicting advice from the parties involved. Before 2013, Economic Affairs relied on the reports of the KNMI and other knowledge institutes and it expected these reports to be paid for by the NAM after its legal obligation to take the necessary safety precautions. However, as the Dutch Safety Board concludes, the NAM, as the exploiter most knowledgeable of the gas fields, welcomed the results from these reports that the earthquakes would only have a minimum impact and hence saw no cause to order additional studies on the uncertainties mentioned in the reports ([24] pp. 65–66). It also took the semi-independent SSM until 2012 to put forward the uncertainties behind the scientific models and risk assessments.

With the NAM unwilling to study the scientific uncertainties, the Ministry passively relying on advice and the SSM (and other expert councils) confirming the official reports, there was little incentive for the KNMI and other knowledge institutes to build alternative models. They tried, in part by looking at international research, but then quickly ran in to the unique material qualities of the Groningen gas field (see note 3; [24] p. 64). What remained were the static models and their outcomes, which 'focused on the number, the estimated maximum magnitude ([24] p. 63).' In the end, this focus on the number worked both ways. It simplified matters for the gas-industrial complex as it constantly reinforced their position that the gasquakes did not pose a safety concern, but over time also fueled the distrust and uncertainty of the Gruningers for whom the message not to worry contrasted with the constant adjustments and their experience of the actual earthquakes. The 2013 SSM report in this sense is interesting as it shows the importance of reflexivity within an energy security and safety debate, in particular the acknowledgement that security of supply still needs a value judgement. Clearly, the Gruningers with their focus on safety (and their search for answers) judged this threshold differently than the gas-industrial complex that looked at the balance between costs, profits, legal obligations and security of supply.

7. Reflection

The Groningen gasquake debate offers an example of a security debate in a developed country that puts security of supply considerations in the context of human security arguments. The analysis builds on the interaction between three lines of enquiry. First, it takes seriously the material reality of the earthquakes, their impacts, but also the gas field itself and the infrastructure around it, which keeps the debate localized (no earthquakes outside Groningen) and situated in a Northern-European market through its pipelines at the same time. Second, it highlights the politics over these earthquakes in terms of their origin and their potential impact, as well as the knowledge politics related to the scientific uncertainty of the models behind the earthquakes and their future trends. Third, it illustrates the struggle by the Gruningers to attribute a sense of urgency to both the materiality of the earthquakes and their future uncertainty. While successful, the above also shows that the local population could not escape the assessments of the gas-industrial complex.

In fact, in order to break with the conservative force stemming from an unreflective use of security of supply and in order to increase the audience acceptance of their safety claim, the local population needed, firstly (and ironically), the frequency and magnitude of the earthquakes as well as the visibility of their impact. Secondly, they helped speed this up by focusing on the scientific

uncertainties in the reports, slowly convincing neighbors and local authorities and then media, semi-regulatory institutions, and so on. Thirdly, once the SSM accepted the claim and published the report that legitimized the safety claim, the focus shifted to the decisions of the Minister of Economic Affairs. Initially the decision not to act, thereafter to the decision about the level at which the natural gas extraction was capped. That said, while deciding to wait, the minister did already demand the report from the GTS on the minimal security of supply levels indicating an early acceptance to review the Dutch security of supply position.

In reflection, this illustration highlights the importance of a contextual understanding of security of supply. Throughout the debate, the gas-industrial complex slowly increased its willingness to accept and compensate for the consequences of the gas extraction. It was not until it had compromised on all most all aspects of the gas supply chain that it was willing to consider a closer look at the meaning of security of supply and reduce the extracted volume for safety concerns. Similarly, the case shows that while the Groningers call for a further reduction, they ultimately take a pragmatic legal stance towards a minimum extraction volume based on security of supply considerations. The debate thus centered on the meaning of security of supply as it relates to the low calorific natural gas of the Groningen gas field, the estimated demand and the available technical capacity to substitute the Groningen gas. From a security perspective, however, the local population through their resistance against the gas extraction practices helped reify the principle of security of supply. Even though their concerns fit a potential wider understanding of human energy security, they never really successfully questioned the security of supply principles behind the decision-making processes. Consequently, security of supply has been reproduced while it structured the debate by setting the outermost boundaries of acceptable actions and reductions. That said, it has not been reproduced the same: the gasquakes have challenged the Dutch notion of security of supply, with natural gas no longer seen as a silent and bountiful resource but as a necessity to which the country is addicted.

From this we can draw three lessons. First, the need to study the use of security and threat images in their wider context. This should include the sociotechnical energy infrastructure, material causal events, and especially how security practices relate to other knowledge practices that are used to make sense of these events. Second, besides the insight that people who use security language are morally responsible for the distinctions they make, the agenda setting power they exert and the resources that are drawn from other options, there is the lesson that security is simultaneously about urgency and conservation. It is about protecting and conserving a certain situation, except that it always fails as security changes things itself. Protecting the existing gas extraction volumes had clear impacts, just as arguing for the safety and living standards had an impact on the actual gas extraction. Security is never static and the search for the definition of what energy security is can therefore only be described as an active political intervention itself. Energy security scholars should be aware of this and not only study “new” security threats or categorize old ones, but explicitly focus on existing energy security practices, their distinctions and the constant renegotiation and hard work that keep them stable.

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