Gas production – case study

Introduction

This case study provides the Dutch National Council of R&Dialogue evidence based input on the role of dialogue in energy implementation projects. Not only gas production in Groningen is investigated; five other case studies are developed, namely: 1) carbon capture and storage in Barendrecht, 2) gas storage near Bergermeer, 3) wind offshore near Noordwijk/Zandvoort, 4) shale gas in Boxtel and 5) local energy cooperation's and their developments.

This case study presents the process and dialogue in the gas exploration and production and direct consequences in the form of earthquakes and damages in Groningen. The objective of this case study is to research the impact of dialogue and process on energy policy and project implementation. Investigated are the implications of this case study on future dialogue and public support for the energy technology of gas production. This is based on stakeholder interviews and analysis, desk research on policy and company documentation, laws and procedures.

First, a short overview of Dutch gas policy and impact of gas exploration and production on Dutch economy is shown. Subsequently, a short historic overview is presented of gas exploration and production in the Netherlands. This leads to a focus on the consequences of gas production for the province of Groningen in terms of earthquakes and vibrations, damages to houses, devaluating house prices etc. and the dialogue that comes along with this. This leads to conclusions and recommendations on the role of dialogue on gas production and the consequences this can have on society.

The history of gas

Coal was the primary energy source before the discovery of gas. Coal was gasified in local gas plants, called town gas. This town gas was distributed on a small scale, mostly at municipal level, and used for heating and cooking devices. Due to the growing society and innovations in the gas sector, gas distribution and usage increased. The benefits of gas is that town gas plants compared to coal plants need less workforce, have smaller relative production costs, attract gas using industry and facilitate higher economic growth, export revenues and a higher production volume is attainable. Local town gas plants emerged, making it possible for Dutch people to use cooking devises and heating.

With the first discovery of an onshore oil well in Schoonebeek in 1947 and gas in Coevorden in 1948, oil and gas exploitation started. The Dutch government decided to switch from coal to gas after the discovery of the Slochteren field in 1959. The discovery of gas provided the NAM (Nederlandse Aardolie Maatschappij B.V. – 50% Shell, 50% ExxonMobil) a concession to drill and exploit the gas. In1963 Gasunie is founded, being responsible for the transport of gas through the Netherland. NAM was obliged to sell gas to Gasunie, fully controlled and owned by the Ministry of Finance. This was the first government imposed energy transition in the Netherlands, than already in a very industrial development phase. [1] [2] [3] [4]

In 1965 the decision was made to close Dutch coal mines. The last coal mine was shut down in 1974. The coal mines were shut down by the government for the following reasons: [5]

- The production costs of gas were lower than those for coal.
- The Dutch gas reserves were much higher than the Dutch coal reserves.

[1] www.nam.nl
[2] Joep Schenk – Groningen-gasveld vijftig jaar
[3] R&Dialogue 2014 – The Dutch energy sector – an overview.
[4] http://www.dwarshuis.com/aardbevingen-groningen/gronings-gas/
[5] Eerste Mijnnota – 3 maart 1966 Kamerstukken II 1965/66 8424

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This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 288980

- The gas production rate was far higher than the coal production rate.

Slochteren is, with almost 3,000 billion m^3 the biggest gas reservoir in Europe and one of the ten biggest gas reservoirs in the world. A small group of people designed the gas grid and the governance structure for the gas value chain. In 1995, the Netherlands made its first move to take part in the liberalisation process and was one of the first European countries to start unbundling the gas and electricity sectors. The unbundling meant a separation of transport and production. The ministry of Finance is 100% shareholder in Gasunie. The Slochteren field is operated by the Maatschap Groningen – owned for 60% by NAM and 40% by EBN (Dutch gas and oil exploration, production, storage and trading company - owned by Ministry of Economic Affairs and has a 40% to 50% equity stake in every exploration and production project in the Netherlands). Gasterra, with as shareholders the Ministry of Economic Affairs (10%), EBN (40%) and Shell and ExxonMobil (both 25%), is responsible for the gas sales. [6] [7]

Gas policy

Dutch government considers gas a transition fuel towards reaching the climate and energy goals for 2020 (20% CO_2-reduction, 20% energy savings, 14% renewables in the mix) and 2050 (80-95% CO_2-reduction). [8] With the Slochteren gas field, gas serves as an important source for energy supply (mainly heat, electricity and feedstock for the industry). Dutch gas policy focusses on small field policy. The large Slochteren field is used as swing producer and small fields operate at maximum production, this towards the development of a gas roundabout, a strategy focussing on the Netherlands as gas hub (in import, export and production) for Northwest Europe. [9] [10] [11]

It is expected that the gas production from the Slochteren field declines within the next 10 to 25 years and that from 2030 onwards, the Netherlands will be a nett importer of natural gas in a business-as-usual scenario. EBN has the ambition to maintain 30 billion m^3 gas production on a yearly basis untll 2030 to fulfil the gas demand till 2030 and beyond. [12] Due to gas production the Netherlands can benefit from own resources and increase trade, creating independence from gas import and usage and expand the knowledge, expertise and experience in the field of gas of Dutch professionals. This is important considering the strong fluctuating gas prices worldwide and its effects on industries, mostly due to cheaper shale gas from the United States. It is expected that regional dependence on gas will increase in future times. The unrest between Russia and Ukraine create more attention towards European independence of Russian gas, not directly affecting the Dutch market due to own production, but will in future time. Especially considering the consequences of gas production in Groningen and the choices that are and have to be made. [13] [14] [15]

The importance of gas

Gas is an important source for heat in buildings, in the energy-intensive industry and electricity. With own production from Slochteren and smaller fields, the gas production fulfils Dutch own demand and provides the opportunity to trade and export gas on the European market, as shown in the chart below.

[6] http://www.ebn.nl/SamenwerkingenEnProjecten/productie/Paginas/Groningen.aspx
[7] http://www.gasterra.nl/over-gasterra/aandeelhouders
[8] http://www.energieakkoordser.nl/energieakkoord.aspx
[9] http://www.nlog.nl/resources/Publicaties/Energierapport2005.pdf
[10] http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2008/06/18/energierapport-2008.html
[11] http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2011/06/10/energierapport-2011.html
[12] http://www.ebn.nl/Actueel/Documents/ebn_focus_on_dutch_gas_2012.pdf
[13] ECN
[14] TNO
[15] http://www.ebn.nl/OverEBN/Paginas/Rol-in-de-olie--en-gassector.aspx

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Gas in the Netherlands

Gas in million m^3	2000	2005	2010	2011	2012
Supply# in the Netherlands	46,346	46,770	52,024	45,426	43,626
Production# in the Netherlands	69,180	74,460	83,944	76,429	76,020
Import of gas	16,500	21,747	24,408	21,812	23,769
Import of LNG	-	-	-	-	961
Export of gas	39,329	49,445	56,433	52,945	57,263
Stock*	-5	8	-19	-2	-115
Total usage in the Netherlands	46,346	46,770	52,024	45,426	43,626

Source: CBS 2013

supply is the primary gas available for usage in the Netherlands and production is the gas that comes from Dutch reservoirs - both onshore as offshore reservoirs.

* positive means decrease in stocks, negative means increase in stocks

Gas and the economy

The impact of gas for the Dutch economy is significant since gas revenues and gas trade are an important source of income for Dutch state. The relatively large energy-intensive industry benefits from the gas production and supply. International developments (the discovery of shale gas in the United States and the changes in their internal market) caused price differences for coal, exported for lower prices to the European market. This is one of the many factors that causes non-profitable business cases for gas power plants. Other factors are, decreasing power demand due to the recession, higher operation costs for gas power plants compared to coal power plants, excess supply of wind and solar power, and that a significant number of long term European gas contracts are linked to oil prices and finally the low price for CO_2 in the EU-ETS. [16]

The economic and financial interests in gas production is high and gas revenues are not directly invested in the region. According to research, the Economic Structure Enhancing Fund ((FES) Fonds Economische Structuurversterking) led to investment in the Randstad region instead of the Northern part of the Netherlands, where the gas is produced, which profited with 1% of the total means. After the abolishment of the FES, the gas revenues flowed directly into general government budget. [17] Gas is important for the Dutch economy, gas revenues contribute to Dutch economy with approximately €12 billion on yearly basis and a significant share in GDP, as shown in the chart below and figure below. Recently, Dutch politics agreed on a 'future fund' wherein gas revenues are deposited. [18]

Gas revenues and its percentage of GDP

Billion €	2000	2005	2010	*2011
Gas revenues	4,490	7,579	10,670	12,391
GDP	480,825	513,407	549,265	554,543
% of GDP	1.07 %	1.47 %	1.81 %	2.05 %

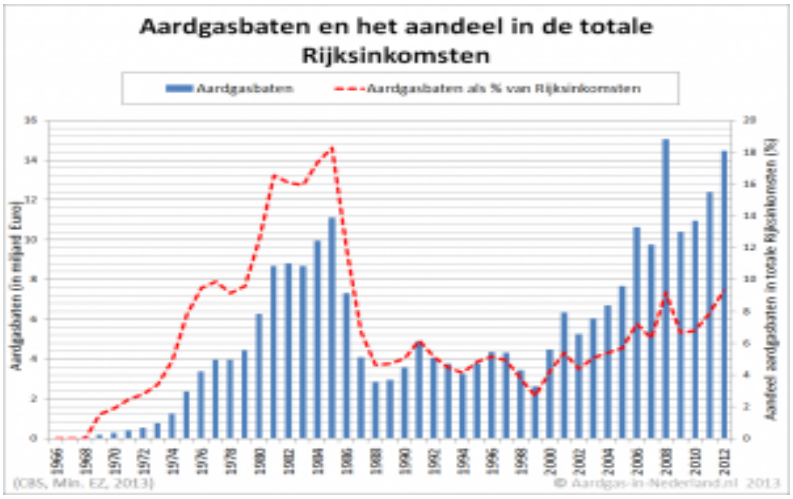
Source CBS 2014

* provisional data

[16] Emissions Trading System – system for trading greenhouse gas emission allowances with a 'cap and trade' principle for more than 11,000 power stations, industrial plants and airlines (only European flights) in 31 countries (EU28 and Iceland, Liechtenstein, Norway).

[17] IOO 2006 - Quick scan regionale verdeling FES-toezeggingen'

[18] http://nos.nl/artikel/665700-geld-aardgas-in-toekomstfonds.html



Source: Initiatief Aardgas in Nederland

SER National Energy Agreement

The SER National Energy Agreement stresses a role of gas in the future of the Netherlands. In the field of gas, the Netherlands is at the top of the world league in term of knowledge, expertise and experience and gas can play a role in the transition towards a sustainable energy supply. Gas is considered a transition fuel – as biogas or 'green' gas, emissions are lower than of coal and by changes in the rules and regulations concerning gas, sustainable development is promoted. [19]

The project – gas production in Groningen [20]

The gas production in Groningen started in 1963 and was perceived rather positive since it brought employment, long-term state incomes, independence of foreign energy sources and a broad own gas network to export gas. It was seen as a revolution away from coal. Local support and compensation measure are provided in an early stage by Shell and ExxonMobil in terms of support social, cultural and sports activities. Subsidence was never considered an option or risk in the beginning. It was expected that subsidence only occurred at shallow soils. First research to possible development of the soil conducted in 1973, wherein it was predicted that by 2050 100 cm subsidence could occur. Later was decided to conduct recurrent research on the development of the soil to develop models and create reports.

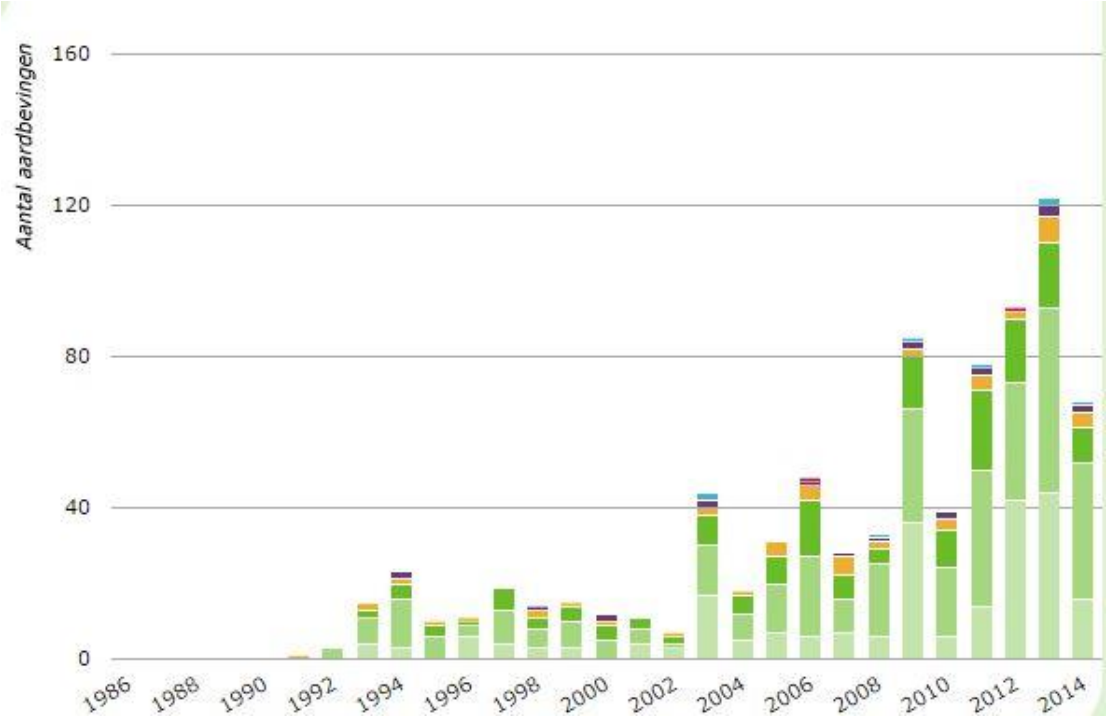
In 1983, the province of Groningen, national government and NAM agreed on a Committee on Subsidence discussing measures on how to deal with the effects of subsidence, and measures to prevent them from happening at all. Agreed is that, based on prices set in 1980 NAM will compensate subsidence up to € 25.5 million for government property and its successors like Groningen Seaports.

The first vibrations were felt in 1986 near Assen. As a response to that, NAM confirms the theoretical possibility for vibrations due to gas production. Research by Massachusetts Institute of Technology (MIT) is conducted in 1990 and concludes that an earthquake of force 3 on Richter scale near Slochteren is to be expected. Over the years, more vibrations were felt, in 1997 the second earthquakes was felt in Roswinkel and in 2006 near Middelstum. Since 1986, KNMI registered around 1000 earthquakes in the northern part of the Netherlands with a maximum magnitude of 3.6 Richter scale,

[19] http://www.energieakkoordser.nl/energieakkoord.aspx

[20] Based on interviews with Province Groningen, Staatstoezicht op de Mijnen, Groninger Bodembeweging, Gemeente Loppersum, NAM, RVO, Ministry of Economic Affairs, Gasterra, Gasunie, TNO, Energy Valley, Energy Delta Institute,

most vibrations are not felt by people. The area around the gas production is monitored and investigated since 1995. [21] [22] [23] [24] [25] [26] [27] [28] [29]



Source: NAM – number of earthquakes and its force – the darker the colour, the heavier the vibrations, up to 3.5 force on Richter scale [30]

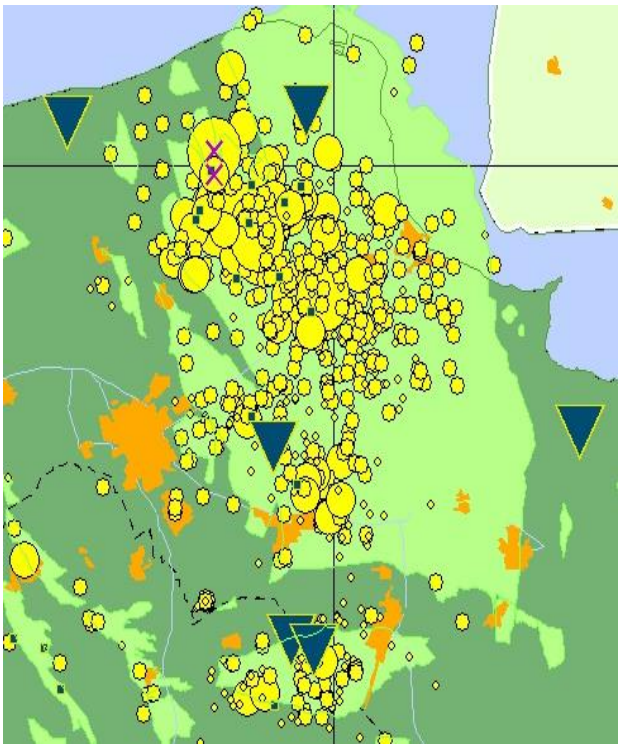
Recent unrest

Since the vibrations and earthquakes continued and intensified during the past decade, local unrest intensified too. The mean reason for the unrest is based on two outputs. In the first place, several research papers concluded that vibrations and earthquakes would not be intenser than force 4 on Richter scale. Second, the position of NAM due to the gas production is distrusted. NAM acknowledged the consequences of gas production later in the process. According to some interviewees, national government policy plans developed in 2006 focussed on the maximum gas production – limitation to gas production for two years 42.5 billion m^3 and a damage trust of €1.2 billion – was developed in 2006, but

[21] Geertsema, Van Opstal 1973 - A numerical technique for predicting subsidende above compacting reservoirs, based on the nucleus of straín concept . Verhandelingen van het Koninklijk Nederlands geologisch mijnbouwkundig Genootschap.
[22] Waal 1986 - On the rate type compaction behaviour of sandstone reservoir rock.
[23] http://www.commissiebodemdaling.nl/
[24] http://www.sodm.nl/sites/default/files/redactie/ep_90-2043_-_subsidence_at_the_groningen_gas_field_the_netherlands%20_an_evaluation_of_the_subsidence_program_directed_by_nam.pdf
[25] http://www.groninger-bodem-beweging.nl/index.php/historie-tgv-gaswinning
[26] http://www.noorderbreedte.nl/pdf/91404.pdf
[27] http://www.mijnbouwgroningen.nl/
[28] http://www.knmi.nl/cms/content/25198/relatie_tussen_gaswinning_en_aardbevingen
[29] http://www.knmi.nl/cms/content/22993/aardbevingen_door_gaswinning_in_noord-nederland
[30] http://feitenencijfers.namplatform.nl/aardbevingen/

only came into practise till 2014. Some interviewees mention that they understand that science and research can make mistakes, but do not understand the position NAM takes in not take responsibility for the earthquakes. Putting up with the consequences of gas production and the intensified effects – more frequent and more forceful vibrations / earthquakes has reached its limits.

In May 2013, the Province of Groningen appoints a committee to give independent advise on structural measures with regard to compensation of the declining image of gas production and the risks for more severe earthquakes. The committee is led by Wim Meijer, former state secretary and royal commissonar of the province of Drenthe. The goals of the committee are to restore trust between the different stakeholders, secure a sustainable economic future for the area, improve quality of the environment and attractiveness of the area and restore the sense of security in the area.[31] [32]



Source: KNMI – yellow dots are earthquakes, green triangles are seismic stations.

The damage comes down to cracks in concrete, foundations and piles, stucco that is damaged and subsidence of houses that cause devaluation of house prices. NAM started to organise the valuation and payment of the damage. After an earthquake a so-called quality expert valuates the damage, after real estate owners filled in the accident report on NAM's website. Besides that, NAM organises living room meetings (*keukentafelgesprekken*) with locals. These activities have two effects, one is that it takes a long time for NAM to value the damage. It can take up a few months before a quality experts measures the damage. Based on this a valuation and offer is drafted that can take two months too. The persons

[31] http://www.provinciegroningen.nl/fileadmin/user_upload/Documenten/Persberichten/2013-05-23_Persbericht_Instelling_commissie_onder_leiding_van_Wim_Meijer.pdf
[32] http://www.provinciegroningen.nl/fileadmin/user_upload/Documenten/Downloads/Eindadvies_Commissie_Duurzame_Toekomst_Noord-Oost_Groningen.pdf

with casualties can apply for a contra expertise. All in all, this process takes more than 8 months before the damage is fixed. Some interviewees mention, that the attitude of NAM is distrusted. Their actions, and in the perceptions of the interviewees the actions of Shell, is perceived a little too late and is an easy way to control the situation with the least commitment. Besides that, the emotional consequences of the vibrations and earthquakes, the feeling of unsafety, risks that can be higher than only cracks in concrete and foundations, the insecurity round the consequences of earthquakes is underappreciated. [33] [34] [35] Furthermore, it is perceived that national interests are more important than local interests and consequences. The argument is that NAM and national government wants to achieve profit maximisation above local interests, as if the local community should be very happy that a trust is implemented. Politics and media support the perception that national interests are more important.

In January 2014, when the Minister of Economic Affairs Kamp went to Groningen for a press conference the emotions ran high and protests occurred because parts of the local community does not feel heard and considers governments measures as a drop in the ocean.

Not one interviewee is against gas production in the area or perceives projects developers in gas as wrongdoers. They stress that the gas production dialogue needs to be open, honest and put safety as a main topic above macro benefits.

Political process

The topic is heavily debated in politics, at all levels. Due to the earthquakes, Dutch government has decided to limit gas production for the coming three years to 42.5 billion m^3 in 2014, 42.5 billion m^3 in 2015 and 40 billion m^3 in 2016. The gas production in the Loppersum area has to decrease by 80% in order to create risk reduction. In the annual report of SodM of 2011, it is requested to conduct research to the consequences of decreased gas production. NAM is legally the responsible party to investigate the circumstances and consequences of the earthquakes and damages. The Technical Committee Soil Movement (Technische Commissie Bodembeweging) advises in cases of disputes on the circumstances of the damage and the extent of the compensation. [36] [37]

Politically the consequences of gas production in terms of earthquakes and subsidence is acknowledged, even as that the consequences of a decreased gas production (20% less production leads to € 2.2 billion less state revenue (based on gas prices of January 2013)). Parallel to the investigations and research, the responsible minister Kamp visits Groningen occasionally. During this process, the Ministry of Economic Affairs together with decentral authorities, the Technical Committee Soil Movement and local interest groups are involved. An independent steering group ensures, monitors and analyses the investigations. [38] [39] [40]

[33] http://www.namplatform.nl/
[34] Based on interviews with Province Groningen, Staatstoezicht op de Mijnen, Groninger Bodembeweging, RVO, Ministry of Economic Affairs, Gasterra, Gasunie, TNO, Energy Valley, Energy Delta Institute,
[35] http://schokkend-groningen.nl/website/schokkend-groningen-nl
[36] http://www.sodm.nl/nieuws/2012/sodm-jaarverslag-2011-gepubliceerd
[37] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2012/09/24/beantwoording-kamervragen-over-aardschokken-in-noord-groningen.html
[38] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2013/01/25/kamerbrief-over-gaswinning-groningen-veld.html
[39] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2013/02/11/kamerbrief-over-gaswinning-groningen.html
[40] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2013/03/28/kamerbrief-over-gaswinning-uit-het-groningen-veld.html

In order to secure the damage claims by citizens, an Ombudsman is appointed (dhr. Leendert Klaassen). [41] [42] [43] [44] Due to the local and political unrest, the Ministry of Economic Affairs and local stakeholders present the report *Vertrouwen op herstel en herstel van vertrouwen,* wherein they reached an agreement on future steps regarding security, preventing damage to the built environment, improving quality of life, improving the economic perspective of the area and improving the claims processing. In order to have a dialogue with relevant stakeholders, a Dialogue Table is appointed with 15 partners discussing the effect and process of the agreement. The Dialogue Table tries to create co-ownership and co-responsibility for support of gas production and helps in finding adequate measures to deal with the consequences of gas production. [45] [46] In the meantime, Minister Kamp debates with Parliament on the consequences and future of gas production. Gas production is a sensitive and political topic, especially considering the positive effects of gas production for state income and the negative effects for local surrounding and community. Dutch parliament is highly involved in the discussion concerning gas production. [47] [48] [49] [50] [51] [52]

Dialogue [53]

When looking at the gas production developments in the Netherlands, we notice that some topics are of main importance for the role of dialogue and the implementation process. The main topic in the dialogue concerning gas production is trust, responsibility and national benefit versus local costs.

Macro versus micro dialogue

Gas production is in the interest of Dutch state and its citizens. It is proven to be a very important factor in state income and plays an important role in the energy security, affordability and sustainability of the Netherlands. The discussion on the impact of gas production is different at macro level – the level of Dutch government and parliament, compared with the discussion the local community has. The latter focuses on damage control, securing the local environment and deal with fears of the consequences of the earthquakes.

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[41] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/ombudsman-gaswinning-groningen
[42] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2013/04/17/kamerbrief-over-nadere-informatie-schadeafhandeling-groningen-gaswinning-en-aardbevingen.html
[43] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2013/08/22/brief-aand-e-tweede-kamer-aanbieding-onderzoeksresultaten-inzake-gaswinning-groningen.html
[44] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2013/09/02/kamerbrief-over-het-aardbevingsrisico-voor-bedrijven-in-de-eemsdelta.html
[45] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2014/01/17/vertrouwen-op-herstel-en-herstel-van-vertrouwen.html
[46] http://www.dialoogtafelgroningen.nl/
[47] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2014/02/05/kamerbrief-berekening-effecten-productiescenario-s-gaswinning-groningen.html
[48] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2014/06/23/beantwoording-kamervragen-over-ingestorte-boerderij-bedum.html
[49] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2014/06/30/beantwoording-kamervragen-over-berichten-aardschokken-ook-een-kans-en-laat-het-werk-niet-weglopen.html
[50] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2014/10/07/kamerbrief-waardeontwikkeling-woningen-groningen.html
[51] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2014/01/17/vertrouwen-op-herstel-en-herstel-van-vertrouwen.html
[52] http://www.rijksoverheid.nl/onderwerpen/aardbevingen-in-groningen/documenten-en-publicaties/kamerstukken/2014/05/07/kamerbrief-stand-van-zaken-gaswinning-groningen.html
[53] Based on interviews with Staatstoezicht op de Mijnen, Groninger Bodembeweging, RVO, Ministry of Economic Affairs, Gasterra, Gasunie, TNO, Energy Valley, Energy Delta Institute,

Over the years, the learning curves shows that having a dialogue between relevant stakeholders from all levels can be very useful. For example, NGOs supported gas production in the Waddenzee after being involved in the dialogue and decision-making process. It is mentioned by the interviewees, that it is important that this dialogue is not held in media but between the relevant stakeholders. This provides a more open and transparent dialogue, contrary to a dialogue held in media that is more reluctant to polarise.

Gas is a highly politicised topic due to its importance for Dutch state income. The relatively late recognition of causality between gas production and subsidence and earthquakes distorted the relationship between local stakeholders and national stakeholders. In an interview, it was mentioned that all stakeholders should 'practise what you / they preach' in order to restore trust. Due to the politicization of the topic it is very difficult to have an open and transparent dialogue. Political relations, at all levels, play a role in the dialogue as some parties argue that the political interests of gas is of main importance for Dutch state that this is prior to local consequences.

Costs versus benefits
It is obvious that the local impact and costs of gas production is high and national / communal level profits from the benefits of gas production. Now the consequences of gas production affect the local community in an unexpected and negative way, some interviewees argue that the local community should benefit more and better from gas production. If it is in the general interest to keep the quality of life at a high level, the region is expected to stay attractive. Silicon Valley in the United States is seen as an example of an area that is highly challenging for earthquakes and offers a high quality of life, improving the local economy. It was mentioned that this can be an exemplary for Groningen.

It is said in interviews, that national government and the project developer should be open and transparent in the profit and benefits of gas production for the Netherlands. Together with this openness create scenarios on the future of gas production and the considerations that have to be made, taken into account different interests. According to the interviews, local community is not against gas production, but want to have the certainty of a safe and secure environment.

Communication
According to the interviews, national government and NAM took their part in the dialogue rather late. By most interviewees, they are considered the appointed to initiate the dialogue, listen to concerns and problems and discuss solutions with involved stakeholders. A proactive attitude is considered better than a reactive position. The position of national government and NAM is slowly changing due to their efforts in organising a dialogue. Another argument is that the stakeholders should 'practise what they preach' both in fulfilling promises and in their communication. It is argued that gas production is a highly politicized topic wherein political relations can lead to different outcomes of the originally promised. This accounts for all levels of government and departments within authorities.

The communication of not seemingly responsible parties e.g. SodM caused friction and activated the protests. Some organisations take responsibility because no one else does and take a position they don't have or should not have. Another aspect of communication is that project developers are rather cautious in their communication afraid of loss of reputation. Their cautiousness is perceived by some parties as non-transparent, keeping other stakeholders deliberately ignorant and not taking concerns and protests seriously. Subsequently, this leads to a lack of trust.

Trust
According to the interviews, the responsible parties have not taken their role and responsibility in the beginning of the local unrest and obvious consequences of gas production. Admitting in a later stadium that gas production (could) cause subsidence and earthquakes and damages the built environment

came for some too little, too late. This causes a lack of trust in a partner in that society that always had a good image and working relationship. It was said in an interview that NAM does not take the problems and concerns at local level serious because they profit too much from it. This causes a declining reputation and disruptive relationship between a party responsible for gas production and the local community.

It is also stated in the interviews that the bigger picture of gas production is missing in the dialogue and therefore the discussion and concerns are too much out of context. The framework wherein gas production should be placed focusses on its importance for Dutch energy sector, industry and households, the role of trade with foreign sources, the impact on state income and subsequently its impact on all Dutch citizens.

Due to the political relation of gas production, the role and function at all levels of authorities is confronted with a lack of trust. Parties are not trusted in their communication because the political consequences and stakes of gas production are too high. One interview said that not one political party wants to admit that the Netherlands has rather gas production at the costs and consequences of citizens in Groningen because it would cost them votes. This show that the dialogue is easily pulled into a political discussion. In the interviews, it is said that municipalities are the optimal stakeholder to have a dialogue with the local community and other involved stakeholders. Most interviewees are fairly happy with the development of the Dialogue Table, its members and the topics they discuss. One interviewee mentioned it a good way forward.

Conclusion

Gas production and the local consequences will stay a topic of discussion in the future. According to interviewees and several documentation, an image on and over dialogue is hard to retrieve because dialogue on gas production is very political and has direct and indirect, open and closed interests. This case study revealed that certain issues could and should be dealt with differently in order to be more successful in the future. When focussing on dialogue, this case study can conclude and recommend the following:

- The decision-making process lies, due to current legislation, in the hands of national government and the project developer;
- The implementation of gas projects follows rules and regulations applied to the gas and mining business;
- Over the years, gas production caused local consequences to the built environment and quality of life;
- Public and local communities in Groningen have been subject to the consequences of gas production;
- In a later stage, the responsible parties confirmed that gas production causes the consequences related to gas production;
- This resulted in compensation programmes / funds for the local community;
- When the earthquakes and subsidence due to gas production intensified, this was not conform earlier research and investigations and the level of compensation was not adjusted;
- This caused local unrest, questions and protests from local communities;
- The project developer is the appointed party to create public support;
- This requires good communication and negotiations, and trust in government, public authorities and market parties;
- When the project developer is not considered a trustworthy partner acting in the interest of all involved parties, unrest and lack of trust increases and the image of the project developer declines;
- In order to restore trust a dialogue is established between relevant stakeholders in order to act in the interests of all involved parties;

- In the dialogue, many different resources and tools of information are used, not always complimenting the dialogue and even disrupting the topic, mainly due to the politicization of the topic;
- The points above create a lack of trust in government, public authorities, market players and communication tools / messages;
- Finally resulting in ongoing research and dialogue on the risks and potentials of gas production, the consequences for the local environment, monitoring and analysing the situation, adapting the consequences of gas production within the accepted view of the local community;

Recommendations:

- Government and market players should involve local communities and involved parties (real estate and landowners, direct involved parties and communities) in the consequences of policy, involve them in research and investigation practises and explain the vision and reasoning behind the policy, be open for discussion and create a co-decision procedure, as not initiated with the dialogue table.
- Government and market players should improve communications on the process itself (vision and goals, implementation process, participation, decision procedure), from the beginning of the process – depending on the level of responsibility at macro or micro level - towards the involved parties, e.g. be an open and transparent during the processes.
- The improvement of communications involves the choice of the communicator, timing of communication, medium used and targeting. Communication should be tuned to the message and goals.
- National government can provide choices / scenarios on the impact of gas production, increasing or decreasing the gas production, the consequences for state revenue and the local impact etc. in order to steer a dialogue, be open and transparent.
- The decision-making and co-ownership process should focus on including stakeholders (direct involved parties) in the agreement creation process being able to draft together a successful process dealing with gas production and its consequences.
- Topics as participation, compensation and other forms of direct engagement, involvement and refund should be an open and transparent topic of discussion amongst the involved stakeholders and dealt with accordingly.