Knowledge Platform
(Kennisplatform Leefbaar en Kansrijk Groningen)

Insight into impact

The consequences of gas extraction for the residents of Groningen

Knowledge overview
july 2019 – july 2020

Introduction

In the province of Groningen, the Netherlands, Europe's largest natural gas field is situated among approximately 20 smaller ones: the Groningen-field. This large field has been exploited by the Dutch Petrol Company (*Nederlandse Aardolie Maatschappij*, NAM) since 1963 and has been of vital importance for the energy provision and security of the Netherlands and several neighbouring countries (Vlek, 2019). In the Netherlands, mineral wealth is owned by the state, not the land-owner, resulting in great revenues for the Dutch state. The revenues of natural gas have constituted a significant part of the Dutch government's income over the last 60 years, with a total benefit of 417 billion euros until 2019 (CBS, 2019).

Concerns about possible ground movements as a consequence of gas extraction were already voiced in the 1970's. However, the NAM assured the public that it was highly unlikely that gas extraction would induce seismicity and that even if it did, this would likely not cause any damage to buildings. It was only in 1993 that the NAM officially registered the first earthquake caused by gas extraction in the Province of Groningen (Vlek, 2019). From 1991 onwards the occurrence of earthquakes as well as their magnitudes increased, especially after 2001. The combination of softness in the underground, continuous drilling and resource depletion continued to cause light earthquakes (M>2.5 Richter) in the following decades (Moraal, 2019). Presently, 80% of the natural gas in the Groningen field is depleted, and approximately 1500 earthquakes have occurred by 2021 (Groninger Bodem Beweging, 2021).

Because the Northern Netherlands historically never experienced tectonic activity, measures for preventative earthquake protection were non-existent. Among other

things, this means buildings and structures are easily damaged by (even light) earthquakes. Although most earthquakes measure below M1.5 on the Richter scale and only a few earthquakes of a magnitude of more than 3 on the Richter scale have been registered, damage, nuisance and unsafety are disproportionately high. Due to the seismic whiplash effect, ground movement increases in softer sediment, causing damages to differ across soil types and be less predictable than expected (KNGMG & NWO, 2017). Nevertheless, both the NAM and the Dutch government denied the causal relationship between gas extraction, earthquakes, damages and unsafety for decades.

The damages, the unsafety and the subsequent denial of these by authorities inspired local protests and collective action. Among these are torchlight processions in the city of Groningen and many smaller towns; protest signs and flags in gardens and windows; citizens' appeals to (local) government representatives; court cases; and several calls (for example, a letter or a manifesto) from civil society organisations like the Groningen Ground Movement (*Groninger Bodem Beweging*, GBB) and the Groninger Gas Council (*Groninger Gasberaad*, GGB) to raise the alarm with the national government.

A relatively heavy earthquake near Huizinge (M3,6 on the Richter scale) on 16 August 2012 appeared to constitute a turning point in government policy (Van der Voort & Vanclay, 2015). It led to widespread awareness of the possibility of heavier earthquakes and associated safety risks. The Ministry of Economic Affairs commissioned numerous studies into various aspects of the earthquakes, damages and the safety of buildings. In the subsequent years, several policy changes followed. A law that entered force in 2016 places the burden of proof for damages caused by induced earthquakes in the

Groningen-field and the gas storage in Norg with the NAM instead of with claimants. This entails that citizens no longer have to prove that damages to their property stem from the earthquakes. The Minister of Economic Affairs, Eric Wiebes, announced that gas drilling would stop in 2022 (Rijksoverheid, 2019; 2020a). The costs for repairs are estimated at 8.5 billion euros (Boersema, 2021). Moreover, the government took up responsibility for handling damage claims and for the large-scale reinforcement operation that is necessary to restore the safety of buildings, so that citizens no longer have to deal directly with the NAM.

A problem experienced by residents when dealing with the NAM was the immense power difference: citizens often felt powerless in relation to the company and the multinationals (Shell and Exxonmobil) that founded the NAM. By taking over responsibility from the NAM for handling damage claims and the reinforcement operation, the Dutch government tries to (partially) amend this. In practice, this turned out differently: also in relation to the government, the various institutions involved and the complex web of rules and regulation, residents continue to feel powerless. Individual residents are often unable to challenge procedures and outcomes, because processes are intransparent and citizens are not given sufficient control in these processes.

Instead of being characterized by decisive action and a crisis response, the government's response in the years following the earthquake in Huizinge resulted in a web of institutions and regulations that has been referred to as an 'institutional spaghetti' (Schmidt *et al.*, 2018). Since 2012, the Dutch State Supervision on Mines (Staatstoezicht

op de Mijnen, SodM) has repeatedly indicated the need for a crisis approach (SodM, 2020). A crisis response would entail decisive action by a single responsible party with a wide mandate. Currently the repair and reinforcement approach is decided through consensus between municipalities, NCG, the province, and the national government and is thus expected to take unnecessarily long (SodM, 2020). In the meantime, the majority of the more than 26.000 buildings that need reinforcement have not been reinforced yet and thousands of new damage claims are registered every week.

Because of the scale of the operation and the suboptimal organization by the government, many residents who were told that their houses might be unsafe years ago, have not seen any reinforcement or repairs. As part of the reinforcement operation, many buildings need to be demolished and rebuilt entirely. For example, in the small town of Overschild (247 addresses), 80% of buildings have to be demolished and rebuilt (Van der Linde, 2019). Finally, damage repairs and reinforcement are organized by different institutions, damage repairs by IMG and reinforcement by NCG. This task division adds to the confusion of residents.

The government response to issues with gas extraction in the Northern Netherlands has not led to sufficient prevention or mitigation of the negative societal impact of gas extraction and earthquakes. Research shows that earthquakes, damages and the (potential) unsafety of buildings affect the health and well-being of the inhabitants of the region (Stroebe *et al.*, 2019a; 2019b; 2019c; 2020a; 2020b). For example, constant fear of damages leads to depression, anxiety and other health issues in Groningen (Postmes, 2018). The government's approach to the situation further aggravates these problems:

the lack of a decisive crisis response has resulted in years of waiting and insecurity for many residents. This, combined with the complex web of institutions and policies invoked to deal with damage claims and reinforcement, has caused anxiety, frustration and chronic stress as well as a higher than average distrust in the national government and the various institutions involved.

The Knowledge Platform *(Kennisplatform Leefbaar and Kansrijk Groningen)* was established to gather and disseminate knowledge about the societal impact of mining in the Northern Netherlands and to stimulate knowledge utilization in mining policy. The current paper is based on the literature study of the Knowledge Platform: *Insight in Impact: the consequences of gas extraction for the residents of Groningen* (*Inzicht in Impact: de gevolgen van gaswinning voor de bewoners van Groningen*, Hupkes *et al.*, 2021). This is the third literature study published by the Knowledge Platform (see also Busscher *et al*., 2020; Sluiter *et al*., 2018). The current overview integrates research results published between July 2019 and July 2020. This paper contains a summary of its main findings and the reflection on recent developments.

Summary

A general overview

Every year, the Knowledge Platform provides an independent and integrated overview of studies concerning the societal impact of gas extraction and earthquakes in Groningen, based on recently published literature (Sluiter *et al.*, 2018; Busscher *et al.*, 2020).

This literature study includes six themes: 1. Governance, communication, and policy; 2. The housing market and economic development; 3. Health and well-being; 4. Experiences of safety, reinforcement, the handling of damage claims and trust; 5. Culture, identity and connections; and 6. Living environment and liveability. These themes constitute the main societal impacts of business activity on local communities as discussed in the social impact assessment literature (Vanclay, 2015).

The findings in our most recent literature study (Hupkes *et al.*, 2021), generally correspond with the overarching findings of earlier overviews in the series of literature studies. In this publication we discuss the main insights from the latest literature study.

The governmental complexity of the situation in Groningen has only increased. Communication between the institutions that are involved in the mitigation of problems arising from gas extraction and between these institutions and citizens can be greatly improved. While the comparative physical and psychological disadvantage of residents with multiple damages to their house is declining, the problems surrounding gas extraction continue to negatively impact their physical and psychological health.

The stress and anxiety deriving from the uncertainty in Groningen has a significant impact on the health of residents (Stroebe *et al.*, 2020a). Pilots and interventions have been initiated to mitigate this, for example municipalities have appointed "earthquake coaches" to offer support to affected residents and a collective of spiritual carers (Spiritual Care Earthquake region, *Geestelijke Verzorging Aardbevingsgebied*, GVA) received funding to offer mental support. The effects of these initiatives in terms of reducing the negative societal impact of gas extraction is yet to be evaluated.

The housing market in the affected area has been negatively impacted by gas extraction: for years it was difficult to sell properties, because the possibility of earthquakes, mining damages and unsafety deterred potential buyers. Between the third quarter of 2012 and the second quarter of 2019, the housing market in the Netherlands first saw a deterioration, followed by a positive development of the market.[1] The housing market in the area affected by earthquakes is undergoing a similar positive development, although with a slight delay when compared to the national housing market. Various studies concerning the depreciation of houses caused by induced earthquakes were published between July 2019 and July 2020. In September 2021 compensation became available for the depreciation of housing prices. The model used to determine the amount of compensation per property remains contested.

[1] The Netherlands currently experiences a housing crisis, amongst other things causing housing prices to rise steeply and making it difficult for certain income groups to obtain suitable housing. Although this ought not to be perceived as a positive development, the economic literature on the housing market generally refers to the rising of prices (amongst other things) as 'positive development'.

Liveability in the region is under pressure as a consequence of the problems caused by the gas extraction. Population decline also plays a role in this. Citizen initiatives can and do contribute to maintaining and improving liveability and in increasing the resilience of communities and individuals. To prevent excessive pressure on the time and energy of citizens and to ensure that the needs and wishes of all members of society are catered to (and not only of those who are participating in citizen initiatives), good (financial) support from (local) authorities for citizens' initiatives is important. Arguably, because of the problems around the gas extraction, more efforts are needed from citizens to improve the quality of life in the region.

In the upcoming years, the reinforcement of thousands of buildings and the transition to green energy are both likely to cause significant spatial changes in the province of Groningen. Public support and participation in these processes are of great importance. While we observe increasing attention for the living environment, liveability and cultural values pertaining to the landscape of Groningen, it is not always clear whether and how this attention will be translated into policy. Further research and a more coherent approach, actively supported by all stakeholders (citizens, architects, (local) governments, construction companies etc.), are of importance here.

Summary per chapter

1 Governance, communication and policy

The previous literature study concluded that policy changes have led to highly complex governance of issues related to gas extraction in Groningen (Busscher *et al.*, 2020). This complicates cooperation between institutions and the decisive execution of policy. Many citizens have difficulty finding their way in the complex web of institutions. In extreme cases, people that were informed of their house being unsafe in 2015, still do not know for which measures and compensations they are eligible. Both the communication between institutions and the communication between institutions and citizens requires improvement.

Governance and policy

Currently, we observe no crisis response in Groningen, even though this was repeatedly recommended by the Dutch State Supervision of Mines (*Staatstoezicht op de Mijnen,* SodM). Between 2019–2020, once again, significant systemic changes have occurred: the Temporary Committee Mining Damage Groningen (*de Tijdelijke Commissie voor Mijnbouwschade Groningen,* TCMG) has been turned into the Institute Mining Damage Groningen (*Instituut Mijnbouwschade Groningen,* IMG) and the Center for Safe Housing (*Centrum voor Veilig Wonen,* CVW) has been abolished, its task and personnel were absorbed by the National Coordinator Groningen (*Nationaal Coördinator Groningen,* NCG) and IMG, see Figure 1. It is important to note damage repairs and reinforcement are organized by different institutions; IMG is responsible for damage repairs and NCG organizes reinforcement. Limited knowledge is available concerning the impact of systematic changes initiated in 2018: no research has been performed concerning these systematic changes yet, perhaps due to the recency of these developments.

Three publications about the decision-making around gas extraction in Groningen have been published between July 2019 and July 2020 (Damveld, 2020; Hakkenes, 2020; Vlek, 2020). Approaching the issue from different perspectives, each of these publications confirms the view that the government knew or could have known what consequences gas extraction might have for the population of Groningen.

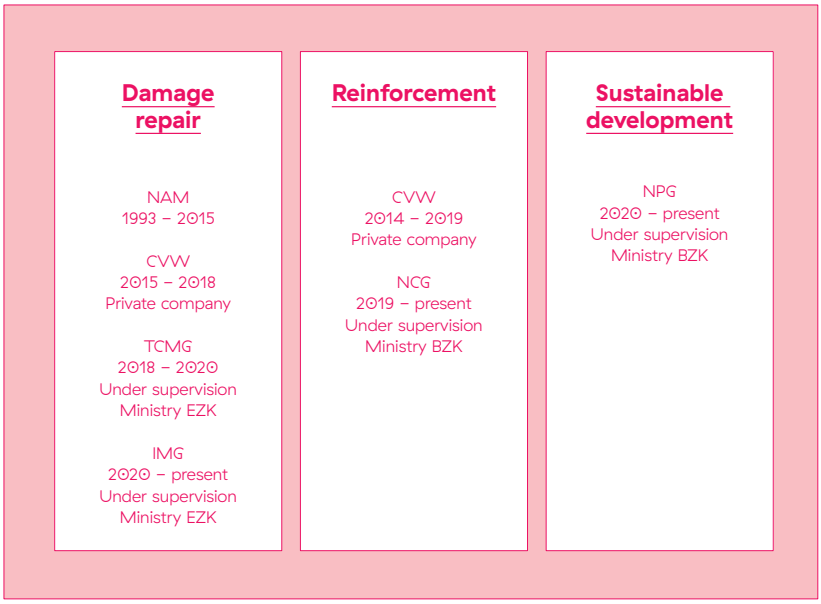

Figure 1. An overview of the different institutions tasked with damage repairs, reinforcement, and development in Groningen.

Research on the role of knowledge utilization in the reinforcement operation, indicates that societal impact is no imperative consideration in the development of policy (Derksen & Gebben, 2020). Instead, technical knowledge and technical models play a central role in the reinforcement operation, even though the involved professionals are not always convinced of the usefulness of this technical knowledge. Assessments of the safety of buildings cost between 10.000–100.000 Euros. Additionally, the development and implementation of technical models and solutions requires significant amounts of money and time, while this approach does not lead to unambiguously positive results. Because of the focus on technical knowledge, the system constructed by authorities and institutions is far removed from the lived reality of residents. Their wishes, needs and experiences are frequently sidelined or ignored.

Communication

Recent publications indicate that communication between institutions and residents is still insufficient (De Onafhankelijke Raadsman, 2019; 2020). Residents are often left in the dark: waiting periods of two years for reinforcement and several months for decisions on submitted damage claims are a rule, rather than an exception. Despite a covenant in which the TCMG and NCG established their intention to cooperate, the processes and procedures for damage repairs and reinforcement remain separate and are hard

to combine for residents. We expect that even the installment of a single point of contact for residents dealing with both reinforcement and damage repairs would improve the situation of residents significantly.

Communication by the involved institutions is complicated by the complexity of the governance system, with its numerous "batches" (groups of addresses which are inspected around the same time), pilots, complicated models for risk assessment, the array of regulations, building safety standards, and a multitude of subsidy arrangements. The differences between all the approaches, rules and regulations appear to have their own internal logic and lead to inequalities that are hard to explain. Technical knowledge is not always communicated in an understandable manner and often does not correspond with the experiences of residents.

Residents indicate that better information would contribute to a feeling of safety. Directly after an earthquake, residents would like access to unambiguous, transparent and independent information. Some residents would also like to know more about earthquakes, risks and measures. Additionally, it is important that residents are kept up to date during the process of handling damage claims and reinforcement. Even when no new steps are taken, residents would like to be informed about the current state of affairs.

Legal aspects

A relatively large amount of research concerning the legal dimension of gas extraction was published between July 2019 and July 2020. One of these publications discuss various aspects of the Temporary law Groningen (*Tijdelijke wet Groningen*, TwG) (Van de Bunt, 2020). Especially the handling of private, legal damage claims by way of public law is criticized by legal experts.

Additionally, legal studies point out that gas extraction may lead to a violation of Art. 2 (the right to life) of the European Convention on Human Rights (ECHR) (Oldenhuis *et al.*, 2019). Gas extraction potentially endangers human lives by causing earthquakes and thereby risking the collapse of buildings: this constitutes a violation of the right to life. Moreover, the right to life is an absolute right. As such, the security of gas delivery, which also has to be maintained to protect the right to life of all Dutch citizens during cold winters, does not constitute a reason for violating the right to life in Groningen.

2 The housing market and economic development

Previous studies concluded that no coherent image exists of the economic consequences of gas extraction in Groningen (Busscher *et al.*, 2020). In contrast, there is a lot of research concerning the housing market in the gas extraction area. Most studies seem to adopt the assumption that gas extraction and earthquakes disrupt the housing market in the area, even though no consensus exists about the gravity of this effect across different publications. Studies confirm this impact by comparing the state of the housing market in risk areas with that in other areas in the Netherlands (Posthumus *et al.*, 2020a; 2020b). Additionally, recent publications focus on the housing market, particularly on determining and compensating losses in value. We conclude that there appears to be little to no research published about the economic consequences of ceasing the gas extraction in 2022 (Hupkes *et al.*, 2021).

The housing market

The housing market in Groningen is not improving at the same pace as the rest of the Netherlands: positive developments are advancing slightly slower than in the rest of the Netherlands (Hupkes *et al.*,, 2021)[2]. For example, between the third quarter of 2012 and the second quarter of 2019, sales prices in the reference area rose by 19,9%, while sales prices in areas with average and high damage intensities rose by only 15,6% and 13,3%. In areas with low and average damage intensities which also experience a decline in population, these developments lingered even longer when compared to the national average. Based on available research, it is not clear whether the housing market in the gas extraction area will catch up on national trends, or whether these differences will remain (Elshof *et al.*, 2020; Posthumus *et al.*, 2020a; 2020b).

In the studies discussed, no attention has been given to the effects of the coronavirus on the housing market.

[2] Five indicators are used in these studies: the ratio between selling price and asking price; portion of sold properties in relation to the housing stock; portion of properties for sale in relation to the housing stock; selling time of sold properties; on-sale duration of properties for sale.

Depreciation

The impending regulation for the compensation of the depreciation of houses, initiated by IMG in September 2020, was the subject of various publications (De Kam & Hol, 2020; Hammerstein *et al.*, 2019; Poort *et al.*, 2019). The committee advising IMG about the model used for determining depreciation percentages compared several models in a report published in 2020 (Hammerstein *et al.*, 2020). Based on four criteria – trustworthiness, justice, comprehensibility and feasibility – the committee advised to use the model of Atlas for Municipalities (also known as the model of Bosker *et al.*, 2018) as a basis for the depreciation regulation.

Atlas for Municipalities published an updated version of the model for determining depreciation (Poort *et al.*, 2019). The model is based on a comparison between transaction prices of sold houses in the risk area and the transaction prices of reference houses sold outside of the risk area. The risk area is defined as the area where up until 31 December 2018 at least 20% of the housing stock has been affected by earthquake induced damages.[3] If the houses in and outside of the risk area are similar in most relevant aspects, it can be concluded that the difference in price is caused by the impact of ground movement. The model is updated with recent data about earthquakes (the measured velocity of the ground is used here), damage claims and transaction prices.

The model of Atlas for Municipalities is not uncontroversial. The three most common critiques are the indicators used for the impact of earthquakes, the selection of reference houses and the boundaries of the risk area based on the amount of damage claims allocated by the responsible institutions (De Kam & Hol, 2020). The model of Atlas for Municipalities measures the impact of earthquakes based on the number of ground movements. Critics pose that other factors, like the prospect of reinforcement, can also influence the behaviour of sellers and buyers. During the selection of reference houses, a limited number of criteria is used, the socio-economic composition of the neighbourhood is for example not considered, even though this can also influence transaction prices. The demarcation of the risk area, based on the amount of damage claims allocated by the responsible institutions, is disputed because previous research indicates that around

[3] It is noteworthy that only damages officially recognized by the responsible institutions are taken into account by the authors here.

25% of citizens are discouraged by the damage claiming process to such an extent that they do not submit claims or postpone it (Postmes *et al.*, 2020). The number of actual earthquake induced damages in several areas could thus be much higher than the model assumes.

While the method of determination and the extent of depreciation of real-estate remain topics of discussion, researchers seem to agree that depreciation occurs. In September 2020, IMG paid the first sums to compensate for depreciation. We do observe that the determination process for compensation remains a black box for residents. We believe this constitutes a risk: the lack of transparency and inclusion can lead to misunderstandings, discussions and decreasing trust among the population of Groningen.

Economics

In the recent literature, we find no unambiguous image considering the effects of (ceasing) gas extraction and gas extraction problems on the economy of the Northern Netherlands. These could potentially include effects on the labour market, such as jobs directly linked to gas extraction, damage repairs and the reinforcement of houses, but also of effects at the level of the household. It remains unclear which costs are made by households as a consequence of gas extraction problems. It also remains unclear how households spend the money they receive as compensation for damages and reinforcement.

Research on the consequences of gas extraction for entrepreneurs demonstrates that a large number of interviewed entrepreneurs experiences negative effects from the gas extraction complications (Stroebe *et al.*, 2020a). They make costs for the repair of damages and have to spend a lot of time and energy on the processes surrounding repairs and reinforcement. The nature and amount of these costs is not exactly clear. Entrepreneurs indicate that the negative effects that they experience could be mitigated by simpler regulations and procedures.

3 Health and wellbeing

Previous studies indicate that the health and well-being of people in Groningen has been damaged by gas extraction problems (Busscher *et al.*, 2020). Earthquakes, damages and the bureaucracy in which residents can become entangled often lead to stress and anxiety. This is an acknowledged and persistent problem. Until recently, not only the number of residents whose health and well-being was damaged increased, but also the severity of their health complaints.

These negative consequences are also found in the most recent studies, but the disadvantages resulting from them are declining slightly (Stroebe *et al.*, 2019a; 2019b; 2019c; 2020a). The gas extraction problems have negative consequences for the (mental) health of residents. Residents suffer from fear, anxiety, insomnia and depression. Residents issuing multiple damage claims, experience more severe consequences than those without damage to their property or those who issued a single claim.

Previous studies indicate that the negative impact on children and youth does not differ substantially from the negative impact on adults (Busscher *et al.*, 2019). The (mental) health of children in the gas extraction area thus also deserves attention. However, no new studies have appeared. The Dutch health monitor youth 2019 does demonstrate that in municipalities affected by earthquakes, youths (between the ages of twelve and sixteen) consider their own health to be of lesser quality than peers in the rest of the country.[4] The youth also report feeling less happy. The health monitor does not present a clear reason for this.

For children and adults alike, health issues become increasingly severe when a multiplicity of problems plays a role. If, besides damages of reinforcement, there are socio-economic issues, like unemployment or poverty, the standardized approach of institutions may be insufficient. This can result in residents ending up in difficult situations.

[4] The Health monitor youth 2019 was executed by the GGD (Municipal health services – Gemeentelijke Gezondheidsdiensten) and the RIVM (National Institute for Public Health and Environment — Rijksinstituut voor Volksgezondheid en Milieu).

Different interventions, for example by the GGD, municipalities and the GVA, aim at limiting the negative impact of problems related to the gas extraction on health. Results concerning the effectiveness of these interventions are not yet available.

We observe that the health of residents in the gas extraction area requires continued attention with a specific focus on the health of children and youth.

4 Experiences of safety, reinforcement, the handling of damage claims and trust

Research demonstrated that residents struggle with feelings of insufficient safety, frustration, powerlessness, indignation, disappointment, distrust and anger (Busscher *et al.*, 2020). Residents with multiple damage experienced the most severe psychosocial impact. These phenomena also seemed to coincide with a lack of trust in organizations like the NAM and the national government. While one study indicated that there is a slight improvement in the experienced trust, it remained unclear what caused this improvement or whether it will persist.

Recent studies indicate that the complexity of the issues seems to increase for some residents. This also increases their psychological distress. Residents with multiple damages experience the most severe impact, although recent studies also indicate slight improvements in this group. It is currently unclear whether this trend will persist. Despite improvements, the psychological impact of damages remains high.

(A lack of) safety and reinforcement

When an (intense) earthquake occurs, this directly leads to negative emotions among residents, amongst which worries about their safety. In periods with fewer earthquakes, some recovery of mental health occurs. Residents with multiple damages structurally feel less safe.

New publications demonstrate that the reinforcement operation has a negative effect on the mental health of residents (Stroebe *et al.*, 2020a; 2020b). Due to the slow process, residents are left in the dark for a long period. This often results in a declining sense of control and a feeling of powerlessness, especially with residents who fear that their homes are (acutely) unsafe. Regulations like Inspection on Request (*Opname op Verzoek*) do not provide solace. Currently, there is no solution for the (direct) feeling of insufficient safety experienced by some residents.

Additionally, residents do not seem to have faith in the reinforcement operation. Of the residents who believe that their house requires reinforcement, only a small percentage actually expects this to materialize.

Damage claims

The number of damage claims submitted with the responsible institutions fluctuates. In some periods the number of claims is significantly higher than in others. These dynamics can be partly explained referring to the occurrence of earthquakes. However, research demonstrates that other factors also influence whether and when residents report damages (Postmes *et al.*, 2020). Residents sometimes postpone the reporting of damages or opt out entirely. The main reasons for this are a lack of trust in institutions or an unwillingness to go through the trouble of reporting it. Residents who wait to report damages indicate that they simply did not have time to report it or did not notice the damage earlier.

When residents judge the handling of damage claims negatively, this is typically not caused by unrealistic expectations. The expectations concerning damage claim handling have generally lowered over the years. Especially the timeframe used by institutions (first NAM, followed by CVW and

TCMG, now IMG) for responding to submitted damages claims plays an important role in negative perceptions of the process.

The procedure for the handling of damage claims has changed since first TCMG and then IMG became responsible for the handling of damage claims. Previously, when residents received the initial damage report, they were able to request counter-expertise free of charge. Currently, when a claimant disagrees with the initial damage report, they have the opportunity to write a response to the report issued by the expert who inspected the damage. This has to be done within two weeks, although residents can request an extension of a few weeks. The time period that residents have to submit a written response to the initial damage report is nevertheless extremely short, especially when compared with the timeframes used by the institutions themselves (De Onafhankelijke Raadsman, 2020). The decision period for damage claims handled by IMG is for example 15 months. Furthermore, not all residents consider themselves capable of (properly) producing a written response (Groninger Gasberaad, 2020). The only help residents receive with this is from the private organization (*Stut en Steun*). Finally, subsidies for trial processes are abolished entirely, severely impacting the ability of inhabitants to contradict authorities.

Social cohesion

Social cohesion and cooperation can help citizens cope with gas extraction problems. When citizens tackle a problem together, the mental resilience of the community and individuals are reinforced. Remarkably, there does not seem to be any direct connection between community cooperation concerning gas extraction issues and cooperation on other topics: villages and neighborhoods with generally strong cooperation do not necessarily cooperate when it comes to damage claims or the reinforcement operation (Stroebe *et al.*, 2019c).

Recognition

Increasingly, both in research and in practice, attention is devoted to the topic of recognition.The introduction of the regulation for the reimbursement of immaterial damage introduced by IMG in 2021 is an example of this. The acknowledgement of the negative consequences of gas extraction is a specific goal of this regulation.

A report written for the Ministry of Economic Affairs and Climate (*Ministerie van Economische Zaken en Klimaat*, EZK) discusses whether and how the government ought to provide recognition for the immaterial damage caused by excessive stress, breach of privacy, hindrance, and insecurity (Verheij *et al.*, 2019). The report suggests a subdivision of damages into three categories, living, well-being and health issues, for each of which an individual could request a compensation of up to a 1000 euros. The report further indicates that this regulation should consider the variety of effects that gas extraction can have on different people in different situations. A solution can only be satisfactory if financial compensation is experienced as adequate, and if victims feel like their suffering is recognized. Apart from adequate compensation, a solution would need to include official apologies by the right people or institutions and the opportunity for those involved to be heard. The regulation would need to be compatible with Dutch law and it should not be overly burdensome for the disadvantaged. It should not over- or under-compensate, it should be executable, and finally it should be in line with usual compensational measures in the country.

Recognition also plays a role in the mental or spiritual care within areas hit by earthquakes. Mental or spiritual caregivers notice that providing a sympathetic ear is one of their most important tasks. They notice that on the one hand people want to be heard, while on the other, they do not want to be treated like victims or constantly talk about these issues. Mental caregivers can facilitate a safe space where residents can express themselves (Van der Veer, 2019). This can in turn provide residents with the tools to express themselves towards other parties like the national government, NCG or IMG. These institutions will need to be willing to listen and to acknowledge the suffering that has been (partially) caused by them.

5 Culture, identity and belonging

In previous literature, a lot of research concerning culture, identity and connections was discussed (Busscher *et al.*, 2020). It was concluded that the

people of Groningen see earthquakes as a threat to their culture and image and that people outside of Groningen actually do associate the province with earthquakes. The Heritage Programme (*Erfgoedprogramma*) was seen as an important opportunity for maintaining and reinforcing the cultural identity of Groningen.

Recent publications underline the importance of (cultural) heritage for connection with the region and its identity (Nationaal Coördinator Groningen, 2020). Cultural heritage can contribute to a feeling of being at home. In heritage policy, attention is increasingly given to the context of heritage. It is no longer aimed at specific heritage objects, but also considers other characteristics of Groningen like landscapes and village centers.

While there are several initiatives that aim at maintaining and restoring the identity of Groningen, there is relatively little research concerning the identity of the area. In order to make coherent policies aimed at reinforcement and maintaining culture, identity and heritage, more research is required. Based on our review of existing research, we conclude that the knowledge level and methods of different municipalities do not appear to be coordinated. It is important to clarify views on the identity of Groningen, and how this can be reinforced and maintained. This process should include residents, instead of just involving experts and (government-) institutions. After all, the goal is to make residents feel at home in Groningen. This is especially important since, in the coming years, major interventions are expected in the landscape of Groningen due to the reinforcement operation as well as the energy transition. Heritage policy can and should put more effort in developing and sharing knowledge, and connecting knowledge areas. The development of connections between different levels and fields of education should be stimulated in this process.

Within the timeframe captured by this study, no new research has been published concerning the image of Groningen. However, the first results of the image monitor executed by the National Programme Groningen (*Nationaal Programma Groningen*, NPG) appeared in 2021. We will consider these results in the subsequent literature study. The NPG aims to improve the broad welfare of Groningen, and to strengthen and improve the image of the province. With the image monitor the NPG intends to monitor the effectiveness of its programmes and investments in the upcoming years.

6 Living environment and liveability

Previous studies concluded that the liveability in Groningen was compromised (Busscher *et al.*, 2020). Gas extraction issues significantly contributed to this, while the decline and halting of gas extraction also provided opportunities, for example in the energy transition. We signal that citizen initiatives play an important role in maintaining and improving the liveability.

Liveability and population decline

Although it seems clear that gas extraction problems have a negative impact on the liveability in Groningen, it remains difficult to measure the precise extent of this impact. Other factors, such as population decline, also play a large role in declining liveability. This phenomenon is often associated with declining facilities and therefore a decline in liveability.

Studies concerning population decline and policy responses to population decline argue that regional policy has contributed to population decline with excessive investments in urban growth areas (Bock *et al.*, 2019). While such policy decisions are based on the assumption of a contrast between urban and rural areas, there actually appears to be a strong coherence between the two and 'typically rural phenomena' like population decline also occur in urban areas. It would be preferable, also for the creation of policy, to focus on the coherence between these types of areas and the opportunities that this brings.

In the studies discussed above no attention was given yet to the effects of the Covid-19 pandemic.

Citizen initiatives

In less populated areas, and as such also in the gas extraction area of

Groningen, citizen initiatives generally play a significant role in maintaining and improving liveability. Different initiatives of the NPG like Toukomst (translated 'future' in the Groningen dialect) and other subsidies, are aimed specifically at funding citizens' initiatives.

Research indicates that social cohesion, rather than spatial cohesion, explains participation in citizen initiatives (Gieling *et al.*, 2019). A study targeting people above the age of 45 demonstrates that having limited time or other priorities are the main reasons not to participate in citizen initiatives (Meerstra–de Haan *et al.*, 2019). In order for initiatives to succeed, it is important not to put an excessive load of personal investments (in time and energy) on citizens. Many different experiences of ownership can play a role in residents' affiliation with initiatives. In order to acquire support from communities, it is essential that initiators can sufficiently deal with all these experiences.

Local governments can also play an important role in the success or failure of citizens' initiatives. They have to provide sufficient (financial) support in order for an initiative to succeed. However, while the involvement of (local) governments can increase the likelihood of success, this involvement should not result in complicated accountability structures, since this would make the task too complicated and time consuming for participants. While citizens' initiatives can play an important role in maintaining and improving liveability, researchers express doubts concerning the large role given to citizen initiatives by local governments (Ubels, 2020). Not all residents participate in citizen initiatives and it should therefore these initiatives cannot be expected to cater to needs and desires of all residents. In order to guarantee the public interest, (local) governments should continue to take responsibility for the maintenance and improvement of liveability.

Energy transition

The energy transition plays an important role in Groningen, because of extensive ambitions concerning the generation of renewable energy and projects like 'gas free neighbourhoods'.

Studies show that of renewable energy sources, solar panels on roofs are deemed particularly acceptable, followed by wind farms at sea, solar farms, geothermal energy, and biomass (Perlaviciute *et al.*, 2019). Wind turbines on land can expect the least support from residents. While the contribution to the energy transition is often considered important, people fear the local consequences of wind turbines on land. Wind turbines could have a strong negative impact on the surroundings and liveability.

For every way of producing renewable energy, residents would like to see certain conditions to be fulfilled, like the local usage of this green energy, involvement in the decision-making process and a fair division of benefits and burdens. It is also important that citizens with diverging socio-economic backgrounds can profit from the energy transition (Straver *et al.*, 2020).

There are many local initiatives committed to renewable energy in the province of Groningen (Sloot *et al.*, 2019). Social cohesion is an important motivator for participants, more important than financial or environmental considerations. With initiatives that were not initiated by citizens this does not play a role. When deciding to connect to the geothermal heat network for example, financial considerations are the most important motivation for residents. However, a discrepancy exists between city and countryside (Louwerse *et al.*, 2020). Inhabitants of the countryside fear that they will be encumbered with the burdens of the energy transition while the benefits will be enjoyed elsewhere. Ideally, there would be a fruitful cooperation between city and countryside. How to achieve this is still unclear.

Reflection on insights and developments from the gas extraction case

Objectives

This reflection was originally published in our literature study covering studies published July 2019 and July 2020 (Hupkes *et al.*, 2021). Between 2017 and 2021, the Knowledge Platform has integrated over 250 studies in three literature studies (see also Busscher *et al.*, 2020; Sluiter *et al.*, 2018). Furthermore, we had hundreds of conversations with citizens and professionals. This has provided us with a broad overview of the situation in Groningen. Against this background, we interpret recent developments related to gas extraction in Groningen. We reflect on (recent) happenings and patterns focusing on four questions:

1. What is the state of affairs concerning gas extraction in Groningen?
2. What is the situation for residents and communities?
3. What could strengthen the position of residents and communities?
4. What do these developments entail for the current approach and the future?

1 What is the state of affairs concerning gas extraction in Groningen?

Every year, many administrative changes are made considering the gas extraction case in Groningen. We discuss some of the most recent ones below.

Reinforcement, damage repairs, and governance

Since 2019, municipalities are the official clients of reinforcement projects: they instruct NCG to carry out inspections and assessments. NCG is assigned the role of the executive organization of the reinforcement operation. While the desired acceleration of the reinforcement operation has not materialized, the operation is taking shape in most villages and neighbourhoods. A total of 26.809 addresses requires reinforcement. By the 30th of April 2021, 7% of these addresses were reinforced, for 5% the reinforcement was in progress, and 35% was ready for planning (Nationaal Coordinator Groningen, no date)[5]. Reinforcement is complex and can be drastic. It has to be kept in mind that the housing stock in Groningen is very diverse, with buildings from many different sizes, styles and periods. In several cases the restoration requires that buildings be demolished and rebuilt entirely. As such, a lot of individual calculations have to be made to successfully reinforce the buildings. This makes the reinforcement operation significantly more complex.

Also the handling of damage claims remains a huge task, partly because of the reinforcement operation. This task is currently being carried out by an independent governing body, IMG. Between 2019 and 2020, there were approximately 1000 new damage claims every week. This results in high pressure on IMG. Particularly since damage claim regulations are complex and IMG has limited capacity. In complex cases, the handling of a damage claim can take years.

[5] The NCG has an online dashboard, where residents can view the progress of the reinforcement operations: https://dashboardgroningen.nl/versterken-en-veiligheid

Because of new laws, which also resulted in the formation of IMG and NCG, the NAM is no longer involved in the handling of damage repairs and the reinforcement operation. The national government takes full responsibility. This change in the system was announced in 2018, and is gradually taking place. In autumn 2020, the national government and regional governments in Groningen made another administrative agreement to accelerate the reinforcement procedure. This was done to make the procedures more manageable for professionals and for residents and to provide residents with "real decision-making power", "clarity", "control" and "perspective" (Rijksoverheid, 2020b). IMG announced in May 2021, that it wants to handle damage claims in an entirely different way.

As such, the "institutional carousel" is turning at full speed: institutions, agreements, and methods are constantly replaced or renewed (Derksen & Gebben, 2019). Research indicates that this system incurs high costs, and significant risks of insufficient communication, transparency and clarity. Providing security, clarity, and continuity should be a top priority: these are often missing and this can bother both residents and institutions. The reduction and planned cessation of gas extraction from the Groningen field leads to new debates, which in turn result in additional uncertainty and unrest, for example about the exact cessation date (Start, 2021). The national government wants to keep the Groningen gas field on stand-by until 2028 in case of cold winters, while the NAM would prefer complete cessation in 2023.

Uncertainty and unrest also surround the predicted end of seismic activity. EZK and the NAM state that seismic activity will reduce quickly after the termination of the gas extraction and that therefore less drastic reinforcement measures are required for many properties. We observe a competition since 2018 between various models offering different ways of risk calculation to substantiate such claims (HRA model and successor, reviews, typology method, etc). These methods are meant to provide direction to policy, but in reality they often lead to uncertainty and paralyze the progress of daily operations.

In the meantime the only certainty is that, even after the termination of gas extraction (whether in 2023 or 2028), the ground will remain unstable. It is unclear how long this instability may ensue, but current estimates are around 10 years. However, the hope and expectation is that earthquakes will diminish in frequency and intensity (SodM, no date). The institutions involved should jointly deal with this uncertainty. Currently this is not the

case, since the relations between different institutions are often disturbed. But, the formulation of a joint position should be the priority of policy, not the constant recalculation of risk.

All institutions involved are primarily focussed on material restoration. Procedural recovery is the main task of IMG, which is concerned with compensating immaterial damages. We worry that due to the massive political pressure to deliver, the necessity to work quickly and the enormous amount of cases, too little time and attention are given to a third dimension, which might be essential for citizens: the restoration of relations. Not just the relationships between residents and the national government are damaged, but also those between local, regional, and national governments and those between governments and the NAM. The Knowledge Platform emphasizes that choosing for one of these dimensions of restoration over another is not an option: we observe that material, procedural, and relational recovery are intertwined and hence all necessary. We elaborate on this in paragraph 3.

Carrying out reinforcement with vigor

The public task in Groningen is large and complex. Researchers and the Groningen Gas Council demonstrate that sometimes, there is a poor match between the policy system (where technology, legal regulation, and money are dominant), and the day-to-day experiences of residents. The danger lies in the lack of connection between the methods of NCG and IMG and the needs of citizens. Municipalities should act as translators between their experiences and viewpoints; it is unclear whether they have sufficient capacity to fulfill this role.

A recent report from *Gronings Perspectief* indicates that professionals experience the execution of the reinforcement operation as almost impossible: they feel trapped in the system, because they want to solve the problems of property owners, but are hardly provided with the tools to do so (Stroebe *et al.*, 2020b). Professionals encounter countless hindrances, among which the constant and difficult coordination between institutions, the bridging of several fields of expertise, the lack of control and oversight, and above all the ever-changing, yet rigid regime of well meant technical, financial, and legal supervision: a thick blanket of rules which deprives the execution of any flexibility.

In the drafting of laws, rules, and procedures, the executability of laws should play a more central role. For example, professionals who are in regular contact with residents could be actively involved in the develop-

ment of laws and policy. This can help to better involve the knowledge and insights of residents, in addition to the necessary knowledge concerning money, techniques, and laws. Additionally, executing professionals could get more authority to find fitting solutions for the problems of residents and deal with procedures in a flexible manner if necessary.

One of our worries is that professionals lack courage and action perspective. A good and careful implementation will have to become central: this requires vigor. The reasons for the current shortcomings might be found in the seemingly rigid system, the returning fearful anticipation of the Parliamentary Survey, strict scrutiny by parliament and the court of audit (*Nationale Rekenkamer*), and the sometimes destructive criticism by researchers like ourselves.[6] All this critical supervision is ofcourse well meant and necessary, but it should not hinder further improvement of the system, adequate problem solving, and the recovery of trust.

2 What is the situation for residents and communities?

The extent of the problems related to gas extraction from the Groningen field, combined with the continuous search for fitting policies have a profound impact on the lives of residents and communities. We elaborate on this below.

Residents are stuck

Research results from *Gronings Perspectief* indicate that mining damage affects the physical and mental well-being of residents. Unsafety, referring to both physical unsafety and experienced unsafety, plays a central role in this. The insecurity with which residents have to live, often for many years, affects them and results in feelings of unsafety. Governments and institutions do not sufficiently succeed in removing these insecurities. Instead, it requires a lot of effort for residents to navigate the network of institutions. Some of them decide to leave the region: fleeing seems to be their only way out (Stroebe *et al.*, 2021).

[6] A Parliamentary Survey is the most severe research mechanism the parliament can invoke. In 2021, a committee was appointed to thoroughly research the developments surrounding the gas extraction case in Groningen and the government's role in this. Crucial decisions and the quality of participation will receive attention, as well as the lessons that can be drawn from this. See also Tweede Kamer (no date) 'Parlementaire enquêtecommissie aardgaswinning Groningen.' Online available via 'https://www.tweedekamer.nl/kamerleden_en_commissies/commissies/peag [Last accessed 23 December 2021]

For some groups of particularly vulnerable residents, consequences can be severe. This applies for example to residents who suffer from additional issues, like health problems, poverty or debts. Stress–related issues can arise in children too. Without proper research, the size and severity of these phenomena will remain hidden.

We expect these issues to continue over the coming years. Especially because the reinforcement operation remains a source of insecurity and stress. The lives of some residents are put 'on hold' for a long time. When the reinforcement operation does take off, it is expected to cause further disturbances through its proceedings. For example, this creates the necessity for residents to temporarily move to a different house and exposes residents to constant construction and noise in their villages and neighbourhoods.

We are concerned that the national interest for the gas extraction problems may decrease. The perception could be that 'the problems in Groningen have been solved'. But the societal problems for residents can continue over the coming years. Individual suffering has to be repaired and new problems have to be prevented. Local institutions will have to remain very alert in relation to the (cumulative) problems of residents. Institutions are good at developing general regulations, but all general regulations should consi–der the existence of countless complex and unique cases. It is tempting to process large amounts of (relatively easy) work quickly, but in the end, it is the amount of complex situations solved that will determine the real societal impact.

Insecurity and distrust

Several studies indicate that residents in the gas extraction area have little trust in the institutions handling the gas extraction problems. Especially trust in the NAM and the government is low. The delay in the reinforce–ment operation (due to changes in policy as well as the pause instituted by Minister Wiebes of EZK in 2018), seems to have severely damaged the trust of residents: does the government even care about their safety?

In the network of institutions and regulations, residents are often powerless. If institutions exceed the set terms for decision–making or if residents want to object to the decision that was reached, few possibilities exist to really challenge the outcome. The few possibilities residents do have, in which starting a court case is a last resort, cost significant amounts of time, money

and energy. At the same time, some regulations imply distrust towards residents. The way in which IMG deals with damage claims originating from the edges of the gas extraction area implies mistrust. IMG seems to meddle with the reversed burden of proof (IMG, 2020). Debates about such issues can continue for years and impede the recovery of relations.

After years of mismanagement and dodging responsibilities, the basic trust of residents in the government has broken. Relationships have to be actively restored. This requires more attention. A panel of professors, for example, opined that it is an illusion that the Parliamentary Survey will restore relations.[7] We observe that many of the institutions involved aspire to the recovery of relations, yet there is no coherent policy for its attainment. Our recommendation is that the recovery of trust and relations will become a priority for every actor.

Loss and strength of social cohesion

In many villages and neighbourhoods, social cohesion is under pressure, because of the inexplicable differences in compensation for damages and the advised reinforcement measures. In the reinforcement operation, the usage of different safety guidelines leads people with (seemingly) similar houses to end up in entirely different procedures. Where one house is rebuilt entirely, a (seemingly) similar house may not be reinforced at all. This can result in jealousy, envy and distrust, even in villages and neighborhoods previously known for their strong social cohesion.

The risk of loss of social cohesion also plays a role in the regulation compensating for the depreciation of the value of houses. Since the start of the regulation in september 2020, IMG has mistakenly paid compensation to 166 families (Miskovic & Braakman, 2021). This concerns families whose homes qualify for 'demolition and new construction'. IMG indicates that in the case of demolition and new construction there is in all likelihood little diminishing value: if the value was diminishing, the newly built house will compensate for this. However, IMG will not reclaim these wrong compensations. This situation may cause a feeling of inequality, because some residents are being compensated and receive a new house, while others receive less money and have to wait years for the reinforcement of their homes. Furthermore, this raises new questions: if IMG makes mistakes and compensates too much in some cases, does it also compensate too little in others?

[7] We refer to a webinar about the Parliamentary Survey about gas extraction Groningen organized by Sustainable Society (University of Groningen) and the Knowledge Platform. See Kennisplatform (2021). "Webinar Parliamentary Survey Gas Extraction Groningen". Available at: https://en.kennisplatformleefbaar.nl/webinar-parlementaire-enquete (Accessed 15/12/ 2021).

In the meantime, research demonstrates that social cohesion and cooperation can make communities and individuals more resilient. The loss of social cohesion may increase the negative impact of gas extraction problems on residents.

The strength of social cohesion becomes apparent in cases where residents took collective action, for example as a reaction to the experienced pressure on social cohesion or the physical appearance of villages or neighbourhoods. In Appingedam (*#EnWijDan*) and Overschild (Village Workgroup Reinforcement Overschild, *Dorpswerkgroep Versterking Overschild*, DVO) residents collectively took action to ensure equal treatment in the reinforcement. Residents recognize a collective interest in the reinforcement or re-design of their environment. By uniting, residents increase the chance that they will be granted a seat at the negotiation table and that they will be able to regain control over the design of their living environment. However, such collaborations do have a shadow side, as you can never involve and satisfy everyone.

Considering this situation, we observe a discrepancy between the experiences of residents and the policies pursued. Residents often benefit from a collective approach which positively impacts their resilience, but the current methods are aimed at individuals. When furthermore, different policies appear to almost randomly apply to different people, this negatively affects social cohesion even more. Where collective interests are at play, this should be incorporated into policies. This starts in our opinion, with support for and the strengthening of community initiatives.

3 What could strengthen the position of residents and communities?

Improving the situation of the residents in the region requires measures that are aimed at material restoration, procedural restoration and the restoration of relations. Below we elaborate on these three dimensions of restoration in Groningen.

Material restoration

Since 2013, damage repairs, safety and compensation are the main goals of the government in relation to gas extraction issues in Groningen. However, the many systemic changes appear to hinder progress in relation to these goals instead of facilitating progress towards achieving them. These changes were partly made to deliver quality, but also to justify the costs incurred. In practice we observe that the constantly changing (safety) requirements hinder the implementation of policies aimed at material restoration.

These changes create uncertainty and cause unrest, for example with the reversed burden of proof: it is a form of recognition for residents and provides some security and trust, but since it was taken up legally in 2017, there are signals that damage inspectors apply it inconsistently. IMG therefore commissioned a study into the settlement of damage claims in Norg and Grijpskerk (Van Hofslot, 2020). Slowly but surely, the burden of proof once again becomes the subject of debate, especially when the director of the NAM began to weigh in on the discussion (Middel, 2021).

Various actors, amongst which the Groninger Gas Council, have called upon the government to instate one central office to which residents can turn for both damage claims and the reinforcement of their homes. They expect that simplifying processes for residents will improve the execution of reinforcement and damage policies. However, as these are theoretically (legally, financially) different tasks and because the roles of IMG, NCG and NPG have become increasingly distinct, this central office has not been installed. Damage claims are legal settlements initiated by individual citizens. Reinforcement is initiated by municipalities and aims at restoring safety in the region as a whole. Meanwhile, making houses more durable and sustainable appears to be difficult to integrate within these other two tasks. Nevertheless: an integrated approach would provide clarity to residents and allows for a more efficient, area-based approach.

Currently, reinforcement is mostly aimed at safety, based on national criteria supervised by the SodM. Therefore, the reinforcement approach is focused primarily on material and technical considerations about safety. In the handling of damage claims, legal considerations are leading. We believe it is preferable and more straightforward to focus on the overall quality of neighbourhoods and of the lives of residents. If residents are properly consulted about their own situation, that of their village or neighbourhood and the improvements they deem necessary, solutions could be effectively adapted to their housing needs and desires, societal functions and sustainability. Yet, an approach in which residents and neighbourhoods are central, seems currently difficult to realize.

Procedural recovery

Currently, considerable unpredictability, legal inequalities and poor communication characterize the approach to settling gas extraction problems in Groningen. Amending this should be the main point of focus in recovering procedures. It is important to note that there is a need for solutions tailored to the circumstances of residents, as there are few generic cases. At the moment, legislation and procedures stifle the execution of the reinforcement operation instead of ensuring legal equality and predictability, as was intended. The risk here is that generic regulations, while legally clear and justifiable, are not befitting for the specific situations residents find themselves in. If there is no room for tailored approaches, it is likely that residents will feel unheard and that they consider the regulations to be cumbersome or unfit. This undermines the effectiveness of rules and regulations.

The regulation of IMG for the compensation of immaterial damage inflicted by the NAM is a development towards the recognition of the psychological pain that affects many residents (the regulation was launched in November 2021). To provide the envisioned recognition and satisfaction, a few conditions need to be met: the regulation needs to be transparent, fast, easy to understand and not burdensome for residents. Rules and procedures are important and necessary, but the "tone" (e.g. do the procedures imply distrust towards residents?) and the attitude of assessors and policy makers (e.g. do they really listen to residents?) are of vital importance for the fair handling of claims.

Whether this regulation for the compensation of immaterial damages will be sufficient, remains to be seen. The problems in Groningen are far from over and restoration and reinforcement will continue to play a role in the foreseeable future. Compensation for immaterial damages should be provided timely and not years after the harm incurred.

Recovering trust and relations

The issues arising from gas extraction have caused significant damage to social relations, for example those between the government and citizens. Recognizing pain and suffering by providing compensation is currently, as far as we know, the only concrete approach aimed at restoring relations. However, adequate financial compensation for material and immaterial damages will not automatically lead to the restoration of relations. Residents need to feel that they have been treated justly and be able to trust that they will also be treated justly in the future. Above all, they need to be able to perceive the government as a trustworthy actor and ally. This requires more than merely the repair of mistakes made.

Within communities, relationships are sometimes damaged as well. Instead of impairing social cohesion, damage repairs and reinforcement should support a community. When compensation for damages and reinforcement measures inexplicably vary within villages or neighbourhoods, this leads to jealousy and frustration. This can be prevented by a collective approach, whereby communities are consulted about the perceived challenges, solutions and preferences. The current approach is often too individualistic, which can cause new problems: the dissolution of community spirit.

Some projects do strongly capitalize on the strengths of communities. The importance of a support base and civil participation is increasingly ack–nowledged. The project Toukomst[8] (Groningen dialect for 'future'), initiated by the NPG exemplifies an ambitious accomplishment. The high number of applications by residents does not only testify to their enthusiasm, but also clearly demonstrates residents' willingness to put effort into improving their environment, if given the chance. Now that the execution phase for most Toukomst–projects has commenced, it becomes important to explore whether and how this approach can be continued and generalized to be applied in other projects.

Finally, the relationships between different governments and levels of government have been severely damaged. The continuously changing approach of the national government has compromised the position of municipalities. For example, in the village Overschild, the municipality initially acted as a supporter and co–instigator of a collective approach to reinforcement. When changes in the approach of the national government and NCG interfered with this approach, it undermined the agency of the municipality. Improving the relationships between levels of government needs to be a main focus.

[8] Toukomst is an initiative of the NCG, where residents of Groningen can hand in ideas for the development of the province. The best ideas are rewarded subsidies: https://www.toukomst.nl/

4 What does this mean for the approach now and in the future?

Which lessons can we learn from the issues that have arisen from gas extraction in Groningen and from the way in which these issues have been dealt with? The central lesson, we believe, is that the societal impact of gas extraction and the associated damages has been denied for too long. In response to these issues, the primary focus was not the well-being of residents, but the economically profitable continuation of gas extraction. The current issues with the reinforcement operation originate here: they are a result of ignoring social impact.

The (scientific) literature on Social Impact Assessments (SIAs) provides an array of opportunities for the prevention, reduction and mitigation of social impact before, during and after mining operations. Drawing on this literature, we explore how mining policy can be structured so that residents experience a more fair division of costs and benefits.

The literature on SIAs distinguishes seven different phases of projects (see Figure 2) (Vanclay, 2015). All seven phases of a project require the active prevention, reduction and mitigation of negative social impact. In the exploratory phase, a SIA is performed, and measures are recorded. During the project, social impact can be monitored referring to the previously established parameters. Involving and informing stakeholders through meaningful participation is required in all phases of the project.

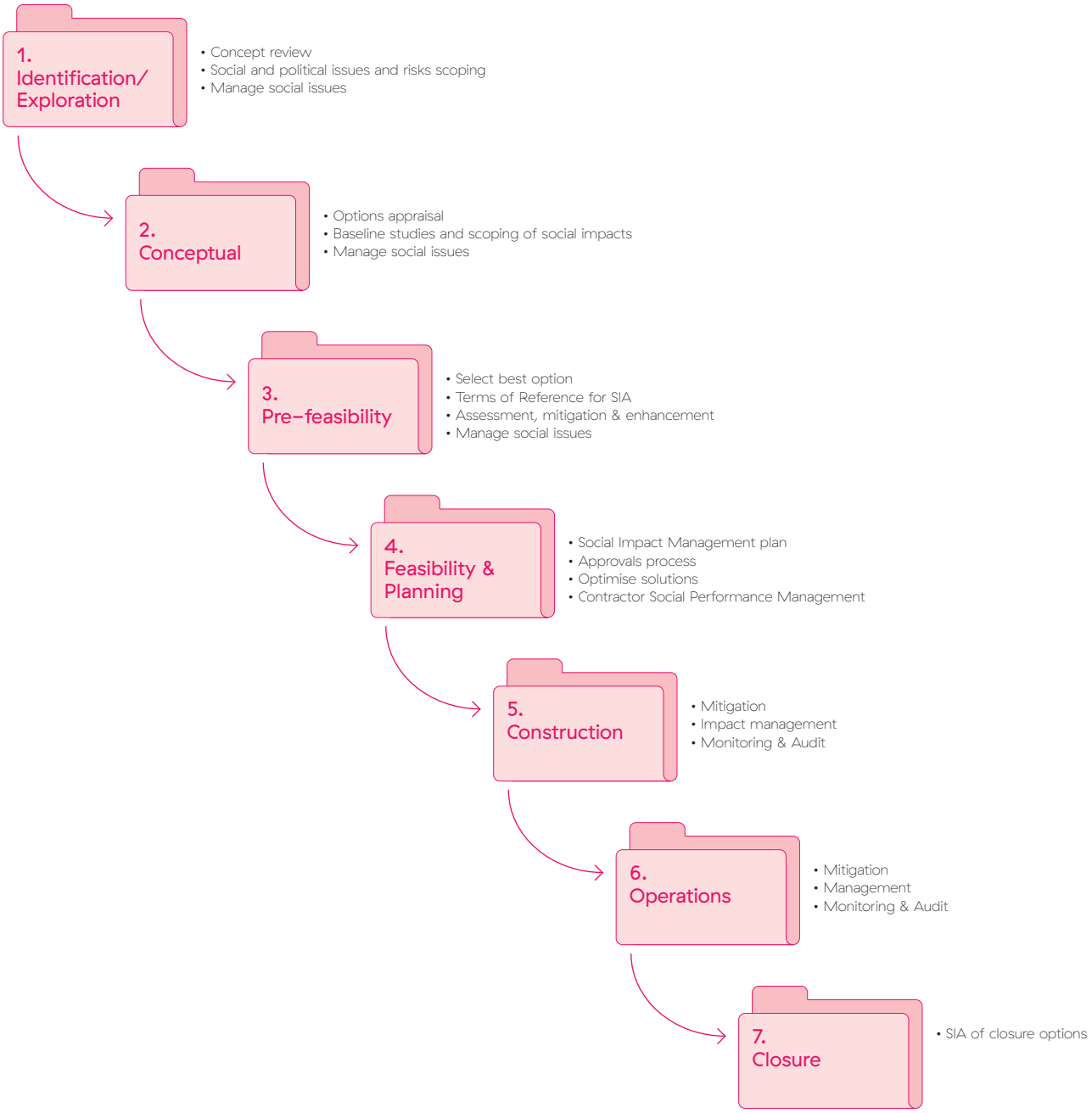

Figure 2. An overview of phases in a Social Impact Assessment (Vanclay, 2015).

Social impact assessment – preventing a new disaster in slow-motion

We observe that the learning capacity of the Dutch government appears to be limited. The ways in which licenses for mining projects are granted and mining projects operate, often repeat the mistakes made in Groningen. Too often the government and private sector decide together and residents are involved too late or not at all. There are several examples of similar situations concerning smaller gas fields in the Northern Netherlands, the placement of solar farms or wind farms, explorations of the possibility of geothermal heating and infrastructural projects related to wind energy, like cables and power lines. Because the Netherlands is a densely populated country, spatial adaptations are difficult to attune to the many different interests and spatial challenges involved. The diverging interests of the government, residents, and the private sector create friction, and citizen participation is not often meaningful. Compensation and participation are insufficiently accounted for in legal guidelines.

The SIA literature provides guidelines for socially responsible entrepreneurship and should be leading for new and existing mining projects. With the implementation of these guidelines, situations like in Groningen can be prevented and mining projects in the Netherlands can be brought in line with internationally accepted norms. Apart from participation and support, residents sharing in projects' profits and properly completing projects, we discuss 5 themes from the SIA literature (based on Vanclay, 2015).

(i) Socio-political context

It is important for every company involved in mining activities to understand the socio-historical context of the area. Companies never start with a clean slate. Projects should only be considered "successful" when the parties involved manage to maintain good relationships between the company, residents and governments; these groups should not become opposed to each other. In Groningen, this could be facilitated by a critical analysis of previous and current shortcoming of policies concerning gas extraction.

(ii) Mitigation and monitoring

In future mining projects it will be crucial to recognize physical and social risks and to ensure proper supervision and monitoring. Monitoring is currently still seen as a purely technical issue in the Netherlands. There is a strong tendency to summarize everything in models and exact numbers, such as the average amount of decibels or distance to a project's activities. This approach focuses on objective technology over the experiences of affected residents. However, the development of monitoring networks is only beneficial if they are supported by the trust of citizens. This requires

more attention for the experiences of citizens. Moreover, proper monitoring includes not just technical quantifications, but also social monitoring (health impact, equal well-being etc.). The SodM calls this 'next level supervision' in which the interests of citizens are better involved (SodM, 2019).

Plans and agreements about monitoring should be made before a project commences, especially when it concerns the monitoring of acceptance and of the added value of projects. The knowledge of residents and social scientists should be integrated better.

(iii) Responsibilities

Prior to the start of projects, clear agreements have to be made on the course of action in case of mining damage or the emergence of safety risks. This includes the prior determination of accountability, safety norms and independent supervision. It is also important that the government has a mandate to intervene and stop projects entirely in case of safety risks, calamities and social disruption. To avoid a conflict of interest and allow the government to act decisively if necessary, the national government should not be financially dependent on extractive industries. Precisely this contributed to the distrust of residents in Groningen towards the national government.

(iv) Social impact

It is important to analyse possible social impacts prior to starting the project. These could be both positive and negative. Alternative strategies should be available to prevent and mitigate these impacts. These typically include a calamity fund for possible negative and unforeseen consequences.

(v) Human rights violations

Mining activities ought not to conflict with human rights. The United Nations Committee for Human Rights already expressed its concerns about the situation in Groningen. It is of vital importance that new mining projects do not repeat such violations.

Participation and public support base

Currently, participation trajectories are too often merely used to (retrospectively) legitimise decisions. One principle of SIAs is that people have the right to be involved in decision-making about planned interventions before these interventions can affect their lives (Vanclay, 2015: 20). To develop sustainable projects, the participation of residents during every phase of

a project is essential. To attain this, meaningful interaction, dialogue with all stakeholders, and having power to influence how social impacts are mitigated are important. The SIA literature considers sufficient time to inform, consult, involve and cooperate with residents to be essential. Giving some amount of control to residents often helps to involve them in plans. Residents need sufficient time to get involved and this should therefore be provided. The national government plays an important role: participation is currently not obligatory by Dutch law and more could be done to stimulate and facilitate participation processes.

In participation trajectories it is important to provide clear frameworks and principles to residents. Residents need to know why a participation trajectory is initiated: can they partake in decision-making, think along and say no? It is crippling when the interests of residents are disregarded as a result of lacking regulations: this undermines trust. Living up to one's promises is crucial for successful participation.

Profiting from mining

When mining projects start, this is often accompanied by high expectations and promises. It is important that ambitions are realistic and that promises are fulfilled. The eventual goal of mining projects should be for all stakeholders to profit from the activities, especially households with limited incomes. Improving employment opportunities can be an incidental benefit, but a region should also see other positive consequences from projects. Having control is important here. This can for example be realized with an area based fund, for which residents themselves can decide on investments in their living environment.

Completing mining activities in Groningen

These conditions derived from the SIA literature show that there is significant room for improvement for socially responsible entrepreneurship in Groningen (Vanclay, 2015). While in Groningen, the government has taken on responsibility for many negative social impacts, the SIA literature assigns this responsibility primarily to the operator. Decently completing mining activities and closing the Groningen field, should be a top-priority for the NAM.

What does ‘decent closure’ entail in this case? At the very least, the NAM should control and minimize environmental, health, and safety risks. In cooperation with the government, the NAM could create a reserve fund for restoring immaterial damage, ensuring safety and stability, and for further compensating possible damages.

Despite the NAM not being responsible anymore for damage repairs and reinforcement, the company remains responsible for its business operations. To obtain and maintain support for mining operations in the future, a good reputation is important. A decent completion of current activities can crucially affect future support. The restoration of trust and forgiveness for the suffering in Groningen will take a long time. In Groningen, rebuilding the trustworthiness of private companies is of vital importance, especially because many of the companies formerly involved in gas extraction are making the transition towards renewable energy provision in the region. Currently, the trust of residents is extremely low and assigning the region a prominent role in the energy transition feels like adding insult to injury. It will be extra challenging to make the acceptance of future projects attractive for residents.

Disruption and unsafety: what do we learn from Groningen for future mining projects?

By law, mining should prevent negative impacts for people and the environment, damages and reduced safety (Mijnbouwwet, art. 33). In 2018, the mining law was changed and it now makes explicit that it is necessary, in Groningen, to avoid 'societal disruption'. There is a lot to be learned from mining in Groningen about negative impacts, unsafety and societal disruption. In this part we draw some lessons. This is not just relevant for the implementation of the law. It is also vital that future mining projects learn from the example of Groningen.

The mining law was adapted in 2018, because of the severe and widespread societal disruptions happening in Groningen. Gas extraction would go towards zero, and the Minister of EZK would determine the amount of extraction from the Groningen field. This implied a difficult decision. On the one hand, there has to be a sufficient supply of energy (security of supply, article 52d, section 2b). On the other hand, physical unsafety and societal disruption has to be kept to a minimum (section 2a and 2e). The term 'disruption' is new in the context of Dutch mining law.

What does societal disruption entail? The law seems to focus first and foremost on physical safety. The first section explicitly indicates that the collapse of buildings needs to be prevented and refers to the '10^{5}-5 norm' to quantify the risk (section 2a).[9] Additionally, the law states that societal disruption in Groningen is undesirable and that the same is true for other parts of the country if energy supply is at risk due to the closure of the Groningen field (section 2e, 2f). With the term societal disruption, the minister refers to 'societal consequences like delays in damage repairs, social insecurity, health effects and social unrest' (Kamerstuk 2019, D25469).
Thus, societal disruption is used as a catchall phrase for damage, unrest and health issues. It also includes 'social security': the safety of residents. Logically, the physical safety of buildings is part of this: the 10^{5} norm refers to the probability of residents dying due to collapse. As visually represented in Figure 3, the physical safety of buildings is not really a separate article in the mining law, but can also be considered a natural part or subset of the concept of social disruption (section 2a, 2e).

Also noteworthy is that the term 'disruption' implies that damage, unrest, ill health and insecurity become unacceptable beyond a certain threshold. But as of yet, the law does not attempt to specify what kind of threshold should be applied. There is only a norm for the collapse of buildings, not for the other negative impacts of mining that disrupt society.

[9] The 10^{5} norm, also known as the Meijdam norm, dictates the maximally acceptable probability of an individual passing away as a result of the collapse of a building in case of an earthquake. In Groningen this maximally acceptable probability is set at ^{1} in 100.000.

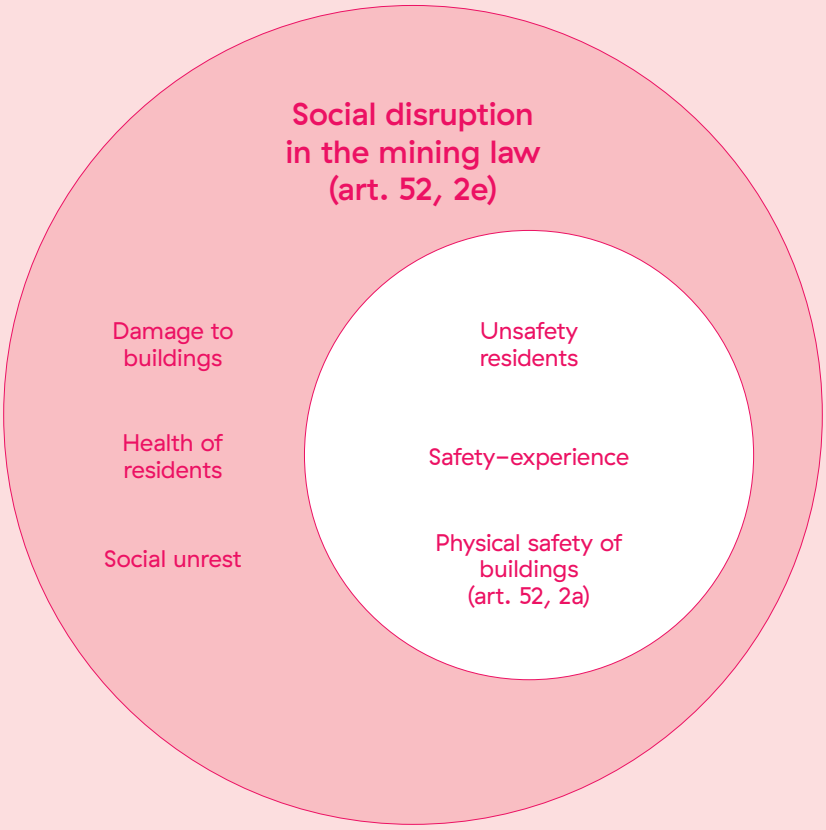

Figure 3. Societal disruption in the mining law

We would argue that it is illogical and even dangerous to reserve a special status for physical safety in the law. A practical example from Groningen can illustrate this. A resident who experiences acute unsafety in their home can report this. If their house is subsequently found to be unsafe, authorities can take several steps. One is to reinforce the building with beams. As a result it passes the safety norms (risk is $< 10^5$). But is a building full of support beams for several years a safe living environment for the residents involved? Hardly, of course. Another option authorities have (and have used numerous times) illustrates even better how the restoration of safety can, under current law, inflict serious harm on residents. Authorities can declare a building unsafe and unfit for residence. The residents have to leave and the house will be demolished. On paper, the destruction of all homes would fully restore safety. But this is obviously hugely harmful and therefore undesirable both for residents and government: structural treatment of people in this way is unsustainable and violates (among others) the European Charter of Fundamental Rights.

This example demonstrates that it is nonsensical to place the safety of buildings above the safety of residents. The building norm cannot be the point of departure: the safety of residents has to be central, not that of buildings.

Analysis: lessons from Groningen

Our literature studies provide a complete picture of the spectrum of social impacts that can arise from mining (Busscher *et al.*, 2020; Hupkes *et al.*, 2021; Sluiter *et al.*, 2018) What are the 'lessons from Groningen' for these negative impacts and for societal disruption? We distinguish between causes, incidents and consequences. Furthermore, there are measures to prevent incidents (prevention) and measures to deal with consequences (recovery and aftercare).

This distinction is known from the 'bowtie model' (see Figure 4) which is used in the Dutch national safety strategy (RIVM, no date): the methodology used by the national government to prepare for all kinds of acute disasters

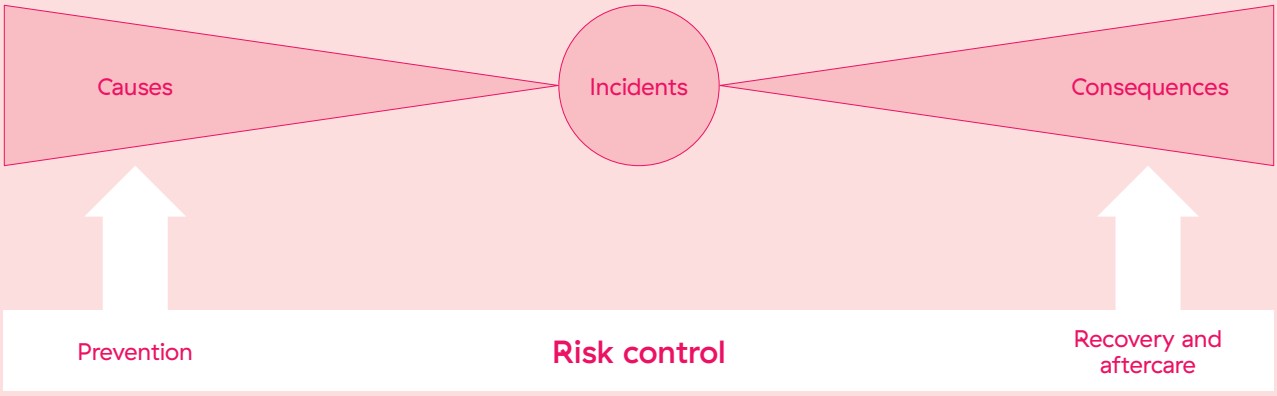

Figure 4. 'Bowtie model' for risk control

and catastrophes, ranging from natural (floods, epidemics) to human and industrial (nuclear disasters, terrorism, earthquakes etc.). The slow motion characteristics of the problems surrounding the earthquakes in Groningen and the COVID-19 pandemic did not fall within the frame of 'integrated risk analysis for national security' but the bowtie model still helps with the analysis.

Causes. There are four risks. Soil subsidence, earthquakes and the risk that toxins like natural gas condensate are released, are known to have direct consequences for residents and institutions. The fourth risk is a substantially bigger earthquake which causes buildings to collapse. (the biggest so far was M=3.6. With an earthquake of M=4.6, 10 times the amount of energy is released). This is a hypothetical risk: an earthquake of this magnitude has not occurred so far but the possibility cannot be excluded.

Incidents. No acute disaster occured in Groningen. However, since 2000 (and according to some long before that too) incidents have occured.

- Heavier earthquakes, like the ones in Westeremden (2006), Huizinge (2012) and Zeerijp (2018) have led to waves of damage claims.
- Infrastructure (waterworks) had to be adapted to deep soil subsidence.
- Deep soil subsidence does so far not cause direct damage to buildings. However, it does change the water balance which in turn can result in indirect damage to buildings.
- In 2018 a leak of natural gas condensate led to nuisance, complaints and health concerns among residents.

Because these incidents occur slowly but surely, because small earthquakes occur often and because the consequences cannot be controlled sufficiently, the situation in Groningen has become disastrous for residents and institutions, both in terms of scale and impact.

Consequences. The most important consequence for residents is that they are dealing with **mining damage.** Often this concerns small damages in high numbers: tens of thousands of claims each year. According to residents and some experts, there is also more structural damage, for example in the foundation of buildings. In some cases buildings are **acutely unsafe**, they have to be supported or are declared **unfit for residence**. An unknown number of these houses have been bought up by the NAM. The total number of residents that needed to leave their home because of acute unsafety is also unknown.

There are many indirect consequences of the gas extraction due to the ways in which society deals with damage and safety risks. An overview:

Even when damage is limited it can disrupt the life of residents. This is partly because of **inadequate damage repairs** and **poor aftercare.** For a long time, the capacity for damage repairs was insufficient. Residents had to wait very long and a lot of repairs were mostly cosmetic. Many claims were rejected.

Many **conflicts between residents and institutions** arose. People with complex damage trajectories often become involved in lengthy procedures. This causes many people to refrain from reporting damages, they do not want to be caught up in lengthy procedures.

Another downside for residents is the risk that buildings can collapse following a heavier earthquake. Preventive measures are being taken to reduce this risk: reinforcement. But, **reinforcement places a heavy burden on residents**. Their lives are considerably affected, the process surrounding reinforcement takes a lot of time and energy. Moving in and out of a temporary home is stressful and disrupts social ties. For the institutions and authorities involved, reinforcement also is a millstone. The reinforcement costs a fortune, is slow and arduous. The reinforcement also causes conflict between residents and institutions, among institutions and among residents. Additionally, the added value of reinforcement is questioned by some. Thus, the preventive measures themselves have become a topic of debate and an incident in itself.

There appears to be **poor cooperation between institutions, governments and the NAM** in relation to the reinforcement operation and the handling of damage claims. There are many institutions involved, it concerns many functions and sectors, and (for professionals too) it is difficult to understand why it has to be so complex and slow. Communication with residents is not great and in many aspects **residents are insufficiently represented** within the process of implementation and policy making. The flawed execution undermines trust in the responsible institutions and in the system as a whole. The lack of cooperation and the conflicts between institutions results in **unclarity and insecurity** among residents.

Another aspect is that, partly because of damages, reinforcement and insecurity, **the housing market is disrupted**. That has negative financial consequences for residents. IMG tries to repair this with compensation for the depreciation of houses. However, this regulation may induce more discussion, inequality, dissatisfaction and social unrest.

Ultimately, this collection of consequences has a negative impact on the **liveability** of the area and threatens the conservation of its **cultural heritage**. The strongest effect on the well-being of the population is that residents feel **powerless** and **unsafe**, as demonstrated in research from *inter alia* Gronings Perspectief. The experienced unsafety does not only result from earthquakes, damages and physical unsafety, but is also caused

by the mentioned insecurity, the 'fuss' concerning damage repairs and reinforcement and the economic consequences. This in turn results in chronic stress, which impacts the **health** and living pleasure of residents.

Lessons for the risk–regulation reflex

In the last 20 years, Dutch public administration experts have written a lot about the 'risk-regulation reflex'. This consists of the possibility that certain social dynamics occur around objectively small risks that then leads authorities to invest extravagantly in safety (Van Toll *et al.*, 2011). We observe that in Groningen, something else went wrong: the government, NAM and public administrators focussed exclusively on the safety of buildings, disregarding the safety of residents. Perhaps fear for the risk-regulation reflex or a desire to cut costs played a role in this. What is certain, is that the risks in Groningen were underestimated and hence not sufficiently addressed. A proper and complete risk analysis was lacking, which is why a disaster in slow motion could occur: the most impactful risks for residents were not considered and addressed in the extraction policy and risk management. The results of this flawed approach are currently being felt.

Lessons for the impact of mining

On the basis of this long list of many different negative effects of gas extraction in Groningen, which constitute the most substantiated negative consequences? What do we learn from this case about the risks of mining in general and about determining social impacts? We close this reflection with a convenient overview (Figure 5).

Figure 5. Social impact of mining

We distinguish five impact areas: housing, environment & economy, social relations, residents & recovery and mitigation. Clear goals and monitoring can be connected to these impact areas. The capacity to successfully execute gas extraction can also be assessed, for example with extraction plans, before the distribution of licenses.

Two new insights are associated with existing approaches to societal impact. The first concerns the central importance of good cooperation between residents, authorities and exploiters: **good relationships** are crucial for a good course of action for mining operations. Our impression is that the gas extraction in Groningen ended up becoming a disaster because cooperation between stakeholders failed as soon as problems arose. The flawed representation of citizens played a central role in this, but later the cooperation between the governments, and between the national government and the NAM broke down as well. The quality of cooperation could be a good risk indicator.

The second insight is the importance of a good **preparation** for social impacts, restoration and mitigation. The preparation in Groningen was insufficient, partly because residents were not involved in decision-making. For example, no standing arrangements were made for the compensation of damages, which is incomprehensible when considering that the level of extraction in Groningen was bound to cause some unwanted side effects. That bad preparation appears to be the rule rather than the exception, and is the result of legislation.

Concluding remarks

The case of Groningen is instructive. The NAM operated the Groningen field without concern for social impacts, because of a combination of laissez-faire legislation and a neglect of monitoring and supervision. The government recently adapted the mining law, but herein reserves a special treatment for the Groningen field. The implicit expectation seems to be that eventually everything will go back to business as usual. So far, this expectation seems illusory because of pervasive concerns across Dutch society that the mishandling of the Groningen case is not incidental. More importantly, one should wonder whether going back to business as usual in the Netherlands is desirable. To prevent new fiascoes like Groningen, we should learn from these lessons: about the origins of societal disruption and how to recognize it, about the development of proper monitoring to ensure timely intervention, and about obtaining a better understanding of the central concept of safety. A much tighter control by the government would provide clarity to companies and citizens concerning the rights and obligations around responsible mining. This would contribute to the necessary recovery of trust.

Colophon

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