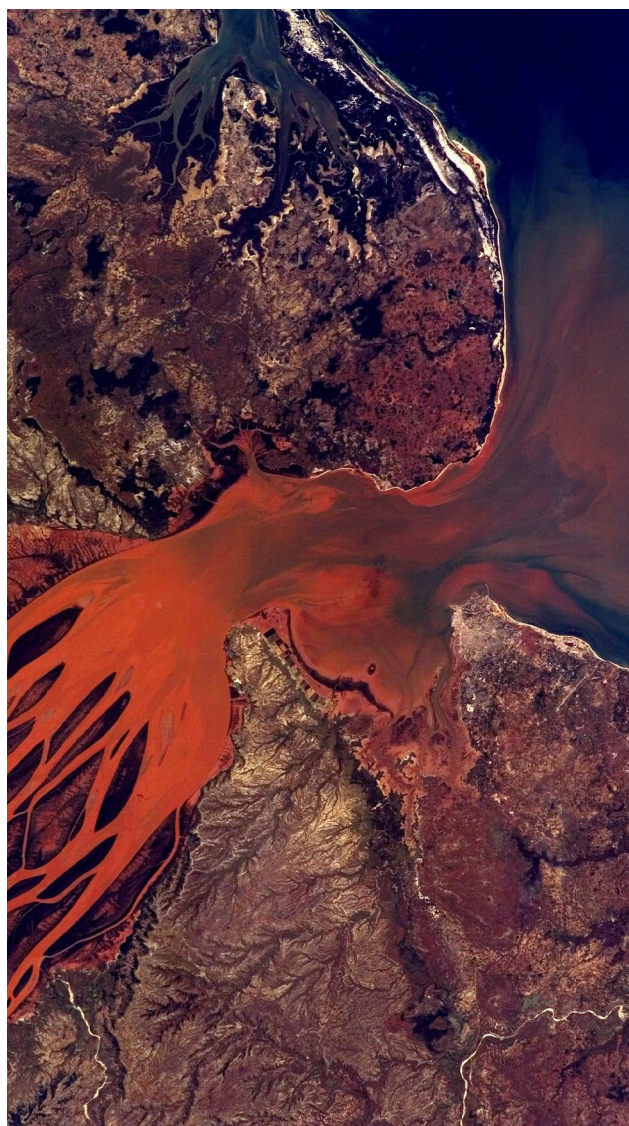




Issue #05 Accidents

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The Groningen 'Accident'

*NCG Atelier
Regiobouwmeester:
design for recovery*

*Enno Zuidema
Pasha Vredenburgt
Anna Herngreen
Quiryn Kaasschieter
Sophia Arbara*

Between 1986 and 2013, the Province of Groningen in the Netherlands experienced approximately 1,000 minor earthquakes induced by decades of natural gas extraction. Until the major 2012 Huizinge earthquake, these tremors were neither widely acknowledged as a serious issue nor explicitly linked to extraction activities. Despite growing evidence, Dutch gas companies and governmental bodies have delayed taking action, often prioritizing corporate interests over socio-environmental concerns. This essay examines the Groningen earthquakes as a socio-environmental "accident"—not as a random event but the outcome of sustained and systemic negligence which beyond physical damage, has led to long-term distrust, governance failures, and fractured communities. This study features the work of the National Coordinator Groningen (NCG) and its Regional Architect Atelier (Atelier Regiobouwmeester) to explore the recovery timeline, the role of design in rebuilding efforts, and how specific design measures (toolbox) can contribute to regional reconstruction and resilience. The Groningen case underscores the need for a more just and proactive approach to environmental governance and design in the peripheral regions affected by resource extraction.



Figure 1: Long process of reinforcement of monumental building, Raadhuisstraat 5, Loppersum. NCG Atelier Regiobouwmeester

THE MAKING OF AN 'ACCIDENT'

Between 1986 and 2013, the Province of Groningen, located in the northern part of the Netherlands, experienced approximately 1000 minor earthquakes induced by the ongoing since the '60s gas extraction activity (Van Der Voort & Vanclay, 2015). Until the occurrence of an earthquake incident near Huizinge on the evening of 16th of August 2012 - measuring 3.6 in the Richter scale- gas extraction induced earthquakes were neither perceived as a major concern nor explicitly linked to gas extraction activity (KNMI, 2025).

For years, Dutch natural gas companies have been actively involved in and funded research initiatives; however, they have not focused their research attempts on the consequences of gas drilling (New Energy Coalition, 2025). This lack of emphasis on the socioenvironmental implications of drilling stymied public understanding of the full scope of the damage. Instead of reducing extraction in response to earthquakes, NAM, a joint venture of Royal Dutch Shell and ExxonMobil, continued operations, sometimes even increasing extractive activities, such as after the major earthquake in 2012 (NAM, 2025; Statistiek, 2019). Today, with gas extraction recently halted, it has been widely accepted that earthquake incidents in Groningen were not an 'accident' but a result of a series of ongoing and exacerbating activities in the area that left imprints with profound physical and social consequences.

This case exemplifies how corporate interests, governmental negligence, and a lack of research on the socio-environmental impact have shaped a disaster that continues to affect the region at various levels and scales. Beyond the structural damage, the disaster has resulted in long-term distrust, governance challenges, and community fragmentation (Schreuder et al., 2023). This essay results from discussions and site visit that were held between Enno Zuidema, Regional Architect at National Coordinator Groningen (NCG) and Pasha Vredenburg, Landscape Architect at 'NCG Atelier Regiobouwmeester' / 'NCG Regional Architect's Atelier', here referred to as 'Atelier', and researchers from the TU Delft Delta Urbanism Research group in January 2025, in Loppersum, one of the affected villages. The aim of this essay is to situate the creation of the Groningen socioenvironmental 'accident', reflect on the timeline and process of recovery and discuss how the design toolbox of the Atelier can support reconstruction and recovery efforts.



Figure 2: Badweg street in Loppersum showing the discrepancies between new and old housing as well as loss of vegetation and lack of planning, NCG Atelier Regiobouwmeester

TIMELINE OF RECOVERY: AN 'ACCIDENT' IN THE PERIPHERY

Peripherality has played a crucial role in the case of Groningen and the timeline of reactions to the socio-environmental 'accident'. Particularly, its location in a peripheral, rural and economically less prosperous position within the Dutch Delta, underscores regional inequalities in disaster response. This positioning is relatable to what scholars have called 'resource peripheries' with specific consequences of marginalization and slow governmental reactions, that such a socio-spatial formation embeds (Irrarázaval & Arias-Loyola, 2021).

The Groningen gas fields have provided the Dutch state, and consequently, the Netherlands as a nation, significant wealth that made immense investment in infrastructure and beyond, possible. This resulted in the sentiment of the Groningen people that their province had been treated as *wingewest*: a term used mostly for colonies to highlight exploitative practices that take place in the benefit of the home countries, applicable also to peripheral regions, where extractive practices that benefit other areas of the country, take place (Schreuder et al., 2023). As a result, distrust towards governments has grown over the past few years, as has the feeling of Groningen people being second rank citizens.

The recovery process in Groningen has unfolded in two distinct phases. Initially, it started with the approach of reinforcing single buildings, where complying with safety norms was the primary concern. Later on and following the parliamentary inquiry by the Committee on Natural Gas Extraction titled 'Groningers boven gas' / 'Groningers over gas' that took place in 2023, the cabinet announced a multi-year approach for Groningen and North Drenthe titled 'Nij Begun' / 'New beginning' (Rijksoverheid, 2023). It involves a package of 50 measures for Groningen and North Drenthe and expands the recovery approach to integrate social, economic and spatial recovery in coordination with partners and residents. Within this framework, where recovery of societal structures meets housing needs and environmental concerns, the reinforcement operation, coordinated by National Coordinator Groningen (NCG) and the Atelier emerged as an implementation organization of the Central government (Rijksoverheid). It is a partnership between five Groningen municipalities, the province of Groningen and the national government (Versterkingsaanpak, 2025).

While the timeline of recovery from the spatial consequences of the 'accident' aim to be fixed within the next decade, the repair of the societal consequences require a much longer-term process. The impacts on well-being, safety and needs of residents also have much broader roots than the seismic activities per se. They are largely part of negligence and ineffective management from



Figure 3: Example of building and street reinforcement project in Loppersum, Groningen. Sophia Arbara

the operators and the government in responding to the affected communities (Schreuder et al., 2023). In that line, the recent Parliamentary Inquiry Committee on Natural Gas Extraction in Groningen approached the topic in a more integral way, aiming to address these deeper societal ruptures. This led the National Government to publicly acknowledge and integrate measures to repay the debt of honor (Ereshuld in Dutch) to the affected communities in Groningen and North Drenthe (Rijksoverheid, 2023). A formalized process of remembering (e.g. through public memorials) and showing the impact on local communities could prevent suppressing the trauma of the 'accident'. This recognition might contribute not only to highlight the societal impact and shed light on the lack of responsiveness and mismanagement in the Groningen 'accident' but also to build upon societal repair. In this context, the actions and measures of the 'New beginning' are key to future recovery and repair.

DESIGN FOR RECOVERY: THE REINFORCEMENT PROJECT

The reinforcement operation of National Coordinator Groningen (NCG) and the Regional Architect's Atelier act together with the Groningen Mining Damage Institute (IMG) as the implementing organizations of the 'Nij Begun' recovery process along with municipalities, the province and

social organizations. The Regional Architect plays an independent role in the process, advising the general director of the NCG Agency. The Regional Architect is supported by the Atelier, comprised of architects, landscape and urban designers. Together they advise daily project leaders, NCG actors, municipalities, citizen initiatives and homeowners on maintaining and enhancing spatial qualities of rural landscapes and housing areas. The Atelier is in charge of implementing reinforcement operations in buildings and infrastructure (e.g. dikes and facilities). However, its scope is not limited there; it also aims to enhance sustainability in housing structures, navigate compensation processes of residents to ensure that these are fair, protect and add quality in rural landscapes, villages, and cities along with the buildings' reinforcement. The timeline of this operation foresees that reinforcement task operations will continue until 2034, with the aim that some part of these will still be completed by the end of 2028 as initially foreseen (Klimaat, 2024; Staatstoezicht op de Mijnen, 2025).

The key to long-term recovery is the area-based approach – developed in collaboration with municipalities – that aims at an integral societal and spatial future development. The reinforcement task involves fostering local ownership to contribute to the broader recovery process as well as strengthening homes and public buildings to withstand further seismic activity; yet delays and inefficiencies have prolonged uncertainty for resi-



Figure 4: Example of building and street reinforcement project in Loppersum, Groningen. Sophia Arbara

dents. Reinforcement projects at the street level illustrate the complexity of this process, as efforts to reinforce an entire street require extensive collaboration among homeowners, local authorities, and structural engineers. To operationalize the strategies of a long term, area-based approach, the Atelier has identified and implemented a series of interventions to improve spatial quality and livability in Groningen's reconstruction efforts. These are grouped into categories and presented as a 'toolbox' for recovery that aims to make spatial quality an integral part of the project. The tools are presented below:

TOOL 1: ACQUISITION AND QUALITY-CENTERED TENDERING

The NCG and the Regional Architect's Atelier have shifted their focus from purely technical reinforcement efforts to include spatial quality as a core principle. To facilitate this, they are working closely with the tendering/Selection Department where a pool of architects—including urban planners, landscape architects, and cultural historians—has been established to assist homeowners in designing homes that integrate seismic reinforcement.

The pool of architects can be used by individual homeowners whose houses need to be reinforced to the extent that the strengthening significantly alters the exterior or interior or if their house is beyond repair and

needs to be demolished. The architect helps either integrate the strengthening into existing buildings or designs a new home for the homeowner. Most of the time, the architect works closely with the homeowners and integrates their preferences in the design. A framework contract is designed to help NCG find designers for larger projects, such as drawing an urban development plan, a vision for a village ('dorpvisie') or a historical analysis of a neighborhood. Tendering and selection processes have been refined to prioritize design quality over cost efficiency, ensuring that spatial improvements are embedded in the reconstruction process. An example of this is the incorporation of bio-based building materials in the existing material list of the NCG and Tender projects following an advice report that the Atelier compiled on using bio-based materials for reinforcement operations.

TOOL 2: THEMATIC ADVICE (E.G. TEMPORARY HOUSING, LANDSCAPE TRANSFORMATIONS)

The second tool involves providing Thematic Advice, such as Advice on the implementation of Temporary Housing or Landscape transformations. The Department of Temporary Housing (THV) has sought the Atelier's expertise in improving the quality of both new and existing temporary housing sites. The focus is placed beyond aesthetics on spatial quality, encompassing usability, comfort, and long-term sustainability.

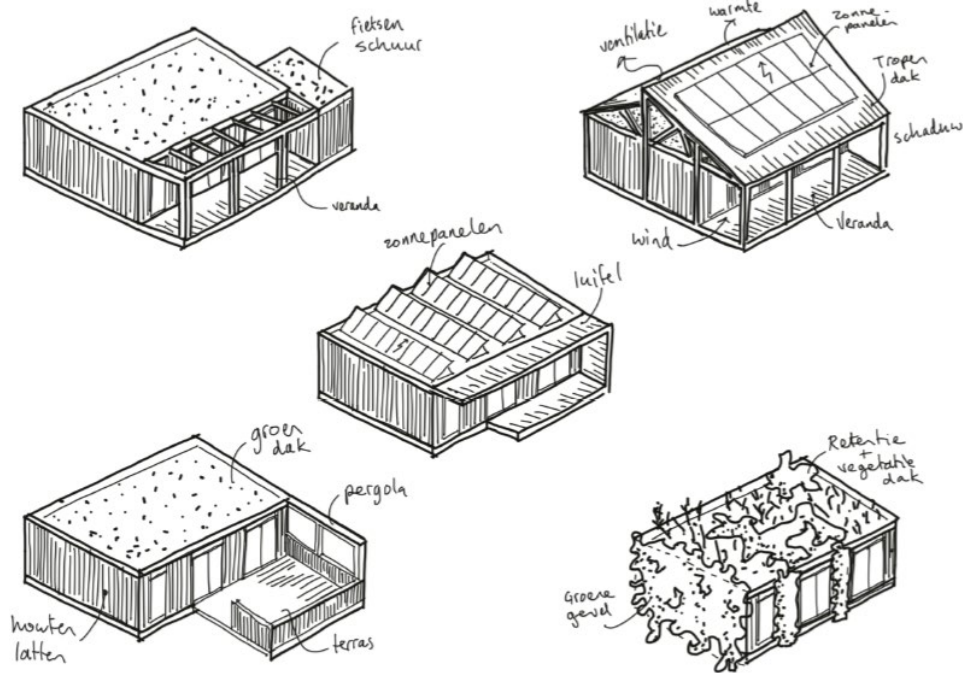


Figure 5: Proposed added qualities for the temporary housing units.
NCG Atelier Regiobouwmeester

Current temporary housing models are short-term solutions, often located in isolated areas with little connection to village centers. To address this, we focus on three levels/scales of intervention for the temporary housing facilities. First, on the architectural and structural enhancements to improve housing conditions (see Figures 5 & 6). Second, on the creation of a sense of place and sense of community. People relocated to temporary housing facilities may stay at their temporary homes for up to four years. It becomes relevant to place these next to existing village functions, such as a supermarket/community centers and schools, and connect them to walking and cycling routes, strengthening the qualities of the site in the present. Third, strategic site selection is prioritized to ensure long-term value for surrounding areas. While the life cycle of temporary houses is approximately 5-15 years, a carefully selected site can ensure long-term development of the area beyond the temporary housing period.

With a view to improve the quality of the space, various recommendations to rebuild and strengthen Groningen in a more coherent and holistic way are being developed, encompassing short-term solutions of housing to long-term landscape transformation strategies (Figure 7). This process sometimes requires a change in mentality, work processes, or ways of collaboration. At times, this leads to challenging discussions and conflict resolution amongst the involved experts. Some of the rec-

ommendations mentioned in this text have already been implemented on a one-to-one basis and in the short-term, while others are more strategic in nature and require a more long-term implementation. The core of the collaboration with THV is to develop a set of conditions that will lead the temporary housing development and the resulting reinforcement procedure of the victims of the Groningen earthquake. The approach to providing consultation can be summarized as starting from a temporary solution towards sustainable creation of spatial value for the future.

TOOL 3: RESEARCH & CONSULTATION THROUGH 'OPPORTUNITY MAPS'/'KANSENKAARTEN'

Recognizing that the earthquakes impact not just individual buildings but entire neighborhoods and landscapes, the Atelier promotes an area-based approach to reconstruction. The development of 'Opportunity maps' helps identify strategic areas for intervention as well as to raise awareness among all actors involved, and consists of three main layers of information; data on (planned) reinforcement, landscape and urban environment plans, spatial and social analyses to enhance livability of the area, co-creation: input from project leaders, the municipality, social workers and the people who live in the villages. about the spatial and social quality of their environment. The aforementioned layers are the main spatial clusters



Figure 6: Long-term landscape impact and integration of landscape elements, production and climate-proof design in temporary housing installments. NCG Atelier Regiobouwmeester

on which the focus for area-based development is placed as these are perceived as the clusters where the biggest risks but also opportunities lie. In several villages, the Atelier and the community are now working together to go beyond strengthening the buildings within but to develop plans to improve the quality of the streets or neighborhoods. The ‘Opportunity Maps’ presented below (Figure 8 & 9) are showing consultation sessions with the village of Kantens. ‘Opportunity Maps’ are not only developed in the villages but also in other settings such as agricultural areas, with a focus on farms and the qualities of the rural landscape.

TOOL 4: SHOWCASING SUCCESS & INSPIRING FUTURE PROJECTS

To address the widespread lack of awareness regarding quality design in reinforcement projects, the Atelier is currently engaged in a series of dissemination initiatives to showcase the possibilities of the reinforcement project.

The first activity involves the development of an inspiration booklet. The inspiration booklet—which will eventually be transformed into a website—showcases examples of building reinforcement and insulation across eight different building types and five historical periods. It also features narratives from homeowners, architects, and contractors, offering insight into the reconstruction process.

Another initiative involves the launch, together with the province Groningen of a provincial architecture award, the Bronzen Havik Prize (www.bronzenhavik.nl). The Bronzen Havik prize has gained significant recognition, celebrating exemplary projects that extend beyond structural reinforcement to enhance the broader living environment. The Platform For Groningen – Architecture and Urban Planning (GRAS) organized the jury process. A broad, multidisciplinary jury nominated nine projects and selected two additional entries. After an extensive, full-day excursion to visit the nominated projects, both the appointed jury and the jury brought together by the public determined the winners and runners-up. The impact of the nomination process, the awards ceremony, and the widespread online attention via social media was substantial. The event was not only a celebratory occasion but also a critical step in assessing the architectural quality of projects in Groningen, particularly within the reinforced and earthquake-affected regions.

Another incentive is the biennial Groningen Architecture Prize, through which communication and dissemination of the reinforcement work can be achieved. This Prize was initiated by the Atelier in collaboration with Libau, the independent advisory organization for spatial quality and cultural heritage in Groningen, Drenthe, and the Province of Groningen. In October 2024, the jury assessed the entries highlighting the distinctiveness of the



Figure 7: Opportunity maps of Kantens, Het Hogeland, source: NCG Atelier Regiobouwmeester

projects, the diversity of the regional landscape, and the architectural character of rural villages.

Outreach initiatives to the broader architectural, design, and planning community are essential, as they set a precedent for the future, inspiring high-quality and innovative reconstruction projects within and beyond the Groningen region.

CAN 'ACCIDENTS' CARRY 'OPPORTUNITIES'?

The Groningen disaster is not the result of uncontrolled natural forces but a consequence of prolonged governmental inaction, corporate negligence, and systemic inequalities in disaster response. The delayed recognition of gas extraction-induced earthquakes, coupled with the slow reaction of authorities, has deeply affected the region's physical landscape and social fabric.

The recovery of Groningen extends beyond repairing physical damage—it requires a holistic approach that integrates structural resilience with spatial quality, restoring community cohesion and trust and addressing the long-term impacts of the crisis. At the publication of 'Nij Begun', the Cabinet concluded with a hopeful perspective for Groningen: "A new beginning for a region that plays a leading role in the field of energy, health, and (agricultural) innovation, with chances for everyone." (Rijksoverheid, 2023, p. 48). Acknowledging that disasters have the

potential to shake societies and their governance systems not only temporarily but often years later as well (Bakema, 2019), moments of shocks such as this carry the potential to systemically redesign their parts.

In this context, the toolbox of interventions developed by the Atelier provides an operational framework and roadmap on how to achieve these long-term transformations. Key tools such as the 'Acquisition and Quality-Centered Tendering' ensure that seismic reinforcement goes hand in hand with high-quality architectural and urban design. By prioritizing design quality, this initiative empowers homeowners and communities to actively shape the reconstruction of their environment rather than passively receiving technical solutions. Similarly, the 'Thematic Advice' tool on Temporary Housing and Landscape Transformations acknowledges that displacement is not just a logistical issue but a social challenge—one that can be mitigated by integrating temporary housing into existing village structures and planning for their long-term spatial contribution. Meanwhile, 'Opportunity Maps' provide a crucial evidence-based tool for guiding area-based interventions. By mapping vulnerabilities, social needs, and urban planning opportunities, this approach ensures that rebuilding efforts are not isolated technical projects but part of a cohesive, long-term vision for Groningen's development. Design awards and the Inspiration Booklet further support this vision by fos-

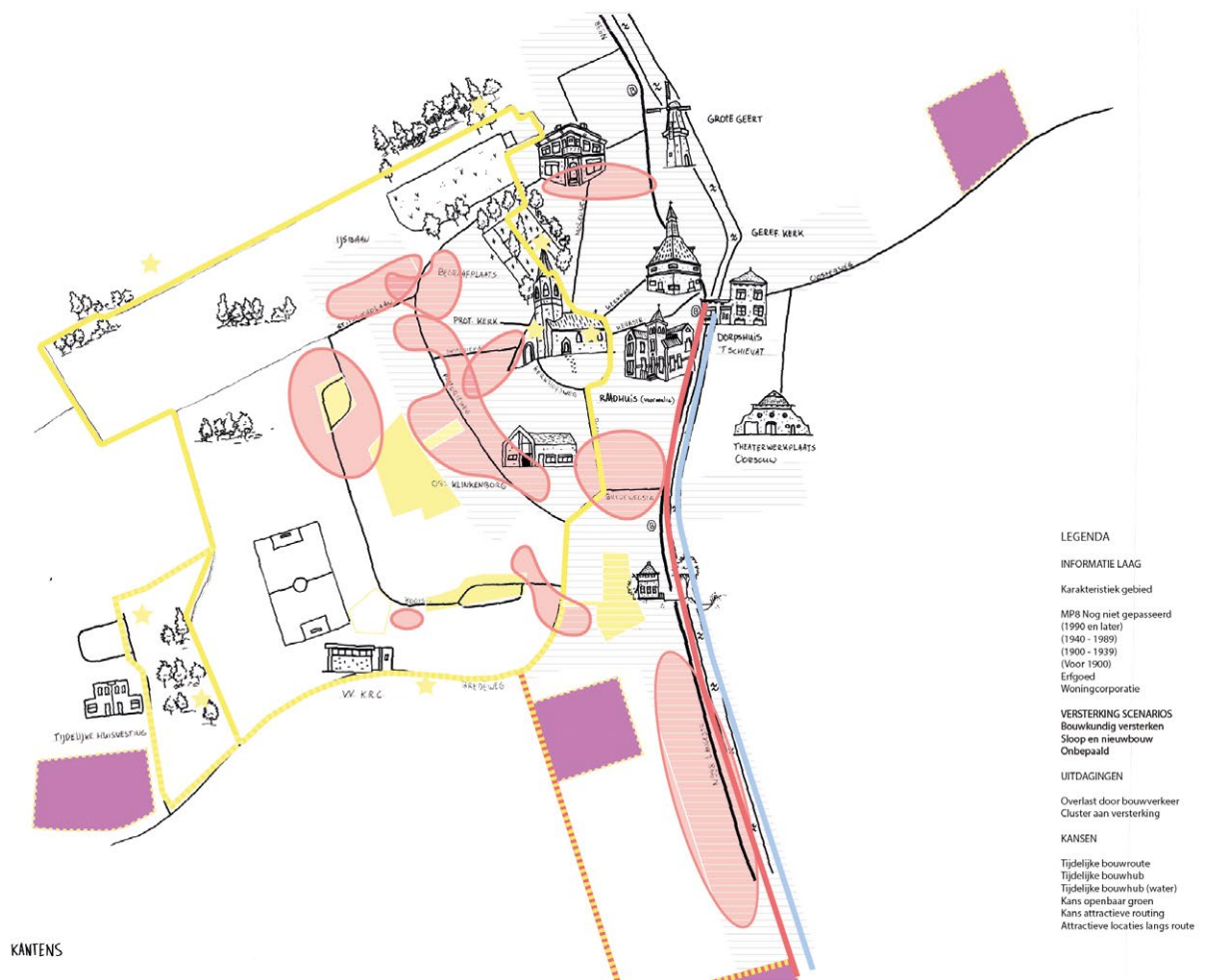


Figure 8: Opportunity maps of Kantens, Het Hogeland, source: NCG Atelier Regiobouwmeester

tering a culture of innovation and design awareness, celebrating reconstruction projects that not only restore but also improve the built environment.

Together, these tools represent a shift from reactive crisis management to a proactive, strategic recovery. A key challenge moving forward is ensuring that recovery efforts do not merely provide temporary fixes but also contribute to the long-term well-being of the affected communities. The reinforcement project, though essential, must be accompanied by policies that prioritize spatial quality, participatory governance, and equitable development.

Additionally, visibility and recognition of the disaster's impact remain crucial. The absence of public memorials or formal acknowledgment of the suffering experienced by Groningen's residents' risks erasing the event from collective memory. Incorporating community-led initiatives, commemorative spaces, and a formal inquiry into past mismanagement could aid in societal healing and accountability. Without such efforts, the disaster remains not just a crisis of the past but an ongoing burden for those who continue to live with its consequences. By shifting from reactive governance to forward-thinking urban, rural and governmental development, Groningen can transform this crisis into an 'opportunity' for meaningful change. Investing in high-quality reconstruction, fostering local engagement, and ensuring a just recovery process can turn the area into a model for sustain-

able post-disaster rebuilding. Rather than allowing this 'accident' to be remembered as a failure of governance, it can serve as a turning point—one that opts for a holistic recovery where the notion of Groningen from a peripheric, extraction landscape shifts to that of a productive, regenerative territory of the future of Dutch landscapes.

- Bakema, M. (2019). Disaster Governance: Analyzing inconvenient realities and chances for resilience and sustainability. University of Groningen. Rijksuniversiteit Groningen.
- Centraal Bureau voor de Statistiek. (2019, May 27). Aardgasbaten uit gaswinning bijna 417 miljard euro [Webpagina]. Centraal Bureau voor de Statistiek. <https://www.cbs.nl/nl-nl/nieuws/2019/22/aardgasbaten-uit-gaswinning-bijna-417-miljard-euro>
- Irrázaval, F., & Arias-Loyola, M. (Eds.). (2021). Resource Peripheries in the Global Economy: Networks, Scales, and Places of Extraction. Springer International Publishing. <https://doi.org/10.1007/978-3-030-84606-0>
- Klimaat, M. van E. Z. en. (2024, September 11). Diepteanalyse haalbaarheid 2028 afgerond—Nieuwsbericht—Nationaal Coördinator Groningen [Nieuwsbericht]. Ministerie van Economische Zaken en Klimaat. <https://www.nationaalcoordinatorgroningen.nl/actueel/nieuws/2024/09/11/diepteanalyse-haalbaarheid-2028-afgerond>
- KNMI. (2025). Zwaarste aardbeving in Groningen-gasveld 10 jaar geleden. <https://www.knmi.nl/over-het-knmi/nieuws/zwaarste-aardbeving-in-groningen-gasveld-10-jaar-geleden>
- NAM. (2025). Gas- en olie productiecijfers | Nederlandse Aardolie Maatschappij. <https://www.nam.nl/gas-en-olie/gaswinning.html>
- New Energy Coalition. (2025). New Energy Coalition. <https://www.newenergycoalition.org/en/about-us/>
- Rijksoverheid. (2023). Kamerbrief over Nij begun: Op weg naar erkenning, herstel en perspectief. <https://www.rijksoverheid.nl/documenten/kamerstukken/2023/04/25/nij-begun-op-wegnaar-erkenning-herstel-en-perspectief>
- Schreuder, W., Busscher, N., Postmes, T., Zijlstra, A., & Vojvodic, E. (2023). Insight into Impact: The Societal Consequences of Gas Extraction in Groningen and Ways of Thinking for the Future. Kennisplatform Leefbaar en Kansrijk Groningen.
- Staatstoezicht op de Mijnen. (2025). Staat van de veiligheid van Groningen in verband met de voormalige gaswinning. Ministerie van Klimaat en Groene Groei.
- Van Der Voort, N., & Vanclay, F. (2015). Social impacts of earthquakes caused by gas extraction in the Province of Groningen, The Netherlands. Environmental Impact Assessment Review, 50, 1–15. <https://doi.org/10.1016/j.eiar.2014.08.008>
- Versterkingsaanpak. (2025). <https://www.provinciegroningen.nl/actueel/dossiers/gaswinning/versterkingsaanpak/>
- Brenner, N. (2016). The Hinterland Urbanised? Architectural Design, 86(4), 118–127. <https://doi.org/10.1002/ad.2077>

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Contacts

For any further information:
JDU-BK@tudelft.nl
<https://journals.open.tudelft.nl/jdu/>
www.deltaurbanism.org

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Authors

Enno Zuidema
National Coordinator Groningen,
The Netherlands

Pasha Vredendregt
National Coordinator Groningen,
The Netherlands

Anna Herngreen
RUIMTEVOLK
The Netherlands

Quiryn Kaasschieter
LAOS Landscape Urbanism,
The Netherlands

Sophia Arbara
Delft University of Technology
The Netherlands

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