Envisioning retreat

Managed retreat as transformative adaptation

Graduation report
Amber van der Voorn
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First mentor:
Dr. V.E. Balz

Second mentor:
Drs. F.L. Hooimeijer

Hogeland

wie niet van grootse luchten houdt
van dunne repen land,
van weidse vergezichten
van leven op de rand
van zoete muren, zilte zee,
van paarse kwelders
geharnast vee
- die heeft hier niets te zoeken

wie niet de wind omarmt
de gure maartse buien
wie hier wil komen lui en
loom om slechts te profiteren
van alles wat de zomer biedt,
om dan weer snel te vluchten
de ijskou in 't verschiet
- die mijde waar hij blind voor is

welkom zijn de gasten
die het geheim begrijpen,
die taal en teken ondergaan;
die met hun voeten willen staan
in natte klei en schapenstront,
die luisteren naar verhalen
van hoe het hier ooit was;

het Hogeland, het platte Wad
zij sloten een verbond:
"voor wie ons volk beschimpen
wordt nooit de lucht geklaard,
de oester blijft gesloten
't mysterie blijft bewaard"

- Alfred van Hall

Abstract

This thesis addresses the prospected future of climate-induced displacement in the Netherlands; managed retreat as part of a new flood defence strategy for the coastal region.

Climate change, sea-level rise and flood threat are relevant subjects for the Netherlands. However, unlike most delta regions, displacement of parts of the population is not part of Dutch culture anymore. An extensive delta system protects even the lowest parts of the country. Displacement, in this case, is not a direct consequence of sea-level rise, but rather a consequence of how the Dutch government decides to deal with it. The delta strategy is currenly in transition, meaning it is unclear what the outcome will be.

The Dutch Delta Programme deals with the uncertainty in sea-level rise predictions by laying out different conceptual scenarios, the most extreme being Move Along. Move Along suggests allowing the ocean to take back parts of the Netherlands. There are more explorative studies on the future of the Dutch coastline. However, none of them incorporate the human aspect in abandoning parts of the country; displacement of part of the population. As sea-level rise is slow-onset, there is time to plan ahead offering opportunity to deal with the displacement in a strategic way.

The project focusses on exploring the potential of combining a strategy for retreat with existing spatial planning goals as a means to deal with the uncertainty of sea-level rise. In addition, this combination creates a shared goal in order to preserve livelihood for the affected population.

Motivation

During my internship at the municipality of Rotterdam, one after the other large scale development was projected. Huge residential towers built to last hundreds of years are arising on land below sea-level. This raised the question how prepared the Netherlands is for a future where sea-levels keep rising.

The summer of 2021 showed us that western Europe is not excused from climate change. We were confronted with high water levels and flooding, resulting in damage of settlement located in floodplains. That same summer, the IPCC presented a report stating that the entire world is starting to experience the impact of climate change.

IPCC: klimaatverandering is onontkoombaar en raakt nu de hele wereld

Klimaat Het klimaatpanel van de VN voorziet sterkere klimaatverandering. In het ergste scenario is de aarde eind deze eeuw 4,4 graden warmer geworden.

Marcel aan de Brugh · 9 augustus 2021 · Leestijd 3 minuten

Overstromingen na zware moessonregens in Islamabad, Pakistan. Volgens het IPCC komen weersextremen als droogtes en hoosbuien de komende decennia vaker voor, omdat de aarde verder opwarmt.
Foto Sohail Shahzad/EPA

Article 1, '**IPCC: climate change is now inescapable and can be experienced throughout the entire globe.** The climate panel from the UN projects strong climate change. In the worst scenario, the earth will be 4.4 degrees warmer by the end of this century.'

Damage to a house in Valkenburg, Limburg. Residents are waiting to be evacuated. (Sem van der Wal)

Sections

introduction

Introduction

During the nineties, after two cases of serious flooding of river landscapes in the centre and the East of the Netherlands, climate change was starting to be 'regarded as a serious condition which required reconsideration of flood defence policy' (Meyer, 2021). This has resulted in an approach that puts the emphasis on "building with nature", "more space for the rivers", and "living with water". It aims to integrate the environmental motives in new flood defence strategies (Meyer, 2021).

Space is needed in order to create sustainable flood defence, and water management systems, meaning the current approach is no longer subservient to urban development, but often competing with it (Meyer, 2021).

Ruimte voor de Rivier (Room for the River) is the flagship programme of this new strategy, which aims to create 'space for the flow and temporary storage of the river water' (Meyer, 2021).

One of the ways in which this space for water is created within the Room for the River programme, is by lowering and moving the dike of an existing polder. By doing so, the area has become subject to controlled inundation. This intervention is also referred to as de-poldering, and is exactly what happened to the Noordwaard polder, where a floodplain for high river flows was created in order to protect downstream settlements (Van Staveren et al., 2014).

Houses and farmhouses have been demolished and rebuild on new dwelling mounds. The government negotiated with each of the 75 affected households, offering to buy out or elevate their homes. In this case, the community's displacement reduced risk for a much larger population down stream (Hino, Field, & Mach, 2017).

De-poldering and controlled flooding are expected to remain at the forefront of policy and societal discussions about flood management in the Netherlands (Van Staveren et al., 2014). The question is what this paradigm means for the coast.

The lower lying coastal areas of the Netherlands face a growing challenge as the uncertainty in predictions of sea-level rise (SLR), as a result of climate change, becomes more evident. The Royal Netherlands Meteorological Institute (KNMI) has identified probabilistic scenarios for the Netherlands, which show that sea levels can rise up to 2 metres in 2100 even if the maximum global temperature increase of 2°C (as stated in the Paris Climate Agreement) is met. In case of greater warming, (an increase of 4°C by 2100) the sea-level can rise up to 3 metres by 2100 in comparison to the baseline set in 1995 (Haasnoot et al., 2020). This is a substantially more extreme projection than the prognosis earlier scenarios for the delta strategy were based on (Haasnoot et al., 2018).

On top of this, land subsidence, which occurs in many urbanised deltaic regions across the world, is amplifying SLR rates. Coastal region often consist of soft soils like clay and peat. Combining this with groundwater extraction, urbanisation and population growth can lead to land levels falling faster than annual mean SLR (Deltares, 2021). The term "relative sea-level rise" combines land subsidence and SLR to address the complete problem (Meyer, 2021).

In relation to the coastal region of the Netherlands, Deltares, commissioned by the Dutch Delta Programme, deals with the uncertainty in SLR predictions by laying out different scenarios; Protected Closed, Protected Open, Seaward, Move Along (Haasnoot et al., 2019). The conceptual character of these scenarios is emphasized, as they are not real life proposals. They are intended for research and will most likely result into a hybrid strategy which differentiates between regions (Nillisen et al., 2021).

There are explorative studies on the future of the Dutch coastline which have put the scenarios of Deltares to practice. Although they are different in approach and gravity, all of them include returning parts of the country to the ocean by the landward relocation of flood defence structures.

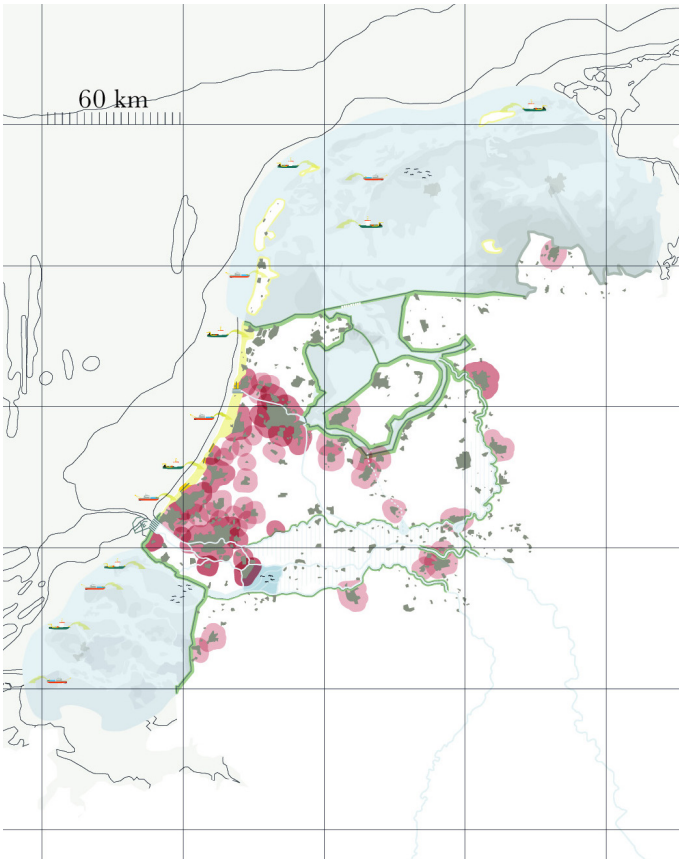
Explaining maps

New Netherlands, the graduation thesis from Geert van der Meulen (2018), identifies regional priorities in the Netherlands as a blueprint for a new country that secures delta stability in order to 'coexist as a prosperous nation living with water, rather than struggling to defeat it' (Van der Meulen, 2018). Inspired by the Room for the River approach it proposes, among others, Room for the Wadden Sea, which will provide space for the rising sea levels. By doing so, the length of the coastline is shortened from 880 km to 580 km, decreasing the flood risk management challenge. The provinces Friesland, Groningen and parts of Drenthe are in this case subjected to inundation.

Netherlands 2120 from the University of Wageningen (2019) shows a future that is less far away. It suggests wide water-retaining landscapes along the more rural parts of the coast. This implies partial or temporary inundation of these regions during high water levels.

Plan B: NL2200 (2020)

(Schuttenhelm, 2019)



Geert van der Meulen - New Netherlands

WUR - A more natural future for the Netherlands in 2120

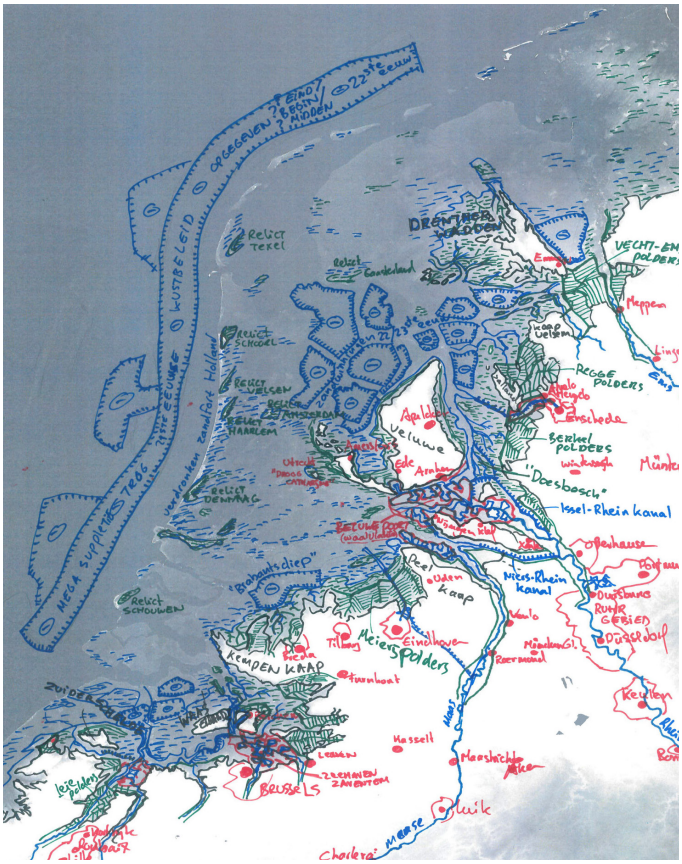
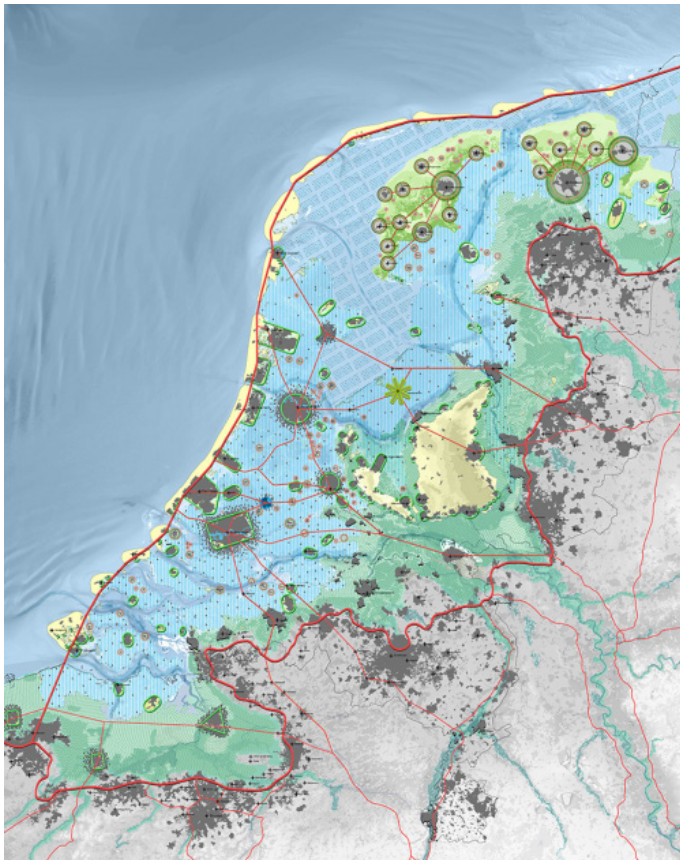


illustration by Kim Cohen



LOLA - Plan B: NL2200

Introduction

This movement towards a new flood defence strategy signals to a future where a significant part of the Dutch population will experience displacement. This will not only have an effect on the displaced part of the population, but on the Dutch population as a whole as the movement of people does not only suggest a sending region, but also a receiving region.

At this point, none of the studies on the future of the Dutch coastline incorporate this human aspect in abandoning parts of the country. However, when looking at the visionary images representing these studies, it does suggest a huge societal shift.

Managed retreat is the term widely used in the context of western delta regions and has a been used to describe population relocation as an element of this landward relocation of flood defence structures. It has been defined as a deliberate intervention, requiring an implementing or enabling party like the government (Hino, Field, & Mach, 2017). Managed retreat as a national strategy is considered transformative adaptation, as it suggests a greater systemic shift due to its large scale and timeframe (Siders, 2019).

There are challenges to managed retreat, the main one being why managed retreat is considered to be controversial; the social and psychological difficulties in displacing people from their homes (Hino et al., 2017). Preserving livelihoods can therefore be considered the main goal of a good implementation of managed retreat (Wilmsen & Webber, 2015). The question is how the transformative nature of retreat on the national scale affects livelihood.

Dealing with managed retreat of a transformative nature is a spatial planning issue. Spatial strategies for both the sending and the receiving region can play a role in the implementation of good managed retreat; by contributing to livelihood preservation (Hino et al., 2017) (Siders, 2019). Moreover, although the transformative nature of managed retreat will have a large impact on society, it can also offer opportunities in relation to livelihood.

In short, the question is what the role of spatial planning can be in sustaining livelihood within the future implementation of managed retreat as transformative adaptation to a changing climate.

This means the focus lies on the least covered subject within existing explorative studies for retreat; the human factor. The research investigates how spatial planning can contribute to livelihood preservation within managed retreat on the national scale in the Netherlands. The project uses research by design to explore this.

In the first chapter, the parameters for the design are set by a literature study and case study analysis. They present a greater understanding on how the context influences the nature of managed retreat, and how different instruments relate to it.

Chapter two uses the contextual conditions to find the right test-case for retreat; north-eastern Groningen. It continues by illustrating a future water-management scenario for the coastal region of north-eastern Groningen, which is used to guide the strategy design. It continues by analysing the instruments in relation to the test-case.

The third chapter proposes a regional strategy for retreat for north-eastern Groningen. It reveals the necessary underlying governmental responsibilities. In addition to this, a local design is used to illustrate the smaller sclae implications of a strategy for retreat.

The project ends by presenting the conclusions and recommendations for transformative retreat in the Netherlands as resulted from the strategy design.

research framew

work

research structure
methodological flowchart
methods explained

Research structure

Problem statement
In context of the development of a new adaptive flood defense strategy for the Netherlands, there is little attention for the human factor of retreat; displacement.

Research aim
The aim of the research is to create a better understanding of the problems and potentials that can surface as a result of displacement through climate-change adaptation; through the implementation of transformative managed retreat. It particularly focusses on the problems and potentials that arise in terms of livelihood, as this has been identified as the biggest challenge of managed retreat.

The particular aim of the research is to define the role of the spatial planner in the implementation of managed retreat.

Research question & subquestions
The main research question resulting from the problem statement and the aim is used to guide the exploration.

How can **spatial planning** contribute to **livelihood** in the context of **managed retreat** in the Netherlands?

The subquestions will be used to cover the different sections of the thesis;

SQ1: To Analyze

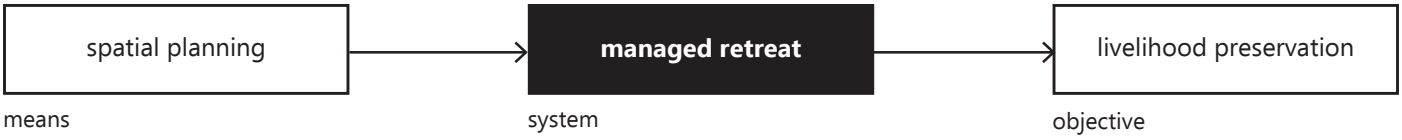
What are **dimensions and instruments of managed retreat**, and how can these be applied to meet the **challenges of the prospected retreat** in the Netherlands?

SQ2: To Propose

What are **livelihood implications** of **the prospected retreat in the Netherlands** and how can they be addressed by a **spatial planning strategy**?

SQ3: To Implement

How can **implementation** be adressed by a spatial planning strategy for managed retreat?



Research structure in relation to the explorative approach (author, 2021)

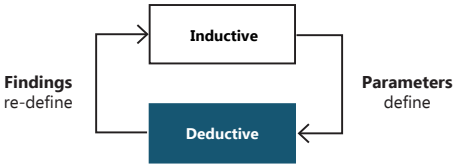
Approach

The project uses the exploratory approach to create a better understanding of the problems and potentials that arise for livelihood during the implementation of managed retreat as transformative adaptation to a changing climate.

An inductive and deductive feedback loop is used throughout the research. Before going to the context, a hypothesis for good managed retreat is created by combining theory with conducted cases of managed retreat. Theory on retreat is used to set the parameters for a case study analysis. Additional theory is used to expand on the knowledge derived from the cases.

By using the contextual conditions that resulted from the analysis, a region along the coast is chosen to test the hypothesis of good managed retreat; North-Eastern Groningen.

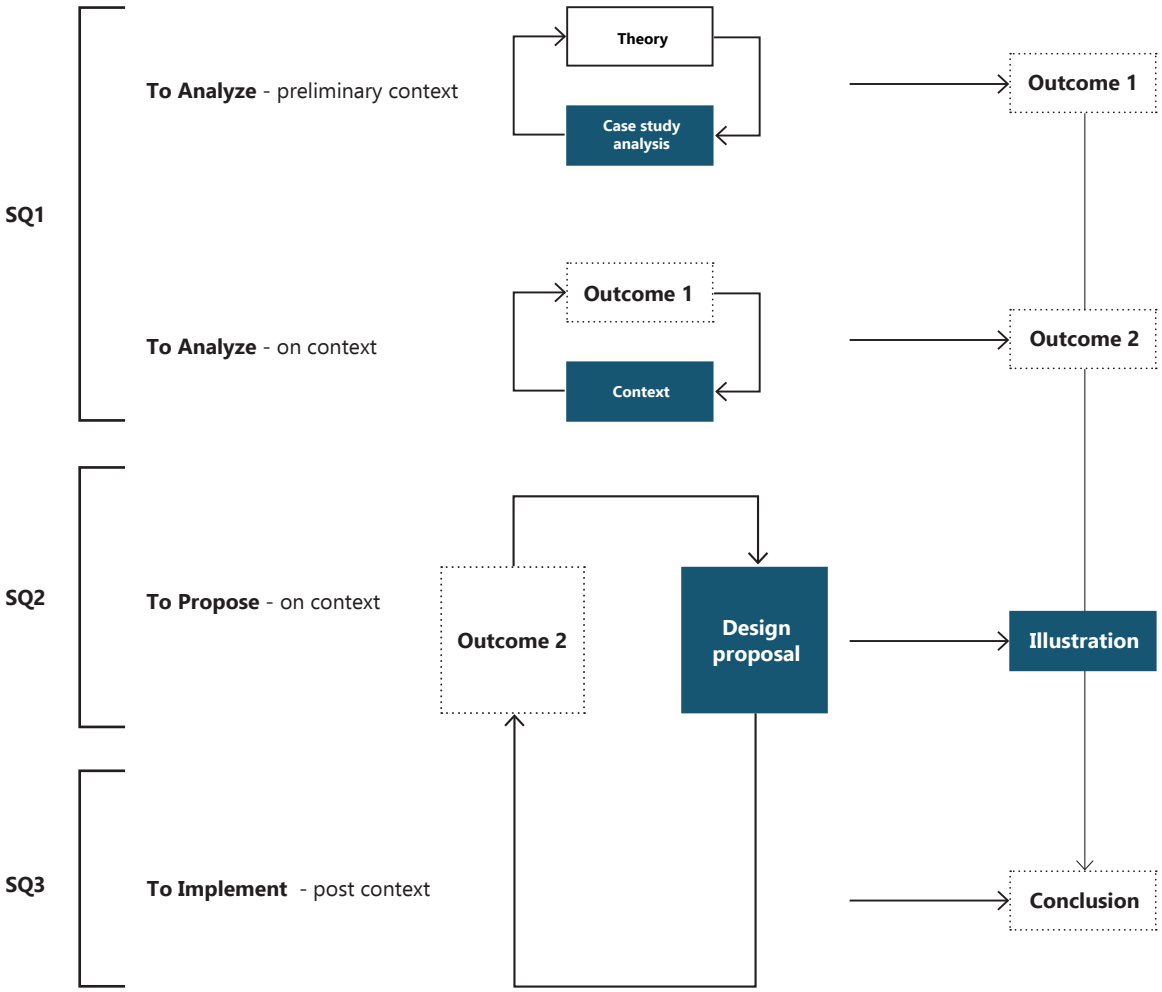
The preliminary analysis is confronted with information on North-Eastern Groningen in order to set parameters for the context specific approach for managed retreat.



These parameters are used to propose a regional strategy for retreat for North-Eastern Groningen with the goal to illustrate what challenges occur during implementation. A local design is used to illustrate the more technical implementation of the strategy and to give an idea of the impact on livelihood.

The insights gained from the proposed approach for retreat are then used to generate recommendations for future implementation of transformative managed retreat, which is the outcome the project is working towards.

In other words, the explorative approach does not create hard conclusions, but rather generates questions to push for additional research, or to underline a problem.



Research structure in relation to the explorative approach (author, 2021)

Methodological flowchart

Research question

How can **spatial planning** contribute to **livelihood** in the context of **managed retreat** in the Netherlands?

Sub questions

SQ1: What are **dimensions and instruments of managed retreat**, and how can these be applied to meet the **challenges of the prospected retreat** in the Netherlands?

To establish a hypothesis for good managed retreat in the Netherlands, and compose an approach that fits the context.

SQ2: What are **livelihood implications** of **the prospected retreat in the Netherlands** and how can they be addressed by a **spatial planning strategy**?

To understand the impact of managed retreat on the sending population and get a grip on the scope and spatial translation of the retreat

SQ3: How can **implementation** be adressed by a spatial planning strategy for managed retreat?

To identify the recommendations for possible implementation of managed retreat in the future

To Analyze - preliminary context

Literature review

- Defining the contextual conditions that influence managed retreat as a way to identify applicable case studies.
- Defining criteria for livelihood preservation within managed retreat in order to assess case studies.
- Substantiating findings from the case study analysis relation to livelihood preservation.

To Analyze - on context

Sending region

Interviews

- Understanding livelihood values of the sending population
- Understanding how people in the sending region to current trends to get insight in possible friction might occur.

Media review

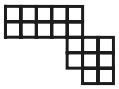
- Substantiating findings from the interviews.
- Understanding the issues that are currently going

Stakeholder analysis

- Identifying main governmental bodies, institution residents within the process of managed retreat.

Backcasting

To Propose - on context

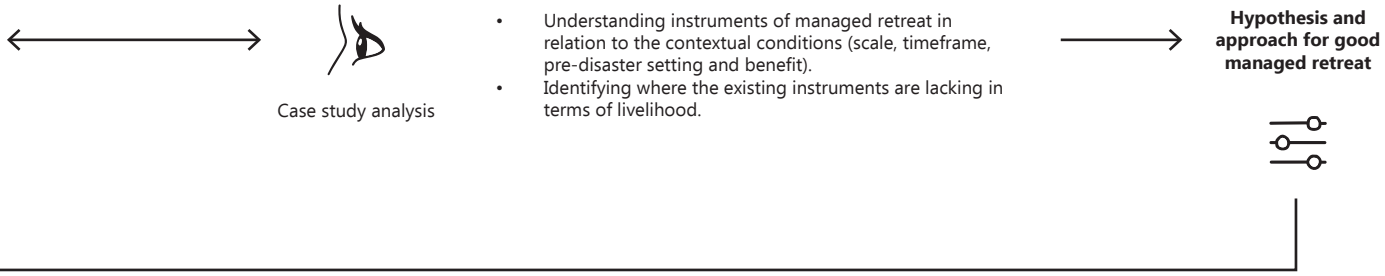


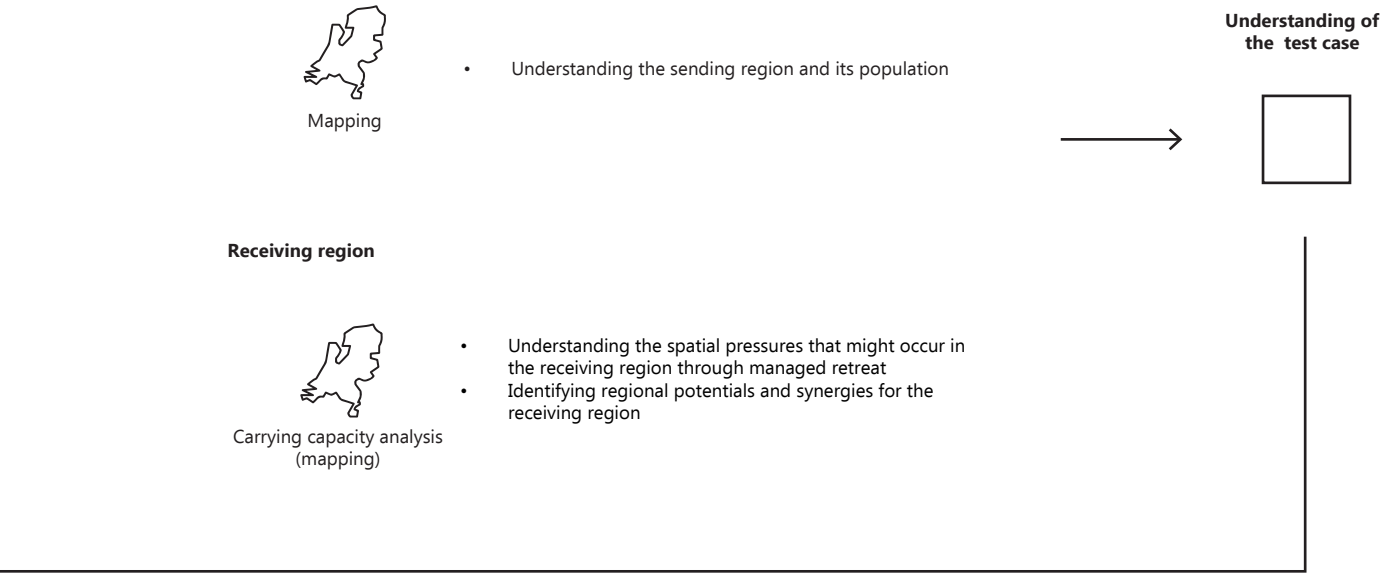
Regional strategy design

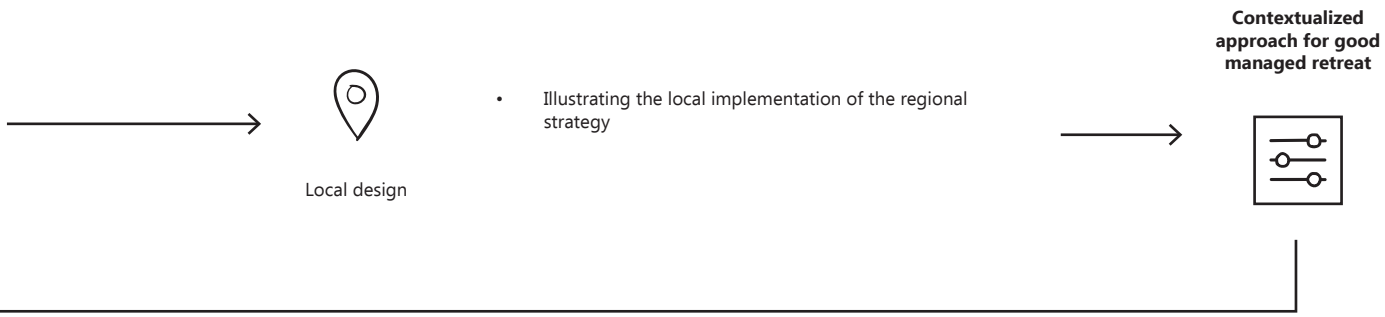
- Illustrating the approach of good managed on the sending region
- Creating the parameters for the local design

To Implement - post context

Recommendations for retreat in the sending region







Recommendations for retreat in the receiving region

Methods explained

In this subchapter the methods used are represented in a more descriptive way. The general research approach used in this thesis is mixed, meaning both quantative and qualititative methods will be used. The methods that are used have a been given specific aims the intention to offer more guidance when the research is conducted.

To Analyze

Academic literature review
Type: Qualitative desk research

The objective of this method is to help build knowledge on the problem fields and identify relevant information for the different variables in the research question as the base for the use of other methods. The literature review identifies the contextual conditions that infleunce the nature of managed retreat. It introduces criteria on livelihood preservation within reteat and thereby sets the base for the conceptual framework, defining the hypothesis for the role of spatial planning.

Aims

1. Defining the contextual conditions that influence managed retreat as a way to identify applicable case studies.
   Keywords used: Human mobility, Planned relocation, Managed retreat, DFDR.

2. Defining criteria for livelihood preservation within managed retreat in order to assess case studies.
   Keywords used: Social justice, procedural justice, distributive justice, DFDR

3. Substantiating findings from the case study analysis in relation to livelihood preservation.
   Understanding instruments for livelihood preservation in relation to demographic decline.
   Understanding pull-factors per biographical stage

Case study analysis
Type: Qualitative

The objective of this method is to analyze conducted retreat projects, and identify appropriate instruments of retreat. As there is no case that is directly applicable to the future Dutch situation, a combination of cases must provide the desired information. Based on the contextual conditions that were established by the literature review, the cases are identified; scale, timeframe (transformative), status of disaster and benefit. The analysis aims to identify how the context influenced the instruments that were used, and how this affected livelihood.

Timeframe:	Autrian Danube catchment (Thaler et al., 2020)
Scale, Benefit:	Makong Delta (International Organization for Migration & Institute of Sociology Ha Noi, 2017) Sao Paulo (Correa, 2011)

Pre-disaster: Depoldering projects along the Dutch river delta (Van Staveren et al., 2014)

Aims

1. Idenfying instruments of managed retreat that relate to the context.

2. Identifying where the existing instruments are lacking in terms of livelihood.

Interviews
Type: Qualitative

The objective of this method is to gain first-hand knowledge on existing trends, and how they are affecting local communities. This is done by interviewing people that are part of the sending population of the test-case. It adds to the more theoretical methods it order to get a better understanding of the less tangible aspects of livelihood. The interviews are semistructured and conducted while visiting festival Hongerige Wolf in Eastern Groningen. The majority of the people that were questioned were volunteers at the venue and have been volunteering for the last couple of years. The sample consisted of a variety of biographical stages and backgrounds.

Aims

1. Understanding livelihood values of the sending population

2. Understanding how people in the test-case sending region react to current trends to get insight in possible friction or mutual gain.

Media review
Type: Qualitative

The objective of this method is to gain knowledge on existing trends. It aims to substantiate the information derived from the interviews with news articles, documentaries and other media sources in order to gain a deeper understanding of the effects of the trends on the sending population of the test-case as a whole.

Aims

1. Substantiating findings from the interviews.

2. Understanding the issues that are currently going on in the test-case.

Carrying capacity analysis
Type: Qualitative

The objective of this method is to gain grip on the pressures and opportunities that arise for the receiving region. Through the use of 4 themes, the region is covered. Infrastructure and urban services, society supporting capacity and environmental impacts are studied through mapping. The institutional setting is covered through desk research.

1. **Environmental capacity (mapping)**
   Resources
   Agriculture
   Glass houses
   Recreation
   Natura 2000

2. **Infrastructure and urban services (mapping)**
   Urban morphology
   Work availability
   Education facilities
   Administrative services
   Transport
   Infrastructure
   Logistics

3. **Society supporting capacity (mapping)**
   Income
   Health
   Education
   Cultural background

4. **Institutional setting (policy documents)**
   Is there cooperation between the municipalities or subregions of the High East?

Aims

1. Establish regions fit for large scale relocation

Mapping & cartography
Type: Qualitative

The objective of this method is to give a spatial translation of a number of analyses. This method is complementing other methods.

Aims

1. Understanding the sending region and its population

2. Understanding the spatial pressures that might occur in the receiving region through managed retreat

3. Identifying regional potentials and synergies for the receiving region

To Propose

Backcasting
The objective of this method is to illustrate the approach of good managed retreat and to investigate what steps are necessary to limit the impact on the population, particularly livelihood.

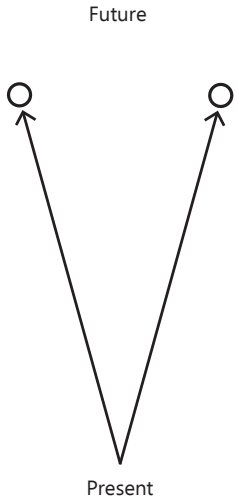
Delta Urbanism is an interdisciplinary research program that investigates the possibilities to combine flood protection, soil and water management strategies with urban design, landscape design and spatial planning, aiming to improve spatial forms and structures and innovate urban systems in urban and metropolitan delta regions (Delta Urbanism - About, 2021). It also stimulates the research oriented approaches to design related to the development of spatial, site and cultural specific design proposals. An example of such an approach is called Backcasting, Backcasting aims at describing a desirable future, narrative or vision through the use of design. It continues by looking backwards from that future to the present in order to develop a pathway of actions needed to realize this future (Haasnoot et al., 2013).

Aims:

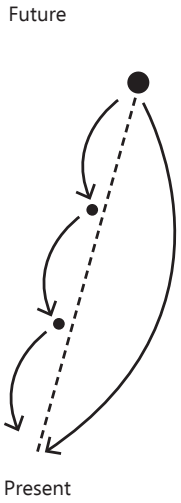
1. Illustrating the approach of good managed retreat in the sending region.

2. Understanding what steps are necessary to preserve livelihood for the sending population

what could be?



how to?



To Implement

Policy document analysis
Type: Mixed

The objective of this method is to collect and analyze main policies, and instruments of planning atnational, and municipal levels in relation to the flood defence strategy. The aim is to identify structures of governance to identify the best layer(s) to interfere.

Aims

1. Identifying existing policy and strategy in the Netherlands that are relevant for managed retreat.

2. Identifying the institutional level(s) at which managed retreat can be implemented best.

Stakeholder analysis
Type: Qualitative

The objective of this method is to identify the possible actors within the managed retreat process. The (lack of) interdependencies between these different actors can expose problems or possibilities within the system. This knowledge can be used to recognize the different roles of actors within retreat.

Aims

1. Identifying main governmental bodies, institutions, private developers, and residents within the process of managed retreat.

2. Establishig ideal power relations and responsibilities between actors.

to analyze

conceptual framework
case study analysis

Conceptual framework
Managed retreat

In the Netherlands, the movement towards a new flood defence strategy for the coast is likely to return parts of the country to the ocean. This includes the displacement of people. The national agency Rijkswaterstaat is responsible for shoreline management and flood safety policy in the Netherlands (Stronkhorst & Mulder, 2014). Displacement as part of this new strategy can therefore be considered the responsibility of the Dutch government.

Managed retreat
Managed retreat is the term widely applied in the context of western delta regions and has a been used to describe population relocation as an element of the landward redevelopment of flood defence structures. It has been defined as a deliberate intervention, requiring an implementing or enabling party like the government (Hino et al., 2017). The definition also has an 'emerging but controversial appeal to scholars' (Ajibade, Sullivan, & Haeffner, 2020), which is why this thesis will continue using the term.

Managed retreat is considered to be controversial due to the social and psychological difficulties that arise when people are displaced from their homes (Hino et al., 2017). Preserving livelihoods can therefore be considered the main goal of a good implementation of managed retreat (Wilmsen & Webber, 2015).

Goal
Residents differ in their capabilities to participate in political issues, to manage and finance retreat, and to re-establish their livelihoods and social networks (Thaler, Seebauer, & Schindelegger, 2020). This means that managed retreat has the challenge that it discriminates, as some gain and others lose during the relocation. It therefore raises issues of social justice (Thaler, 2021).

Social justice has recently become a more important aspect and concern in flood risk management policy, and subsequently managed retreat approaches (Thaler, 2021). In relation to managed retreat and social justice, Thaler (2021) identifies two different categories; distributive and procedural justice.

Distributive justice concerns the perceived fairness in how rewards are distributed across parties. Procedural justice concerns the perceived fairness in the process leading towards distribution of rewards. In other words, distributive justice involves the physical compensation replaced residents receive, whereas procedural justice focusses on the participation of residents within the process.

Socially just compensation mechanisms can therefore be considered of great importance in achieving livelihood preservation in retreat.

Status of disaster & benefit
As managed retreat is state-led, the nature of the relocation process is most fundamentally shaped by the relationship between the two parties involved; the implementing party and the residents. An important characteristic in this relationship is the motivation for retreat for both of these parties. This differentiation in motivation is primarily influenced by the pre- and post-disaster setting (Hino et al., 2017).

In post-disaster settings, threat is high. In these cases both the implementing party and the residents are motivated to move, meaning that the retreat is voluntary in nature. In pre-disaster settings, this is different. The implementing party represents a larger part of the population and is therefore more likely to support retreat when benefits are perceived on a larger scale, or over a larger timeframe. The residents, on the other hand, do not represent this larger part of the population. Therefore, in a pre-disaster setting, with the lack of (perception of) direct threat or disaster, there will be little motivation to move. If retreat is in this case still conducted, it is conducted for the greater good (Hino et al., 2017). Residents in this situation are not motivated to move which is why this kind of retreat is involuntary in nature. At the same time, enabling this pre-disaster managed retreat may boost local input and ownership by eliminating the time pressure of post-disaster settings which can be beneficial for procedural justice and ultimately livelihood preservation (Hino et al., 2017).

Scale & timeframe
There are different overarching approaches to managed retreat. It is used as a tool in both Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA). CCA involves adjusting to a specific set of long-term and permanent conditions, namely a warmer planet with higher sea level and more extreme weather, whereas DRR is simply interested in reducing the risk of natural hazards without necessarily pushing society to adapt to a specific environment (Strom, 2019).

In addition to CCA, there is another form of adaptation; transformative adaptation. Managed retreat by definition relocates people and assets, but the extent of the transformative nature depends on the scale at which this happens. When a community is relocated as a tool in CCA, it is transformative for the community but not for the nation. Large-scale managed retreat at a national level suggest redesigning underlying norms and infrastructure. Moreover, it would require a systemic shift, which is why managed retreat on the national scale can be considered transformative adaptation (Siders, 2019).

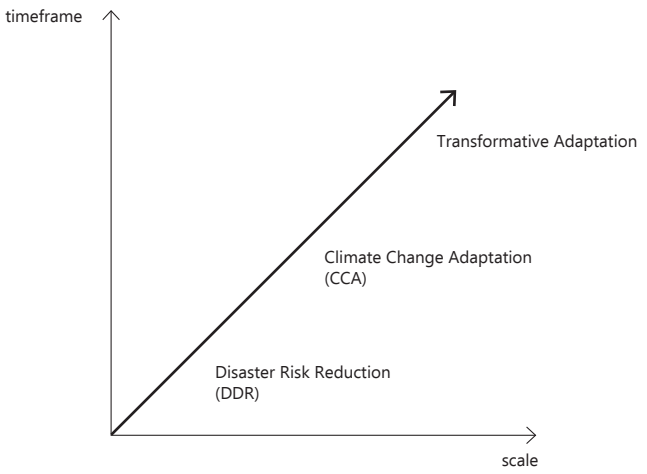
Managed retreat of transformative nature can cause problems for livelihood preservation as the feasibility

of traditional compensation mechanisms can be influenced by the large scale and timeframe. An example of a problem that might arise in terms of scale, is that property acquisition programs are unlikely to be able to meet retreat at a transformative scale (Siders, 2019).

This scale can also offer opportunity. By combining managed retreat with urban regeneration, retreat can be a 'move to opportunity, rather than a move from the familiar,' (Hino et al., 2017). This increases the voluntariness of the move, which reduces the impact on livelihood. 'Retreat is not a goal. Building sustainable, safe, economically and culturally thriving communities with strong connections to a healthy coastal environment

Contextual conditions	Prospected
Scale	Large part of population
Timeframe	Large timeframe
Status of disaster	Pre-disaster (proactive approach)
Benefit	Broader society / Residents

(author, 2021)



(author, 2021)

is a goal' (Siders, 2019). This suggests spatial planning as a means to contribute to distributive justice as it can offer an improved living environment as compensation to the displaced residents.

In other words, in transformative retreat spatial planning can contribute to a shared benefit for both parties involved and can therefore contribute to livelihood preservation for retreat in a pre-disaster setting.

Conceptual framework
Spatial planning

Spatial planning
Spatial planning is concerned with identifying long- or medium-term objectives and strategies for regions. (Economic commission for Europe, 2008). It involves the distribution of spatial resources and therefore has an important role within the concept of socio-spatial justice (Klosterman, 1985). In addition to this, adaptation to climate change asks for serious adjustments to the spatial organization of our environment. This also puts demands on spatial planning (Van Buuren et al., 2013). This combination of aspects underpins the potential of spatial planning within good implementation of managed retreat.

Uncertainty
Making decisions about how to adapt to climate change and particularly SLR in the face of uncertainty is a challenge. After all, it is unclear whether adaptation is necessary, whether it is enough and whether it does generate the intended results (Van Buuren et al., 2013). In addition to this, the large timeframe that is discussed implies uncertainties about a multitude of external factors, like population development, new technologies, and economic trends. Moreover, not only environmental conditions, but also societal perspectives and preferences may change over time (Haasnoot et al., 2013). Uncertainty can be an important obstacle for decision-making and may cause hesitation. This asks for the possibility to reconsider decisions when the situation alters. In addition to this, there is a need for no- and low-regret measures (Van Buuren et al., 2013).

Contentiousness
The uncertainty of climate change and its long-term character are important explanations for the inherent controversial character of many climate adaptation measures. If there was no doubt about the seriousness and urgency of climate change and its consequences, realizing consensus about adaptation measures would be much easier. This asks for joined problem solving to create mutual benefit (Van Buuren et al., 2013).

Adaptive spatial planning
Spatial planning has to play a vital role in implementing adaptation measures and in safeguarding the climate robustness of spatial developments. At the same time uncertainty and contentiousness call for an adaptive approach in which learning, experimentation, dialogue and flexibility are central. In other words, spatial planning should foster stability and robustness as well as flexibility and resilience.

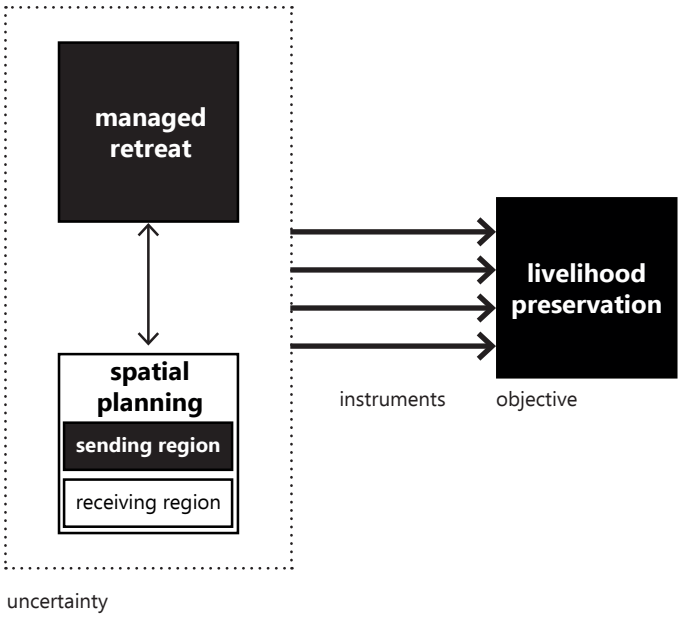
To achieve this, adaptive spatial planning aims to look for ways to combine goals and orchestrate situations of mutual gain. By combining climate adaptation goals with goals that satisfy and facilitate the socioeconomic ambitions of its society, the interventions that are made will always serve a purpose. This results in no- or low-regret measures, allowing decisiveness in an uncertain context. In addition, in relation to contentiousness, a plan that contributes to the ambitions of society is more likely to result in a consensus (Van Buuren et al., 2013).

The principles of decisiveness and flexibility are also important in governance. It is possible to set decisive norms on a more generic, national level while at the same time leaving room for tailor-made interventions on the regional or local scale. This creates robustness in ambitions, but allows parties to act on existing trends and look for mutual gain. (Economic commission for Europe, 2008).

In addition to the local flexibility, governance of adaptation should also create organizational arrangements that are able to deal with the uncertainty of climate change. These arrangements are needed to allocate responsibilities and competences necessary to ensure decisive action when required. Climate change does not respect the administrative boundaries which is why arrangements should be made that enable concerted action by different domains (Van Buuren et al., 2013) (Economic commission for Europe, 2008).

Conceptual framework diagram
The conceptual framework presents the relation between the main bodies of research.

It starts with the general system of research; managed retreat. Livelihood preservation is the goal of good implementation of managed retreat. The thesis will look at the opportunity that arises when managed retreat and spatial planning goals are combined. and how uncertainty can be dealt with.



case study analysis

european cases
non-european cases
conditions & instruments

The contextual conditions of managed retreat that prevailed during the literature review and helped frame the definition, are summarized in table 1. The table can be used to find cases, in order to approach the knowledge gaps, and their corresponding compensation schemes.

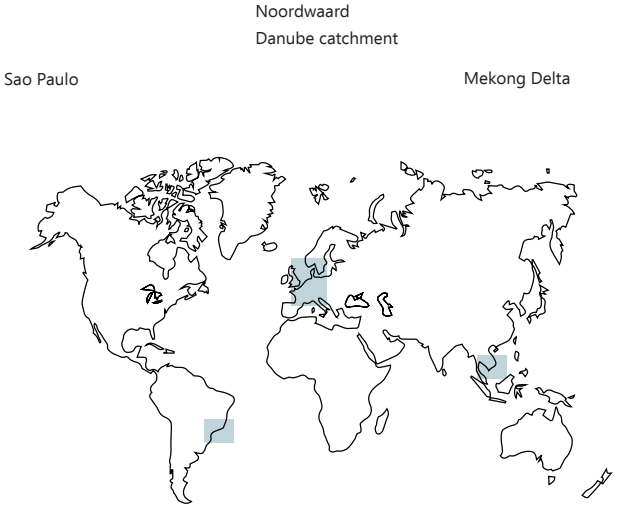
A comparative case study analysis will look at different approaches to managed retreat in relation to their contextual conditions. It will identify the lessons learned from the implementation, and underpin the hypothesis of good managed retreat.

Once the cases are identified, they are analyzed to establish if and how livelihood preservation was achieved, by looking at policy in relation to the compensation scheme (distributive justice) and the political environment (procedural justice). Each case will be compared using the same structure:

1. Location
2. Problem
3. Policy (distributive justice)
4. Political (procedural justice)
5. Population impact
6. Conclusions

Depending on the case and the information that is available, some elements in this structure are more elaborate than others.

There are both European and non-European cases. The European cases will be covered more thorough, as their neo-liberal government structure makes them more representative for Dutch implementation. The non-European cases provide information on the missing contextual conditions; the large scale and timeframe.



Contextual conditions	Prospected
Scale	Large part of population
Timeframe	Large timeframe
Status of disaster	Pre-disaster (proactive approach)
Benefit	Broader society / Residents

European cases

European cases
The Noordwaard case provides a substantial amount of information on what systems are in place in the Netherlands that aided the implementation.

The Austrian case, which is larger in scale and timeframe, is the Danube catchment. Although the publication describes the retreat as planned relocation, it is very similar to the Noordwaard. Since the 1970s, national, regional, and local authorities in Austria have organized a managed retreat for private households and businesses along the Danube River moving more than 500 households. It identifies a strategy of so-called waves of relocation (Thaler, 2021). Having recently conducted wave three, the information can provide valuable input for retreat in the Netherlands (Thaler, Seebauer, & Schindelegger, 2020).


noordwaard
danube catchment
1 : 10.000.000
N

European cases
Noordwaardpolder (Van Staveren et al., 2014)

Location
The Noordwaard region is located at the heart of the Dutch delta. The Noordwaard agricultural polder is wedged between the Sliedrechtse and Brabantse Biesbosch wetlands. It is one of the Room for the River projects and appointed as a de-poldering area, meaning that the dikes of the area have been lowered or removed in such a way that daily tidal movements and seasonal flooding will occur.

Problem
Restoring tidal and flood dynamics contributes positively to the environmental quality of the surrounding Biesbosch wetlands. In addition to the environmental drivers, the project contributes to a reduction of upstream river water in extreme conditions. Before the de-poldering works the area housed about 75 households, 26 of which were farmer families, who had the option to stay in the Noordwaard on newly constructed houses or farms on mounds, or to be financially compensated to move elsewhere.

Policy (distributive justice) & Political (procedural justice)
The Noordwaard project was not the first de-poldering project in the Biesbosch. A small polder was flooded following a storm breaching the polder dikes in 1962. Instead of repairing the dike, the new director of Staatsbosbeheer refrained from action and sustained tidal interactions in the area, which developed as part of the Biesbosch wetland. These actions were against prevalent flood management policy.

A second de-poldering initiative came up in the early 1990s. Nature development became a priority for national governments in the 1970s, which was embedded in a nation-wide Nature Policy Plan (NOP). It aimed to prevent ecological deterioration of the river landscape and promotion of nature restoration, often at the expense of agriculture. This introduced a de-poldering paradigm in the region. After the floods in 1993, its water and nature objectives became co-equal when the NOP was included in the Room for the River Programme.

Several exploratory studies in preparation of the Room for the River programme in the early 2000s discussed the potential of Biesbosch area for flood retention. However de-poldering the Noordwaard was not explicitly mentioned. During so-called design sessions, a round of interactive stakeholder consultations, a list of potential measures was composed for the lower river region. During the design session de-poldering the Noordwaard was formally not on this list, but was discussed as an alternative to another de-poldering project which was considered unfeasible. After the meeting, a representative from the farmers organization supported the Noordwaard suggestion,which was quickly picked up by the Steering Committee who coordinated the second phase of the consultation sessions.

Houses on mounds in the Noordwaardpolder (ANP)

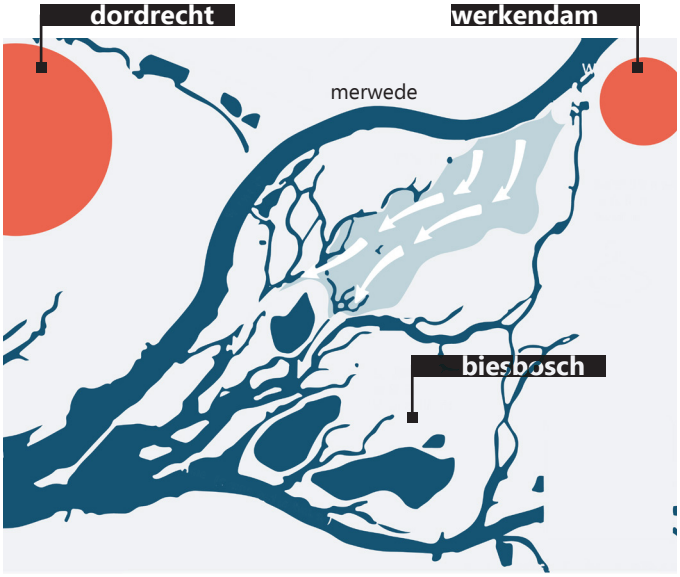
A governmental body was in charge of the design sessions and in firm control of who could sit at the negotiating table, the objectives, what was placed on the agenda, and what type of information and research were mobilized to inform the citizens about their options (Schut, Leeuwis, & Paassen, 2010).

The design sessions tried to put emphasis the urgency of the matter so the question did not become what to do, but when. Stakeholders started to understand that something substantial had to be done in the area to secure future safety. This approach led stakeholders to conclude that one big measure was preferable to a set of smaller measures. The argument that this would reduce uncertainty and public unrest in De Noordwaard was used to persuading stakeholders. It eventually created public support for de-poldering (Schut, Leeuwis, & Paassen, 2010).

In the beginning there was no organized protest against the de-poldering plans. Although it was clear that polder inhabitants were unhappy with what might happen to the area and to their agricultural practices, they also felt that going against the Room for the River programme, would have only a small chance of success. Especially considering that only a few dozen people lived in the area, while the Room for the River programme was of national relevance, both in terms of its setup and its thematic focus. It was also remarked that the NOP had already opened the door for continued de-poldering in the Noordwaard, and that sooner or later there would come an end to agriculture in the Noordwaard anyway.

By the end of 2003, the Steering Committee decided that de-poldering the Noordwaard was the preferred measure to reduce peaks in river discharge. At this point de-poldering antagonists formally organized themselves. A series of alternatives to de-poldering were proposed, however the government was not receptive to the design options as antagonists represented only a fraction of the polder inhabitants, while the farmer representative organization spoke on behalf of the majority.

In 2005, the government gave the Noordwaard the status of 'frontrunner project'. This means that, while anticipating the formal decision, implementation of the de-poldering works had already been formally decided upon and only the layout specifications were still open to discussion. This means a governmental decision made an end to attempts of societal actors resisting the measure, thereby concluding a complex negotiation and decision making process. It took until 2011 for developments to start. The planning and design process of the earlier years built up trust and reliance to co-decide on the new layout plan of the area, or to choose for financial compensation when farmers preferred to relocate.



Population impact
The duration design process has had negative and positive effects. It built up trust. On the other hand, this long preliminary stage resulted in a long and tiring process which required a lot of patience from the households that were involved. During this entire period, residents experienced a lot of uncertainty (MVO, 2012).

Half of the people decided to stay in the Noordwaard. The other half was compensated to move out of the Noordwaard. Most people who stayed were excited to get the opportunity to live in an unique location, and were therefore more patient (MVO, 2012).

European cases
Noordwaardpolder (Van Staveren et al., 2014)

Conclusions

1. The citizens of the Noordwaard were involved from the beginning of the process. **Interactive design sessions** focussed on creating awareness of the need for a substantial measure. Which measure this would be was co-decided. This process created **understanding** for the importance of the project. Understanding for the measure aids the perceived fairness of the project and therefore aids **procedural justice**.

2. Within the compensation scheme, there was an **element of choice**. Households had the option to stay in the Noordwaard on **newly constructed farms or houses on mounds**, or to be **financially compensated** to move elsewhere. Still, some of the citizens felt they were forced to leave the polder. This feeling might have to do with the duration of the entire process. The first design sessions started in 2002, and the first developments started in 2011.

3. An additional benefit was that the **interactive process** built up **trust and reliance**. During the next phase of the project, this trust was used to co-decide on the new layout plan of the area, and for the negotiations for the financial compensation for the residents that decided to relocate.

4. The **national relevance** of the project also created **understanding** among the residents. Especially considering only a small group of people lived in the Noordwaard. At the same time, it created the feeling of helplessness. This feeling was partly mitigated by the interactive nature of the process.

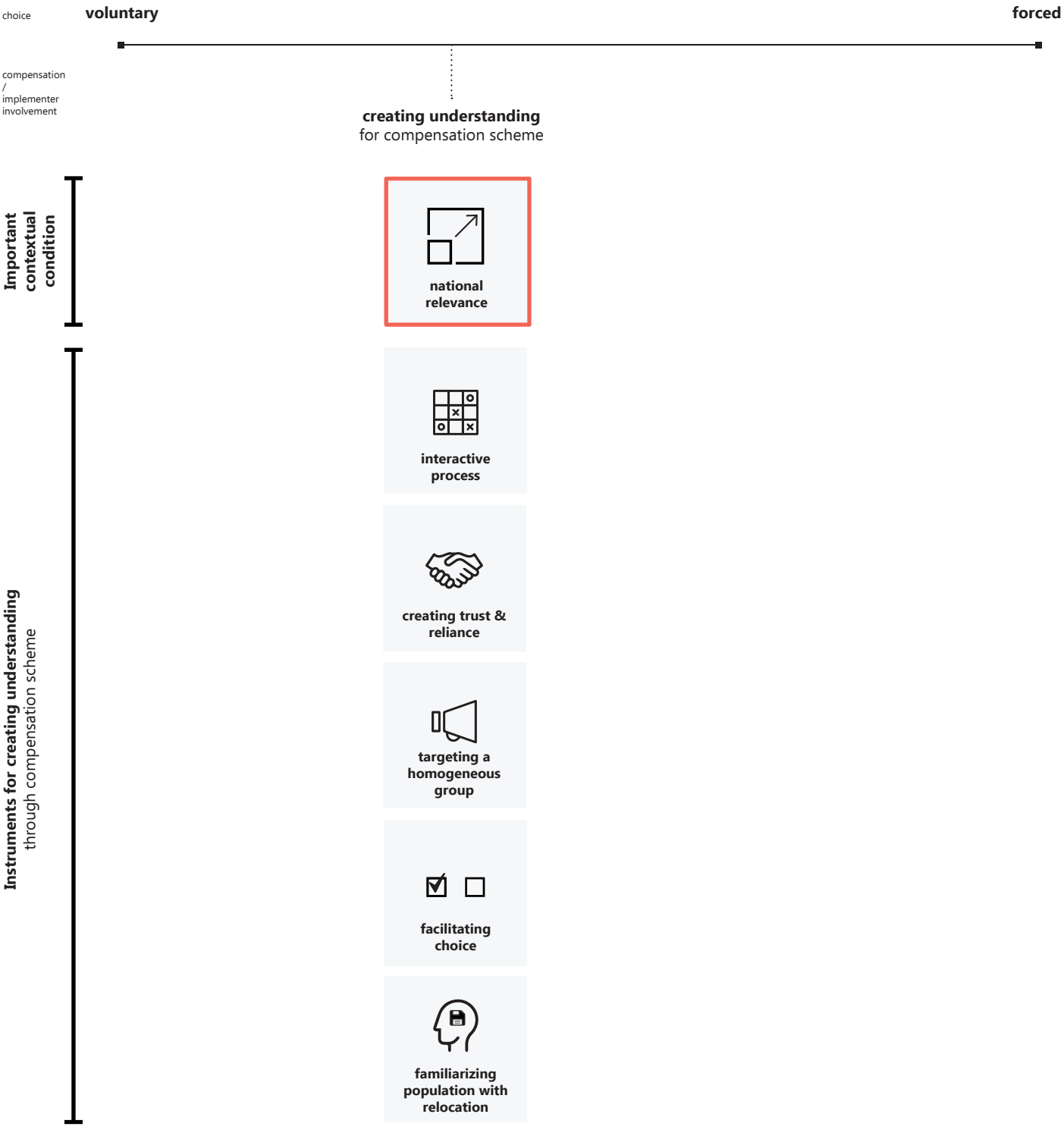
5. The presence of a large **homogeneous group** among the residents made **communication** easier. The farmers **advocacy organization** represented one-third of the households. They were also able to **make overarching decisions**; they chose clarity for the larger group over relocation of the other group.

   However, it is unclear if all residents were equally represented as the government had control over who could sit at the negotiating table. In the writings about this case, there is a considerably larger focus on the farmers. The farmers advocacy organization was already an **existing body**. The other residents had to **organize themselves for the first time** and this might have **negatively impacted their involvement**, and therefore challenges procedural justice. On the other hand, for farmers **stakes might have been higher in terms of livelihood** as their land is not just their home but also their work.

6. A **gradual introduction** of de-poldering as a measure in the region helped create acceptance of the paradigm. De-poldering was a **familiar measure** in the Biesbosch.

7. Project already had the frontrunner status. This status is what is unbeneficial for procedural justice, but did provide clarity. This illustrates the negative impact of a interactive process; it creates a large period of time in which the sending population experiences a lot of uncertainty.

	Prospected	Noordwaard
Scale	Large part of population	Small part of population (<100)
Timeframe	Large timeframe	Small timeframe (2000 - 2014)
Status of disaster	Pre-disaster (proactive approach)	Pre-disaster (proactive approach)
Benefit	Broader society / Residents	Broader society



European cases

Danube catchment (Schindelegger et al., 2020) & (Thaler et al., 2020)

Eferding basin

Location

The Danube River crosses Austria. Urban development along its riverbanks contributed to a drastic change in the flood dynamics. The large river basins that are primarily occupied by agriculture are prone to frequent and severe flooding. In the recent past large floods occurred in 1991, 2002 and 2013 greatly damaging homes, and causing short-term displacement of the affected households. Initiated by national and regional authorities as a response to the past flood events, the river shows a long tradition of high-level standard protection to reduce the risk of future flood hazard events. However, this could not guarantee the ability to construct flood alleviation schemes everywhere.

Problem

Population relocation as a tool in managing flood risk first started in the 1970s, by chance. Lightning struck a farmhouse in the southern Machland basin causing a fire and eventually destroying the building. The mayor of the municipality was responsible for the building regulations and refused to allow the reconstruction of the farmhouse. As the building had been affected by flood many times before, he raised money to enable the relocation and succeeded. As the Machland basin only housed farms, agricultural funds were available to all households that were just above the water level. The funds were available for a period of 10 years, allowing the farmers to receive compensation for a voluntary relocation. This means they were left with the choice to either stay or leave. All of the 40 households applied for the funds, and were ultimately relocated.

After the first wave, the 1991 flood event at the Danube River in the Machland restarted the discussion on relocation as a tool in flood protection. Over the years a relocation framework was developed to 'ensure on the one hand the efficient use of public money and on the other hand to guarantee the identified households a transparent and fair offer' (Schindelegger et al., 2020).

Policy (distributive justice)

The connection to agricultural funds was abolished, and compensation payments were acknowledged as an investment for flood alleviation schemes. This resulted in a voluntary, anticipatory compensation scheme.

The compensation scheme was based on shared contributions: 50 per cent of costs were taken over by the national government, 30 per cent by the regional authority and the rest by homeowners as individual contributions. The scheme compensated for 80 per cent of the time value of buildings as well as 80 per cent of estimated demolition costs. Plots remained with their owners, under the condition that there would be no further construction activity.

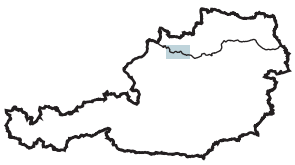
Concerning the resettlement locations, the legal

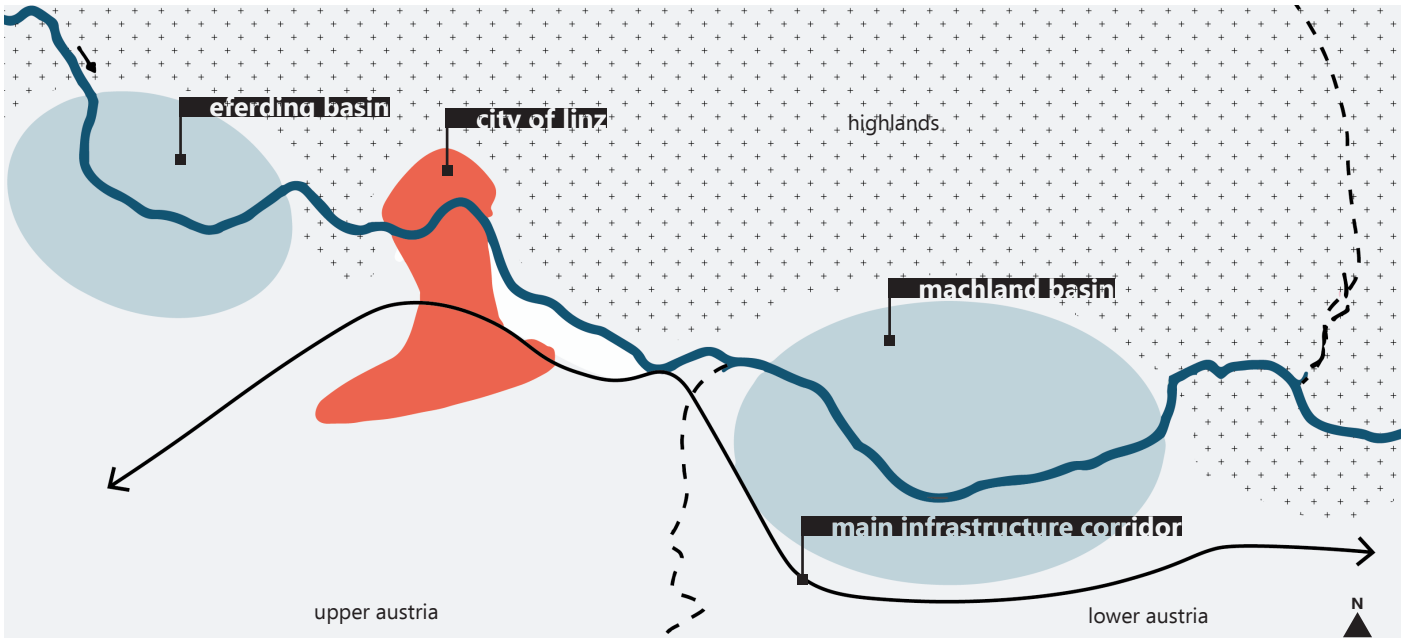
restrictions evolved between the three relocation waves. In the first wave, residents were allowed to choose their new locations based on traditional flood knowledge. In the second wave, households were only allowed to choose a new location outside of the flood-prone area with a 1:100 return period. In the third wave, this return period was increased to 1:300, meaning households had to relocate further from their original homes. Such provisions were possible due to the establishment of the relocations as a funding scheme in which applicants accept the given rules and not as a buyout program in which the public administration acquires property ownership

Political (procedural justice)
The Federal Ministry for Transport, Innovation and Technology played a crucial role in the second wave. They took over the main responsibility for the design of the compensation scheme, in terms of which actors are involved, who pays, level of compensation, time framework from offer to demolition and so forth. Nevertheless, the position of the Ministry changed drastically (from an active to an inactive player) within the third relocation wave. Here, the regional authority took over the key responsibility for designing, organising and implementing the compensation scheme.

In waves 2 and 3, the local authorities had only a minor opportunity to influence the relocation decisions. The main actions performed by local authorities were to convince citizens to accept the offer and to provide new building plots for the affected households This low involvement was also caused by lack of social capacity at local level; the planned relocation process overwhelmed most of the mayors. Similar results can be found in the lack of residents' inclusion and participation in the process. Residents were given mainly a passive, non-participatory role. The regional authority provided information at several meetings for citizens, where the presentation included intermediate results in an expert language. Local knowledge, needs and interests were not included in the decision-making process.

In the first two waves, the process of implementation showed the importance of pre-signals for acceptance and successful implementation in the region. In particular, the large 2002 relocation process in Upper Austria arose from a ten-year pre-discussion. A problematic example can be observed in the third relocation wave. The third relocation wave was initiated after the 2013 flood event without any previous local discussion. The regional authority had already intended the planned relocation process before the 2013 flood occurred but without consulting with local authorities and residents. Consequently, mayors and residents were overwhelmed and surprised by the relocation option after the 2013 flood, triggering mistrust in regional authorities.





European cases
Danube catchment (Schindelegger et al., 2020) & (Thaler et al., 2020)

Population impact
In the first relocation wave, only farmers were affected. For the second and third wave the implemented planned relocation projects varied in scope from stand-alone buildings to entire villages.

Place attachment, a feeling of being rooted in the region as part of personal identity and biography constituted a similar long-grown, ingrained mind-set that made residents reluctant to leave. Within the strategy there were measures taken to try and overcome this place attachment, but two dynamic processes turned out to be much more important for residents to accept the program: social learning and network effects, as well as coincidence with biographical stages and personal circumstances.

Social network effects played out across the entire process from first movers to the completed relocation of entire communities. Early relocators acted as role models for those contemplating relocation. Some of the early relocators demonstrated to those who were still in doubt that establishing a new or even better livelihood was feasible. In all relocation waves, very late relocators had encountered feelings of being left behind on their own, as their surroundings depopulated, social support diminished and communal infrastructure was dismantled; eventually, this encouraged them to abandon the risk area as well. Residents assessed the relocation program on their current living situation and biographical stage. They were more willing to accept the compensation payment if they anticipated changing housing needs. The importance of the relocation program coinciding with personal circumstances or biographical stages underpins the importance of the relocation timeframe. Keeping the policy window open for a long time in wave 1 increased the chance that the offer coincided with a household situation that favoured relocation. The short availability period of just five years in wave 3 resulted into few households entering appropriate circumstances within this short timeframe. This may have contributed to the low acceptance rate.

Some households struggled with the decision to accept the relocation and remained deadlocked in an uncertainty that kept them from actively shaping their life course. These households observed their friends and neighbours moving on with their lives but could not overcome their own procrastination. Households confronted with personal crises in addition to the issue of relocation, such as older or ill persons, those less affluent or single parents, also struggled. Their coping capacities were already overstretched by their personal crisis, which left them little space to tackle the relocation issue. This, again, highlights the critical role of personal circumstances in the uptake of planned relocation.

Conclusions

1. The Austrian strategy is the result of a process of continuous adaptation, refinement and learning in the form of **waves**. It shows that managed retreat can only be understood and implemented with a long-term perspective. This **long-term perspective** offers the opportunity to slowly introduce the scheme to a community and to **familiarise it with the relocation specifics, benefits and drawbacks**.

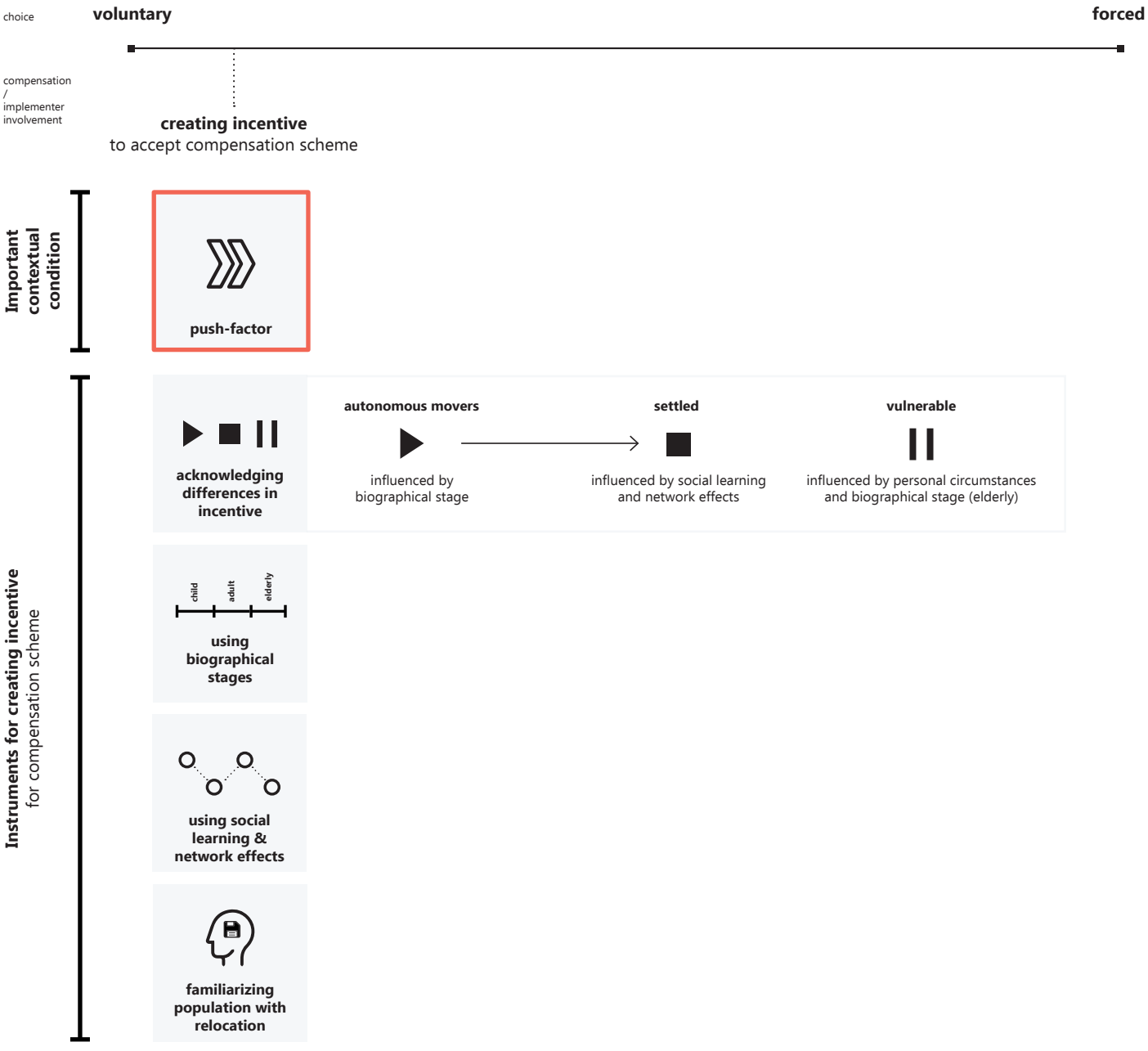
2. The strategy makes use of a **voluntary compensation scheme**. This is not a buyout program, but **a funding scheme in which applicants accept the given rules**. The goal in a voluntary compensation scheme is to make sure the population accepts it.

3. Based on the analysis of the case, there are three groups that can be identified within the sending population; **the autonomous movers, the settled and the households that are stuck**. The autonomous movers can be early movers that are willing to accept the compensation scheme. They might rely on **biographical stage** for favourable timing. The settled, on the other hand, are reluctant to accept the compensation scheme due to place attachment. This might be influenced by **social learning and network effects**. The **autonomous movers can therefore provide incentive for the settled**. For the households that are stuck, **personal circumstances** limit the acceptance of a voluntary compensation scheme. This might also change over time, but the effect is harmful. There is little attention to this group in the Austrian case.

4. The **large timeframe of the policy windows** proved important here. The longer compensation funds are accessible, the higher the likelihood that the compensation offer will **coincide with biographical changes and personal circumstances** favourable to relocation. It also allows **social networks effects** to take hold, and provide the more settled to follow the example of **early movers**.

5. For the Austrian case, floods that occurred during the policy window proved effective in creating incentive to accept the compensation scheme. Communication of the future increase of these threats increased this. Therefore, **the presence or threat of a crisis causes a crucial push-factor**.

	Prospected	Danube Catchment
Scale	Large part of population	Small part of population (+/-500)
Timeframe	Large timeframe	Large timeframe (1972 - present)
Status of disaster	Pre-disaster (proactive approach)	Post-disaster (reactive approach)
Benefit	Broader society / Residents	Residents

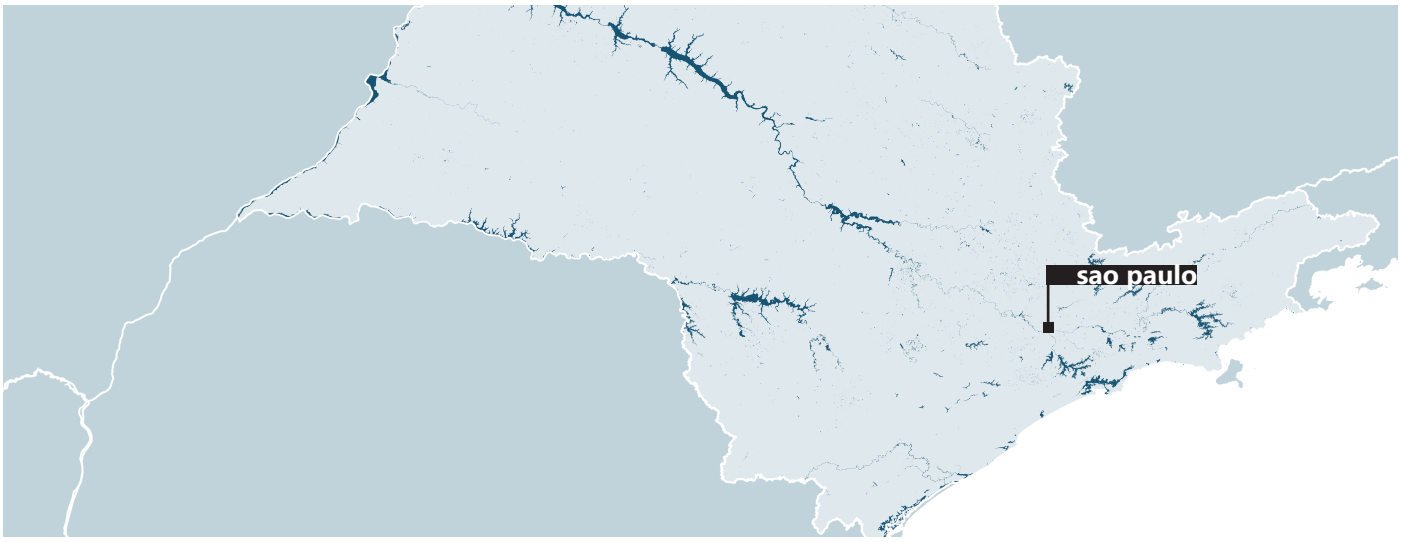


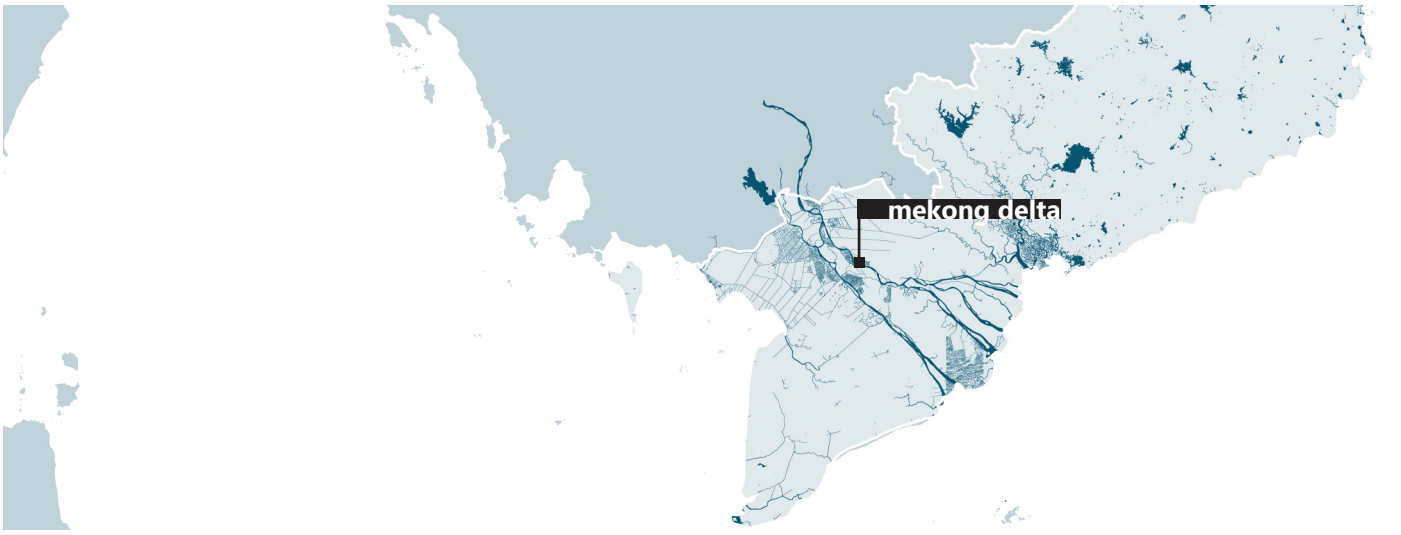
Non-European cases

Non-european cases
These cases will focus primarily on the scale of the retreat, as this is the thing that is most important in covering

The Brazilian government relocated 8000 households out of favelas in low-lying areas of Sao Paulo, giving them the option to select between several alternative housing locations to minimize community disruption. The program also improved drainage infrastructure.

Launched in 1996, the Vietnam government's Living with the Flood policy resettled an estimate of half a million people who were living in flood-prone areas of the Mekong Delta. Resettlement clusters were constructed outside of the flood zone or at an elevation above the record flood level.





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Non-European cases
Sao Paulo (Correa, 2011)

Location & Problem
The unauthorized occupation of land by favelas on the banks of streams in São Paulo put the low-income population that settled there at risk. The Stream Canalization Programme was introduced to mitigate these risks through the use of relocation. It was carried out in two stages, from 1987-1994 and from 1995-2007. In addition to risk reduction, the programme aimed to incorporated a number of additional goals; reducing floods and mudslides through canalisation, improving sanitary and housing conditions for the target families by moving those at risk to higher quality houses, improving infrastructure for transportation and protecting green areas. The programme was therefore conceived as a program to reverse both environmental and social degradation in the low-lying areas São Paulo.

The program involved resettling approximately 8000 households who were occupying the areas where the works were carried out and where there were recurrent floods. It was initially estimated that the program would take from four to five years to complete, but, due to its complexity, it lasted 10.

Policy (distributive justice)
Four relocation options were designed for the households in the at-risk areas or areas needed for infrastructure works; **(a)** resettlement in housing complexes, which the majority chose; **(b)** resettlement in new houses built in the same favelas, which were improved and upgraded; **(c)** resettlement in houses not affected by floods in the same favelas (exchange relocation); and **(d)** cash compensation for property.

Political (procedural justice)
Social management was closely coordinated with the parties responsible for executing the redevelopment of the sending region, those responsible for constructing the housing complexes in the receiving region, and with entities providing social services. A Resettlement Advisory Council was established. The Council coordinated activities and helped monitor the process. Local leaders and representatives also were directly involved, as were non-governmental organizations operating in the areas.

Households to be resettled in the new housing complexes were first registered through a census. This helped determine the likely demand for education and health services in the receiving region and the number of households motivated to move to these new complexes. It also prepared them for future process.
In addition to this, a socio-economic study was conducted to get a profile of the sending population. Characteristics such as household composition, socio-cultural ties, financial status, and participation in community activities were covered.

The social management team held periodic meetings with the communities, their representatives and local organizations to report on the progress and prepare for the move. Households were taken to visit the housing complexes to ensure they were familiar with their future homes and characteristics of the new neighbourhoods. The units within the housing complexes were even divided so as to reconstitute the composition of neighbourhoods within the favelas.

Population impact
Although the complexities were underestimated, the results confirmed that the project and resettlement process were positive. Flood control and health conditions were improved. Housing conditions were met, along with other environmental and social benefits, and public utilities and services.

Conclusions

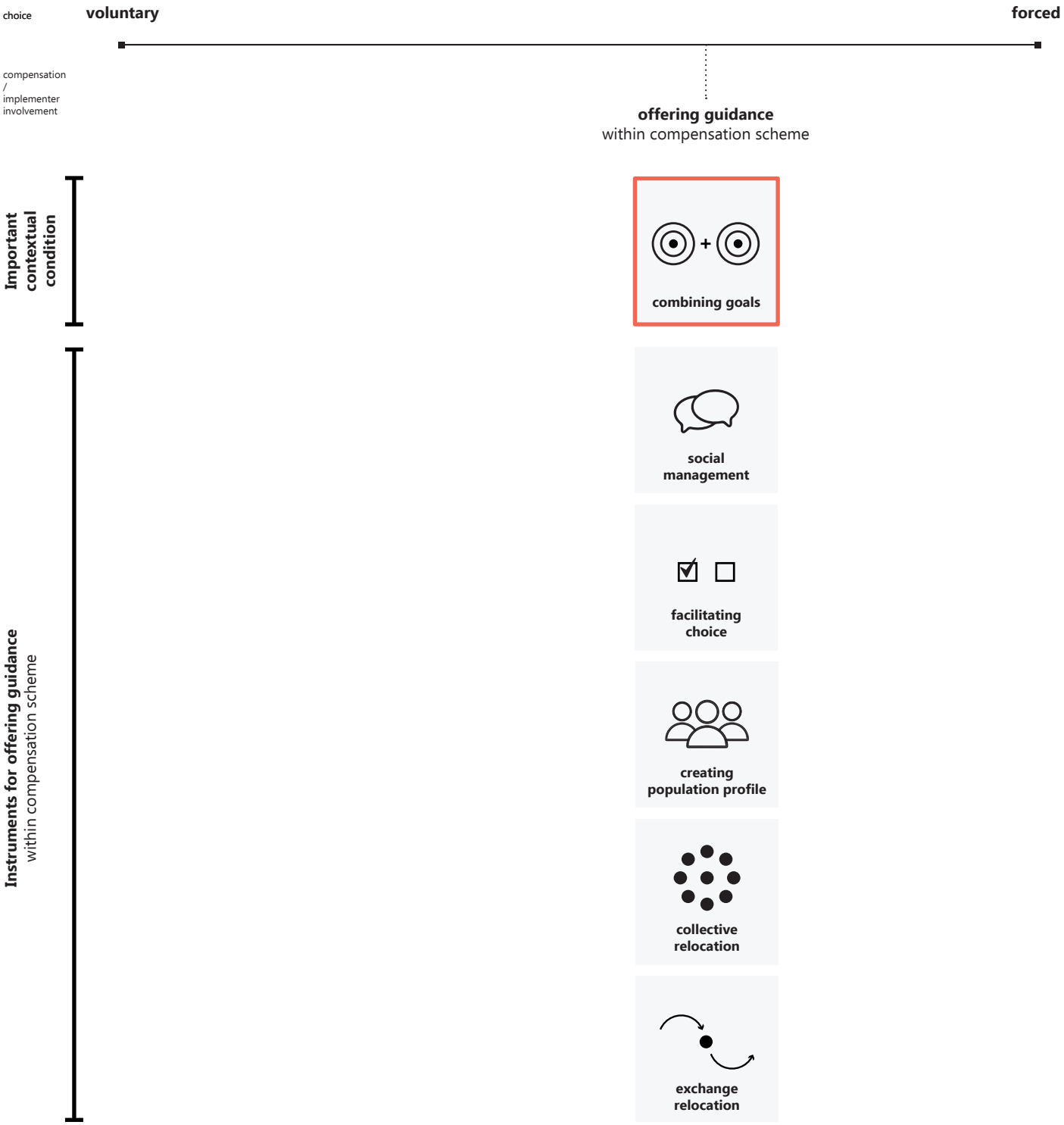
1. The Stream Canalization Programme used relocation to achieve goals in relation to both **risk reduction** and **redevelopment goals**.

2. Implementer involvement within the programme was extremely high. This might be caused by the **vulnerable group** the programme is targeting. It can offer insight in the **social management** necessary to aid the relocation of vulnerable communities.

3. The **element of choice** within the compensation scheme allowed the households to **remain in control**, and to choose an option that fit **those least affluent**.

4. A **comprehensive profile** of the sending population which offered the option to **match the capacity of the receiving region**.

	Prospected	Sao Paulo
Scale	Large part of population	Medium part of population (+/- 25000)
Timeframe	Large timeframe	Medium timeframe (1987 - 2007)
Status of disaster	Pre-disaster (proactive approach)	Post-disaster (reactive approach)
Benefit	Broader society / Residents	Broader society / Residents



Non-European cases

Makong Delta
(International Organization for Migration & Institute of Sociology Ha Noi, 2017)

Location
Viet Nam is highly exposed to disasters, and several regions experience frequent flooding, landslides, and cyclones, with significant impacts on human security, livelihoods, and assets. The low lying Mekong Delta is the most vulnerable region.

Problem
Relocation has been part of development planning and flood mitigation strategies in the Mekong Delta since 1996 through an approach known as 'Living with Floods'. Under this approach, communities have been relocated to areas with lower exposure and dyke systems to mitigate flooding.

Policy (distributive justice) & Political (procedural justice)
The current programme aims to provide relocation areas and stabilize livelihoods of households in high-risk areas through the construction of relocation clusters. It consists of collective relocation, in which a community is relocated as a group to a single, newly developed relocation site.

The national strategy for disaster prevention, poverty-reduction and rural development provide a framework that links relocation projects to both risk reduction and rural development goals. The programme emphasizes that relocation should also provide improved living conditions in relocation areas through investment in infrastructure, vocational training, and economic development. This has resulted in the provision of land and livelihood support, assistance with relocation costs, housing, and food. In 2012, this compensation scheme was updated based on the knowledge derived from the previous waves of relocation. The relocation programme remains part of the regional development master plan for the region's socioeconomic development to 2030.

Achieving the goals of these policies requires effective and comprehensive coordination between agencies from the central to the local level, and projects can benefit when project planners and implementing staff develop strong coordination mechanisms to deliver effective relocation planning and support programmes.

Population impact
In the Mekong Delta, several planned relocation projects have achieved positive outcomes in some aspects such as reduced risks and increased access to services. Restoring incomes, however, is challenging because relocation affects many aspects of livelihoods. Most rural communities rely on their land for income, which is difficult to maintain when relocated.

Conclusions

1. This programme resulted from the notion that the relocation should result in both **risk reduction** and **rural development** goals like poverty reduction.

2. The pace of the relocation programme was achieved through **collective relocation**, and through the development of **set relocation clusters** that are aimed to provide improved living conditions. This collective way of relocating the low-income population enables redistribution of assets.

	Prospected	Mekong Delta
Scale	Large part of population	Large part of population (+/- 500.000)
Timeframe	Large timeframe	Medium timeframe (1996 - present)
Status of disaster	Pre-disaster (proactive approach)	Post-disaster (reactive approach)
Benefit	Broader society / Residents	Broader society / Residents

Contextual conditions and instruments

Conclusions

1. In the Austrian case, the **instruments** focussed on **creating incentive** to accept the **voluntary** compensation scheme. The **large timeframe** enabled the voluntariness and was the instrument that allowed different processes to take place: It let autonomous movers reach the right **biographical stage**, and pushed **social learning and network effects** for the people that were **settled**. For the households that are **vulnerable**, personal circumstances also changed over time, but the effect was **harmful**. The timeframe also allowed households to get **familiar with relocation** before implementation of the strategy.

   In addition to large timeframe, the voluntariness was also enabled by the **post-disaster setting**. Flooding events functioned as a natural **push-factor** througout the duration of the policy window.

   For the prospected implementation of managed retreat, the **large timeframe can aid a voluntary approach**. The challenge, however, is to create incentive to accept a voluntary compensation scheme, without flood hazard as a **push-factor.** In addition to this, there should be more attention towards the harmful effect on the **vulnerable groups**.

2. In the Noordwaard case, the instruments focussed on **creating understanding** for an **involuntary** compensation scheme for retreat in a **pre-disaster setting**. Design sessions made citizens realize a substantial measure was necessary. This understanding was backed by the **national relevance** of the project. The residents realized that they were just a **small population** that could offer a solution to **broader society**. In addition to this, de-poldering was already a **familiar measure** in the region, which increased the understanding.

   The interactive process was aided by the presence of a large homogeneous group. This made communication easier which built up **trust and reliance** for the next phases of the development.

   For the prospected implementation of retreat, the Noordwaard case presents instruments that create **understanding for retreat** in a **pre-disaster setting**. This might be more difficult for the larger scale, when 'broader society' is smaller in relation to the population that has to move.

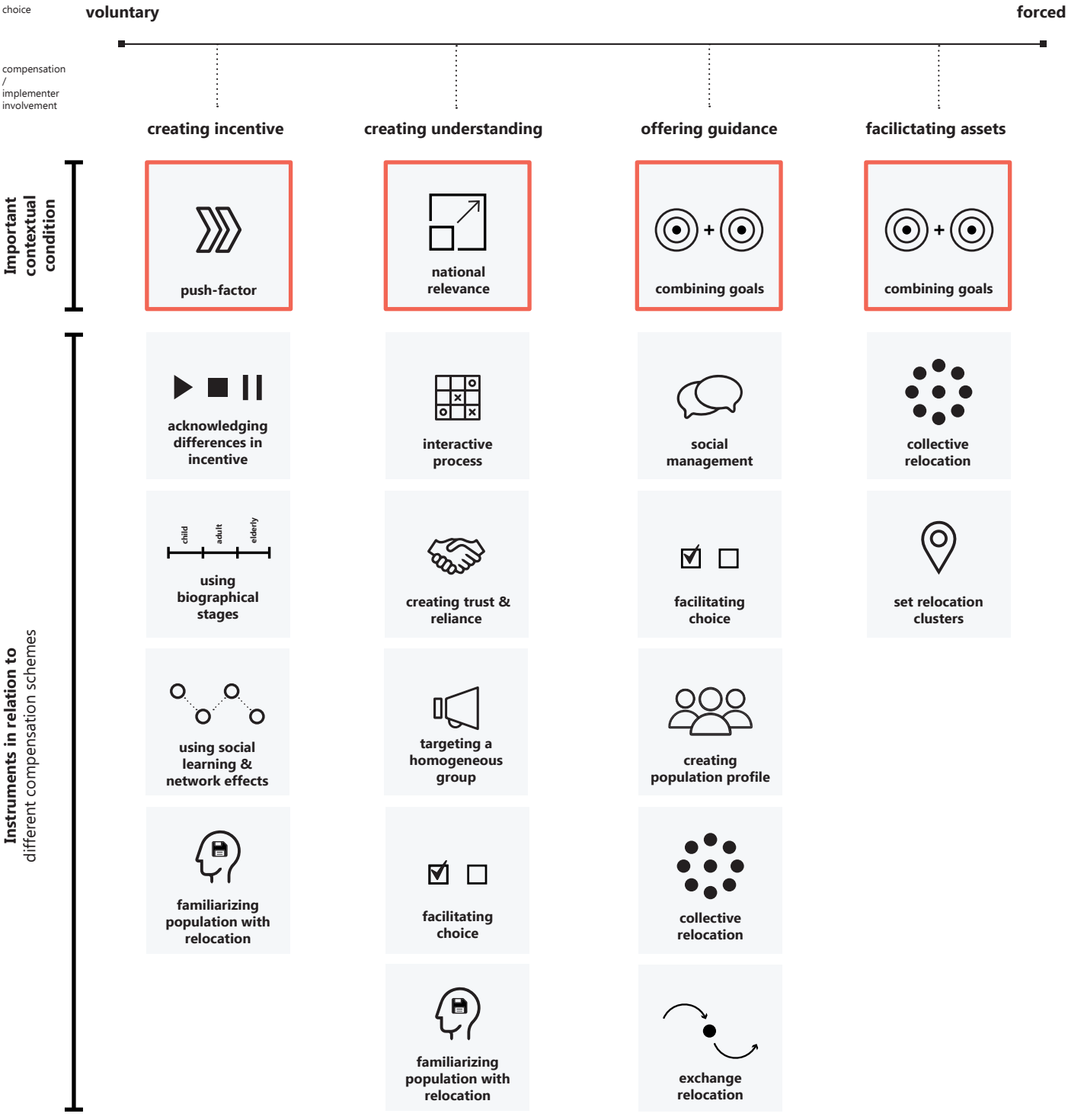
3. In the non-European cases, the **large scale** of the sending population **could not sustain a voluntary approach**. The **instruments** focussed on **offering guidance** throughout the implementation of the involuntary compensation scheme. The targeted communities consisted largely of informal settlements that housed low-income groups. By **combining flood-risk reduction with poverty reduction or redevelopment**, livelihood improvement in the receiving region became the shared goal. This resulted in an appealing offer for the vulnerable groups, which was carefully communicated through extensive **social management.** The **collective relocation** to **relocation clusters** enabled the implementing party to provide the livelihood improvement, as well as increase the pace of the relocation. In the Sao Paulo case the **element of choice** within the compensation scheme did allow for some degree of voluntariness.

   For the prospected implementation of managed retreat, the non-European cases can offer insight in dealing with the **scale of the retreat** by **combining goals**. In relation to this, they show the potential of **collective relocation** and the importance of a **designated receiving region** to ensure livelihood improvement for the more vulnerable groups.

The cases have presented a number of instruments that apply to different contexts (scale, timeframe, status of disaster, benefit) and degrees of implementer involvement. What is important to notice, is that for the most voluntary compensation scheme, the contextual conditions played a crucial part in the success of the retreat. The instruments presented by this case are processes rather than tools. The push-factor created by the flooding events in combination with the long duration of the policy window increased the incentive to accept a scheme for retreat. The lack of this push-factor in the Noordwaard case was overcome by the benefits that were perceived for broader society. However, if the scale of the sending population increases, this might not be sufficient. In the pre-disaster setting, the context should present another push-factor in order to sustain the voluntariness.

An important thing to take into consideration is that both non-european cases targeted informal communities with low socio-economic status. This is very different from the population in the Netherlands. For example, the costs of buying out households in informal settlements is not to be compared to buying out formal homeowners. The **voluntary compensation schemes** where the implementer involvement puts the focus on **creating incentive and understanding for retreat** is therefore a more realistic option, and is aided by the **large timeframe** that is available. The instruments of the non-European cases can still be of value within such a scheme, especially in terms of scale and in relation to the more vulnerable share of the sending population.

	Danube Catchment	Noordwaard	Sao Paulo	Mekong Delta
Scale	Small part of population (+/-500)	Small part of population (<100)	Medium part of population (+/- 25000)	Large part of population (+/- 500.000)
Timeframe	Large timeframe (1972 - present)	Small timeframe (2000 - 2014)	Medium timeframe (1987 - 2007)	Medium timeframe (1996 - present)
Status of disaster	Post-disaster (reactive approach)	Pre-disaster (proactive approach)	Post-disaster (reactive approach)	Post-disaster (reactive approach)
Benefit	Residents	Broader society	Broader society / Residents	Broader society / Residents



on context

establishing regions
towards a strategy

establishing regions

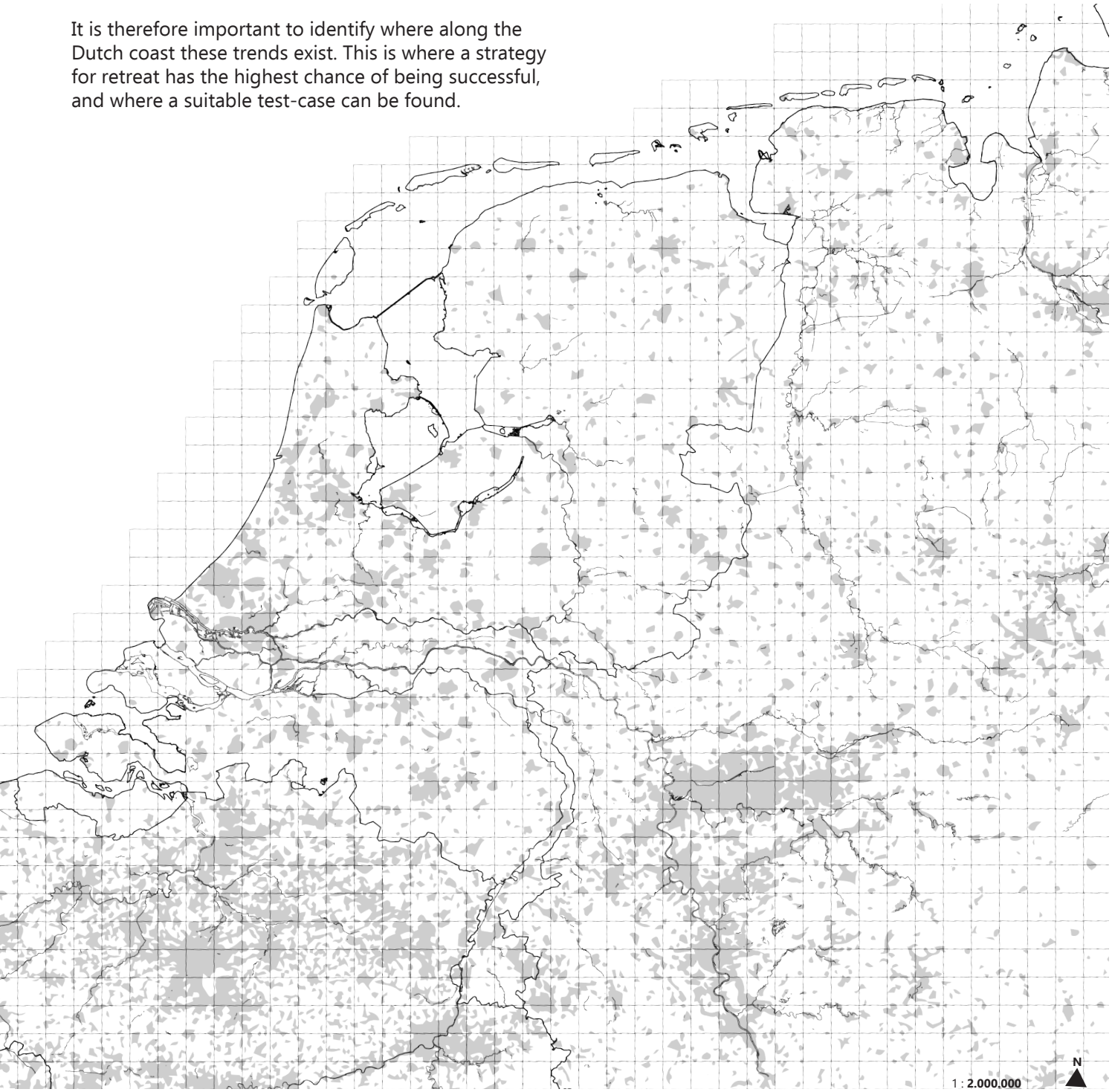
sending region
choosing scenario
receiving region

Sending region
Contextual conditions

Contextual condition
As concluded from the case-study analysis, there are contextual conditions that highly influence the success of a retreat strategy. Two of these conditions have a similarity; they rely on using existing trends.

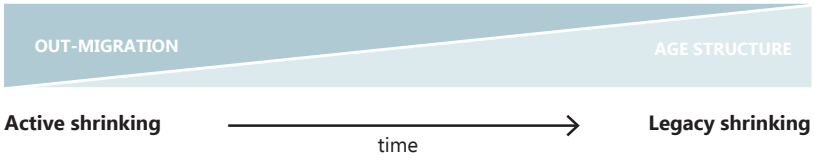
In the absence of threat as a push-factor, trends that are prevalent in the sending region might be able offer a similar role in creating incentive to move. In addition, these trends can possibly offer a combination of goals to increase the support for retreat.

It is therefore important to identify where along the Dutch coast these trends exist. This is where a strategy for retreat has the highest chance of being successful, and where a suitable test-case can be found.



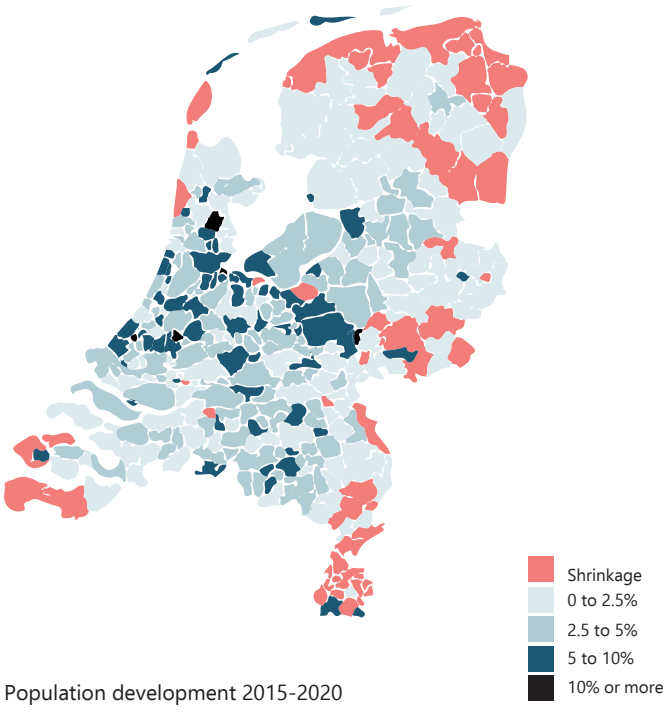
Sending region
Contextual conditions

Demographic decline
The most obvious trend is demographic decline. Decline is a push-factor in itself, but is also a symptom of other push-factors. These push-factors cause the out-migration of youth, so-called active shrinkage. Subsequently, legacy shrinkage is caused by the distorted age structures, like aging and dejuvenation, as a result of the out-migration in the past. The process creates a negative feedback loop (Copus, 2019).



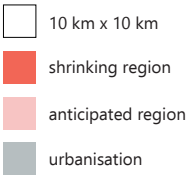
Relation between active and legacy shrinkage, adapted from (Copus, 2019).

The population development between 2015 and 2020 shows decline along large parts of the coast. The Dutch goverment identifies regions of focus that are dealing with demographic decline. Four of these regions are along the northern coast (Ministerie van Algemene Zaken, 2021). These regions are expected to experience more shrinkage; at least 12,5% in the coming two decades. The northern coast could therefore potentially make for a suitable test-case.

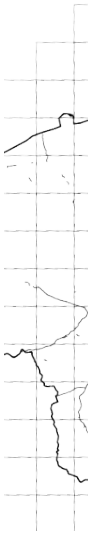


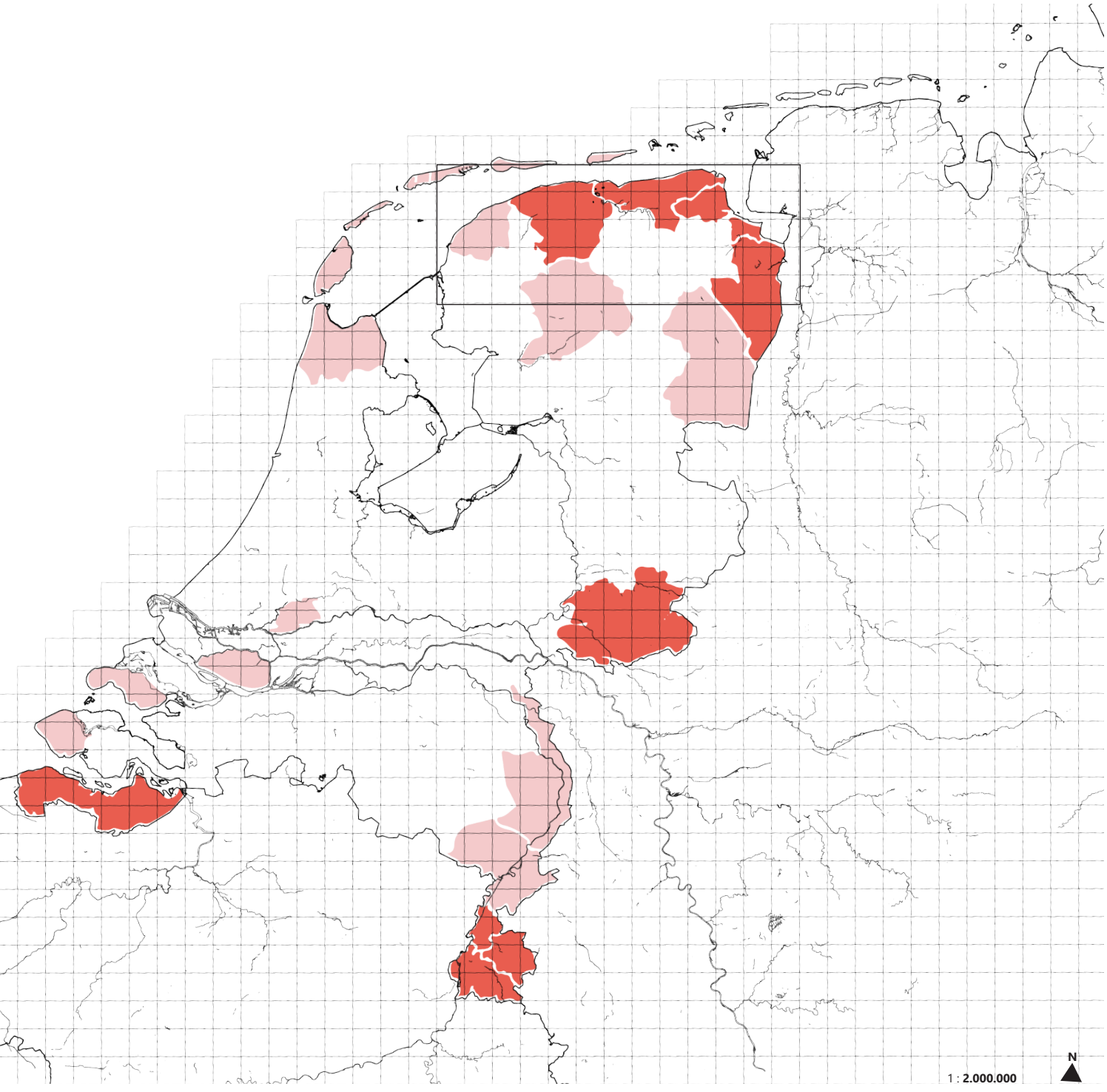
Population development 2015-2020

push-factor



Identified regions of demographic decline and regions where decline is anticipated (Ministerie van Algemene Zaken, 2021)

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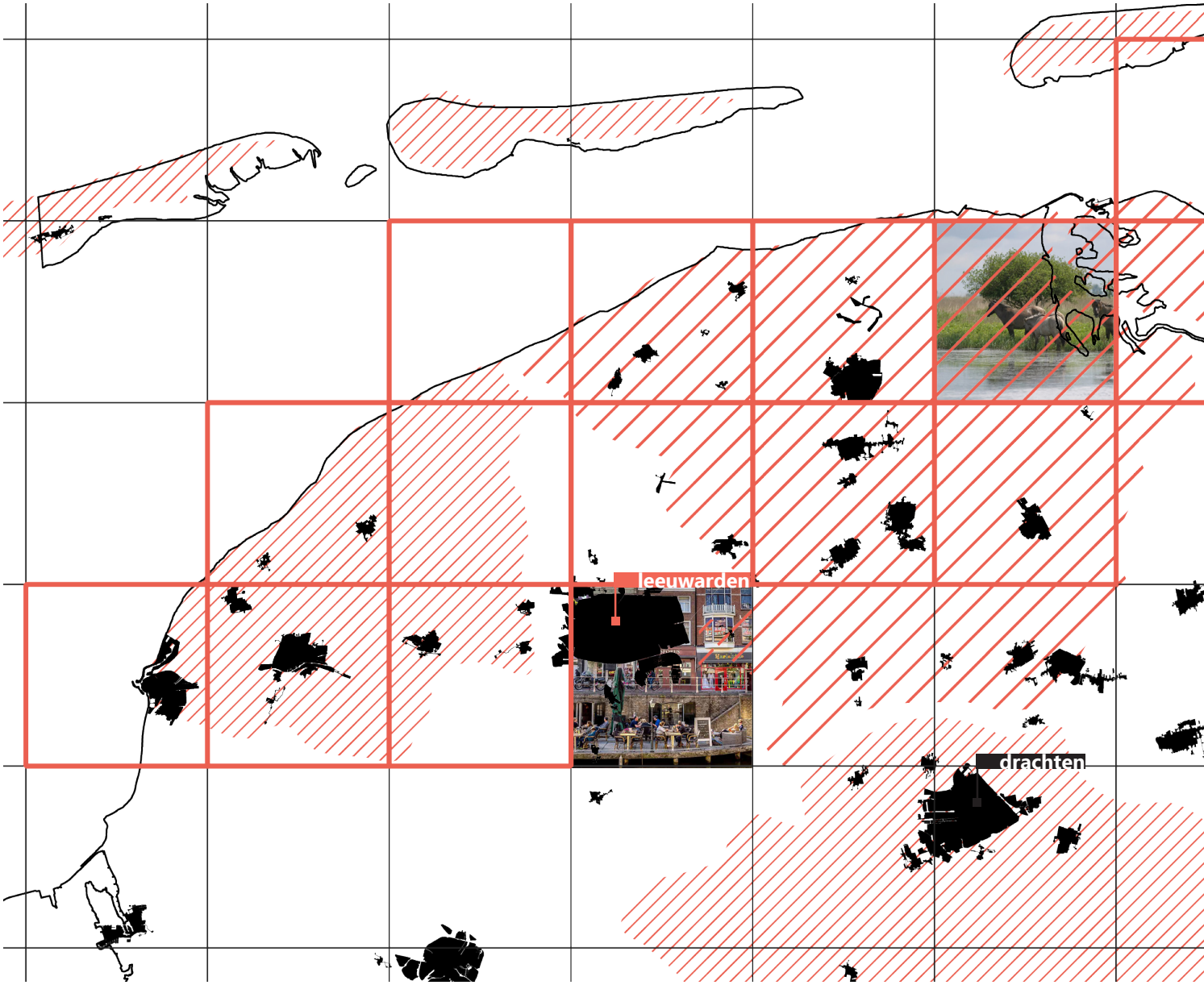
Sending region
Contextual conditions

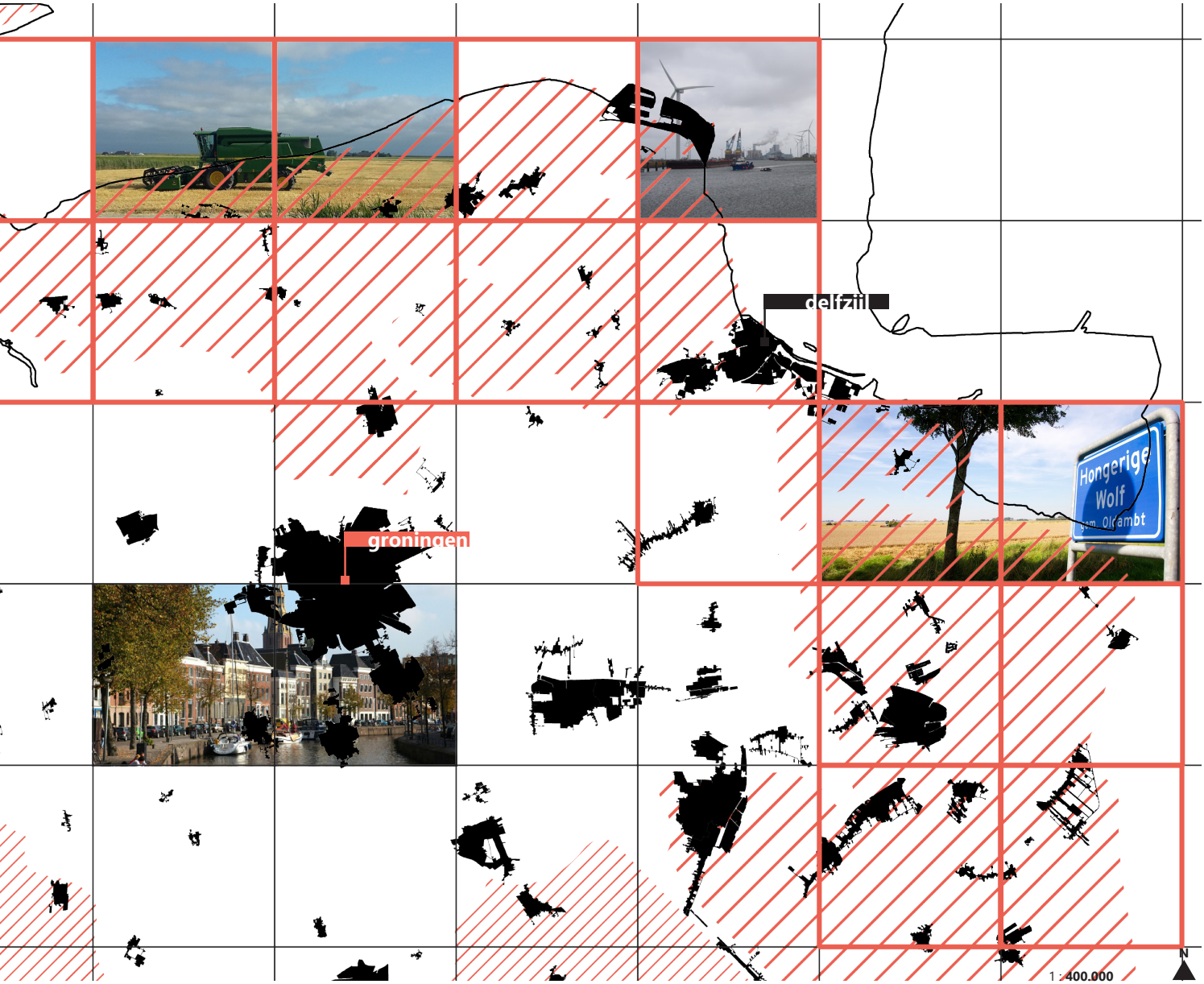
Northern coast
The northern coast consists of the provinces Friesland and Groningen with their respective capital cities Leeuwarden and Groningen. For both provinces, only their capital cities have more than 100.000 citizens. The cities and their surrounding regions are growing, whereas the rural areas are in decline.

The Groninger landscape is particularly recognized for its vastness, caused by the large scale cultivation of grain.

push-factor

The northern provinces with marked regions of demograpic decline and density as illsutrated by landscape characteristics.

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Sending region
Contextual conditions

Understanding demographic decline

As mentioned earlier, demographical decline can be a symptom of other push-factors. To understand the decline, the different factors of decline are taken apart.

Elderly (legacy shrinkage: aging)
People above 65 are (almost) retired and therefore not contributing to the labor force anymore. As they age, their need for help increases.

Children (legacy shrinkage: dejuvenation)
The amount of households with children portrayes the potential juvenation in the region if these children decide to stay in the region.

Opportunity (active shrinkage: outmigration)
The high poverty rate illustrates the lack of opportunity.

Especially the north-eastern part of Groningen has a high percentage of people over the age of 65. At the same time, the amount of households with children is low. This means the process of legacy shrinkage is already in effect, indicating out-migration of the past.

The high poverty rate in this region also suggests there is little opportunity in this region. This makes the region unattractive for young people to move towards, causing a negative feedback loop.

There out-migration in north-eastern Groningen can be traced back to one big push-factor; the gas-extraction crisis.

push-factor

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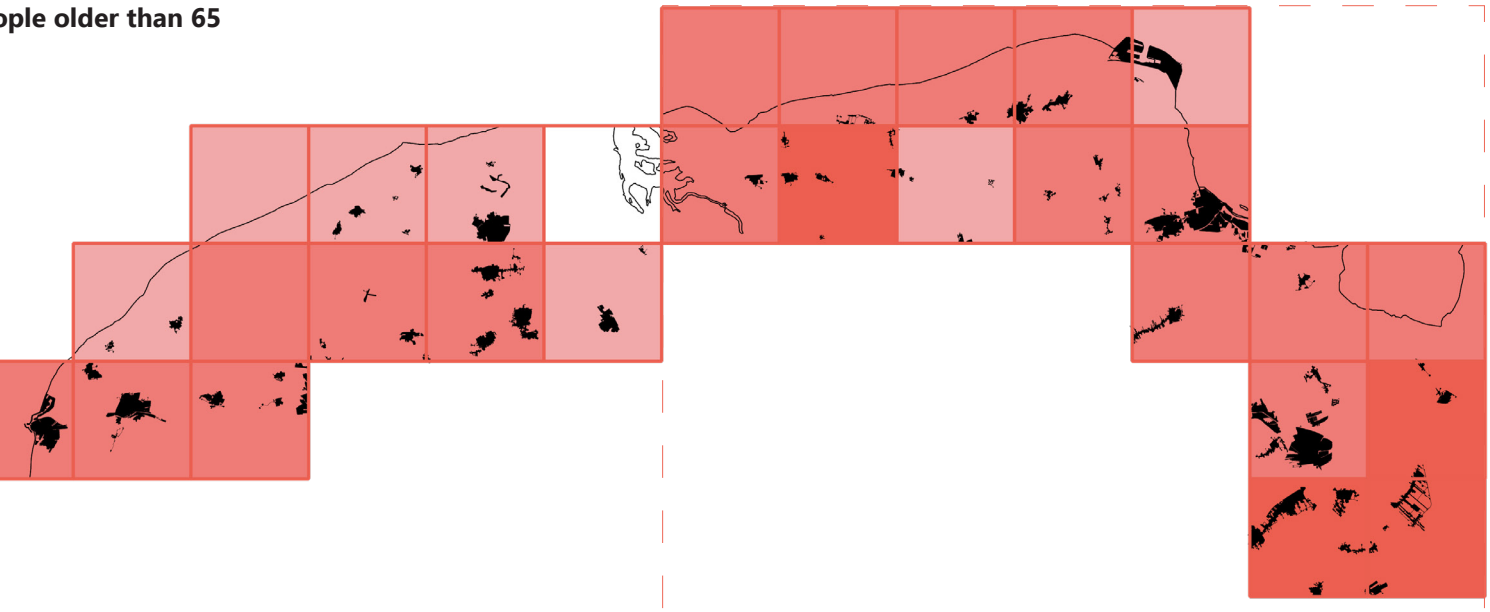

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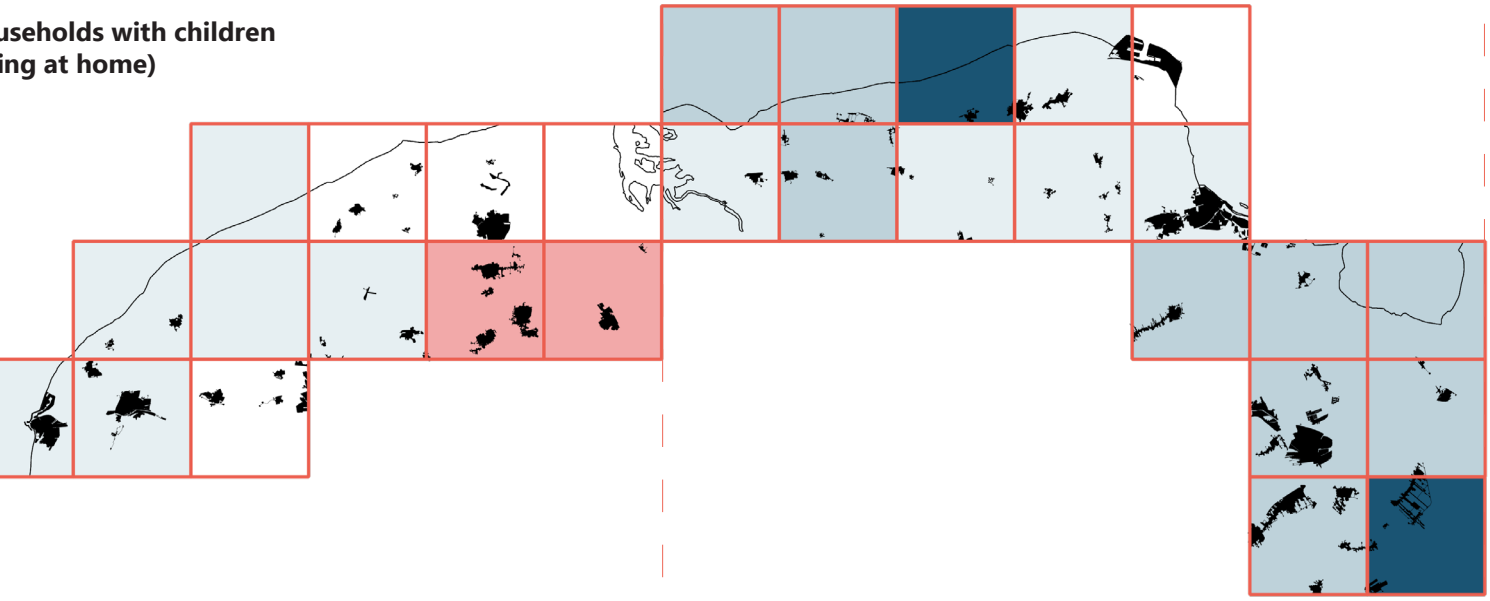

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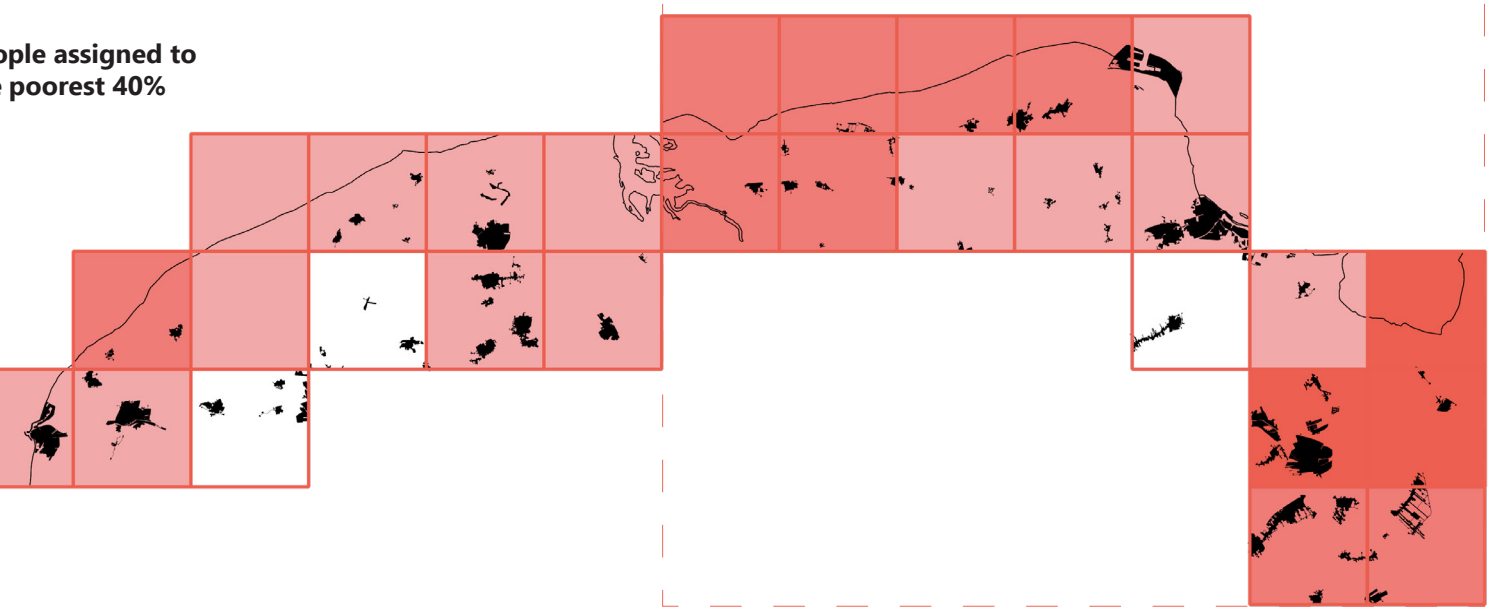
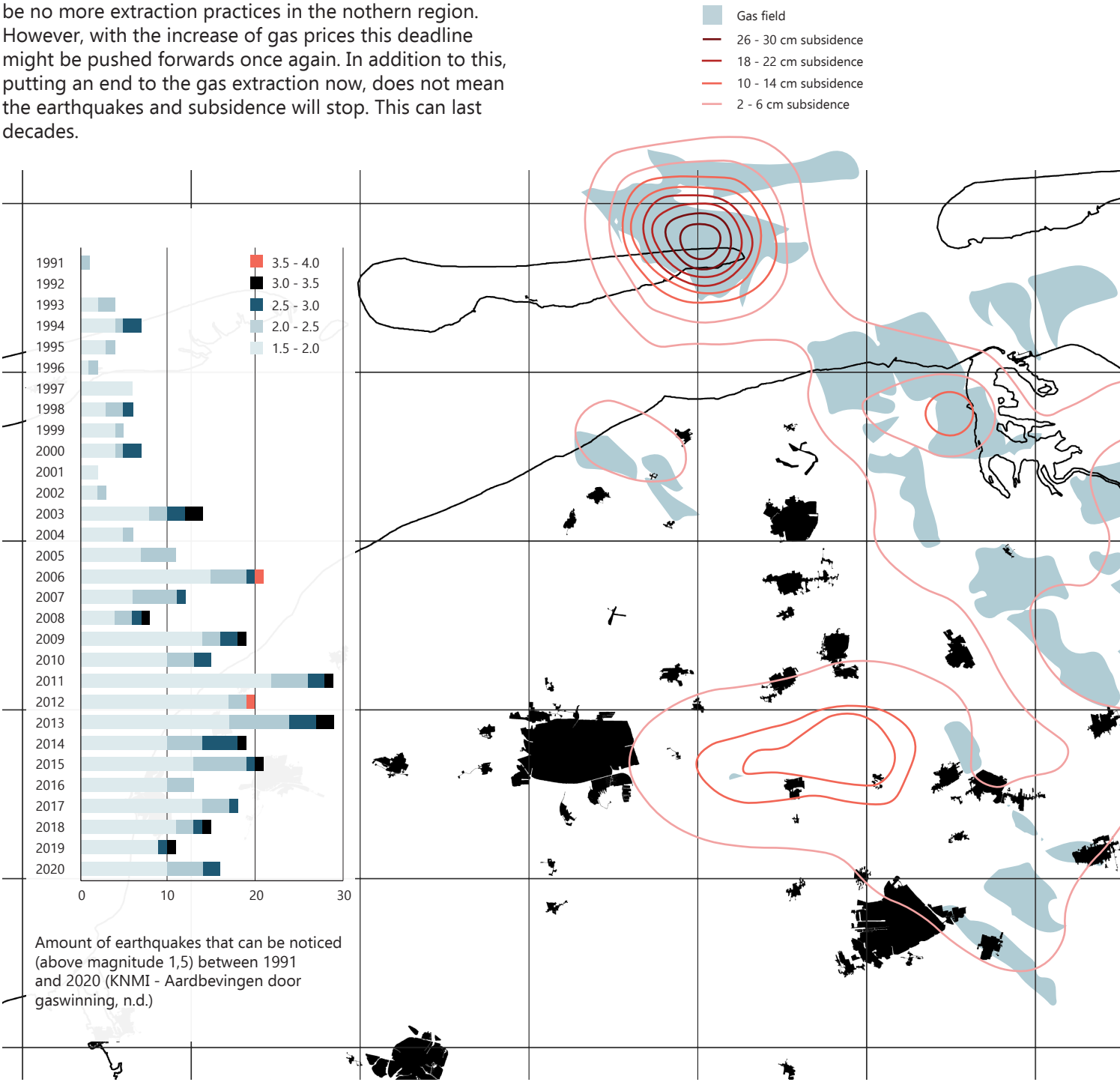


Sending region
Contextual conditions

At the beginning of the nineteenth century, caused by land subsidence as a result of the gas extraction, the first earthquakes occurred. Over the years they increased in severity, peaking in the early 10s, and have damaged buildings and roads, creating unsafe situations for citizens. In addition to the physical loss, it has created phychological stress (Rijksuniversiteit Groningen et al., 2020). This has resulted in loss of livelihood for a large part of the Groningers, and has played a role in the demographic decline in the region. In 2018, pressured by the crisis, the national government decided start phasing out the gas extraction. In 2022 there should be no more extraction practices in the nothern region. However, with the increase of gas prices this deadline might be pushed forwards once again. In addition to this, putting an end to the gas extraction now, does not mean the earthquakes and subsidence will stop. This can last decades.

push-factor



Amount of earthquakes that can be noticed (above magnitude 1,5) between 1991 and 2020 (KNMI - Aardbevingen door gaswinning, n.d.)

Article 2, '**Stress and gloom caused by earthquake damage in Groningen.** A poll conducted among 4000 Groningers shows that they experience psychological and physical stress from damage caused by the quakes.'

Article 3, '**Ending the gas extraction today, does not mean there will be no more earthquakes by tomorrow.** The gas extraction region in Groningen has become unpredictable.

Stress en somberheid door bevingschade in Groningen

Uit een peiling onder ongeveer 4.000 Groningers blijkt dat zij psychisch en lichamelijk lijden onder de schade die ontstaat door gasbevingen.

Mark Middel · 28 mei 2019 · Leestijd 2 minuten

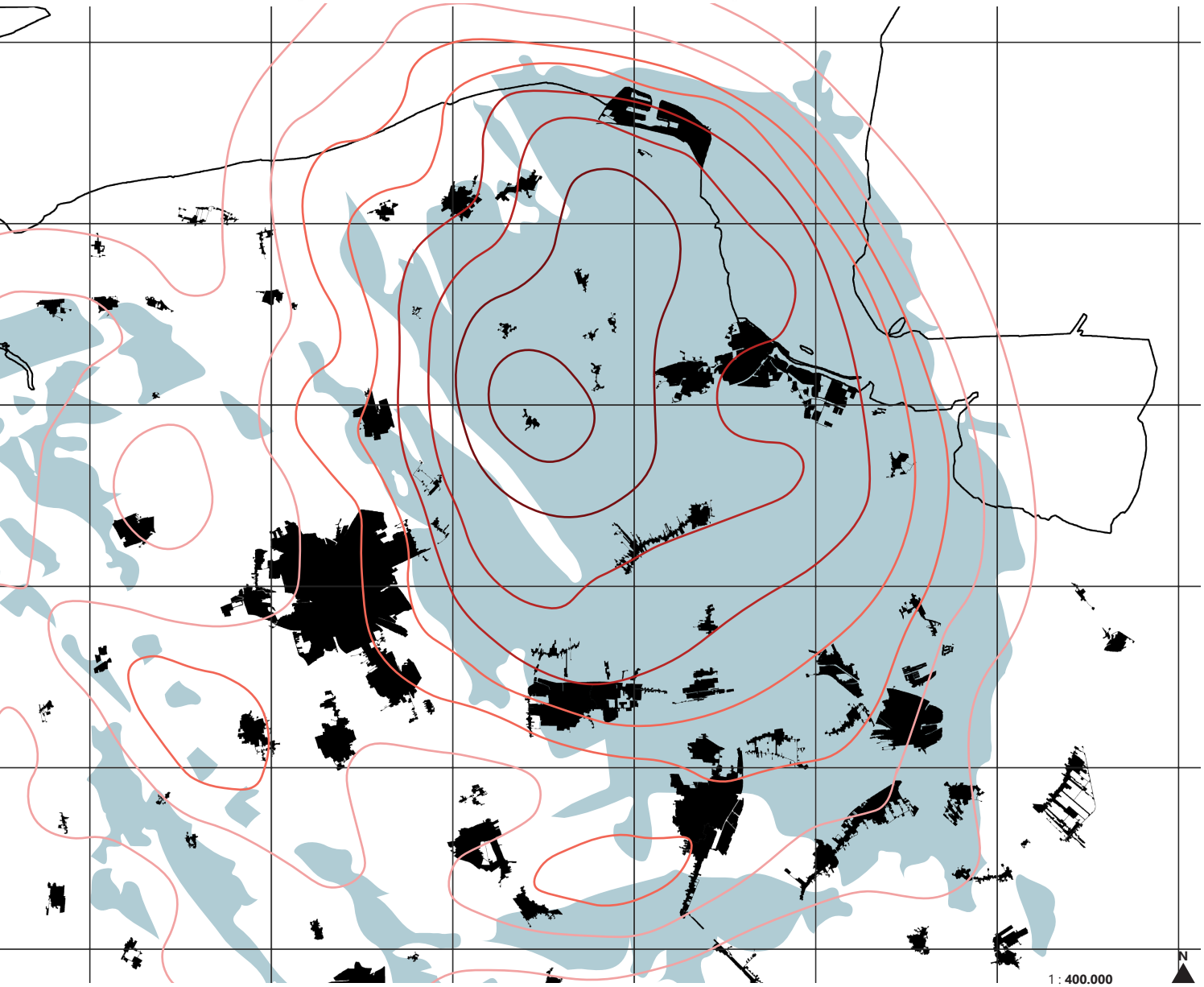
Een bewoonster van Westerwijtwerd wijst schade aan die is ontstaan door een aardbeving met een kracht van 3,4. Het is de op twee na zwaarste beving in de provincie Groningen als gevolg van de gaswinning.
Foto Gerwin de Vries / ANP

'Als je vandaag de gaskraan dichtdraait, is het niet zo dat je morgen geen bevingen meer hebt'

Läslo Evers Het gaswinningsgebied in Groningen werd door drie bevingen opgeschrikt. „Het gebied is heel grillig", zegt de seismoloog.

Mark Middel · 5 oktober 2021 · Leestijd 2 minuten

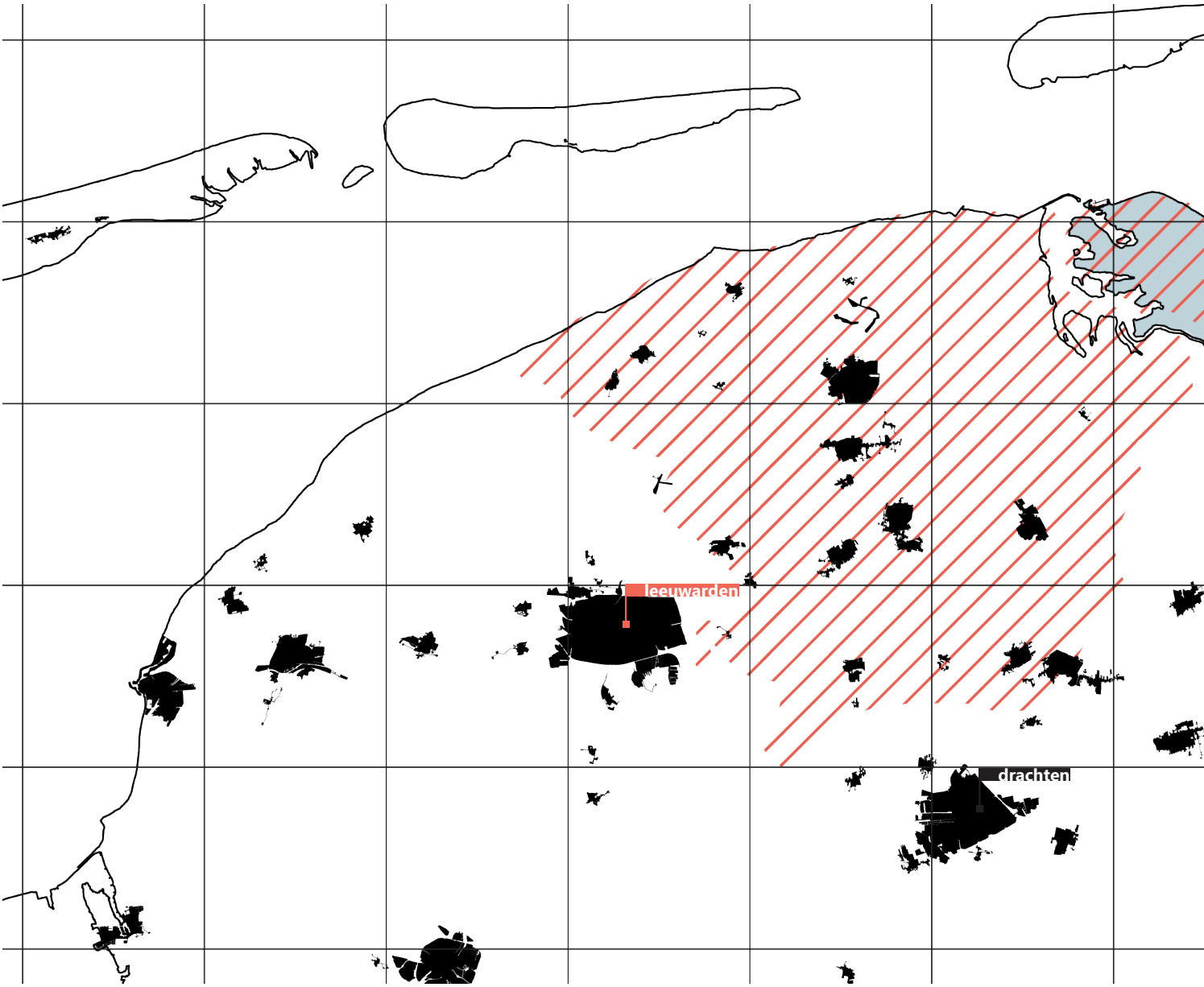
De NAM-locatie bij Zeerijp. Het dorp kreeg maandag twee voelbare bevingen te verduren.
Foto Kees van de Veen



Sending region
Contextual conditions

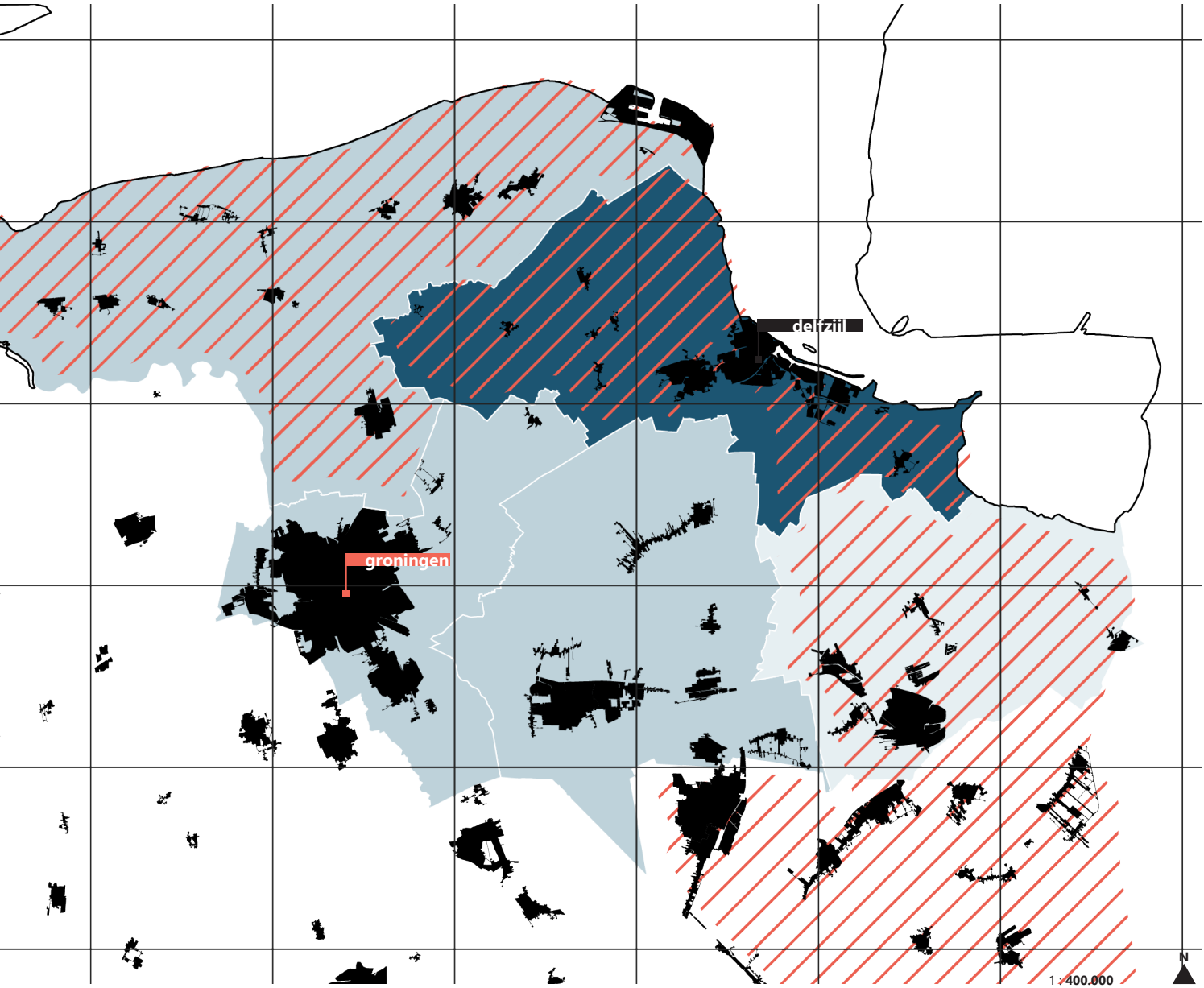
Demographic decline and the gas-extraction crisis are both issues that are challenging livelihood in north-eastern Groningen. The government has established redevelopment plans aimed to mitigate the effects of these issues. In the coming years, the plans can potentially be combined with a strategy for retreat. This way, retreat is embedded in broader (re)development plans which creates benefits for the sending population.

combining goals



Plan of action demographic decline, cooperation arrangements for a structural approach in (anticipated) shrinking regions (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties & Directoraat-Generaal Wonen en Bouwen, 2016).

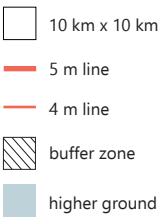
Multi-year reinforcement plan 2021 - 2028 (Nationaal Coördinator Groningen, 2021)

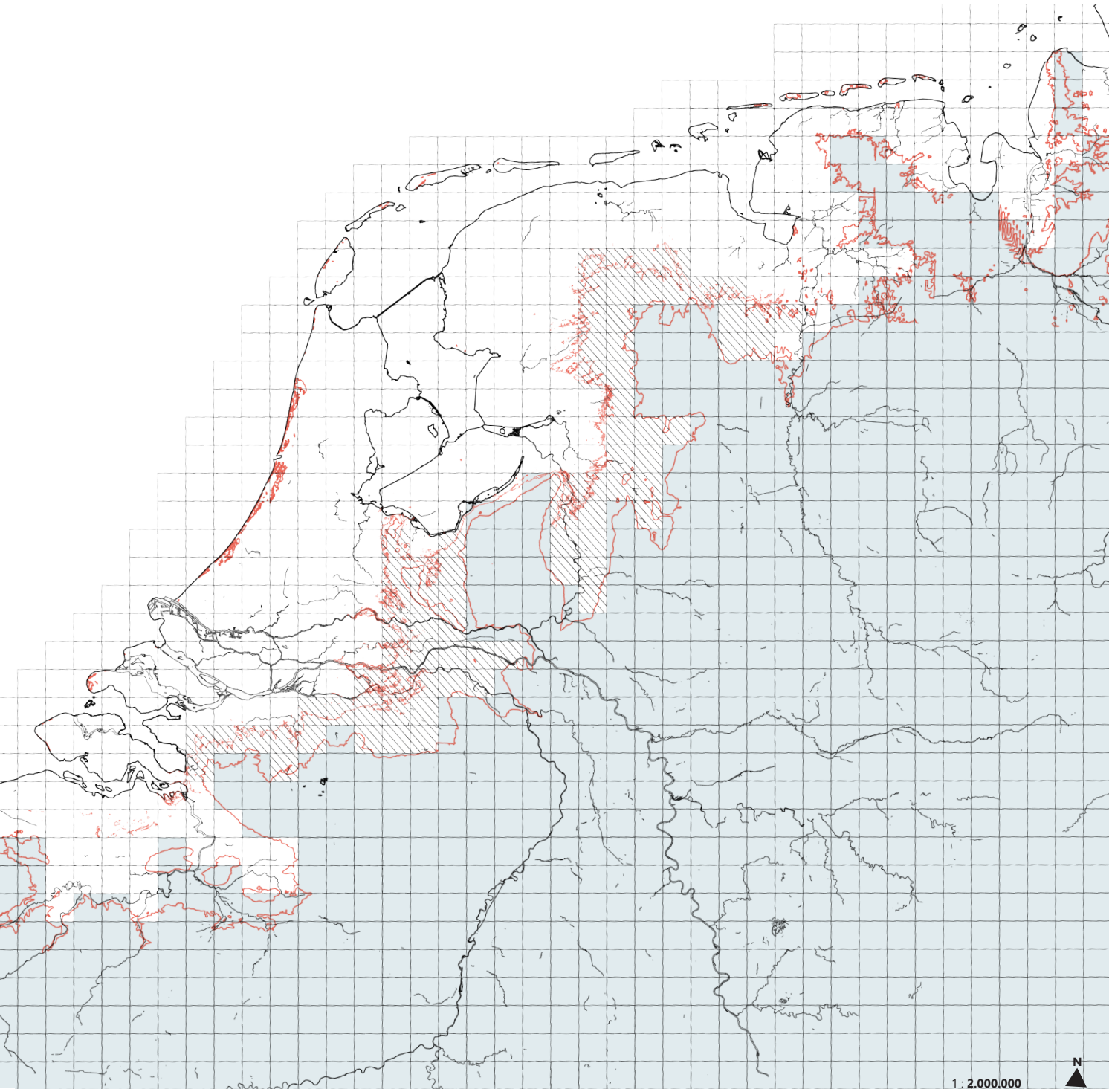


Receiving region

Receving region
As the primary goal of managed retreat is adapting to the changing climate, the move should not provide temporal safety from SLR, but should be a long term solution.

The receiving region is established through the 5 meter height line, as instructed by the European Environmental agency, which will offer long term protection. To create a less superficial region, a 4 metre line is also added to create a buffer zone. A grid of 10 by 10 kilometers is used to interpret these lines in a more abstract way. Together they embody the receiving region, which we will call the High East.

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creating scenario

SLR projection

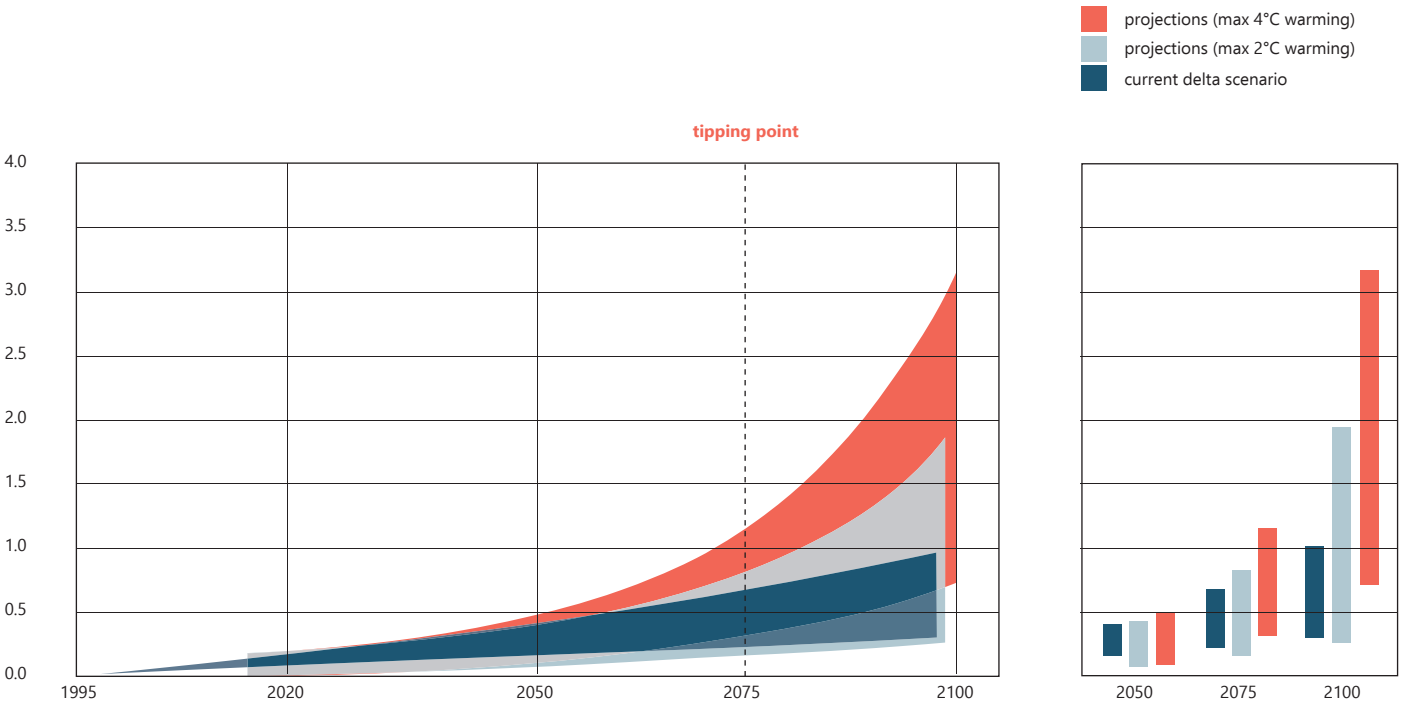
Test-case
Following the analysis of the contextual conditions, the north-eastern coast of Groningen presents an interesting test-case. In order to move towards the strategy design, a scenario for retreat is needed that guides the design. The degree of retreat is determined by just how fast sea levels rise, which is why a SLR scenario is created to guide the strategy design.

Uncertainty
The Royal Netherlands Meteorological Institute (KNMI) has identified probabilistic scenarios for the Netherlands, which show that sea levels can rise up to 2 metres in 2100 even if the maximum global temperature increase of 2°C (as stated in the Paris Climate Agreement) is met. In case of greater warming, (an increase of 4°C by 2100) the sea-level can rise up to 3 metres by 2100 in comparison to the baseline set in 1995 (Haasnoot et al., 2020). This will continue after 2100, with SLR of up to 5-8 metres by 2200. This is a substantially more extreme projection than the prognosis earlier scenarios for the delta strategy were based on (Haasnoot et al., 2018).

These extremer projections are the result of uncertainty about the West Antarctic Ice Sheet (WAIS). Accelerated disintegration of the ice sheet caused by an increase in global temperature has been recognized as a tipping point for accelerated SLR (McSweeney, 2021).

The WAIS holds enough ice to raise global sea levels by around 3 meters. The long-term stability of the WAIS is of particular concern because it is a marine-based ice sheet (McSweeney, 2021). According to the IPCC's report on the ocean this means that it sits 'upon bedrock that largely lies below sea level and is in contact with ocean heat, making it vulnerable to rapid and irreversible ice loss.' In other words, once global temperatures reach a certain threshold, a negative feedback loop will occur which results in the disintegration of the ice sheets which cause an acceleration in SLR. For the most extreme scenario the graph by Haasnoot et al. (2018) suggests that the WAIS tipping point will be around the year 2075. After this, the graph shows an exponential rise.

As retreat is an extreme measure which has a huge impact on livelihood, it is more likely to be an answer to an extreme scenario for SLR. In addition to this, it will not be implemented based on a hunch, meaning there can be no doubt about its necessity.

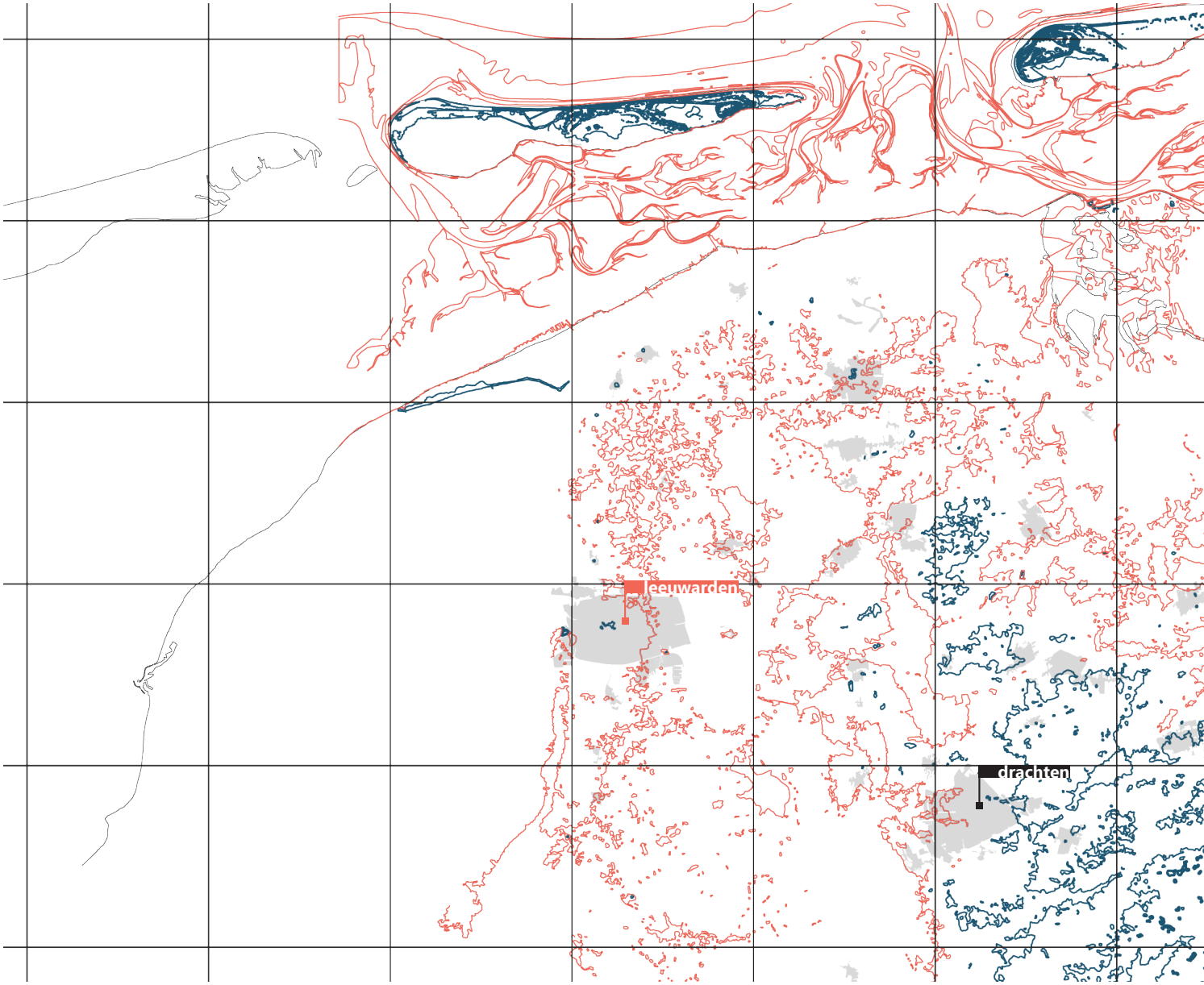


Possible SLR for the 21st century according to the current delta scenario and the projections of accelerated SLR as a result of disintegration of the WAIS (Haasnoot et al., 2018)

SLR projection

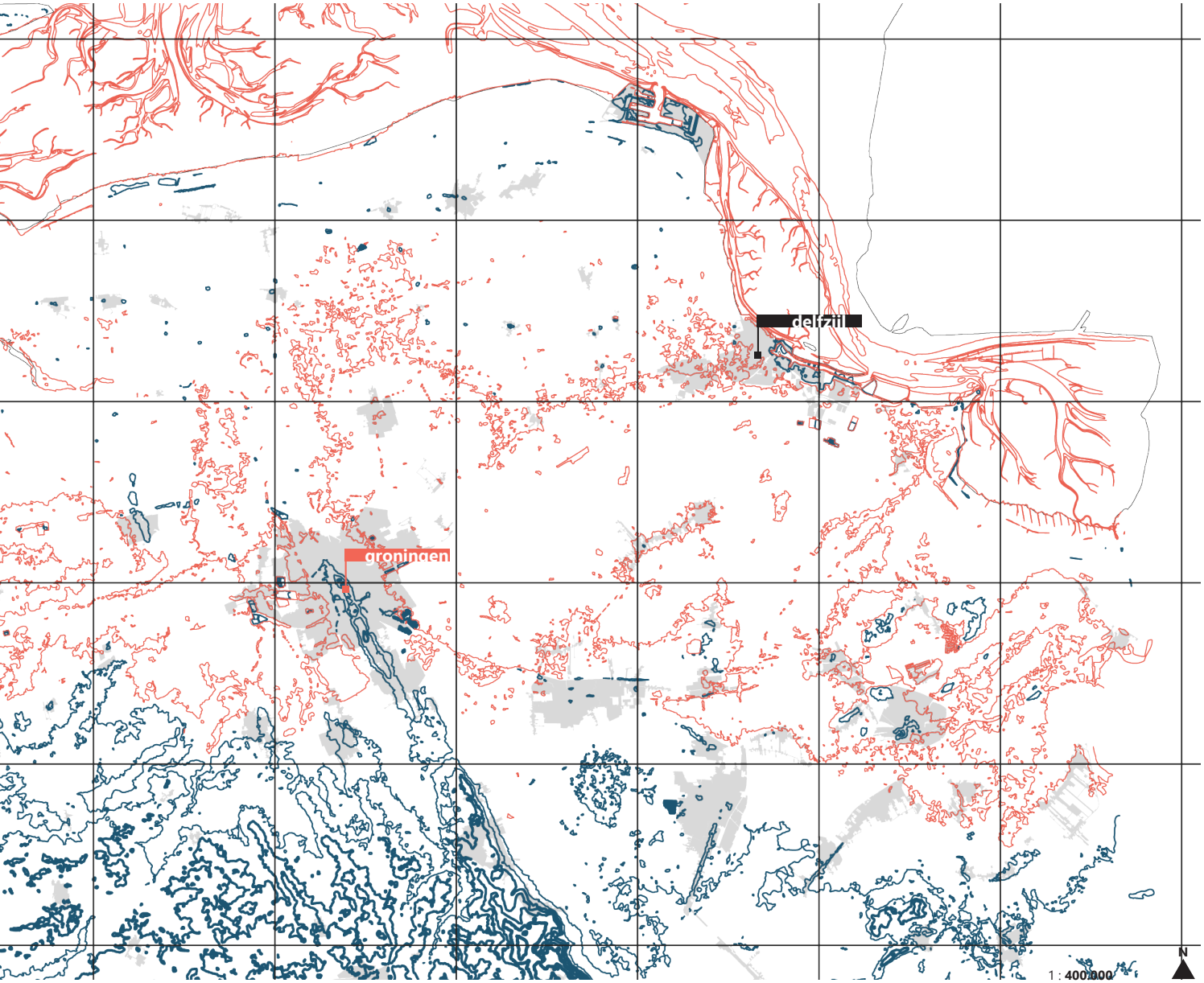
Scenario

To guide the strategy design the most exteme scenario for SLR is used; an increase 4°C by 2100. This includes the tipping point in 2075. For the design we state that from that year onwards, there is clarity on how much sea levels will be affected by the WAIS. This means the strategy should incorporate a way to deal with this uncertainty until then.



Heightlines making a distinction between the regions above and below sea-level.

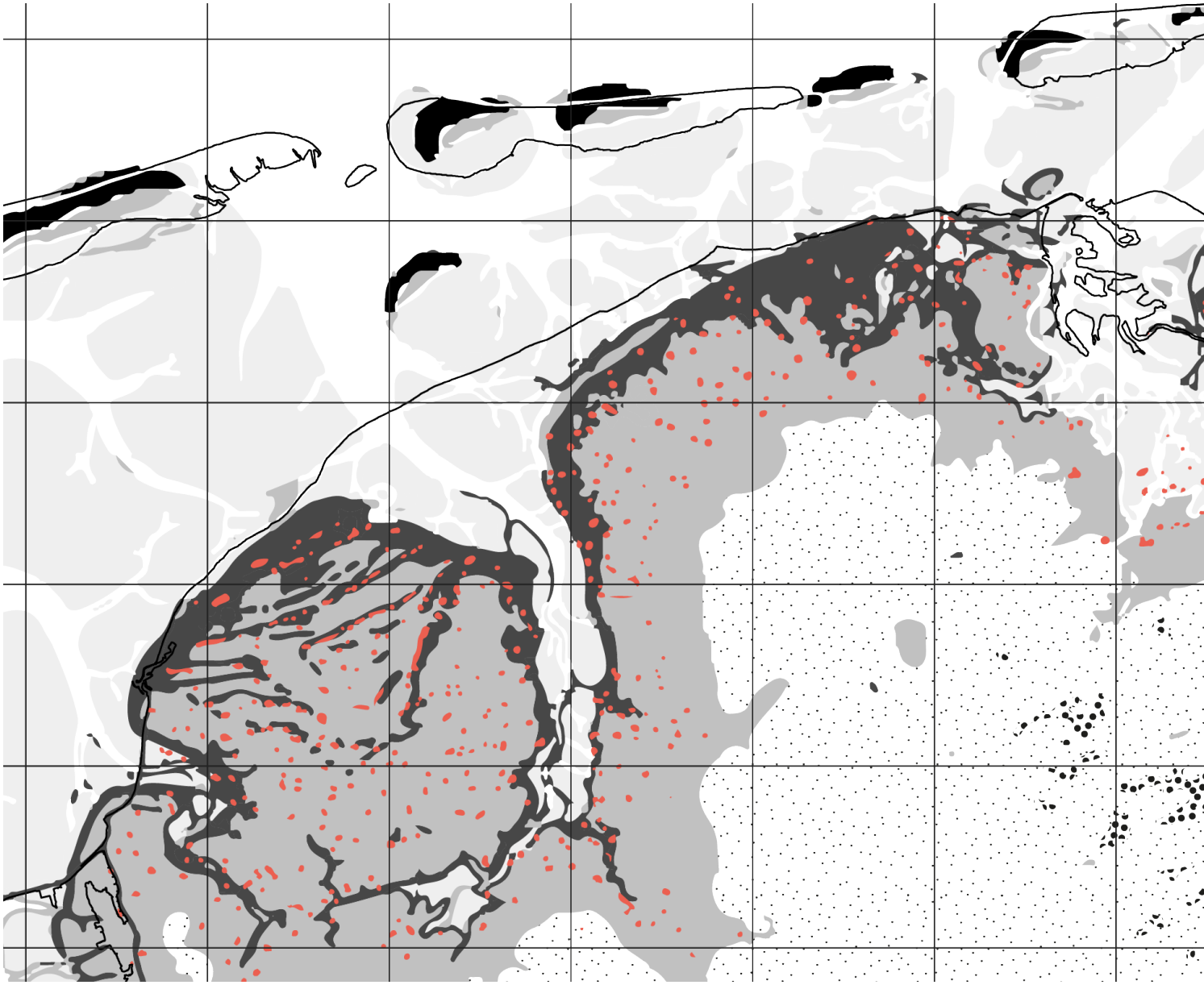
-50 m - 0 m
0 m - 3 m
3 m - 12,5 m
12,5 m - 25m



Landscape features

In addition to the timeline, it is important to establish what retreat in the test-case might look like after the tipping point is reached. The historical landscape of the northern coast can offer a possible future.

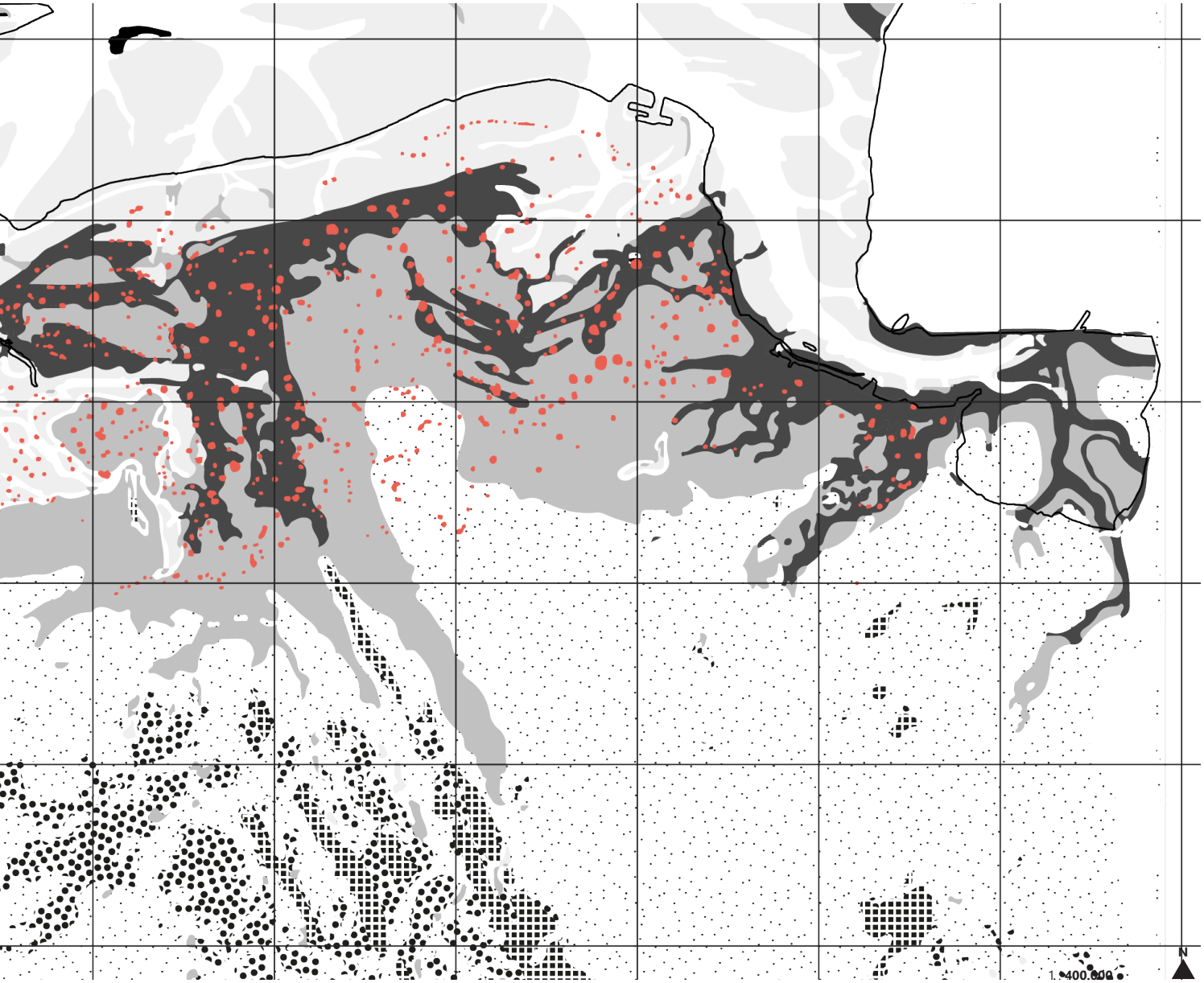
Salt-marsh landscape
Before there were dikes for protection the northern coastal region was a dynamic landscape. In 800 AC the coast was moving seawards eventhough sea-levels were rising. This was caused by the surplus of sediment. The surplus caused sand banks to arise in the tidal basins. These sand banks remained dry during high tide. The pioneer vegetation that could develop under these conditions ensured that sludge could accumulate. This way salt marshes formed. Under the influence of the relative sea level rise, in combination with supply of sediment, the salt marshes kept increasing in height and expanded in a seaward direction. On the edges of these salt marshes sediment accumulated more easily. As a result, sandy ridges with a height of a few decimetres developed along the coastline: the salt marsh embankments. Wierden, or mounds, are elevated landforms which originated in this period, before there were dikes to protect the population. They were built in areas of the landscape that were naturally elevated due to the siltation of the (former) coastline; on salt marsh embankments. With the rising sea-level and the subsequent sedimentation and man-made elevations, clusters of mounds would over time merge together, creating larger (village) mounds (Nieuwhof, Nicolay, & Wiersma, 2018).



Wierden-landscape, salt marsh embankments at the foot of a village mound (Geert Hendrik Streurman, Veenkoloniaal Museum, Veendam)

The northern coast in 800 AC.

- sand dunes
- salt marsh embankments
- salt marshes
- mudflats
- historical dwelling mounds (elevated grounds)

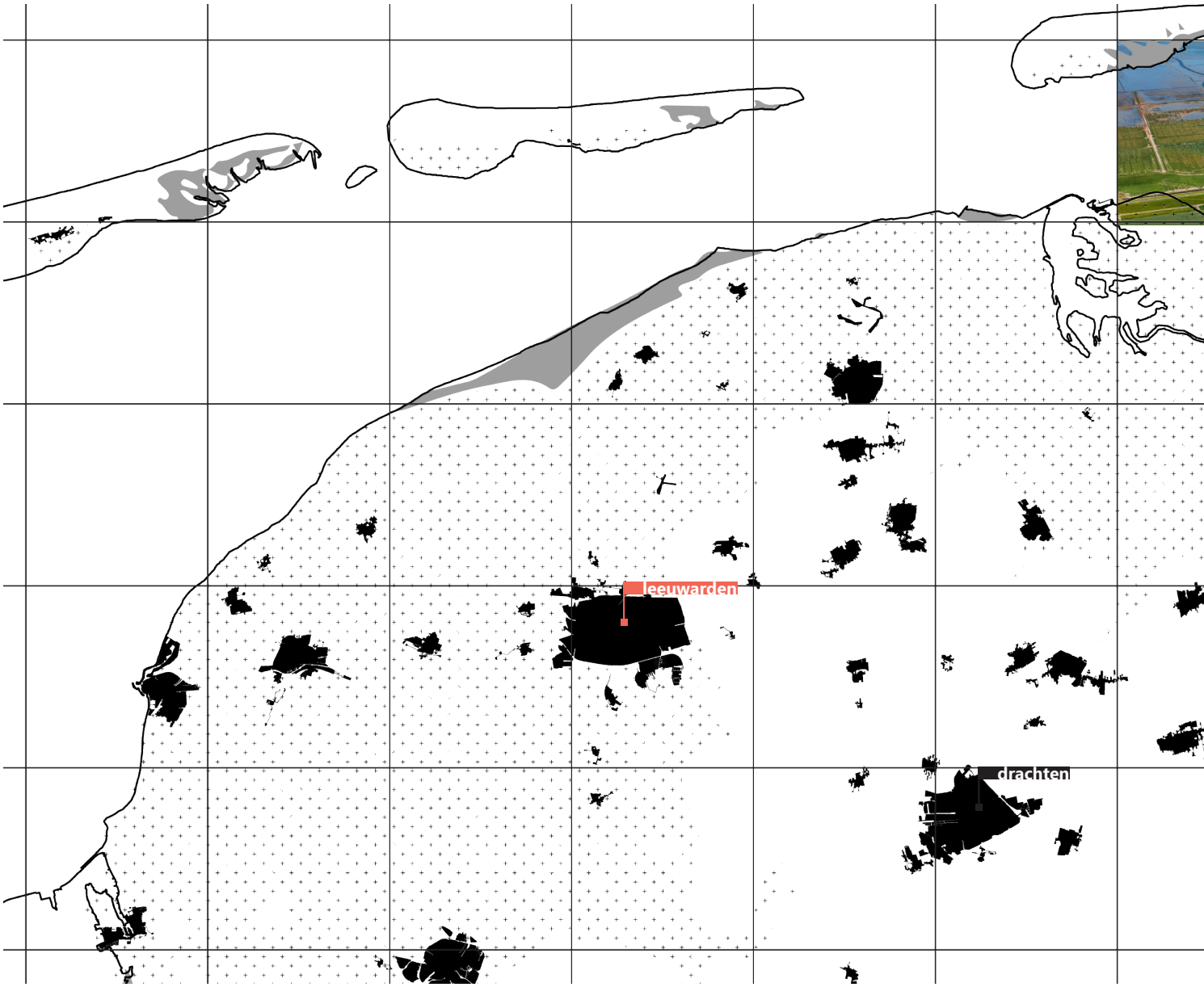


Landscape features

Wierden-landscape
Around the 12th century mounds lost their function due to the construction of dikes. However, while diked areas were threatened by subsidence and dike breaches with disastrous consequences, people lived successfully on mounds on salt marshes outside the dikes until the 19th century (Nieuwhof, Nicolay, & Wiersma, 2018). Today, mounds are still part of the northern landscape, although they do not have a protective role anymore.

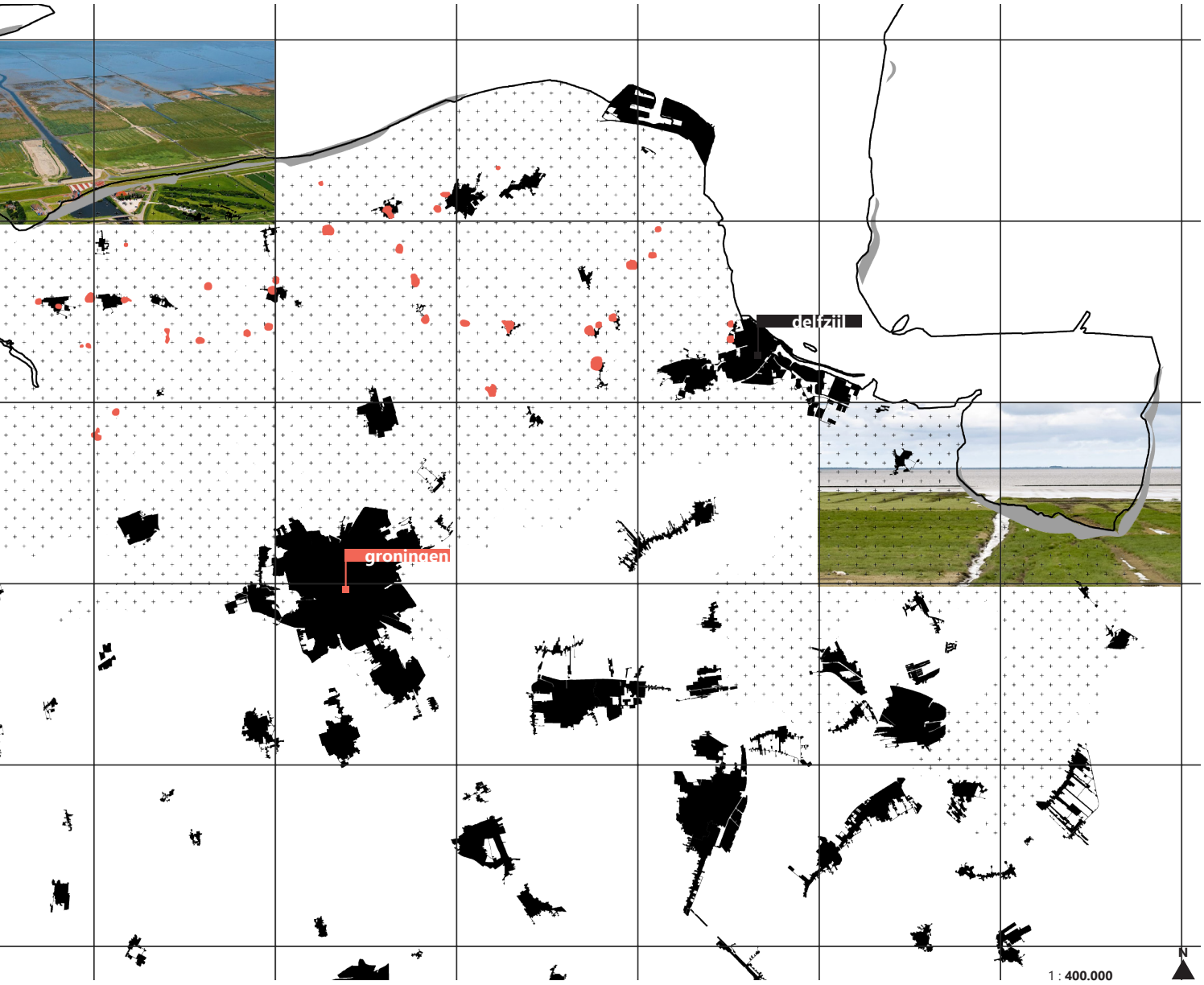
Nowadays, during a storm the water is pushed up against the dikes, creating high water levels. In the salt marsh landscape without dikes, the rising water was able to flow out over a large area creating more storage capacity and therefore less extreme water levels (Nieuwhof, Nicolay, & Wiersma, 2018). This wide water-retaining landscape was used as protection, and the mounds allowed people to settle within it.

The publication by the association for dwelling mound research (2018), stresses that the landscape history of the salt marsh area can teach us several things. The long history of living on mounds and mounds on salt marshes outside the dikes shows that this can be a good alternative to the classic fight against the sea for which we Dutch are known, and for which ever higher dikes are needed (Nieuwhof, Nicolay, & Wiersma, 2018). In light of the history of the region, and the current building-with-nature paradigm mentioned in the introduction, retreat of the northern coast is likely to involve a modern form of wide water-retaining landscapes. The remaining historical dwelling mounds can offer places for settlement within this landscape.



The northern provinces with historical dwelling mounds and the remaining outer-dike salt marsh embankments.

places
remaining useful dwelling mounds (>3m)
clay on the surface
salt marshes (outside of dikes)



Scenario manifesto

With this information the guiding water-management scenario is illustrated.

Towards 2075
Due to the demographic decline trend, the northern coast is identified as a possible region for coastal retreat as a solution to extreme SLR. This means that as long as it is uncertain to what extent sea-levels will rise, preparations are made to allow easy implementation of retreat if necessary. During these preperations, retreat and (re)development goals are combined in order to increase support for retreat in relation to the uncertain pre-disaster setting.

After 2075
In 2075 the WAIS tipping point is reached. In face of the exponential rise (also after 2100) the government decides to change the flood defence paradigm and create a landscape that is alive, moving with the water and growing over time. Dikes are no longer reinforced. Rather, the landscape behind the dikes is able to retain the water, creating a natural buffer which allows sedimentation to take place. This marks the start of the large scale retreat strategy in the northern coastal region.

Settlements within this landscape are still found on the historical dwelling mounds that are high enough to be safe during storms. Together they form a system of communities that are self-sustaining. The sedimentation that occurs can provide fertile soil for the cultivation of saline crops, allowing the region to maintain its agricultural role for local use.

strategy concept

The years of uncertainty focus on using demographic decline in order to prepare the region for possible retreat.

combining goals

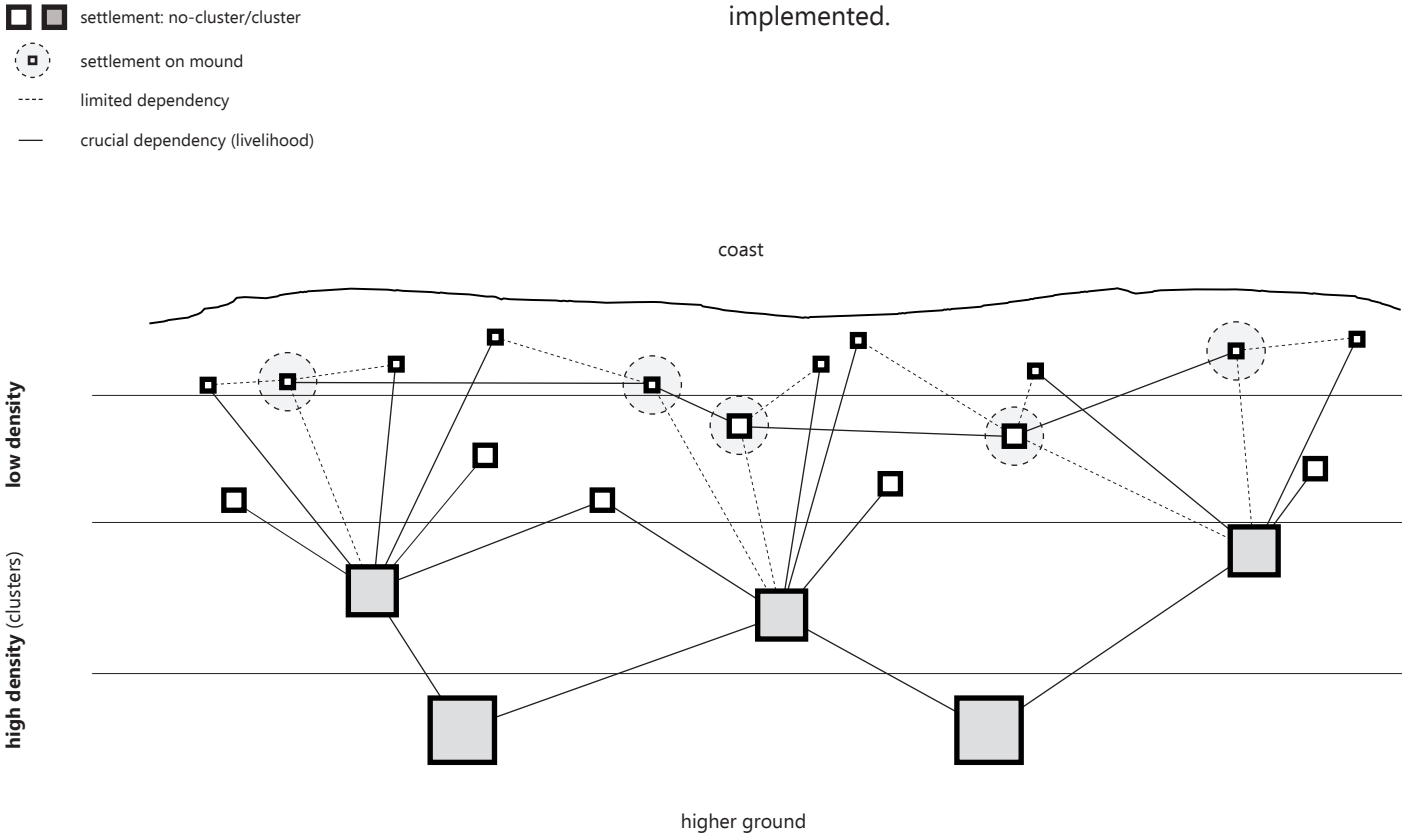
Centralisation
The challenge of demographic decline is primarily tackled by the question how amenities can be preserved in a region that is in decline.The plan of action established in 2016 writes that when a region is experiencing demographic decline, the support for amenities deminishes, which results in impoverishment of the region and ultimately loss of livelihood. However, a village can be liveable without the presence of amenities, provided that regional amenities are of high quality and easily accessible, and that there is a meeting place for residents in the village (van Binnenlandse Zaken en Koninkrijksrelaties & Directoraat-Generaal Wonen en Bouwen, 2016).

In other words, the distribution of amenities needs a regional strategy. This ensures the region is resilient to further decline, because amenities are centralised in clusters where the support base is high, and can take a hit.

Combining goals
Creating this resiliency can be useful for future implementation of retreat. By rearranging the size of clusters in relation to their proximity to the sea, retreat can be implemented while sustaining livelihood in the sending region.

At the same time, smaller scale retreat can be used to create this regional configuration and be an instrument in sustaining livelihood once regions become too sparsly populated. For this role of retreat towards 2075, a voluntary compensation scheme is used. This is enabled by the large timeframe, that is available (50 years) and by the presence of demographic decline as a push-factor.

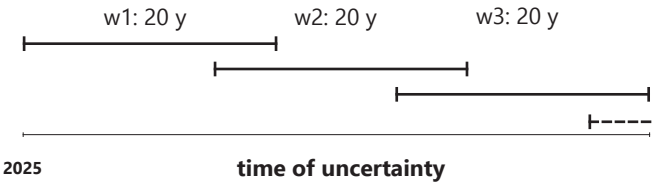
This centralisations strategy should also incorporate the potential of the historical dwelling mounds. Settlement on mounds higher than 3 meters are assigned a different role within the strategy. In contrast to supporting decline in villages close to the coast, dwelling mounds in the coastal region should become resilient settlements that can sustain themselves (and eachother) once retreat is implemented.



Schematic illustration of proposed hierarchie of settlements in relation to the coast (author, 2022)

Towards 2075

In order to reach this hierarchy, a regional centralisation strategy is proposed. In face of the uncertainty, the centralisation strategy is rolled out in consecutive waves of 20 years until the tipping point is reached. Each wave has specific goals:



First wave:

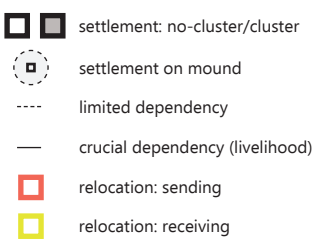
1. Decreasing the impact of demographic decline on the vulnerable groups along the coast (villages with distorted age structures)
2. Relieve unmarketable property owners (as a result of the gas extraction crisis).
3. Familiarizing the community with a voluntary compensation scheme for relocation
4. Adapting the voluntary compensation scheme to local needs
5. Understanding which people are willing and fit to establish self-sustaining communities on historical mounds.

Second wave:

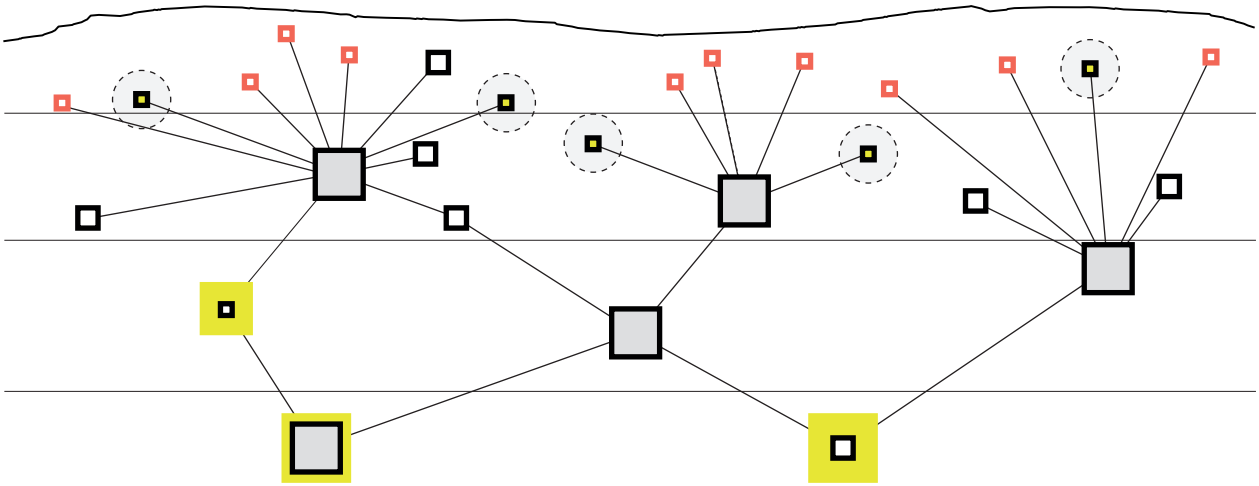
1. Controlled decline along the coast
2. Maintaining the size of the supporting clusters
3. Increasing independence of self-sustaining communities on historical mounds.

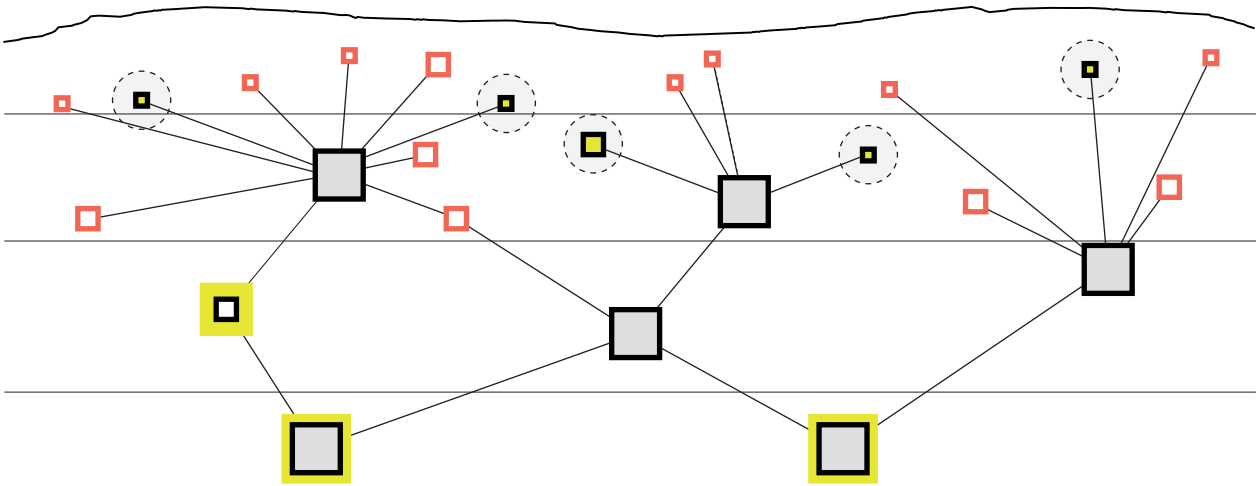
Third wave:

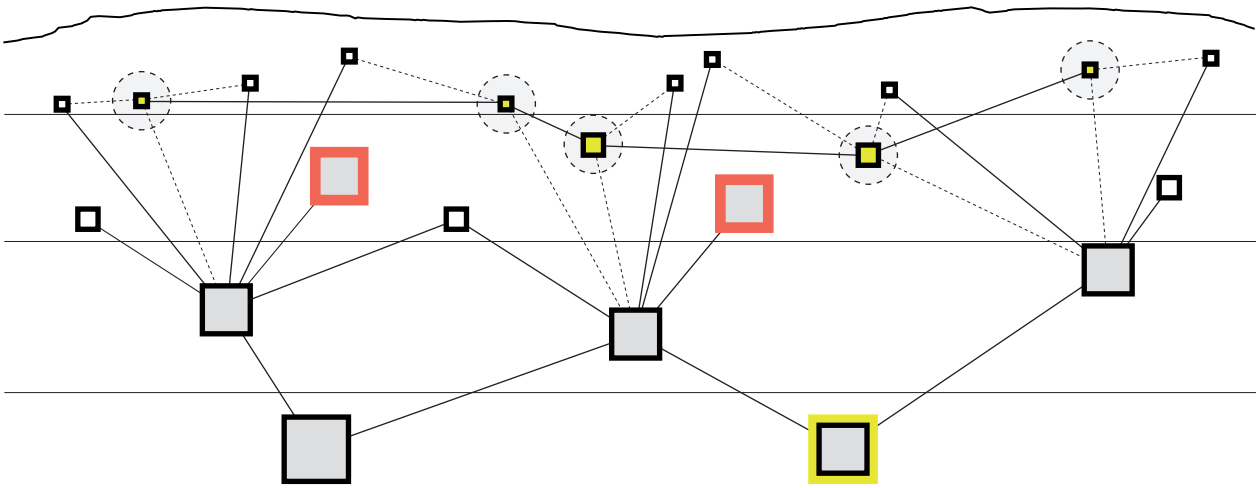
1. Decreasing size of clusters that are no longer needed to support the surrounding region
2. Increasing independence of self-sustaining communities on historical mounds that can support the surrounding region



coast







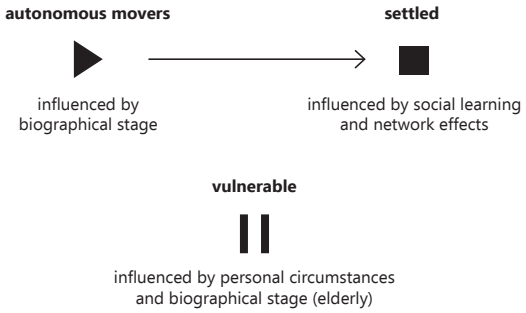
higher ground

refining instruments
towards 2075

using demographic decline
using biographical stages
set relocation clusters
using social learning & network effects
collective relocation
trust & reliance
exchange relocation

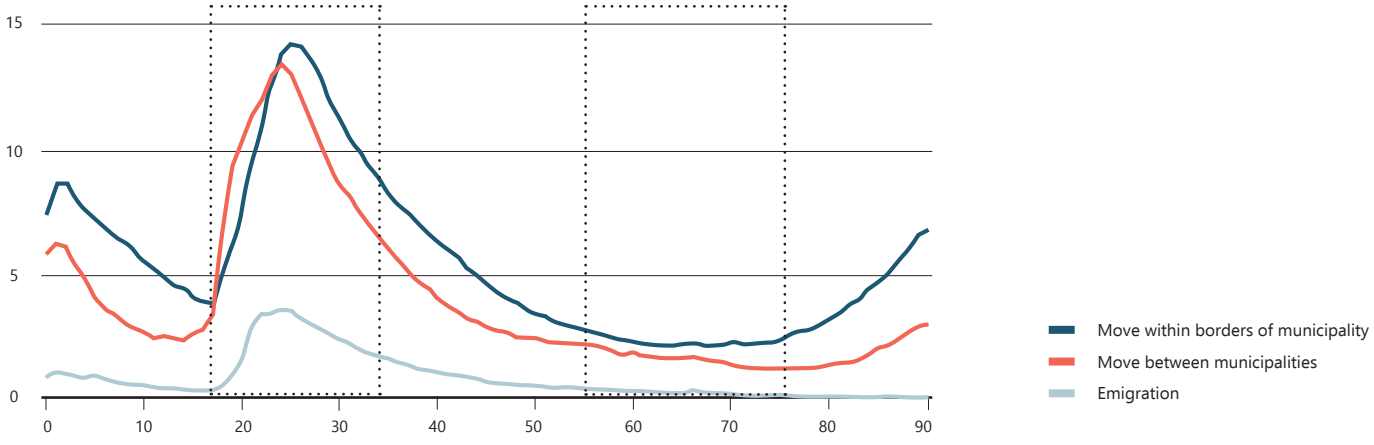
Using biographical stages

Different incentives
In order for the population to accept a voluntary compensation scheme there is a strong reliance on biographical stages, social learning and network effects. These can be merely processes that occur as a result of the policy window. For the test-case, concerning the regional scale of its implementation, it is valuable to understand how these processes can be used as instruments. Especially in relation to livelihood preservation for the vulnerable.



Autonomous movers
The strategy for retreat will start with focussing on the autonomous movers as literature showed they are able to act as rolemodels for the other groups. The case study revealed that biographical stage is the determining (limiting or stimulating) factor for autonomous movers, which is why we will look at the impact of these different stages on the residential mobility of an individual.

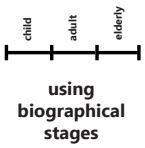
The graph below shows the residential mobility in the Netherlands. It does so by portraying the percentage that moved per age group for the year 2017. A higher percentage results in a higher perceived residential mobility.



Domestic moving and emigration in the Netherlands 2017, residential mobility per age (CBS, 2020)

Using biographical stages

Children
Children rely on the residential mobility of their parents, but at the same time greatly influence them. At 4 years old, the graph shows a peak in mobility which coincides with the age at which children in the Netherlands start primary school. After this, mobility drops fast. Especially the amount of moving between municipalities plunges. This indicates that once a school has been chosen, families become increasingly settled in their region.



Young adults
The highest mobility is found in the age between 20 and 35. This is the time when young adults start studying or working, move out, or move in together and settle. Especially in the early twenties, this results is more moving between municipalities than within the borders. This group can be considered the easiest to motivate. The article from CBS (2020) specifically recognizes that moving in together and studying increases the chance of moving over a longer distance, which is necessary when moving to the receiving region. In addition to this it states that property ownership plays a big role in moving mobility. People who rent move the most. This is an additional reason why younger people have a higher mobility rate. They rent more often. Once people buy their property, their mobility decreases. People who live in social housing move the least, and also over a smaller distance.

Settled adults
At the age of 35, the decline in mobility has again reached the 10 percent margin, meaning the mobility peak is on its return. According to CBS (2021) families with children hardly ever move over great distances because they are more connected to their region due to the school and social ties of their children. In 2020, the average age of women having their first child was 30,1. From the generation of women that was 55 in 2020, 82 percent had at least one child (CBS, 2021). Although this percentage might be lower for the new generations, the majority of women do get children and therefore experience the impact of parenthood on their mobility.

Young elderly
Between 55 and 75, the residential mobility is relatively constant, but also the lowest. This does not necessarily mean this group unmotivated to move, but it is their move is often less urgent (CBS, 2020). To gain more insight in the limiting factors but also the pull factors of their moving mobility, some additional statements are made about this group (CBS, 2020).

If the young elderly were born in the region, they are less likely to move. If they moved here from another region, they have less ties and are more likely to move a greater distance. They also move more often. In addition to mobility history, the movement of the young elderly is strongly influenced by the proximity to family members. This group is tied and moves over a smaller distance if their children or parents live close by. If their parents live far away, they are more likely to move over a greater distance. Almost always towards their parents. However, children (and especially grandchildren) are the bigger determining factor. If children live far, this group is likely to move in their direction. Finally, young elderly show a dominant movement from urban to rural.

The young elderly are an important age group within the autonomous movers. Once they lose their independence, for example due to illness, they can be considered vulnerable; they become frail elderly. Motivating this group to move before they lose their independence is important.

Frail elderly
Between the age of 75 to 80, the majority of the elderly go from being independent and possibly having a supporting role to their (grand)children, to needing

support. At this stage, proximity to children again proves important (CBS, 2020).

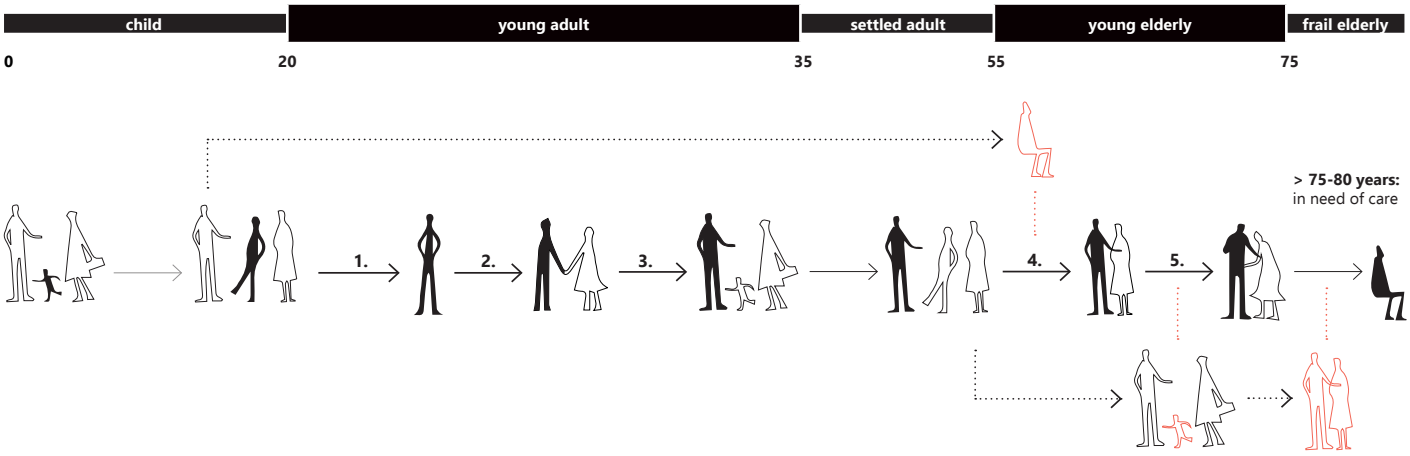
Due to the healthcare reform of 2015, elderly are expected to live at home longer, relying on home care or care from family members. This means that nursery homes now function as a last option; when there is a need for 24-hour care. From the people who died in 2017, 46 percent lived in a nursing home at the moment of death. Half of these elderly moved here during the last year of their life, at an average age of 84 (Verkooijen, 2020). This is also the age at which residential mobility starts to increase, caused predominantly by this move to nursing homes.

Moments of opportunity
There is a substantial difference between the residential mobility experienced for each biographical stage. The **young adults** are the **easiest to motivate**, whereas the **young elderly** are the **most crucial to motivate.** What is also clear, is that there is a strong relation between these biographical stages, caused by family ties. These limiting and stimulating factors can be used to develop a retreat strategy for the autonomous movers. In light of the biographical stages of focus, the young adults and the young elderly, we identify 5 moments of opportunity. These can be used to help create the incentive needed for a successful strategy.

For the young adults, these moment of opportunity are identified as the first time they **move out** (1), the moment they **move in together** (2) and the moment they **settle down** (3) and have children. The last one is the most important, as settling down suggest there is a large chance they will be there until becoming empty nesters. When choosing a place to settle, finding the right **housing** and **neighbourhood** appear to be a big determining factors; both should be able to accompany a change in household formation (CBS, 2020). The first and second moments are also interesting as people might be pulled to the region prior to settling down by, for example, **study and work availability**. Of course the moments of opportunity do not have to be individual steps, nor does this have to mean a young adult cannot move more than three times.

For the young elderly the first moment of opportunity is when they become **empty nesters** (4) after their children move out (CBS, 2020). In this biographical stage the **attachment to work** is still a limiting factor, as it proves more difficult to change jobs once one gets closer to the age of retirement (CBS, 2020). In addition to work, empty nesters are also influenced in mobility by the proximity to their parents, who at that age have a higher chance of requiring aid. **Retirement** (5) is the moment where work disappears as a limiting factor. At this moment, **health** becomes the dominant reason for wanting to move. This translates into **future proof housing**; a house with the option to accomodate them once they become more vulnerable. An example would be a house without doorsteps. Health is also a reason why (grand)children become an important pull factor (CBS, 2020).

These pull-factor per biographical stage can be used to steer the autonomous movers towards the desired resilient regional configuration.



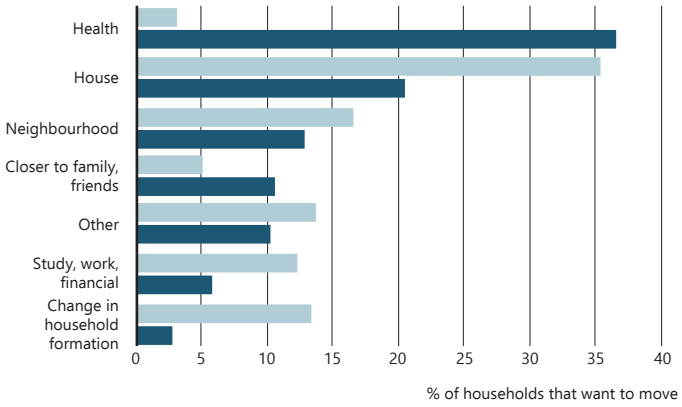
Set relocation clusters

The pull-factors can be embedded in the development of set relocation clusters.

Senior communities
For the young elderly senior living communities can offer future proof solution in relation to their health. Located close to amenities and in connection with a central healthcare institution (potentially in a bigger cluster), the community allows vulnerable residents to look out for each other.

Multigenerational communities
The relation between the young elderly and the young adults creates another potential for the relocation clusters; multigenerational living communities. This way, the intergenerational relation, limiting or stimulating, can be used to increase incentive to move.

set relocation clusters



Most important reasons for wanting to move in the Netherlands in 2015 (CBS, 2020)

young adults

Moving out

+ Available housing
+ Available education
+ Job opportunities

Moving in together

+ Available housing
+ Job opportunities

Settling down

+ Available housing
+ Neighbourhood appropriate for young children
+ Job opportunities

young elderly

Empty nesters

+ Available housing
+ Job opportunities (difficult)
+ Closeness to parents (care)

Retirement

+ Health (future proof)
+ Closeness to (grand)children

Using social learning & network effects

using social learning & network effects

The settled and the vulnerable
Influenced by the autonomous movers, the settled experience social learning and network effects. Social learning and network effects work especially well when households share the same biographical stage. This way, it is easier for people to imagine themselves making the choice. A household that decides to move because of the experience of a moved neighbour can be considered positive motivation. However, there can also be a negative motivation. As the region depopulates, social support diminishes and communal infrastructure is dismantled. This causes livelihood degradation and ultimately the acceptance of the compensation scheme.

Centralisation as a regional strategy sustains livelihood under greater demographic decline, thereby reducing the amount of households that experience this negative motivation from the process. The autonomous movers can be used to create the hierarchy in clusters that are needed for a resilient regional plan. This allows the settled to remain in their villages although they are in decline. The most vulnerable regions are those that consists of small villages. Here, one household leaving can have a huge impact. These settlements are communities and households are therefore used to relying on each other to some extent.

Loppersum (Joop Siepel)

Collective relocation

Drawing on local communities
Collective relocation can offer a different solution for the settled and the vulnerable. Incorporated in the voluntary compensation scheme, collective relocation can be provided as an option for small villages. This is illustrated by the case of Ganzedijk, a village in Eastern Groningen.

collective relocation

social management

In 2008, the small village Ganzedijk was planned to be demolished due to impoverishment caused by social issues, vacancy, and overdue maintenance. The plan sparked a lot of resistance among the citizens of Ganzedijk. After reaching the national news, the villagers were given the option to present a counter plan. The counter plan "Energiek Ganzediek" was produced by and for the citizens of Ganzedijk and the Hongerige Wolf, the neighbouring village, and focussed on the possible self-sustainability of the village (Actie Commité Ganzedijk Blijft, 2008). It was accepted and resulted in the demolishment of only 14 houses. All citizens who wanted to stay, stayed. On grounds where houses were demolished, elements were added to increase social cohesion. Examples of this are the butterfly garden, and the community centre that was recently renovated.

In an interview conducted in 2018, a citizen of Ganzedijk named Sara Lich stressed the importance of these social elements in the village."We are getting older, our children are working, we have to make things work around here. We are trying to put this to practice and I think we are succeeding. We currently also have a neighbourhood whatsapp group which allows us to share things. This is a comforting idea for the people that live alone. We have to look out for each other a bit" (Sitalsing, 2018). Ganzedijk shrunk from 170 citizens in 2009, to 120 in 2019 (Finsterwolde Ganzedijk, 2021). As Sara Lich described, the population is getting older. However, since the demolition plans the village has put its focus on community organizing, and is therefore able to cope with this decline.

In addition to illustrating how a village relies on its community and would therefore favour collective relocation, it also shows how a vulnerable village can exist as long as the community is aware of the challenge and willing to act on it. Community organizing proves important, and in this case it was sparked by the proposed plans from the municipality. In Energiek Ganzediek (2008), the citizens actually thank the municipality for proposing the demolition, which allowed them to come up with their own plans. By presenting the option to be compensated to move elsewhere, the population in the coastal region is pushed to start the dialogue on the long-term future of their village. This way members of the community can express their own future plans. For example, one household might have planned to move after their retirement. At the same time, when the majority of the community expresses that they have no intention to leave, they can come together and create a plan to maintain their livelihood. This way, a comfortable living environment for the settled can be maintained, while also offering more centralized communication for monitoring the village while it keeps shrinking. In this situation it is crucial to provide guidance throughout the process in the form of social management. Doing this well can create trust and reliance for later implementation later implementation of retreat.

Community building in Ganzedijk

Ganzedijk, de feniks van Oost-Groningen

In Ganzedijk vind je stilte en uitzicht op wolken en weilanden. Beeld reyer boxem

In februari 2008 werd Ganzedijk landelijk nieuws. Het Oost-Groningse gehucht zou compleet van de kaart worden geveegd. Nu, tien jaar later, zijn er vlindertuinen, een 'social sofa' en plannen om gezamenlijk te gaan koken.

Karin Sitalsing 8 februari 2018, 14:21

Article 4, Article 4, Article 4, '**Groningers have lost all faith and feel helpless.** The earthquake in Westerwijtwerd is the third heavy quake in seven years time. Groningers are starting to lose faith in the promises from the government.'

Children from Ganzedijk made drawings for this story bank in 2013. (Vlinderpark, n.d.)

Bastiaan (52)

settled

Bastiaan lives in Ganzedijk. He lives alone, in the same house that he was born in. His family has been living in the region for decades. The street next to his house was named after the brother of his grandfather who was a member of the resistance and lost his life because of this.

“ ”

Ganzedijk is a small village. Most people who live here have lived here for decades. Everyone knows each other. I like that about living here, you are never alone. There used to be a lot of vacancy in the village. It was sad to see. These days it is better. People still leave, but there is no more vacancy. I am proud that we are doing so well right now. It took a lot. A new community centre just opened at the end of the street. I try to go there in the weekends, but I have to work often.

I really enjoy my work. I am responsible for the sterilisation of hospital equipment. The hospital was located in a town nearby, but it closed down a few years ago. I used to be able to go by bike but now it is in Groningen, which takes 40 minutes by car. I would prefer to live closer to work and to the shops, but I do value the peace and quiet of Ganzedijk. When I look out of my window all I see are meadows. I would not want to change that. Luckily my friends and sister live close by.

Trust & Reliance

Trust in Groningen
A study on the connection of populations with their region conducted by I&O research (2019), states that Groningers are among the people that are most proud of their province. The majority of the surveyed citizens feel that they are Dutch before anything else (57%). However, Groningers feel more connected with their province than they do with the Netherlands; they feel more Gronings than Dutch (Kanne & Engeland, 2019).

Although citizens of Groningen are proud of their province, they feel like they are often subject of negative stereotyping. There is insufficient attention for the northern region from national media and even less from national politics (Kanne & Engeland, 2019).

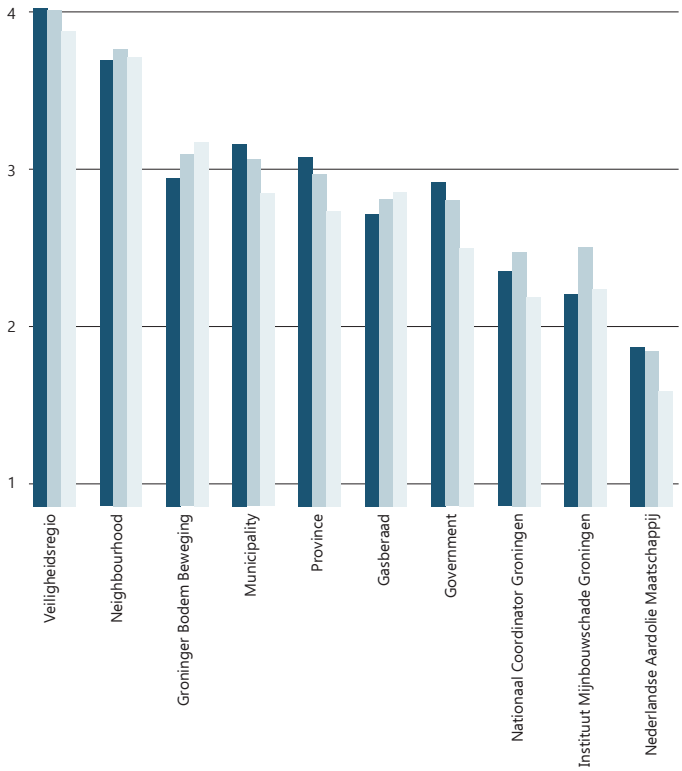
This feeling of neglect is caused largly by the national gas extraction that has created loss of livelihood for a large part of the Groninger. The report 'The social impact of gas extraction in Groningen' (2020), states that not the earthquakes do not directly cause the loss of livelihood. Rather, psychological problems, like the feeling of stress, are caused by uncertainty and the tedious process trying to claim compensation for damaged property. The Groningers are not responsible for this damage, but are forced to actively pursue their right to be compensated, and are continuously disappointed (Rijksuniversiteit Groningen et al., 2020). In addition to this, it has also resulted in people being unable to leave their homes. Damaged houses are unmarketable, meaning the homeowners cannot afford to move.

The poor handling of those affected has resulted in a mistrust of the national government. What is interesting is that the gas extraction is of national relevance, as it creates benefits for broader society; cheap gass and economic certainty nationally (Hino et al., 2017). The sending population of the test-case therefore has a negative affiliation with a government pushed strategy that creates benefits for broader society.

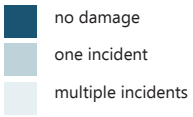
The graph on the right shows the amount of trust per party involved in the gas extraction process. The Veiligheidsregio takes an informative role. It seeks to create awareness of the risks of earthquakes and subsidence caused by the extraction. It is also responsible for the public health service (GGD), which is doing a lot in relation to stress related issues as a result of damaged homes. The amount of trust in this particular organization suggests that people value being aware of the situation.

Community in Groningen
Something else that can be concluded from the graph, is that the trust in the neighbourhood is high, and even sees a slight increase after incidents. This suggests the social network of the Groningers can provide support in

trust & reliance



Trust of Groningers in organizations and people according to the last measurements; March 2020 (Rijksuniversiteit Groningen et al., 2020).



times of crisis. Another party that increases in credibility once incidents occur, is the Groninger Bodem Beweging. This organization serves the interest of the victims and campaign against the gas extraction.

What can be concluded, is that the trust of the East Groningers has endured a lot. This has resulted in more reliance on the community than on institutions. The centralisation strategy can worsen the situation, but also has the potential to rebuild trust. By offering a just process and mitigating the effects of previous mistakes, the centralisation strategy can make up for this loss.

Trust in Groningen

Reportage

Groningers zijn moedeloos, machteloos

Westerwijtwerd De aardbeving in Westerwijtwerd is de derde zware in zeven jaar tijd. Groningers hebben steeds minder vertrouwen in de beloftes van Den Haag.

Mark Middel · 22 mei 2019 · Leestijd 4 minuten

Article 5, '**Groningers have lost all faith and feel helpless.** The earthquake in Westerwijtwerd is the third heavy quake in seven years time. Groningers are starting to lose faith in the promises from the government.'

Een kerncentrale in Groningen? 'Wij zijn geen afvoerputje van Nederland'

Article 6, **'A power plant in Groningen? We are not the drain of the Netherland'**

Connie (72)

II

vulnerable

Connie has lived in a village called Hongerige Wolf since 1977. She moved here from Zaanstad. She wanted to have a house with a garden so she could be outside often. In the Randstad this was too expensive. Although she has been living here for quite some time, she is not a Groninger. 'You never become a Groninger unless you are born here'.

“ ”

I love my house and garden. There is not much else to do. I have the option to invite friends over and I have enough spare rooms so they can stay with me for some days. I would describe my village as a small dike, because it is just that. I have my workshop in the village, and one of my closest friends, Thea, lives here aswel. I also have a lot of friends and family far away; in the Randstad and in Brabant. I visit them by car. So I either visit people in the village, or outside of Groningen.

The Community centre in Ganzedijk only just opened. It is still at an early stage but I hope it will become lively. It is also used for community organizing. For example, we would like to restart the mobile bakery, but there is resistance from some of the citizens. We are going to discuss this next week in the community centre. The social aspect of a bakery is what interests me most.

My favourite spot is at home, but due to damage from the earthquakes and the painfull process of trying to get compensation, my home has been a source of stress aswel. It feels like I am a hostage of my own house. I am stuck to it because there is no option to sell it due to the damage. What hurts me most, is how my house now reminds me of experts coming in and doing measurements which would later result in a report stating I don't qualify for compensation. Those are not the memories I want to have here. This has even had some negative effects on my relationship with the neighbours, as some did get full compensation. I try not to envy them but it did change our relationship.

If I move I would like another house that allows for outside living, with a nice garden. But honestly, I don't even think about moving because I don't consider it an option anymore. If it weren't for the damage, I think I would have already moved a decade ago. Everyone was leaving back then. Fixing the damage was my main focus. I wanted to sell my house and leave the area aswell. Fighting for compensation took so long, that I am now 72. There is no need for me to move anymore. The next time I move, it is probably to an elderly home. I now want to focus on trying to stay here as long as possible, and making sure my house is safe. I have two daughters. One lives very close by, in Drieborg. I like the idea that she can be there for me in the future.

Exchange relocation

Dwelling mounds
The centralisation strategy proposes a different approach for the dwelling mounds. These settlements should use the period of uncertainty to move towards self-sustainability. This experimental environment requires a diverse population that is enthusiastic about this goal. It requires pioneers. Communicating this future key function of the mounds is essential. It is important to understand the motivation of the households that are currently living on the mounds. They can choose to take part in the self-sustaining initiative, but are not obliged.

Exchange relocation is one of the options in the compensation scheme which allowed households on higher ground that chose to leave the area to switch places with households that were exposed to flooding. For the centralisation strategy this instrument can be used to swap a household on the mounds that wishes to accept the voluntary compensation scheme with a households that wishes to be part of a self-sustaining community. This way, the community on the mound is slowly increasing its sustainability capacity, mobilizing the existing residents.

exchange relocation

social management

Hester (40)

autonomous mover (pioneer)

Hester lives in Borgercompagnie together with her husband and two young kids. Her husband was born in this village. Two years ago they won a competition for the redevelopment of an abandoned primary school in the village. It is now their home and a lot more spatious than their previous house in Amsterdam. Borgercompanie is a stretched out village that predominantly houses people over the age of sixty. Because it is so streched out, it is difficult to have spontaneous encounters. Her husband started a fitness school on the former playing ground of the school. It is well visited because it has created a place for the villagers to meet. Anna also works from home.

“ ”

They say that the city is anonymous, but in my opinion a villlage without a main square is more anonymous. There are no amenities and most of the traveling is done by car. This makes it difficult to have spontaneous encounters.

It was so nice to see how intrigued everyone was when we started renovating the old school building. We organized tours which were visited by a lot of people from the community. They were excited to see the plans we had. We realized that once people are given I place to meet, they gladly make use of it. We are glad we can create this for the community. This is also why my husband started the fitness school.

Oude school De Butte krijgt bed-and-breakfast en woonbestemming

Gepubliceerd op 18 oktober 2019 11:44

De voormalige openbare basisschool voor daltononderwijs De Butte in Borgercompagnie krijgt een nieuwe bestemming. De nieuwe eigenaren willen in het gebouw wonen. Ook willen ze er activiteiten ontplooien: een bed-and-breakfastvoorziening en multifunctioneel gebruik van de voormalige gymzaal. Om dit te kunnen realiseren moet het bestemmingsplan worden gewijzigd.

Article 7, ‘Old school De Butte will become a bed-and-breakfast and an additional residential destination.

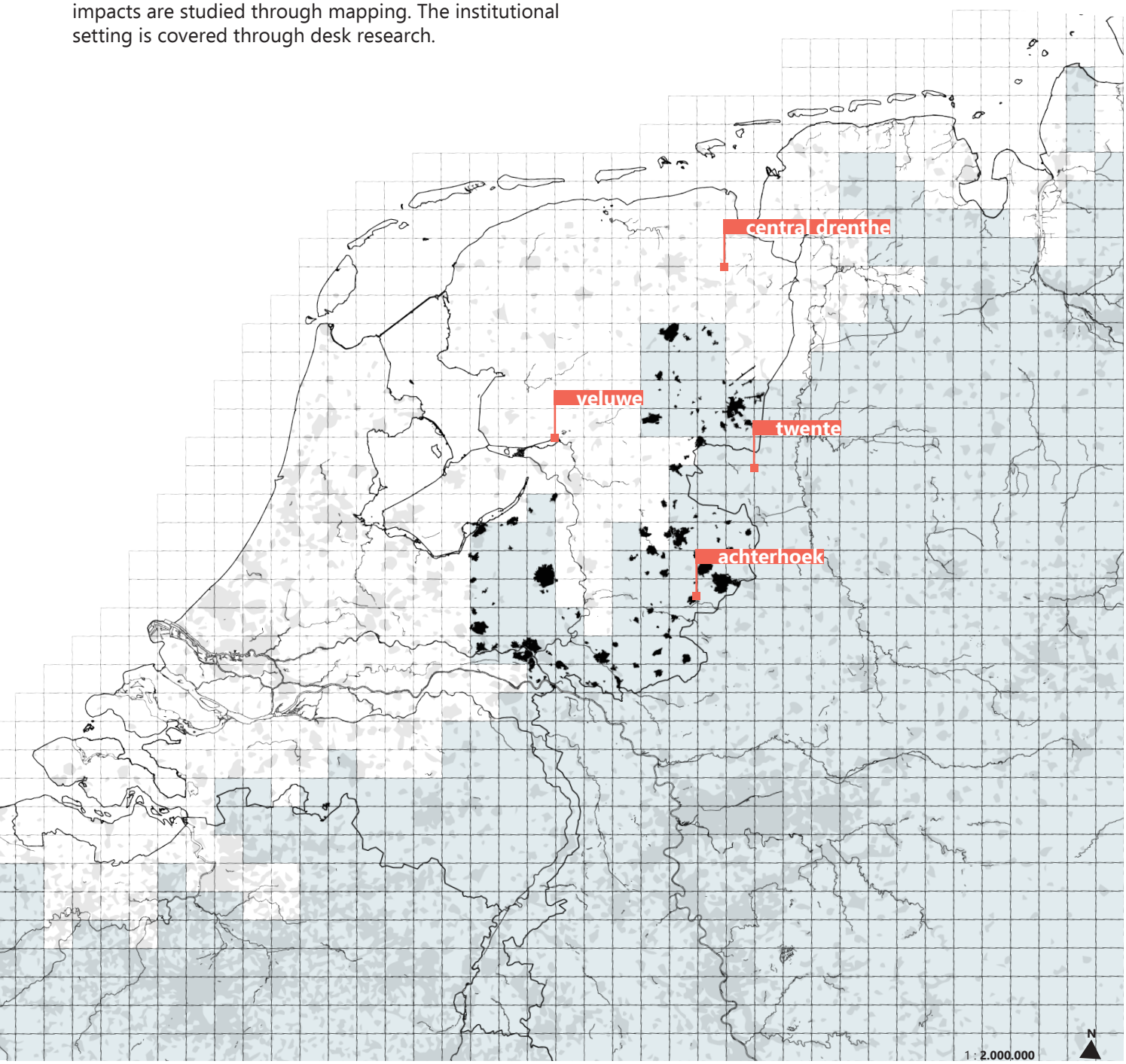
refining instruments
after 2075

Set relocation clusters after 2075

The period of uncertainty does not only require a strategy for the sending region, but also for the receiving region. If the tipping point is reached, this region should be able to take a substantial amount of the population within decades. In the period leading up to this tipping point, land reservations maintain flexibility in the receiving region. In addition to this, organizational arrangements are made and tested by small scale relocation. In order to identify the potential regions for future relocation clusters, the receiving is analyzed using the Carrying Capacity approach. Through the use of 4 themes, the region is covered. Infrastructure and urban services, society supporting capacity and environmental impacts are studied through mapping. The institutional setting is covered through desk research.

set relocation clusters

Within the High East we recognize 4 subregions; Central Drenthe, Twente, de Achterhoek and de Veluwe. Twente and de Achterhoek are two historical regions that are still recognized today. They both encompass several municipalities. The borders shown in the map do not match the exact borders of these regions, but offer an abstracted overview.



Set relocation clusters after 2075

Natura 2000, resources, agriculture, recreation
The natural environment of the High East is characterized by its scenic coulisse landscape, by heath and by forrests. It is responsible for a large part of the Dutch food production, and functions as the national periphery.

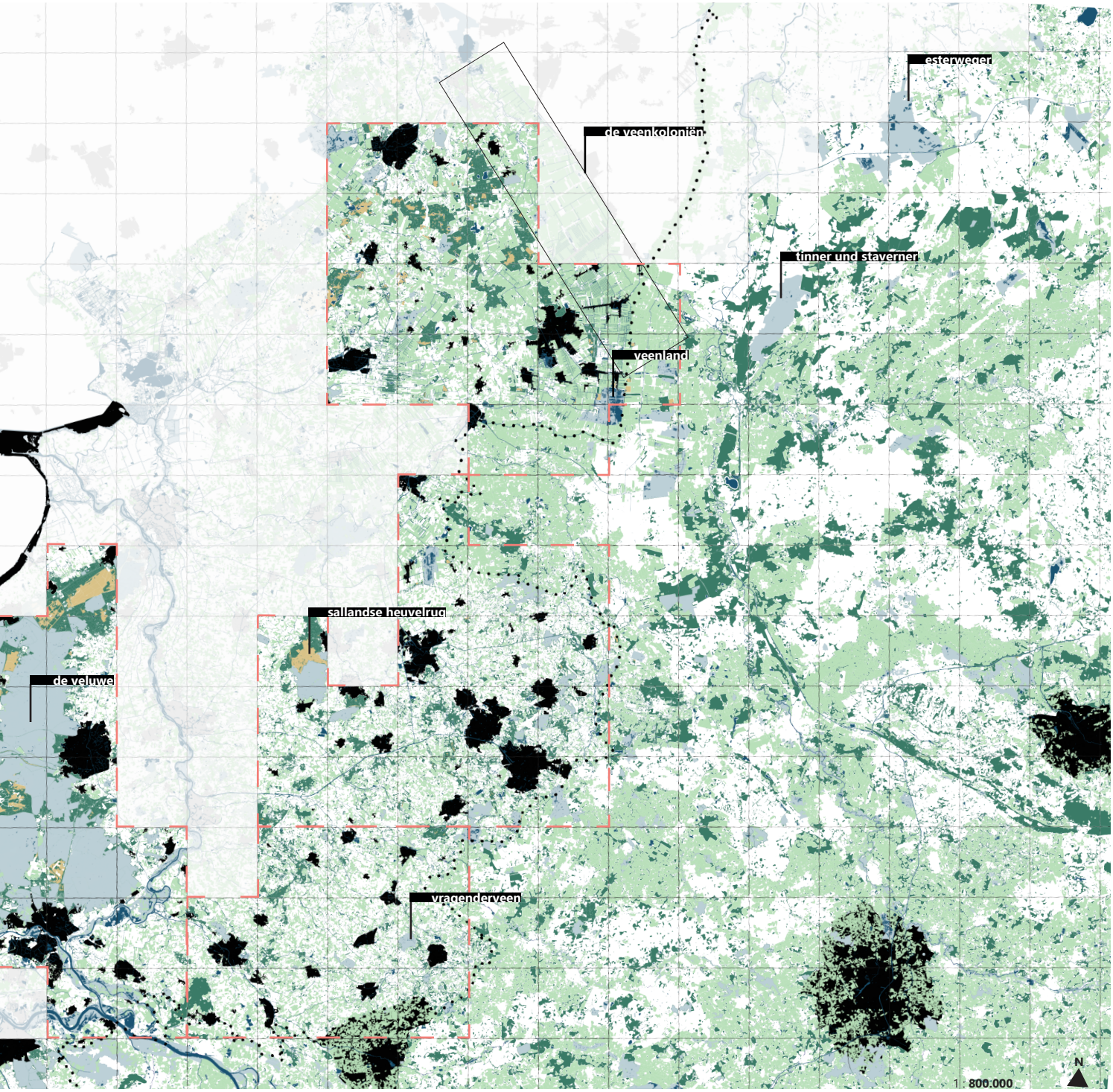
Central-Drenthe
The northern subregion has the highest density of farmland forrest and heath. This results in a vastness of the landscape comparable to that of Groningen.

Twente
Twente has a different coverage of farmland. The plots are less wide, resulting in a coulisse landscape. Along the border with Germany there are a number of nature reserves. These reserves consist of scenic walking and biking routes.

Achterhoek
The Achterhoek has the same coulisse characterisitics, but has less forrest coverage.

Veluwe
The Veluwe is the biggest nature reserve of Europe. It has been under a lot of pressure due to factors such as the nitrogen crisis. In contrast to the other subregions, this region is expected to grow in population untill 2040. As this will continue to put pressure on the reserve in the future, we will refrain from using this area as the receiving region. Rather, we focus on the subregions that are expected to experience demographic decline.

Aerial of coulisse landscape in the Achterhoek (Siebe Swart)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veenland
sallandse heuvelrug
de veluwe
vragenderveen
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1 : 800.000

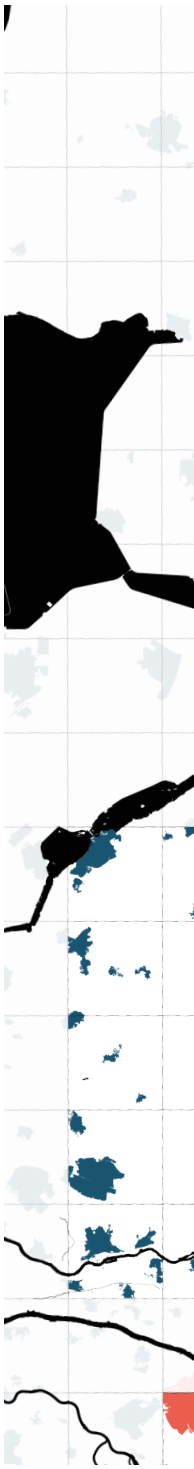
Set relocation clusters after 2075

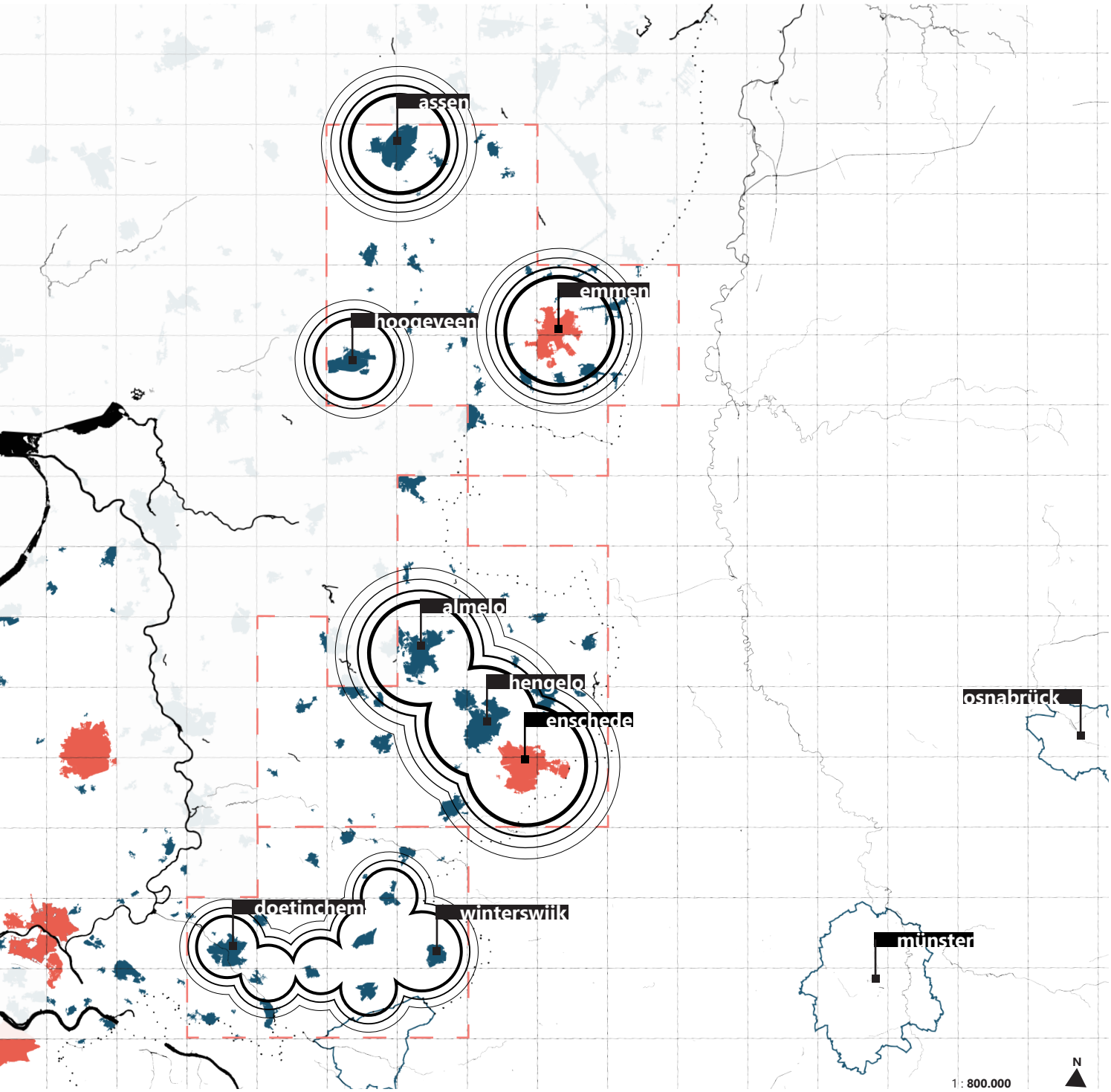
Regional morphology
The subregions each show different characteristics in terms of morphology.

Central-Drenthe
This subregion consists of three bigger cities with very little urbanization in between. The big distances prevent the region from becoming urbanized.

Twente
Twente is characterized by an urbanized region, with Enschede, Hengelo and Almelo forming a cluster of cities. The surrounding smaller cities can benefit from this cluster.

Achterhoek
The last typology shows a collection of smaller cities that all have more or less the same distance to each other. This results in equally distributed, small-scale urbanization througout the region.

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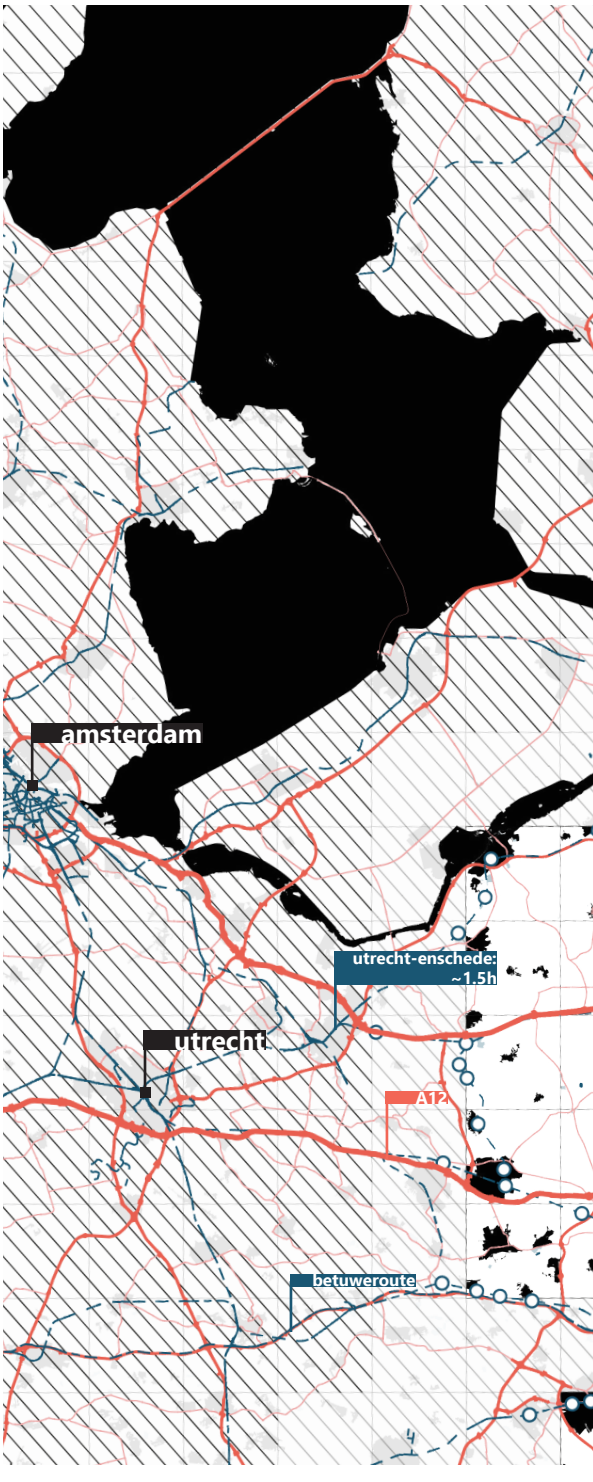
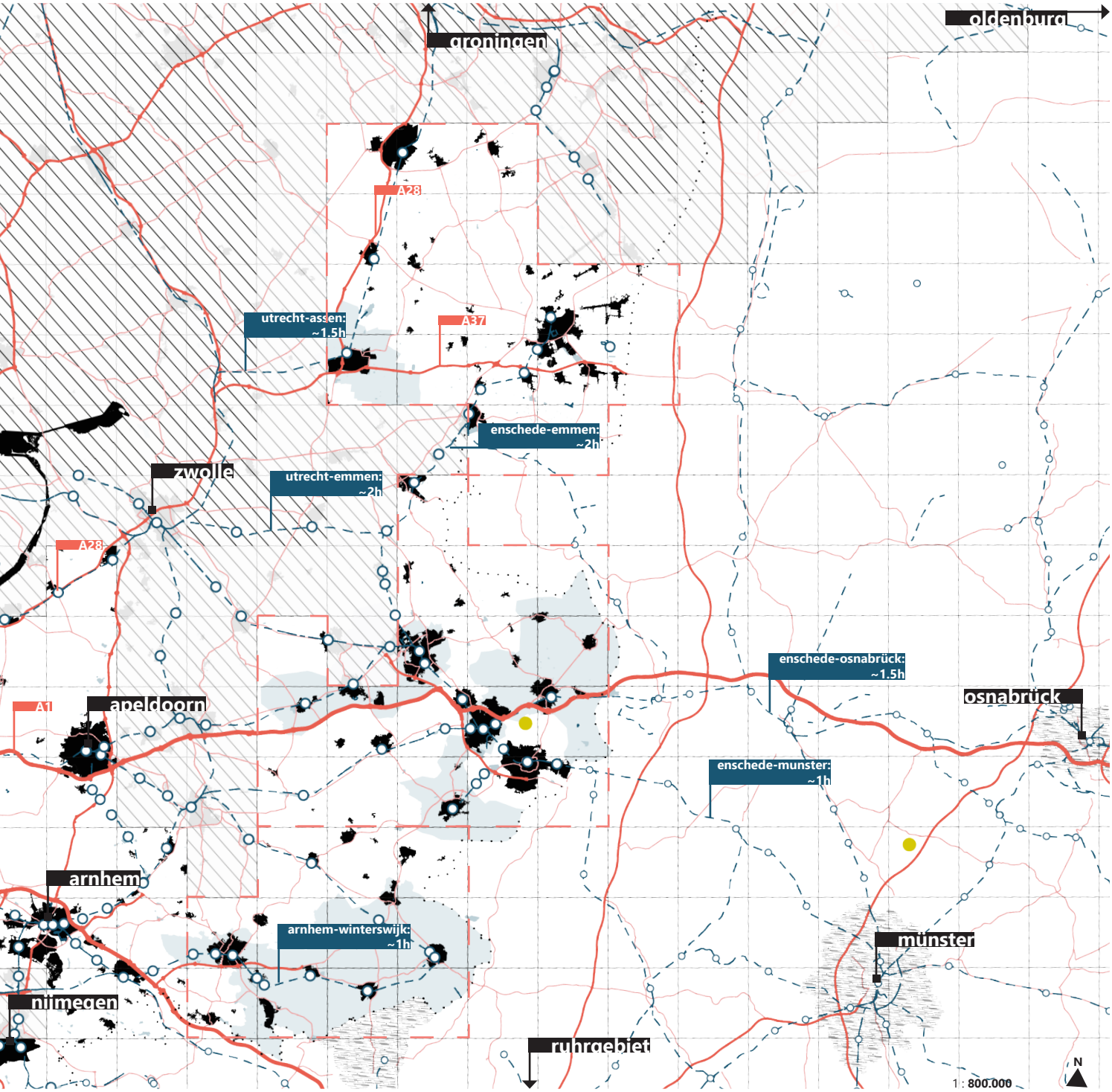
Set relocation clusters after 2075

Transport, infrastructure & logistics
The High East is an important link in the logistic system of the Netherlands. Its proximity to the border with Germany and connection with both Dutch ports make it an interesting place for distribution centres. In the municipalities that make up the High East, 7.1% of the businesses are part of the export branch. This is higher than the national average of 6.2%. In some municipalities, this rate is higher than 8%. (LISA, 2021)

In relation to public train transport, there is a difference in connectivity for the regions in the High East. Although peripheral, the connection of Twente and the Achterhoek with the rest of the Netherlands is up to standard. Most of the larger places in the region have their own trainstation. For Drenthe, only a single set of tracks connects two of the three cities with the rest of the Netherlands, and ultimately Groningen. This can be considered a poor connection.

The connectivity between regions within the High East can be considered poor. Especially the city of Emmen is poorly connected, relying on a bus connection to Assen. In addition to this, the connectivity between the outskirts of Twente and the Achterhoek is also relatively poor.

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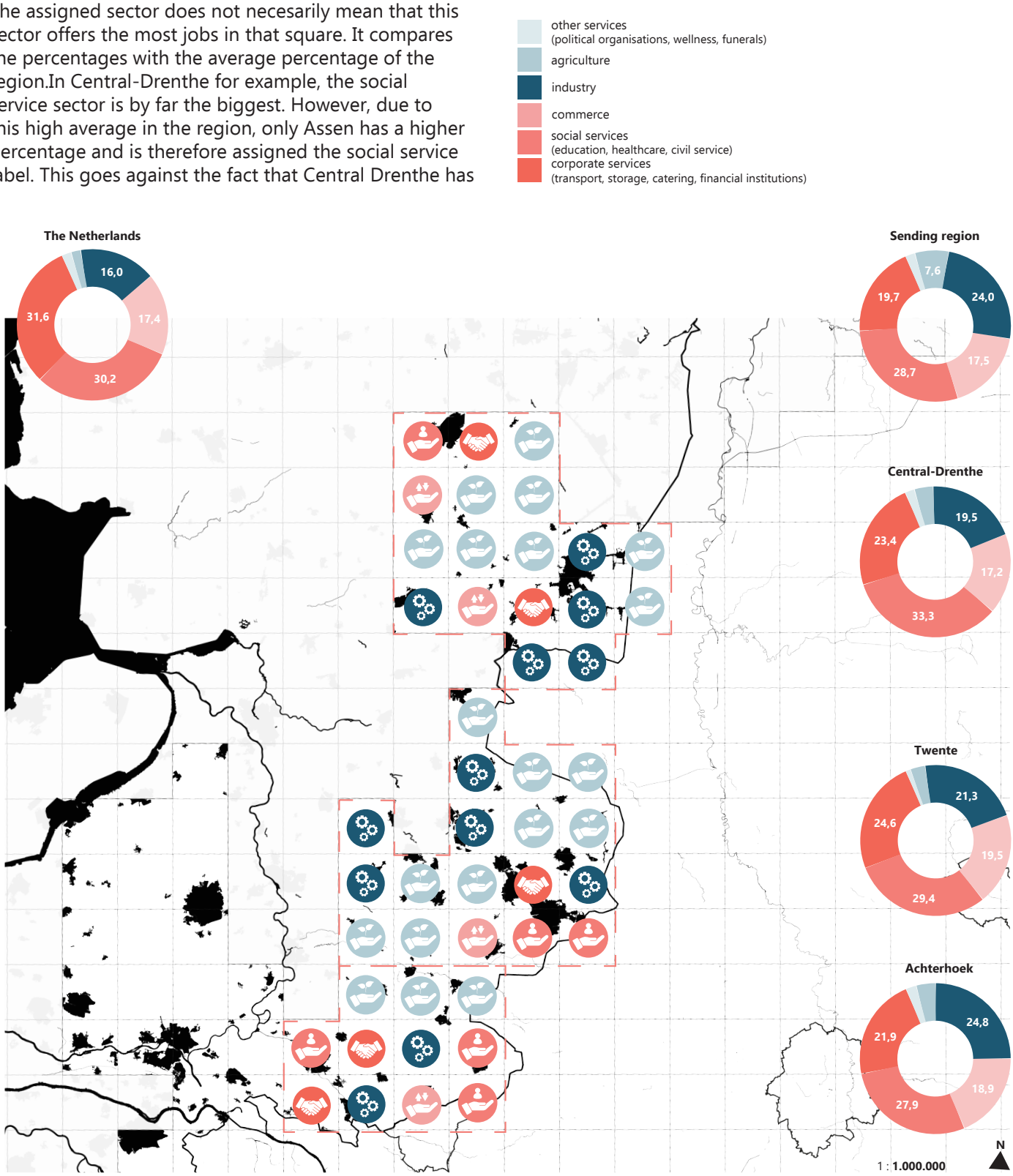
Set relocation clusters after 2075

Work availability, Education facilities, administrative services

The work availablity largly relies on the if the dominating sectors in the area match the demand of the sending population. The followig map shows an abstract overview of which sector dominates for each square.

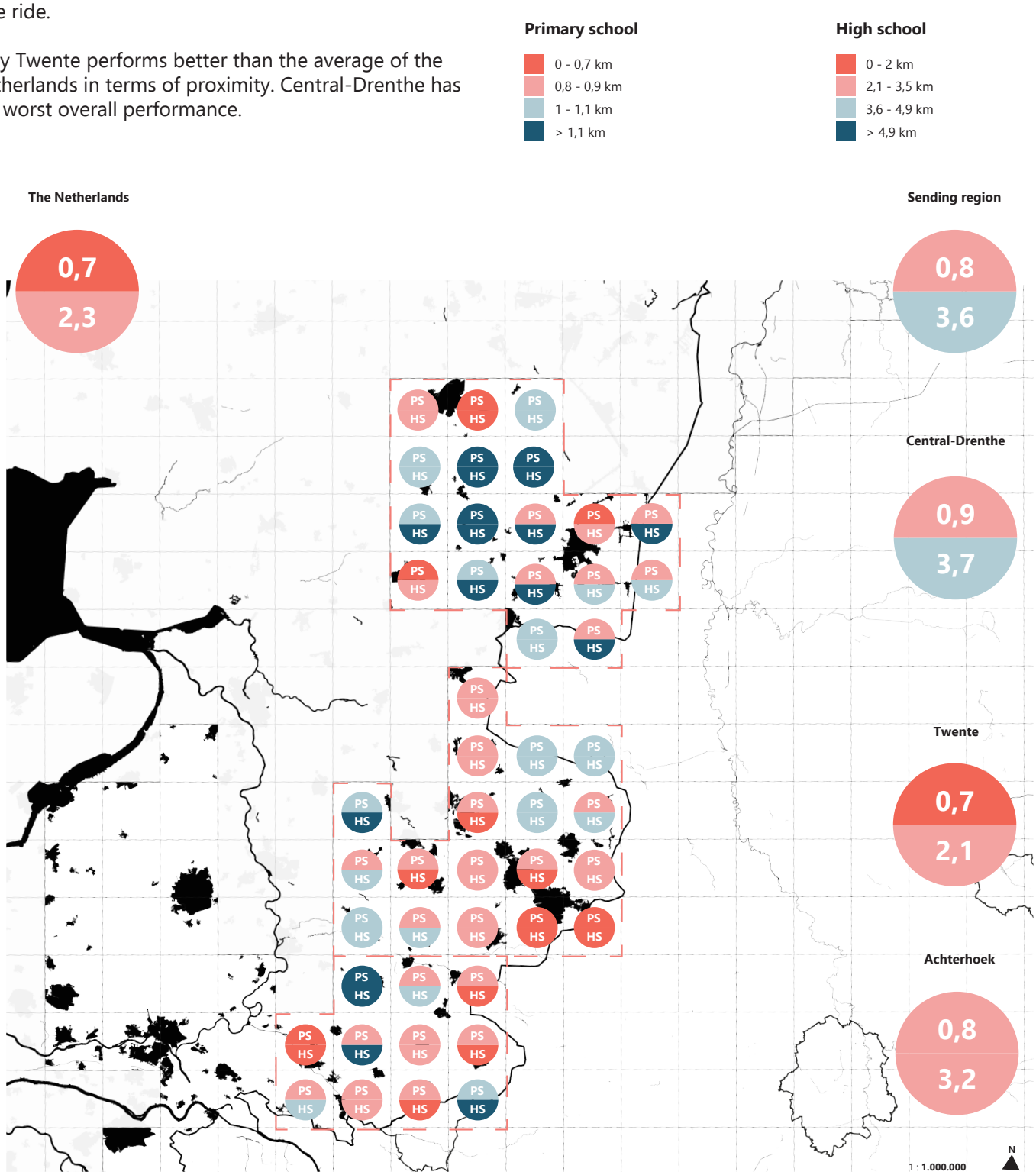
The assigned sector does not necesarily mean that this sector offers the most jobs in that square. It compares the percentages with the average percentage of the region.In Central-Drenthe for example, the social service sector is by far the biggest. However, due to this high average in the region, only Assen has a higher percentage and is therefore assigned the social service label. This goes against the fact that Central Drenthe has the highest percentage in social service compared to the other two regions. This high percentage is caused by the large share of jobs in healthcare and well-being as a result of the large share of elderly.



The proximity to education facilities is of value for young families to settle. This map shows the average distance to the nearest primary school (PS) and high school (HS).

For primary schools, more than 1,0 km is considered undesireable. This is comes down to a 10 minute walk, or a 3 minute bike ride. As children are more independent when they start high school, the desirable distance increases. We consider 3,6 km to be the margin; a 12 min bike ride.

Only Twente performs better than the average of the Netherlands in terms of proximity. Central-Drenthe has the worst overall performance.



Relocation clusters

Concluding map
The conclusion aims to choose regions fit for relocation clusters based on the following citeria;

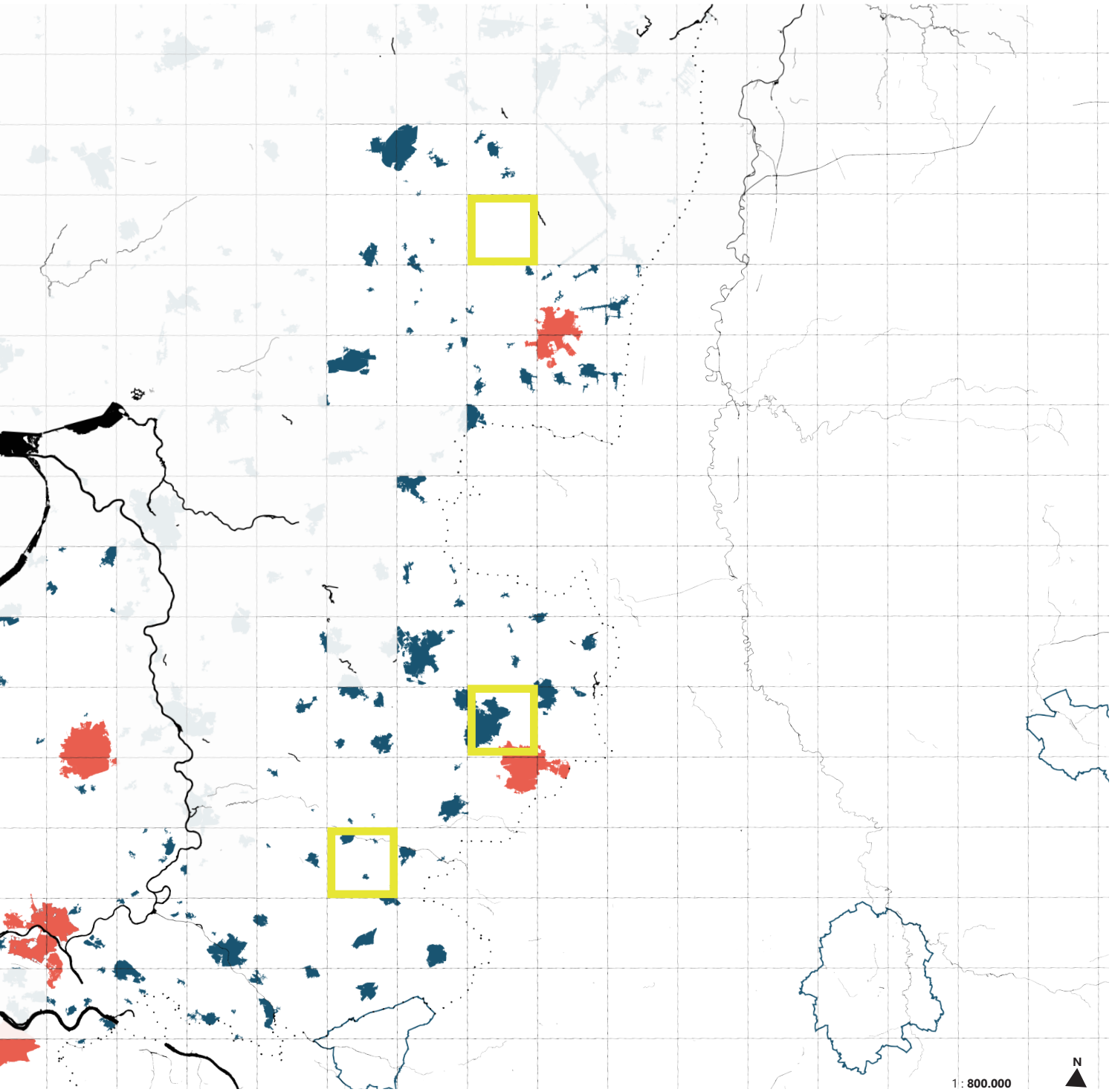
1. Interesting places for relocation clusters at the moment
2. Places where the development of a relocation cluster can improve the quality of the high east: synergy

As the three subregions of the high east differ in regional morphology, they can provide a variety in relocation clusters.

Drenthe
In relation to morphology, the province of Drenthe is most similar to the sending region. This also surfaces in the landscape features. A relocation cluster in this subregion would therefore be appropriate for those that are attached to Groningen and its vastness. The location of the cluster in Drenthe can help increase the accessibility of Assen and Emmen, and can help increase the concentration of both primary and secundary schools in the region. The cluster would provide an sudden increase of the population thereby increasing the support for public trasnport and other public services.

Twente
The relocation cluster in Twente focusses on creating an urbanised region, adding to existing cities while limiting the footprint of the new settlements. The infrastrucure that is already available to the region is likely to be able to facilitate the sudden growth.

Achterhoek
The Achterhoek is charactarized by its similar-sized cities. The region that is suggested for the new relocation cluster aims to improve the connection between the subregions in the High East.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to propose

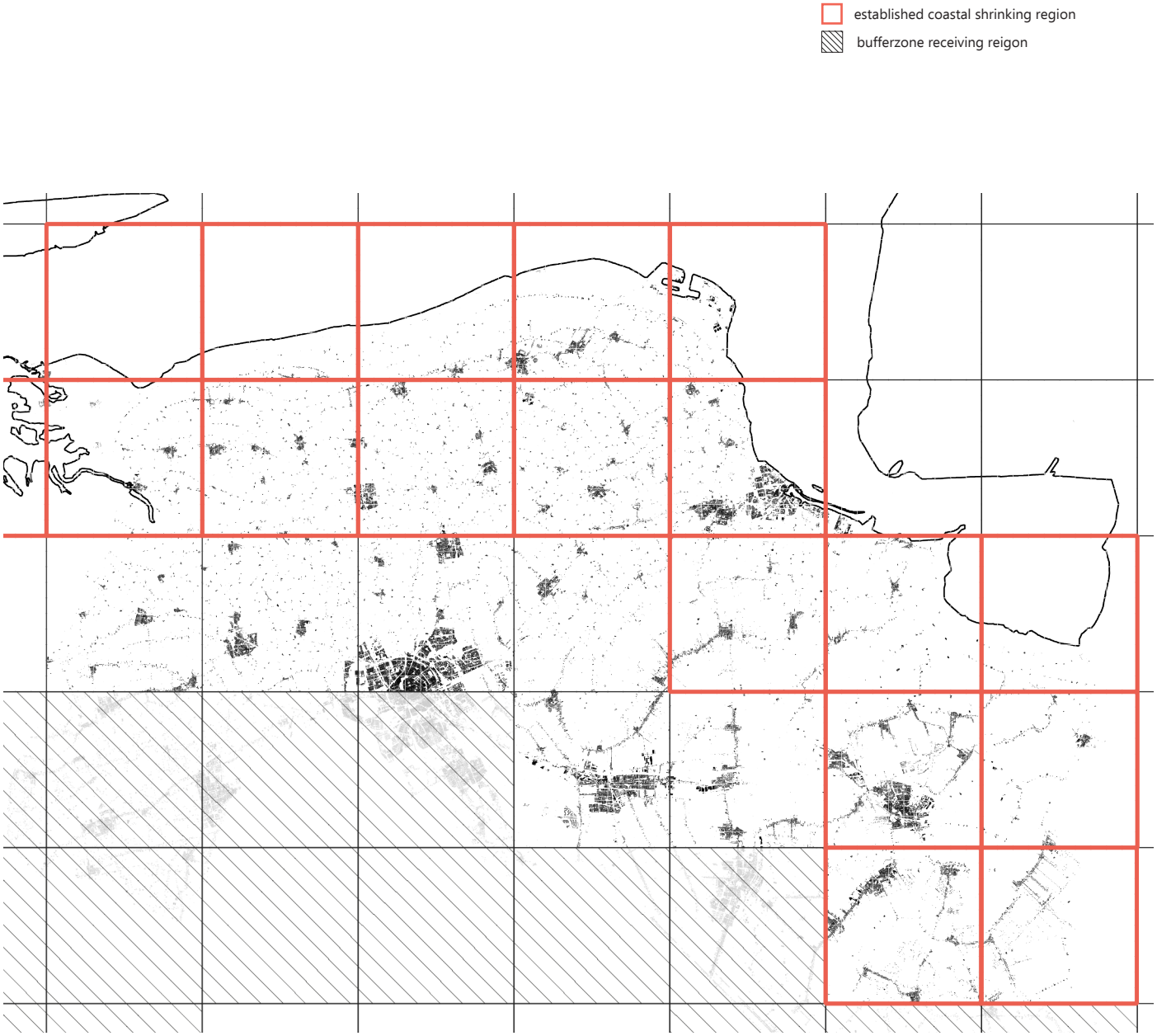
regional strategy
local design

regional strategy

regional distribution
landscape features
biographical stages
waves of retreat
structures of governance

Regional distribution

The basemap for the projection of the strategy includes the outline of the High East, and the established region of demographic decline. A grid of 1 by 1 km is layed out in order to generate more detailed data on the sending population and the spatial translation.



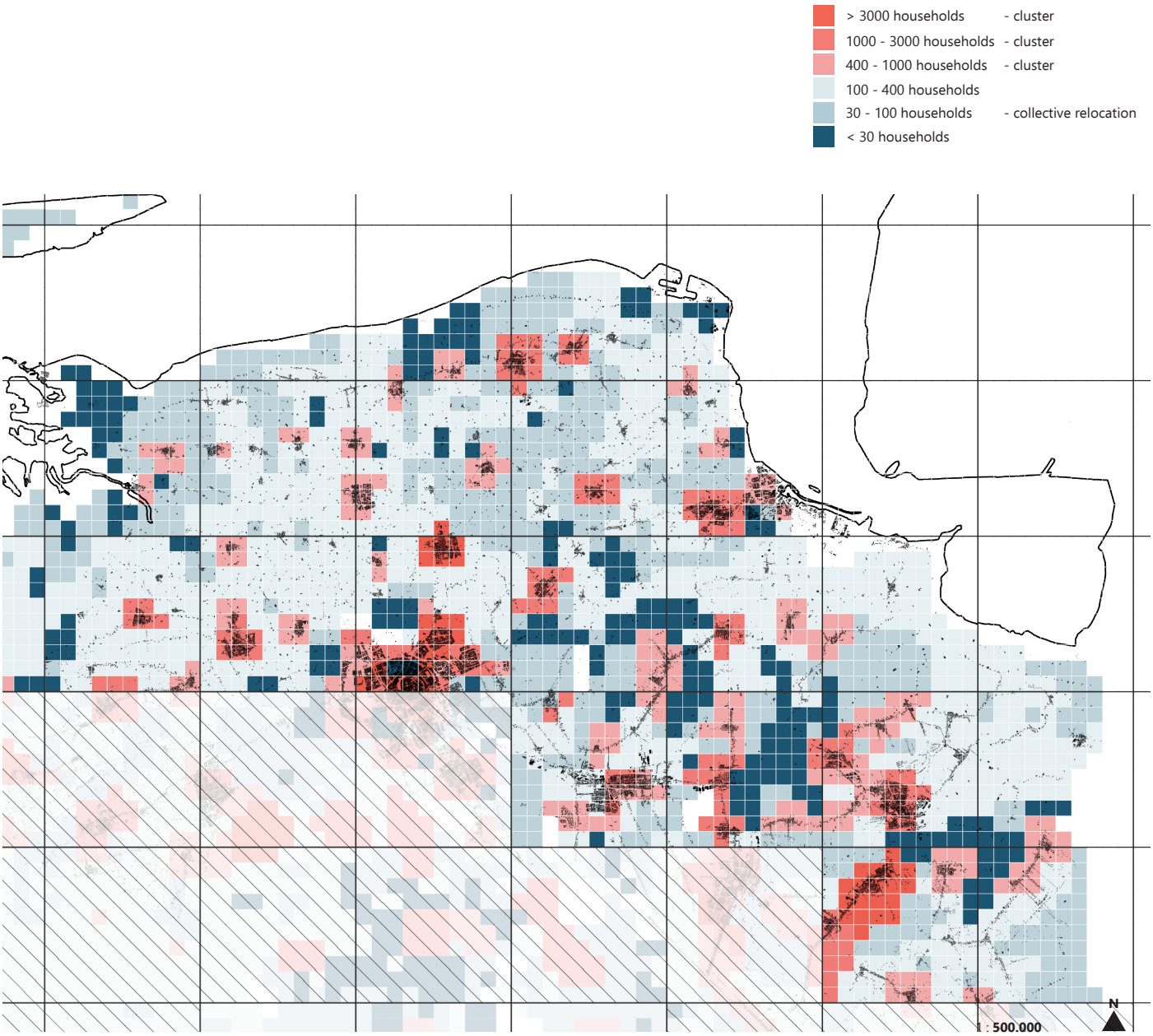
Regional distribution

Clusters

The map below shows the concentration of households per km^2. Clusters are identified where the concentration of households is higher than 400 per km^2. They are deemed self sufficient enough to handle shrinkage.

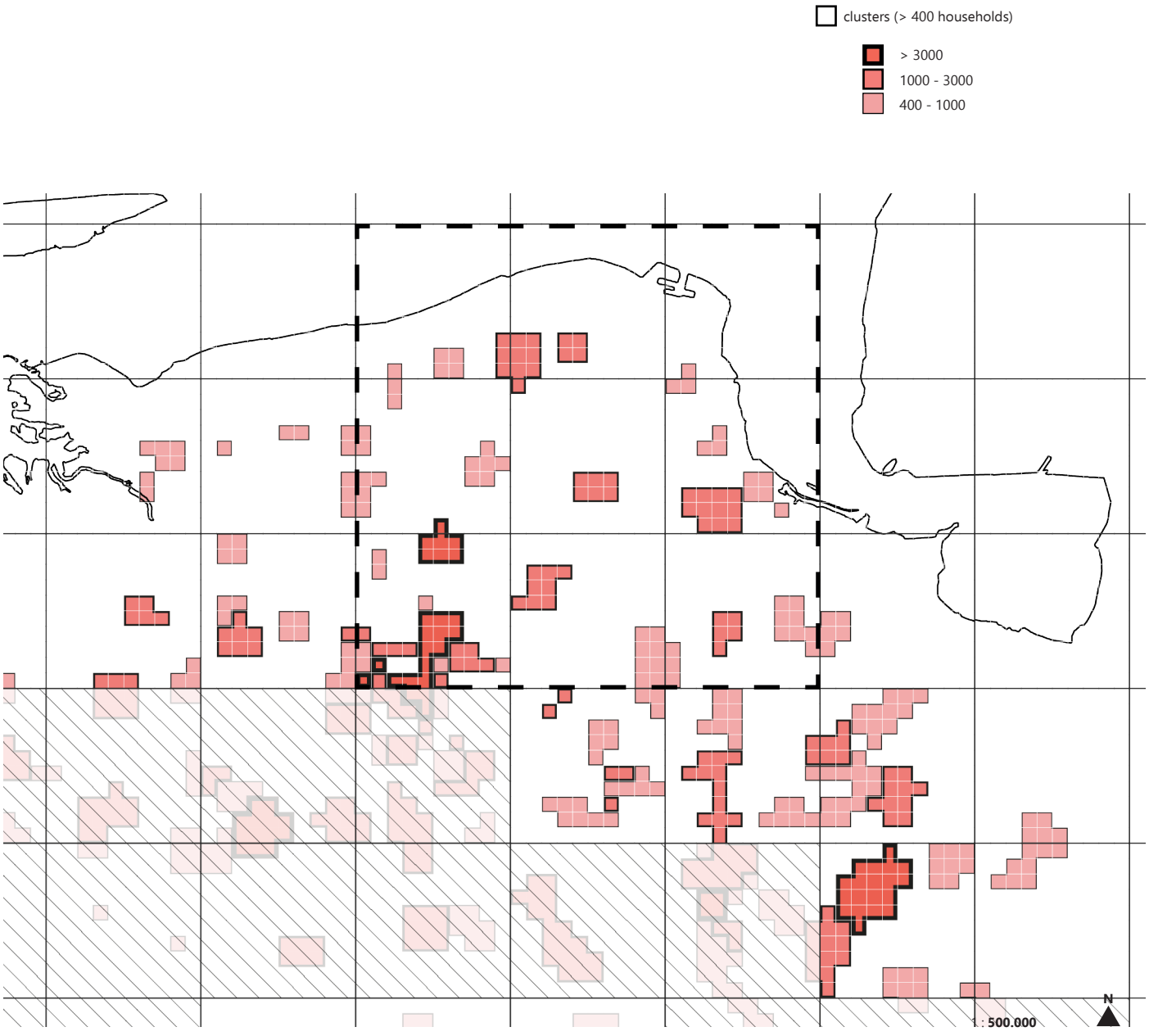
Collective relocation

Areas that have a density of 30 to 100 households are eligible for collective relocation. This is the same density as was found in the village of Ganzedijk. Liveability in these settlements will quickly deteriorate once the first households leave.



Hierarchy of clusters

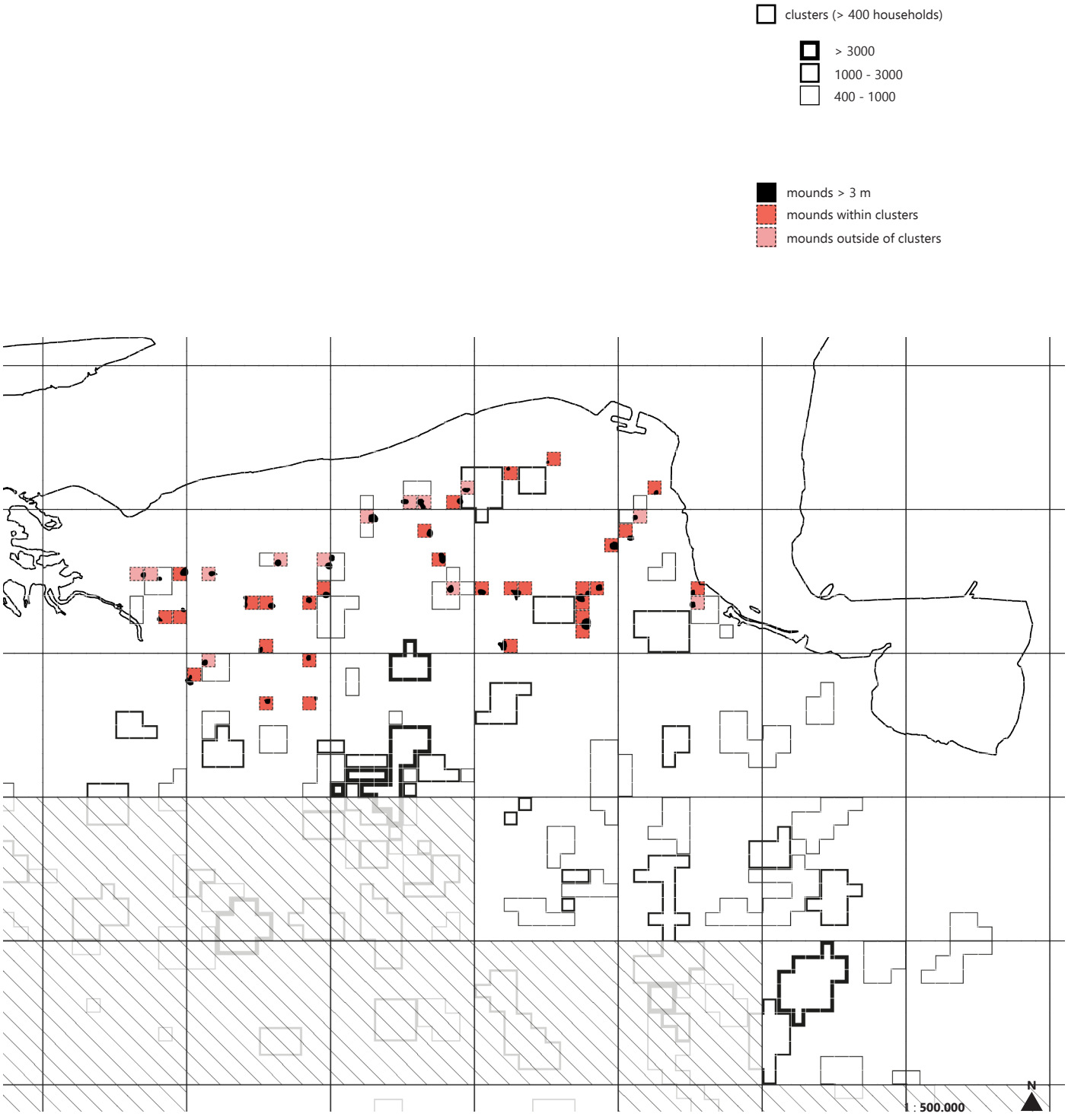
The status quo on the hierarchy of clusters is shown in the map below. The central coastal region of Groningen particularly shows a lack of hierarchy, with some densely populated clusters near the coast.



Landscape features

Mounds

As introduced before, historical mounds can offer safe higher ground in the sending region. In light of this long term projection, a margin of 3 metres is taken to identify mounds that are fit.

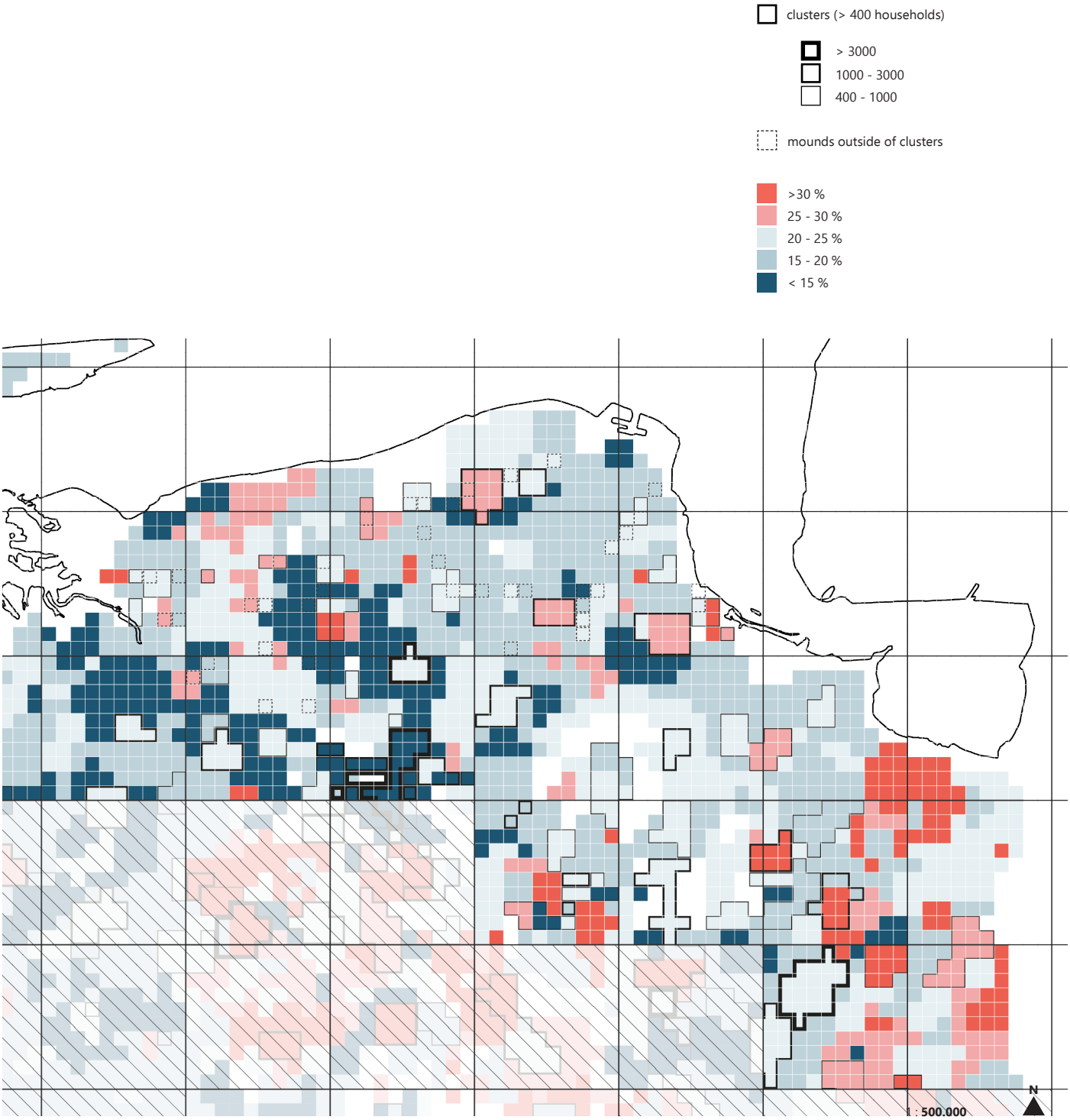


Biographical stages

Retired young elderly / frail elderly

The map is produced using data on the concentration of people that are over 65 years of age. This part of the population be considered the (future) vulnerable.

There is a higher concentration of frail elderly in clusters compared to the area outside of clusters. Eastern Groningen also sees high concentrations.

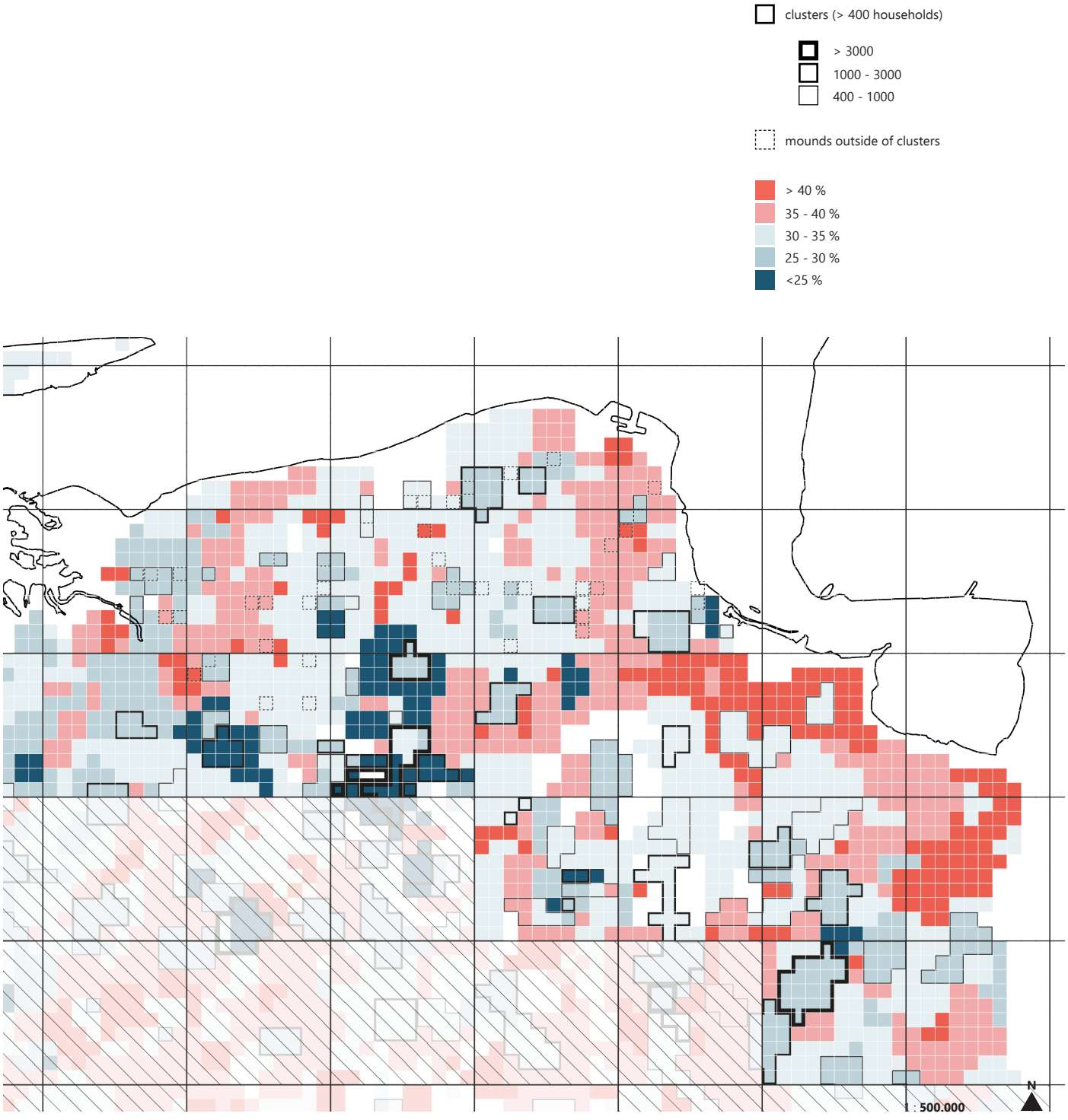


Biographical stages

Settled adults / young elderly

The map is produced using data on the concentration of people between the ages of 45 and 65. The majority of this group will retire in the coming two decades.

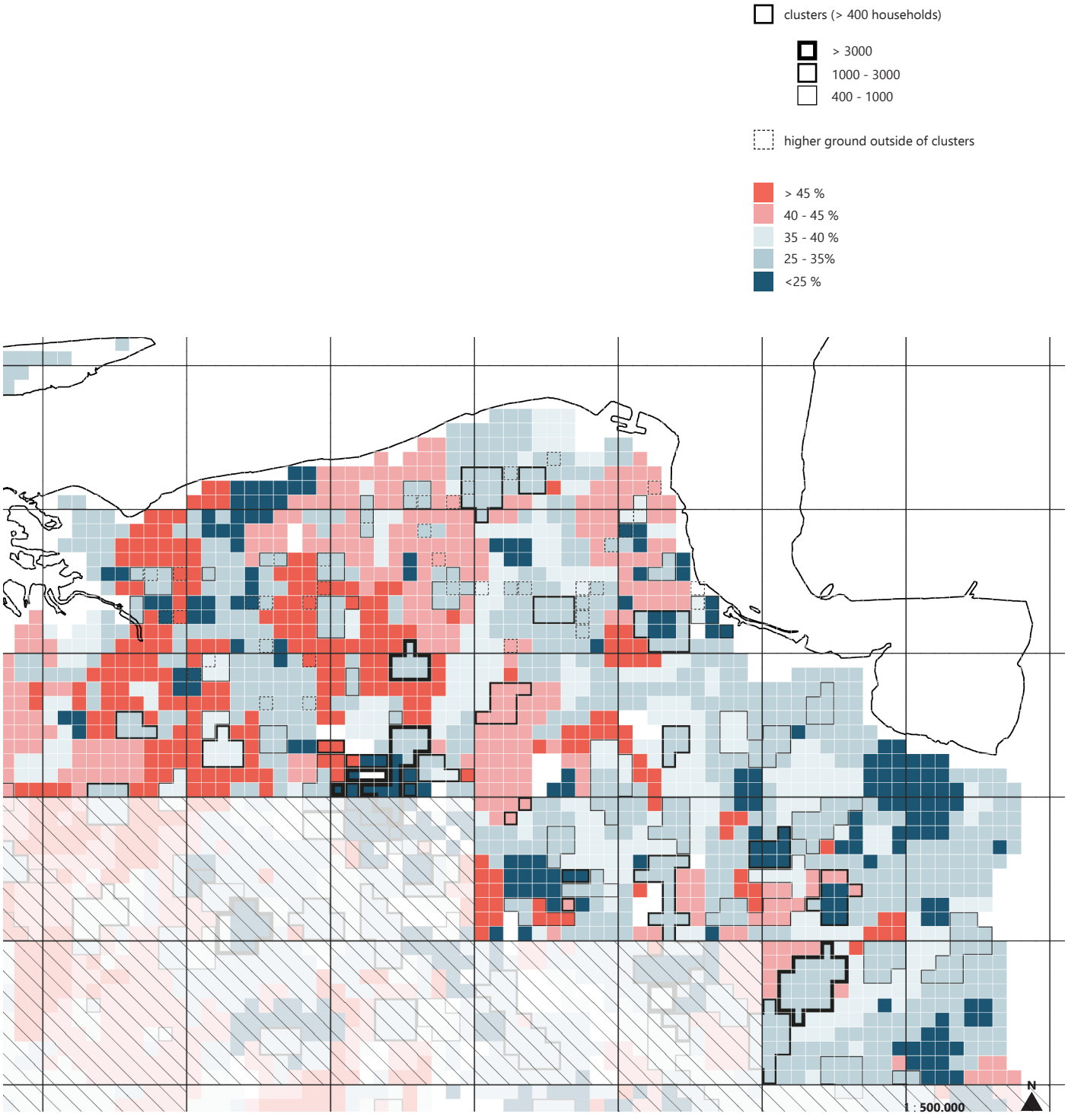
The map shows higher concentrations outside of clusters, especially in the eastern region.



Households with children

Households with children are likely to experience their children moving out within the next 20 years. This is an opportunity to create pull-factors for both the young adults, the ones moving out, as the young elderly, the empty nesters.

Households with children are more concentrated outside of clusters, especially in the north-werstern region.



Waves of retreat

WAVE 1 -
TACKLING DEMOGRAPHIC DECLINE IN THE OUTSKIRTS

Goal:

1. Decreasing the impact of demographic decline on the vulnerable groups along the coast (villages with distorted age structures)
2. Relieve unmarketable property owners (as a result of the gas extraction crisis).
3. Familiarizing the community with a voluntary compensation scheme for relocation
4. Adapting the voluntary compensation scheme to local needs
5. Understanding which people are willing and fit to establish self-sustaining communities on historical mounds.

Duration:

20 years

Allows for target group to reach the right biographical stage and allows social learning and network effects to take place

Roll-out region > voluntary compensation scheme:

Region where livelihood is under pressure:

Shrinking region outside of clusters as defined by the national plan for population decline where there is a high concentration of (future) vulnerable groups.

(regions with >30% of +65 or >35% 45-65: the one has a bigger volume and therefore a higher margin percentage)

These age groups will be the first to become vulnerable due to continuing decline)

Roll-out region > exchange relocation:

Dwelling mounds higher than 3 meters outside of clusters

attracting pioneers by writing out competetions for self-sustainable development of abandoned building (most have vacant schools)

Roll-out region > collective relocation:

Region where households density is between 30 and 100 households per km^2

Biographical stage of focus:

Young elderly

Additional target group:

Citizens with unmarketable housing due to damage caused by earthquakes

Moment of opportunity:

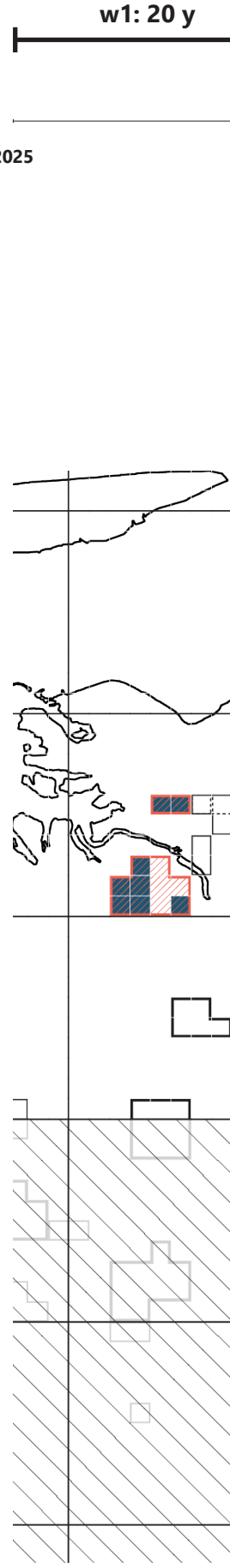
Empty nesters / Retirement

Pull-factors:

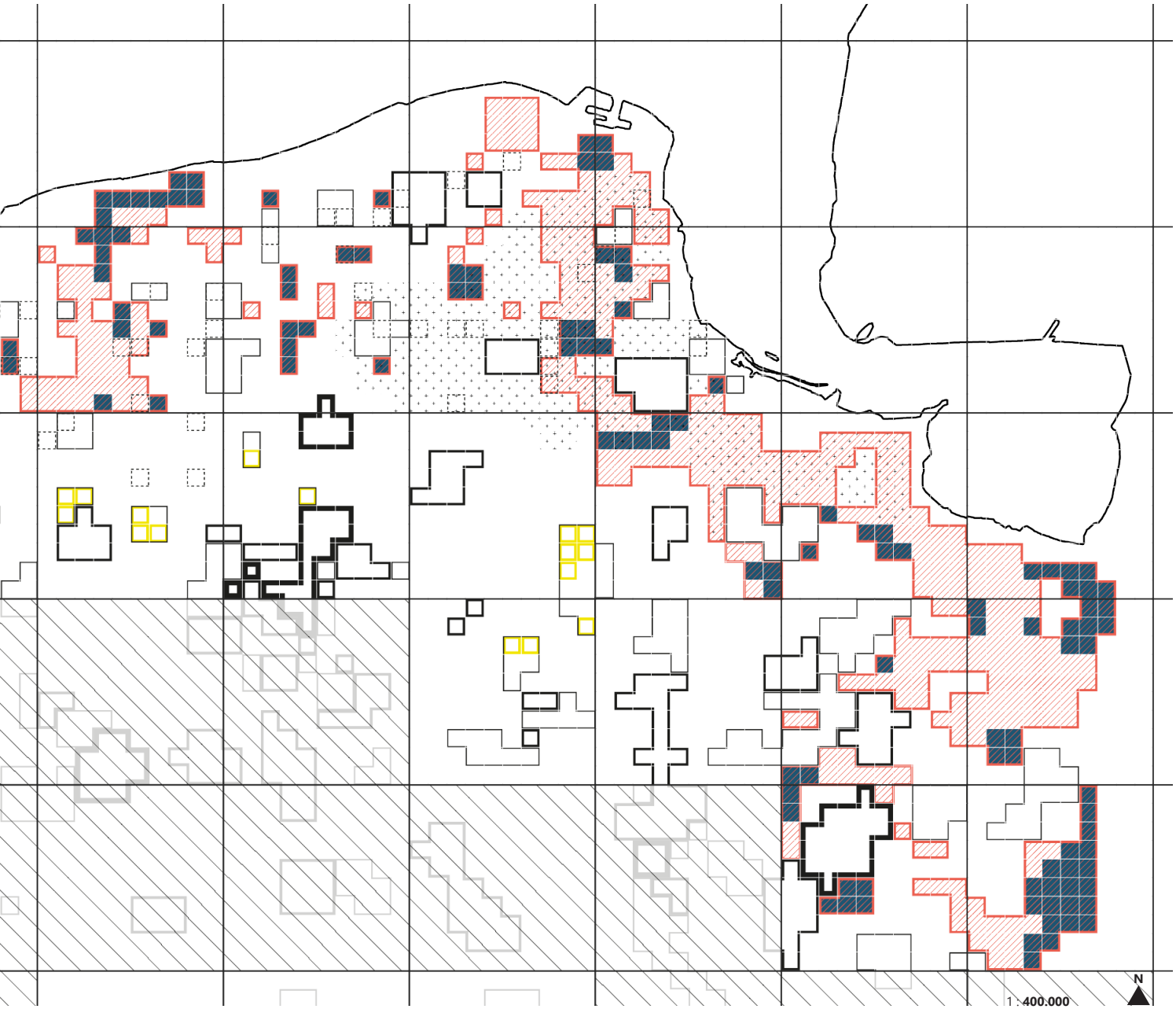
- Future proof housing (senior living communities > close to amenities)
- Job opportunities for young elderly

When accepting scheme choice of relocating:

1. Cluster region: relocation clusters
2. Exchange relocation (possibility to apply for a position on the mounds)



time of uncertainty



Waves of retreat

WAVE 2 -
TOWARDS A RESILIENT CONFIGURATION

Goal:

1. Controlled decline along the coast
2. Maintaining the size of the supporting clusters
3. Increasing independence of self-sustaining communities on historical mounds.

Duration:

20 years

Allows for target group to reach the right biographical stage and allows social learning and network effects to take place.

Roll-out region > voluntary compensation scheme:

Region where livelihood is under pressure:

Shrinking region outside of clusters as defined by the national plan for population decline where there is a high concentration of (future) vulnerable groups.

Roll-out region > exchange relocation:

Dwelling mounds higher than 3 meters outside of clusters

Roll-out region > collective relocation:

Region where households density is between 30 and 100 households per km^2

Biographical stage of focus:

Young adults and young elderly > possible autonomous movers

(regions with > 35 % households with children at this moment)

Households with children are aged 30-55, and will be 45 and 70, when wave 2 starts. All of these will reach the right biographical stage for moving within wave 2.

Moment of opportunity:

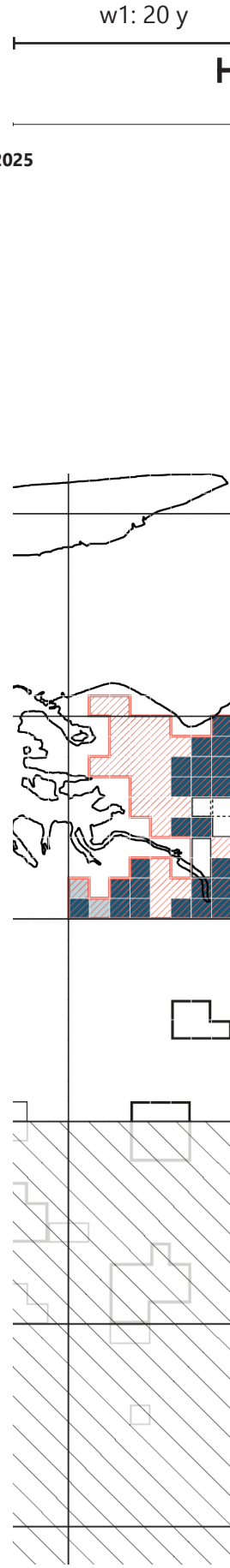
Moving out / settling down / empty nesters

Pull-factors:

- Good settling environment (housing/work/school)
- Future proof housing (senior living communities > close to amenities)
- Closer to (grand)children (multigenerational living communities)

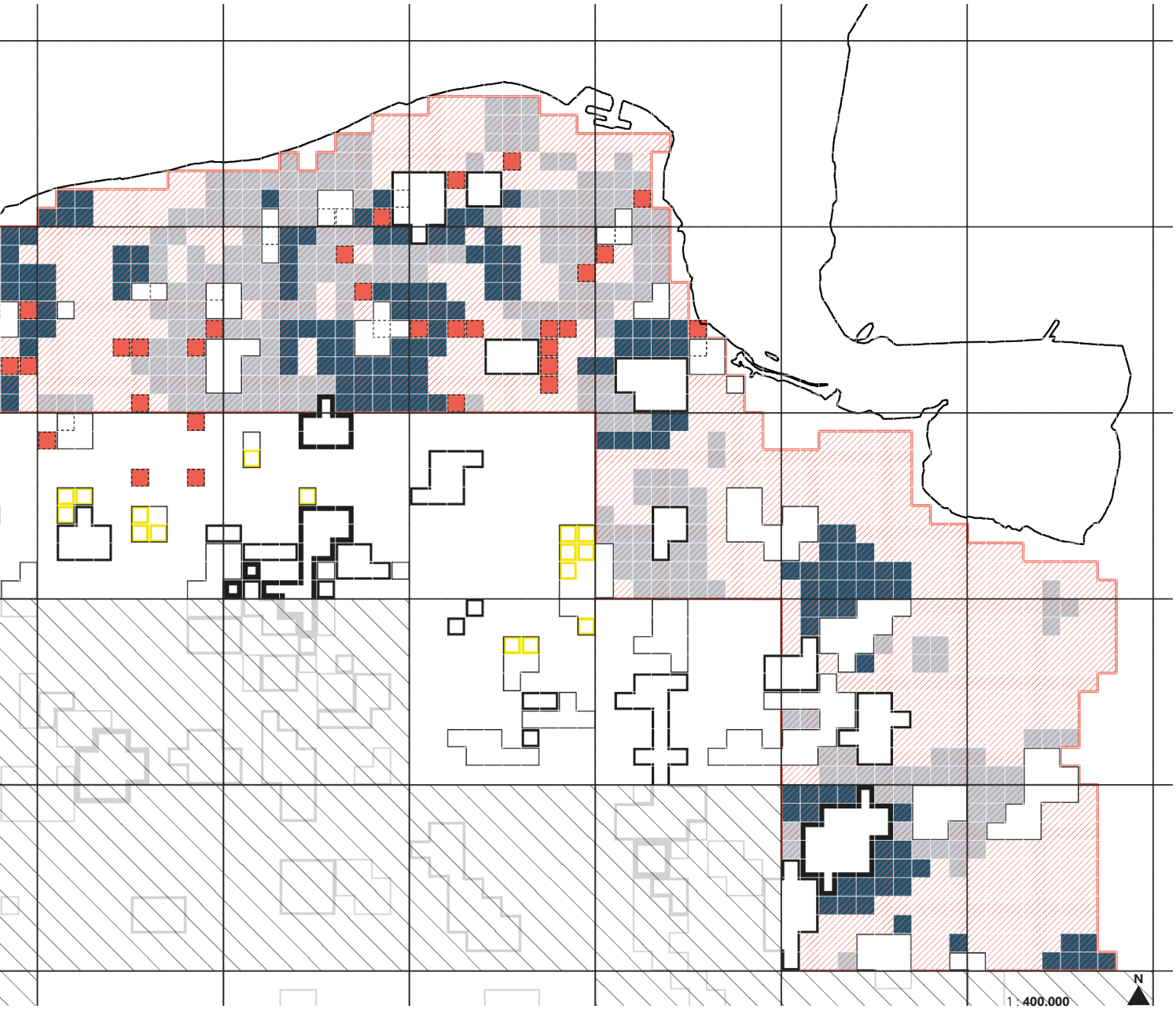
When accepting scheme choice of relocating:

1. Cluster region: relocation clusters
2. High East: relocation clusters
3. Exchange relocation (possibility to apply for a position on the mounds)



w2: 20 y

time of uncertainty



Waves of retreat

WAVE 3 -
TOWARDS A RESILIENT CONFIGURATION

Goal:

1. Decreasing size of clusters that are no longer needed to support the surrounding region
2. Increasing independence of self-sustaining communities on historical mounds that can support the surrounding region

Duration:

20 years

Allows for target group to reach the right biographical stage and allows social learning and network effects to take place.

Roll-out region > voluntary compensation scheme:

Non-supporting clusters:

Depending on the developments in wave 1 and 2, outer clusters might have lost their an important share of their supporting function due to decline of the hinterland. To reach the desired hierarchy in clusters, the compensation scheme is rolled out in these clusters.

While these clusters are in decline throughout wave 3, its amenities (in reduced size) are relocated on self-sustaining mounds in the area.

Roll-out region > exchange relocation:

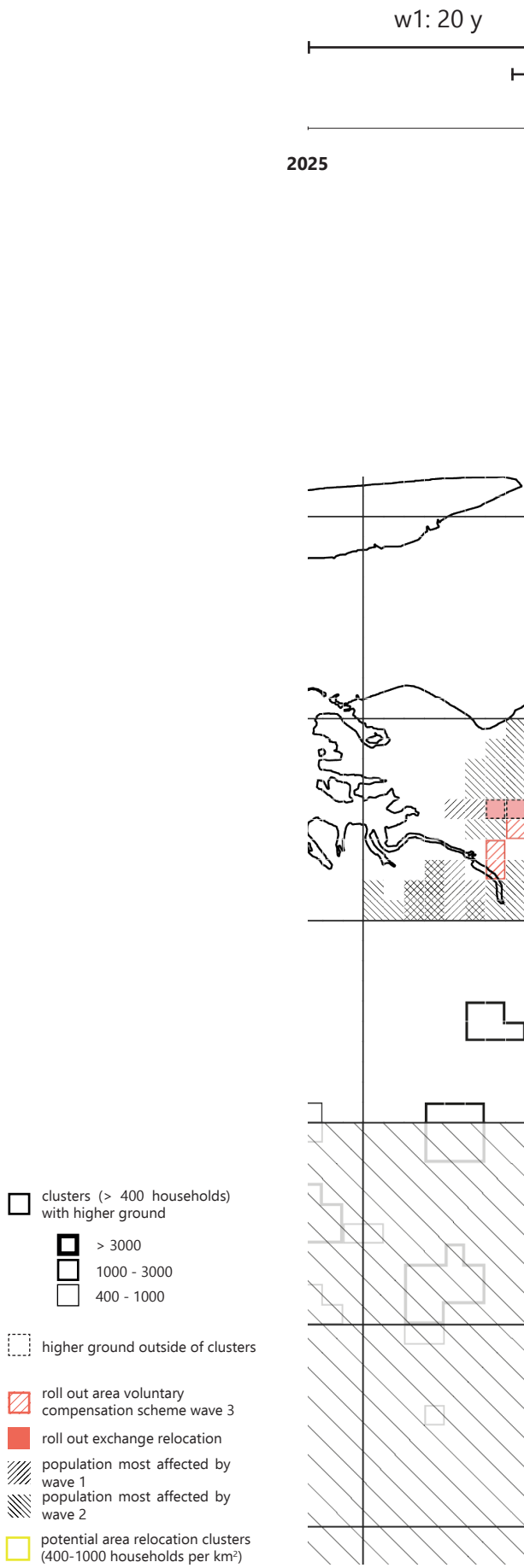
Dwelling mounds higher than 3 meters

Pull-factors:

- Good settling environment (housing/work/school)
- Future proof housing (senior living communities > close to amenities)
- Closer to (grand)children (multigenerational living communities)

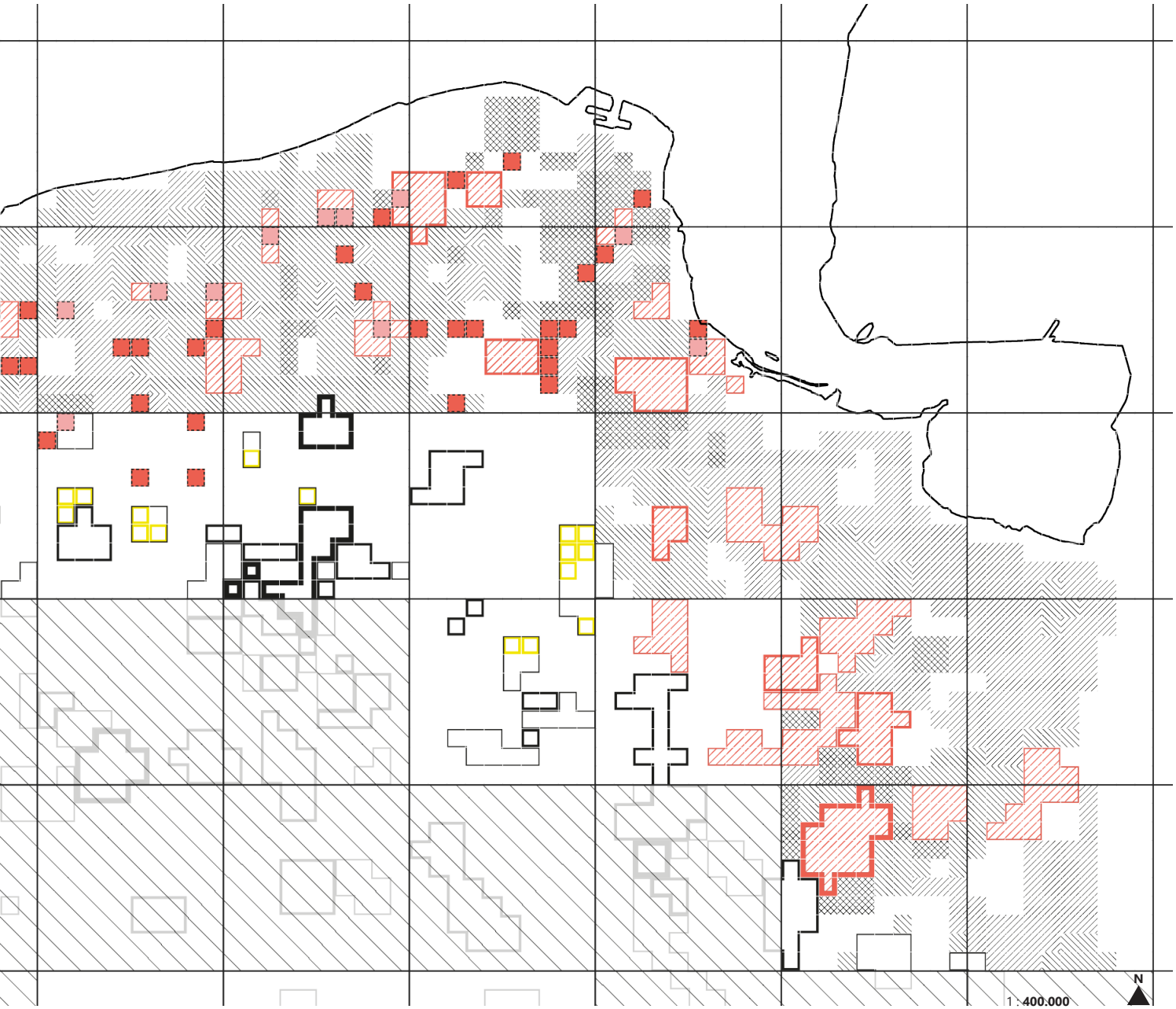
When accepting scheme choice of relocating:

1. Cluster region: relocation clusters
2. High East: relocation clusters
3. Exchange relocation (possibility to apply for a position on the mounds)



w2: 20 y **w3: 20 y**

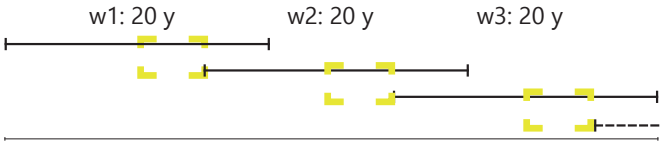
time of uncertainty

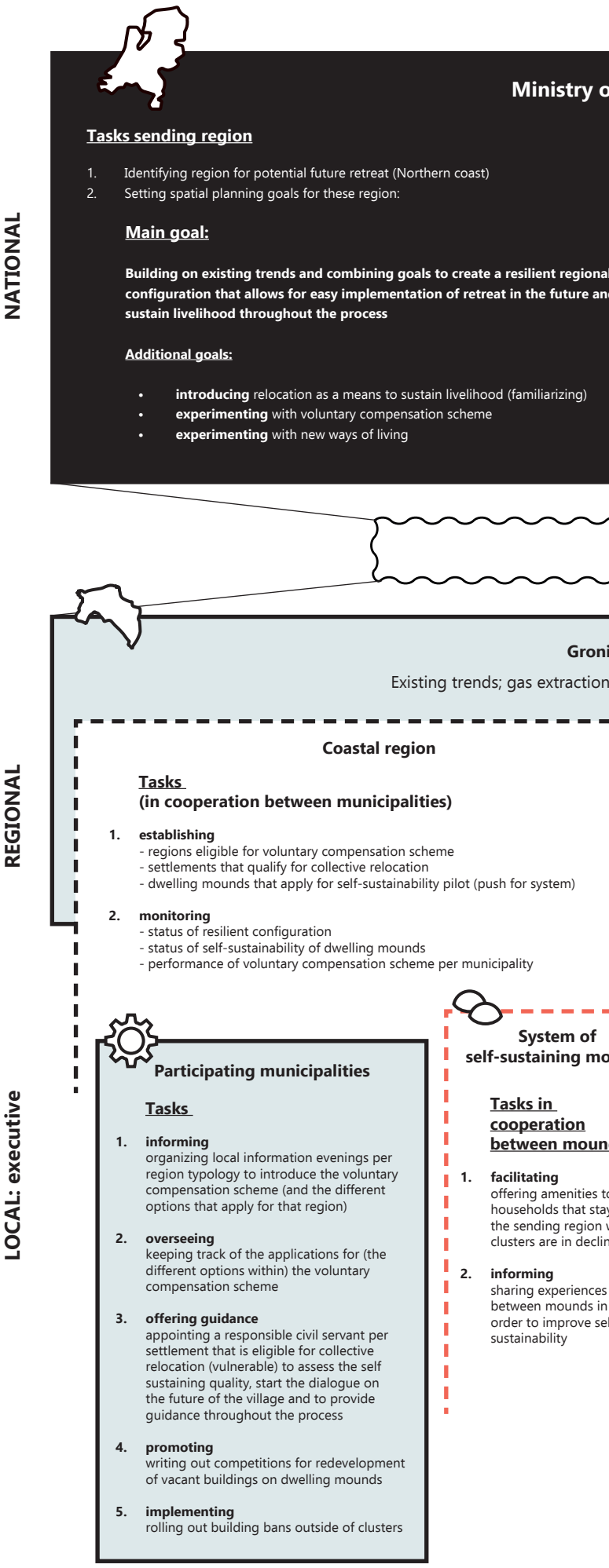


Structures of governance

First wave
The rol-out area of the voluntary compensation scheme in the first wave is limited and the target group is homogeneous. This offers a challenging yet manageable introduction to relocation as part of the centralisation strategy. It creates the opportunity to establish regional and interregional cooperation, and learn from the process.

Halfway each wave the structure is reevaluated and adjusted to location specific needs.





national government
research institute
existing bodies of governance
existing cooperation, new tasks
new cooperation

f Internal Affairs

Tasks receving region

1. Identifying potential receiving region (The High East)
2. Setting spatial planning goals for these region:

Main goal:

Creating relocation clusters that can generate mutual gain

d can

Ministry of Infrastructure and water management

Tasks

1. Developing water-retaining landscape of the Northern coast
2. Overseeing the development of the modern dwelling mounds

Ministry of Finance

Tasks
providing additional funding for

1. the implementation of a voluntary compensation scheme
2. the construction of relocation clusters

Deltares

1. **Providing** ministries with technical advice on water-retaining landscapes and the structure of the dwelling mounds
2. **Studying** retreat process
3. **Studying** self-sustaining dwelling mounds

ACTION PLAN: RESILIENT COAST

ingen
crisis + demographic decline

Cluster region

Tasks
(in cooperation between municipalities)

1. **establishing**
   - which clusters are supporting clusters
   - development locations for senior living communities
2. **monitoring**
   - quality of life in relocation clusters

Participating municipalities

Tasks

1. **rezoning**
   making land-use reservations for the relocationg clusters
2. **attracting amenities**
   making sure the right amenities are present near the relocation clusters
3. **active monitoring**
   in order to create social learning and network effects it is important to make sure the relocated react positively to their new living environment and communicate this experience to their previous community

The High East

identifying regions fit for relocation clusters and how they distinguish themselves from other relocation regions in the High East

Drenthe

Hoog Drenthe

1. **Rezoning**
   making land-use reservations for the relocationg clusters

Overijssel

Twente

1. **Rezoning**
   making land-use reservations for the relocationg clusters

Gelderland

Achterhoek

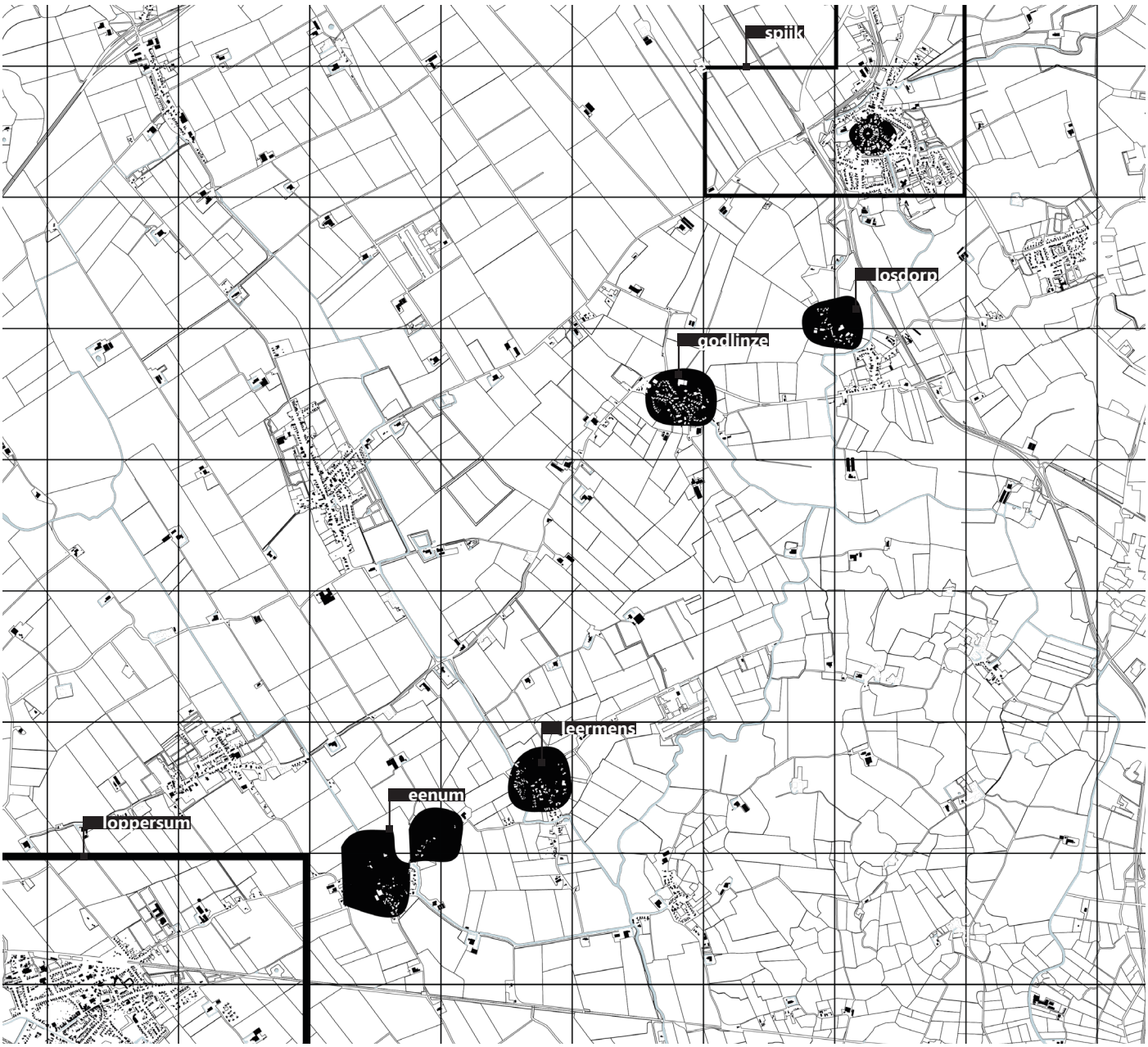
1. **Rezoning**
   making land-use reservations for the relocationg clusters

local design

system of mounds
self-sustaining mound
towards self-sustainability
2150

System of mounds

Local implementation
The local design will illustrate the implementation of the strategy on the more tangible scale. It will focus on the system of self-sustaining mounds. It will zoom in on one in particular; Godlinze.



Self-sustaining mound

Godlinze
Godlinze is a dorpswierde, or village mound. It has a population of 240, with more than halve being over the age of 45. Godlinze has experienced dejuvenation, resulting in the closing of its primary school.

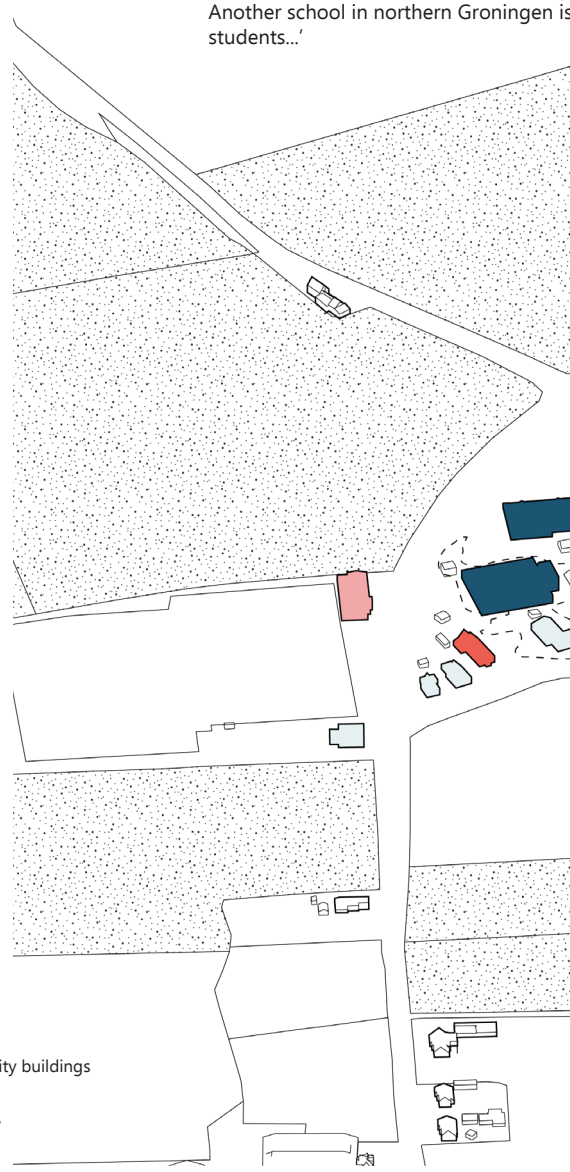
Except from two churches, a community centre, a football club and a family restaurant, there are no amenities on Godlinze.

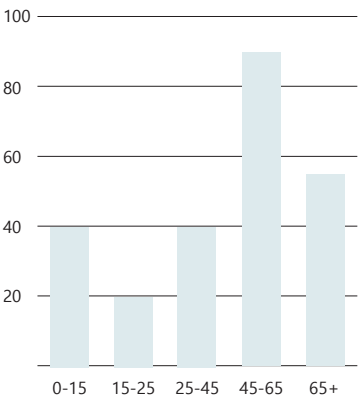

School in Godlinze dicht

29 november 2010, 13:07 · Archief

Opnieuw moet een basisschool in Noo
het dalend leerlingental haar poorten

Article 8, '**School in Godlinze is closing**
Another school in northern Groningen is
students...'





Age distribution in Godlinze

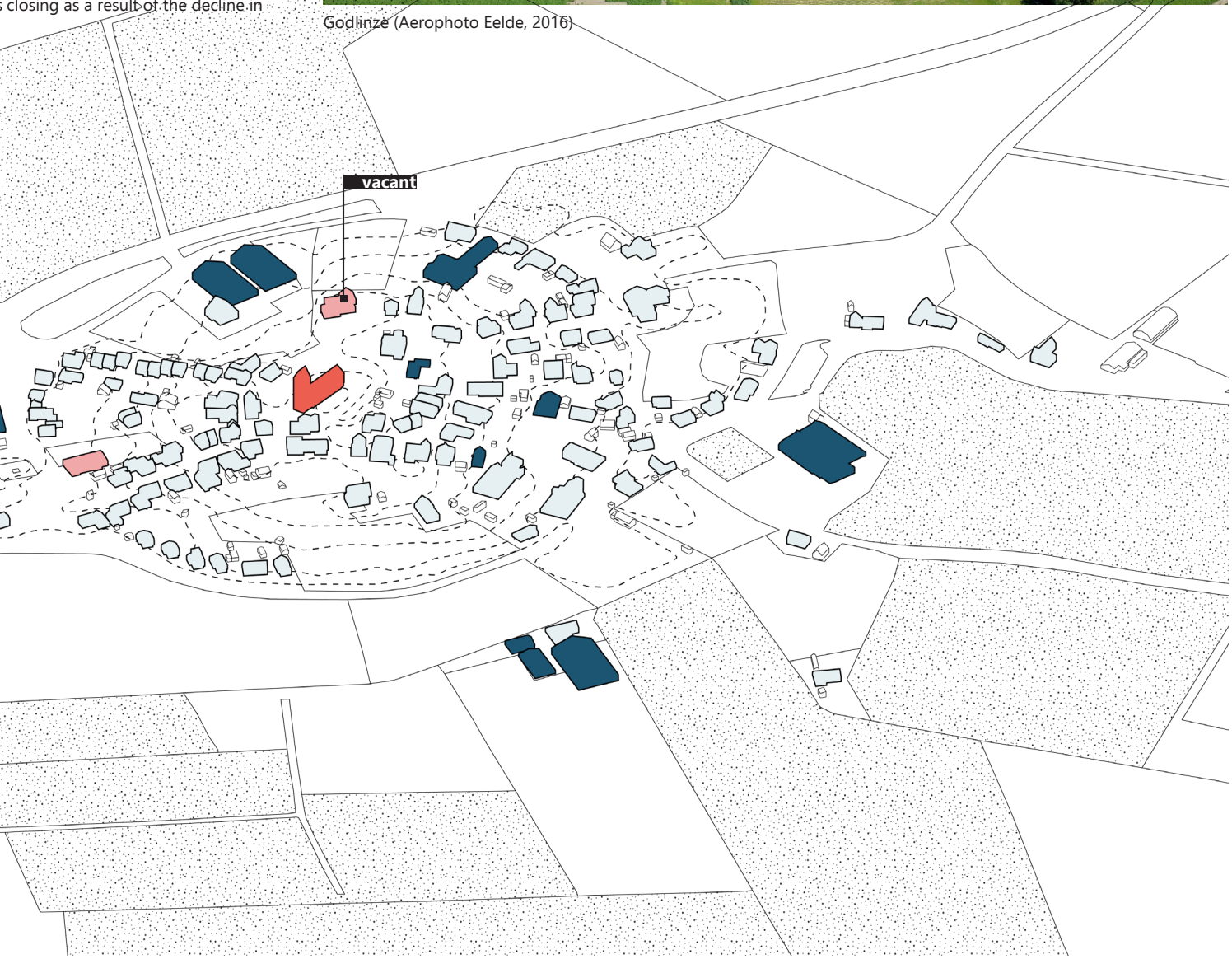
t in augustus 2012

Deel dit artikel

ord-Groningen als gevolg van sluiten.

its doors in August of 2012.
s closing as a result of the decline in

Godlinze (Aerophoto Eelde, 2016)



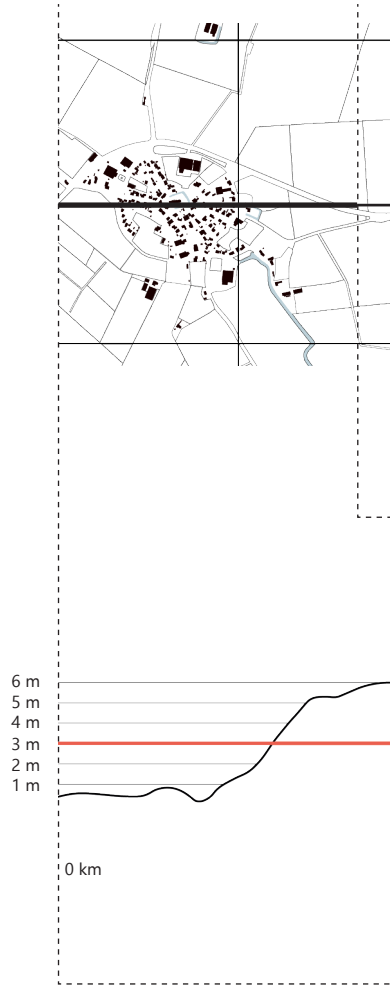
Self-sustaining mound

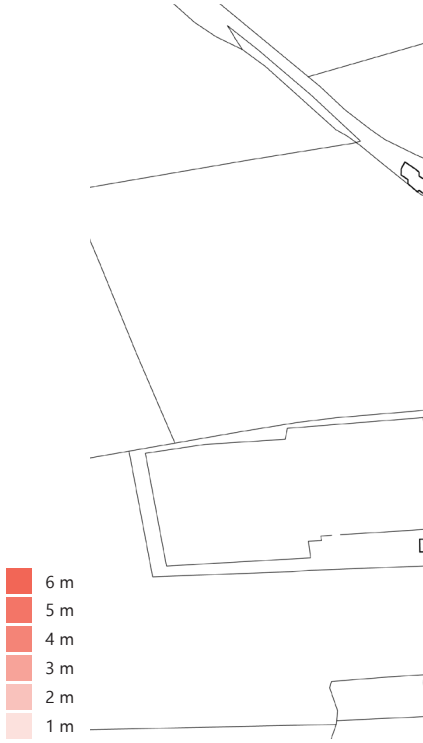
Height
As shown in the section, the heighest point of the mound that Godlinze was built on is 6 meters. This is the same height as the dike nearest dike (Actueel Hoogtebestand Nederland, 2020).

The idea is that this village mound is able to be self-sustainable in times of high water, while at the same time offering protection for the people that decided to remain in the sending region.

In short, the village mound has two goals;

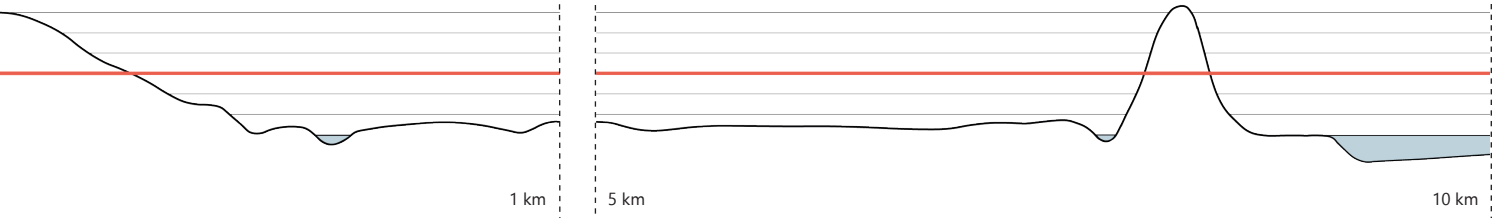
1. self-sustainability; offering amenities for people that remain in the sending region
2. future protection



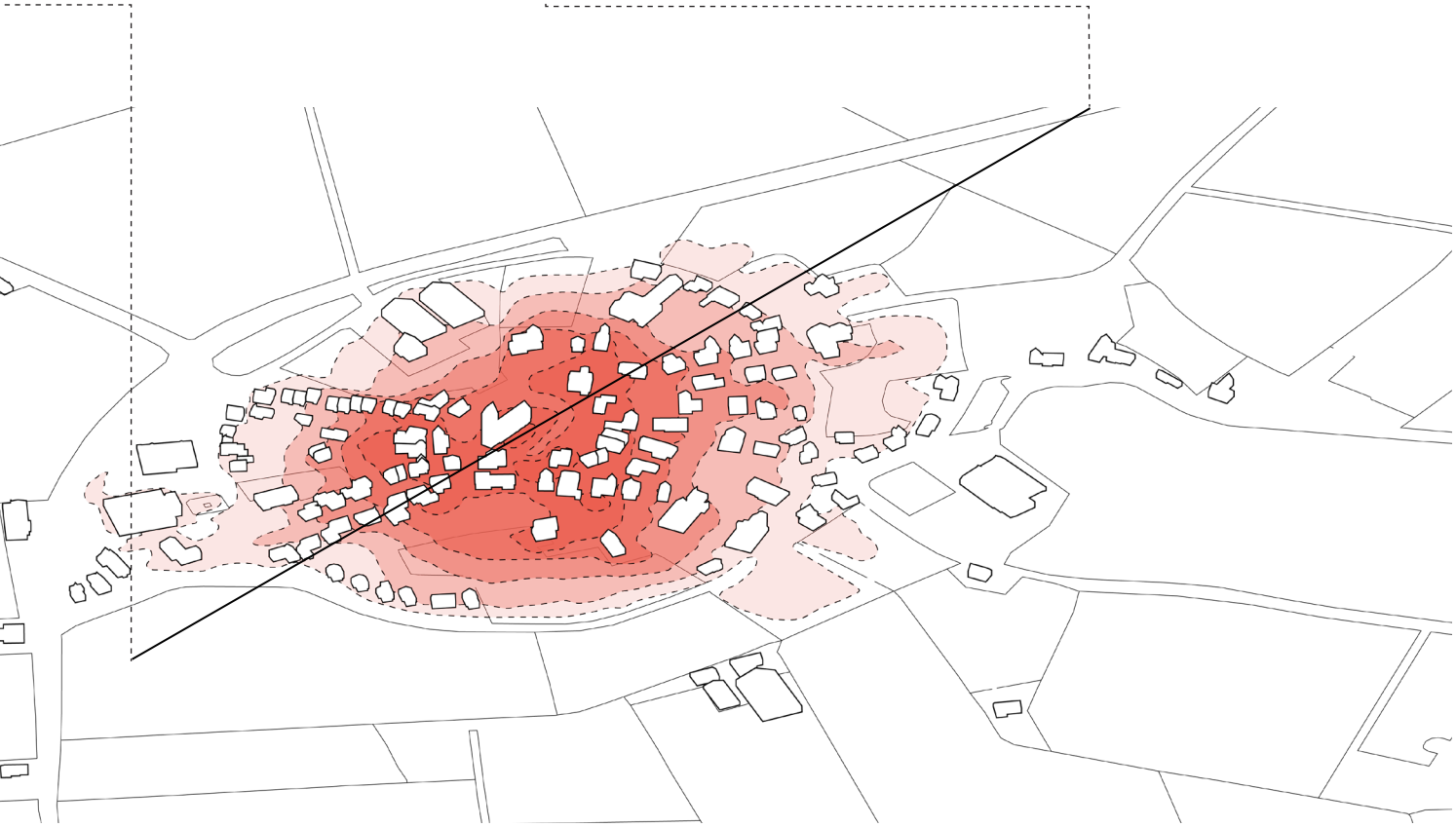


1 : **25.000**

N



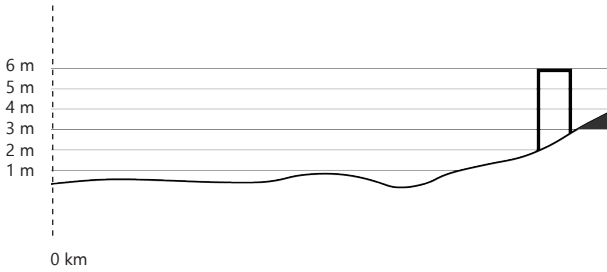
adapted from actueel hoogtebestand (AHN3) image by author

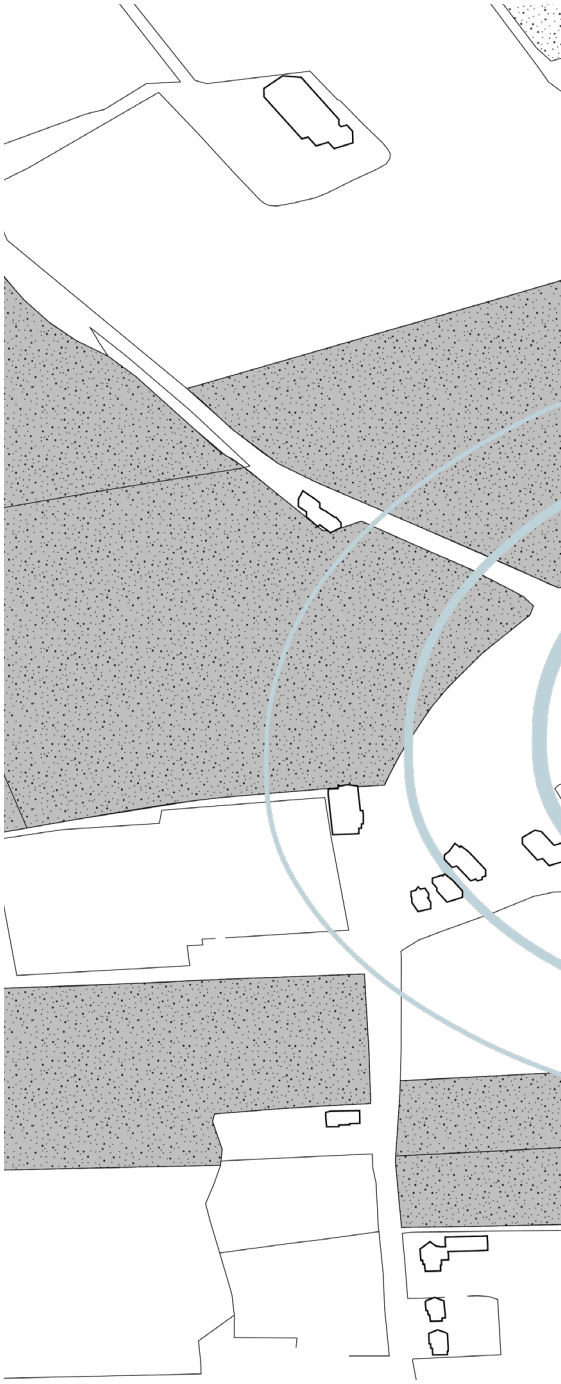


Self-sustaining mound

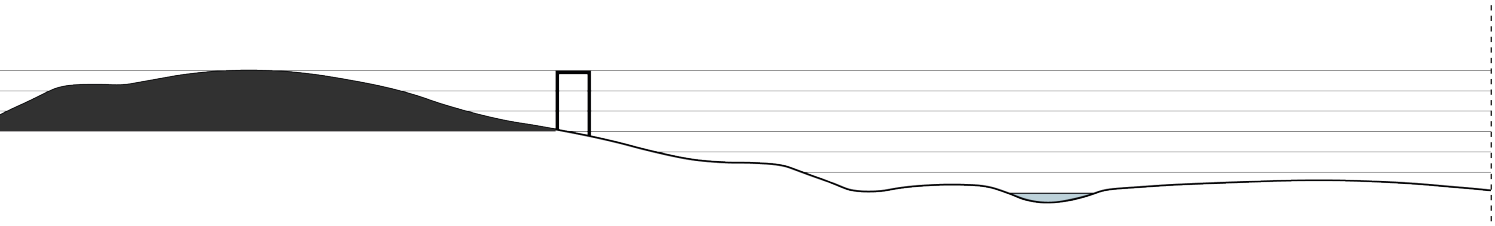
Goal 1: protection
The modern dwelling mound consists of a structure that defines the edges of the village and can provide protection while sea-levels keep rising.

Goal 2: self-sustainable and supporting
The structure is not a dike, but a functional ring consisting of housing and amenities, while also providing space for the production of electricity and food.



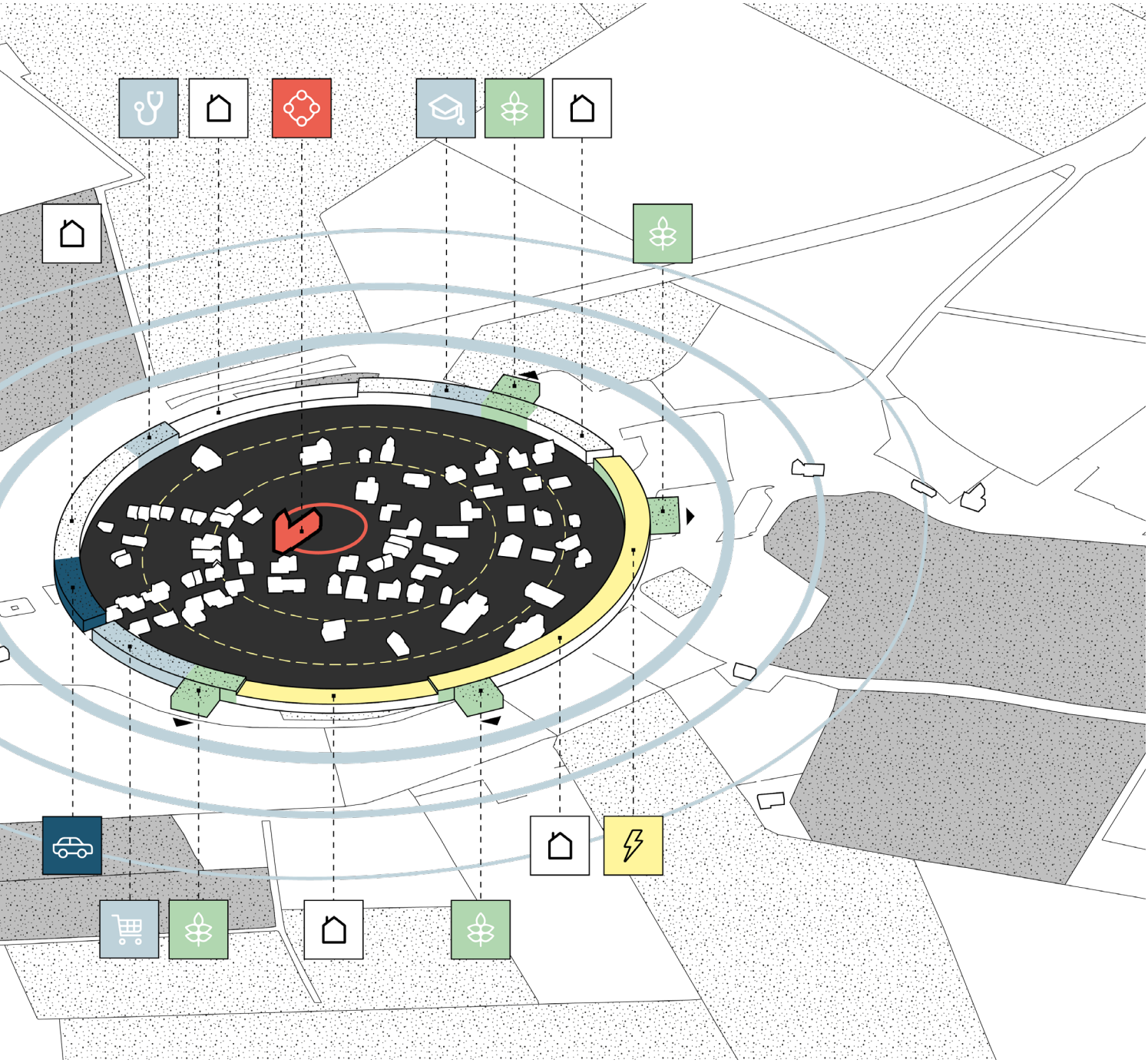


- meeting place for local community
- amenities: grocery store
- amenities: school
- amenities: general practitioner
- shared mobility hub
- food production
- energy production
- self-sustainability initiatives
- housing
- saline farming



1 km

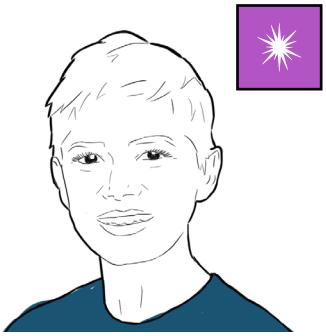
adapted from actueel hoogtebestand (AHN3) image by author



Towards self-sustainability

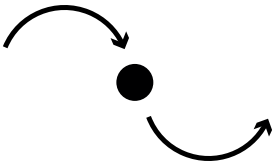
Start of wave 1
In order to start the self-sustaining paradigm on the dwelling mound, the abandoned school building is used to start a competition for self-sustainability initiatives. The competition also states that the iniative should create a place to meet for the community.

The community centre is used to discuss the future of the village. Once every week, a member from the municipality organises walk-in hours to provide residents that are interested in applying for the voluntary compensation scheme with information.

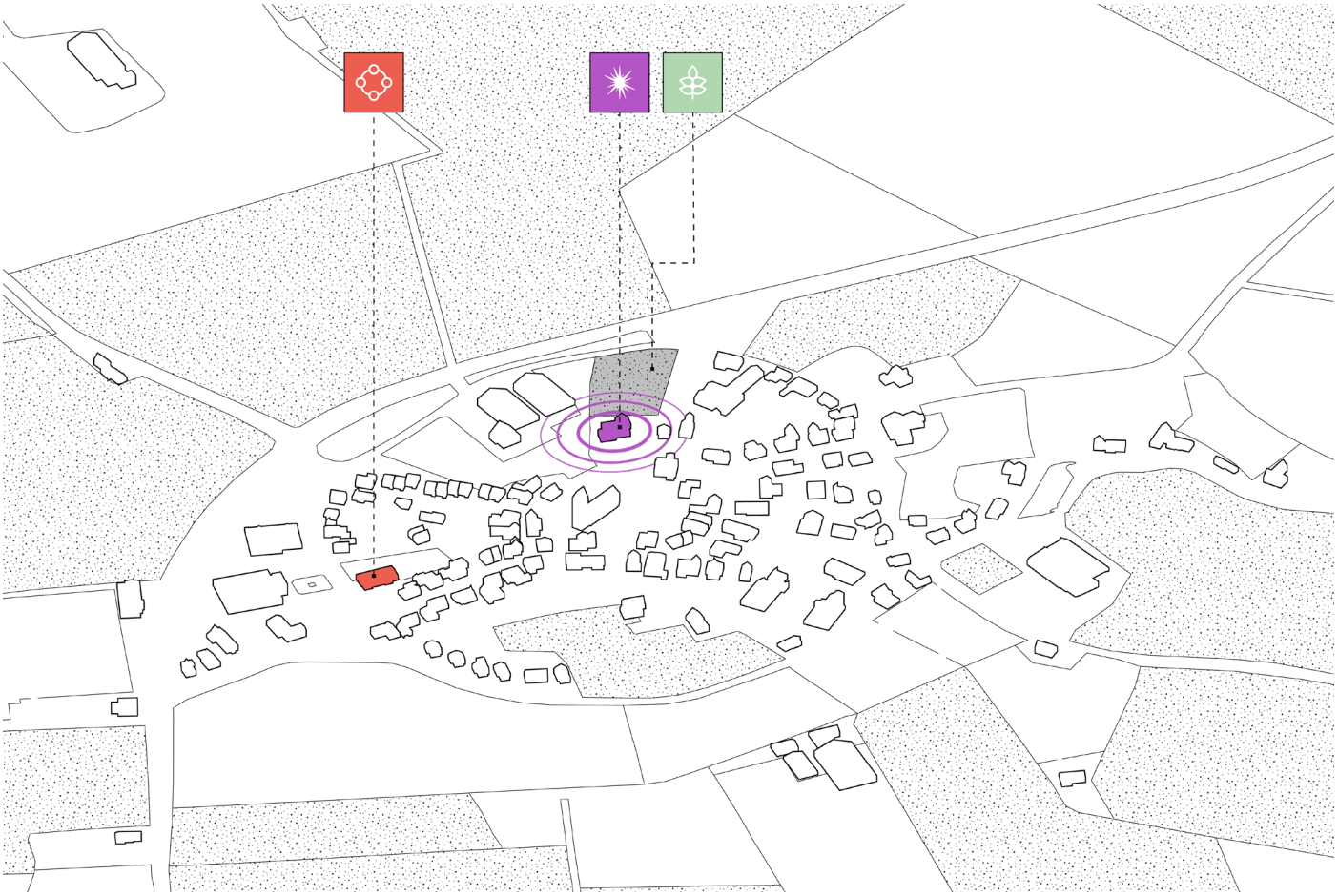


I am excited to create a community that works with nature and provides a comfortable living environment for me and my family

Pioneers (households from decline region get priority)



Young elderly moving (to relocation clusters)



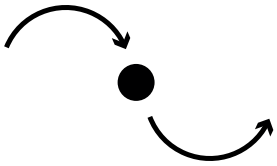
Start of wave 2
With the community slowly embracing the self-sustainability paradigm and the additional accretion of new and motivated households with additional knowledge, the mound is gradually becoming less dependend on neighbouring clusters. In addition to their knowledge, the majority of these new residents work from home, and are therefore able to spend more time on the community.

Farmers in the surrounding area use a portion of their land for local food production. It is almost enough to feed the entire community.

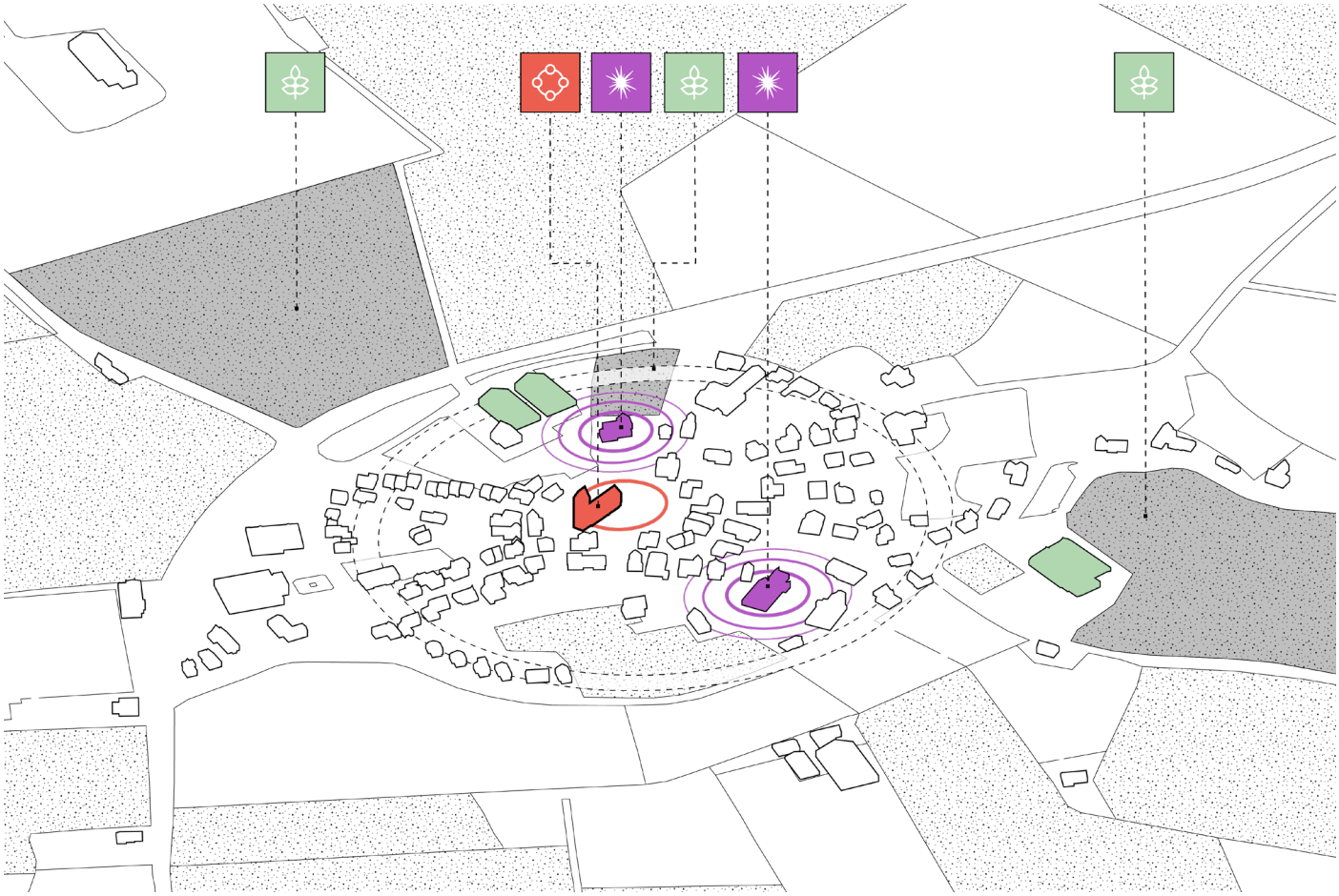
Every month there is a village meeting in the central church, which now functions as the new community centre. The church grounds are now public terrain and function as the central park.

Talks are starting on the development of the protective structure, meaning that households living in the trajectory of this new development will not be replaced once they leave.

Selected households that applied for exchange relocation within voluntary compensation scheme



Households moving (to relocation clusters)



Towards self-sustainability

Start of wave 3
The development of the protective structure has started. In addition to protection, the ring provides space for amenities. Depending on the state of the surrounding centralisation developments, nearby clusters might not be able to sustain their supporting function. This is when amenities are slowly relocated towards the mounds, in reduced size. The mound now holds to supporting role for the housholds that have remained in the coastal region.

The selection for new households is based on looking for the vital professions such as teachers and doctors.

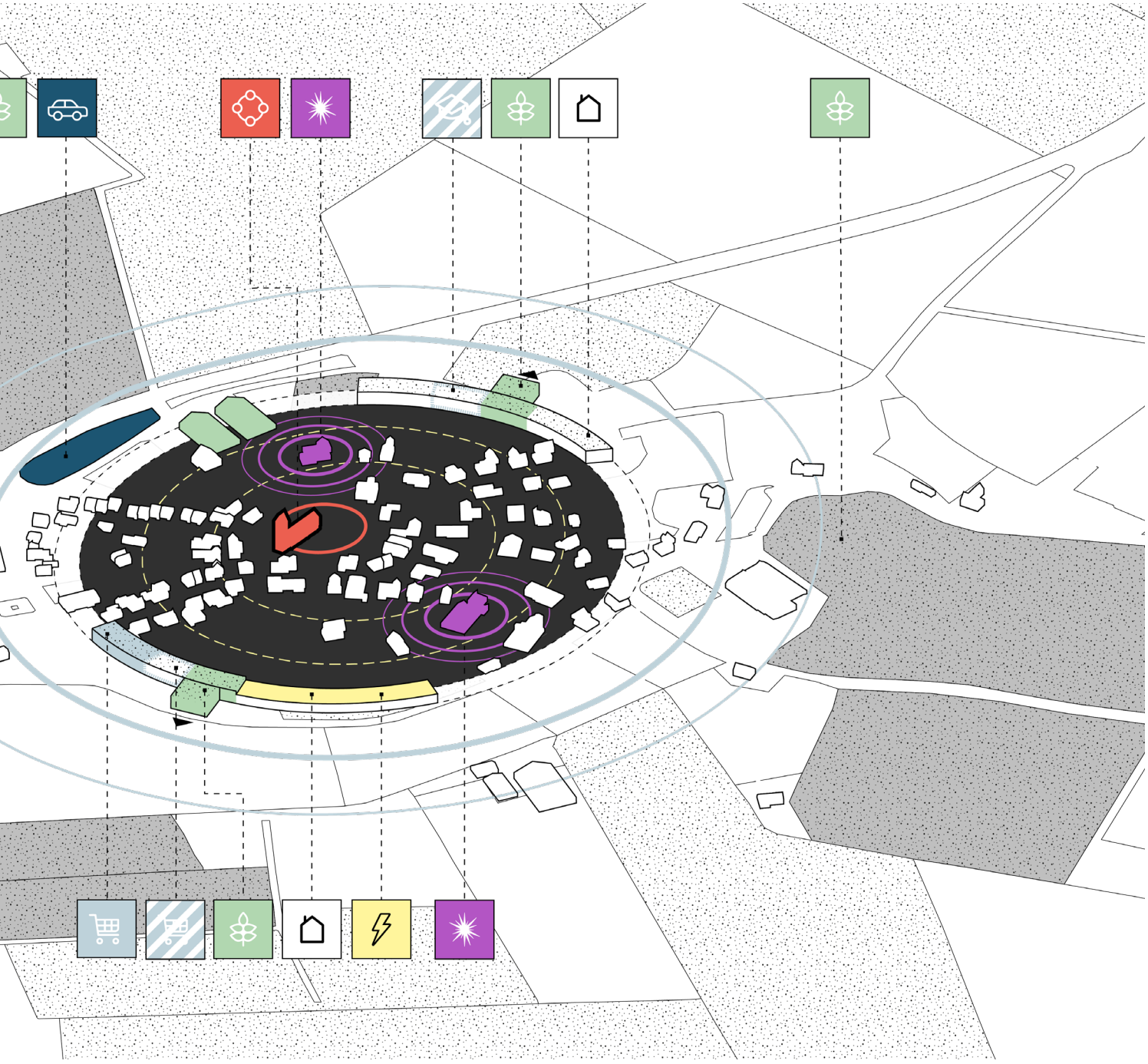
Farmers that are using their land to produce food for the mounds can apply for a place in the new structure. They are also responsible for using their expertise to create a roof top garden for food production.

More housing asks for more public space. Shared mobility allows for more space within the boundaries of the mounds.

- meeting place for local community
- amenities: grocery store
- amenities: school
- amenities: general practitioner
- shared mobility hub
- food production
- energy production
- self-sustainability initiatives
- housing
- saline farming

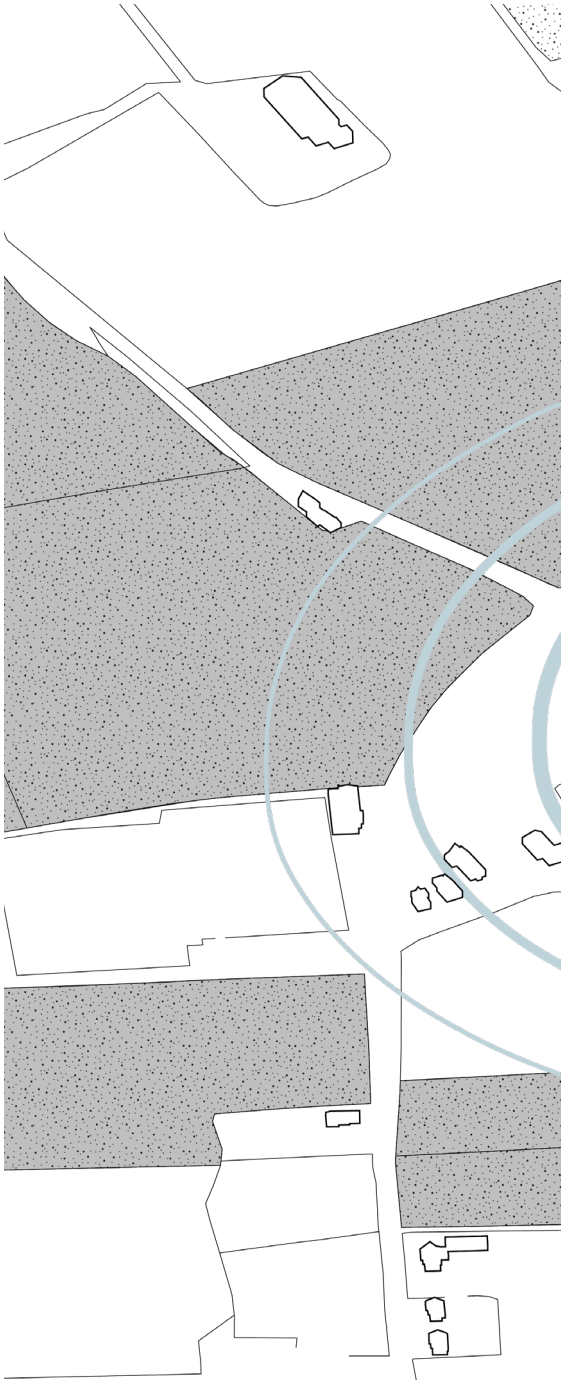
Selected households that applied for exchange relocation within voluntary compensation scheme

Households moving (to relocation clusters)

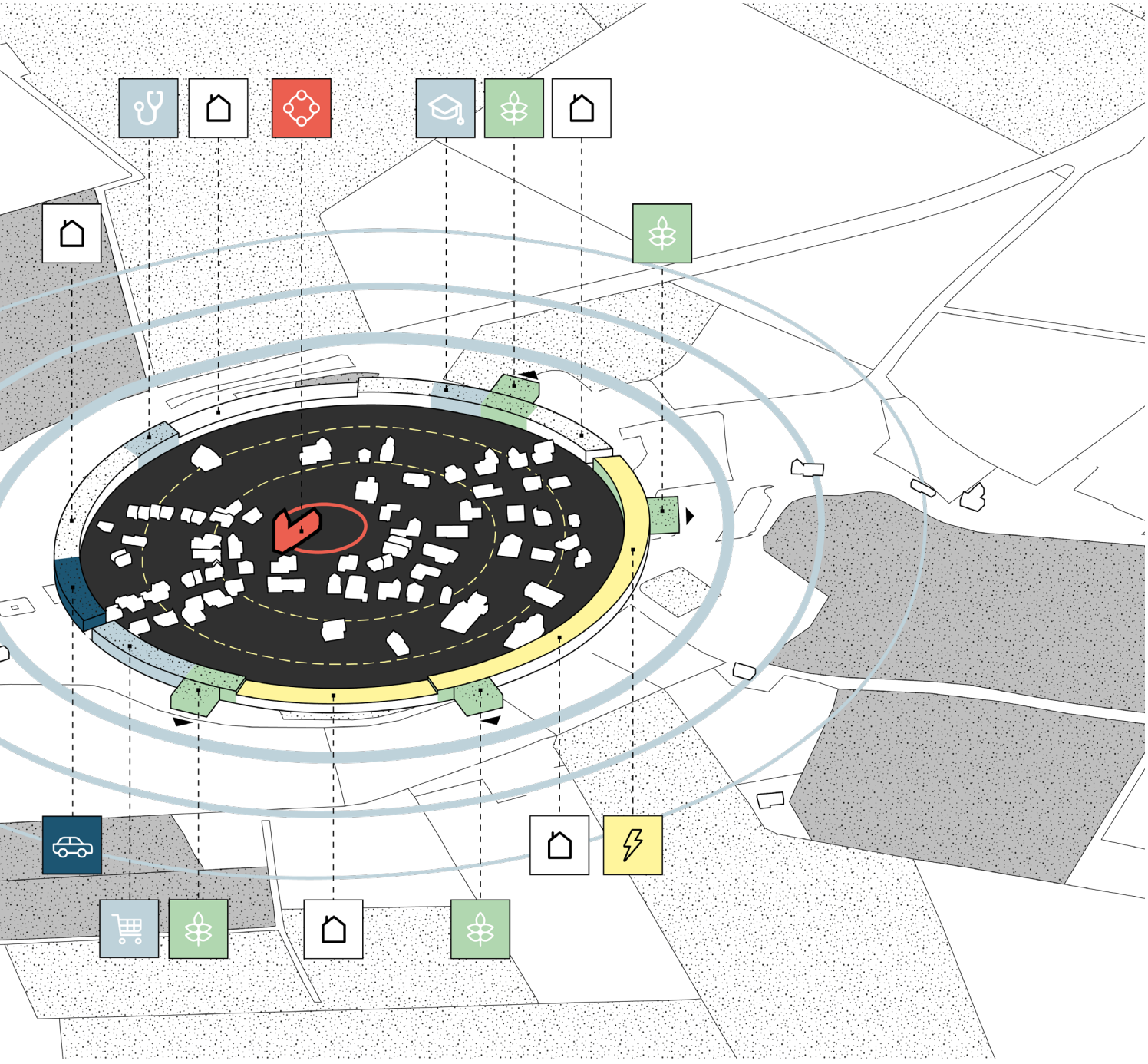


Towards self-sustainability

After the tipping point
With the tipping point reached, the system of mounds is close to being finished. With large scale retreat starting and the surrounding clusters seriously declining, the mounds start to rely on their own capacity. They offer amenities to the households that have not yet started the relocation process, or that are hesitant. This way, their livelihood is maintained to some extend.



meeting place for local community
amenities: grocery store
amenities: school
amenities: general practitioner
shared mobility hub
food production
energy production
self-sustainability initiatives
housing
saline farming



2150 (projection)

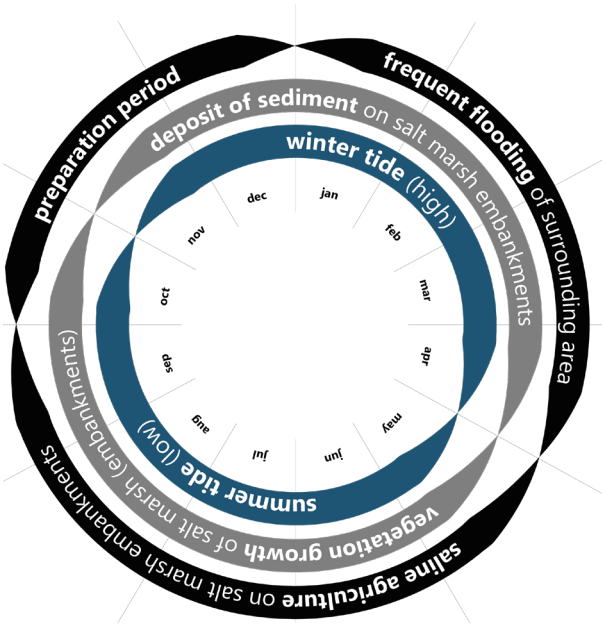
The following visionary images show what a water-retaining coast might look like in 2150, once sea-levels keep rising.

Summer
At spring-tide, which occurs twice a month, waves can overtop the dike resulting in some flooding of the coastal polders causing the deposit of nutritious sediment which is feeding the landscape.

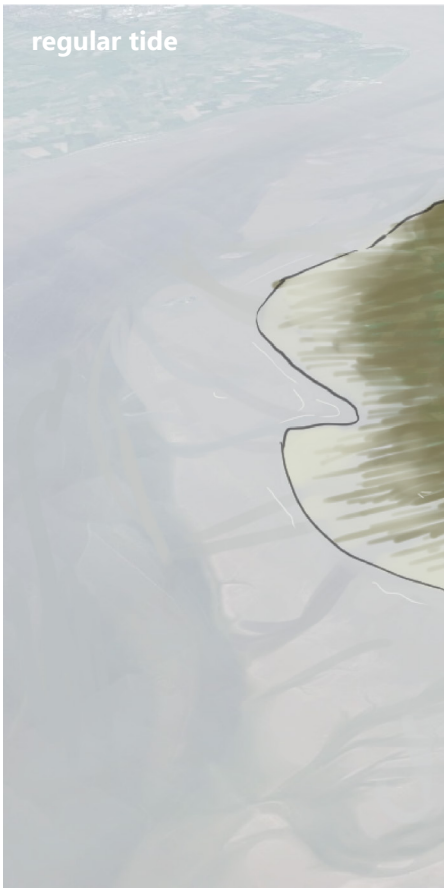
During the regular tidal differences, water will remain behind the dike. This allows salt marsh vegetation to develop and creates a habitat for all sorts of species.

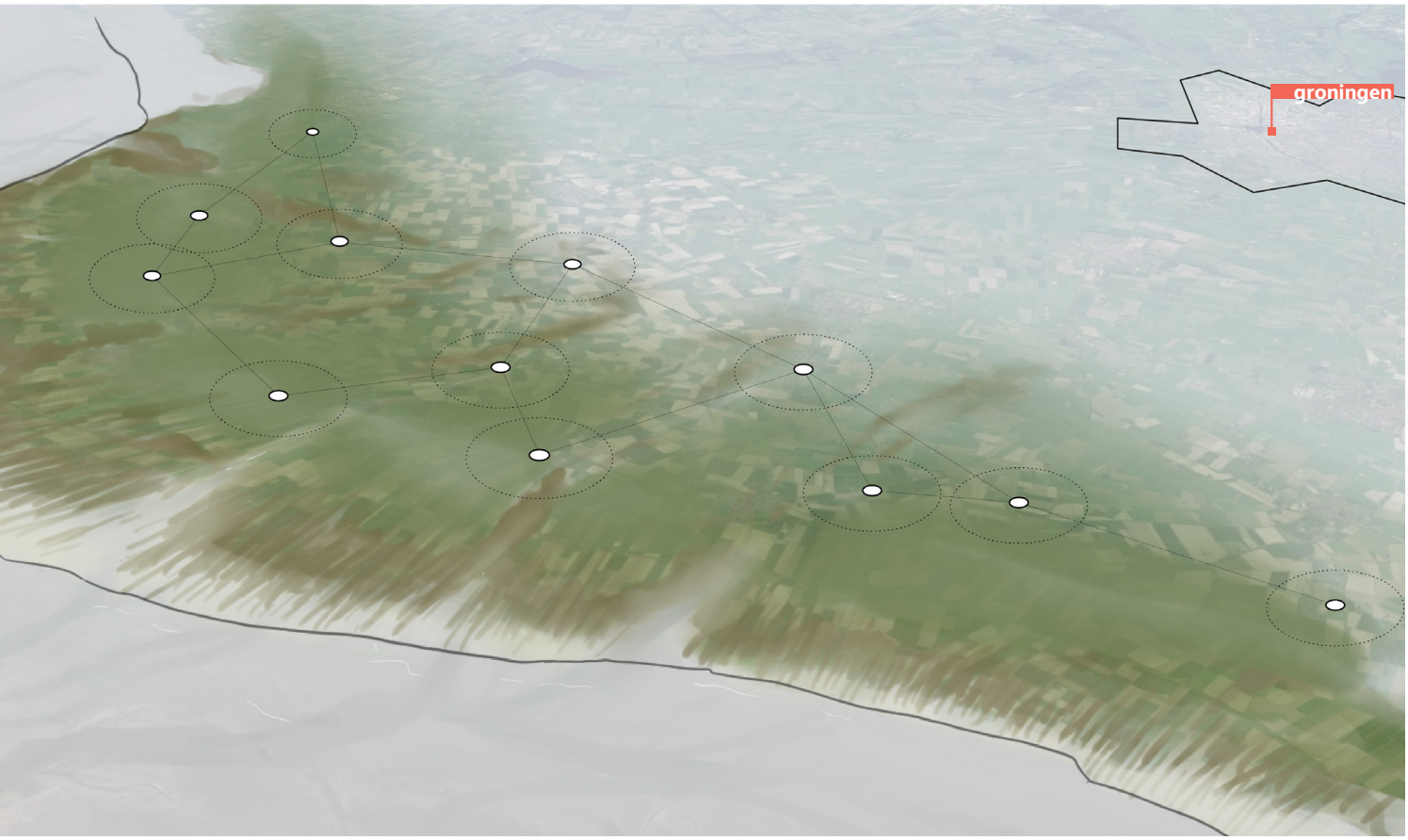
The settlements on mounds are able to live without restriction during this period. Their surrounding land can be used for saline agriculture.

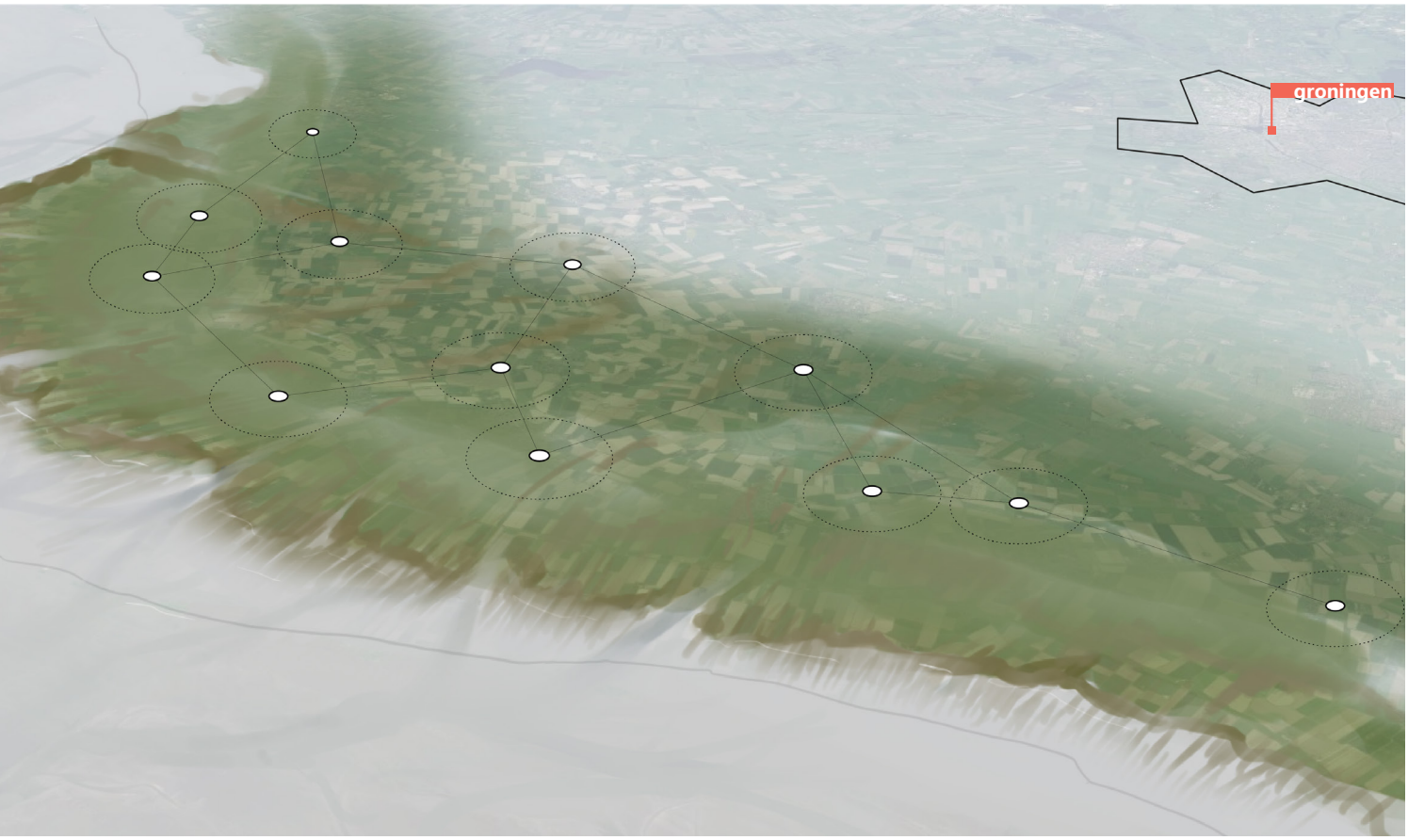
Young salt marshes (Ivo Vrancken)



mounds
salt marsh landscape
water




groningen

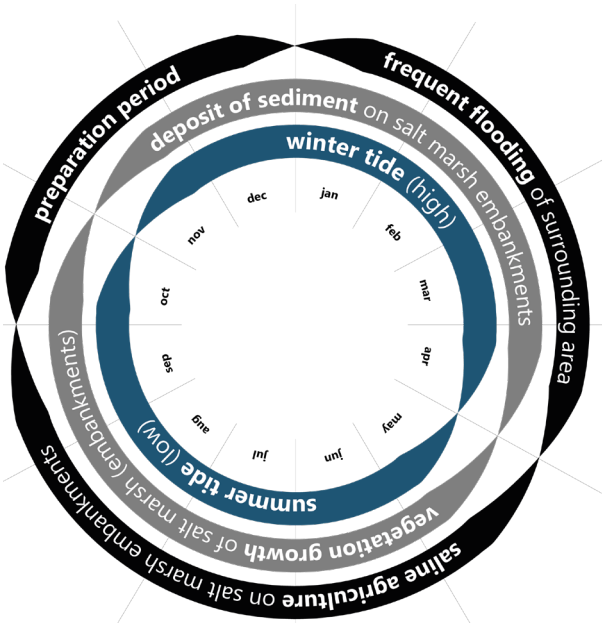

groningen

2150 (projection)

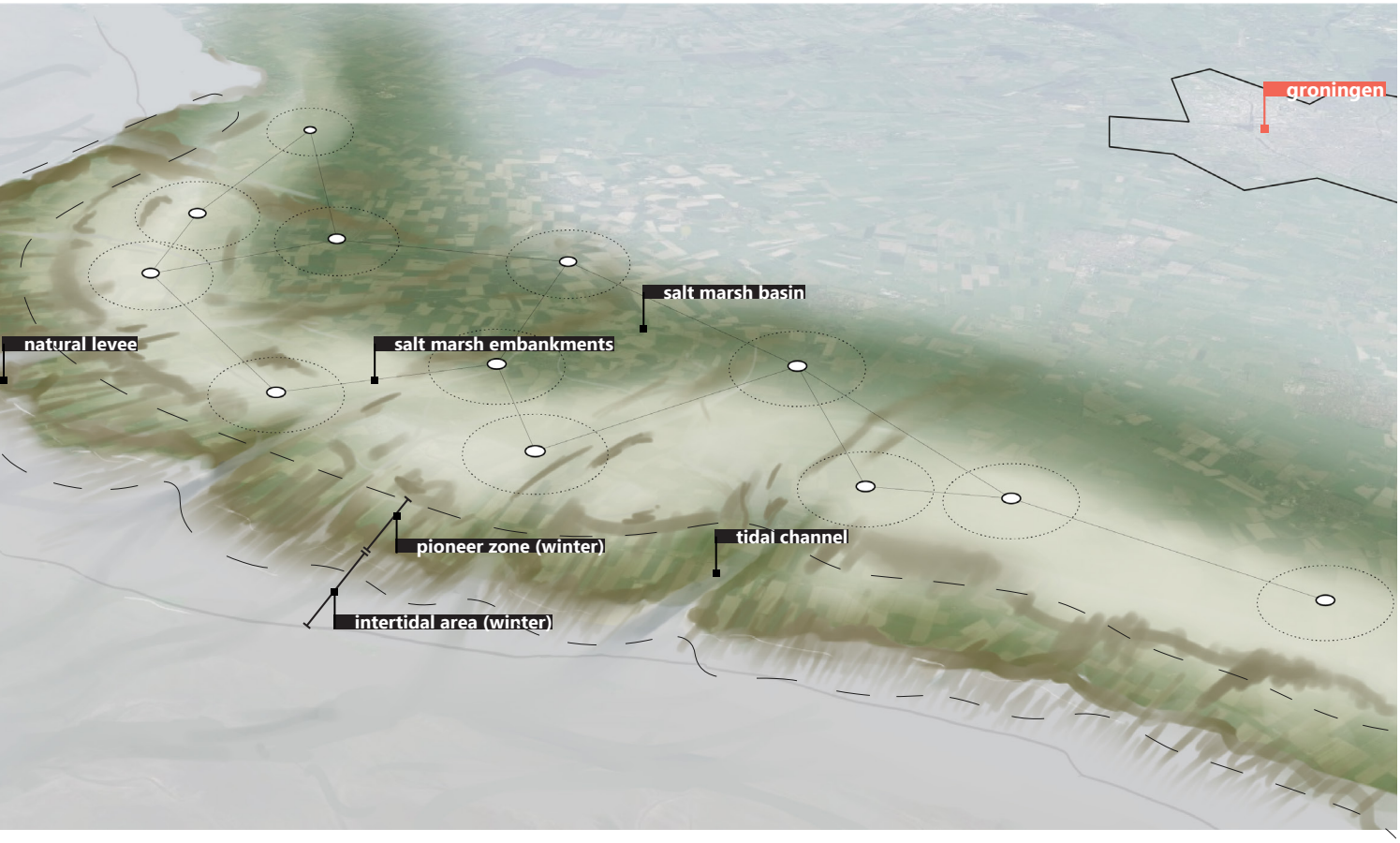
Winter
During winter, waterlevels are higher. This results in more frequent flooding of the coastal polders. The constant supply of sediment in creating a natural levee.

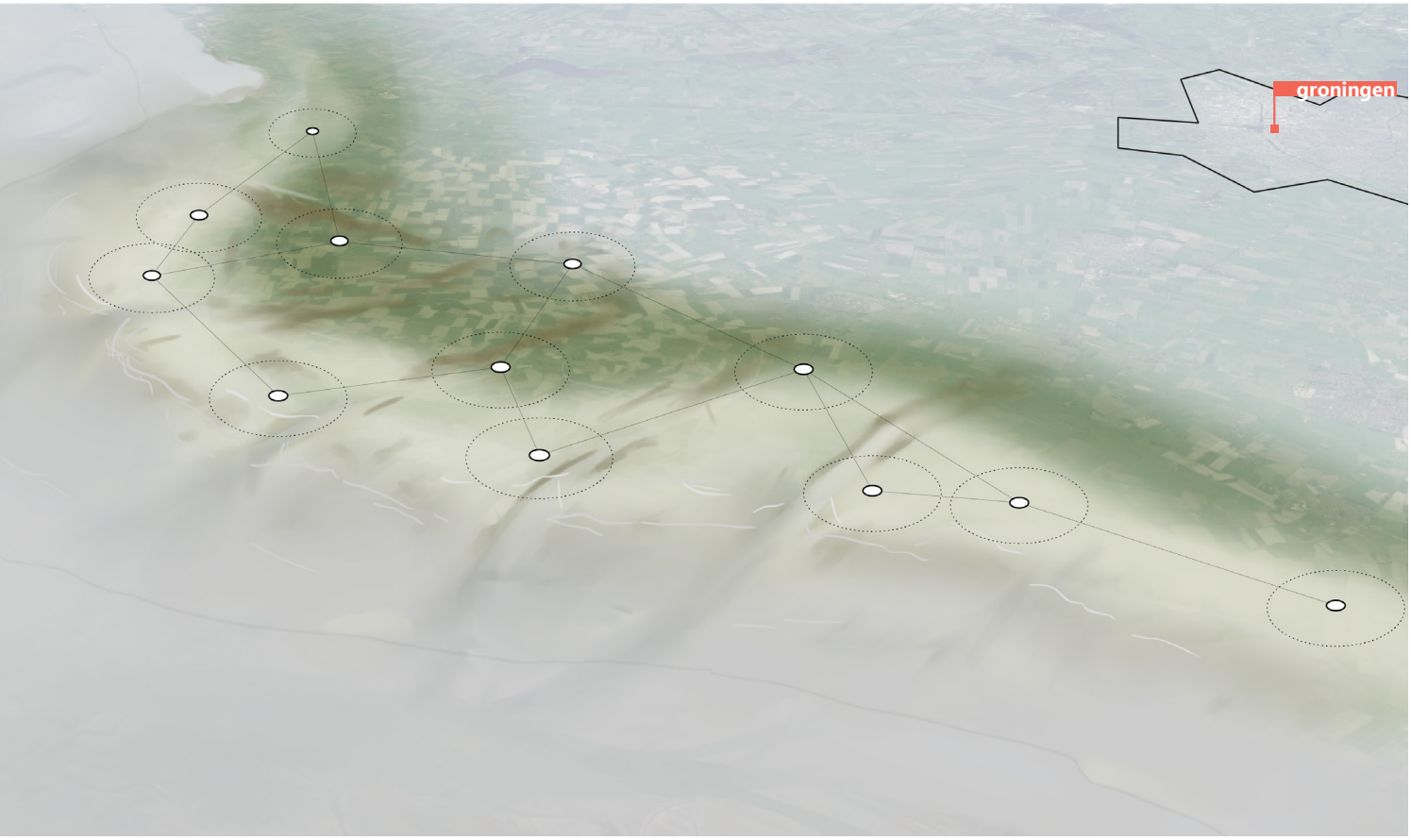
During storms or springtide water levels are highest. This allows salt marsh embankments to grow, creating a more robust landscape that can provide more protection during future storms.

In winter, the mounds are in close contact with each other. They are prepared for storms meaning they have enough supply to survive a period of harsh weather.



mounds
salt marsh landscape
water


groningen
salt marsh basin
natural levee
salt marsh embankments
pioneer zone (winter)
tidal channel
intertidal area (winter)


groningen

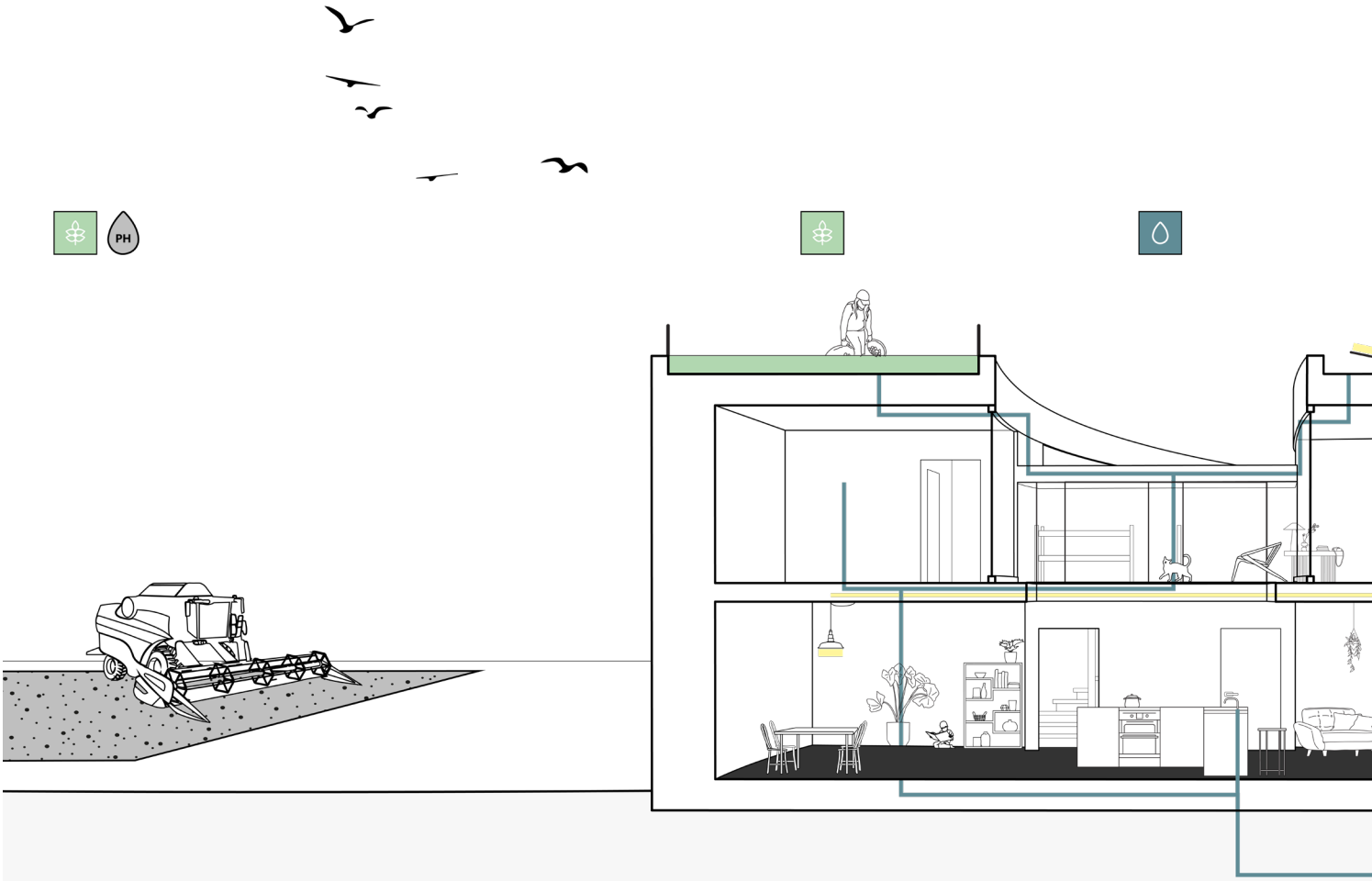
2150 (projection)

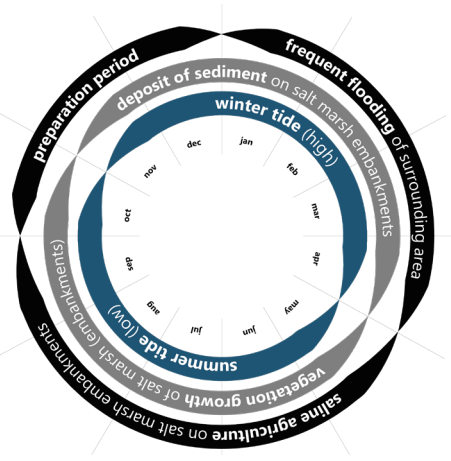
Summer
The section shows the life on the village mound. During summer, tide is low which allows for agriculture on the fields surrounding the village. The sediment that was deposited during winter tide enriches the soil, but is saline. Throughout the years, farmers of the mound have gained experience with crops on this soil, resulting in saline agriculture.

Not all crops are able to grow on this soil. In summer, the roof is partially used to produce more specific crops and herbs. Households are expected to take care of their own part.

Solar panels on the other part of the roof produce electricity for the housing and amenities found in the ring, but also for the existing buildings.

Grey, but non-saline water is captured on the roof of the ring structure. It is transported to a central point where it is purified and reused by the households in the village.



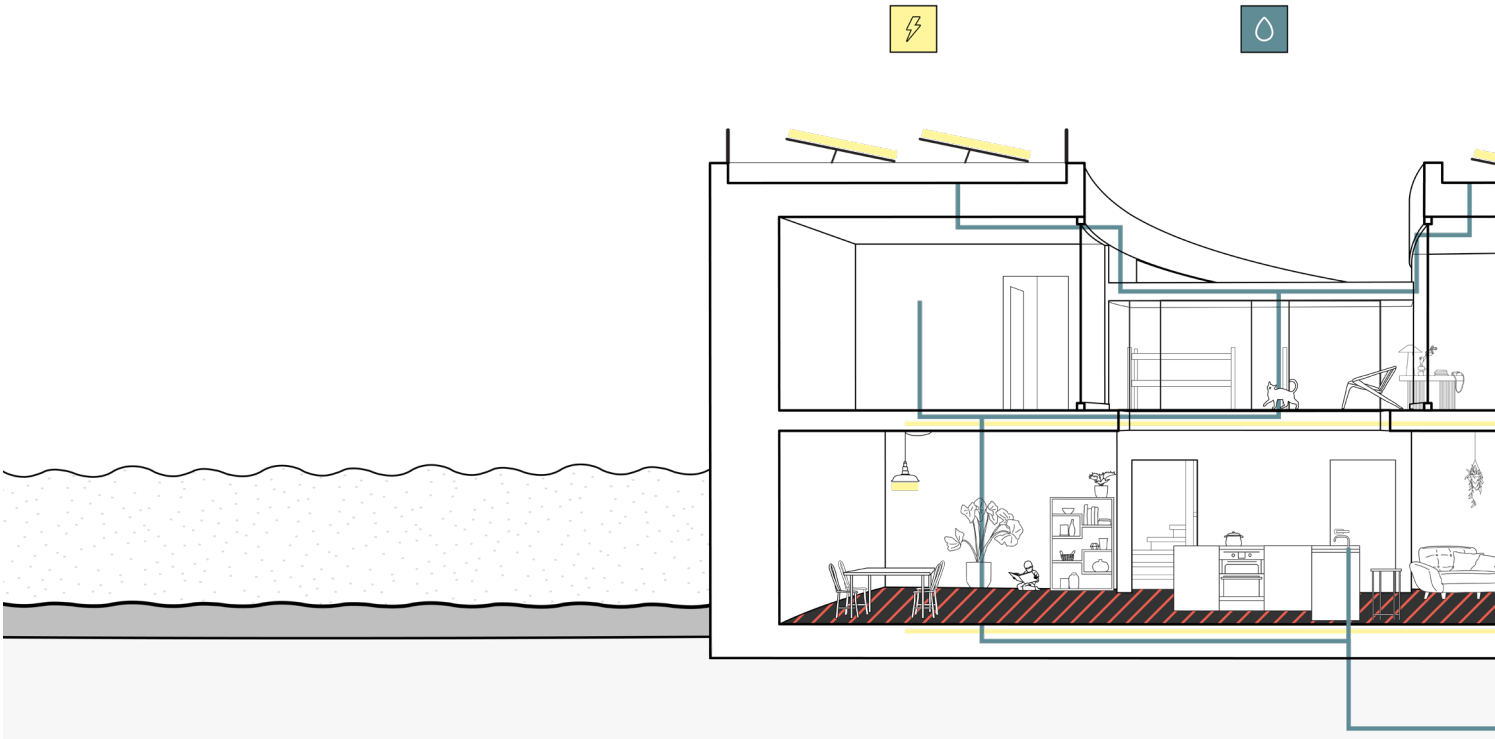

preparation period
frequent flooding of surrounding area
deposit of sediment on salt marsh embankments
winter tide (high)
summer tide (low)
vegetation growth of salt marsh (embankments)
saline agriculture on salt marsh embankments
jan
feb
mar
apr
may
jun
jul
aug
sep
oct
nov
dec

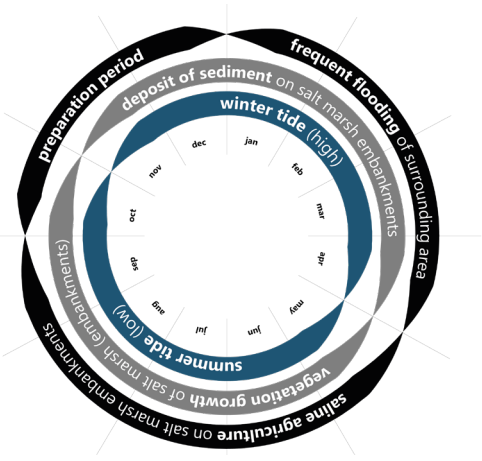
2150 (projection)

Winter
During winter, spring tides are able to reacht the walls of the protective structure. In the event of spring tide, the community on the village mound is cut off from the world, and has to rely on its own capacity.

As there is less sun, the entire roof is used for energy production. This way the demand for additional energy as a result of heating can be met.

During spring tide, sediment is deposited on the area outside of the structure, providing the soil with nutrients.

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saline agriculture on salt marsh embankments
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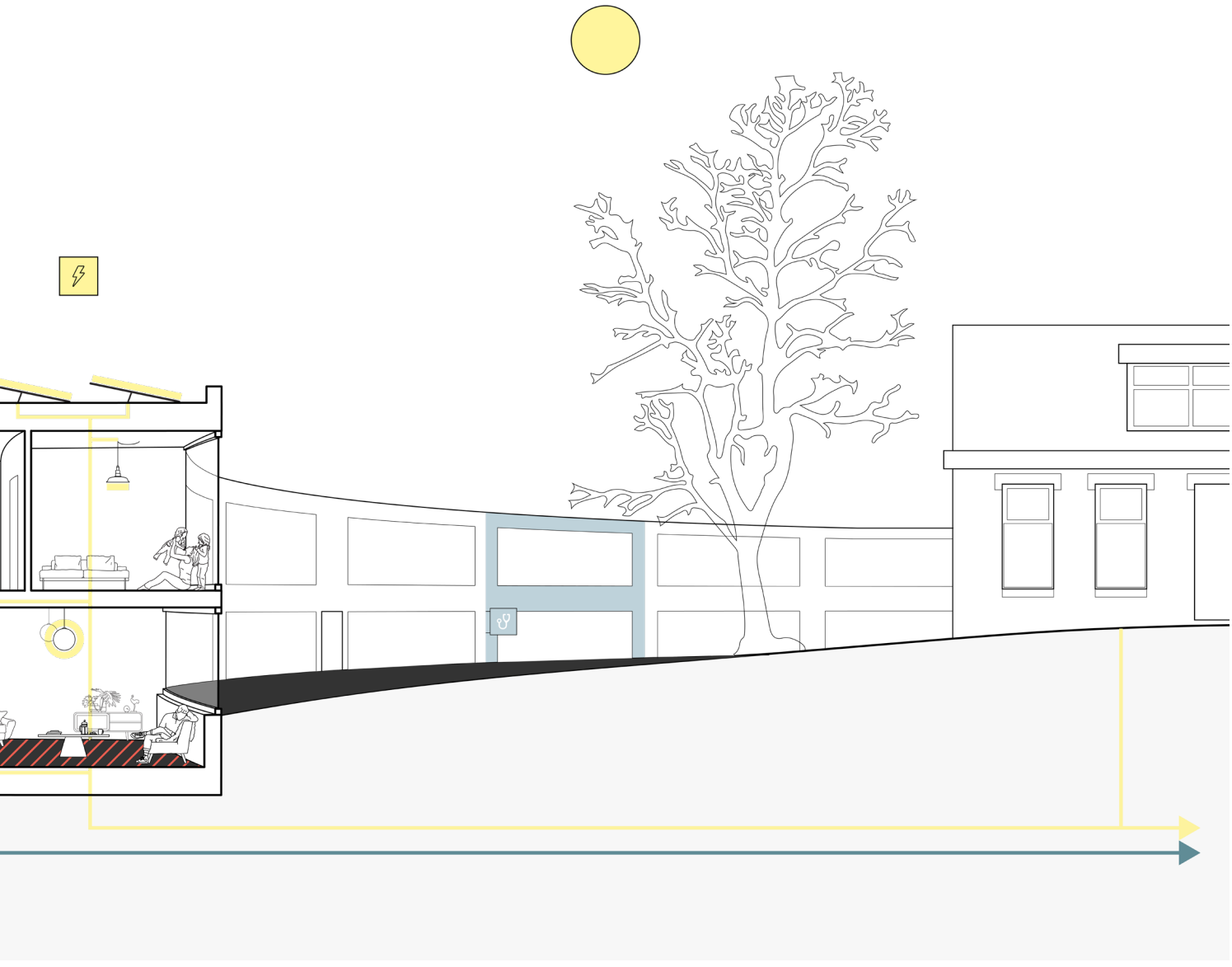

2150 (projection)
winter

2150 (projection)
summer

2150 (projection)
summer

2150 (projection)
summer

Elements
The first image shows one of the self-sustainability initiatives that originated in wave 1, before the protective ring wat built.

In the back the new structure is visible with windows overseeing the mound. The roofs are used for food production and the general practitioner is also located in this part of the ring.

The road is the main pedestrian axis of the mound and leads towards the central meeting place. It encourages encounters within the community, especially between the old village and the new structure.

Elements
The second image shows one of the openings of the ring with saline farmland on the horizon. The opening is closed off during high tide.

conclusion & ref

flection

Conclusion

The thesis is explorative in nature, and aims to create a better understanding of the problems and opportunities that arise in relation to managed retreat as transformative adaptation and its effect on the population.

The question this thesis aimed to answer is:
How can spatial planning contribute to livelihood in the context of managed retreat in the Netherlands?

Preserving livelihood is believed to be achieved by a socially just managed retreat process (procedural justice) and by creating socio-spatial justice (distributive justice).

The spatial strategy presented in this thesis was built on the notion that within pre-disaster retreat at the transformative scale, spatial planning can contribute to livelihood preservation by creating shared benefit for both parties involved; the implementing party and the households in the sending region. It can do so by building on existing trends.

The case study analysis presented empirical evidence of this notion. The four different cases illustrated how the contextual conditions influence the retreat strategies and their compensation schemes. Both non-European cases, which were conducted on the transformative scale, combined retreat with rural development goals. The corresponding compensation schemes focussed on offering guidance or facilitating assets, but did not allow voluntariness. In the post-disaster setting, targeting informal settlements, the forced nature of the retreat strategy was successful. The strategy for retreat that presented the most voluntariness consisted of a compensation scheme that focussed on creating incentive to move. The large timeframe allowed households to reach the right biographical stage, and pushed social learning and network effects. The latter did cause loss of livelihood for the vulnerable groups (lack of procedural justice). The post-disaster setting proved important in creating incentive, with flood-hazard as a push-factor. The presence of a push-factor and the possibility to create mutual gain by combining goals is especially important in the pre-disaster setting. Both these conditions rely on existing trends.

Strategy concept
The test-case was chosen on the basis of an existing trend; demographic decline. Decline is a push-factor in itself, but is also a symptom of other push-factors. In regions that are in decline, livelihood is under pressure. One of the ways in which the Dutch government aims to mitigate the effect of demographic decline is through centralisation; carefully allocating spatial resources to ensure sufficient support base even when decline continues. A strategy for retreat and centralisation can go hand in hand; creating this resilient regional configuration can be used to sustain or even improve livelihood in de regions that are currently in decline. At the same time this configuration allows gradual implementation of retreat in the future; by rearranging the size of clusters and therefore the allocation of spatial resources in relation to their proximity to the sea, retreat can be implemented while sustaining livelihood in the sending region for as long as possible. At the same time, smaller scale retreat can be used to create this regional configuration.

The chosen water management scenario illustrated a possible tipping point in 2075. The strategy deals with this uncertainty by moving towards this resilient configuration. When retreat turns out to be unnecessary, this configuration remains a no-regret measure, as it serves another purpose as well; battling the impact of demographic decline.

Instruments
The strategy makes use of a voluntary compensation scheme. This is not a buyout program, but a funding scheme in which applicants accept the given rules. The goal in a voluntary compensation scheme is to make sure the population accepts it. By introducing this scheme, households have a choice to stay or to leave but are also able to choose the right moment for relocation within the duration of the policy window. The idea is that over time a population flow will develop due to social learning and network effects caused by early relocators who are the first accepters of the voluntary compensation scheme.

The challenge of distributive justice lies in maintaining quality of life for the ones that remain in the sending region. Where this quality of life is under pressure, tools are introduced to mitigate the negative effect of the strategy. Community organizing can be used to start the dialogue on the future of the village. This can result in collective relocation, or in a move towards future where the community actively looks out for each other with the aim to stay in the sending region for as long as possible. It is then the task of the implementer to monitor the quality of life in these villages. If this reaches a substandard level, collective relocation can be the final solution. The relocation clusters are located in the outskirts of existing villages that need to grow in size to be able to fit the resilient configuration. These clusters should create pull-factors that fit the biographical stage of focus.

The trust of the East Groningers has endured a lot. This has resulted in more reliance on the community than on institutions. The centralisation strategy can worsen the situation, but also has the potential to rebuild trust. By offering a just process and mitigating the effects of previous mistakes, the centralisation strategy can make

up for this loss.

Strategy design (backcasting)
The strategy introduces three waves of 20 years. The first wave uses small scale relocation as a means to tackle the impact of demographic decline in the outskirts. It focusses on the regions where vulnerability is high, and will become more vulnerable in the future; regions with a high concentration of young and frail elderly. The relocation clusters provide the appropriate pull-factors for this target group. Senior living communities can offer future proof solution in relation to health. Located close to amenities and in connection with a central healthcare institution (potentially in a bigger cluster), the community allows vulnerable residents to look out for each other. The first wave familiarizes the sending population with a voluntary compensation scheme for relocation. In addition to this, it is a way to experiment with relocation as a tool, and to find out what works best for the affected population.

The second wave focusses on creating controlled decline along the coast while maintaining the size of supporting clusters. It is likely to create a larger population flow due to social learning and network effects. It will therefore put more focus on the growth of the relocation clusters, and ultimately the movement towards the resilient configuration. The relation between the biographical stages of focus, the young elderly and the young adults, creates another potential for the relocation clusters; multigenerational living communities. This way the intergenerational relation, limiting or stimulating, can be used to increase incentive to accept the voluntary compensation scheme.

From the second wave onwards, the High East is presented as additional relocation option within the voluntary compensation scheme. This is done to start collaboration between the sending and the High East in case of larger scale retreat after the tipping point.

The third wave tackles the relocation of people inside the clusters. It depends largely on the success of the previous waves. As relocation remains voluntary, it is difficult to predict to what extent the centralisation has developed. Clusters that are no longer supporting the surrounding region on a large scale will be affected by the third wave. This will reduce the size of clusters closest to the coast and therefore aid the movement towards the hierarchical spatial configuration that is required.

Throughout all three waves there is also the option to relocate to historical dwelling mounds. In contrast to supporting decline in villages close to the coast, dwelling mounds in the coastal region should become resilient settlements that can sustain themselves (and each other) once retreat is implemented. In addition to this they should, as the coastal region keeps declining, be able to facilitate people who choose to stay in the sending region; they become the new clusters. For the dwelling mounds exchange relocation is used to swap a household on the mounds that wishes to accept the voluntary compensation scheme with a households that wishes to be part of a self-sustaining community. This way, the community on the mound is slowly increasing its sustainability capacity, mobilizing the existing residents.

The role of spatial planning
Transformative retreat in the pre-disaster setting asks for a shared benefit. Spatial planning can provide this shared benefit, and thereby limit the effect on livelihood. This is done by allocating spatial resources in both the sending and the receiving region;

In the sending region, the role of spatial planning is to use existing trends, and the corresponding regional development to create a resilient regional configuration that can ensure quality of life during the implementation of retreat in the future. In the example presented by this thesis, this trend was demographic decline.

For the receiving region the role is to create the pull factors that relate to the sending population. In the first phase, the focus should be on the vulnerable groups, as they are less likely to be able to cope with demographic decline as a result of the implementation of retreat.

Recommendations per actor

National government
The national government has to be proactive in dealing with the uncertainty of climate change in order to limit the impact at a later stage. They need to take extreme SLR into account and have to make regional priorities in order to stimulate settling of the population in areas above sea-level. They have to do so by making use of the amount of time that is available and by embedding retreat in existing national and regional spatial plans.

In addition to this, the government has to look into a fit compensation scheme that deals with climate change adaptation specifics. The scheme has to focus on creating understanding for the adaptation measures, and ultimately on creating incentive to move. This proactive approach can sustain voluntariness troughout the retreat process; the large timeframe allows an element of choice (timing), familiarization, and the opportunity to create trust and reliance.

Deltares (research institute)
Research on the future of flood defence in the Netherlands should incorporate the human impact of

Conclusion

retreat; particularly which measures can be taken now to reduce the impact in the future. By researching cases of retreat and monitoring the implementation of retreat measures in the Netherlands, Deltares can expand its role as a government advisor.

Local government
Within climate adaptation measures, the local government needs to function as the link between national policy and local impact and therefore plays a crucial role in creating tailor-made strategies for socially just retreat on the local level. They do not only have an executive role in relation to social management, but should also monitor the impact of the implementation.

Vulnerable groups
Specific attention should be paid to the vulnerable members of the population, as this group is less self-reliant and is therefore more likely to be impacted negatively by a voluntary compensation scheme. By focussing on existing community structures (e.g. villages) and extensive locally implemented social management, these groups can be guided through the process, and make a considered choice.

Autonomous movers
Autonomous movers are easily motivated and important for a succesful retreat strategy. Providing the right pull-factors (e.g. relying on biographic stage) might be enough to start a migration flow.

Settled
The settled are reluctant to move due te place attachment but may be influenced by social learning and network effects. By implementing a voluntary compensation scheme in regions with large homogeneous groups (e.g. biographic stages), this process is more likely to occur.

Dutch population as a whole
The Dutch population that lives below sea level should have a greater sense of what this means in relation to climate change. They must not back away from conversations about the future of the coast. This requires flexibility and understanding, which can be created through a slow introduction to retreat as a measure in flood defence.

Reflection

The strategy that was proposed is the result of backcasting from a probabilistic water-management scenario. It is an exploration rather than a real life proposal and presents subjects of discussion.

Voluntariness
The degree of voluntariness presented by the strategy is questionable. Focussing on social learning and network effects actually means that people are forcing each other to move, rather than being forced by the government. In other words, making this compensation scheme voluntary does not mean there is no impact. People that decide to stay but see their neighbours leave might still have their connection to their physical and natural environment, but lose their social ties.

In addition to this, the affordability of this voluntariness seems a problem. Although a voluntary compensation scheme is less costly than a buy-out scheme, it still requires enormous amounts of money considering there are more than halve a million households in the sending region. Once a household applies for the compensation scheme, there is already a motivation to move. The voluntary compensation scheme can be seen as an extra incentive. One can argue that, by focussing on the right biographical stages and creating their corresponding pull factors in the receiving region, the same population flow can be initiated without or with limited use of a compensation scheme. In this case, the nature of the movement is voluntary, autonomous migration.

An example of creating a large scale migration flow is the urbanisation of Flevoland, a Dutch province created through the reclamation of land from the former South Sea. In 1940 the reclamation started. From the 1947 onwards, the first residential clusters developed which are similar to what the research refers to as relocation cluster. Due to the redevelopment of a large part of the city of Amsterdam, there was a housing shortage. Flevoland could offer spacious housing for the city dwellers, which created a migration flow towards the new province. In the meantime there have been periods of out-migration, but right now Flevoland has a population of more than 400.000. For further research, the recommendation is to look into a more significant role of the receiving region in the story of retreat in which the goal would be to create a spatial strategy focussed on voluntary migration which would make large scale implementation of a compensation scheme avoidable.

Ethical dilemmas
"Tackling the climate crisis requires a global transition that must be implemented locally. How do you ensure that you involve people locally in a global crisis?" (Vlaanderen, 2021)

This is a quote from Kees Vlaanderen, a film-maker who covered the placement of a large wind turbine park in East-Groningen and, more importantly, the impact this has on the population. It covers the issue of a greater-good dilemma; pushing something that affects one area negatively, but creates benefits for a larger region. It is something that is increasingly relevant for a country that is trying to adapt to a changing climate.

Groningers are very familiar with the greater-good dilemma. They have often been subjected to negative effects as a result of the focus on the national economy. The most recent and prominent example of this is the gas extraction crisis which resulted in earthquakes and subsidence. This loss of livelihood also contributed to the demographic decline in the region. In other words, the current status of Groningen is not just a result of trends, but resulted from profit-driven governmental decisions of the past. Using this status as a means to legitimate retreat in Groningen and introducing a strategy that once again has an impact on the livelihoods of Groningers while benefitting the rest of the country, is likely to result in well-founded extreme opposition. The appreciation of the living environment is complex and difficult to capture. It does not only rely on biographical stages. It is about attachment, a feeling of home and being rooted in a place. Although the strategy aims to preserve livelihood for the Groningers the handling of the gas extraction damages showed the amount of psychological stress that can result from households having to deal with uncertainty.

Methodology
As the nature of the thesis is explorative, a research by design approach was used. The parameters for the design were set by a literature study and case study analysis. This resulted in a strategy concept which was then projected on region, north-eastern Groningen. Ultimately, a technical design tried to translate a specific aspect of the strategy that was developed on the local

scale. The combination of these elements worked well to support the explorative nature of the project. In the end, designing a relocation cluster rather than a dwelling mound might have been the better choice, as it would have been able to provide more in-depth information on the local implication of the strategy.

The methodology used biographical stages as a means to identify reasons to move. Although this resulted from the case study analysis, the appreciation of the living environment is not limited by biographical stages. Towards the end of the project a different framework was found that, in the end, might have been more applicable. It consists of the drivers of migration (Black et al., 2011). For further research, this framework can offer a more in depth analysis.

Data
As the research was not determined by administrative borders, the project refrained from using any in the mapping analysis. Grids were introduced from both 10 and 1 km depending on the scale that was covered.

A lot of the datasets that were used were categorized by municipality, district or neighbourhood. These datasets were extrapolated in Qgis in order to fit the grid. Due to the difference in district sizes, the accuracy differs slightly throughout the grid. In order to mitigate the impact these inaccuracies on the outcome of the strategy, these locations were not used to zoom in on.

The people that were interviewed were all met during the same occasion; an art festival in North-Eastern Groningen. In order to make sure the group would still be diverse there was a focus on finding people with different biographical stages and from different villages. In the end, this resulted in what a diverse group of people who all had different stories and could therefore highlight different aspects of the strategy. The only thing they had in common was the appreciation for the way the festival created more commotion in the otherwise quiet region.

Generalisation
The societal impact of development related to climate change adaptation is a relevant topic. As the extent to which the climate is changing becomes more clear, the effect it will have on the livelihoods of the Dutch population will increase. As mentioned in the paragraph about the ethical dilemma, the challenge is to involve people locally in this national (or global) transition. The research can add to the discussion on how the long-term perspective of spatial planning can mitigate the impact of adaptation measures on the population. This can start with the discussion where to allow, but particularly where not to allow urbanisation.

In addition to the sending region, the research has proven that it is relevant to start the dialogue on role of the high east in the implementation of retreat. A timely response allows the creation of pull-factors, which contributes to the voluntariness involved in the strategy, and ultimately the preservation of livelihood for the sending population. This dialogue can start with thinking about making land-use reservations.

Personal experiences
Although I expected the graduation year to be a challenge, I was overwhelmed by the way this project took hold of me. Having no experience with the duration of the project and the sheer scale of the subject I tried to cover, I found myself struggling to maintain overview of my project. The lack of structure caused by the explorative approach to my research was not beneficial. However, it did allow me to go outside of my comfort zone and be fascinated by the individual parts of the project.

The anthropological aspect is what particularly interested me; trying to understand the local impact of government policy, and thinking about the ethical dilemmas that surfaced during of the project. Dealing with this sensitivity and speaking with actors is something I have realized I am interested in. I enjoyed getting to know the Groningers. I visited the festival Hongerige Wolf where I met people who create activities for locals to increase liveability in their living environment and to show visiting Randstedelingen just how beautiful their rural area is.

On the other hand, this sensitivity was also the challenge of my thesis. With a project on this scale, a certain abstraction is necessary. Trying to maintain this abstraction while questioning the local impact on the population kept persuading me to think about the smallest details of the project. It took a long time for me to realize that this was the problem I was running into. In the end, I think I would have benefitted from having a more clear research structure as it would have allowed me to spend my time more efficiently.

Something else that I learned, is how much I value working in a group. It is the thing I have missed the most this last year. As the first year of the masters showed, being able to share thought and discuss each other's work is something that works well for me. It allows me to structure my thoughts and learn from my peers.

Start of theater performance at Hongerige Wolf festival (Gerty)

Theater performace ‘De Tijdreizigers’ at Hongerige Wolf festival (Gerty)

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