Connected Futures:

A People-Centred Vision for Energy and Mobility Transition in Zeeland

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Mobility Transition in Zeeland

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ABSTRACT

Zeeland offers significant opportunities for a sustainable energy transition. However, Zeeland is often treated as "the battery" of the Netherlands, supplying energy to more populated regions while receiving fewer resources in return. The province is also physically and socially disconnected, both from the rest of the country and internally, which results in a strong dependence on car-based mobility. This makes for the main spatial tensions of Zeeland's future: accessibility, industrial activity, and its fragmented energy landscape.

This strategy addresses the question: How can endogenous renewable energy production in Zeeland be spatially structured to support sustainable industry and mobility transition across its communities? Our theoretical framework is grounded in socio-environmental spatial justice, with a focus on distributional, recognitional, and operational dimensions.

The proposed vision organizes renewable energy into clustered landscapes located near industrial sites, supported by an expansion of offshore wind to minimize landscape disruption. To improve accessibility and local energy production, an integrated hub system is introduced, combining shared mobility and public transport to connect dispersed villages with larger cities while embedding energy systems within mobility infrastructure. New forms of renewable energy, such as tidal and kinetic energy, are incorporated in existing infrastructure, and industries are encouraged to adopt more sustainable practices.

It is important to understand how landscapes, like the one in Zeeland, can adjust and contribute to the energy transition, without overpowering the landscape and respecting its communities. It teaches us how to not only view the energy transition as a technical challenge, but also a social one. The energy transition can contribute to increasing the accessibility of a disconnected area. This strategy can help designers understand how to include the voices of communities and stakeholders in designs.

Keywords: *Energy transition, Endogenous energy production, Zeeland, Socio-environmental spatial justice, Accessibility*

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Glossary

Socio-environmental spatial justice
The fair distribution of environmental benefits and burdens across a geographic area, ensuring all communities, regardless of location, have equal access to clean energy, mobility, and decision-making power.

Fragmented landscape
A landscape broken into smaller, isolated patches by infrastructure (roads, industry, or energy grids), which can obstruct ecological connectivity and social cohesion.

Car slaves
A term describing individuals or households forced into car dependency because alternative transport options (like public transit or cycling) are unavailable or insufficient in their area.

FLEX system
A flexible approach to energy or transport management that adjusts supply, demand, or routing in real-time to maximize efficiency.

M.E.H.
Mobility Energy Hub: a physical location that integrates transport services (like shared bikes or cars) with energy infrastructure (such as EV charging and local energy storage).

M.R.E.Z.
Multiple Renewable Energy Zone: Designated geographic areas where multiple forms of renewable energy, such as wind; solar, and potentially hydrogen, are co-located to optimize land use and grid connections.

Endogenous energy production
Generating energy using local resources found within the community or region (e.g., a local cooperative's wind turbine) rather than importing energy from outside. This works two ways, so also not exporting all the produced energy out of the region.

Energy transition
The structural shift from fossil-fuel-based energy systems to renewable sources like wind, solar, etc.

Mobility transition
The shift away from private, fossil fueled engine vehicles toward shared, electric, and active transport modes (walking/cycling).

Transitional communities
Local groups or neighborhoods that are actively participating in or being reshaped by the shifts in energy and mobility systems.

Shared mobility
Transportation services that are shared among users, such as bike-sharing, car-sharing, or on-demand shuttles, reducing the need for private ownership.

Stakeholders
Any individuals, groups, or organizations (such as residents, local government, or the North Sea Port) who have an interest in or are affected by a project.

North Sea Port
The cross-border, 60-kilometer-long, port area spanning from Ghent in Belgium to Terneuzen and Vlissingen in the Netherlands.

Omgevingswet
The Dutch Environment and Planning Act, designed to simplify and merge various laws for the physical environment into a single legal framework.

Borsele vs Borssele
A local distinction; Borsele (one 's') refers to the wider municipality, while Borssele (two 's's) refers specifically to the village within that municipality.

01 Context

Introduction

The global shift towards sustainable energy systems has become an urgent priority. It is no longer driven simply by climate concerns, but also by geopolitical uncertainty and the simple reality that fossil fuels are finite. Formed over geological timescales, fossil fuels are a depletable, non-renewable resource that cannot be replaced within human timeframes. Accelerating mitigation is therefore essential, not only to limit global warming, but also to reduce the spatial and social risks that climate change brings to places and communities. Recent geopolitical tensions have also exposed how fragile energy supply chains can be, strengthening the strategic case for faster deployment of cleaner and more resilient energy technologies (IEA, 2024; IRENA, 2024).

Within this wider transition, the Dutch province of Zeeland provides a particularly relevant case study. Zeeland hosts nationally significant energy infrastructure and sits at a key interface: it connects offshore energy production to onshore transmission networks, while also supporting energy-intensive industrial demand. This concentration makes the energy system highly visible in space, through corridors, landfalls, substations, and industrial landscapes, and it places Zeeland on the frontline of national energy ambitions. Yet it also raises difficult questions about fairness. Who benefits from this infrastructure, and who carries its burdens? In this sense, the energy transition should not be understood as a purely technical substitution of fuels and technologies. It is also a geographical process that reorganizes where energy is produced, how it is moved, and where its impacts are felt, reshaping landscapes as well as place-based economies (Bridge et al., 2013).

Zeeland's socio-spatial conditions further complicate how the transition unfolds on the ground. Research on transport poverty in the region shows that in peripheral rural contexts, everyday life is strongly shaped by private-car dependence. This dominance of car-based norms influences how people experience accessibility and can deepen exclusion for those who have limited mobility options (Pot et al., 2020). Demographic dynamics add another layer of pressure: regional forecasts and monitoring point to longer-term trends of population ageing and the outmigration of younger people for study and work. These trends can weaken local adaptive capacity and influence how transition costs and responsibilities are distributed across the population (PBL & CBS, 2022; ZB Planbureau en Bibliotheek van Zeeland, 2018). At the same time, planning documents note that traditional public transport in Zeeland is under strain, which can intensify broader challenges of accessibility, participation, and everyday connectivity (Provincie Zeeland, 2022).

Institutionally, Zeeland's energy transition is shaped by multi-scalar governance, where national climate and grid objectives intersect with regional strategies and local planning concerns. Importantly, RES 2.0 Zeeland frames the transition explicitly as a whole-system challenge and emphasizes societal involvement and stakeholder collaboration as essential conditions for implementation (Provincie Zeeland, 2025). This reinforces the need to treat the transition not only as an engineering challenge, but as a socio-spatial transformation that must be negotiated in place: with attention to local landscapes, everyday life, community well-being, and legitimacy.

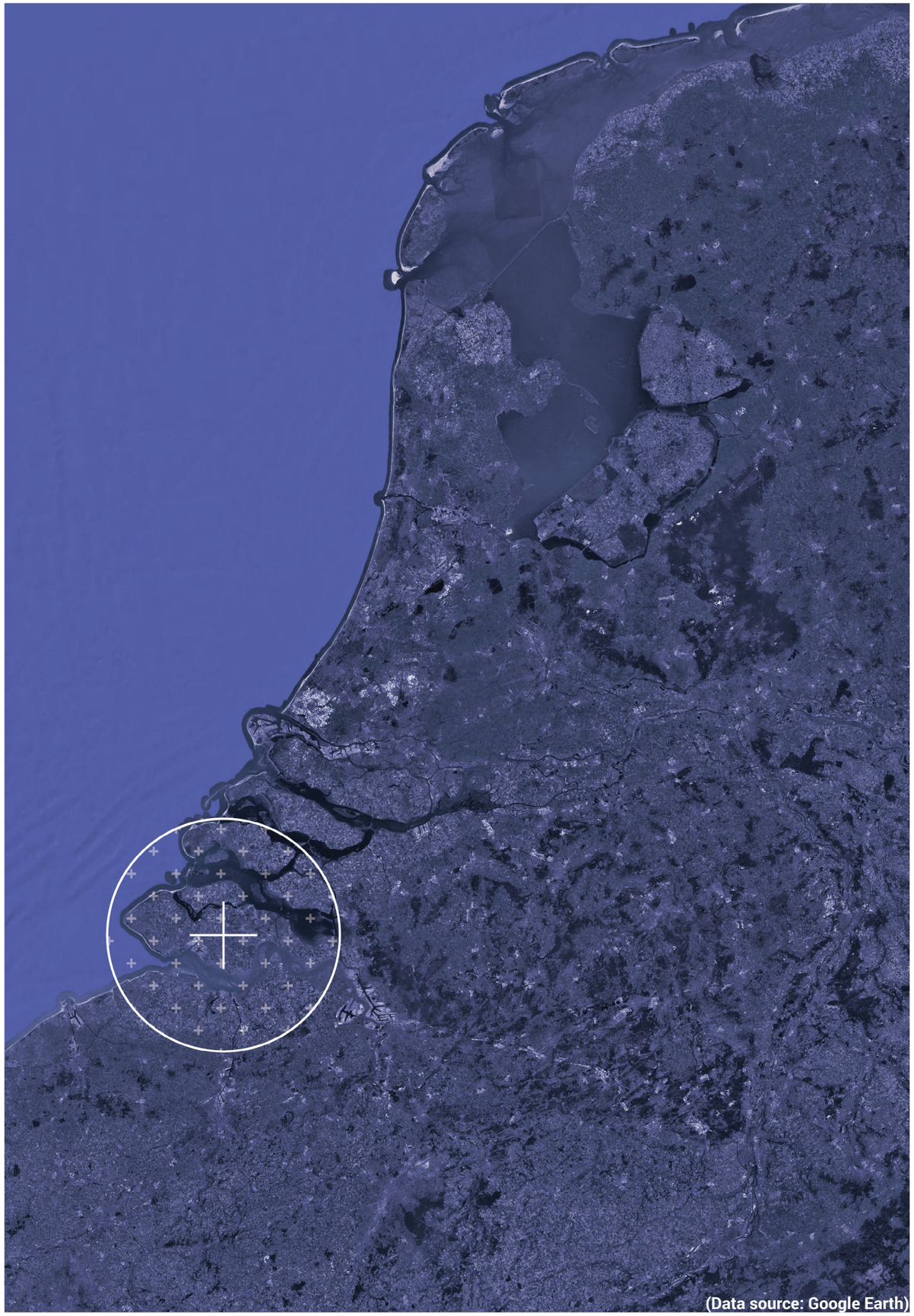


Figure 1.1- Aerophoto of Zeeland's location

Fieldtrip

Our field trip began by train from The Hague and Delft to Middelburg. From there, we rented a car, temporarily adopting the everyday reality of the region's car-dependent population. We then travelled through Vlissingen, its port area, Borssele, and finally reached Terneuzen(see Figure 1.2). During our time in the main urban centres, we observed the presence of energy production installations embedded within or close to residential areas, yet accompanied by limited and fragmented mobility connections. A striking contrast emerged between the urban settlements and their surrounding industrial landscapes, revealing a highly distinctive and uneven energy geography. At the same time, Zeeland demonstrates significant potential for water-based energy systems, particularly in areas such as Vlissingen and Terneuzen, where proximity to coastal and industrial infrastructures creates opportunities for innovation.

Through our interviews with local residents, we gained valuable insights into their lived experiences, concerns, and expectations (see Figure 1.2). Mobility proved to be a central issue, strongly shaping everyday life and access to work and services. At the same time, attitudes toward the energy transition appeared ambivalent. While many residents expressed resistance to further industrialization, pollution, and the expansion of the cooling towers, there was also a noticeable sense of passivity or uncertainty regarding their role in shaping future developments. This reflects broader challenges related to public engagement and the social acceptance of transition processes.

Overall, the key outcome of our field trip is the recognition of Zeeland as a fragmented landscape (spatially, socially, and infrastructurally). This fragmentation is reflected in Figure 1.2, which illustrates the disconnection between energy production, mobility networks, and local communities, as well as in the uneven distribution of benefits and burdens. These observations reinforce the need for a more integrated and spatially just approach to the energy transition, one that better connects infrastructure, supports local accessibility, and actively involves communities in shaping their future.

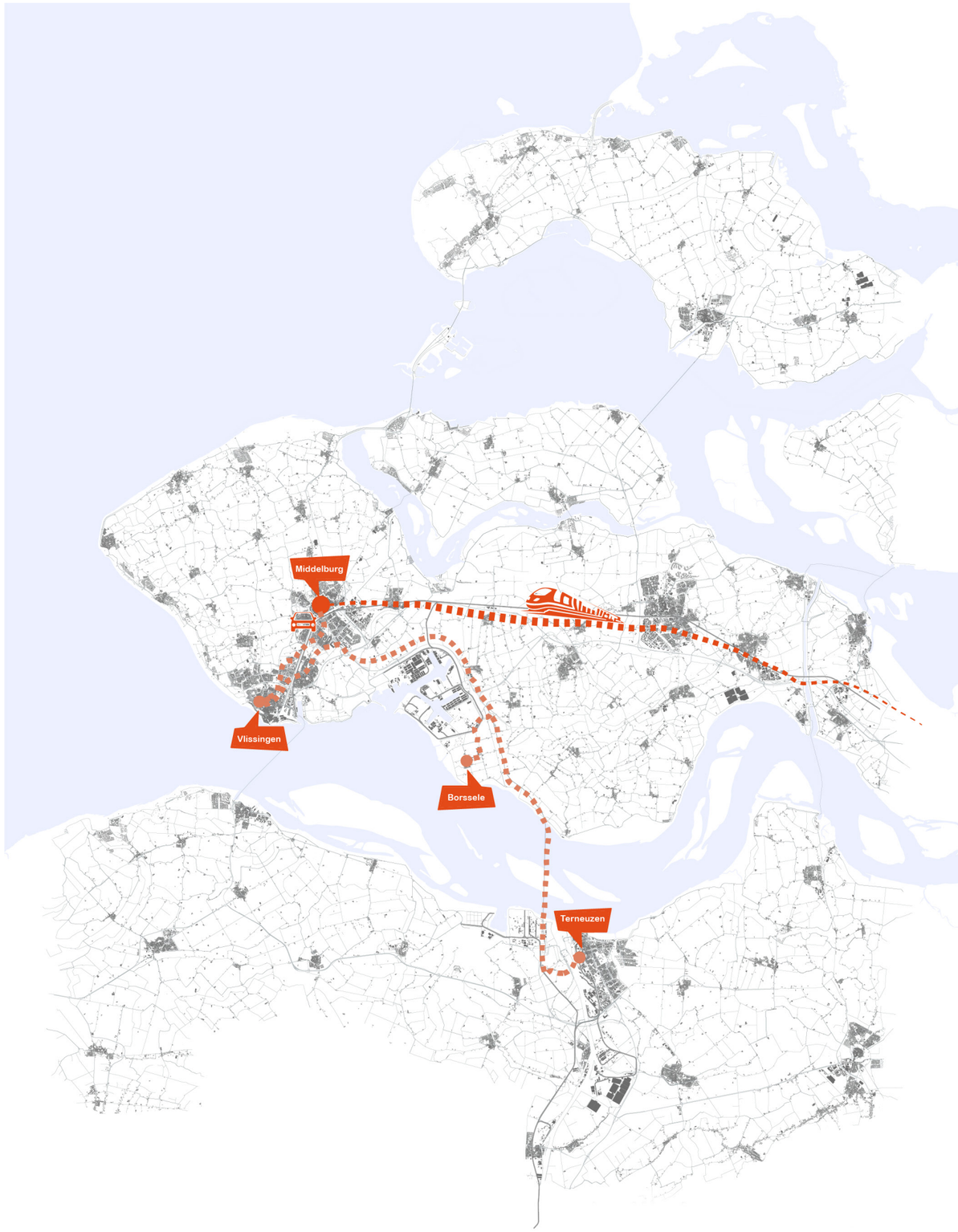
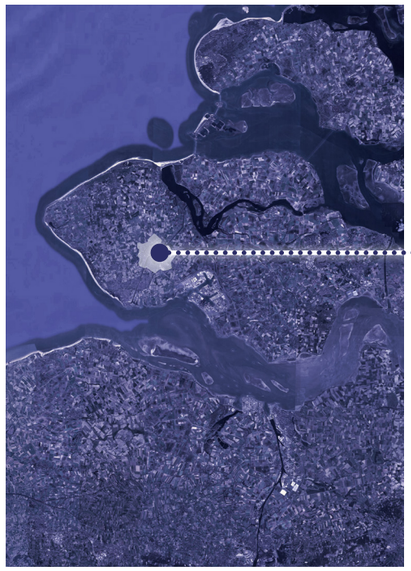
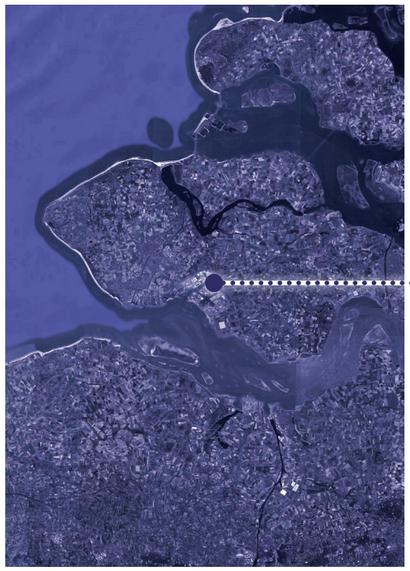


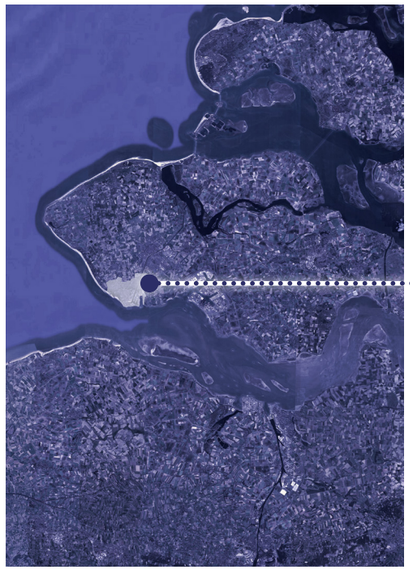
Figure 1.2-Fieldtrip map



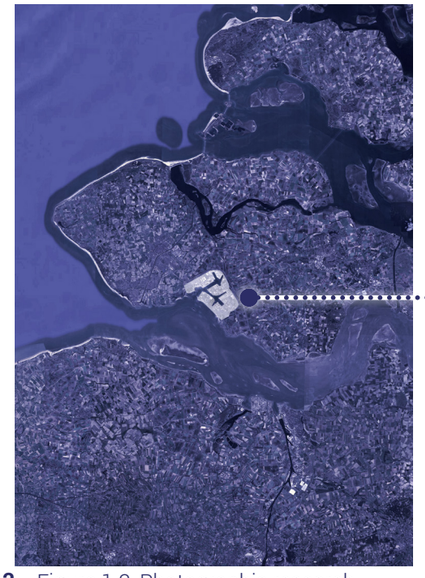
Middelburg



Borssele



Vlissingen



Vlissingen Port

Terneuzen

Fragmentation

Energy transition

Mobility

Car-dependency

Industrial landscape

Spatial inequality

Water-based energy

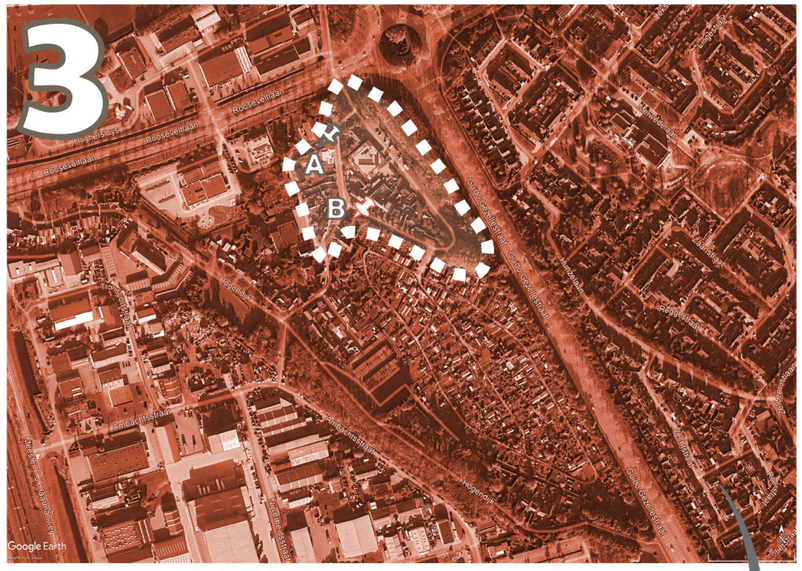
Public perception

Community engagement

Spatial integration

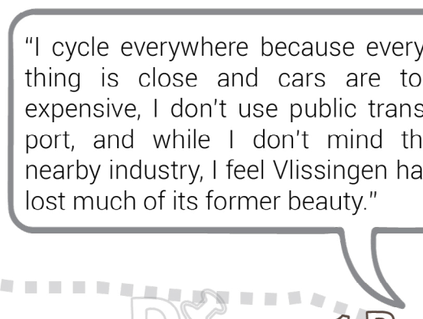
 Figure 1.3-Photographic research

Interview findings



"I mostly bike since I live and work nearby, and while trains to Rotterdam are improving, unreliable buses often force me to cycle or drive to the station."

1.A



"I cycle everywhere because everything is close and cars are too expensive, I don't use public transport, and while I don't mind the nearby industry, I feel Vlissingen has lost much of its former beauty."

1.B

1.C

"I drive and bike to work because public transport in Zeeland is too slow, infrequent, and poorly connected—so unless service improves drastically, the car remains the only practical option."

"We've lived here all our lives and still drive, so transport isn't an issue, and the nuclear plant doesn't bother us—most long-time residents don't mind expansion, though newer people seem more divided."

2.A

"Daily life here depends on long car commutes because train connections to major cities are poor, while energy infrastructure is visible but industry doesn't really affect me."

1.D

"Zeeland feels poorly connected and in decline—young people leave for study and don't return, renewable energy feels ineffective, and ties to Belgium are stronger than to the rest of the Netherlands."

3.A

"I rely on my car and bike because public transport is useless, and living near the Sluiskuil waste factory means dealing with pollution and bad smells."

3.B

Community research

In the first week we got introduced with **atlas.ti** to get a better view on the needs of our community. We all dived into our own theme to cover the base of our research and with that found 30 articles that were relevant.

Intentional AI coding was used to make a co-occurrence analysis. Figure 1.5 shows the positive and negative sentiments related to the impact of sustainable energy production and energy infrastructure.
These sentiments are divided in 6 categories, based on the main interest of this project.
The graphic shows that the feeling about the impact of the energy transition is almost as much negative as it is positive.

After that **atlas.ti** was asked to make a summary of all the articles. It gives you a separate summary for every article, which is convenient if you have large articles, but this was not the case here. Therefore it would cost almost as much time to summarize the articles yourself, to find the overall summary of the articles.

In conclusion, this software gave us a broader insight of our communities. However, it would be more useful in a bigger project with large texts. Furthermore, as we did this research very early in the process our communities changed and not all the data was useful anymore. We can now conclude that the Zeeland community is open for changes under the conditions that the community is involved, the mobility is better and the well-being is kept in consideration.

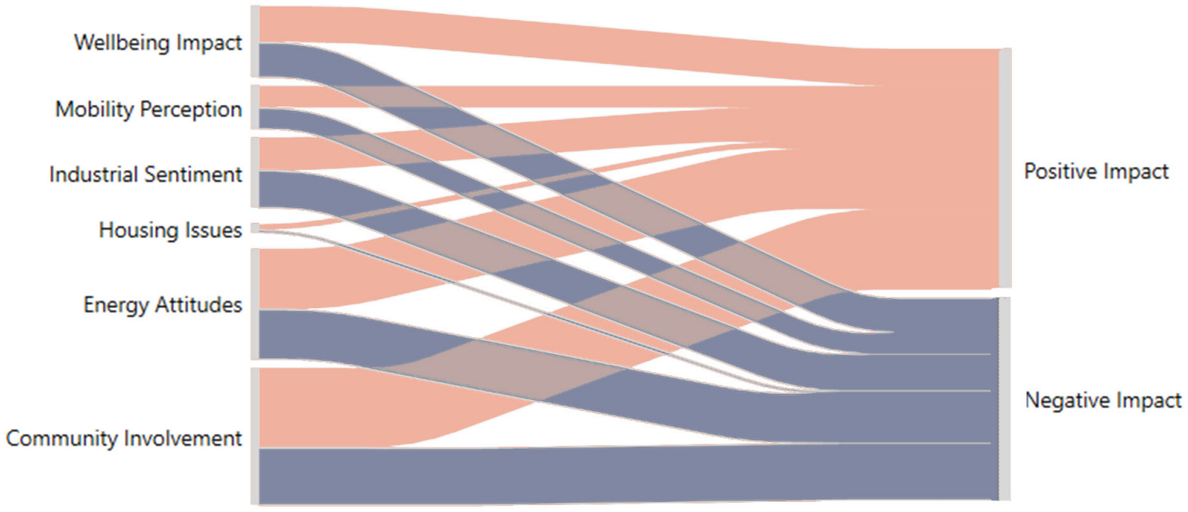


Figure 1.5-Co-occurrence analysis diagram, made with the use of Atlas.ti

Conclusions

The **field trip** from The Hague and Delft to Zeeland (via Middelburg, Vlissingen, Borssele, and Terneuzen) revealed a fragmented landscape, as it can be seen in Figure 1.6, where energy production sites are located close to residential areas but lack strong mobility connections. A clear contrast exists between urban areas and surrounding industrial zones, highlighting an uneven energy distribution. Zeeland also shows strong potential for water-based energy systems, especially in coastal and industrial areas.

Interviews with residents emphasized mobility as a key issue affecting daily life, alongside mixed attitudes toward the energy transition. While there is resistance to further industrialization and impoverishment of the landscape, there is also uncertainty about public involvement in decision-making.

Using **Atlas.ti,** 30 articles were analyzed through AI-supported coding, showing nearly equal positive and negative sentiments about the sustainable energy transition. Although useful for gaining insights, the tool was less effective for small datasets and early-stage research.

Overall, Zeeland is characterized by spatial, social, and infrastructural fragmentation. The region is open to change, if that also includes mobility improvements, community involvement, and well-being is prioritizing. This highlights the need for a more integrated and social justice approach to the energy transition.

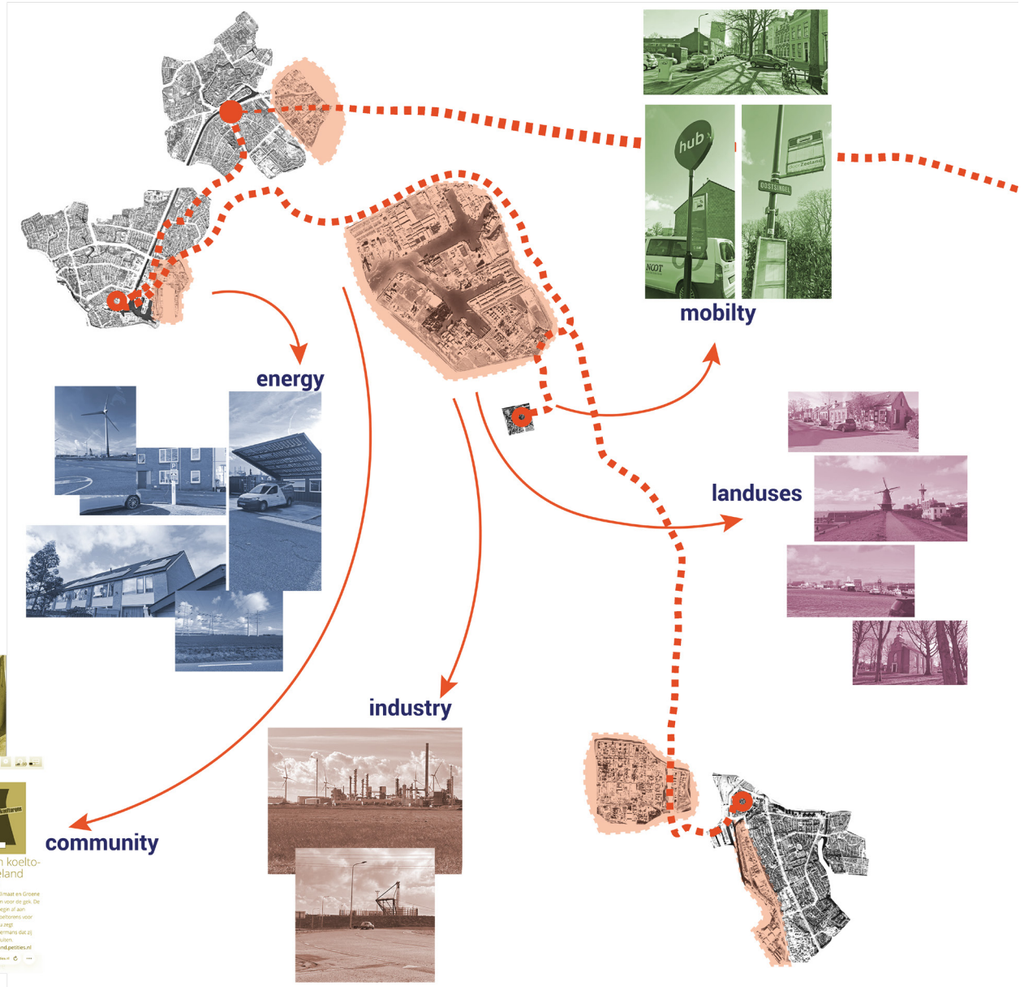


Figure 1.6-Fieldwork findings collage

Problem statement

Contextualization of the problem

The province of Zeeland, a peripheral and highly industrialized region in the southwest of the Netherlands, is increasingly characterized by spatial and social fragmentation. Since industrialization, large-scale industrial complexes, port infrastructures, and energy production facilities have occupied significant portions of the landscape, particularly around Middelburg, Vlissingen, Borssele and Terneuzen. While these functions are economically vital, they have created physical barriers, environmental pressures and infrastructural disconnections that divide settlements, restrict waterfront access, and reinforce car dependency.

This issue affects multiple groups which fall under the umbrella of the car slaves, people who have become structurally dependent on private cars. The groups that are affected are residents living in proximity to industrial sites, and the workers in the industries. This spatial condition reinforces inequalities in access to services, employment, public goods, and natural landscapes.

There are already some existing initiatives wanting to improve the accessibility of Zeeland. There are intervention guidelines for the transition towards a more sustainable and integrated energy system. However, these interventions primarily focus on economic growth and energy infrastructure, while the spatial and social consequences of industrial concentration and mobility disconnection remain insufficiently addressed. The transition toward an integrated energy system (Regionale Energiestrategie Zeeland , 2023) is spatially demanding and risks intensifying existing fragmentation if not coordinated with mobility, housing, and landscape strategies.

Therefore, the problem is not only industrial overuse of land, but the absence of an integrated spatial strategy capable of reconnecting settlements, infrastructures and landscapes while negotiating the pressures of national energy transition policies. A visual representation of the problem can be seen in Figure 1.7.

Relevance of the issue

The issue this research addresses is the lack of an integrated spatial approach that connects industrial transformation, energy transition and regional mobility with social cohesion and landscape continuity. We need to figure out how large industrial areas, infrastructure corridors and energy production sites together do not create spatial breaks in Zeeland, so these breaks do not affect accessibility, environmental quality, and the regional identity of its residents.

This issue is highly relevant because the continuation of current patterns may lead to cumulative negative effects. If fragmentation is not addressed, Zeeland risks increasing environmental pollution, infrastructural overload, and extreme net congestion within its energy grid. Net congestion not only limits the expansion of renewable energy and sustainable industry, but also restricts the construction of new housing and the connection of dwellings to the energy network. In this sense, spatial fragmentation directly constrains both ecological transition and socio-economic development.

The consequences are felt by multiple groups, but in this research, there will be a focus on two groups: local residents living near industrial sites and workers in the industry. Over time, persistent disconnection may lead to broader social, economic, and environmental decline, reinforcing the marginalization of peripheral communities and weakening regional resilience.

The significance of this problem extends beyond Zeeland. Similar dynamics can be observed in other European port-industrial regions such as Rotterdam and Antwerp. In both regions, industrial transformation risks reinforcing spatial separation unless integrated planning frameworks are implemented.

Addressing fragmentation in Zeeland therefore contributes to broader debates on sustainable energy landscapes in peripheral territories. It advances academic understanding of how energy transition processes reshape rural and semi-urban regions, not only metropolitan cores. Moreover, it promotes a multi-scalar perspective that integrates energy systems, mobility infrastructure, housing development, and landscape design within a single spatial framework.

Resolving this issue would provide conceptual and methodological tools for managing complex, multi-factorial transitions. It would contribute to future research by demonstrating how spatial planning can mediate between technical energy systems and social-spatial realities and how integrated design strategies can reduce pollution, improve connectivity, and enhance environmental, economic, and social performance simultaneously.

Ultimately, the relevance of this research lies in its potential to transform energy transition from a purely technical operation into a spatially just and territorially cohesive process. This could strengthen regional identity, reduce environmental pressure, and support long-term resilience in peripheral industrial landscapes.

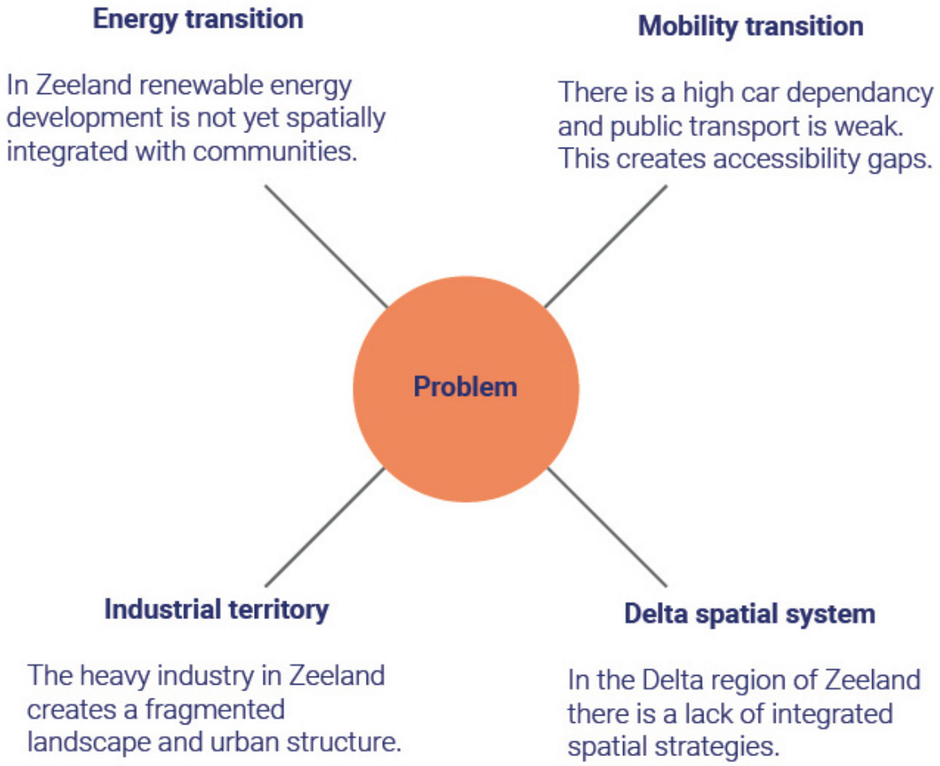


Figure 1.7-Problem statement diagram

Research questions

The communities that are affected by the energy transition are the residents living near industrial sites and commuters working in the industrial sector.
For these communities it is important to work on a spatial approach that connects industrial transformation, energy transition and regional mobility with social cohesion and landscape continuity.

Research questions have been made to use as a guide for research by design. The research questions can be seen in Figure 1.8.

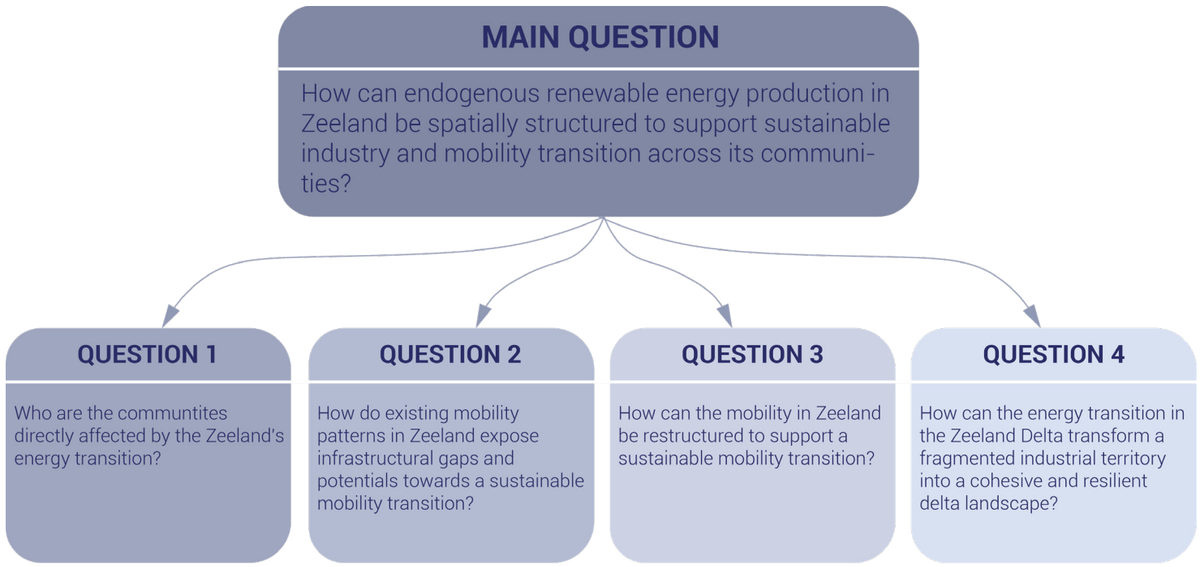


Figure 1.8-Research questions diagram

Objectives

This research aims to investigate the underlying causes and spatial consequences of infrastructural and industrial fragmentation in the highly industrialized energy landscape of Zeeland, while exploring how the ongoing energy transition can become a catalyst for territorial reconnection rather than further separation.

Zeeland functions as a strategic national energy region, yet its transformation into an energy-producing landscape has generated spatial and social fragmentation. Current policy responses primarily focus on increasing green energy production and expanding grid capacity. However, urgent challenges such as net congestion, infrastructural overload and declining spatial cohesion indicate that technical solutions alone are insufficient.

To address this, the research sets the following objectives illustrated in Figure 9:

1. To map and analyse patterns of spatial and infrastructural fragmentation in Zeeland, identifying barriers created by industrial zones, energy corridors, and mobility systems.

2. To assess the social and environmental impacts of these fragmentations, including car dependency, limited accessibility, pollution exposure, landscape discontinuity, and threats related to water and climate vulnerability.

3. To examine existing strategies such as RES 2.0, mobility flex programs, and energy infrastructure expansion, evaluating their spatial implications and limitations in terms of social cohesion and territorial integration.

4. To develop an integrated multiscalar spatial framework that reconnects industrial, mobility and residential systems, aligning energy transition with housing, landscape continuity, and public accessibility.

5. To propose spatial design and planning strategies that connect community and industry through the energy transition, transforming infrastructural corridors and energy landscapes into connective rather than divisive elements.

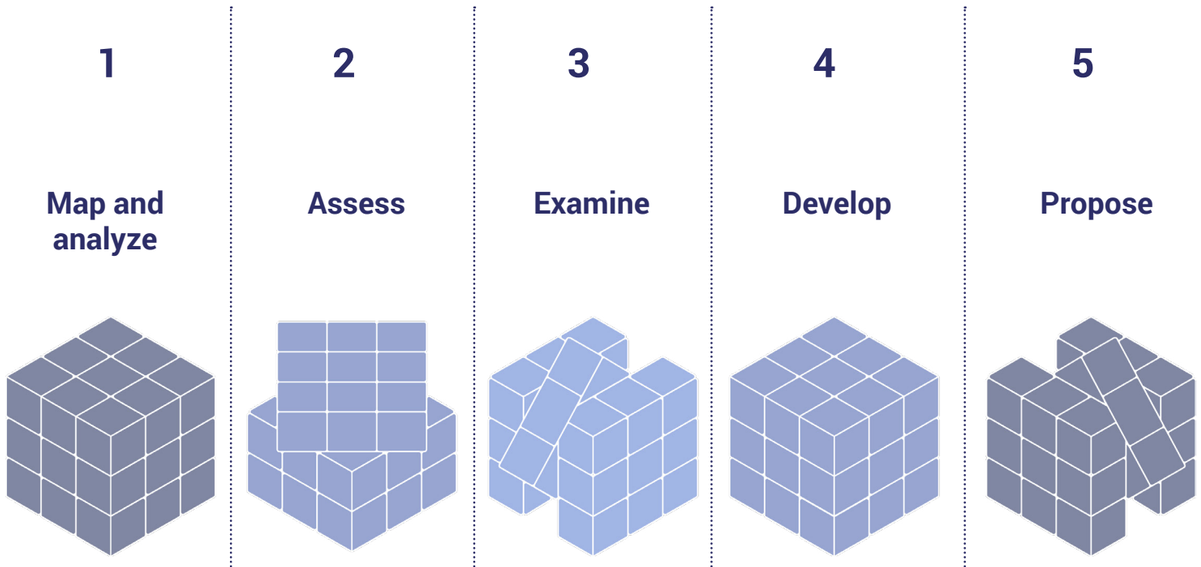


Figure 1.9-Objectives diagram

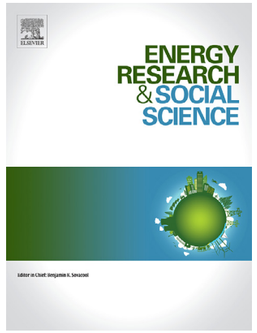
02

Research methodology

Theoretical framework

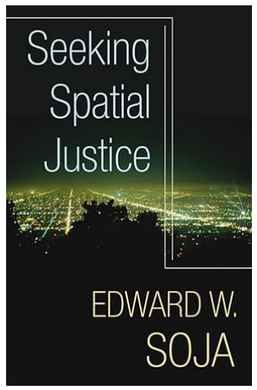
Energy justice:

Jenkins et al. (2016) describe several steps being taken towards energy justice. It researches where injustices occur, developing new processes of avoidance and remediation and recognizing new sections of society. Furthermore, it illustrates that energy justice provides a new stimulating framework for bridging existing and future research on energy production. And illustrates consumption when whole energy systems approaches are integrated into research designs. Lastly, it suggests three areas for future research: investigating the non-activist origins of energy justice, engaging with economics, and uniting systems of production and consumption.
This engagement encourages the community of Zeeland to be more involved in the process of the energy transition.



Spatial justice:

Spatial justice is the fair and equitable distribution of resources, services and opportunities in the available space (Soja, 2009). It puts attention to how spatial decisions are made, therefore, it is not separate from social justice.
Soja (2009) argues that it matters where things like housing, infrastructure and resources are located. Furthermore, they argue that space is not neutral but actively shapes inequality and opportunity.
Traditional research focuses on social and historical factors. Space is now added a third dimension, making it a triple dialectic.
This equal distribution is very important for more rural places like Zeeland. These communities also deserve equal access to services and opportunities.



Mobility justice:

The central idea of Sheller (2020) is that mobility is not equally distributed but is shaped by power, inequality and social structures. Therefore mobility is not neutral but governed and unequal. There are 3 types of crisis that include mobility justice: climate, urban and migration crisis. For the report the climate crisis is the most relevant.
Sheller (2020) argues that transport justice and urban accessibility must be placed in the wider context, the energy transition, for example, is one of the driving issues around mobility justice.
This is also shown in this report, which dives further into the interlinks between energy and mobility.

Conceptual framework

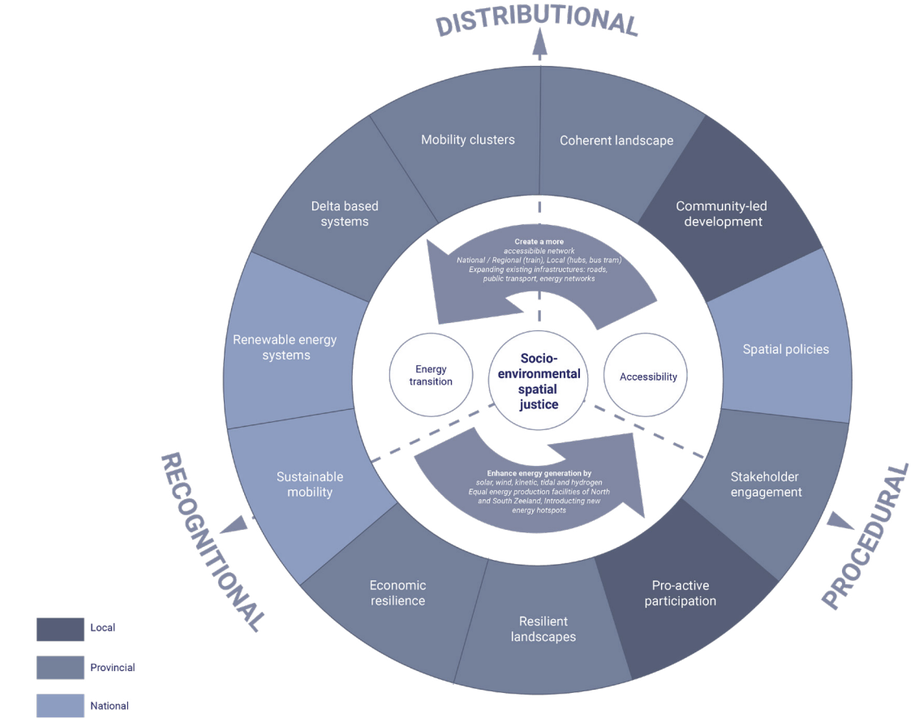


Figure 2.1- Conceptual framework diagram

The central theme of this research is socio-environmental spatial justice, as shown in Figure 2.1. This concept serves as the guiding principle for understanding and shaping the energy transition in Zeeland. To operationalize this theme, the research focuses on two interrelated challenges: energy transition and accessibility.

The framework is structured around 11 key concepts, each of which contributes to the realization of socio-environmental spatial justice. These concepts are grouped under three dimensions of justice: distributional, procedural, and recognitional. In addition, each concept is linked to a specific level of governance: local, provincial, or national. Represented in the framework through a gradient of blue tones.

The selected concepts reflect both a forward-looking vision for Zeeland and the lived experiences of its communities. Through fieldwork, interviews, and contextual analysis, it became evident that the energy transition is not only a technical or infrastructural issue. Instead, it is deeply social, environmental, and spatial in nature. The concepts therefore highlight themes that are essential for regional development as well as for the well-being of residents. They express a shared ambition for a transition that is fair, inclusive, and locally beneficial, rather than one that primarily serves national energy demands.

At the core of the framework, socio-environmental spatial justice connects all concepts. It emphasizes both the fair distribution of benefits and burdens and the importance of inclusive and equitable decision-making processes. The three dimensions of justice can be understood as follows:

1. **Distributional justice** focuses on how the benefits and burdens of the energy transition are shared. In Zeeland, this is particularly relevant, as local communities often feel they bear the burdens of energy production without receiving proportional benefits. (source?)
2. **Procedural justice** relates to the fairness and inclusivity of decision-making processes. It stresses the importance of meaningful participation, ensuring that communities feel heard and able to influence outcomes.
3. **Recognitional justice** concerns the acknowledgment of diverse needs, histories, identities, and aspirations. It highlights the importance of mutual understanding and coexistence among communities.

Together, these dimensions show that justice is not only about outcomes, but also about processes and recognition.

The framework is informed by an integrative, relational, and realist ontological perspective. This perspective acknowledges both the material conditions of the region, such as infrastructure, industry, and geography and the relationships between actors, including institutions, governments, and communities. It therefore captures both the physical structures shaping the transition and the social dynamics that influence how these structures are experienced and governed.

Finally, the framework actively guides the research and design process. By using socio-environmental spatial justice as a central lens, it directs attention to how transitions impact communities and landscapes, while also considering the roles and interactions of different governance levels. In doing so, it supports the development of strategies that are not only technically effective, but also socially and context-sensitive.

Methodology

Phase 1: Analysis (Week 1, 2 and 3)

The project began with defining the overall task: to investigate the energy transition in the Netherlands from the perspective of a specific community. Zeeland was selected as the study area, with a focus on the southern islands, including the cities Middelburg, Vlissingen, Borselle and Terneuzen
.
A field trip on February 16 provided initial spatial insights into the region, including visits to Middelburg, Vlissingen, Borssele, and Terneuzen. This was complemented by preliminary research into industry, mobility, demographics, and energy systems, primarily through mapping and spatial analysis.

Simultaneously, an iterative process was initiated to define the relevant community. The focus gradually narrowed to residents living near industrial sites and people working within the industrial sector.

This phase resulted in the formulation of the main research question:

How can endogenous renewable energy production in Zeeland be spatially structured to support a sustainable transition in industry and mobility across its communities?

Phase 2: Vision Development (Week 4 and 5)

Building on the initial analysis, research was expanded and deepened, including additional focus on tourism and its relationship to the regional system. The definition of the community was further refined during this phase.

A clear problem statement was established, forming the foundation for the project. Based on the accumulated insights, a synthetic spatial sketch was developed to integrate key dynamics and relationships within the region.

This synthesis informed the creation of a conceptual framework, which served as the basis for the project's vision. At the same time, initial stakeholders were identified, and their roles within the system were explored. Potential opportunities, for example using an existing initiative for improving mobility, were considered. And also the clashes, for example the difficulty of providing good infrastructure for a low-density area, were thought of.

The midterm review primarily focused on improving the clarity and communication of these ideas.

Phase 3: Strategy Formation (Week 6, 7 and 8)

In the final phase, the focus shifted towards translating the vision into a strategic framework. This included a more detailed analysis of individual stakeholders, their interests, and their influence within the system.

A deliberative arena was defined to structure interactions between stakeholders and support decision-making processes. Policy analysis was incorporated to ensure alignment with existing frameworks and feasibility.

Based on these elements, a strategic plan was developed, integrating spatial interventions and governance mechanisms. The process remained iterative, with continuous refinement based on feedback from each other and the tutors.

A peer review confirmed the effectiveness of the group collaboration throughout the process.

Finalization and Reflection (Week 9 and 10)

In the last week the final tutor session took place, this was focused on structure and visual quality. The project concluded with a final presentation, in which the key outcomes and proposals were communicated. This was followed by a reflection phase, evaluating both the methodological approach and the collaborative process, and identifying key lessons learned.

The optimization of theses processes can be seen in Figure 2.2.

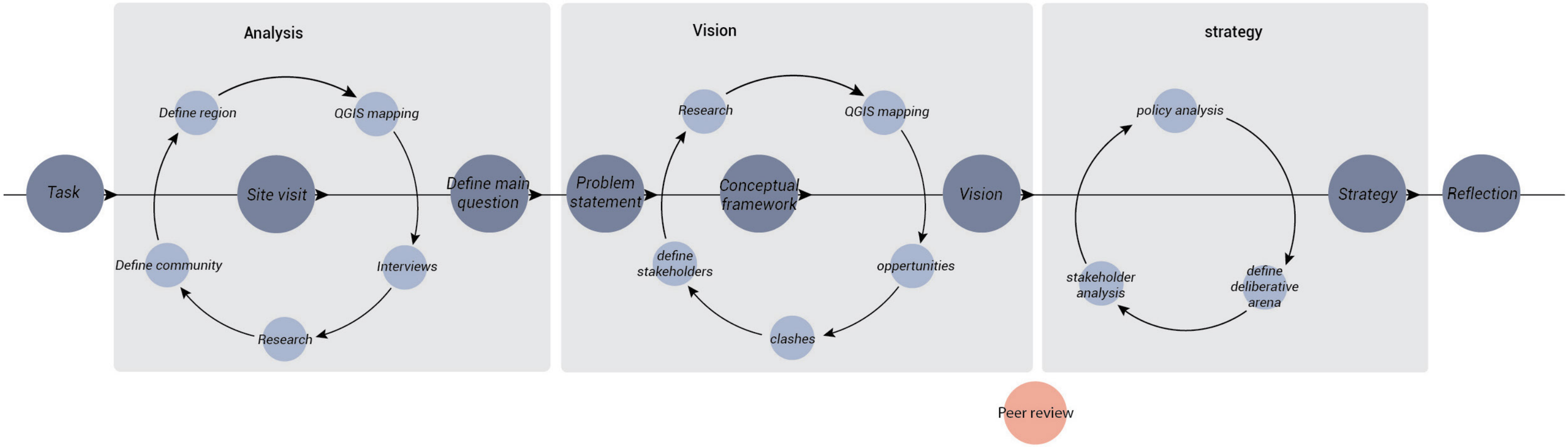


Figure 2.2- Methodology diagram

Transitional values

These diagrams explain the transition around our two main themes: the energy transition and the mobility transition.

The **first diagram** (Figure 2.3) illustrates the transition from a car-dependent transport system to a more sustainable and integrated mobility model. Initially, the system is dominated by private car use, where the car is the primary mode of transport. This leads to increasing pressure on infrastructure, congestion, and limited flexibility in mobility options. At the same time, there is growing recognition of the need for change, prompting early interventions such as mobility investments and the introduction of shared transport solutions.

As the transition progresses, the two pathways intersect at a critical phase where traditional car-based systems and emerging sustainable alternatives coexist. This stage is marked by experimentation, policy adjustments, and reorganization of transport systems. Investments in public transport and shared mobility services begin to reshape travel behavior.

In the later stages, the system shifts toward reduced car dependency. Public transport becomes more efficient and widely used, making private cars not necessary anymore. The end state represents a sustainable and convenient transport system, characterized by integrated mobility services, improved accessibility, and a significant reduction in private car use.

The **second diagram** (Figure 2.4) depicts the transformation of the energy landscape from a fossil fuel–based system to a decentralized, sustainable energy model. Similar to the first diagram, it shows two intersecting pathways representing the old and emerging systems.

At the beginning, the energy system is heavily reliant on fossil fuels, resulting in environmental pressures and inefficiencies. This centralized model dominates the landscape, limiting flexibility and resilience. The transition begins with gradual changes, including the introduction of renewable energy sources and local energy initiatives. Small-scale interventions, such as community energy projects, start to emerge alongside the existing system. However, fossil fuels still play a significant role during this phase.

The intersection represents a period of restructuring, where both systems interact. This stage includes the expansion of renewable energy, technological innovation, and the development of new infrastructure. It is also a phase of negotiation and adaptation, as stakeholders adjust to new energy dynamics.

In the final stage, the system evolves into a clustered and integrated energy landscape. Renewable energy sources become dominant, supported by local energy hubs and interconnected networks. This results in a more resilient, sustainable, and efficient energy system with reduced environmental impact.

Together, the diagrams emphasize that transitions are not linear but involve overlapping phases where old and new systems coexist. They highlight the importance of investment, experimentation, and systemic change in moving toward more sustainable futures in both mobility and energy sectors.

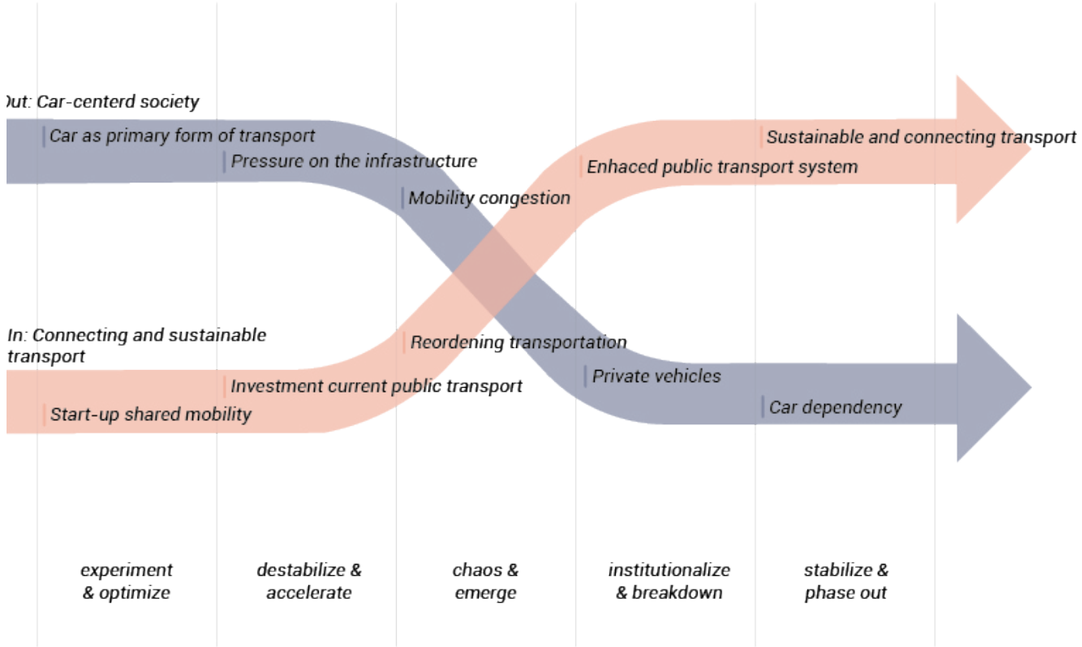


Figure 2.3- Transitional values of mobiltiy

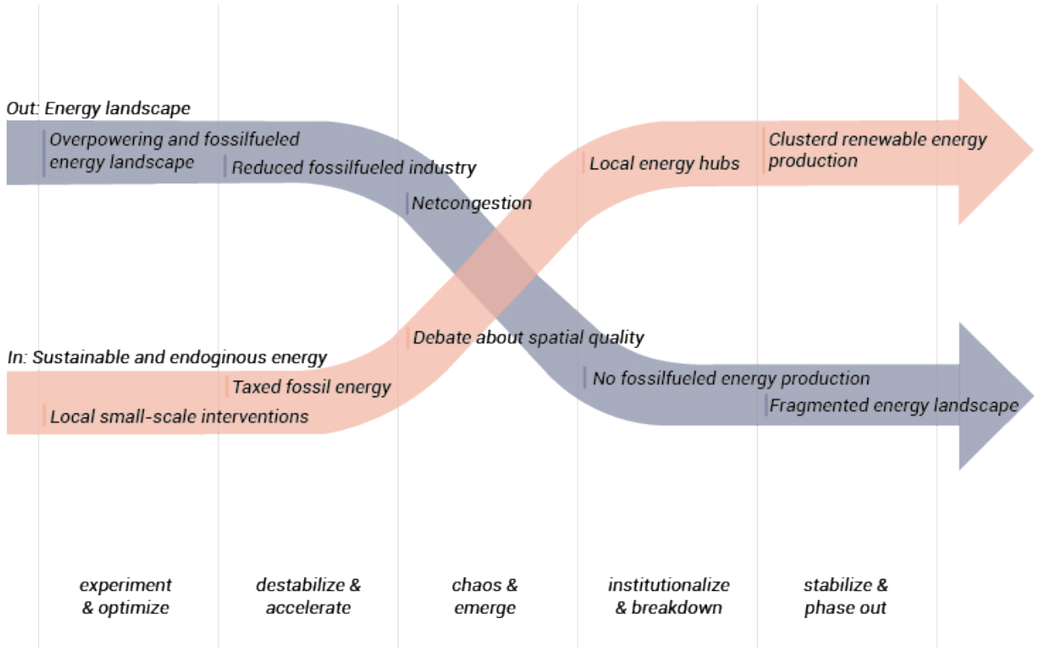


Figure 2.4- Transitional values of energy

03

Analysis

Analysis Themes

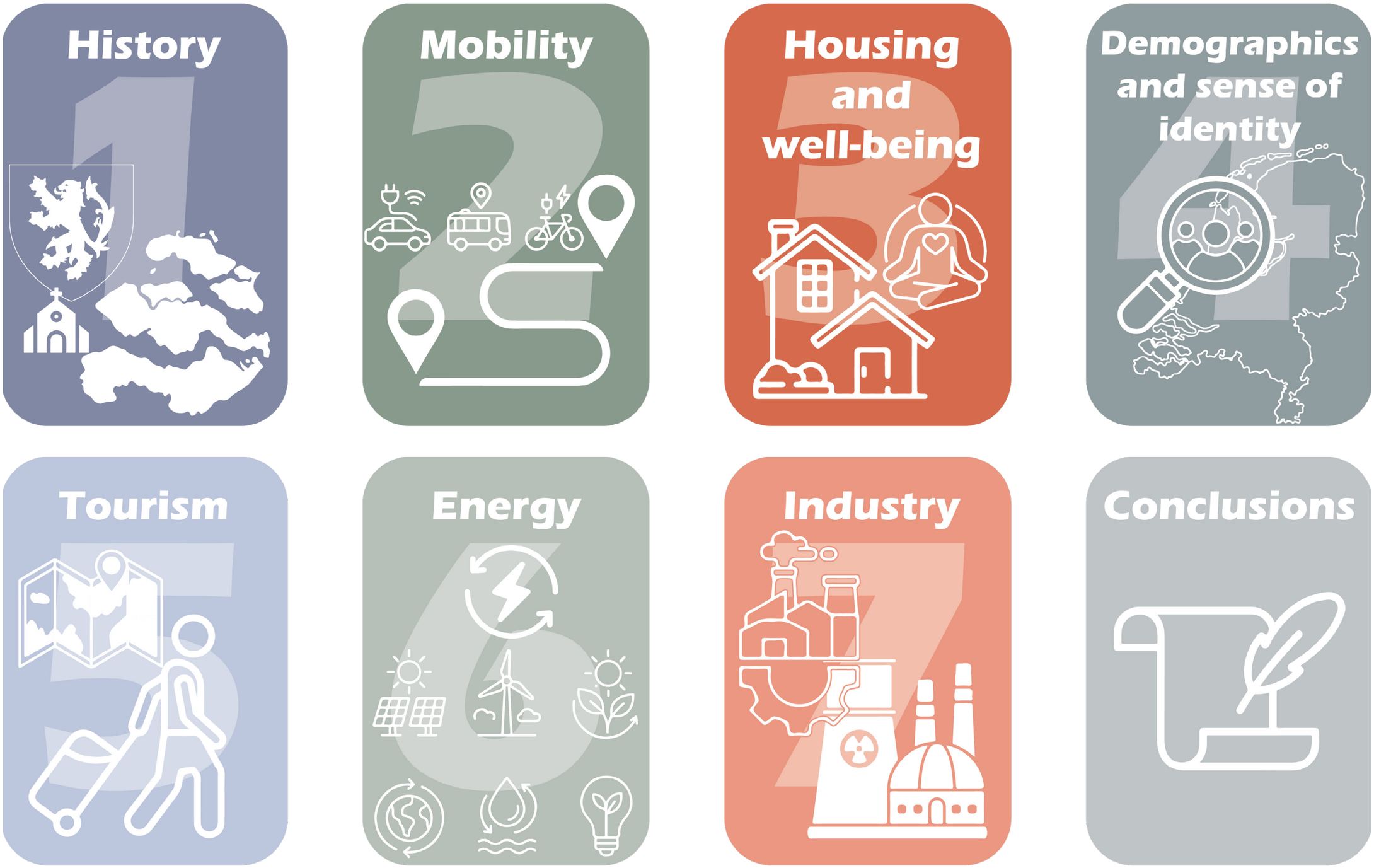


Figure 3.1- Analysis themes

History of Zeeland

Zeeland has a long history when it comes to water management, energy production, infrastructure development, and industrial growth that shaped Zeeland and their communities over time. The North Sea Flood of 1953 marks the beginning of large-scale infrastructural water management projects that have defined Zeeland's landscape over the decades (Ministerie van Infrastructuur en Waterstaat, 2025). The Delta Works and the Maeslantkering stand out as innovative and ambitious projects, which were designed to protect the province from flooding, while integrating modern engineering solutions (Ministerie van Infrastructuur en Waterstaat, 2026).

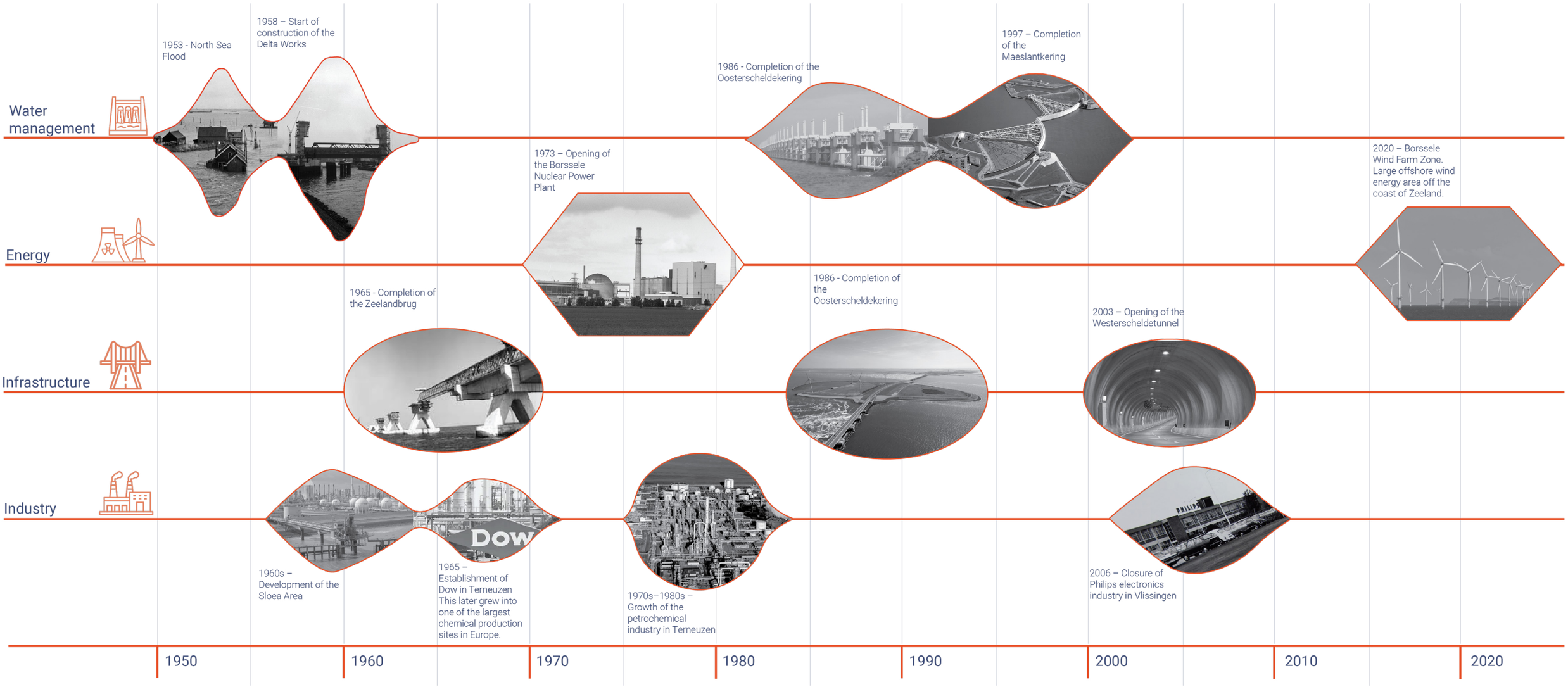
Other large infrastructural developments in Zeeland are also closely linked to water. They focus on connecting the islands through bridges and tunnels, to improve regional accessibility such as the Zeelandbrug and the Westerscheldetunnel.

These interventions improved accessibility for Zeeland's local communities.

In the energy sector, Zeeland has been innovative as well. The Borssele Nuclear Power Plant, opened in 1973 and was a milestone in Dutch nuclear energy. This created jobs and strengthened the local economy, but also raised concerns among residents living near the plant regarding safety and environmental impact. Together with the Borssele Offshore Wind Farm Zone, which opened in 2020, these energy developments reflect Zeeland's leadership in sustainable energy generation (Borssele Wind Farm Zone, n.d.).

Zeeland's industrial landscape also developed significantly, beginning with the creation of the Sloegebied in the 1960s. This area grew into a dominant petrochemical hub, with companies such as Dow Terneuzen, and has remained an important part of the province's economy (Chemie en Procesindustrie, n.d.). This industrial growth formed the foundation for both communities, generating employment and economic development, while also introducing concerns related to pollution and environmental quality.

The transitional points of history can be seen in the Figure 3.2.



34 Figure 3.2- History of Zeeland timeline

Mobility

Zeeland is a relatively isolated province in terms of national (public) transport connectivity (see appendix 9). As shown in figure 3.6, a single railway line forms the only direct public transportation link between Zeeland and the rest of the Netherlands. Within the province, infrastructure is predominantly car-oriented, but there is also a large cycling network in place (figure 3.3). A dedicated cycling 'highway' (figure 3.4) runs along the coastline, which is connected to the South Holland coast. This route mainly serves recreational and tourist traffic, rather than daily functional mobility.

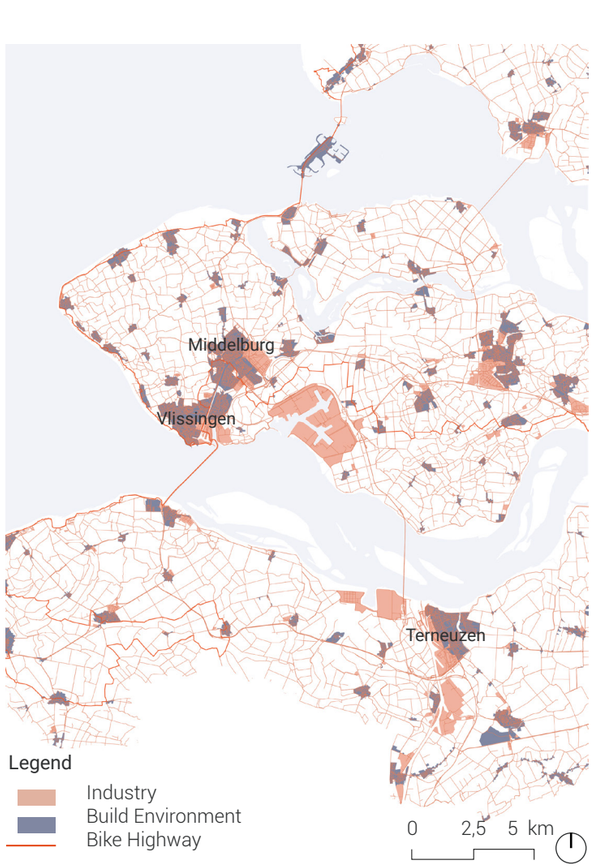


Figure 3.3- Bike network of Zeeland

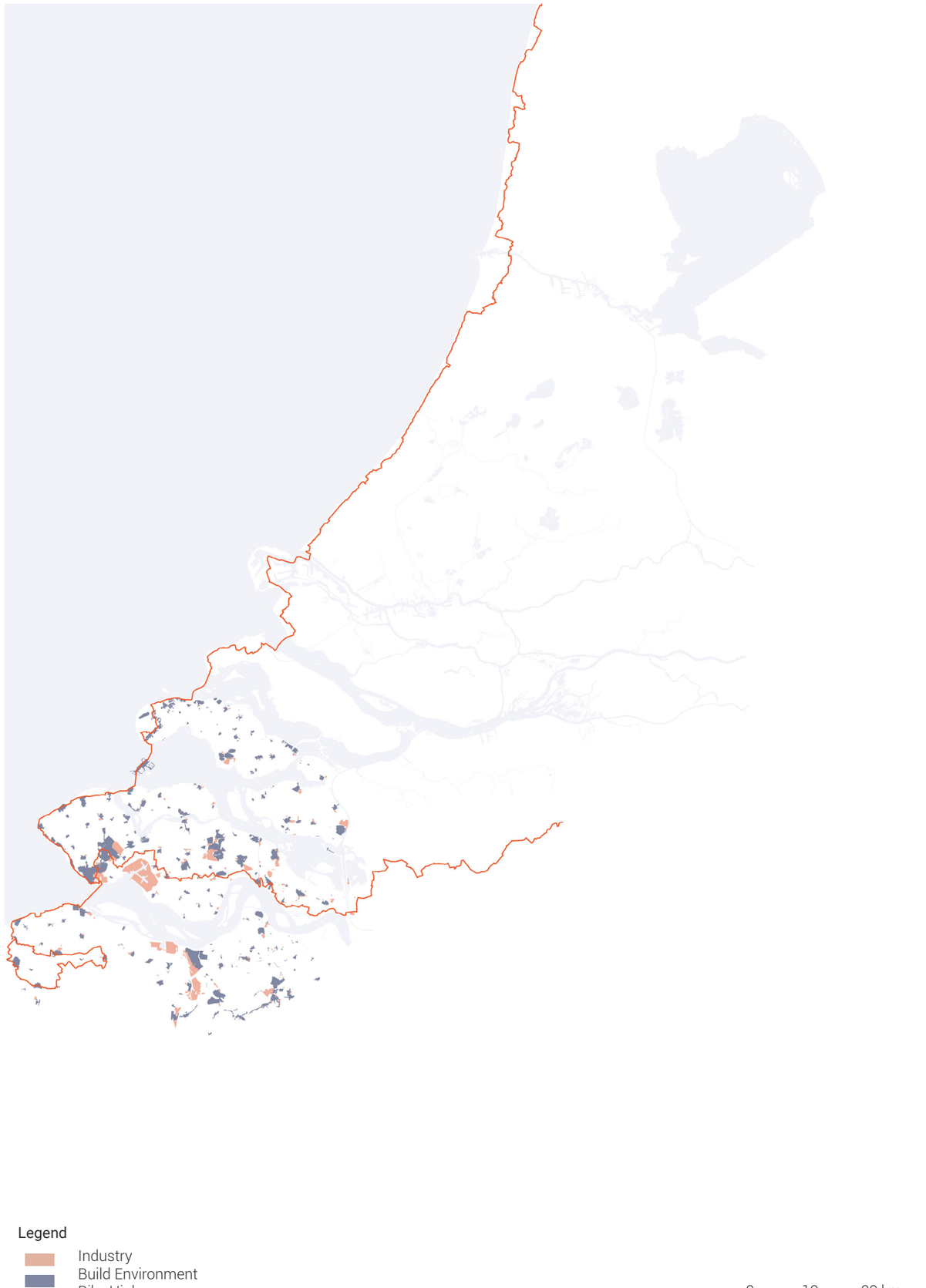


Figure 3.4- Bike network of Zeeland (national)

Mobility

Next to the railway line, several bus and ferry routes operate within the province (figure 3.6). However, these services run at low frequency, and some are so infrequent that they cannot be considered reliable for daily commuting purposes. As a result, residents are largely dependent on private car use. This pattern is further reinforced in more spatially fragmented villages, where the limited service frequency makes public transport an even less reliable alternative for everyday travel.

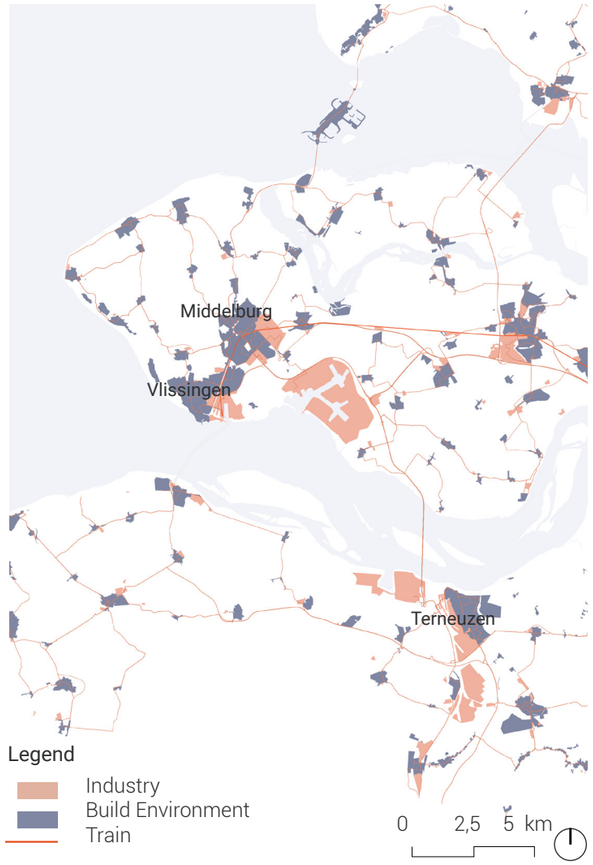


Figure 3.5- Public transportation of Zeeland

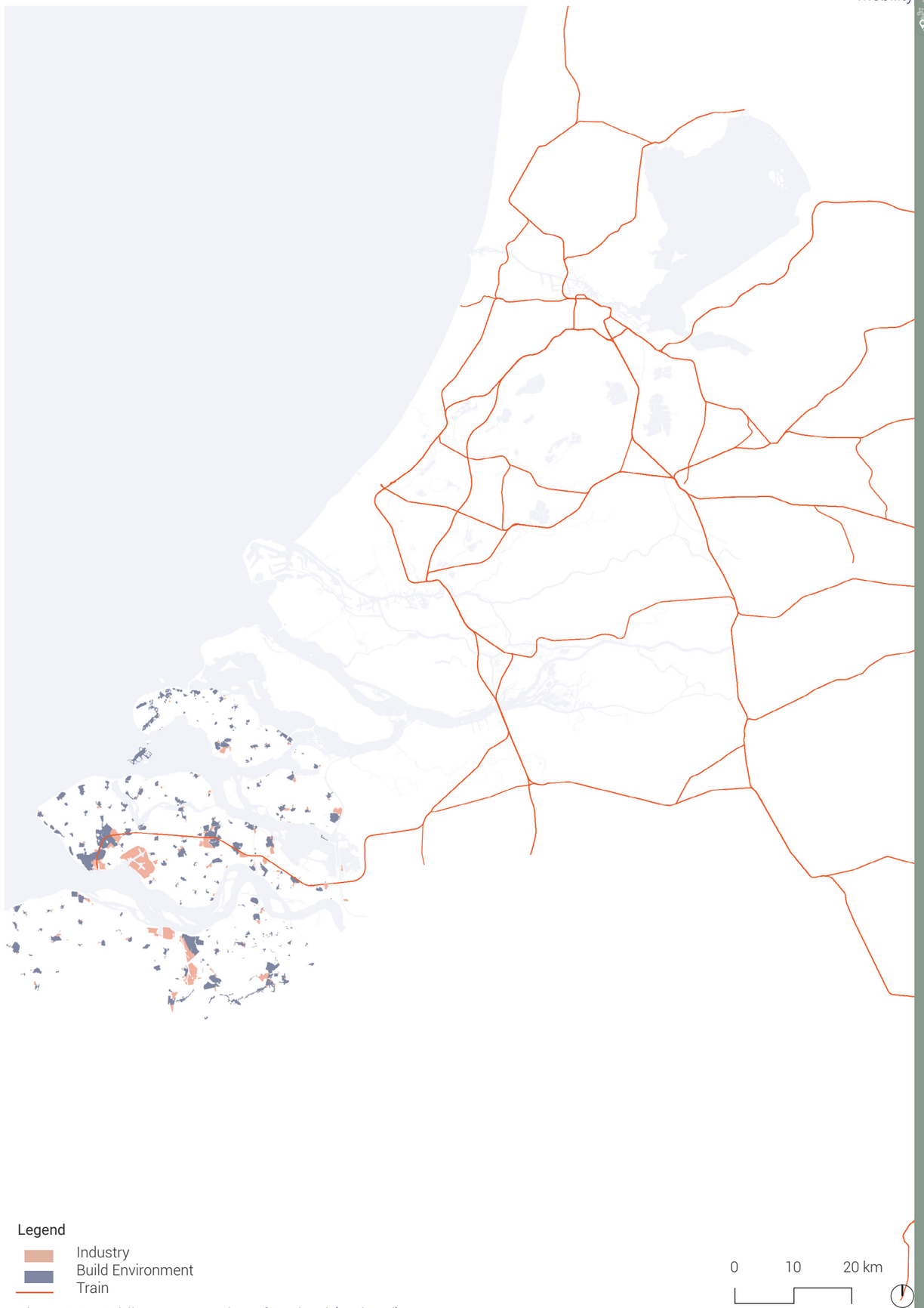


Figure 3.6- Public transportation of Zeeland (national)

HUBs system

To address this problem, the province of Zeeland has implemented a FLEX system in 2025 (figure 3.8): a flexible public transport network in which designated hubs integrate multiple modes of transport, including bus, shared vehicles, and / or on-demand flex taxis (Reizen door Zeeland, n.d.). Areas served by this system benefit from this improved connectivity, as the FLEX network substitutes the fixed timetables of conventional public transport with a more demand-responsive approach.

As shown in Figure 3.7, residents in denser areas tend to commute to school and work primarily by foot or bicycle. In more spatially fragmented areas, where facilities are more dispersed, this pattern shifts. The lower proximity of essential services makes travel by foot or bike less practical, which results in higher levels of car dependency among residents, including those working in industrial areas.

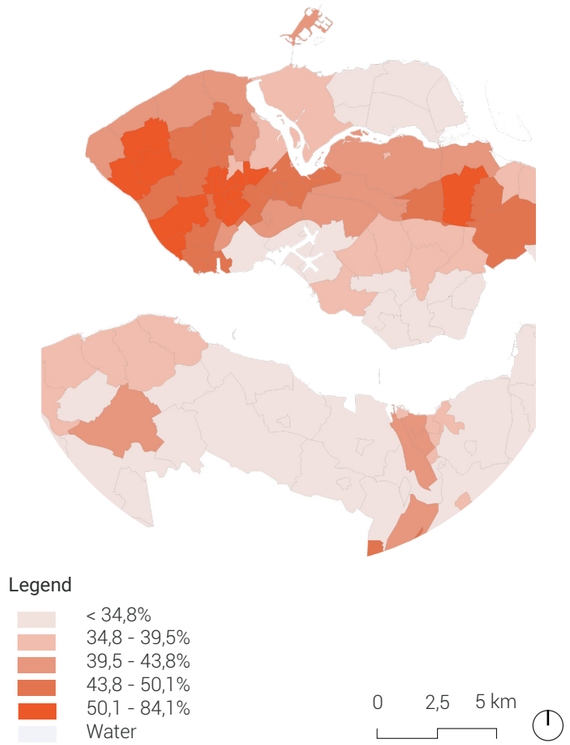


Figure 3.7- Percentages walking or cycling to school or work

Figure 3.8 -Flex location map

Housing

Just as in the rest of the Netherlands, also Zeeland faces a housing crisis. There is a housing shortage of 16.500 houses, these are planned to be built before 2030 (Gemeente Borsele et al., 2023). At the same time there is a vacancy of 8 percent (Provincie Zeeland in Cijfers en Grafieken | AlleCijfers.nl, 2026c). This is significantly higher than in the rest of the Netherlands with 4 percent.

Housing affordability is another challenge that starters in the housing market are facing. In recent years, house prices have increased significantly throughout the whole of the Netherlands, making it difficult for starters to obtain a house. The graphic of the house prices of the Netherlands in comparison to Zeeland are pretty similar. However, in the apartment prices you see how Zeeland has not had the same rise in price as the rest of the Netherlands. This could indicate that Zeeland has become a less wanted place to live in. The map, figure 11, shows that a lot of people are not satisfied with their current housing conditions. And again it shows that people are more dissatisfied in the rural areas in comparison to the more dense areas.

Although the causes of this trend are complex, the growth of second-home ownership, particularly in tourist areas such as Renesse, plays a significant role in Zeeland. Properties are often sold at higher prices to non-local buyers, reducing the availability of affordable housing for permanent residents. At the same time, the social structure of these areas is changing, as fewer families live there year-round and local facilities are forced to scale down (Bollen, 2022). This dynamic not only affects housing accessibility, but also undermines community cohesion, making Zeeland less attractive for starters to settle down and start a family.

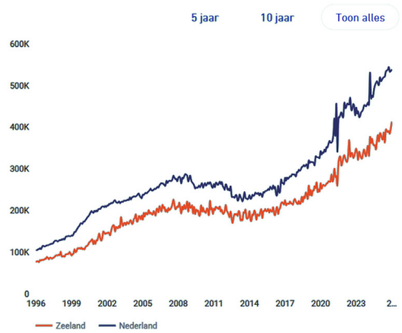


Figure 3.9-House prices

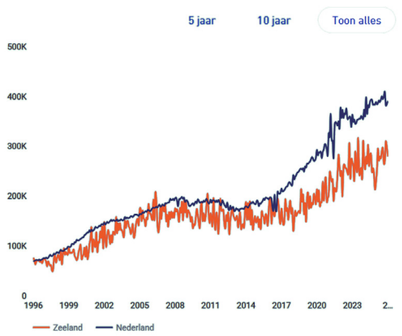


Figure 3.10-Apartment prices

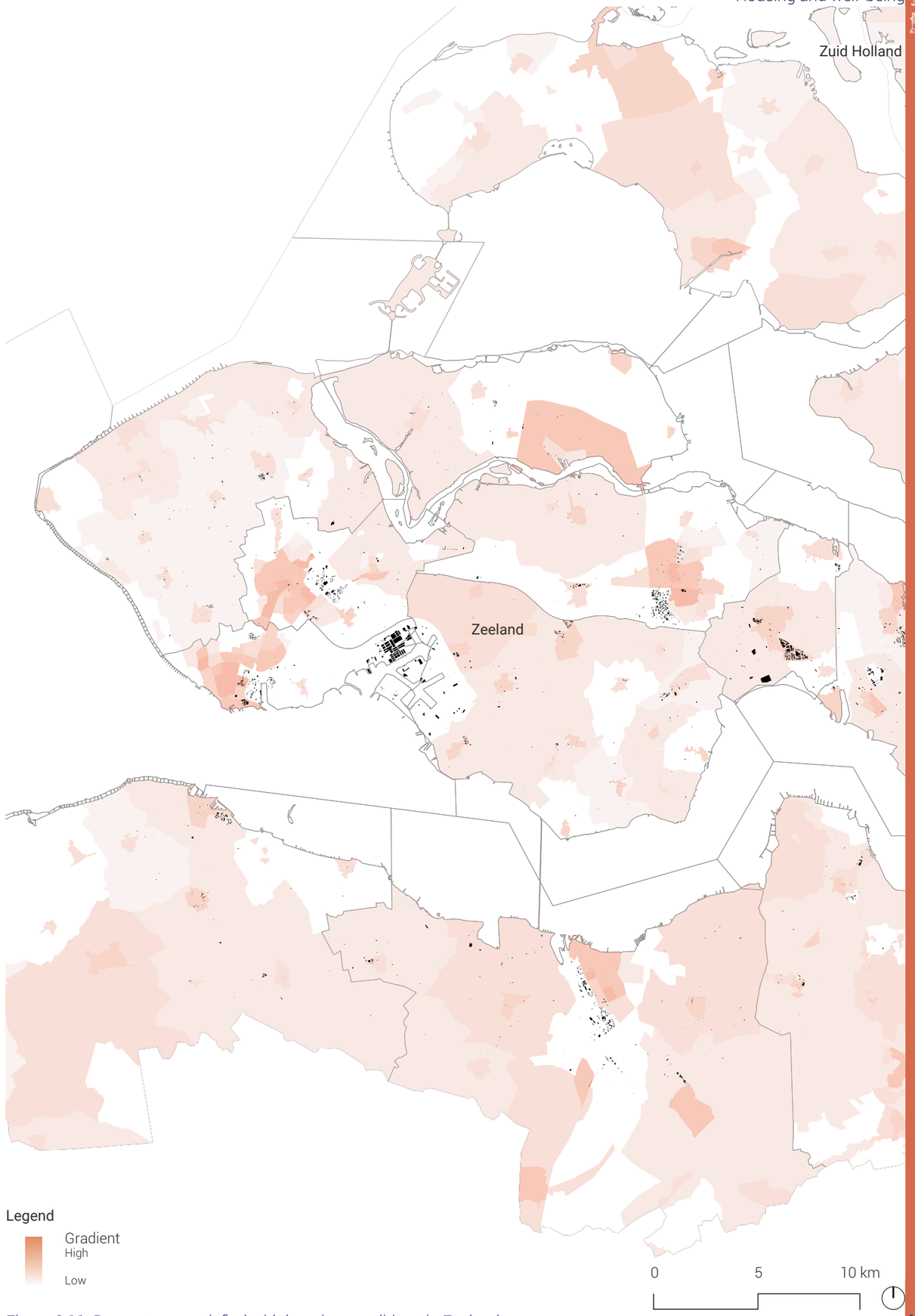


Figure 3.11-Percentages satisfied with housing conditions in Zeeland

Wellbeing

The transition towards a more sustainable energy system within Zeeland brings significant infrastructural changes to Zeeland's landscape. While these developments are necessary for achieving climate goals, they also have direct implications for the communities living and working in their proximity. Industrial activity and energy infrastructure, ranging from the Sloegebied port cluster to offshore wind installations and the Borssele nuclear plant, generate a range of negative environmental influences, including noise, air pollution, light emission, and odour disturbance. These influences do not affect all residents equally; communities situated near industrial zones bear a large share of the environmental burden. Understanding how industry and the energy landscape affect residential well-being is therefore a necessary step in developing a vision and strategy that is responsive to the needs of these communities.

The community concerns map and the environmental health risks map (figures 3.12, 3.13) illustrates the estimated impact of ambient noise and air pollution (figure 3.14) on public health, which is expressed as a percentage of total disease burden (Atlas Leefomgeving, n.d.). Together, these two pressures form a significant source of health pressure for residents living in proximity to industrial areas.

The green typology map (figure 3.15) reveals that the majority of Zeeland's landscape consists of agricultural green, which offers limited access to urban green spaces that support physical and mental well-being (World Health Organisation, 2017). In contrast, the light emission map (figure 3.16) highlights concentrated levels of artificial light in and around port areas. Excessive light emission poses risks, not only to nearby residents, but also to the broader environment, as it disrupts natural light cycles and biodiversity (RIVM, 2013).

Industrial areas in Zeeland also consist of numerous cooling towers (Figure 3.17). Due to their height, these structures have a significant visual impact on the landscape by disrupting the open horizon. In addition, cooling towers discharge thermally elevated water into natural water bodies, which can disturb local ecosystems and aquatic environments (Philipsen, 2026).

When combining the maps, it shows that residents living near industrial sites are disproportionately exposed to multiple overlapping negative environmental impacts, each of which individually affects quality of life. This spatial concentration of environmental pressures shows the importance of integrating well-being considerations into the sustainable energy vision for Zeeland's regional transition.

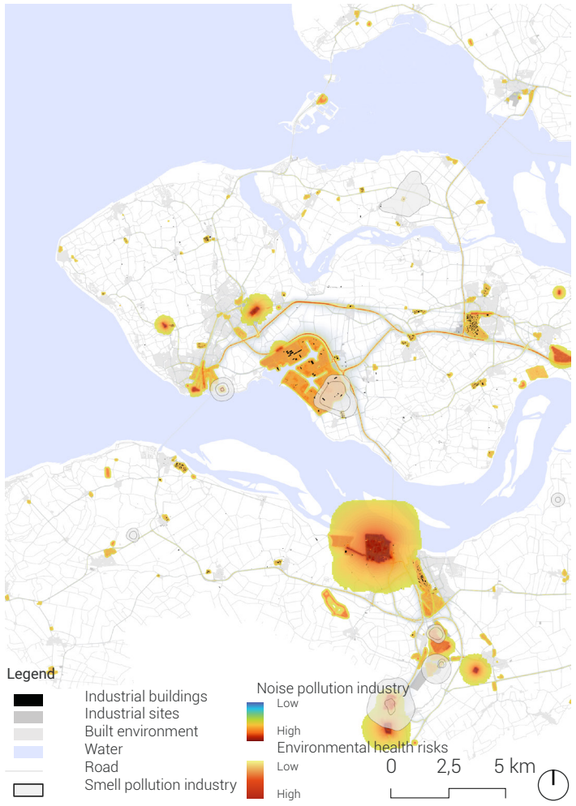


Figure 3.12-Community concerns

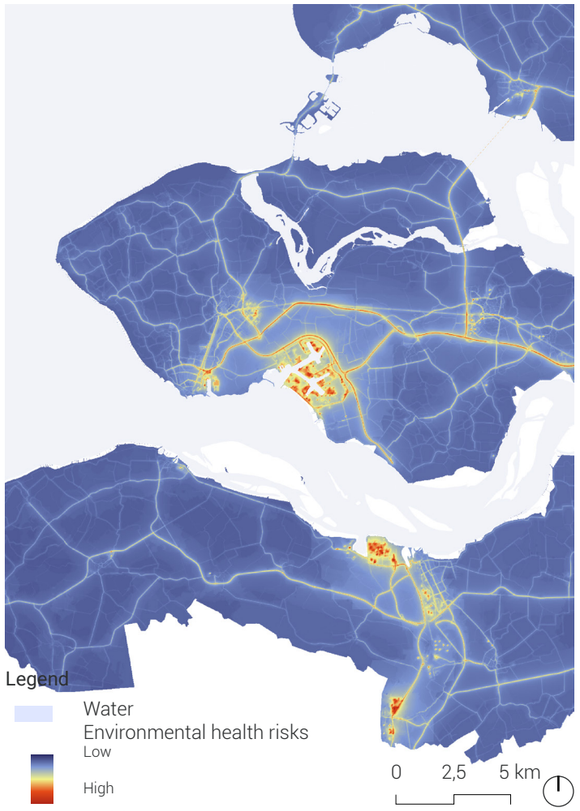


Figure 3.13-Environmental health risks map

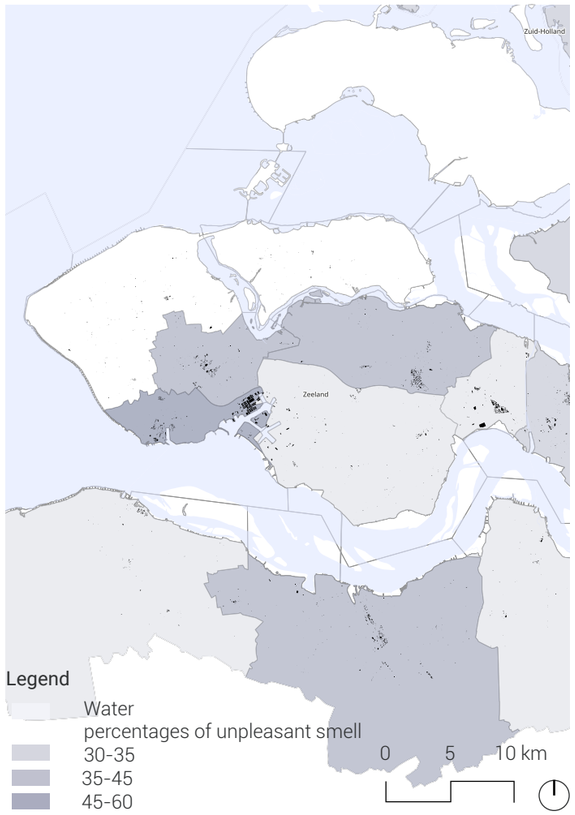


Figure 3.14-Percentages of unpleasant industrial smell

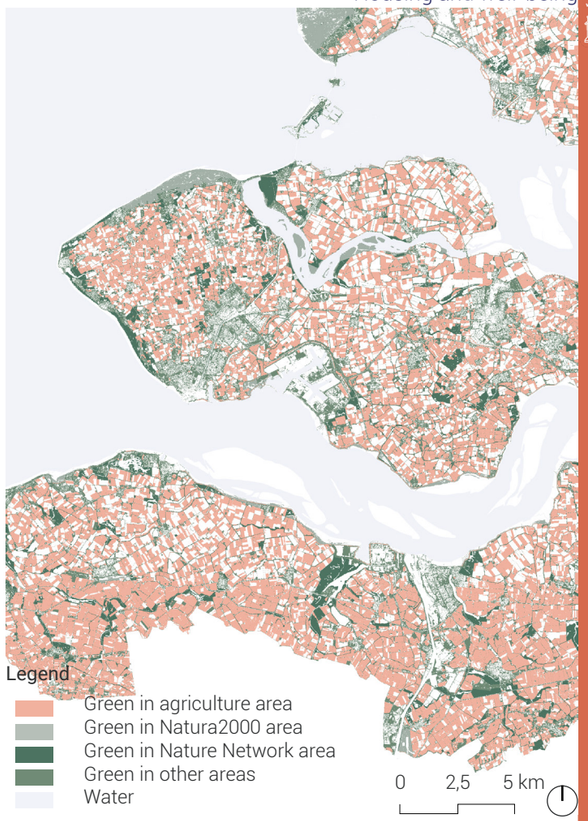


Figure 3.15-Types of green map

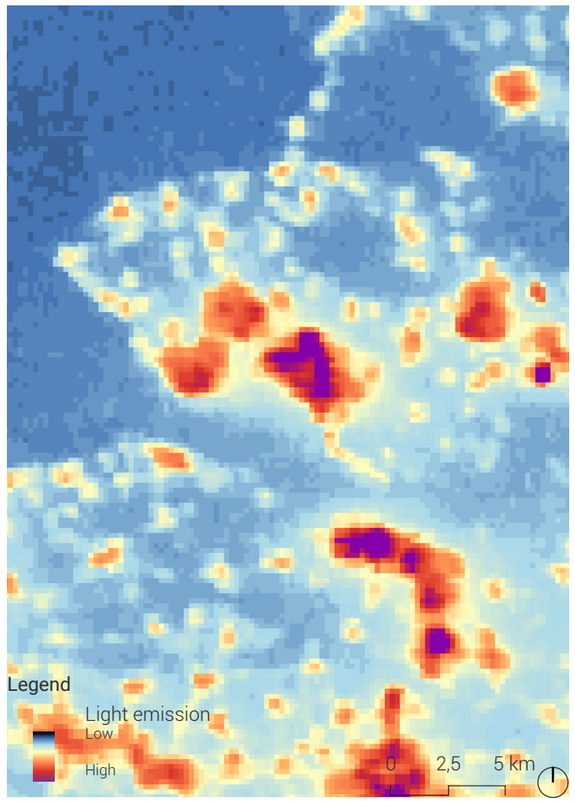


Figure 3.16-Light pollution map

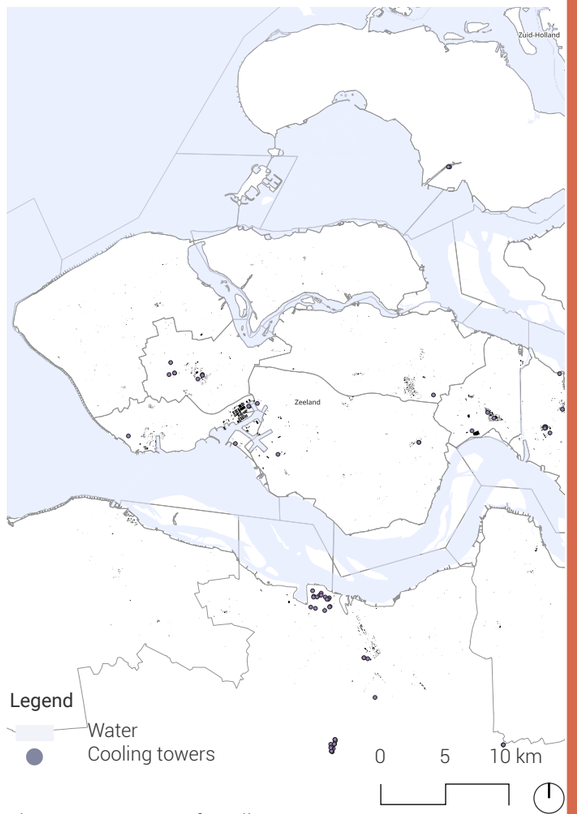


Figure 3.17-Spots of cooling towers map

Demographics

When looking at the demographics of Zeeland, it can be concluded that the population is characterised by ageing and a relatively low share of highly educated residents (AlleCijfers.nl, 2026; figure 3.18,figure 3.19). This reflects a broader regional trend of brain drain, in which young and highly educated people leave the province to study or pursue better job opportunities elsewhere (Koerting, 2024) .

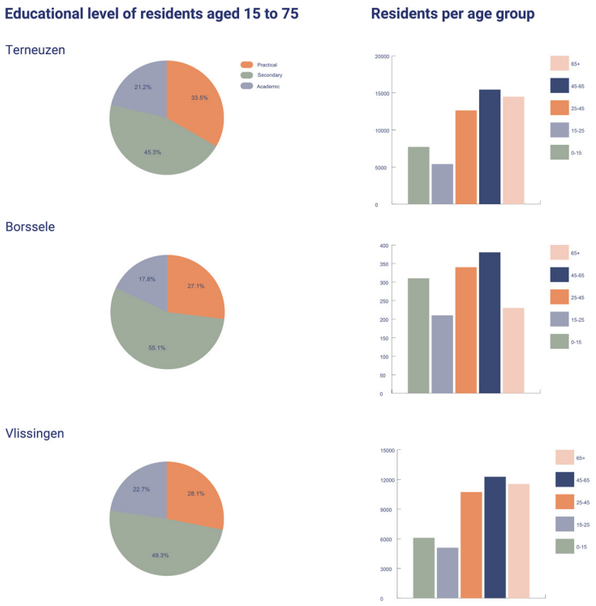


Figure 3.18-Educational level and age groups diagram

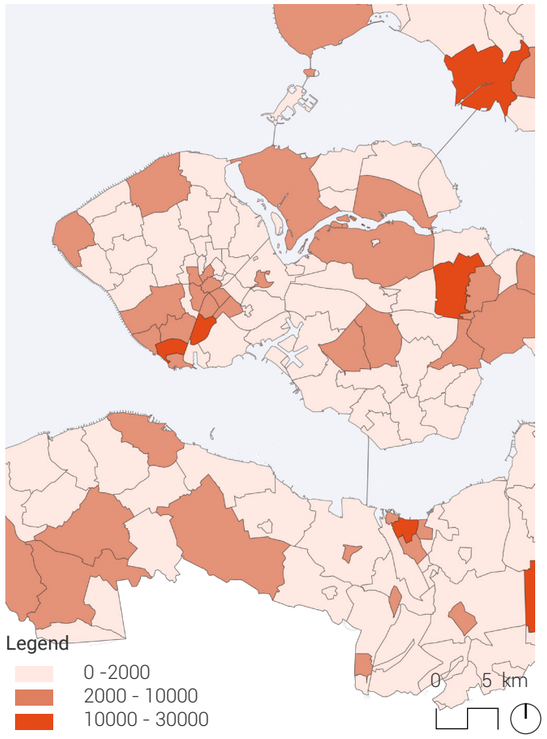


Figure 3.19- Population size

Sense of identity

The identity of Zeeland's residents, known as Zeeuwen, is deeply rooted in the region's history, landscape, and collective memory. Dineke van Kooten, a Dutch coach, speaker and author, conducted research on the identity of Zeeuwen in 2024. She wrote that water has shaped Zeeland not only physically, but culturally. It has been a source of conflict, livelihood, and identity across centuries, from the Second World War, to the flood disaster of 1953, to a long tradition of trade, fishing, and shipbuilding along its shores (Dineke van Kooten, 2024).

Zeeland is a unique delta landscape, situated on the boundary between land and sea. This constant interaction with nature has created a mentality of resilience and self-reliance that remains central to Zeeuwse identity today (Dineke van Kooten, 2024). The provincial coat of arms carries the motto "Ik worstel en kom boven", which translates to "I struggle and rise", a phrase that encapsulates the determination with which Zeeuwen have historically faced difficulties (Provincie Zeeland, n.d.).

This resilience is reinforced by a strong sense of community. Zeeland's longstanding geographic isolation has fostered tight local networks built on mutual support, and a degree of aversion towards outside intervention (Kooten, D. v., 2024).

The communities at the centre of this spatial vision (those working in and living near industrial areas) are accustomed to living alongside large-scale industrial and energy infrastructure, bearing its environmental costs with little public acknowledgement. Their resilience should not be mistaken for indifference. Rather, it reflects a cultural pattern of silently absorbing the burden. Any vision and strategy for Zeeland's regional transition must recognise this and ensure that the needs and voices of these communities are not overlooked.

Figure 3.20- Sense of identiy collage

Tourism

Tourism is an important characteristic of Zeeland's regional economy and spatial identity, and is therefore relevant to a strategy for sustainable mobility and energy.

The province receives approximately 3.6 million stay-overnight tourists generating over 22 million overnight stays and 12.5 million day visits yearly (HZ Kenniscentrum Kusttoerisme, 2024). However, as figure 3.21 illustrates, tourism is not evenly distributed across the province. While the overall number of overnight stays decreased by 5% (Holm, 2026), this average differs per municipality (figure 3.23): Terneuzen has a decline of 54%, while Vlissingen has an increase of 12%. Figure 3.25 shows the facilities in Middelburg and Vlissingen, and figure 3.26 illustrates those in Terneuzen.

The main source of travel for tourists visiting Zeeland is the private car. Due to this large volume of visitor movement, tourism is one of the main contributors to seasonal traffic pressure and strain on infrastructure, together with carbon emissions (HZ Kenniscentrum Kusttoerisme, 2024). At the same time, these tourists create an opportunity: by changing this mobility demand towards more sustainable alternatives, the province can reduce its environmental footprint. Some natural areas lack any public transport access, which further reinforces their dependancy. The main policy ambition of Zeeland is to reduce reliance on private car use by encouraging more sustainable alternatives, including public transit, cycling, e-bikes and shared mobility, which are supported by facilities such as park-and-ride locations and electric vehicle charging infrastructure (HZ Kenniscentrum Kusttoerisme, 2024). Tourism is also important for job opportunities of residents (figure 3.22). This opens opportunities for innovation around accessibility.

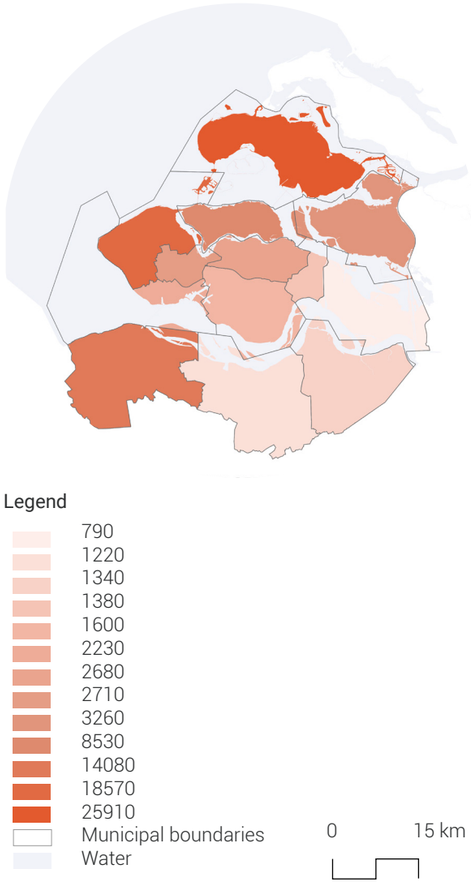


Figure 3.21- Accomodation offer units 2025

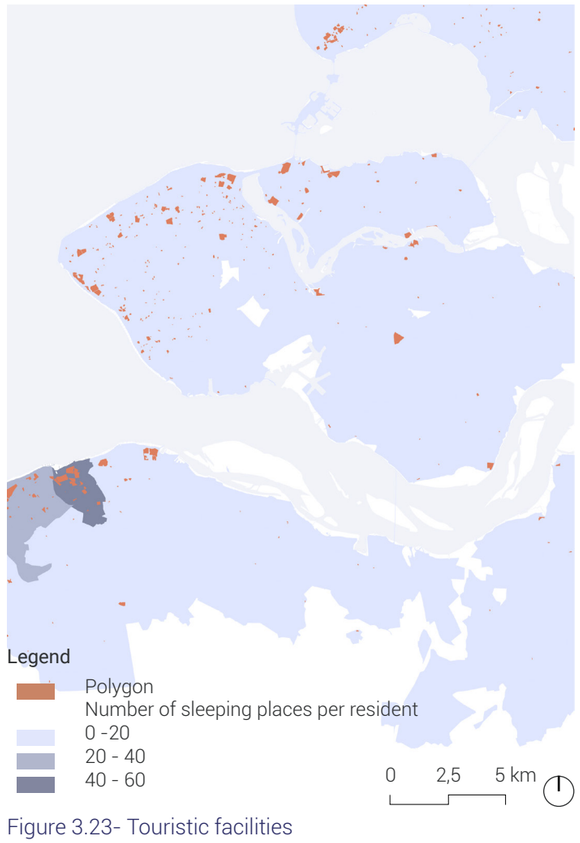


Figure 3.23- Touristic facilities

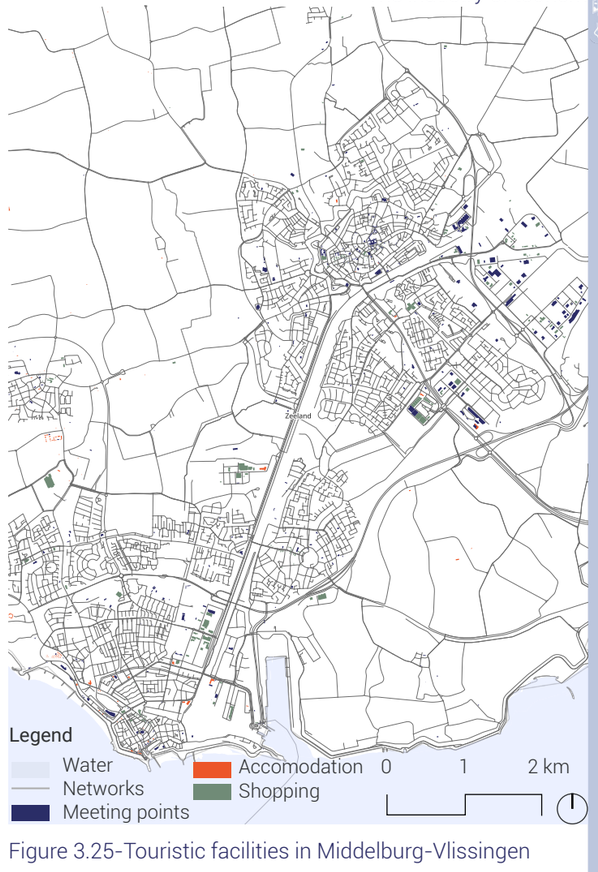


Figure 3.25-Touristic facilities in Middelburg-Vlissingen

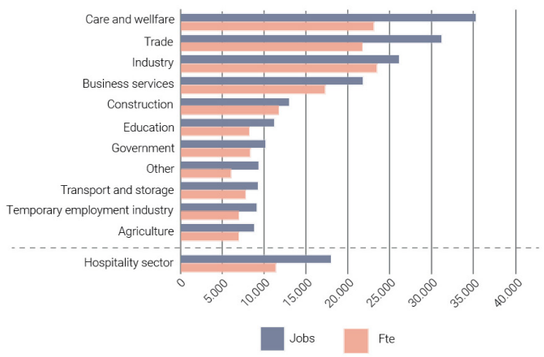


Figure 3.22 -Labour market of Zeeland

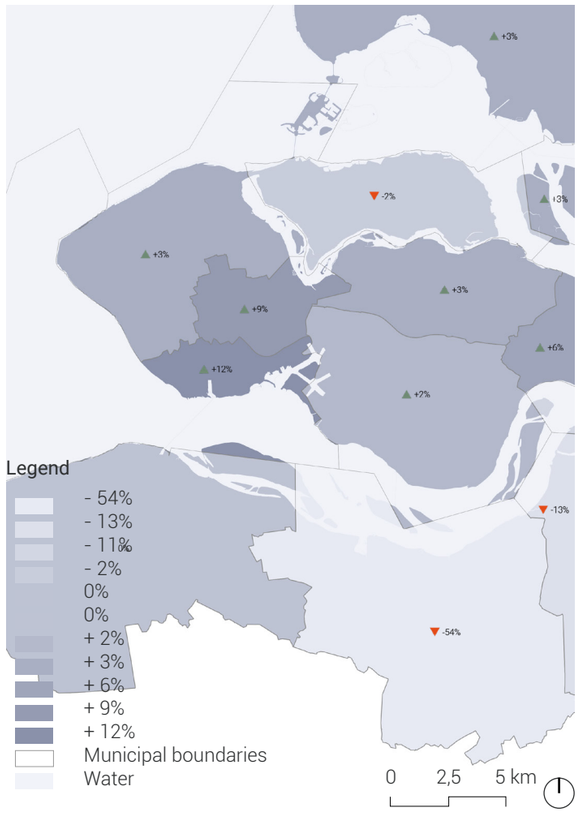


Figure 3.24-Decrease or increase in overnight stays in Zeeland

Figure 3.66- Touristic facilities in Terneuzen

Energy Infrastructure and Transition

Zeeland's energy landscape (figure 3.28) is characterised by large-scale infrastructure that serves beyond the province itself. The map showing the national energy infrastructure can be found in the appendix 6, which illustrates how Zeeland's energy network connects to the national grid.The offshore wind park and the industrial energy clusters on site primarily generate energy for national consumption, rather than for local use. This creates a tension for the communities of Zeeland: the province bears the spatial, environmental, and social costs of energy production, while the benefits flow largely outward.

By the end of 2024, Zeeland had reached approximately 1,310 MW of its 1,700 MW of its RES (Regional Energy Strategy), representing around 77% of the goal for 2030 (Provincie Zeeland, n.d. -a). The province has set a target in the RES of 34% CO2 reduction by 2030 (RES Zeeland, 2020). The solar energy potential and the wind potential can be found in appendix10 . These show that the potential when it comes to solar and wind energy is relatively high.

Figure 3.27 illustrates the different types of energy production present in the region. Zeeland's energy landscape is primarily composed of two renewable energy sources: wind and solar. A smaller but emerging contribution comes from tidal energy. Beyond these, hydrogen and kinetic energy represent future potential that is yet to be fully developed in the province.

Grid Congestion

A big challenge for Zeeland's energy transition is the congestion of the public electricity grid. The existing high-voltage infrastructure was not designed to accommodate the scale of renewable energy generation that is now being developed in the province (Stedin, n.d.). As a result, the grid is increasingly unable to absorb peak production from wind and solar installations, which forces energy producers to lower output at the moments when generation is highest (Renewable Advisory Experts, 2025). Grid congestion does not only affect energy producers, it also delays new sustainable energy connections, which slows the transition down for businesses and residents that want to adopt renewable energy (IEA, n.d.).

Solar

Solar energy is currently generated through a combination of rooftop solar panels and solar parks within the landscape. The RES solar target of 1,000 MW for 2030 is divided between rooftop solar (400 MW) and solar parks (600 MW), with rooftop installations identified as the primary focus for the future (RES Zeeland, 2020). The potential for solar expansion for the energy transition lies in integrating generation more directly into the existing infrastructure, like existing industrial and residential roofs.

Wind

Wind energy in Zeeland is concentrated in clusters near industrial sites on land and offshore (Borssele at Sea). The Borssele offshore wind park, spanning 344 km², generates 1,502 MW, and is among the largest offshore wind installations in the world (Rijkswaterstaat, n.d.). On land, wind development follows a cluster strategy, which is favoured by the province to avoid a scattered wind landscape and to minimise spatial impact on residents (Provincie Zeeland, n.d.-b).
Future wind expansion is expected near the existing industrial sites, which falls in line with the cluster development vision of the province of Zeeland (Provincie Zeeland, n.d.-b). Offshore expansion building on the existing Borssele infrastructure offers the highest wind speed potential compared to land, and the least amount of interference with the landscape.

Tidal

Tidal energy is in an early and experimental phase. At a local scale, the Water2Energy tidal turbine in Vlissingen demonstrates localised potential for this energy type. Using the tidal difference between the Westerschelde and the Walcheren Canal, the installation generates sufficient electricity for approximately 80 households and to power itself (Provincie Zeeland, n.d.-c). This shows potential for endogenous energy production on a local scale, using existing sluice infrastructure.

Kinetic Energy and Hydrogen

Beyond the existing renewable energy installations, two emerging technologies are relevant for Zeeland's energy transition: kinetic energy from mobility and hydrogen.
Kinetic energy from mobility infrastructure is currently not used in Zeeland, but future potential exists for integration into roads and cycling networks. Technologies such as piezoelectric tiles, which convert the pressure of footsteps or vehicle movement into electricity, have been piloted in Germany (TÜV NORD, 2026). Harvested energy could power sensors, street lighting, or signals, and is especially applicable at mobility hubs and high-intensity roads. As a form of endogenous energy production, kinetic energy offers communities a more direct relationship with their energy sources, while reducing dependence on larger-scale external infrastructure.
Hydrogen is emerging as an important element in Zeeland's energy transition. Unlike solar or wind, hydrogen is not an energy resource in itself, but as an energy carrier. It can store and transport renewable energy in a form that is suitable for applications where direct electrification is not usable and where fossil fuels are currently used. This makes it valuable for heavy industry. The province is positioning itself as a leading European hydrogen hub, with ambitions centred on large-scale electrolysis and the SeaH2Land programme by Ørsted, targeting green hydrogen production for industrial applications at the ports of Vlissingen (Ørsted, n.d.). Other hydrogen plans in Zeeland are TotalEnergies & Air Liquide in Vlissingen-Oost, expected to be realized by 2029 (TotalEnergies, 2025), and VoltH2 in Vlissingen en Terneuzen, expected to be realized by 2026 (VoltH2, n.d.).

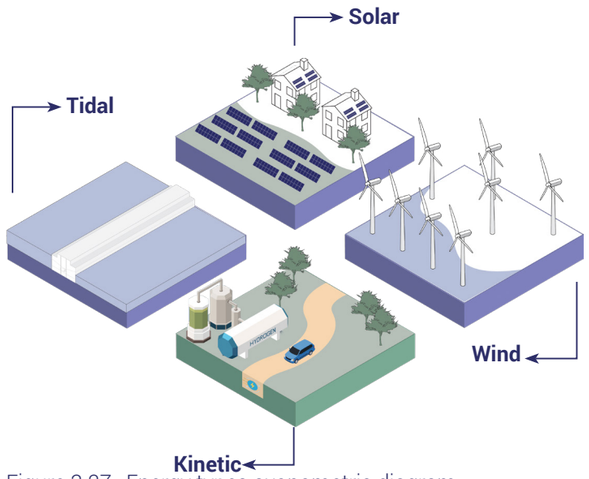


Figure 3.27- Energy types axonometric diagram

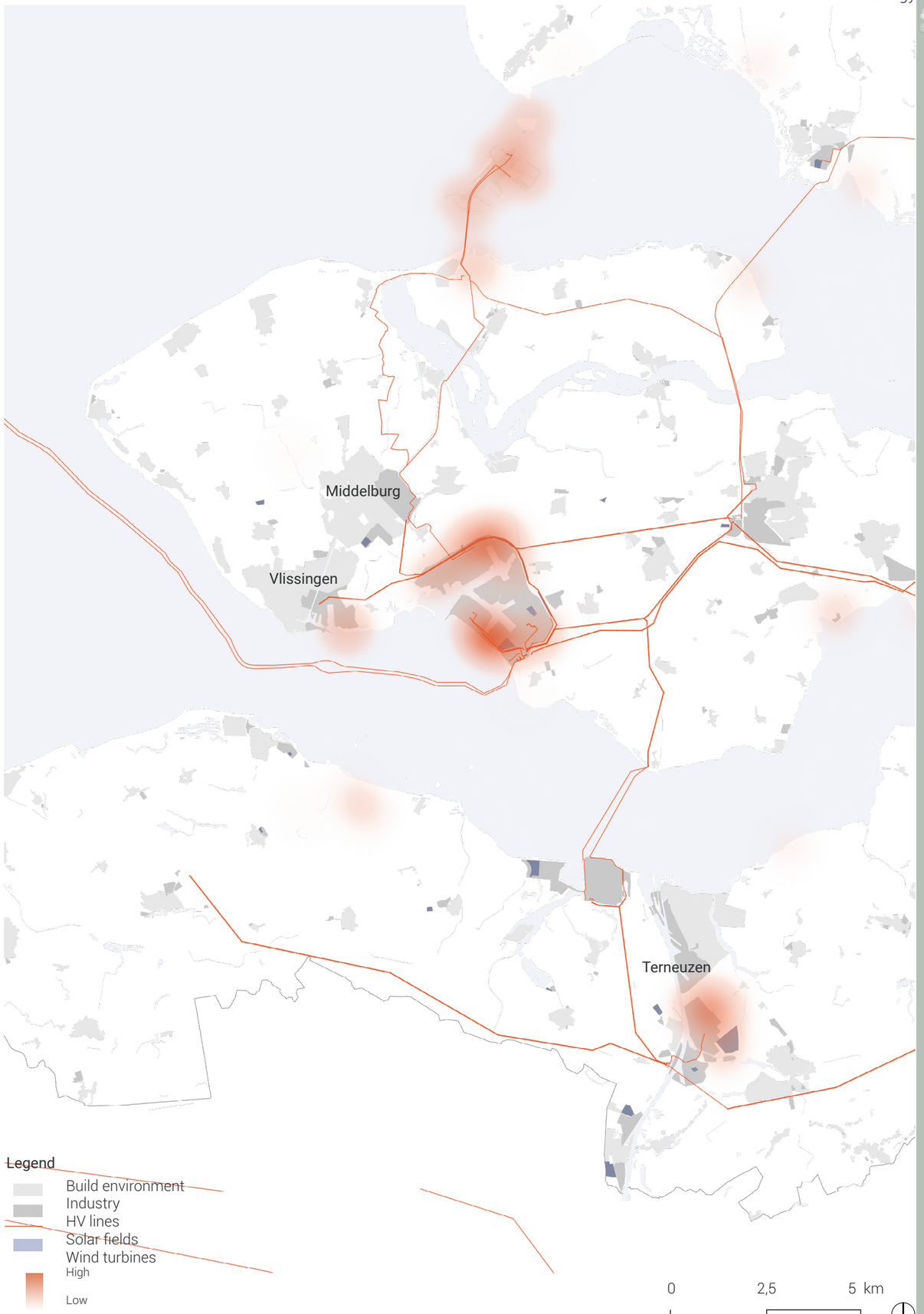


Figure 3.28-Energy map

Sustainable energy flow map

The sustainable energy flow map shown in figure 3.29 illustrates the spatial relationship between renewable energy production and local energy demand across Zeeland. The map is structured around two categories: production and demand. Within each category, locations are assigned a value from 1 to 5, reflecting the relative size of either their energy output or their consumption. Based on these values and the spatial proximity between production and demand points, connecting lines are generated. The thickness of each line represents the strength of the relationship: thin lines indicate low proximity and demand, medium lines indicate a moderate proximity and demand, and thick lines reflect high proximity and demand between a production and demand point.

This visualisation reveals that the strongest energy flow relationships are concentrated in the corridor between Middelburg, Vlissingen, and Terneuzen, where large-scale industrial demand and significant renewable production are located in close proximity. The Borssele offshore wind park has a high production value, but generates thinner connecting lines due to its spatial distance from demand points. Coastal and offshore areas show strong production values, which are driven by wind, while inland and urban edge areas contribute through solar. Together, the map identifies where supply and demand are best aligned and point to the most viable locations for sustainable energy expansion.

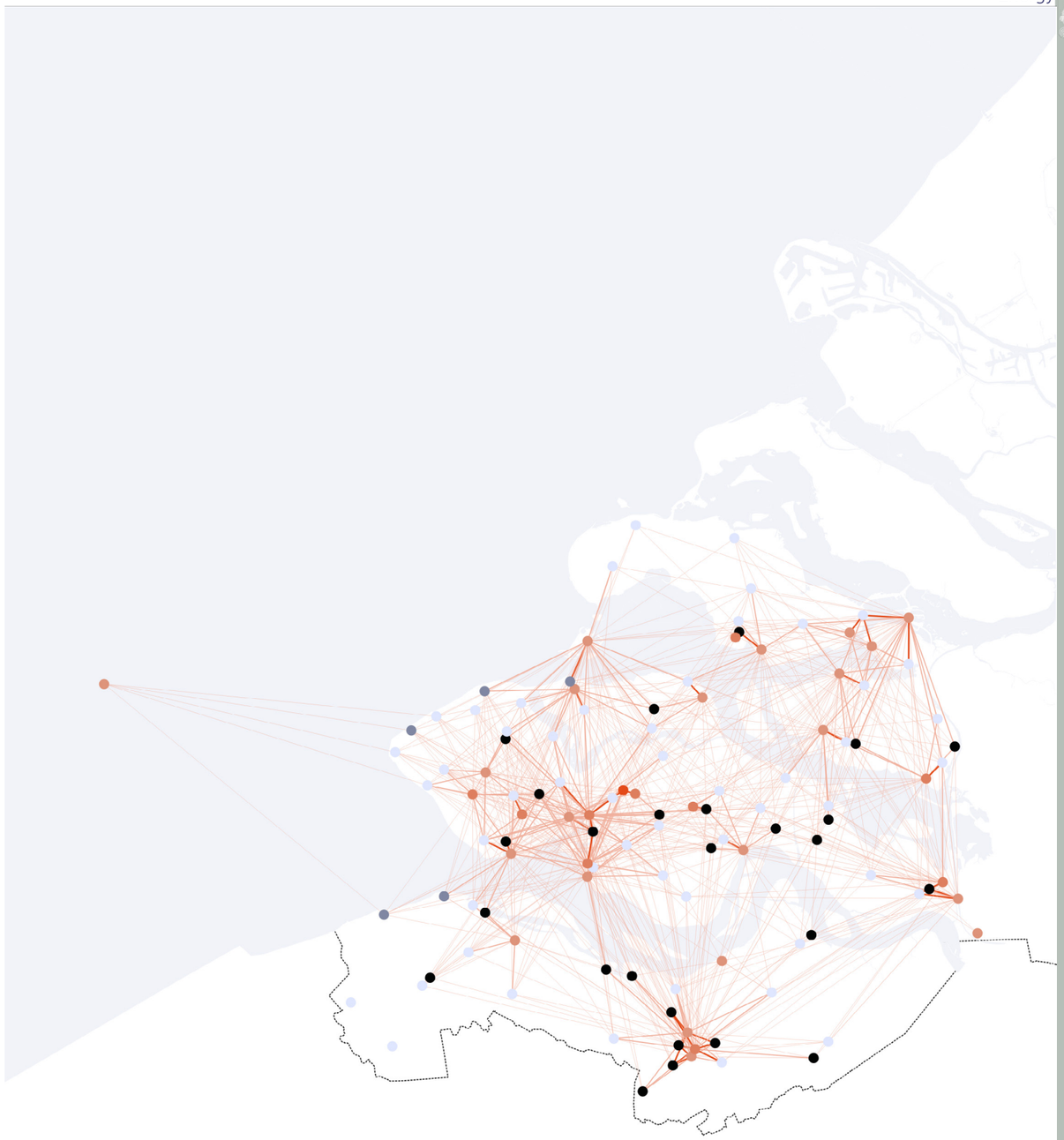


Figure 3.29- Sustainable energy flow map

Energy potential map

Figure 3.30 shows the spatial potential for renewable energy development across Zeeland, and identifies both opportunities and constraints. Natura 2000 areas are indicated as restricted zones, where energy development is excluded to protect sensitive natural environments.

For solar energy, potential is concentrated in the built environment and industrial areas, where rooftop installations offer the most viable form of expansion. Wind energy potential is mapped off shore and along existing energy infrastructure suitable for expansion. Tidal energy potential is identified at existing sluices, where the delta infrastructure can be adjusted without requiring new civil works. For kinetic energy, potential is linked to high-frequency mobility corridors. To identify these roads, space syntax was used which can be found in appendix 10 . The most common used roads are illustrated in figure 3.30 in blue. Finally, hydrogen potential is mapped around future planned production facilities.

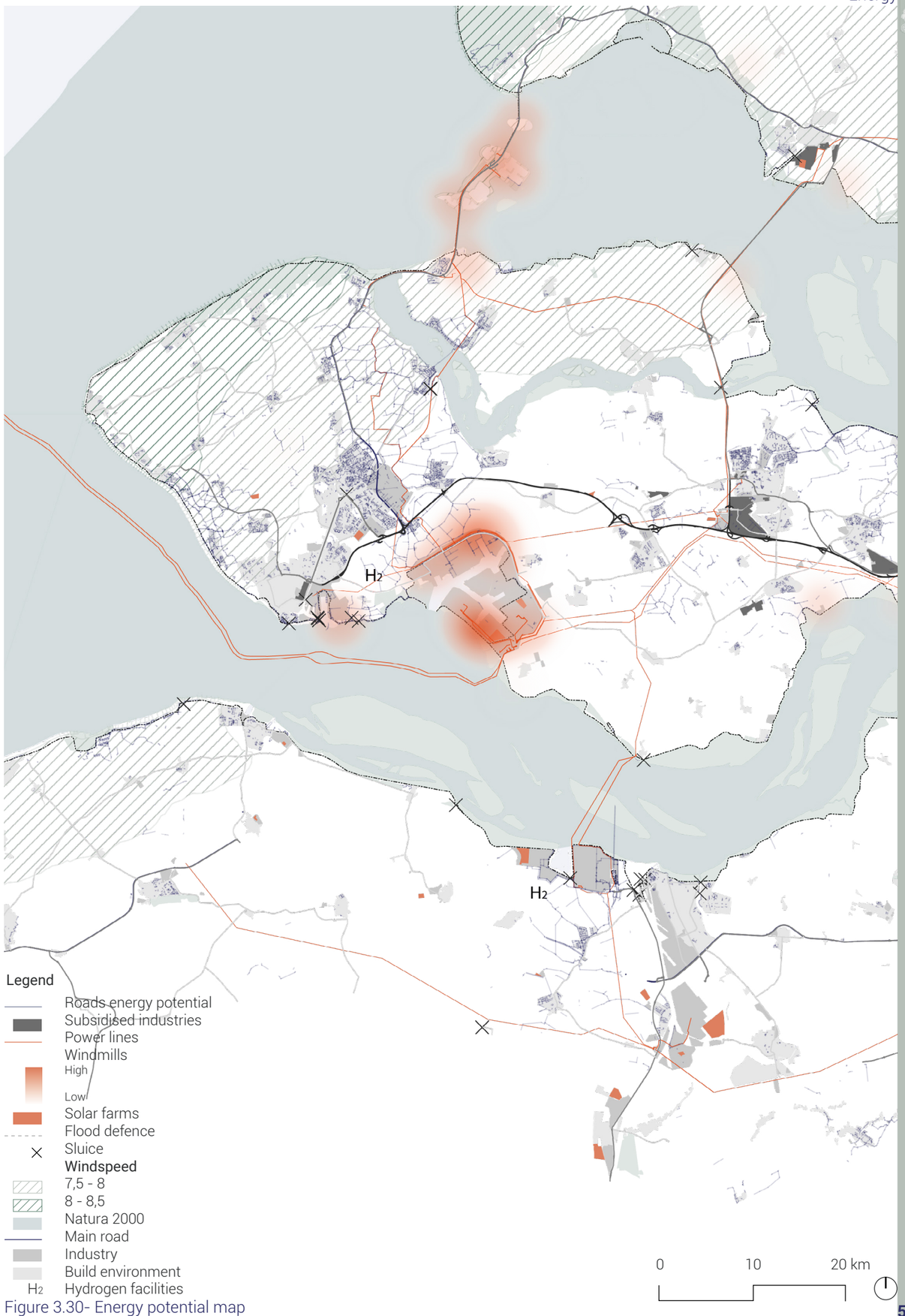


Figure 3.30- Energy potential map

Industry

Zeeland's industrial landscape is strongly defined by its strategic delta location at the intersection of major European maritime and inland transport corridors. Positioned between the ports of Rotterdam and Antwerp, and directly connected to the North Sea, the region functions as a key logistical gateway linking global shipping routes with the European hinterland. This geographic advantage underpins its long-standing industrial development and its role within broader transnational economic networks (Provincie Zeeland, n.d-d.; CBS, 2024).

This spatial condition has enabled a model of port-led development, centred on the North Sea Port, a cross-border port system integrating Vlissingen, Terneuzen, and Ghent. The port accommodates over 550 companies and supports more than 100,000 jobs, forming one of the most important industrial clusters in the Netherlands and Belgium (North Sea Port, 2024; UWV, 2025a). Industrial activities, including petrochemicals, logistics, and bulk processing, are structurally organized around deep-water access, multimodal infrastructure, and port basins. This is clearly illustrated in the Vlissingen port map, where large-scale industrial plots are directly embedded within port infrastructure (Figure 3.32) , and in the Terneuzen industries map, which shows a dense concentration of heavy industry along the canal and port interfaces (Figure 3.33) .

At the same time, Zeeland's industrial system is inherently cross-border, forming part of a wider Dutch–Belgian economic region. The institutional integration of Zeeland Seaports with the Port of Ghent has resulted in a unified port authority and shared industrial ecosystem, facilitating flows of goods, energy, and labour across national boundaries (North Sea Port, 2025; UWV, 2025b). This cross-border configuration enhances competitiveness, but also increases interdependencies within the delta region.

Increasingly, this system is evolving into an energy-industrial cluster, aligned with national and European decarbonisation strategies. The region plays a central role in the Dutch energy transition, hosting renewable energy production, industrial energy demand, and emerging infrastructures such as hydrogen networks and carbon capture systems (RES Zeeland, n.d.; Smart Delta Resources, 2023). The Smart Delta Resources cluster explicitly aims to transform Zeeland into a climate-neutral industrial hub by integrating energy production, storage, and industrial processes. The production sites map reflects this transition, showing the spatial distribution of wind turbines and subsidised renewable energy sites embedded within industrial areas (Figure 3.34) . This co-location of energy and industry reinforces the logic of clustering as a strategy for efficiency and system integration.

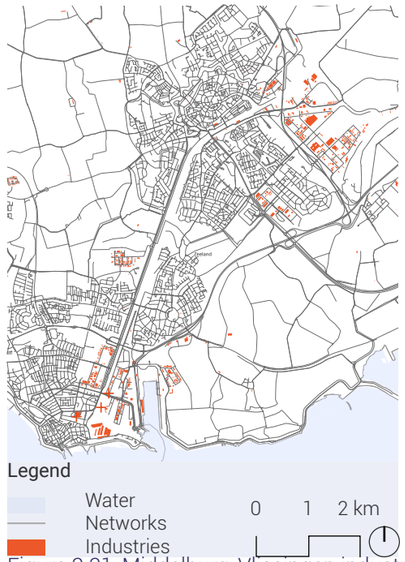


Figure 3.31-Middelburg-Vlissingen industries

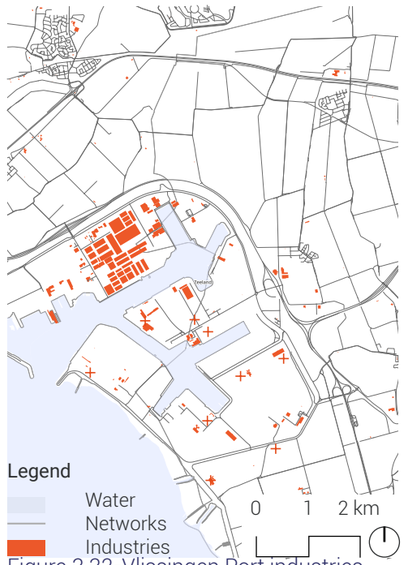


Figure 3.32-Vlissingen Port industries

Figure 3.33- Terneuzen industries

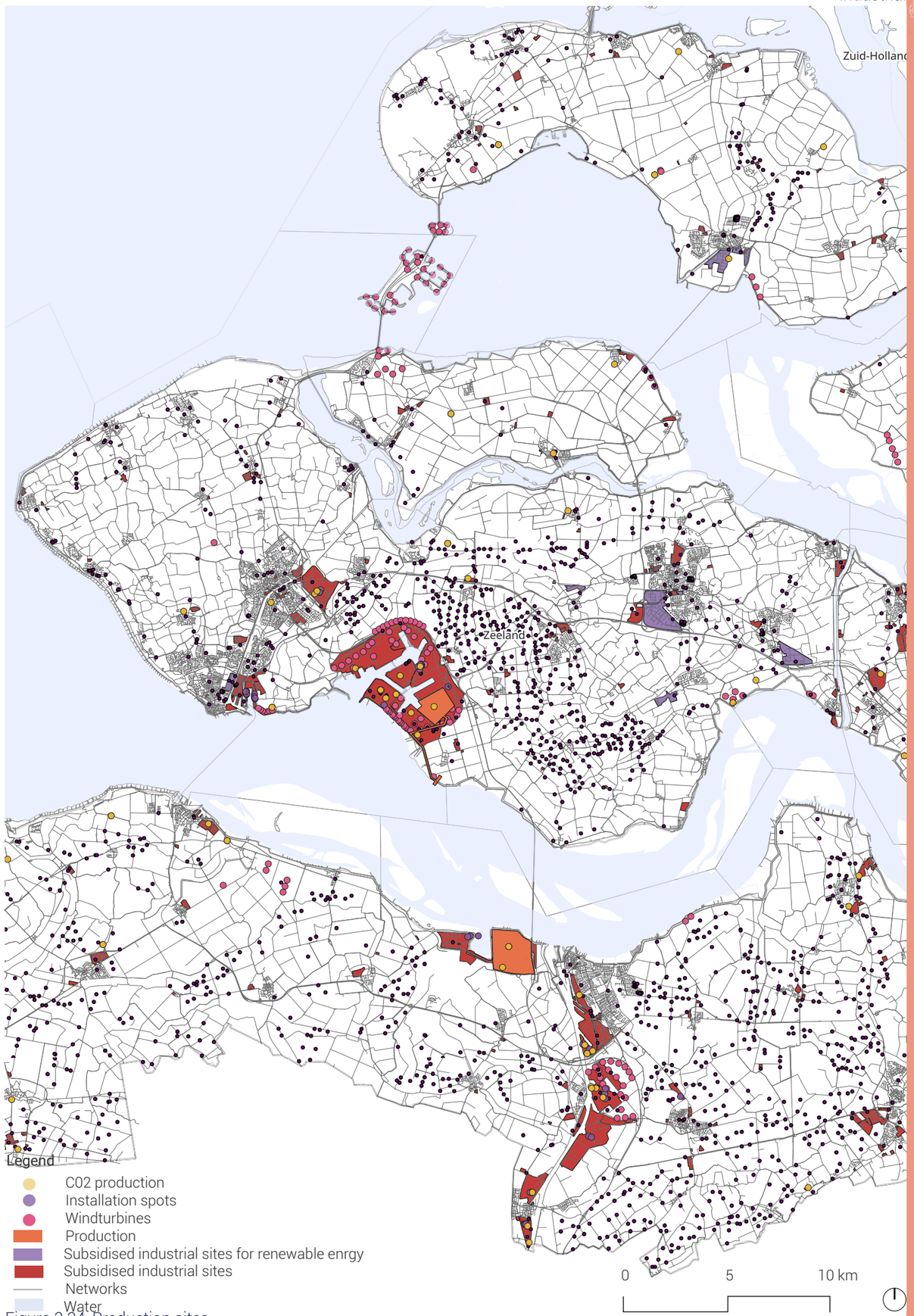


Figure 3.34-Production sites

Industry

However, this concentration of industrial and energy activities generates significant environmental pressure as it can be seen in figure 3.35. Zeeland faces challenges related to industrial emissions, nitrogen deposition, landscape fragmentation, and impacts on nearby communities. Regional reports highlight tensions between economic growth and environmental quality, particularly in areas where heavy industry and residential zones are in close proximity (Provincie Zeeland, n.d-d.; PBL, 2023). The Middelburg–Vlissingen industries map illustrates this spatial condition, where industrial areas are located in close relation to urban settlements, intensifying potential conflicts between production, liveability, and ecological systems.

In conclusion, Zeeland represents a highly integrated industrial region shaped by its delta geography, port-based development model, and cross-border networks. While its transformation into an energy-industrial cluster positions it at the forefront of the energy transition, it simultaneously amplifies environmental pressures, making the region a critical site for balancing industrial competitiveness with sustainable spatial development.

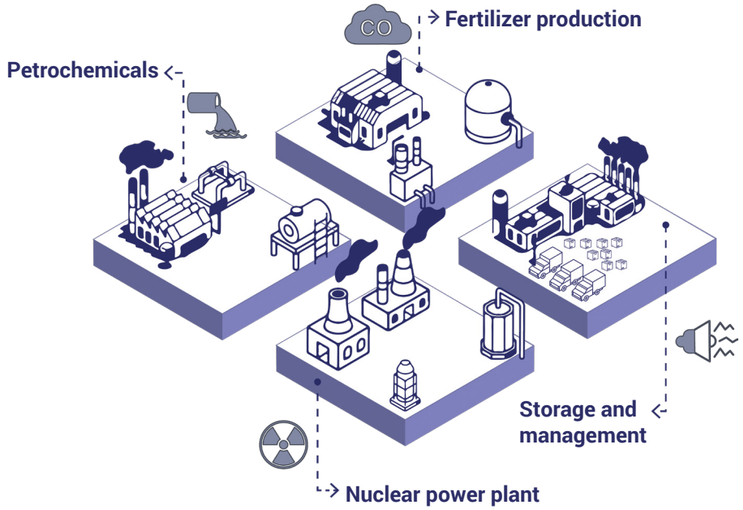


Figure 3.35- Industrial types axonometric diagram

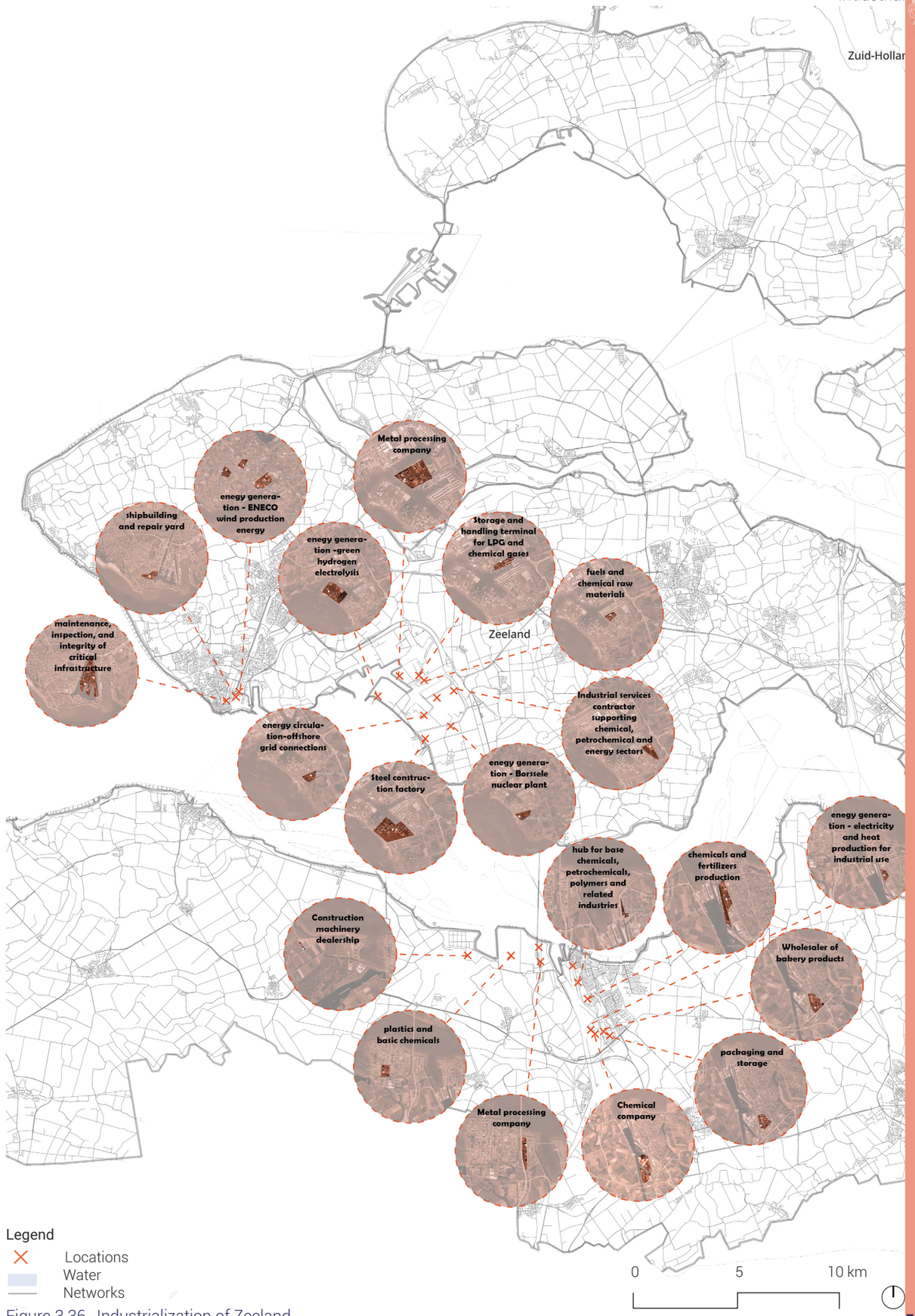


Figure 3.36- Industrialization of Zeeland

Conclusions

In conclusion, Zeeland is characterised by its delta geography, relative isolation, and unique energy landscape. These conditions shape the lives of its car-dependent communities. Shaped by water management, infrastructure, and industrialisation, the region has created both economic opportunity and vulnerability. At the same time, an aging population and regional brain drain influence the social dynamics and long-term resilience of its communities. The North Sea Port cluster, in combination with the energy production sites, supports over 100,000 jobs and more than 550 companies, making it an important economic backbone for Zeeland and its communities.

Figure 3.37, the synthetic map of the built environment, highlights how residential and industrial areas are intertwined. It shows that communities living near industry experience both direct economic benefits, such as employment, and environmental pressures, including pollution and noise. Industrial areas sit close to the built environment, while forest and recreation zones are mainly located along the coast.

Energy infrastructure,including nuclear, wind, solar, and emerging hydrogen technologies, positions Zeeland at the forefront of the energy transition and gives the region significant potential.

Figure 3.38 shows the synthetic map of Zeeland's energy infrastructure, illustrating the large concentration of energy systems within the province. The region demonstrates strong progress toward its RES targets and holds potential across multiple renewable sources. Wind energy is generated offshore and in clustered onshore locations near industrial sites. Power lines connect the islands, forming a collaborative system. Zeeland hosts one existing tidal turbine, several planned hydrogen facilities, and a nuclear power plant. Wind energy remains the backbone of the transition, which is complemented by emerging opportunities in tidal, kinetic, hydrogen systems, and solar energy on existing infrastructure. The most effective future developments lie in reinforcing existing industrial–energy clusters and integrating production more directly into industry and the built environment.

Figure 3.39 presents the synthetic map of Zeeland's mobility system. The province has one train line, with three intercity stops and nine stations in total. Although bus coverage is extensive, reliability remains limited, leaving many places difficult to access. This emphasizes the car dependency of the residents of Zeeland.

The combined synthetic map (Figure 3.40) integrates the energy, mobility and built environment layers. This shows how the spatial vision for Zeeland cannot treat energy, mobility, the built environment as separate systems. It highlights current conditions and serves as a backbone for developing future scenarios and an eventual spatial vision. It provides insight into both the existing situation and the potential opportunities for transformation.

Figure 3.37 - Synthetic map of the built environment

Figure 3.39 - Synthetic map of road network

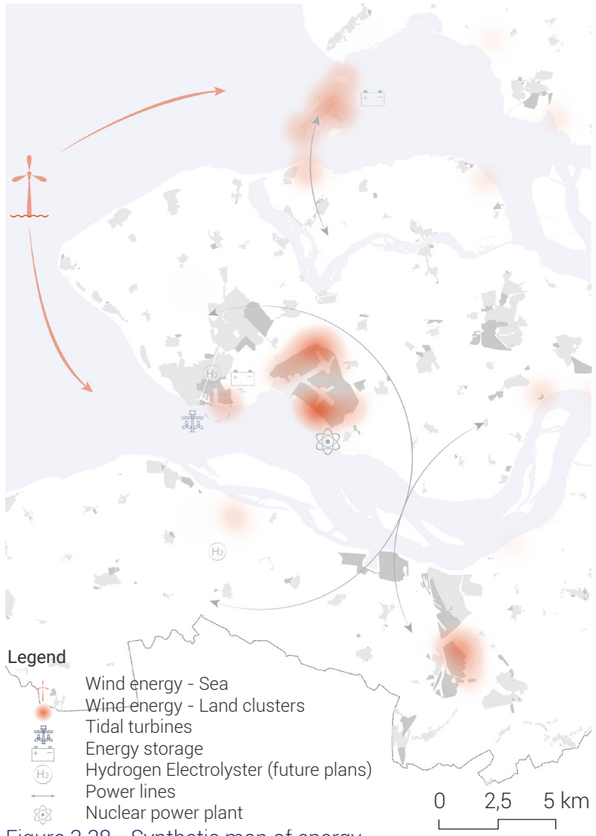


Figure 3.38 - Synthetic map of energy

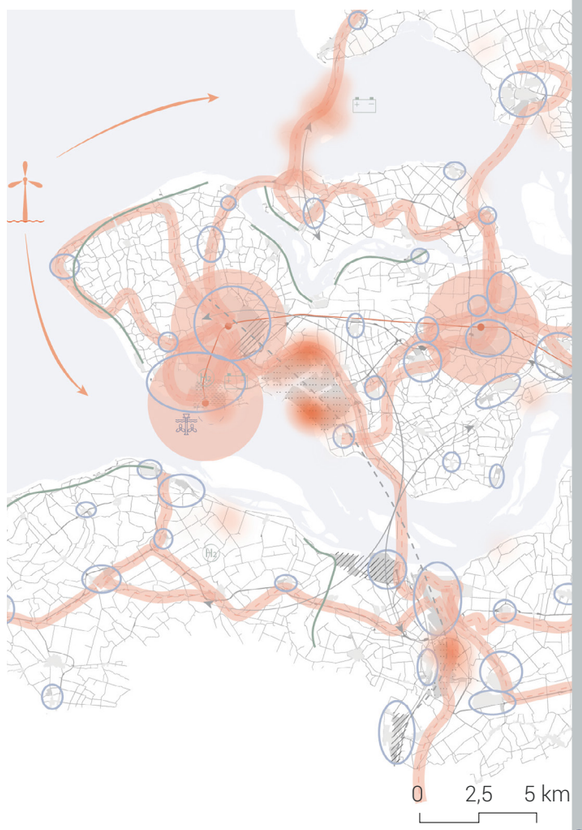


Figure 3.40 - Combination of synthetic maps

04 Vision

Transitional communities

The transitional communities of Zeeland consist of two groups:

Residents living near industrial sites and

Workers in the industry.

These two groups occupy slightly different positions. However, they are both car dependent communities due to Zeeland's lack of mobility alternatives, and are both closely connected to Zeeland's industrial landscape: residents through their proximity to industrial sites, and workers through their employment within them.

The communities share several wishes and concerns, mostly related to limited mobility and health risks associated with the industries. However, they also have specific wishes based on their different relationships to the industry. Their wishes and concerns form the basis for a shared vision for the future of Zeeland.

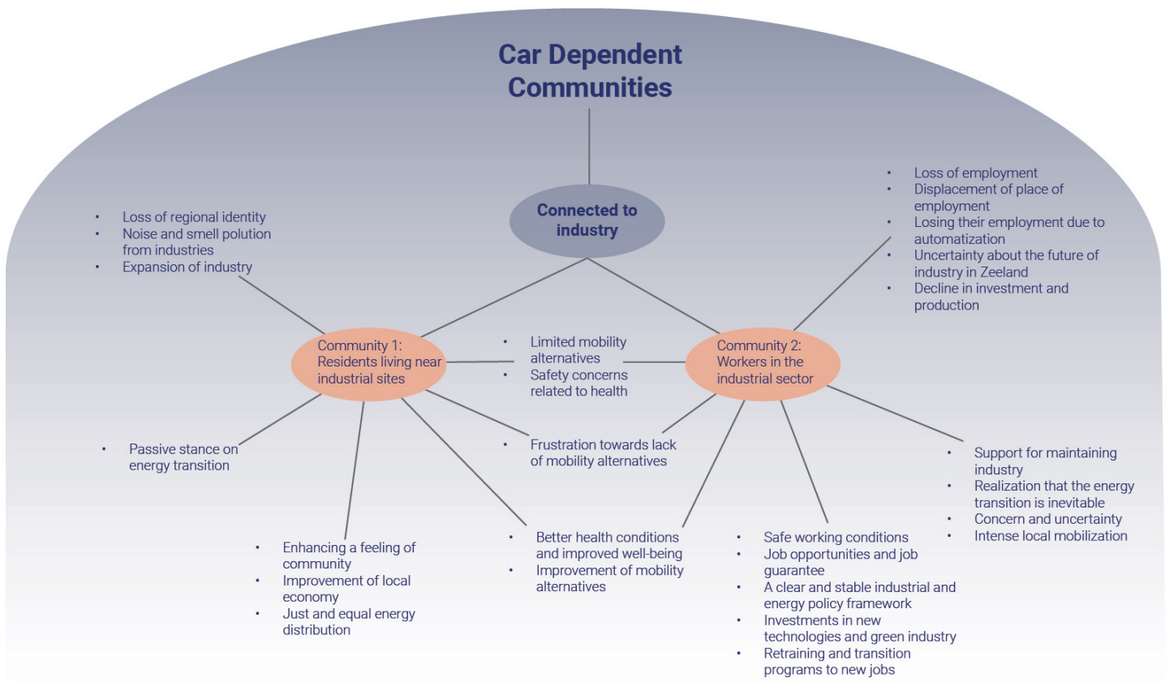


Figure 4.1 - Diagram of communities in transition

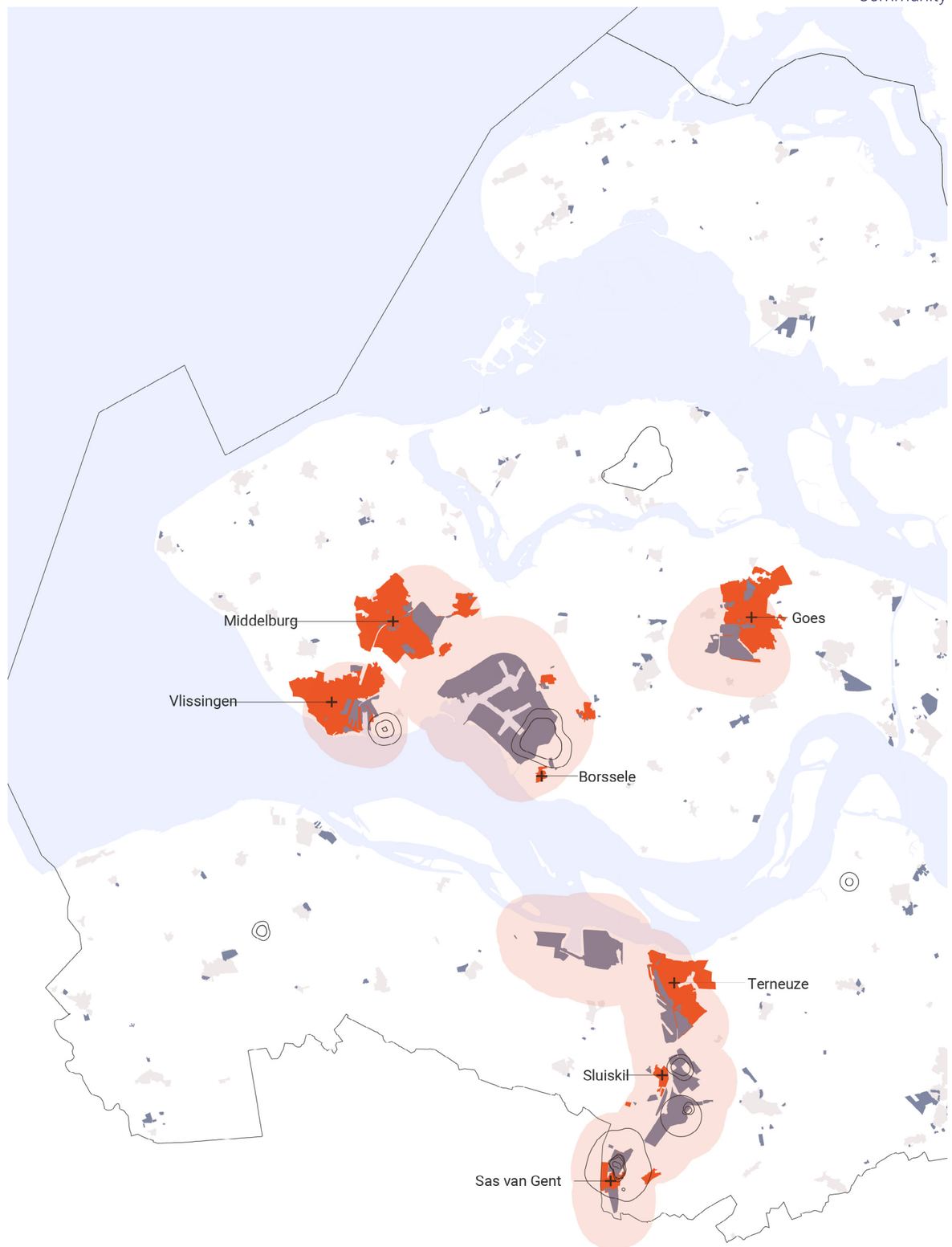


Figure 4.2-Communities affected by industrial sites

Transitional communities

Residents living near industrial sites play a very important role in the region's energy transition. Their proximity to industrial sites brings issues such as, noise pollution, odor disturbance and safety risks. That's why this community is at the forefront of experiencing the impact of potential transformation in the industrial landscape. The community consists of residents living close to large industrial areas in Zeeland. These industrial areas are mostly located in the municipalities of Vlissingen, Borsele, and Terneuzen, which are all part of the North Sea port region. The industrial landscape in these areas mostly consist of port infrastructure, energy production and petrochemical industries.

Concerns

Research indicates that residents living near industrial sites have a larger chance of health related issues such as birth defects, childhood cancers, chronic respiratory and cardiovascular diseases. (Johnston & Cushing, 2020). These communities are often poorer and face more stress, which makes these health risks even worse. Furthermore, residents in these areas have a higher risk for acute exposures resulting from events such as flooding. Which is more likely to happen now due to the climate change and the vulnerable location of Zeeland. These health risks are especially likely in the proximity of Petrochemical industries like in the Sloesgebied (near Borsele) and the Kanaalzone (near Tererneuze). Residents living near these types of industries have a higher risk of brain cancer, leukemia, and asthma hospitalizations due to emissions of toxins. (Brender et al. 2011) Therefore neighborhoods near the Sloesgebied and the Kanaalzone are the most vulnerable groups in this community.

Residents living near Zeeland's industries face a range of concerns. Many feel their regional identity is under pressure as industrial areas expand. Limited mobility options and a strong dependence on cars contribute to a sense of isolation from the rest of the region. In addition, residents worry about the noise and air pollution from the industries, along with health and safety risks, and are therefore also concerned for further industrial expansions.

Wishes and attitude

This community emphasizes the importance of improved health conditions and overall well-being with less negative impact from local industry and pollution. There is also a strong expectation for an enhanced feeling of community that is not undermined by industrial development or large infrastructural changes. There is also a clear demand for better mobility alternatives, to improve regional connectivity. Finally, the community calls for just and equal energy distribution and equitable access to local amenities. Residents are concerned that the benefits of the energy transition and infrastructure developments are not distributed fairly. Because of this, in terms of the energy transition the residents have a more passive and cautious stance. Interviews indicate that the energy transition is not a huge priority for the residents. The residents are generally skeptical against all types of industrial expansion even for renewable energy. Residents would only back new renewable energy expansions if it directly improves their day to day lives.

The people working in the industries of Zeeland form a very important socio-economic group, supporting the region's strong industrial economy. These workers are mainly located in areas such as Zeeuws-Vlaanderen and the Kanaalzone, where industries like chemical production, manufacturing, and port activities provide a large share of employment (UWV, 2025; CBS, 2024). Their economic stability is closely tied to the continuity and performance of these industries, making them highly dependent on the long-term viability of the industrial sector.

Concerns

The main concern of this community is the potential loss of employment due to industrial decline, restructuring, or relocation. This is closely linked to fears about the future of industry in Zeeland and possible decline in investment and production.There is also concern about automation replacing jobs and the displacement of workplaces, which could force workers to relocate or lose employment. Similar to other communities, limited mobility alternatives remain an issue, alongside health and safety concerns related to industrial work.

Wishes and attitude

This community places strong emphasis on employment security and economic stability. A key expectation is the preservation of existing jobs, as well as the creation of new employment opportunities within emerging sectors such as renewable energy and green industry. In addition, workers stress the importance of safe working conditions and improved health and well-being. Given the risks associated with industrial environments, these aspects are essential for a sustainable future. There is also a clear demand for better mobility alternatives, as current limitations affect commuting and access to jobs. Furthermore, workers expect a clear and stable policy framework from the government, providing long-term certainty about the future of industry in Zeeland. To support the transition, they highlight the need for investment in new technologies, as well as retraining programs, allowing workers to adapt to new types of employment. Finally, there is a strong desire to be more included in decision-making processes, ensuring fair participation in shaping the region's future.

Overall, this results in a general feeling of concern and uncertainty. While workers recognize that the energy transition is inevitable, they strongly support maintaining industry in the region. Their attitude can therefore be described as cautious but pragmatic, with a focus on protecting economic stability during the transition.

Community 1 - Residents living near industrial sites

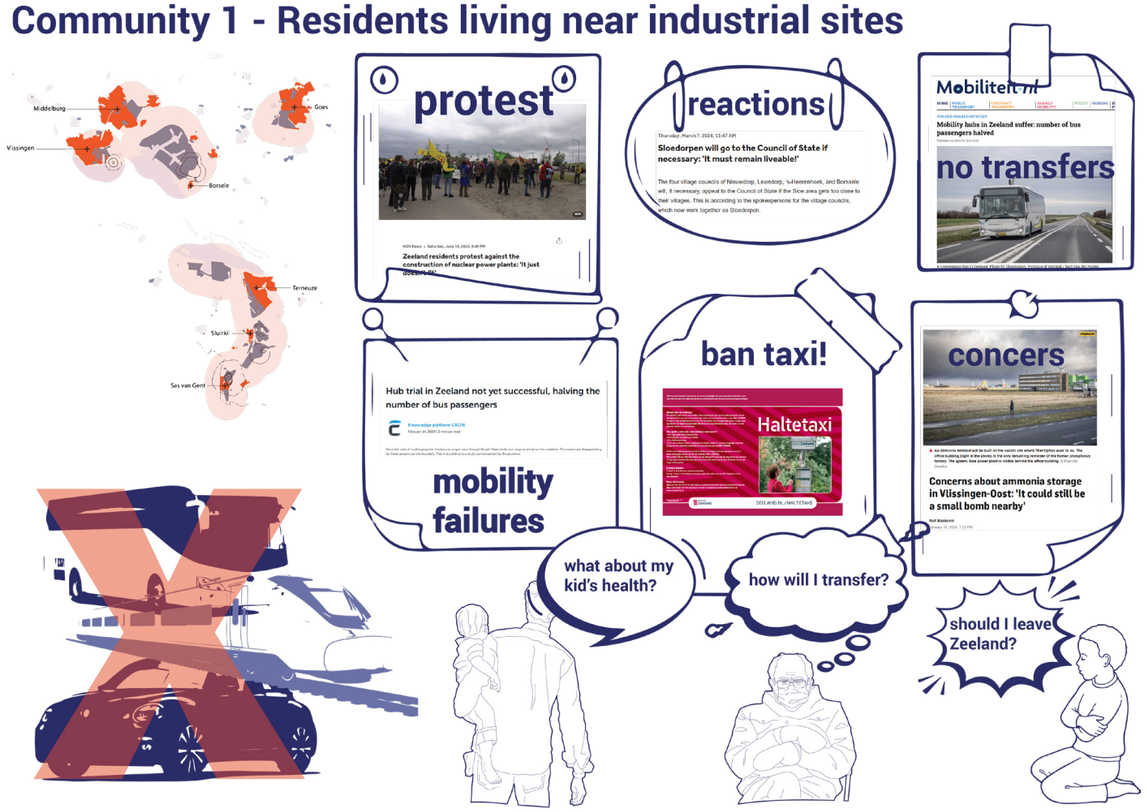


Figure 4.4 - Community 1 diagram

Community 2 - Residents working in the industry

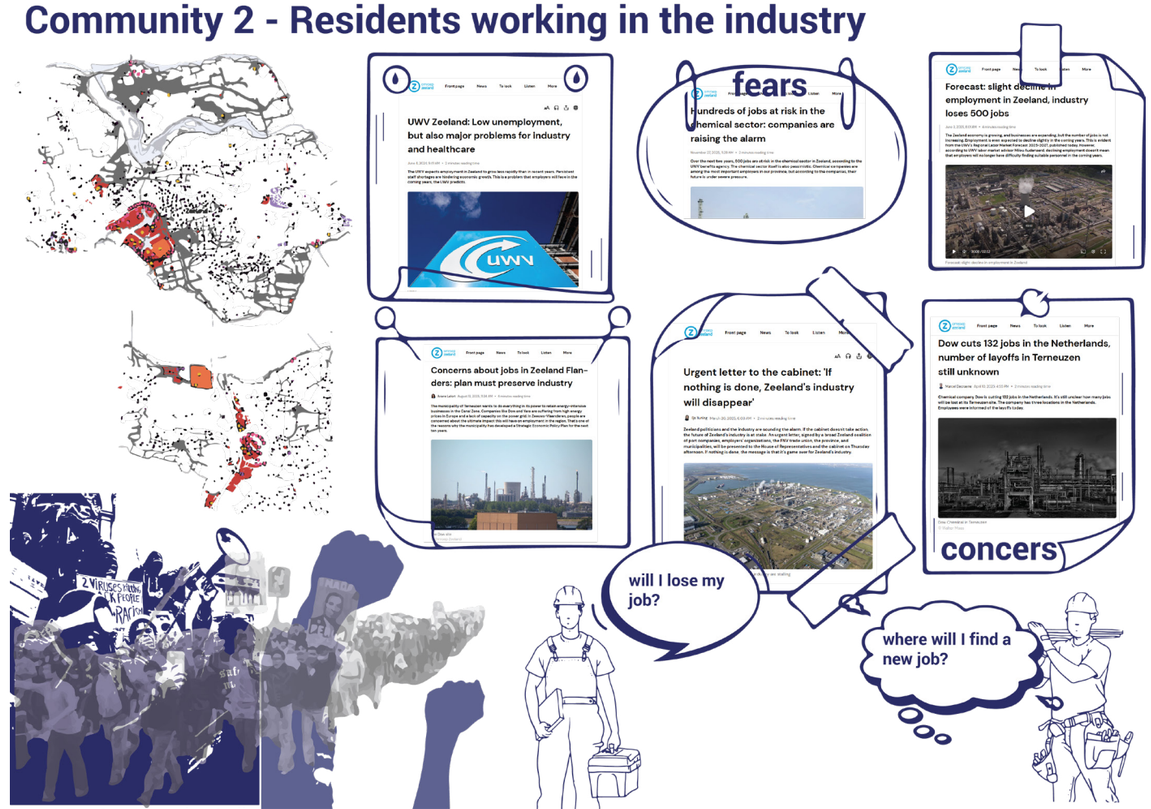


Figure 4.5 - Community 2 diagram

Stakeholders: synergies and conflicts

The deliberative arena, the societal arena, plays a crucial role in shaping decision-making by bringing together diverse stakeholders into a shared negotiation space. This enabled different interests, concerns and expectations to be explicitly addressed, increasing transparency and inclusivity in the process. The stakeholders which are part of the societal arena are environmental activists (Borsele Tot De Kern), residents near industrial sites, workers in the industrial sector, youth, and touristic business owners. These are explained more in depth in chapter 5.

Synergies, such as the shared interest in improved mobility and economic stability, facilitated consensus around integrated solutions like Mobility Energy Hubs. At the same time, conflicts (particularly between industrial growth, environmental quality, and residents' well-being) required trade-offs and adaptive strategies. These tensions led to more balanced decisions, ensuring that spatial interventions not only support energy transition goals, but also address social equity and regional cohesion.

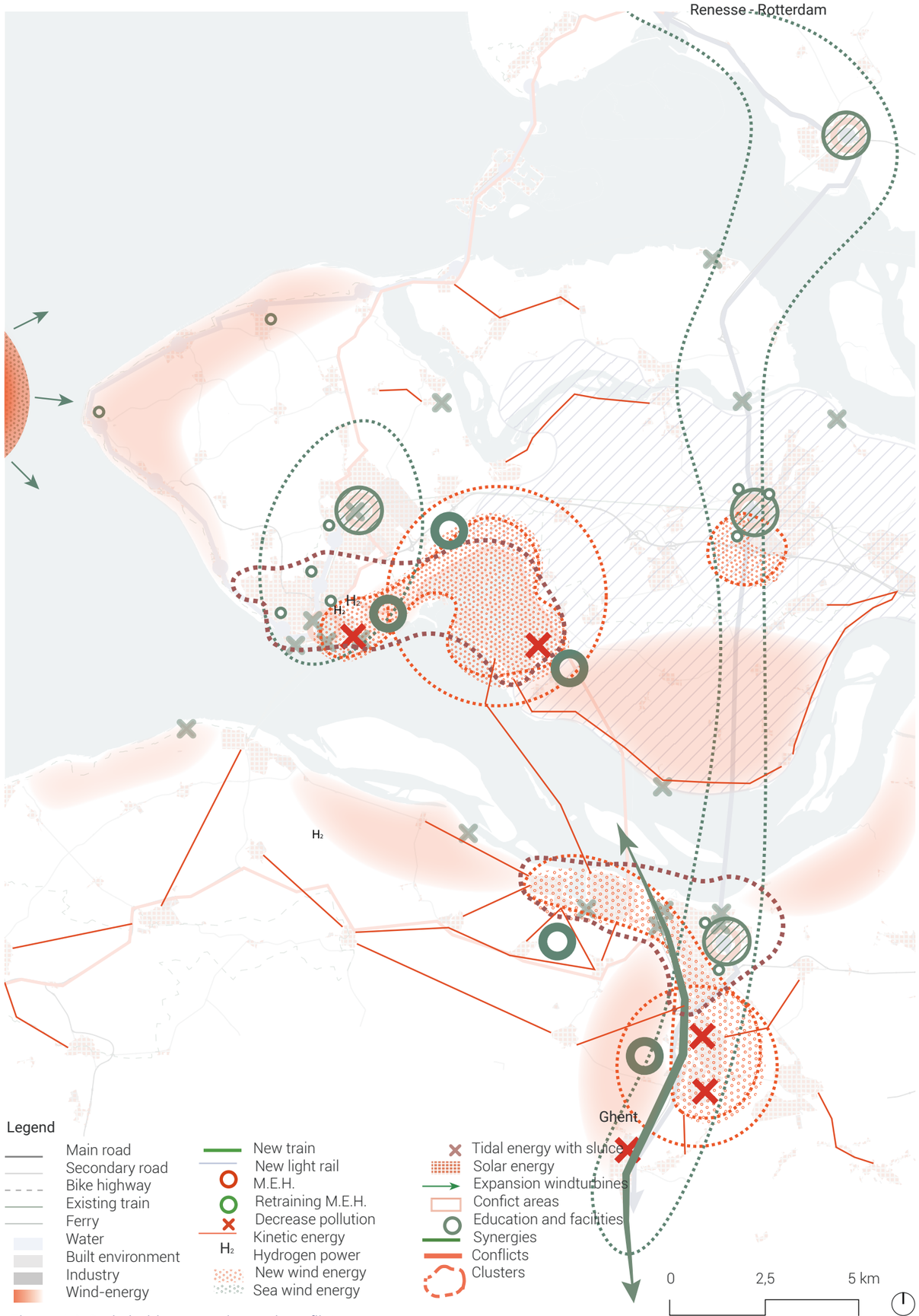


Figure 4.6-Stakeholder synergies and conflicts map

Vision

Based on the wishes of the communities and input of the stakeholders, there are six design principles created to guide the community vision.

First, the communities emphasize the need for increased generation of solar, wind, tidal, kinetic, and hydrogen energy. These efforts aim to create a reliable and sustainable energy supply that benefits the residents of Zeeland.

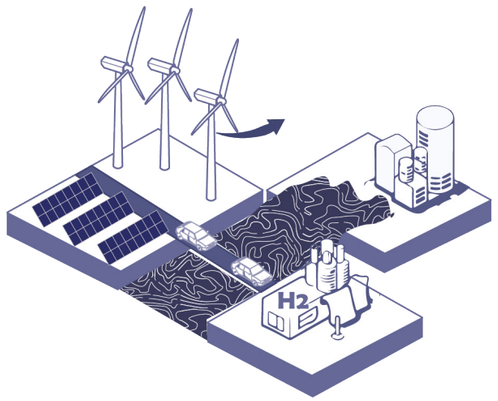
Second, the communities stress the importance of clustering the industries to avoid fragmentation. This approach minimizes disruption to the landscape, and keeps industrial activities at a safe distance from residents.

Third, the communities call for a more equal energy production between North and South Zeeland. This ensures that no area carries a disproportionate burden, and that all residents have fair access to clean energy.

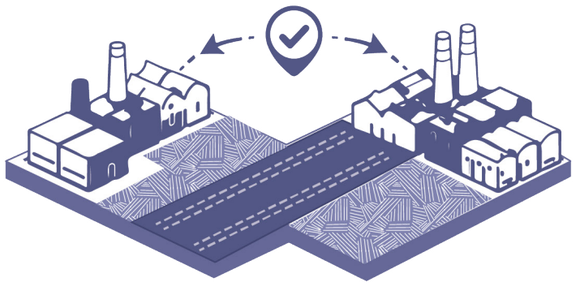
Fourth, the communities highlight the need for a more accessible mobility network, with regional train connections and local mobility points offering trams and buses. By creating improved mobility alternatives, the communities become less car-dependent while accessing work, education, and services efficiently.

Fifth, the communities suggest the development of new energy hotspots. These hotspots provide energy for the area and for new mobility alternatives.

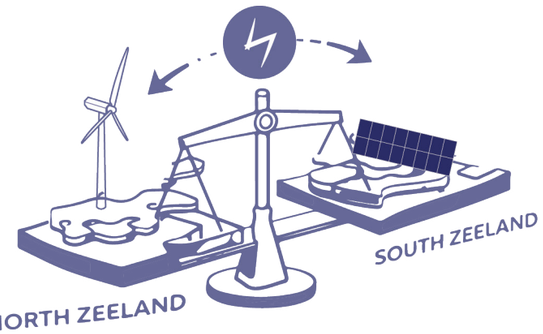
And finally, existing infrastructure should be expended, both for public transport and energy networks, creating a network that forms an integrated system that supports both mobility and energy needs across the region for both communities and all of Zeeland.



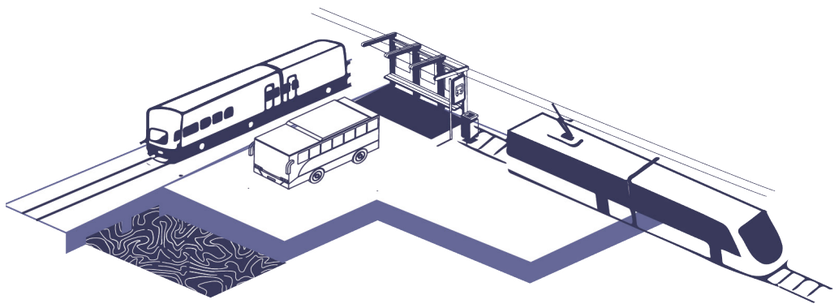
**Enhance energy generation by:
solar, wind, kinetic, tidal, hydrogen**



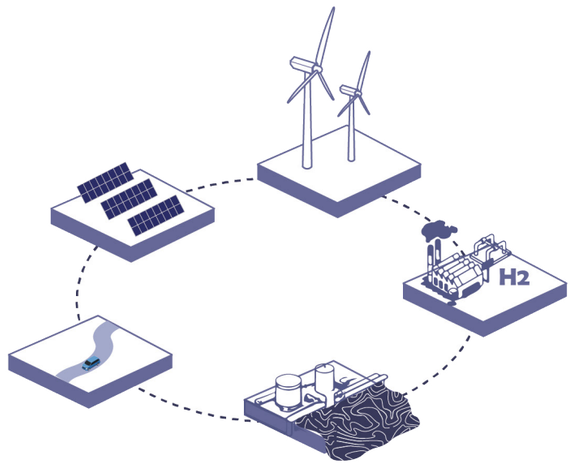
Clustering industries to avoid fragmentation



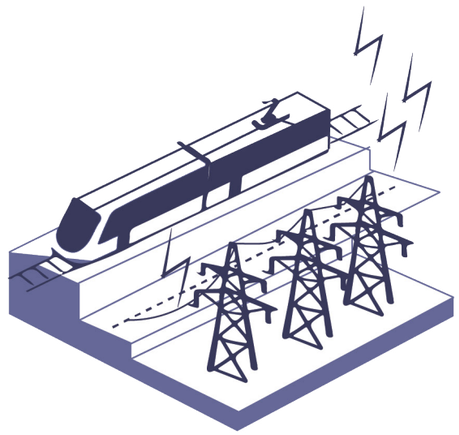
Equal energy production facilitiesof North and South Zeeland



**Create a more accessible network:
National/Regional (train), Local (hubs, bus, tram)**



Introducing new energy hotspots



**Expanding existing infrastructures:
roads, public transport, energy networks**

Figure 4.7-Design principles

Vision

The community's vision proposes an integrated system in which energy production and mobility are closely connected and adapted to the regional context of Zeeland. The goal is to create a system that is both sustainable and efficient, while responding to the needs of the communities, and incorporating the input of stakeholders discussed in the deliberative arena.

The energy interventions, shown in figure 4.8, shows several renewable energy sources that are introduced in the region. Tidal energy is implemented at locations where sluices already exist, making use of current water infrastructure. For wind energy, existing wind parks will be expanded, for example near Vlissingen, alongside the development of new clusters near Goes and Terneuzen.

Solar energy is primarily integrated into the built environment, by placing solar panels on rooftops instead of building large-scale solar parks. This reduces the spatial impact on the landscape. In addition, kinetic energy is explored along the main roads in Zeeland as an experimental form of energy generation. Hydrogen is further developed in locations where projects already exist or are planned. Currently, hydrogen production is taking place at Vlissingen through Ørsted's SeaH2Land programme, while additional projects are planned for Vlissingen-Oost (TotalEnergies & Air Liquide, expected by 2029) and for Vlissingen and Terneuzen (VoltH2, expected by 2026); these projects will supply energy to the nearby industrial areas.

In the mobility interventions, shown in figure 4.9, several interventions are proposed to increase regional and local accessibility. A new train line connects Zeeland more directly to Rotterdam and Ghent, strengthening its position within a wider network. In addition, a light rail along the coast improves access to Zeeland's tourist areas, and connects these coastal towns to the public transport system.

As highlighted in figure 4.10, the existing FLEX system is being expanded to improve local mobility connections. Currently, this system only operates in the western part of Zeeland, so an extension to the eastern part of the province is proposed. Alongside this, new larger mobility and energy hubs are introduced. In these places, energy and mobility systems come together. These mobility energy hubs include elements such as solar panels, energy storage, charging stations, and a variety of mobility services.

Together, these interventions form a connected system (figure 4.11), where energy and mobility come together, built around the needs of the two communities, while also considering the interests of the stakeholders.

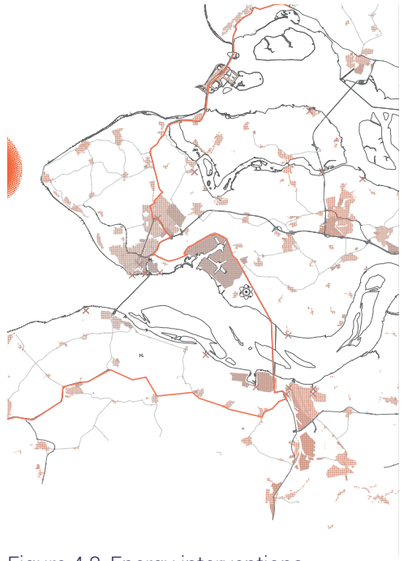


Figure 4.8-Energy interventions

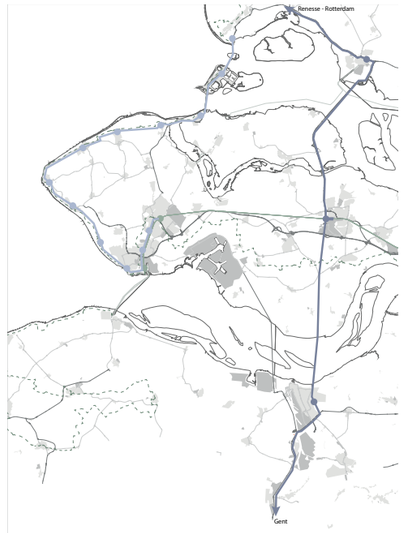


Figure 4.9-Mobility interventions

Figure 4.10-M.E.H expansion

Figure 4.11-Vision map

Vision

The systemic sections describe the energy and mobility system in three stages: the current situation, the transitional phase, and the future vision. It shows how the region evolves over time, and how different elements are interconnected.

In the current situation, shown in figure 4.12, the system is characterized by several challenges. There is a strong dependence on fossil fuels and industrial energy systems, combined with high CO2 emissions, noise pollution, and environmental pressure. The region also faces grid congestion, which is limiting the integration of new renewable energy sources. Mobility is largely car-dependent, with limited public transport alternatives.

In the transitional phase (figure 4.13), the opportunities and tensions become visible. New forms of renewable energy production are introduced through investments, alongside changes in industrial processes. This creates possibilities for symbiosis between industry and the residents of Zeeland, as the new energy production benefits the communities. At the same time, there are still concerns related to nature, agriculture, and existing industries, as spatial changes may lead to conflicts over land use and environmental impact. The system is therefore in a state of adaptation and negotiation.

In the future vision, shown in figure 4.14, the system becomes more integrated, balanced, and sustainable. Energy production is locally embedded and completely integrated and energy hubs manage storage and distribution. Mobility is improved through new public transport connections and the new expanded M.E.H system, this reduces the dependence on cars. Industrial activities are more clustered, particularly around port areas, allowing for better and more efficient use of infrastructure and resources.

Overall, the system shifts from a fragmented and fossil-based structure to a connected, renewable network, where energy, mobility, and industry are closely aligned.

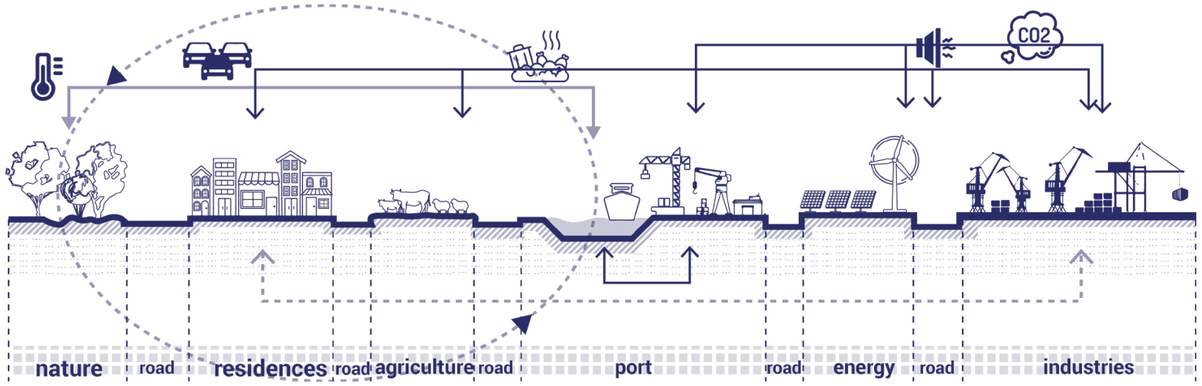


Figure 4.12-Systemic section of the current situation

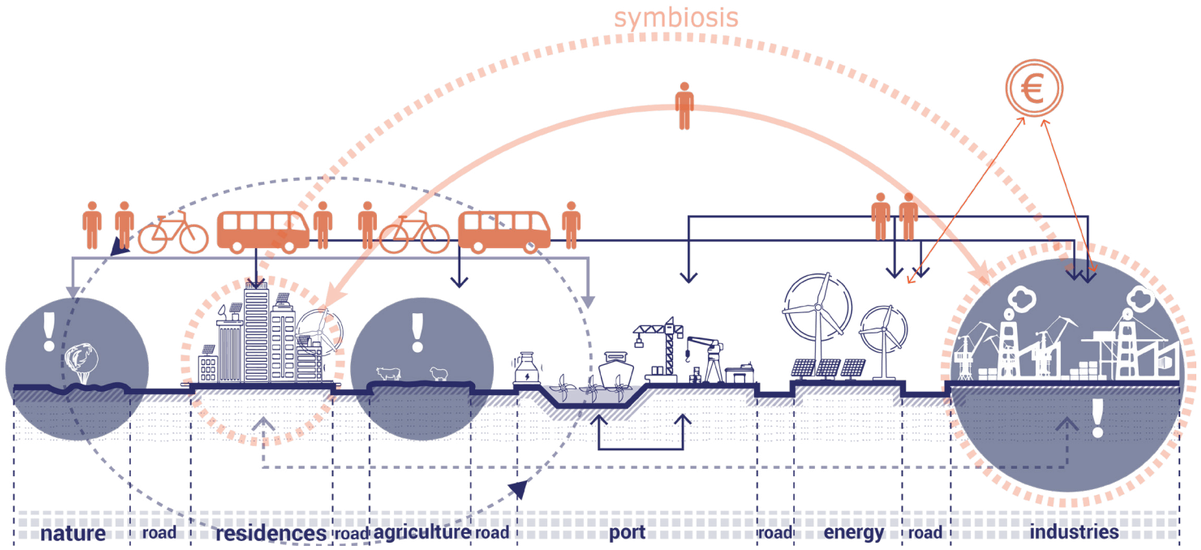


Figure 4.13-Systemic section of the transitional situation

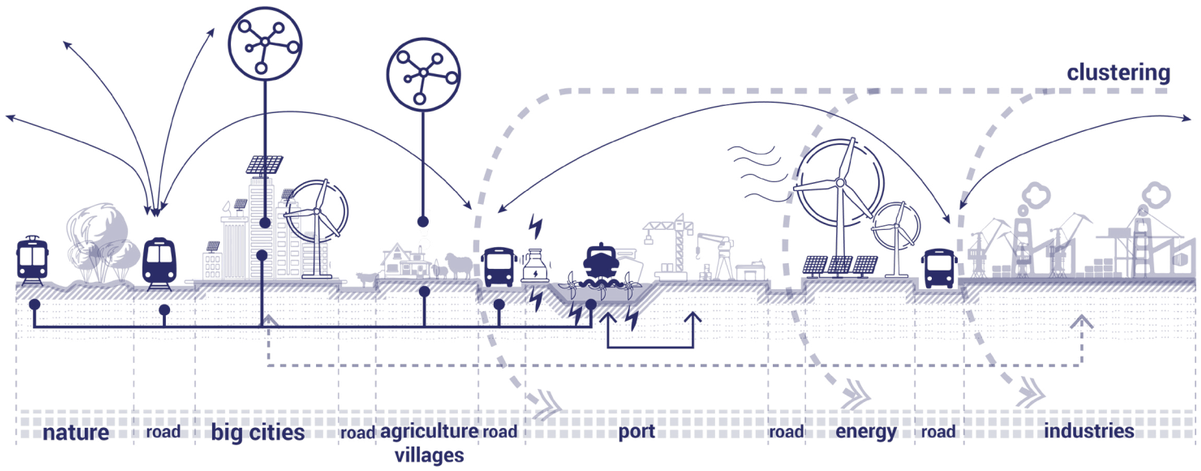


Figure 4.14-Systemic section of the desired situation

05

Strategic development

Stakeholders: interest and power

The spatial vision for Zeeland is modified by the interaction of five key stakeholders: environmental activists (Borsele Tot De Kern), residents near industrial sites, workers in the industrial sector, youth, and touristic business owners. Their perspectives, as shown in figures 5.3 and 5.4, reveal both strong synergies and significant conflicts. The positioning paper of Environmental Activists (Borsele Tot De Kern) is provided in Appendix 12, the paper for residents near industrial sites in Appendix 13, for touristic business owners in Appendix 14, for youth in Appendix 15, and for workers in the industrial sector in Appendix 16.

A major area of synergy lies in broad support for a sustainable energy transition, but only under specific spatial and social conditions. Environmental activists and youth strongly support offshore wind expansion, particularly around the Borssele wind park, as it minimizes landscape disruption and local burden. Similarly, residents and industrial workers accept smaller-scale or integrated energy solutions such as tidal, solar, and kinetic energy, because they work within existing infrastructures rather than imposing new spatial pressures. Across stakeholders, there is also shared enthusiasm for mobility improvements, including new train connections and mobility hubs, which are seen as enhancing accessibility, reducing car dependency, and improving overall quality of life. Touristic business owners and youth especially align here, as better transport strengthens both economic vitality and regional attractiveness.

However, conflicts with the proposed vision emerge in the spatial distribution of energy infrastructure and in questions of justice. Environmental activists and residents strongly oppose further onshore industrial expansion, particularly in already burdened areas, such as Ritthem and Sluiskil. Also touristic business owners and youth argue that Zeeland risks becoming a national “energy sacrifice zone,” making their support for the vision conditional on improvements in health and safety.

Youth perspectives introduce a different layer of tension. While generally supportive of energy transition, they emphasize quality of life factors such as housing affordability, education, and cultural opportunities. They support clustering of wind turbines, but resist excessive landscape industrialization, and tourism-driven housing pressures. This creates a conflict with touristic business owners, who advocate for expanding tourism infrastructure and accessibility, which may unintentionally worsen housing shortages.

Touristic business owners, while economically aligned with regional development, also resist large-scale energy expansion that could harm Zeeland's landscape identity. Yet, they show flexibility by conditionally supporting the vision if they are included in policymaking, and if investments in cycling and public transport are strengthened.

Overall, the vision is co-produced through negotiation. Synergies around clean energy, integrated infrastructure, and mobility create a shared foundation. Yet, conflicts over spatial justice, environmental burden, and regional identity force the vision to evolve into a more balanced approach. Stakeholders collectively push the vision away from a purely technocratic energy strategy toward one that integrates liveability, fairness, and local inclusion, ultimately reshaping it into a more socially grounded and place-sensitive plan.

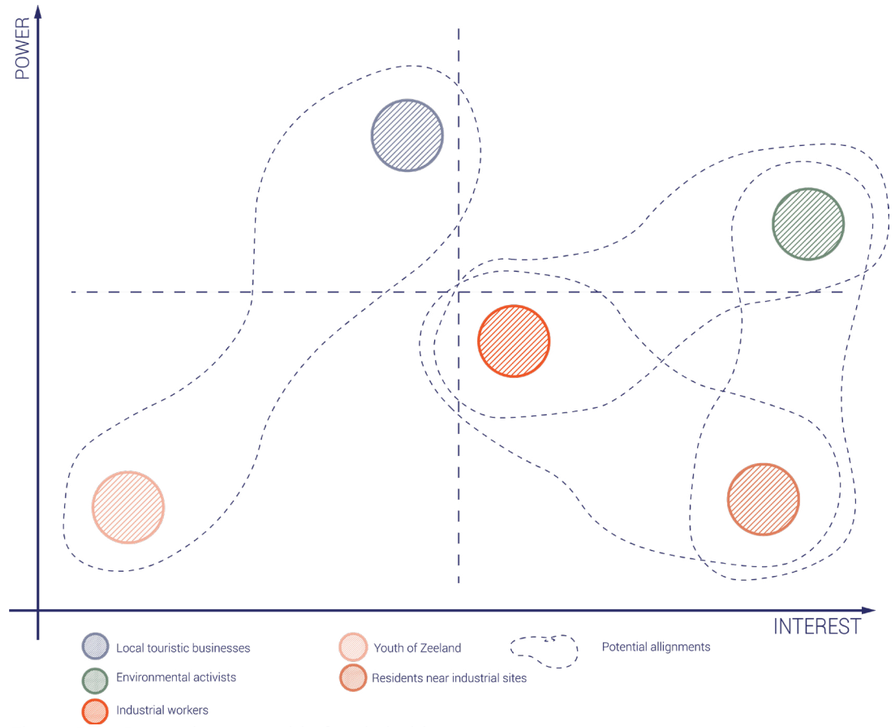


Figure 5.1 - Power-interest grid of stakeholders

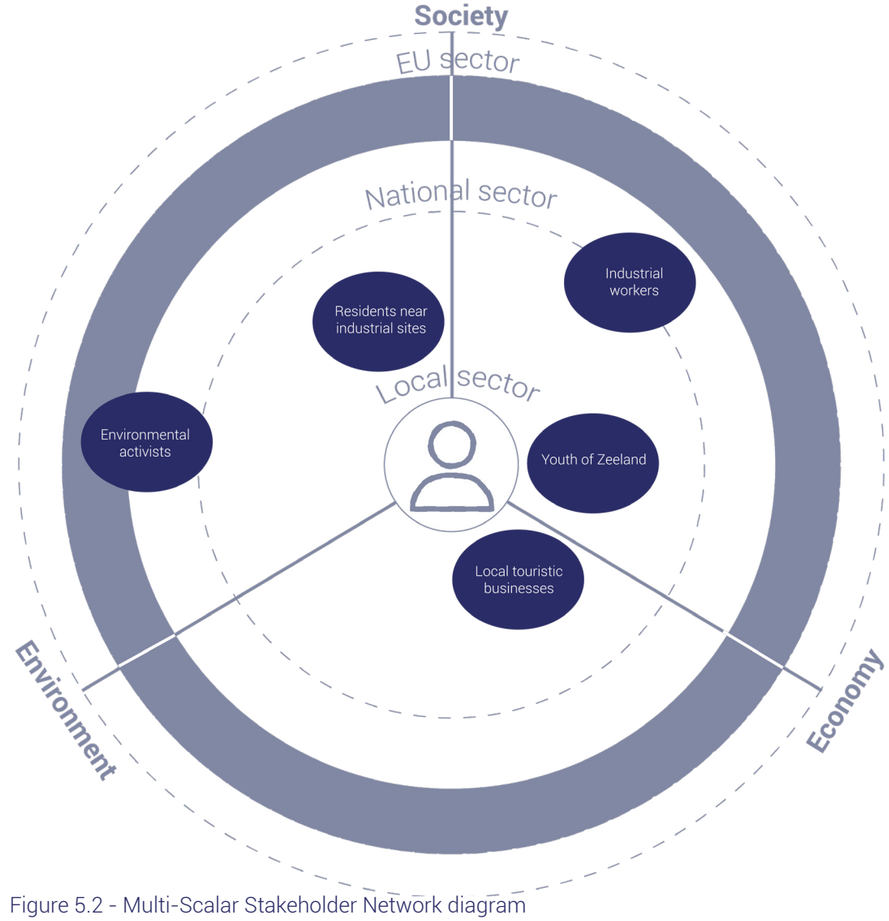


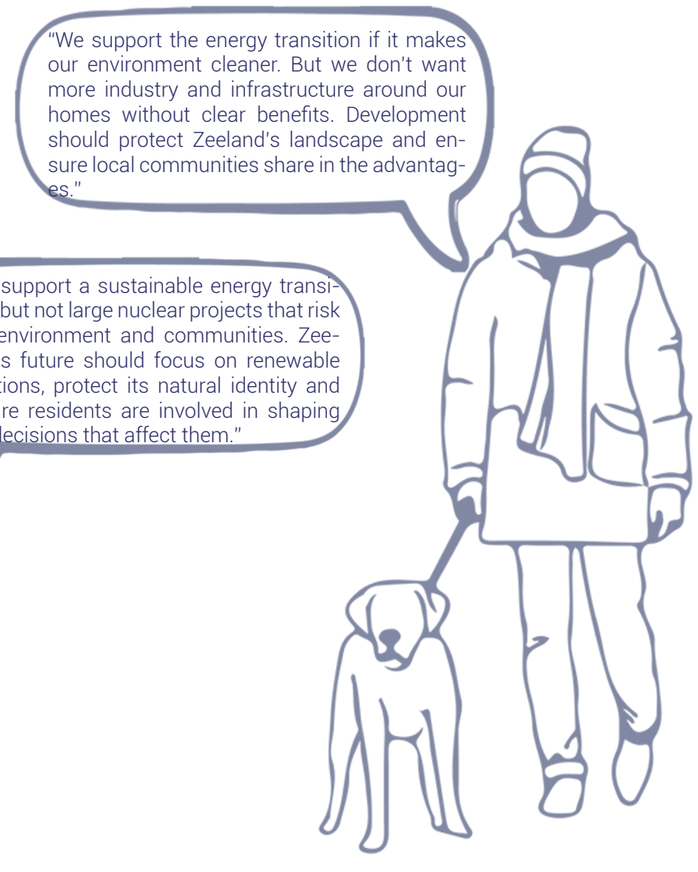
Figure 5.2 - Multi-Scalar Stakeholder Network diagram

Stakeholders: synergies and conflicts

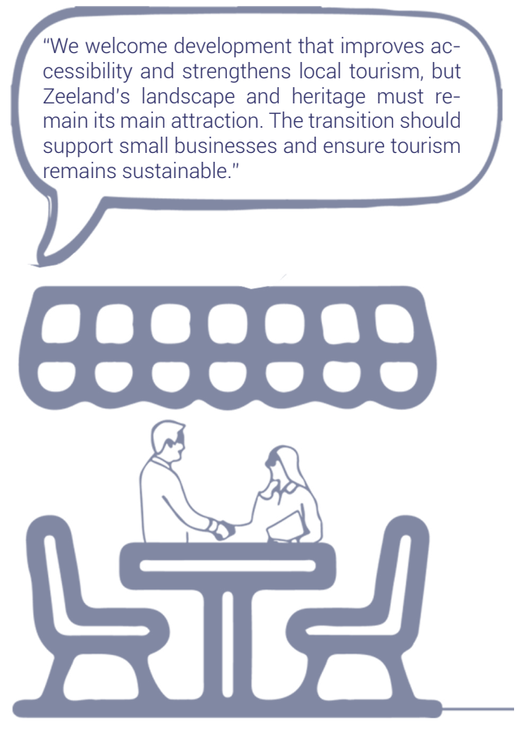
Youth of Zeeland

Industrial workers at risk

Environmental activists TotDeKern



Residents living industrial sites



Local touristic businesses

Figure 5.3-Statements of the stakeholders

Stakeholders: synergies and conflicts

	Stakeholders	Projections		Limitations	Synergies			Conflicts		
		Expectations	Fears			With			Between	
Private sector	**Local touristic business owners**	1.Increase region's employment 2.Included in policy making 3.Respecting the natural environment 4.Enhance accessibility	1.Negative impact on tourism attractiveness 2.Over-expansion of the energy landscape 3.Loss of landscape quality	1.Economic dependence on external factors 2.Limited influence on large-scale spatial planning decisions 3.Conflict between economic growth and environmental protection 4.Fragmented representation 5.Dependence on accessibility infrastructure	**Enhancement of public transport**	+	**Environmetal activistsTot De kern, Local touristic business owners, Residents living near industrial sites, Youth of Zeeland, Industrial workers**	**Expansion of the energy landscape**	-	**Environmetal activistsTot De kern, Local touristic business owners, Residents living near industrial sites, Youth of Zeeland** **Industrial workers**
Civil society	**Environmetal activistsTot De kern**	1.Different types of endogeneous renewavble energy production 2.To combat nuclear expansion	1.Impact on the landscape 2.Impact on nature 3.Quality of life in nearby villages related to nuclear expansion	1.No formal decision-making power 2.Dependence on public support and political attention 3.Difficulty influencing national-level energy strategies 4.Often perceived as "anti-development"	**The improvement of the mental and physical well-being of both the tourist and the resident**	+	**Local touristic business owners, Residents living near industrial sites, Youth of Zeeland**			
					Appealing to Zeeland's heritage with the endogenous Delta energy production	+	**Environmetal activistsTot De kern, Local touristic business owners, Residents living near industrial sites**	**Removal or relocation of industry**	-	**Environmetal activistsTot De kern, Residents living near industrial sites,** **Industrial workers**
	Residents living near industrial sites	1.Better health conditions/well-being 2.Enhancing a feeling of community 3.Just and equal energy distribution 4.Equal distribution of ammendities	1.Loss of regional identity 2.Safety concerns related to health 3.Noise/smell polution from industries 4.Expansion of industry	1.Low trust in politics 2.Limited political and institutional power 3.Socio-economic vulnerability 4.Spatial immobility 5.Often reactive rather than proactive	**Local recreation offers are aligned with resident demand.**	+	**Local touristic business owners, Residents living near industrial sites, Youth of Zeeland**			
					Expansion of wind energy	+	**Environmetal activistsTot De kern, Youth of Zeeland, Industrial workers**	**Expansion of the nuclear energy**	-	**Environmetal activistsTot De kern, Residents living near industrial sites,** **Industrial workers**
	Youth of Zeeland	1.Employment in the area 2.Beter connection to work/school 3.Large-scale sustainable energy projects	1.Replacement of nature for industrial expansion 2.Limitation of afforable housing 3.Consequences of energy transition	1.Underrepresented in decision-making processes 2.Limited economic and political power 3.High mobility 4.Dependence on housing market conditions 5.Weak institutional voice	**Improvement of health condition**	+	**Environmetal activistsTot De kern, Local touristic business owners, Residents living near industrial sites, Youth of Zeeland, Industrial workers**			
	Industrial workers	1.Job opportunities/job guarantee 2.Retraining and transition programs to new jobs 3.Inclusion in planning and decision-making processes.	1.Loss of employment 2.Uncertainty about the future of industry 3.Safety concerns related to health 4.Limited mobility alternatives	1.Limited influence in planning 2.Strong dependence on industrial employers and global markets 3.Vulnerability to energy prices and economic restructuring 4.Geographically "locked" in industrial zones 5.Cannot control the speed or direction of the transition	**Increasing the region's employment**	+	**Local touristic business owners, Youth of Zeeland, Industrial workers**	**Tourism related policies**	-	**Local touristic business owners,** **Youth of Zeeland,**
					Be included in policy making	+	**Local touristic business owners, Residents living near industrial sites, Youth of Zeeland, Industrial workers**			

Figure 5.4-Stakeholder Dynamics Matrix

Stakeholder Landscape

The governance of Zeeland's energy and mobility transition consists of a network of local, provincial, national, and international actors, each influencing how spatial strategies are developed and implemented (figure 5.5). Their roles, policies, and power determine how the strategy for Zeeland can be realised in practice, and how decisions move from policy to spatial intervention. Figure 5.6 shows the relationships between these actors and their position within the public, private, and civil-society domains. Figure 5.7 places these same actors within the power–interest model, which shows how their influence and engagement take place in the governance dynamics. Not all stakeholders involved in Zeeland's transition are included in this stakeholder analysis. Instead, the focus is on the most relevant actors who have direct influence on the spatial strategies of this project.

Local stakeholders

At the local level, municipalities such as Borsele, Middelburg, Vlissingen, Veere, Goes, and Terneuzen form the first layer of governance. They control local spatial planning, issue permits for energy and mobility projects, and represent the political interests of their communities. Although they operate within national and provincial frameworks, municipalities translate these policies into concrete spatial decisions and participate in regional governance structures. Local environmental groups, including Borsele Tot De Kern, play an important civic role by shaping public opinion, contributing local knowledge, and participating in formal consultation procedures. Their ability to submit objections or mobilise community support means they can influence, delay, or reshape projects, making them important actors in the negotiation of spatial change.

Provincial stakeholders

The Province of Zeeland acts as the central governance layer for regional spatial planning, energy strategy, mobility, and environmental protection. It sets the regional spatial vision (Omgevingsvisie), the Regional Energy Strategy (RES), funding, and mediates between municipalities and national ministries. The province also manages cross-border coordination with Belgium, which is important for mobility and port development. North Sea Port, a semi-public actor situated in Vlissingen, Terneuzen, and Ghent, governs industrial zoning, port expansion, and the siting of energy infrastructure. It coordinates hydrogen pipelines, offshore wind landing points, and industrial energy clusters, and negotiates with national and EU institutions. Stedin, the regional electricity distribution operator, determines local and regional grid capacity, and co-designs the RES through data and infrastructure planning. The Zeeuwse Milieufederatie (ZMF) represents environmental interests at the regional scale, provides ecological expertise, and participates in RES Zeeland, where it can challenge or reshape project proposals. The RES Zeeland Governance Board brings these actors together, by coordinating municipalities, the province, grid operators, and societal partners to translate national climate targets into regional spatial action.

National stakeholders

National governance actors set the frameworks within which Zeeland operates. Rijkswaterstaat implements national mobility and water-infrastructure policy and sets technical standards that provinces and municipalities must follow. The national government (Rijksoverheid) establishes climate law, energy frameworks, and cross-border obligations, with ministries such as Ministry of Infrastructure and Water Management (IenW), Ministry of Economic Affairs & Climate (EZK), and the Ministry of Climate Policy and Green Growth, steering mobility, water safety, industrial decarbonisation, and the energy transition. Public transport operators, including NS and ProRail, do not set policy but influence governance through operational potential, and service contracts negotiated with provinces. TenneT, the national high-voltage grid operator, determines where the national grid expands, and how the future energy system is physically structured, making it an important actor in the potential of regional energy ambitions. National NGOs such as Natuurmonumenten influence spatial decisions through formal objections, Natura 2000 procedures, and environmental directives, shaping how energy and mobility projects interact with protected landscapes.

	Stakeholders	Projections		Power	Resources
		Interest	Problem		
Public sector	Local municipalities	Local spatial planning, mobility access, liveability	limited funding, resident opposition	●●●○○	• Permitting authority • Local knowledge • Political legitimacy
	Province of Zeeland	Regional spatial strategy, mobility, energy transition	Balancing municipalities, industry, and national goals	●●●●○	• Environmental vision • Funding • Permits • Policy
	Rijksoverheid	National climate targets, energy system design	Political pressure, budget constraints, EU compliance	●●●●●	• Legislation • Subsidies
	Rijkswaterstaat	National mobility and water infrastructure	Ageing infrastructure, climate adaptation needs	●●●●●	• Technical expertise • Infrastructure budgets
	European commission	EU climate targets, Green Deal	Member state alignment	●●●●●	• Funding • Regulatory power
	Government of Belgium	Cross-border infrastructure, North Sea Port governance	Funding gaps	●●●●○	• National ministries • Binational agreements
	RES board	Regional coordination of energy transition	Conflicting interests	●●●○○	• Stakeholder network • Strategic planning • Data
	Public transport operators	Efficient, reliable public mobility	Weak infrastructure, cost pressures	●●○○○	• Service contracts • Operational expertise
	Regional electricity distribution operator (Stedin)	Grid reliability, Renewable energy transition	Grid congestion, rising demand	●●●○○	• Infrastructure • Technical expertise • Investment
	Public energy actors (TenneT)	High-voltage grid expansion, offshore wind integration	Grid congestion, long timelines, regulatory complexity	●●●○○	• National investment plans • Technical control
Private sector	North Sea Port	Industrial growth, logistics, energy infrastructure	Spatial constraints, environmental regulation	●●●●○	• Strategic land control • Investment partnerships
	Local Tourism Business owners	Boost regional employment, accessibility, natural environment	Tourism appeal, energy infrastructure, Loss of landscape quality, Dependence on transport	●○○○○	• Economic dependence • Limited influence on spatial planning • Local expertise
Civil society	Local Environmental groups	Nature protection, landscape quality, public participation	Industrial expansion, weak environmental guidelines	●●○○○	• Legal connections • Communities • Local expertise
	Environmental & Land scape Organisations (ZMF, Zeeuwse Milieufederatie)	Regional environmental protection, policy influence	Regional environmental protection, policy influence	●●○○○	• Ecological expertise • Legal capacity
	Natuurmonumenten	Nature conservation, EU directive enforcement	Habitat loss, infrastructure conflict	●●●○○	• Legal influence, public support, ecological expertise
	Industrial Workers	Job security, Retraining and transition support	Uncertainty about industrial future, health risks	●●○○○	• Limited planning influence • Dependence on employers and global markets
	Residents near Industrial Sites	Better health and well-being, stronger community cohesion, fair energy distribution	Loss of regional identity, Health and safety risks, pollution (noise, smell), industrial expansion	●○○○○	• Limited institutional power • Socio-economic vulnerability
	Youth 15-25	Local employment, better mobility to work/school	Lack of affordable housing, uncertain transition outcomes	●○○○○	• Underrepresented in decision-making • Limited economic and political power

Figure 5.5-Stakeholders profiling diagram

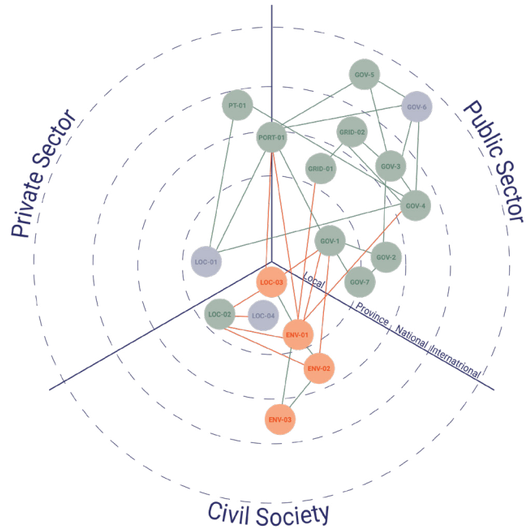
Stakeholders

International stakeholders

International governance adds another layer of influence. The Government of Belgium co-governs the North Sea Port region, and controls the Belgian rail network that Zeeland seeks to connect to, making it an important decision-maker for cross-border mobility and port development. The European Commission sets binding EU climate and energy targets through the Green Deal and renewable energy directives. It funds large-scale infrastructure projects, such as rail expansion, hydrogen corridors, and offshore wind, and enforces environmental and nature-protection laws. Zeeland's energy and mobility ambitions are therefore both enabled and constrained by EU frameworks, which shape the strategic direction of regional planning.

Stakeholder Alignment

Comparing the five focus stakeholders with the governance stakeholder landscape shows both synergies and tensions within Zeeland's regional energy and mobility transition (figure 5.8; appendix 1, 2, 3, 4, 5). Positive overlaps take place where interests align around shared objectives such as improved public transport, spatial quality, and sustainable industrial development. Actors like Rijkswaterstaat, North Sea Port, and public transport operators align with local municipalities and industry workers through their focus on accessibility and employment, which reinforces the support of the proposed infrastructure projects. Disalignments come up where environmental and spatial priorities conflict with industrial expansions. Groups such as Natuurmonumenten and local environmental organisations often oppose large-scale industrial development or grid expansion, which creates friction with North Sea Port, Rijkswaterstaat and grid operators. These contrasts show the negotiation space within Zeeland's governance: collaboration between aligned actors can positively influence implementation, while misaligned interests need mediation, this to balance ecological preservation with economic and infrastructural growth.



Public sector

GOV-1 Local municipalities
GOV-2 Province of Zeeland
GOV-3 Rijksoverheid
GOV-4 Rijkswaterstaat
GOV-5 European commission
GOV-6 Government of Belgium
GOV-7 RES board
PT-01 Public transport operators
GRID-1 regional electricity distribution operator
GRID-2 Public energy actors

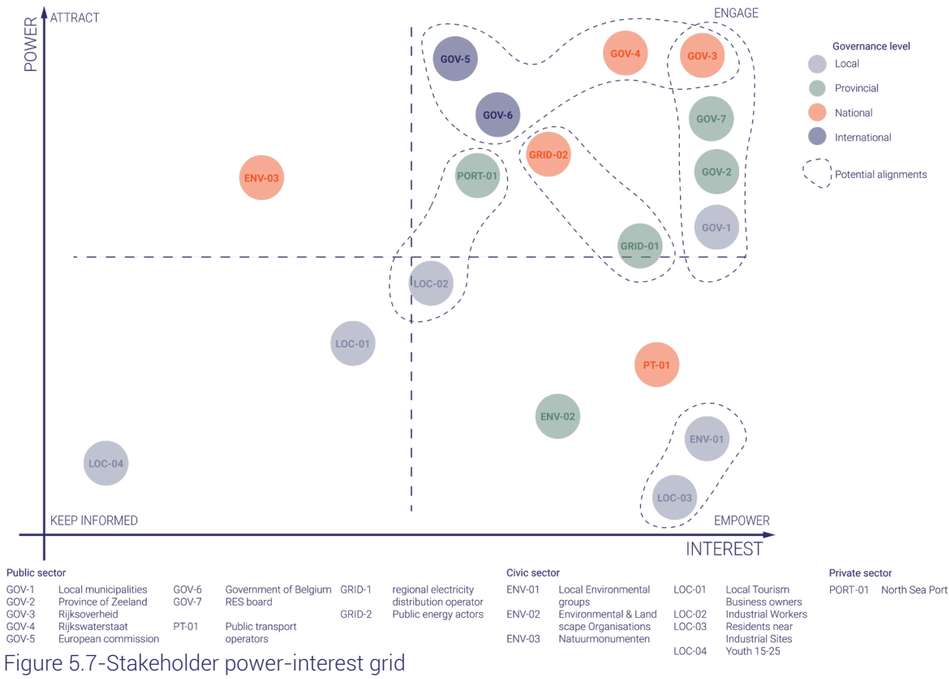
Private sector

PORT North Sea Port
LOC-01 Local Tourism Business owners

Civic sector

ENV-01 Local Environmental groups
ENV-02 Environmental & Land scape Organisations
ENV-03 Natuurmonumenten
LOC-02 Industrial Workers
LOC-03 Residents near Industrial Sites
LOC-04 Youth 15-25

Figure 5.6-Stakeholder relationships diagram



Public sector

GOV-1 Local municipalities
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Civic sector

ENV-01 Local Environmental groups
ENV-02 Environmental & Land scape Organisations
ENV-03 Natuurmonumenten
LOC-01 Local Tourism Business owners
LOC-02 Industrial Workers
LOC-03 Residents near Industrial Sites
LOC-04 Youth 15-25

Private sector

PORT-01 North Sea Port

Figure 5.7-Stakeholder power-interest grid

	Stakeholders	Alignment / disalignment					
		Alignment	Power	Why	Disalignment	Power	Why
Private sector	Local Tourism Business owners	Public transport operators	●	Improvement of public transport	Regional electricity distribution operator	●	Improvement of public transport
		Rijkswaterstaat	●	Improvement of public transport infrastructure			
		Province of Zeeland	●	Manages regional mobility planning			
Civil society	Environmental activists (Tot De Kern)	Environmental and landscape organisations	●	Represent environmental interest on regional level	Province of Zeeland	●	Sets the regional spatial strategy It coordinates the Regional Energy Strategy
		Natuurmonumenten	●	Objects to nature invasive plans, involved in EU directives	Regional electricity distribution operator	●	Spatial influence of energy infrastructure
		Rijksoverheid	●	Ministry of Climate Policy and Green Growth protecting natural sites	North Sea Port	●	Industrial and expansion near residential and recreational sites
	Residents near industrial sites	Rijkswaterstaat	●	Improvement of public transport infrastructure	North Sea Port	●	Industrial and expansion near residential and recreational sites
		Environmental and landscape organisations	●	Represent environmental interest on regional level	Province of Zeeland	●	Sets the regional spatial strategy It coordinates the Regional Energy Strategy
		Public transportation operators	●	Improvement of public transport			
	Youth of Zeeland (15 - 30)	Rijkswaterstaat	●	Improvement of public transport infrastructure	Province of Zeeland	●	Sets the regional spatial strategy It coordinates the Regional Energy Strategy
		Environmental and landscape organisations	●	Represent environmental interest on regional level			
		Public transportation operators	●	Improvement of public transport			
		Government of Belgium	●	Improvement of international public transport connections			
		North Sea Port	●	Increasing the region's employment			
	Industry workers	North Sea Port	●	Increasing the region's employment	Environmental and landscape organisations	●	Advocates against industrial expansion
		Rijkswaterstaat	●	Improvement of public transport infrastructure	Natuurmonumenten	●	Advocates against industrial expansion
		Public transportation operators	●	Improvement of public transport			

Figure 5.8-Stakeholder alignments diagram

Environmental policies

The environmental and spatial policies in Zeeland operate within a multi-level governance system, combining national regulation, regional coordination, and local implementation. At the national level, the Environmental and Planning Act (Omgevingswet) provides the overarching legal framework, aiming to ensure a safe and sustainable physical environment while integrating spatial planning with environmental protection and participatory processes (Environmental and Planning Act, 2024).

At the regional level, the Province of Zeeland translates these goals into strategic frameworks such as the Klimaatadaptatiestrategie Zeeland 2021–2026 and the Regional Energy Strategy. These policies coordinate climate adaptation, energy transition, and ecological development, aligning sectoral objectives within a coherent spatial vision (Provincie Zeeland, 2019). Municipalities, in turn, are responsible for implementing these policies locally through planning instruments and spatial interventions.

A key characteristic of these policies is the broad involvement of stakeholders. Public authorities define and regulate the framework, while private actors play a crucial role in implementation and investment. At the same time, citizen participation is emphasized, particularly in planning and environmental decision-making, reflecting the need to balance economic development with environmental protection and social acceptance (Provincie Zeeland, z.d.-e; Environmental and Planning Act, 2024).

Overall, these policies (see figure 5.9) reflect a shift toward an integrated and spatially embedded model of governance, where coordination across scales, stakeholder collaboration, and spatial planning are essential for achieving sustainable regional development.

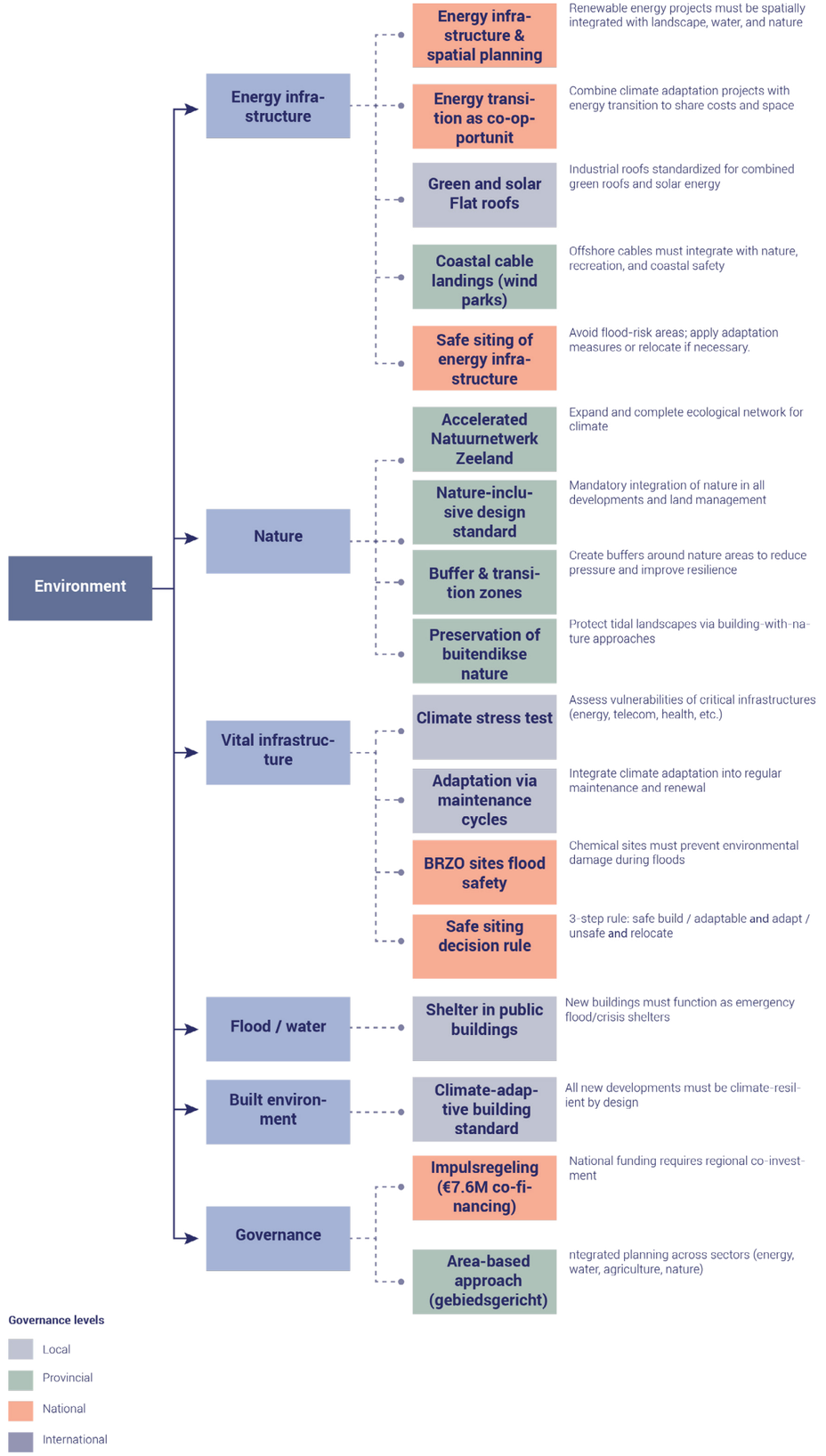


Figure 5.9-Environmetal policies

Industrial policies

The industrial policies outlined in figure 5.10 focus on managing the transition of industrial sectors toward sustainability, while ensuring labour protection, economic stability, and regional development. These policies operate at the intersection of industrial transformation and social policy, emphasizing the need to balance decarbonization with workforce security.

A central component of these policies is the support of industrial transition through innovation and sustainability measures. Reports indicate that investments in environmental goods and services, as well as clean technologies, are key drivers for economic transformation and job creation within green industries (Ecosys, 2023). At the same time, governments promote industrial decarbonization through subsidies, public-private partnerships, and long-term transition strategies that encourage technological upgrades without disrupting production systems .

Equally important is the emphasis on labour-related policies, which aim to protect workers during this transition. Policies such as wage increase mechanisms, minimum wage adjustments, and redistribution of wealth are introduced to address economic inequalities and rising living costs. Additionally,training and upskilling programs are essential to enable workers to transition into emerging green sectors. These initiatives are complemented by employment support policies that recognize the vulnerability of workers in declining industries and aim to facilitate their reintegration into the labour market .

Health, safety, and environmental protection are also central. Policies enforce strict safety regulations, including radiation protection in nuclear-related industries and broader workplace safety standards. Monitoring systems and performance indicators are introduced to ensure compliance and improve operational performance through continuous feedback .
A notable addition is the proposed policy for spatially just industrial transition, which ensures that employment opportunities remain within affected regions. By linking industrial restructuring with local labour markets, this approach seeks to prevent regional economic decline and uneven spatial impacts, promoting a more balanced and equitable transition .

Overall, these industrial policies reflect an integrated approach that combines economic transformation, social protection, and spatial justice, ensuring that the shift toward sustainability does not disproportionately burden industrial workers or specific regions.

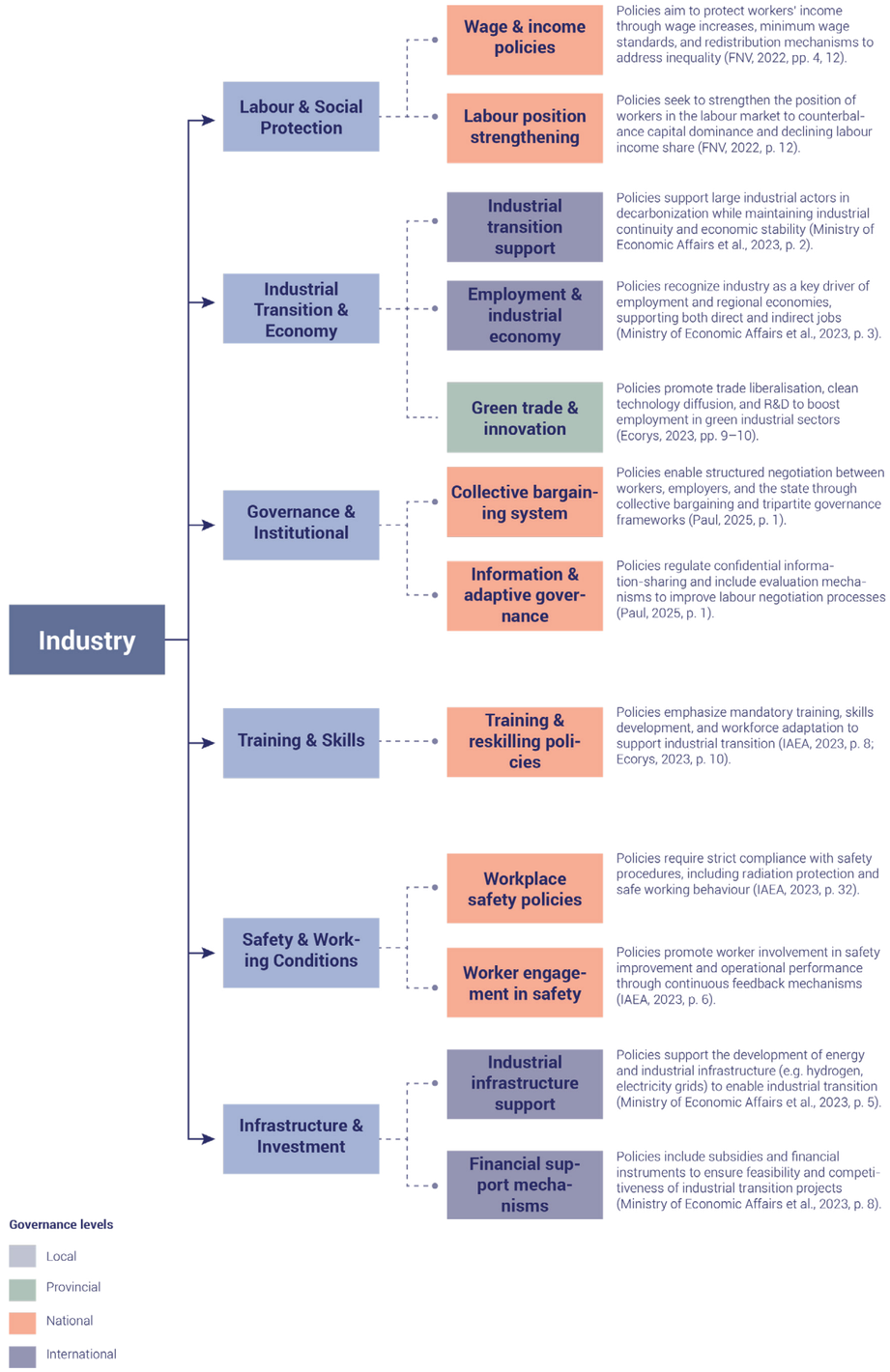


Figure 5.10-Industrial policies

Housing policies

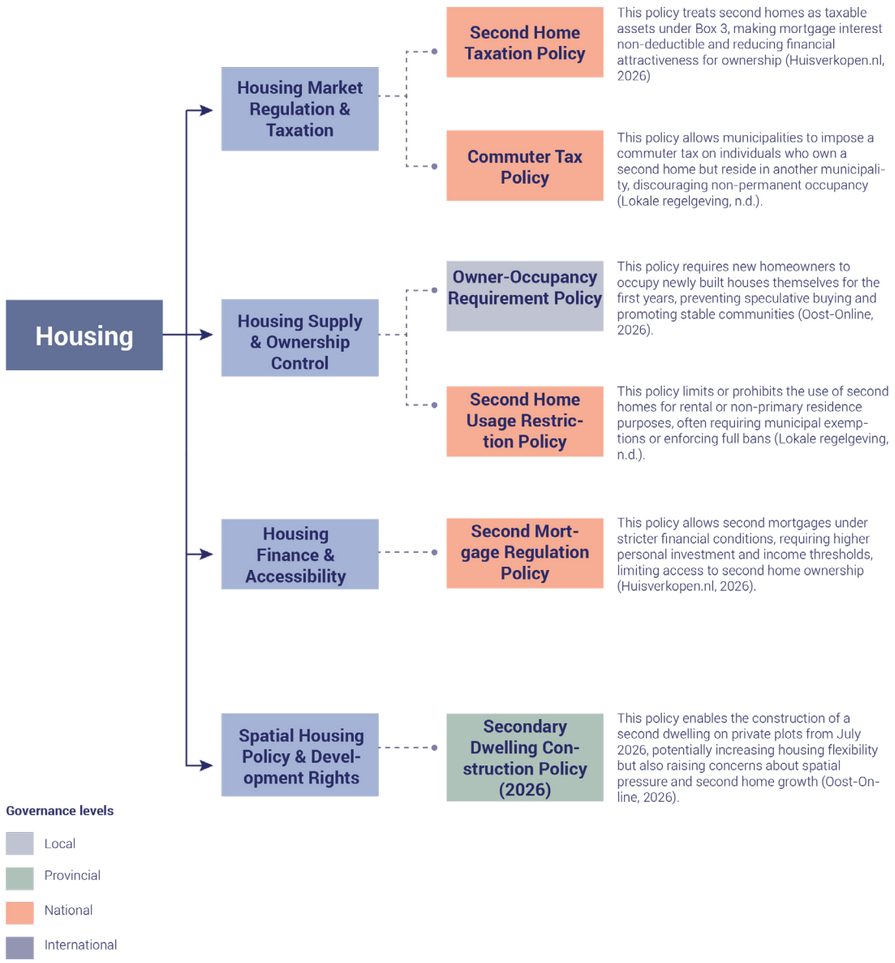


Figure 5.11-Housing policies

Housing policies in Zeeland primarily address the regulation of second homes in order to protect housing availability and maintain local community stability. A key mechanism is the taxation of second homes, which are classified as assets and therefore subject to less favorable tax treatment, reducing their attractiveness as investment properties .

In addition, several municipalities impose strict usage regulations, including requirements that newly built houses must be owner-occupied for the first years after construction. In many cases, renting out second homes requires special permits, while some municipalities enforce complete bans on non-residential use, aiming to prevent speculative ownership and seasonal vacancy .

Financial barriers also play a role, as obtaining a second mortgage requires higher personal capital contributions, further limiting access to second-home ownership(see figure 5.11). Moreover, municipalities can impose additional taxes on non-resident owners, reinforcing local control over housing markets .

Recent and proposed measures emphasize stronger spatial regulation, including bans on recreational housing in city centers and restrictions in areas experiencing population decline. These policies aim to ensure that housing remains accessible to permanent residents and supports balanced regional development.

Tourism policies

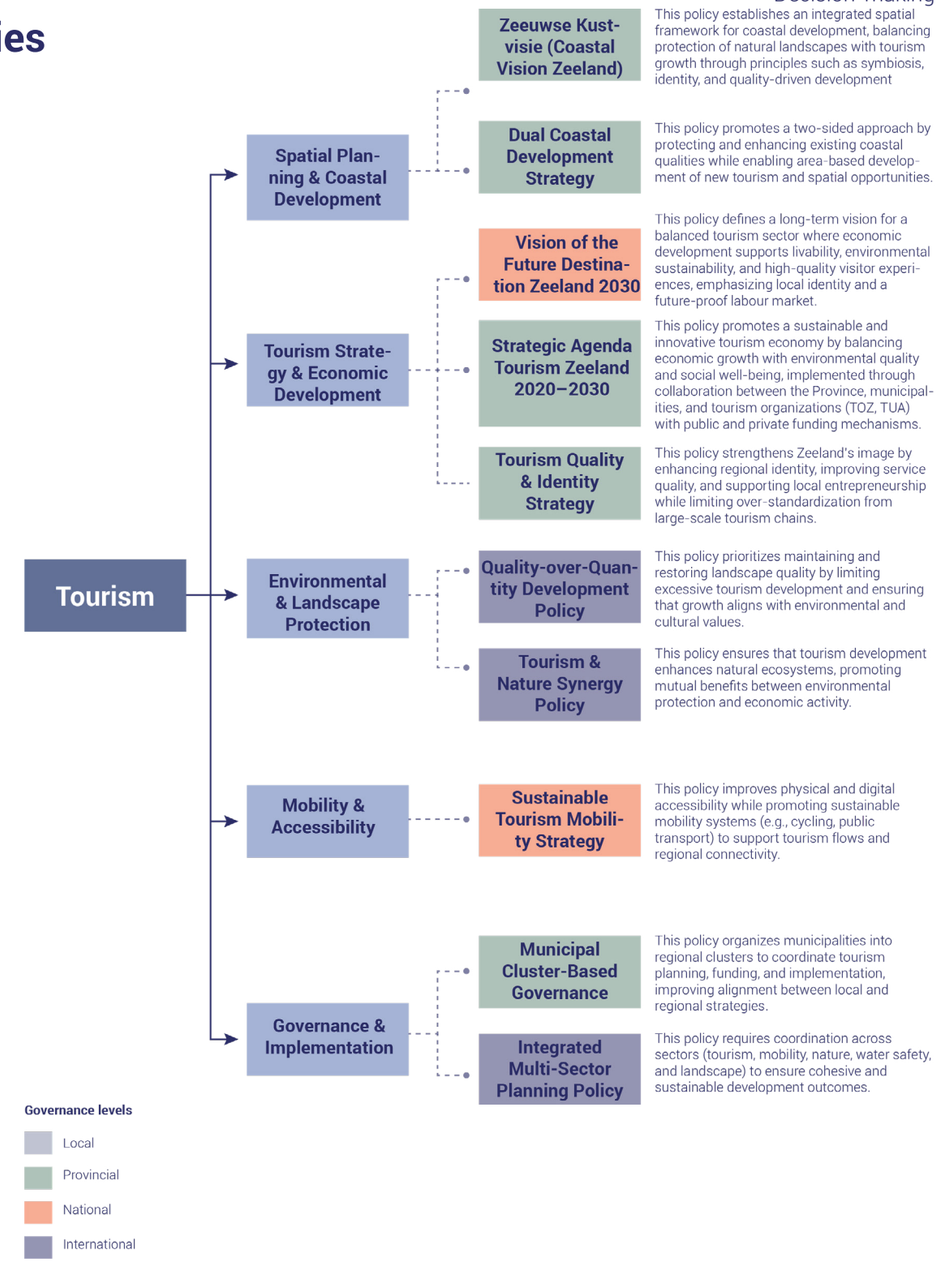


Figure 5.12-Tourism policies

Tourism policies in Zeeland (figure 5.12) focus on balancing economic growth, environmental quality, and local identity, while supporting small and medium-sized enterprises (SMEs). Existing strategies emphasize strengthening the region's attractiveness through improvements in coastal landscapes, recreational infrastructure, and spatial quality, while ensuring that tourism development does not compromise environmental sustainability .
A key objective is the diversification and upgrading of the tourism sector, including the enhancement of cycling networks, coastal accessibility, and recreational facilities. These spatial interventions aim to distribute tourism flows more evenly across the region and reduce seasonal and geographic pressure on specific areas .
At the same time, policies highlight the importance of supporting local businesses, particularly SMEs, which form the backbone of Zeeland's tourism economy. Strengthening collaboration between small and medium enterprises is seen as essential for increasing resilience and enabling access to resources, such as energy transition support and innovation opportunities .
Finally, recent policy directions emphasize improving the quality of facilities and achieving a better work–life–economy balance, ensuring that tourism contributes positively to both local communities and regional development.

New policy additions

Existing policies

The existing policy guidelines that are implemented in our strategic development concern the sectors of industry, tourism and environment, as the figure 5.13 illustrates.
New policies

The new policies that have been created (as it can be seen in figure 5.14) refer to the following sectors:

Housing:

Primary Residence Protection & Anti-Second Home Policy
This policy aims to protect the livability and social cohesion of Zeeland's urban centers by restricting the use of residential properties as recreational or second homes. It introduces a complete ban on second homes within city centers, while expanding exclusion zones in areas experiencing significant decline in permanent residents, such as Renesse. By prioritizing primary residence occupancy, the policy seeks to stabilize local communities, maintain year-round population levels, and prevent housing market distortion driven by tourism demand. Through targeted spatial regulation and municipal enforcement, it supports a more balanced housing system aligned with long-term regional sustainability and social continuity.

Environment:

Integrated Industrial Pollution Reduction Policy
This policy aims to reduce cumulative industrial pollution by introducing area-based emission standards, real-time environmental monitoring, and stricter environmental permitting across industrial zones. It promotes a spatially integrated approach by establishing buffer zones between industrial activities and residential areas, improving public health and environmental quality. Implemented through collaboration between the Province of Zeeland, municipalities, RUD Zeeland, industry stakeholders, and local communities, the policy ensures that industrial development aligns with socio-environmental safety and long-term regional livability.

Tourism:

Sustainable Local Tourism Development Policy
This policy aims to strengthen the image and sustainability of Zeeland's tourism sector by improving the quality of facilities, ensuring a balanced price–quality ratio, and enhancing cycling infrastructure across the region. It promotes a tourism model based on small and medium-sized local enterprises, limiting the dominance of large-scale commercial chains in order to preserve the regional identity. The policy also supports collaboration between local businesses and provides targeted subsidies to facilitate their participation in the energy transition, such as the installation of solar panels. Through this approach, tourism development is aligned with environmental sustainability, local economy support, and place-based identity preservation.

Industry:

Spatially-Linked Job Security & Transition Guarantee Policy
This policy ensures that industrial workers affected by the energy transition are guaranteed continued employment within their region, either through job retention, relocation within the same industrial cluster, or direct transition into new energy sectors. It establishes a spatially grounded framework that links industrial transformation with local labour security, preventing regional economic decline and uneven spatial impacts.

Energy:

Sustainable Industrial Energy Transition Policy
This policy mandates the transition of heavy industry in Zeeland toward renewable energy sources and circular production systems. It requires industrial actors to adapt their processes to energy sources such as solar, wind, and tidal energy, while reducing resource consumption and emissions. Transition plans must prioritize climate resilience, minimize environmental impacts, and ensure the protection of surrounding communities. Implemented through coordination between North Sea Port, industrial stakeholders, municipalities, and the Province of Zeeland, the policy supports a balanced shift toward a low-carbon industrial system while maintaining regional economic stability.

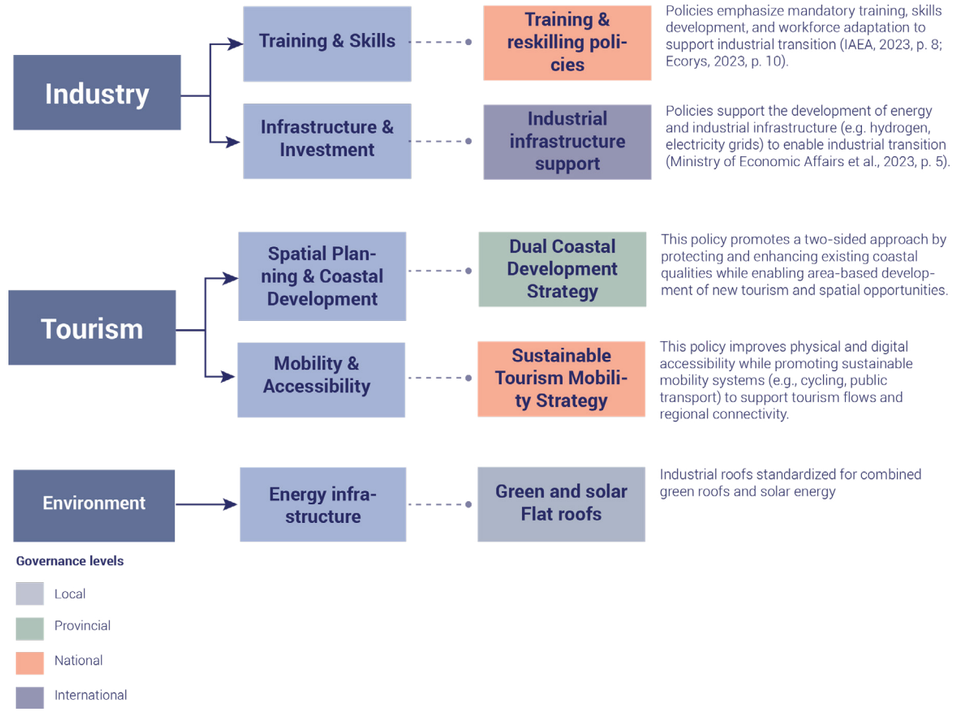


Figure 5.13-Existing policies in use

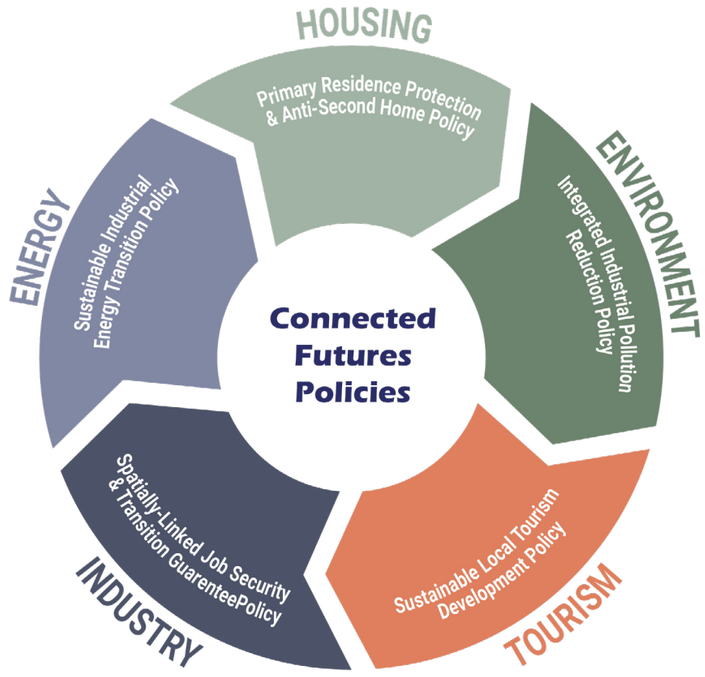
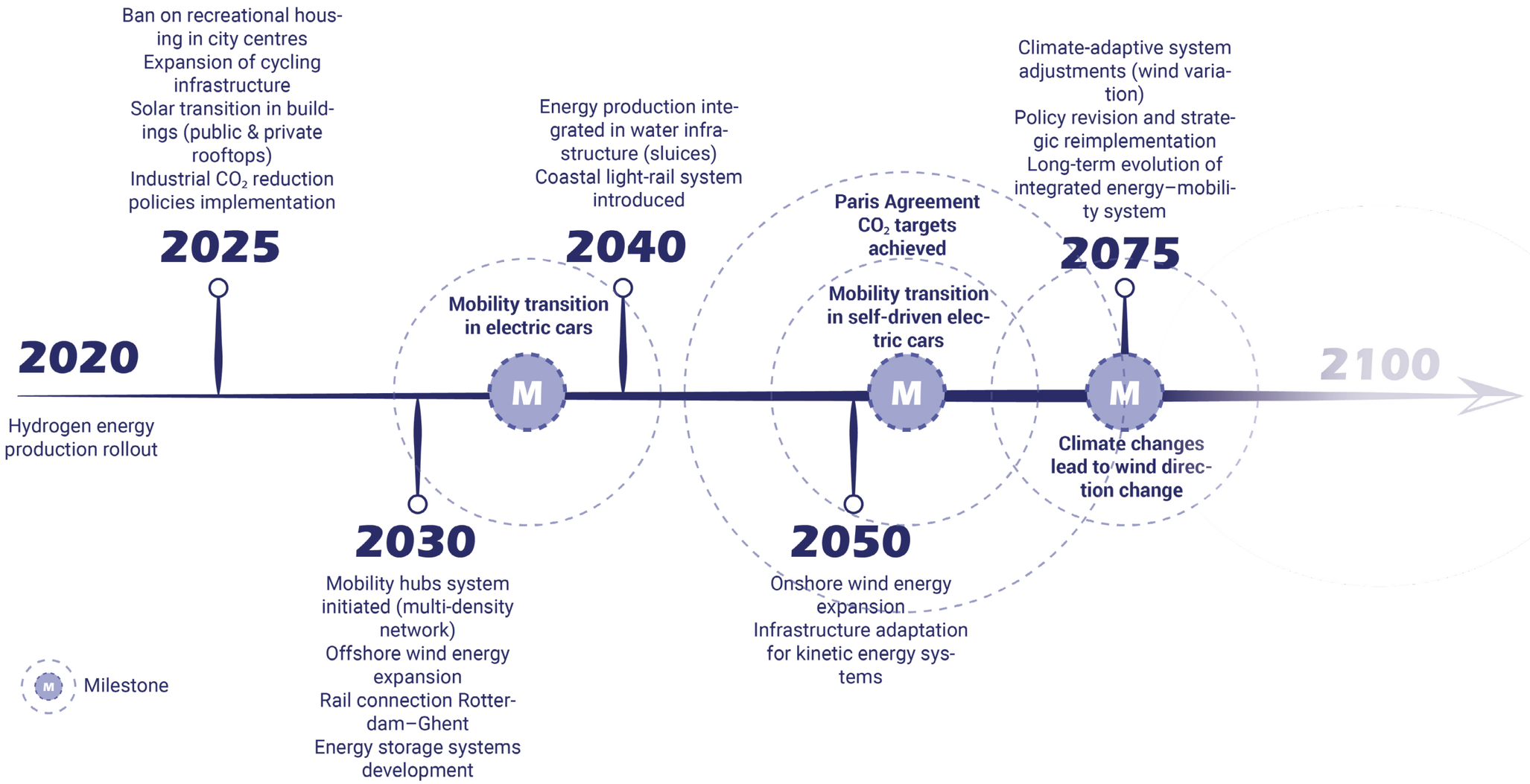


Figure 5.14-New policies proposed

Timeline



Phase 01 (2020–2035): Laying the foundation	Phase 02 (2035–2050): System integration	Phase 03 (2050–2075): Adaptation and maturity
This phase focuses on policy implementation and initial interventions:	This phase is defined by major infrastructural developments and system connections:	The final phase focuses on long-term adaptation and system optimization:
Restrictions on second homes and promotion of solar panels	**New railway connection between Rotterdam and Ghent**	**Revision of policies based on outcomes**
Subsidies for renewable energy and rooftop installations	**Light rail along the Zeeland coast**	**Adaptation to climate change impacts (e.g. wind variation)**
Initial offshore wind expansion	**Preparation of infrastructure for kinetic energy**	**Continuous evolution of energy and mobility systems**
Development of hydrogen energy and storage systems	**Expansion of onshore wind energy**	
Introduction of electric cars and mobility hubs	**Strengthening of climate policies (CO2 reduction goals)**	

Figure 5.15-Timeline

Phasing

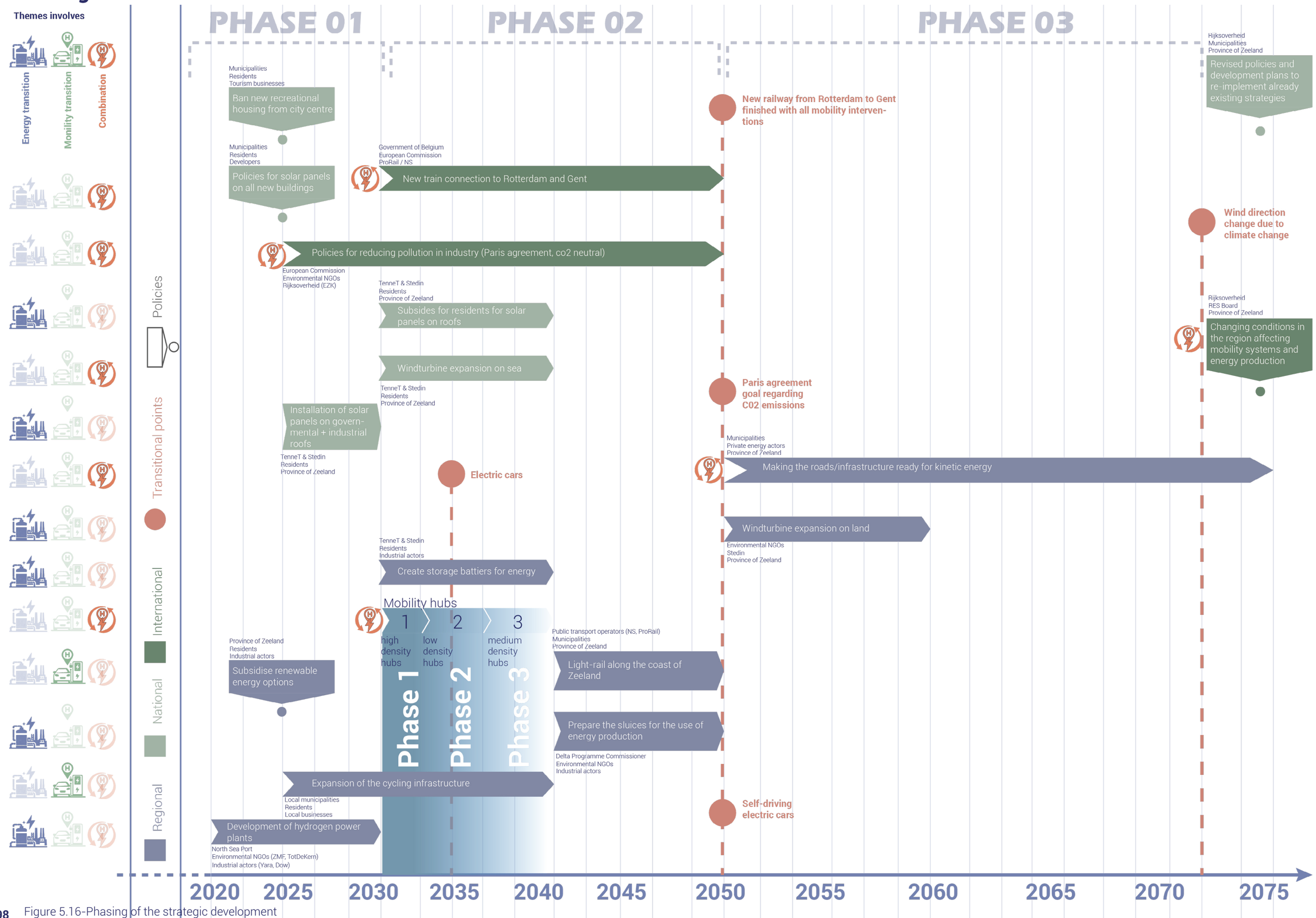


Figure 5.16-Phasing of the strategic development

Strategic plan

The strategy is built around two complementary systems, addressing the two main issues in the region, which are accessibility and energy. These two systems are the Mobility Energy Hubs (M.E.H.) and the Multiple Renewable Energy Zones (M.R.E.Z.). Together, they guide the spatial development of energy production and mobility infrastructure across Zeeland.

M.E.H. are integrated hubs where mobility and energy come together. These hubs provide public transport connections while generating and supplying energy, for example through solar panels, energy storage, and charging points. The M.R.E.Z. strategy focuses on the expansion of wind energy across Zeeland. Existing parks are expanded or new clusters are formed.

The combined map, illustrated in figure 5.17 shows how the M.E.H and M.R.E.Z. interact at the regional scale. Energy generated in renewable zones can be used for mobility-energy hubs and provide public transport and shared mobility services that operate using the energy produced locally. Together, these strategies create a connected, sustainable system, where energy production, mobility, and industrial activity are efficiently aligned to serve the residents by improving accessibility while preserving Zeeland's landscape and regional identity.

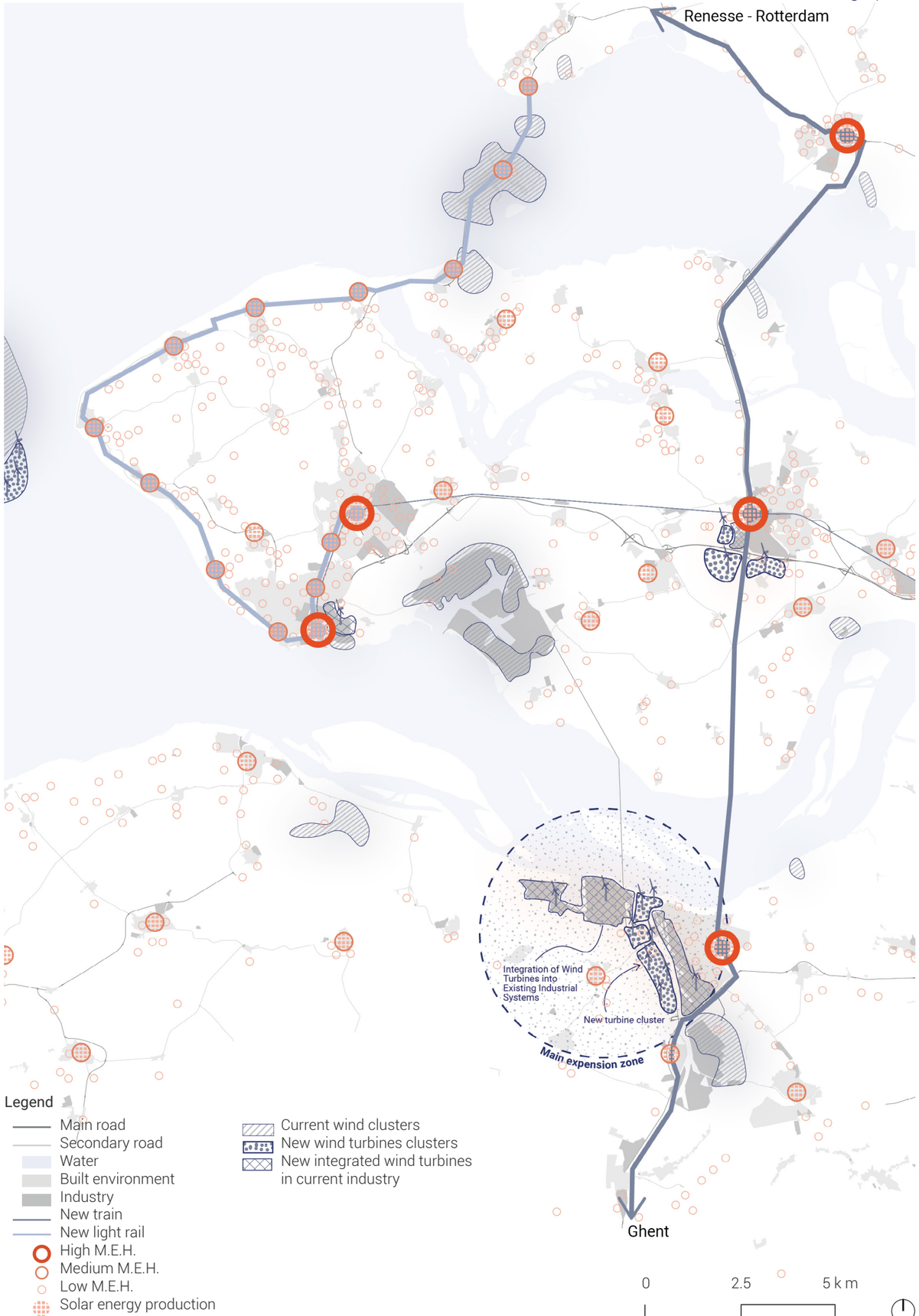


Figure 5.17-Combined strategic system

M.E.H strategy system

Mobility Energy Hubs (M.E.H.) (figure 5.18)

As already mentioned M.E.H. are integrated hubs where mobility and energy come together and provide public transport connections, while generating and supplying energy. The system is divided into high, medium, and low density M.E.H., based on the population of the surrounding area.

1. High density M.E.H. serve the most dense cities and villages of Zeeland. They connect to the train network, provide buses and autonomous vehicles. In the cases of Middelburg and Vlissingen the M.E.H. also connects to the light rail infrastructure. The high density M.E.H. also include bike storage, shared mobility, energy production and storage, and educational or retraining facilities.

2. Medium density M.E.H. are located in mid-sized towns. They focus on bus, bike storage, shared mobility, energy production and storage, and provide meeting spaces to support social cohesion. In the coastal tourist towns the medium density M.E.H. connected to the light rail.

3. Low density M.E.H. serve smaller villages, providing on-call mobility, solar energy production, and bike storage and rental services. These M.E.H. maintain local identity while ensuring access to mobility and energy services.

Figure 5.18- M.E.H. strategic system

M.R.E.Z Strategy system

Multiple Renewable Energy Zones (M.R.E.Z.) (figure 5.19)

The M.R.E.Z. strategy focuses on the expansion of wind energy across Zeeland. The largest expansion is planned near Terneuzen, close to industrial areas, but at a further distance from residential neighborhoods.

This strategy integrates wind turbines into existing industrial areas, maximizing efficiency and minimizing impact on the landscape. This follows the example of the wind energy clusters integrated in the industrial area of Vlissingen. Offshore expansion at the Borsele wind park further increases renewable energy capacity, while using Zeeland's coastal location strategically.

Figure 5.19-M.R.E.Z. strategic system

Strategic system 1- M.E.H

The M.E.H. is, as the name suggests, a place where mobility and energy are combined.

The M.E.H. consists of three categories, the high density M.E.H., the medium density M.E.H., and the low density M.E.H. In these three categories mobility and energy come together in diverse ways.

Different forms of public transportation are present at each M.E.H., and in each category there are diverse ways of producing (and storing) energy.

Each one of the categories has their own rules regarding the radius of influence, the program, and how it is linked to Zeeland's identity, this can be seen in figure 5.20.

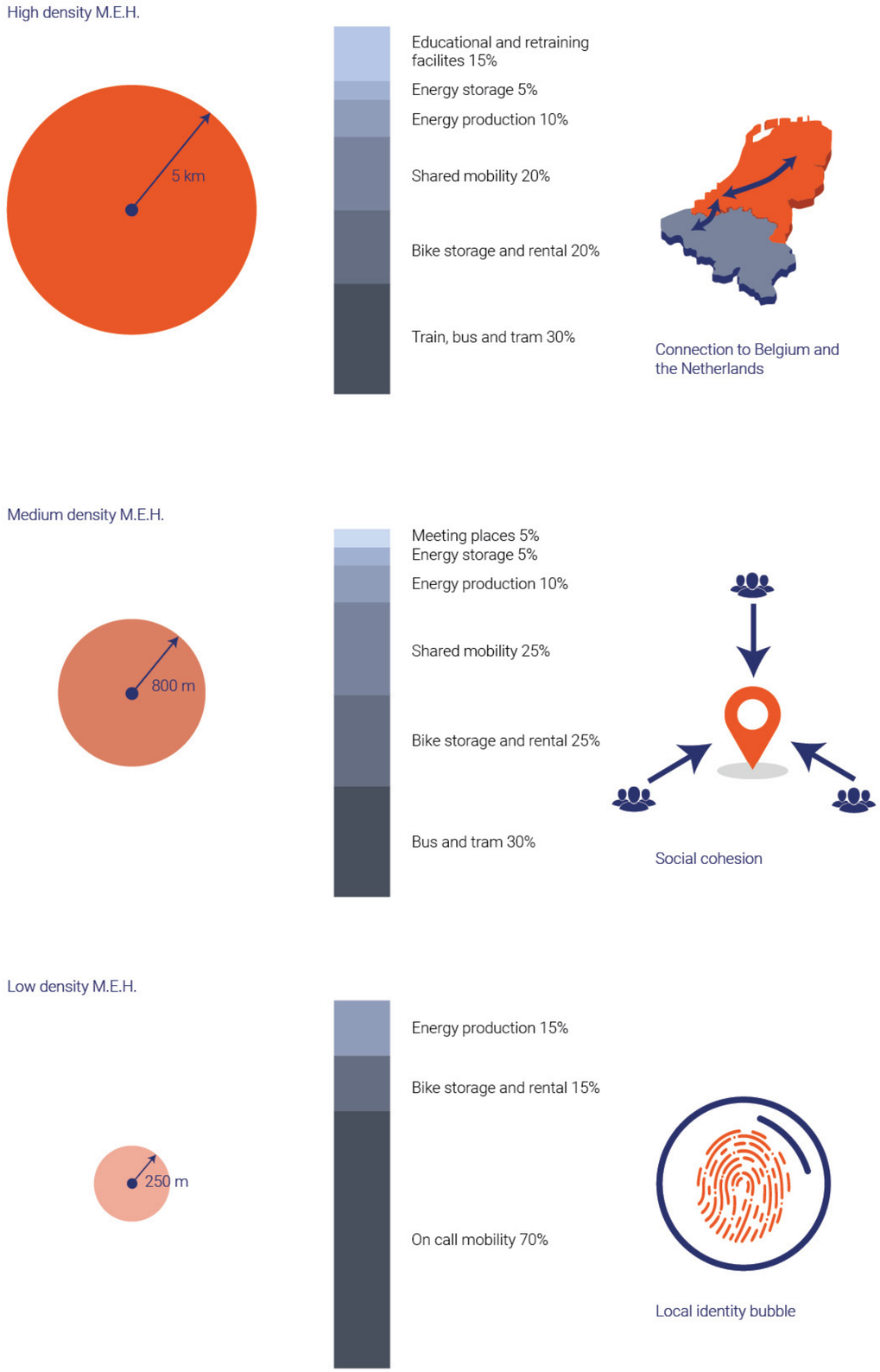


Figure 5.20-Strategy scheme for M.E.H

High density M.E.H.

Figure 5.21-MEH collage 1

High density M.E.H.

Overall content:

Train station, bus stop, and a tram (only in Middelburg and Vlissingen)

Bike storage and bike rental

Parking place for shared cars and scooters

Solar panels who produce energy for the surrounding area, and kinetic energy on the main road

Energy storage batteries placed in the building of the bus stop or tram stop

Educational and retraining facilities, this could be an education centre for post-highschool education of training facilities for people working in nearby industries

Policy guidelines:

Training and reskilling policies

Industrial infrastructure support

Dual coastal development strategy

Sustainable tourism mobility strategy

Green and solar flat roofs

The last step in connecting Zeeland with each other and the rest of the Netherlands is the High density M.E.H. For the high density M.E.H. the radius of influence is 5 kilometers, which is shown in figure 5.23. The main program of the high density M.E.H. is the train and the bus and/or tram stops. There will be a covered stop to offer shelter and provide a space for energy production. Besides these stops, the shared mobility and bike storage are a big part of the program. This is there to encourage people to use the train, tram or bus in combination with cycling or the use of a shared vehicle. Another way to attract people to this M.E.H. is to offer an education place. These can differ from a HBO school to a training facility for industry workers. Finally, there will be energy production and storage to use the power during peak times, and therefore lower the pressure on the energy network. The energy production will happen partly with solar panels on the roofs of the M.E.H. stop. The axonometric drawing that is seen in figure 5.22, shows how the high density M.E.H. could look, when the above-mentioned rules are applied.

A standard solar panel produces around 365 to 730 kilowatt hour (kWh) a year (essent, sd). Assuming the high density M.E.H. will have around 4 times the amount of space for solar panels as the mid density one, 64 solar panels, and it will produce 23360 to 46720 kWh a year. This power can, for example, be used to partially power the tramline, which usually uses around 0,08 kWh a kilometer (NS, 2022). This means around 438.000 kilometers a year. As the new trainline is around 130 kilometers long this is over 3000 rides powered by these solar panels, per M.E.H.

To realize a high density M.E.H. some infrastructural changes are needed. A trainline needs to be built to connect Ghent with Rotterdam via various villages in between and stops need to be placed in the passing villages. All of the M.E.H. need a bike storage and rental place. All the newly built buildings need to be provided with solar panels. For the power that these solar panels produce, new powerlines might need to be laid. For these infrastructural changes there are some stakeholders involved to make this happen. Provincial municipalities will take a leading role in realising the high density M.E.H. But also the national government, and even the government of Belgium are involved in the placing of the new trainline. The public transport operators, like the NS, will have a big say in the operation of the new trainline. The regional electricity distribution operator (Stedin) will contribute to the realization of new powerlines. Stakeholders that are affected by the coming of the high density M.E.H. are all the stakeholders, since this intervention is very big and makes Zeeland more accessible and less dependent on cars and on the one train rails going in and out of the region.

In figure 5.21 you can see the desirable future that the high density M.E.H. will create. The M.E.H. will make it possible for high density areas to be more connected to the rest of the province. This might encourage more people to live in Zeeland or go on a daytrip by train, since it is easier for them to reach facilities and amenities in the bigger cities.

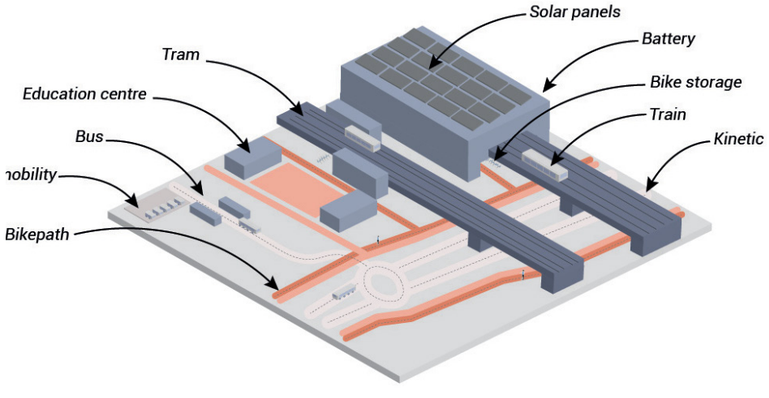


Figure 5.22-Axonometric for High density M.E.H

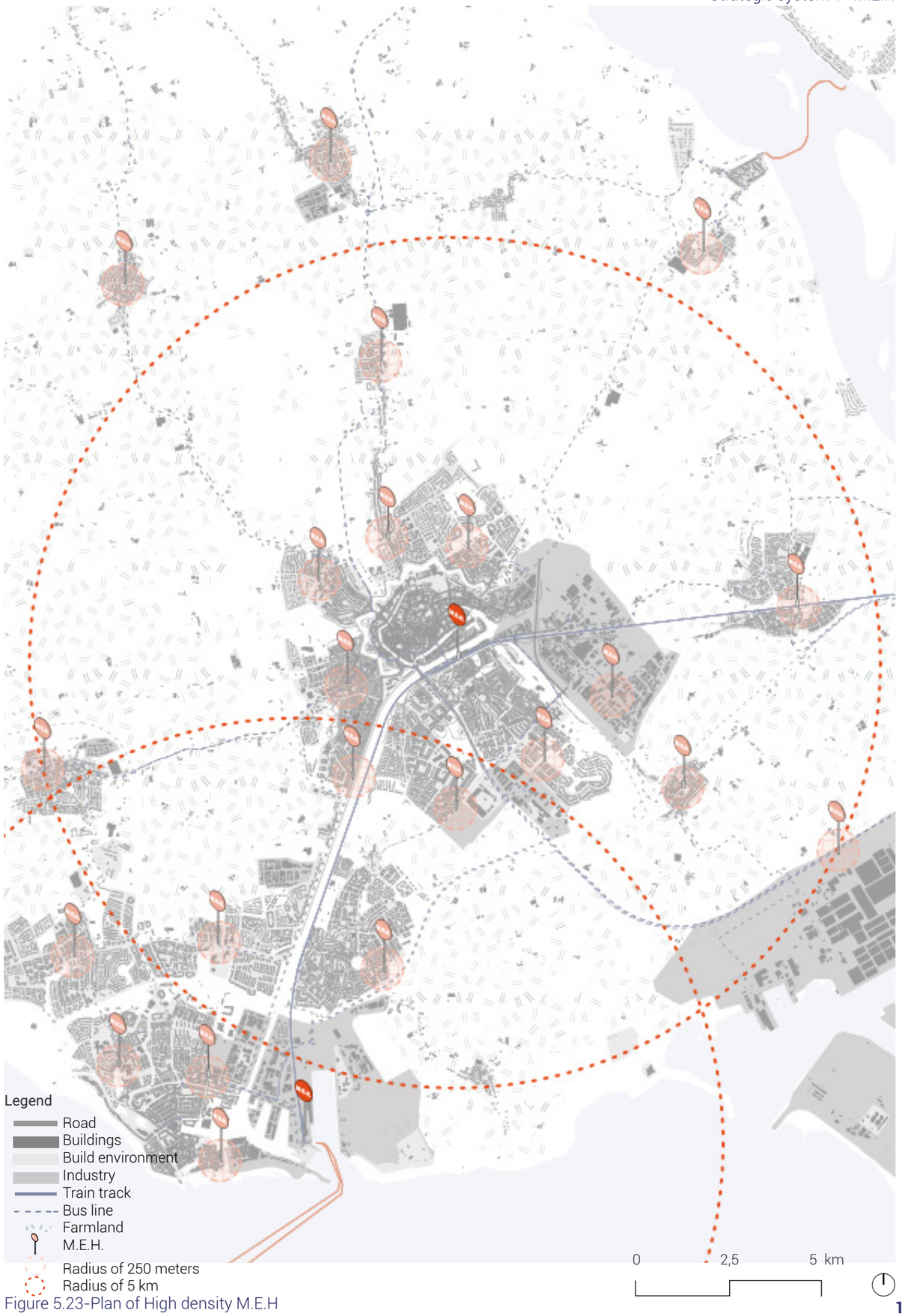


Figure 5.23-Plan of High density M.E.H

Medium density M.E.H

Figure 5.24-MEH collage 2

Medium density M.E.H

Overall content:

Bus stop and tram stop (only in the coastal villages)

Bike storage and bike rental

Parking place for shared cars and scooters

Solar panels who produce energy for the surrounding area, and kinetic energy on the main road

Energy storage batteries placed in the building of the bus stop or tram stop

Meeting area, this could be a small bench in a park or a kiosk etc.

Policy guidelines:

Industrial infrastructure support

Dual coastal development strategy

Sustainable tourism mobility strategy

Green and solar flat roofs

To connect the whole of Zeeland with each other, and the rest of the Netherlands there is another step needed. This is the medium density M.E.H. For the mid density M.E.H. the radius of influence is 800 meters, which is shown in figure 5.26. The main program of the mid density M.E.H. is the bus and/or tram stops. There will be a covered stop at both the bus, and the tram stops to offer shelter. Besides these stops, the shared mobility and bike storage are a big part of the program. This is there to encourage people to use the tram or bus in combination with cycling or the use of a shared vehicle. Another way to attract people to this M.E.H. is to offer a meeting place. These can differ from a little park to a place to drink a coffee depending on the location and their needs. Finally, there will be energy production and storage to use the power during peak times, and therefore lower the pressure on the energy network. The energy production will happen partly with solar panels on the roofs of the M.E.H. stop. The axonometric drawing that is seen in figure 5.25, shows how the mid density M.E.H. could look, when the above-mentioned rules are applied.

A standard solar panel produces around 365 to 730 kilowatt hour (kWh) a year (essent, sd). Assuming the mid density M.E.H. will have around double the amount of space for solar panels as the low density M.E.H., concluding in 16 solar panels. And it will produce 5840 to 11680 kWh a year. This power can, for example, be used to partially power the tramline, which usually uses around 0,16 kWh a kilometer (Tram (Groene Stroom), n.d.), this means around 54.000 kilometers a year. As the tramline is around 50 kilometers long, this is 1000 rides powered by these solar panels, per M.E.H.

To realize a mid density M.E.H. some infrastructural changes are needed. A tramline needs to be built along the coastline and stops need to be placed in the passing villages. The same goes for bus stops and routes to connect all the midsize villages to the bigger network. All of the M.E.H. need a bike storage and rental place. All the newly built buildings need to be provided with solar panels. For the power that these solar panels produce, new powerlines might need to be laid. For these infrastructural changes there are some stakeholders involved to make this happen. Local municipalities will take a leading role in realising not only the low, but also the mid density M.E.H. The public transport operators will help with the decision-making for the locations of the M.E.H. The regional electricity distribution operator (Stedin) will contribute to the realization of new powerlines. Stakeholders that are affected by the coming of the mid density M.E.H. are the industrial workers, the residents, and the youth, since these stakeholders might all benefit from the M.E.H.

In figure 5.24 you can see the desirable future that the mid density M.E.H. will create. The M.E.H. will make it possible for medium density areas to be more connected to the rest of the province. This might encourage the tourist to reduce their car use when on holiday in Zeeland, since it is easier for them to reach facilities and amenities in the bigger villages.

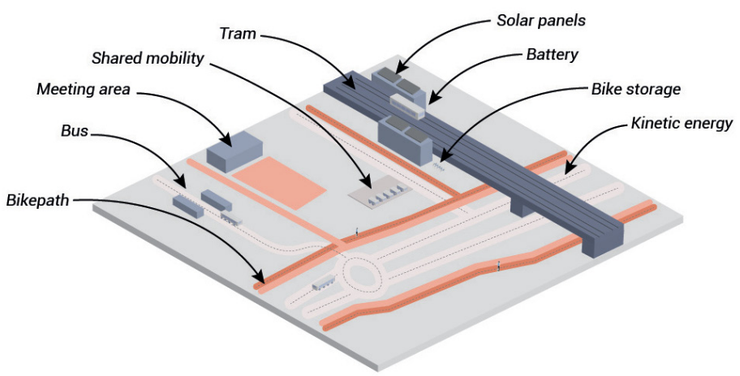


Figure 5.25-Axonometric for Medium density M.E.H

Figure 5.26-Plan for Medium density M.E.H

Low density M.E.H

Figure 5.27-MEH collage 3

Low density M.E.H

Overall content:

On call mobility

Energy production (solar)

Bike storage and rental

Policy guidelines:

Sustainable tourism mobility strategy

Green and solar flat roofs

For the low density M.E.H. the radius of influence is 250 meters, which is shown in figure 5.29. The main program of the low density M.E.H. is on call mobility. There will be a covered stop at the low density M.E.H. to offer shelter. Besides on call mobility there will also be space for bike storage and rental. This is there to encourage people to use the on-call mobility in combination with cycling. Finally, there will be energy production. The energy production will happen solely with solar panels on the roofs of the M.E.H. stop and the bike parking. The axonometric drawing that is seen in figure 5.28, shows how the low density M.E.H. could look, when the above-mentioned rules are applied.

A standard solar panel with a capacity of 250 to 400 Watt produces, with an average of 4 to 5 peak sunlight hours a day, around 365 to 730 kilowatt hour (kWh) a year (essent, sd). Assuming the low density M.E.H. will have eight solar panels, it will produce 2920 to 5840 kWh a year. This power can, for example, be used to power streetlights, which usually use around 60 kWh a day (Demian, sd).

To realize a low density M.E.H. some infrastructural changes are needed. In the locations where there currently are no existing covered stops, these need to be built. The same goes for bike storage and rental. A place needs to be created where private bikes and rental bikes can be parked, this will also be covered. On these covered surfaces solar panels need to be installed. For the power that these solar panels produce, new powerlines might need to be laid. For these infrastructural changes there are some stakeholders involved to make this happen. Local municipalities will take a leading role in realising the low density M.E.H. The public transport operators will help with the decision-making for the locations of the M.E.H. The regional electricity distribution operator (Stedin) will contribute to the realization of new powerlines. Stakeholders that are affected by the realization of the low density M.E.H. are the industrial workers, the residents, and the youth, since these stakeholders might all benefit from the M.E.H.

In figure 5.27 you can see the desirable future that the low density M.E.H. will create. The M.E.H. will make it possible for low density areas to be more connected to the rest of the province. This might encourage the youth to stay in Zeeland, since it is easier for them to reach facilities and amenities that are not nearby.

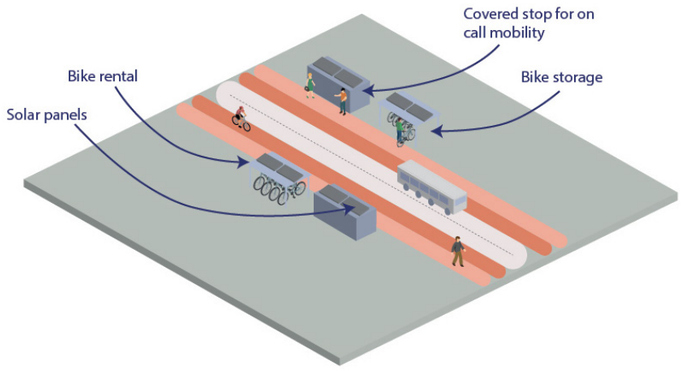


Figure 5.28-Axonometric for Low density M.E.H

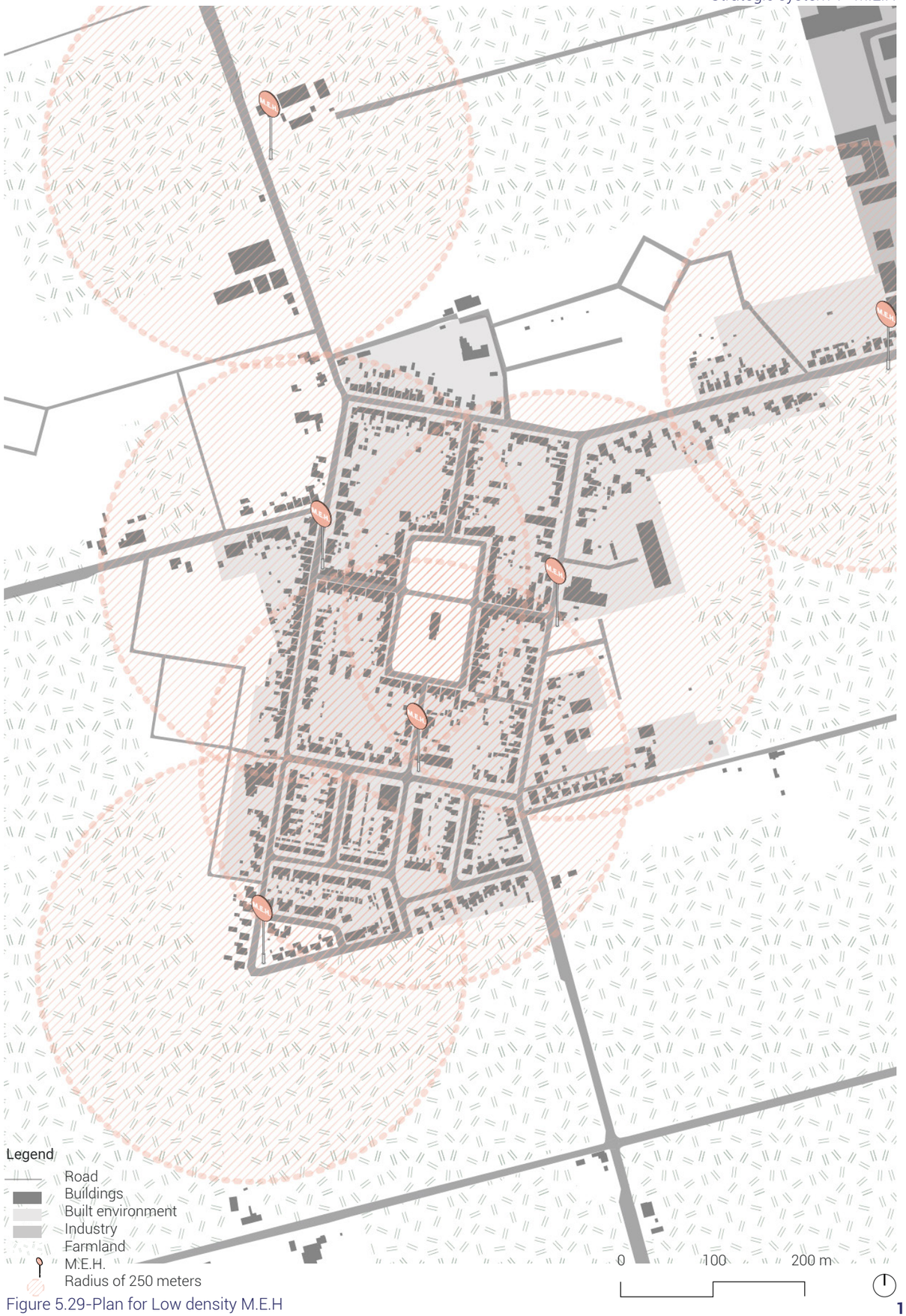


Figure 5.29-Plan for Low density M.E.H

M.R.E.Z.

Figure 5.30-MREZ collage

M.R.E.Z

The M.R.E.Z. strategy (figure 5.32, 5.34) shows how renewable energy infrastructure can be spatially implemented in the Terneuzen area and the expansion of offshore wind energy production, while managing grid congestion and ensuring that new energy generation serves local industrial, and residential demand. Rather than supplying all generated electricity into an already congested public grid, the strategy is built around four energy flows (figure 5.31):

- Wind - (battery -) industry;
- Wind - hydrogen -industry;
- Wind -local grid - built environment;
- Tidal- (battery -) local grid - built environment.

These flows together form an endogenous integrated energy system that serves the communities of Zeeland directly. The M.R.E.Z. strategy creates an energy system in which wind, tidal, battery storage, and hydrogen work together and avoid net congestion, while serving industrial and public demand.

1. Energy at Sea

To minimise the spatial impact of energy infrastructure on land, the offshore energy park will be expanded. The existing offshore wind infrastructure in Zeeland (Borssele at Sea) consists of 173 monopile foundation wind turbines with a combined capacity of 1502,5 MW (Rijkswaterstaat, n.d.). While this is a significant contribution to the province's renewable energy output, new turbine technologies and foundation engineering create potential for innovative expansion. Figure 5.32 illustrates the section of the offshore energy expansion strategy for Zeeland, showing the existing and added offshore wind turbines and their connection to the land.

New generation offshore wind turbines now can reach capacities of 15 to 20 MW per unit, with some prototype models exceeding 20 MW, which are already being used in Europe and China (Buljan, 2025). One of these developments is the OceanX dual-rotor turbine from Mingyang Smart Energy, a floating offshore concept rated at up to 50 MW per unit (Recharge, n.d.). This design reduces structural weight and increases efficiency through intelligent monitoring, which allows the turbine to rotate to face the optimal wind direction for higher capacity. In this offshore wind expansion, 20 additional turbines are proposed, each with a capacity of 20 MW, which result in a total additional capacity of 400 MW (figure 5.32).

Floating wind turbines are relevant for Zeeland's offshore expansion. In deeper water bodies, wind speeds are more stable, and of higher energy value than in shallow areas near the shore. This new technology of floating wind turbines makes it possible to develop projects in much deeper waters, as described by Recharge (n.d.). Floating foundations also cause less ecological disturbance to the seabed compared to fixed monopiles, and can be built quicker and inflict less ecological disturbance while doing so (Rebuck et al., 2024). Together, this makes floating offshore wind a big opportunity for Zeeland's offshore energy development, which builds on the existing Borssele infrastructure while extending into deeper and more productive waters.

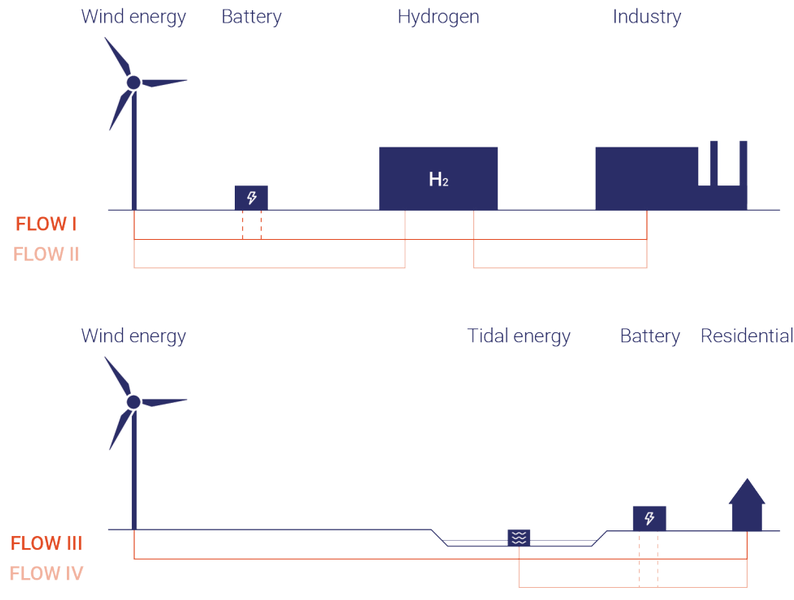


Figure 5.31-Section for energy flows

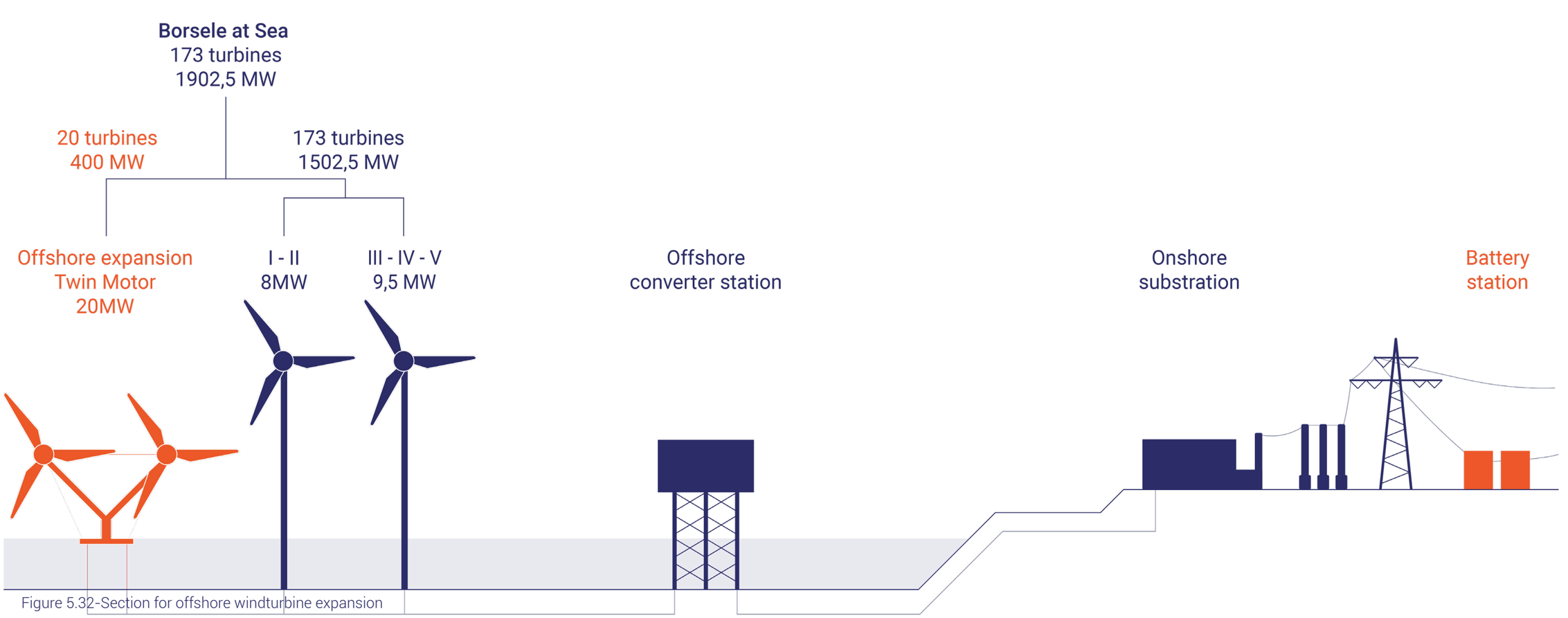


Figure 5.32-Section for offshore windturbine expansion

M.R.E.Z

2. Energy on Land

The main contribution of new energy capacity in the M.R.E.Z. strategy in Terneuzen (figure 5.33) is the expansion of onshore wind energy near the existing industrial cluster DOW Terneuzen as an additional energy source next to the existing solar panels. These new turbines are marked with orange in figure b. Approximately 40 new modern wind turbines, each with a capacity of 4 MW, would add around 160 MW of sustainable energy production. Accounting for the Dutch onshore capacity factor of 27%, this produces an estimated yearly (8760 hours) energy production of approximately 378,000 MWh (E = 160 MW × 0.27 × 8,760 h).

To avoid exporting all this production into the congested public grid, two strategies are proposed for the use of renewable energy in industrial sites:

· Direct coupling to industrial sites: turbines feed electricity directly into industrial facilities with large electricity demand, which bypasses the public grid;
· Hybrid wind–hydrogen model: excess renewable power that cannot be immediately used is directed to power a local electrolyser. With an electrolyser efficiency of approximately 50–55 kWh per kilogram of hydrogen, surplus wind energy can be stored and used to create sustainable fuel for industrial processes.

For periods of peak surplus, a large battery provides storage. This battery charges during peaks and discharges during industrial demand peaks, which keeps industrial processes running on clean energy, while reducing stress on the grid.
Although some new wind turbines are located near existing MV lines within the landscape, they themselves are not feeding into the public grid. Their electrical connection is part of the industrial energy system that supplies DOW Terneuzen and the batteries. They will only contribute to a large demand of the public grid.

Tidal energy is created from already existing sluices, which can be found in figure b marked as crosses. These are mostly situated at West-Buitenhaven and Uitwateringskanaal in Terneuzen. They form the base of the small-scale endogenous energy system. Tidal energy is predictable by nature. The tidal cycle takes approximately 12.5 hours, with maximum flow occurring twice a day during mid-tide, which lasts approximately 2 to 3 hours. This predictability makes it suitable for pairing with battery storage to avoid contribution to the existing net congestion at peak generation. Using the tidal difference between the waterbodies, an installation with a peak capacity of 100 kW can generate sufficient electricity for approximately 80 households, as proven with the existing Tidal2Energy turbine in Vlissingen (Provincie Zeeland, n.d-d.).

To save tidal peak production, small battery systems are proposed in proximity of the existing sluice locations. Different configurations of sluice battery combinations make for different battery sizes:
· A configuration of 2 sluices (Uitwateringskanaal) have a peak capacity together of 200 kW, which requires a battery of approximately 600 kWh to store a 3-hour peak (E = 200 kW × 3 h);
· A configuration of 4 sluices (West-Buitenhaven) increases peak capacity to 400 kW, with a storage requirement of 1,200 kWh (E = 400 kW × 3 h).
These batteries store surplus tidal energy when local cable capacity is insufficient, and release it within hours to serve local demand and reduce strain on the grid.

Communities

By integrating offshore wind, onshore wind, tidal energy, and local storage into one coherent system, the M.R.E.Z. strategy improves Zeeland's energy autonomy, while limiting the spatial burden on land. Industrial workers and daily commuters benefit from a more reliable and resilient energy supply that supports large industrial sites, such as DOW Terneuzen. Residents living near industrial zones experience reduced landscape intrusion, as the largest new energy generation is generated offshore. For the wider population of Zeeland, the strategy delivers cleaner and locally produced energy, while preserving most of the province's open landscapes and ecological qualities. In this way, the M.R.E.Z. approach supports both regional industry and the everyday quality of life of Zeelanders.

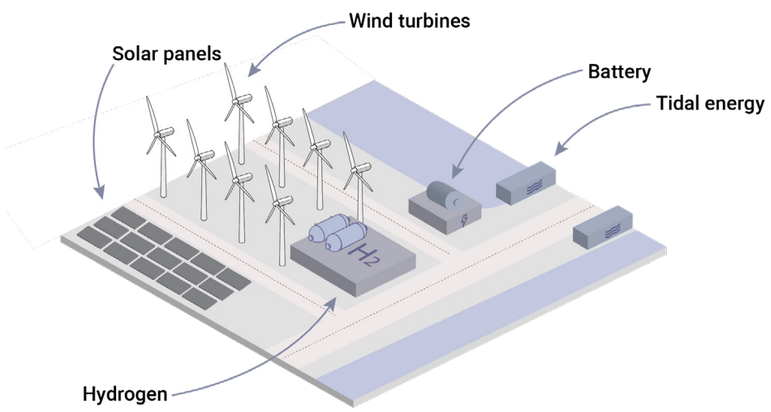


Figure 5.33-Axonometric for energy production

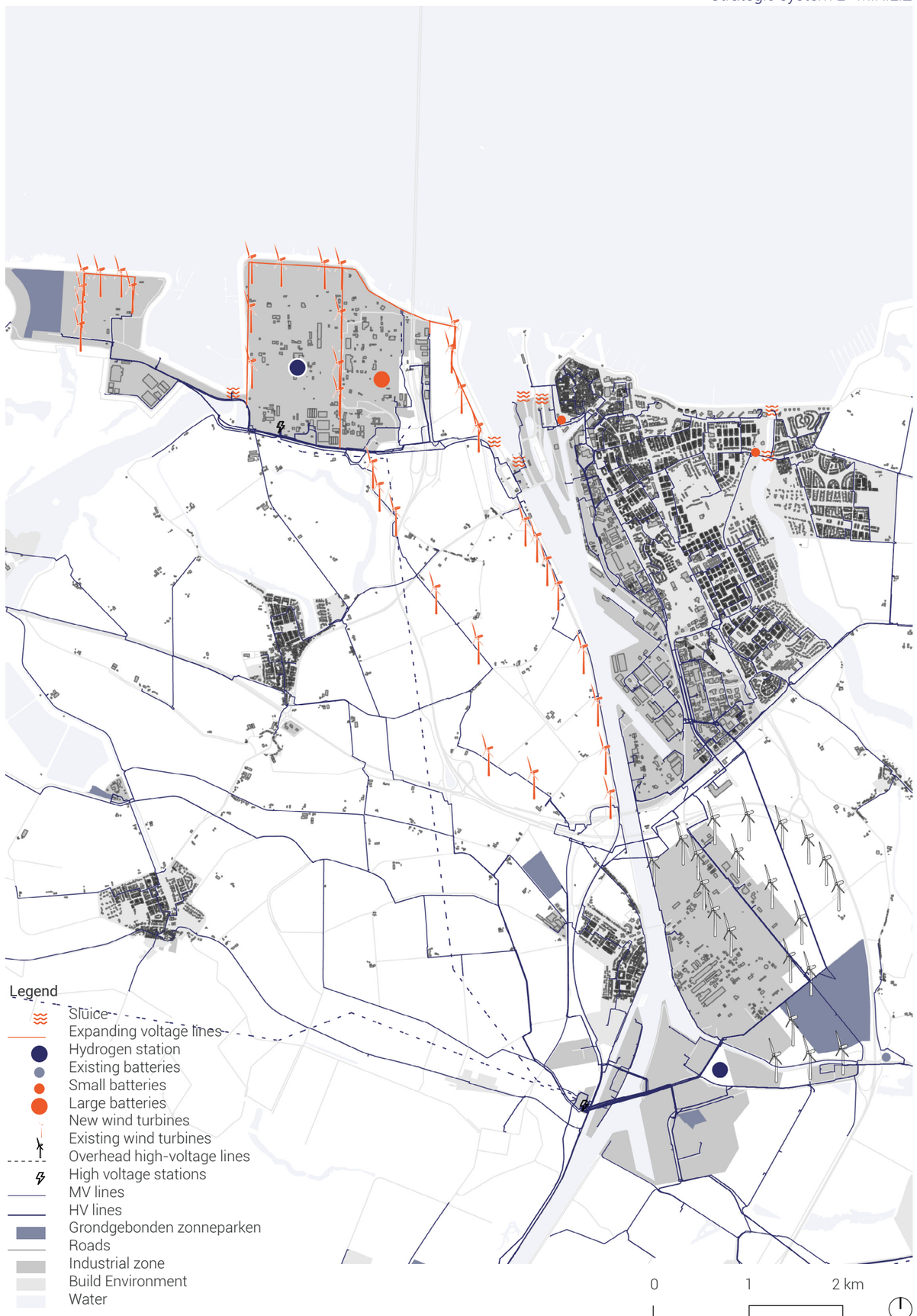


Figure 5.34-M.R.E.Z. Strategy

06

Conclusion and Reflection

Conclusion

This chapter brings together the findings from the research questions, which outline how Zeeland's communities intersect within the broader regional transition. Each sub-question addresses a different layer of the spatial and social structure. Together, the answers build toward the main research question, which shows how Zeeland's energy transition can be spatially organised to support both sustainable mobility and a sustainable energy transition, while centering the wants and needs of communities. The reflection evaluates the framing of the questions and highlights where alternative formulations could have strengthened the research focus. The chapter also includes an assessment of how the project aligns with the Sustainable Development Goals (SDGs).

Question 1: Who are the communities directly affected by Zeeland's energy transition?

There are many communities affected by the energy transition in Zeeland. The main transitional community is the car slaves, the people who are dependent on the use of private cars. This community encompasses all of Zeeland, since the province has very bad accessibility. In this research there was a focus on the communities which are connected to the industry, which can be subdivided in residents living near industrial sites and industrial workers. These two communities are the main focus point of this research. Besides these communities there are also stakeholders who are affected by the energy transition. These stakeholders can be categorized in the following categories: public sector, private sector and civil society. Extra attention has been paid to five stakeholders in these categories. A closer look is taken at how they feel about the energy transition in Zeeland, these were the local touristic business owners, local environmental groups, industrial workers, residents near industrial sites and youth (15-30).

Question 2: How do existing mobility patterns in Zeeland expose infrastructural gaps and potentials towards a sustainable mobility transition?

The existing mobility patterns expose some infrastructural gaps. There is a very strong car dependency, a fragmented regional connectivity, weak public transport hierarchy and a mismatch between infrastructure and energy transition goals. These points came forward through research and analysis.
Based on research and the community's hopes and wishes some potentials came forward. There is an opportunity for integrated mobility-energy systems, the development of M.E.H. networks, decentralised and shared mobility solutions and reconfiguration of mobility corridors.

Question 3: How can the mobility in Zeeland be restructured to support a sustainable mobility transition?
The mobility infrastructure of Zeeland can be restructured through a Mobility Energy Hub (M.E.H.) system that supports a sustainable mobility transition. This approach is suited for Zeeland's spatially fragmented landscape, where residential areas vary considerably in size, density, and accessibility. The M.E.H. system integrates energy and mobility by combining endogenous energy production through solar and kinetic energy with mobility infrastructure. The system is divided into three categories: low, medium, and high, with each version adjusted to different population densities within the region.

High density M.E.H. serve the largest cities and villages in Zeeland, and are connected to (new) train lines, bus services, and autonomous vehicles. In Middelburg and Vlissingen, these M.E.H. also integrate with the light rail infrastructure that connects to coastal areas. Additional facilities include bike storage, shared mobility, and storage, together with educational or retraining spaces. They have solar and kinetic energy infrastructure, enabling it to generate and store its own energy. Medium density M.E.H. are located in mid-sized villages, and focus on bus connections, bike storage, shared mobility, and storage, together with meeting spaces to support social cohesion. They also have solar and kinetic energy infrastructure. In coastal tourist towns, medium density M.E.H. are connected to the light rail. Low density M.E.H. serve smaller villages, and provide on-call mobility, solar energy production, and basic bike storage and rental.

Question 4: How can the energy transition in the Zeeland Delta transform a fragmented industrial territory into a cohesive and resilient delta landscape?

The transition from fossil fuel to renewable energy offers an opportunity to restructure Zeeland's mobility, by using Zeeland's endogenous energy production to support new mobility alternatives that make Zeeland's landscape less fragmented and more connected. The energy transition also enables the chance to restructure Zeeland's industrial landscape, by clustering it together with new energy production sites creating a cohesive and resilient landscape in Zeeland's delta. Instead of treating energy, mobility, and industry as separate systems, the transition can integrate them into one cohesive network that benefits the communities.

Main research question: How can endogenous renewable energy production in Zeeland be spatially structured to support sustainable industry and mobility transition across its communities?

With all of the subquestions answered there is also an answer for the main question. Endogenous renewable energy production in Zeeland can be spatially structured through a clustered, multi-scalar energy landscape that links production sites, industry, and mobility systems instead of spreading infrastructures fragmented across the region. The M.E.H is the way to integrate energy production, storage and the transition to sustainable mobility. It gives the community better accessibility and makes them less dependent on non-sustainable ways of traveling, for example with the car. Together with M.R.E.Z it gives spatial structure to energy zones that produce endogenous renewable energy, without disturbing the landscape of Zeeland even more. Together these strategies form the bases of a spatial structure to support the energy transition and make Zeeland more accessible at the same time, while keeping the needs of the communities in consideration.

Reflection on research questions

The main research question is an appropriate question related to the chosen communities. But some of the subquestions could have been framed in a different way. The first sub question is very broad, and we did not focus on all the communities, but only on two. It might have been better to ask how the chosen communities are affected by the energy transition in Zeeland. For the second question it might have been better to ask what gaps and potentials are exposed, instead of how. The third question is relevant and related to the research and design that has been done for this project. The fourth question is also relevant, but it might have been useful to dive a bit more into how a cohesive and resilient delta landscape can be created.

Community representation

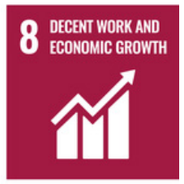
Through site visits and interviews with local residents in the Middelburg, Vlissingen, and Terneuzen areas, it became clear which communities in Zeeland are most affected by the region's energy and industrial infrastructure. With the visit it became clear that low accessibility across residential areas, and a high degree of proximity between residential zones, and industrial and energy sites was present. These findings contributed to the focus of the spatial vision, which centres on two communities: residents living near industrial sites, and industrial workers, both groups characterised by a strong dependence on the private car as their primary means of mobility.

Evaluation based on the S.D.G.s

SDG 3 - Good health and well-being
The project contributes to improved health and well-being by reducing car dependency and promoting cleaner mobility systems. The introduction of the Mobility Energy Hub (M.E.H.) network enhances access to services and encourages active and shared mobility, while the shift towards renewable energy reduces air pollution in industrial and residential areas. This leads to healthier living conditions, especially for communities located near industrial zones.

SDG 4 - Quality education
The proposal supports quality education through the integration of educational and retraining spaces within high-density M.E.H. hubs. These spaces can facilitate knowledge exchange and skill development related to the energy transition, enabling local communities (especially youth and workers) to adapt to new economic and technological conditions.

SDG 7 – Affordable & Clean Energy
This is one of the strongest contributions of the project. By structuring endogenous renewable energy production through clustered systems such as M.R.E.Z and integrating solar, kinetic, and offshore energy, the proposal increases local energy production while reducing dependence on external fossil-based sources. The spatial integration of production, storage, and consumption ensures a more efficient and accessible clean energy system.



SDG 8– Decent work and economic growth
The project supports economic development by promoting industrial transformation and the creation of new job opportunities within the renewable energy sector. Furthermore, the improvement of accessibility enhances the sustainable tourism market, while creating new job opportunities for young people.

SDG 9 – Industry, Innovation & Infra-structure
By integrating energy, mobility, and industrial systems into a cohesive infrastructure network, the proposal implements innovation in the industry and transport infrastructure. The development of Mobility Energy Hubs and the clustering of industries around renewable energy zones represent innovative spatial strategies that enhance infrastructural efficiency and resilience.

SDG 10- Reduced inequalities
By improving accessibility across Zeeland, the project reduces spatial inequalities between urban centers and rural or peripheral communities. The multi-scalar M.E.H. system ensures that even low-density villages (like Borssele) gain access to mobility and energy services, addressing current disparities caused by car dependency and fragmented infrastructure.

SDG 11 – Sustainable Cities & Commu-nities
This goal aims to make cities and human settlements inclusive, safe, resilient, and sustainable by 2030. With this project it was tried to take the needs, hopes and dreams of the communities in consideration. Therefore, the strategy is made to improve the living conditions of the community and also make the city more sustainable, mostly in ways of mobility.

SDG 13 – Climate Action
The transition to renewable energy sources, combined with a shift toward sustainable mobility systems, significantly contributes to climate change mitigation. By reducing CO emissions from both industry and transport, the project aligns with long-term climate goals and supports the development of a low-carbon regional

Figure 6.1-S.D.G.s

Scientific contribution

This research contributes to the debate on energy transition by reframing it as a spatially and socially embedded process, rather than a purely technical, infrastructural, or economic challenge. Existing approaches to energy transition in the Netherlands, including the Regional Energy Strategy framework, have increasingly adopted a more integrated perspective on the energy system, acknowledging the interrelation between electricity generation, the built environment, mobility, and infrastructure (RES Zeeland, 2025). However, in practice, these approaches still tend to prioritize energy targets, grid expansion, and implementation efficiency, while the spatial and social consequences of these transformations remain insufficiently addressed.

In Zeeland, this limitation is particularly visible. As a peripheral and industrialized region, Zeeland is shaped by port-industrial development, large-scale infrastructures, and dispersed settlements. These conditions create physical and social fragmentation, reinforce car dependency, and intensify inequalities in access to employment, services, mobility, and landscape quality. This research therefore contributes to existing knowledge by positioning Zeeland's energy transition within a framework of socio-environmental spatial justice, showing that transition processes cannot be understood only in terms of decarbonization targets, but must also be assessed in relation to territorial cohesion, accessibility, and the everyday lived realities of affected communities.
A first scientific contribution of this work is therefore conceptual. The project advances the understanding of energy transition by linking energy production and infrastructure to spatial structure and community life. This builds on Sijmons' (2014) argument that energy and space are reciprocally related, and that every energy system has a spatial footprint that transforms landscapes and patterns of settlement. Rather than treating energy infrastructure as a neutral technical layer, this research understands it as a territorial force that reshapes access, environmental quality, and regional identity. In that sense, the project contributes to the growing body of work that sees the energy transition as a spatial design challenge, not only as an engineering problem (Sijmons, 2014).

A second contribution lies in the project's critique of existing governance and planning approaches. Research on Dutch regional energy transitions has shown that stakeholder participation is often dominated by actors from the state and the market, while citizens and civil society are weakly involved or only indirectly informed (Lelieveldt & Schram, 2023). This creates a lopsided transition process in which the perspectives of affected communities remain underrepresented. This research addresses that gap by starting from the needs and perceptions of communities living near industrial sites and those structurally dependent on private cars. In doing so, it contributes to existing debates by demonstrating that spatial planning can serve as a mediating framework between top-down energy policy and bottom-up territorial concerns.
A third contribution is methodological. The project combines spatial analysis, field observation, community-centered problem framing, stakeholder mapping, visioning, and strategic design within one iterative process. Instead of separating research from design, it uses design as a way to synthesize territorial knowledge and translate it into spatial principles and interventions. This is particularly relevant in the context of socio-technical transitions, where technological, economic, and societal factors are deeply interdependent. As Swennenhuis et al. (2024) show in their study of industrial decarbonization in the North Sea Port area, transition processes cannot be explained through techno-economic variables alone, because societal support, governance commitment, and public trust interact dynamically with infrastructural and economic conditions. This research extends that insight into the field of spatial planning by showing how design-based methods can make such interdependencies visible and operational at the regional scale.

More specifically, the project contributes a spatially integrated framework organized around six design principles: diversifying renewable energy generation, clustering industries to avoid further fragmentation, balancing energy production across North and South Zeeland, improving mobility accessibility, developing new energy hotspots, and expanding existing infrastructures as integrated systems. These principles translate community concerns into a coherent spatial logic. In this sense, the project contributes not just a design proposal, but also a way of structuring regional energy transition through spatial principles that address multiple systems simultaneously: energy, mobility, delta landscape, and industry.

The project also offers a practical and transferable contribution. Current energy strategies in Zeeland explicitly recognize the increasing pressure of grid congestion, the spatial challenges of renewable energy deployment, and the growing need for coordination between sectors (RES Zeeland, 2025). Similarly, recent research on offshore system integration stresses that future energy transitions require integrated approaches across electricity, hydrogen, infrastructure, and spatial planning in order to address congestion, affordability, and territorial pressures (Blom et al., 2025). This research contributes to practice by showing how such integration can be approached spatially, not only technically. It demonstrates that regional design can help organize endogenous renewable energy production in ways that also improve accessibility, reduce environmental pressure, and strengthen territorial cohesion.

Finally, the broader scientific relevance of this work lies in its applicability beyond Zeeland. Similar tensions between industrial concentration, fragmented mobility networks, environmental burden, and energy transition pressures can be found in other European port-industrial regions. By focusing on a peripheral, non-metropolitan territory, this research expands the debate on energy transition beyond dominant metropolitan cases, and contributes to a more differentiated understanding of how transitions unfold in rural-industrial and semi-urban regions. It therefore adds to existing knowledge by demonstrating that spatial planning can play a critical role in mediating between technical energy systems and socio-spatial realities, and that integrated design strategies can simultaneously support environmental, economic, and social performance.
Overall, the scientific contribution of this research lies in showing that energy transition should be understood not only as a process of decarbonization, but as a spatial justice project. By combining socio-environmental concerns, community perspectives, and regional design, this work contributes conceptual and methodological tools for managing complex, multi-scalar transitions in a more inclusive and territorially responsive way.

Limitations

Despite the comprehensive and integrative approach adopted in this research, several limitations must be acknowledged. These relate primarily to data availability, methodological assumptions, analytical depth, and the inherent complexity of long-term spatial and energy transitions.

A first important limitation concerns data availability, particularly in relation to the social dimension of the study. While the research aimed to address two key community groups, local residents and industrial workers, there was a significant lack of accessible and detailed data regarding the latter. Specifically, information on the socio-demographic characteristics of industrial workers, such as age distribution, gender, socio-economic background, and spatial distribution, was limited or not readily available. This constrained the ability to develop a fully evidence-based understanding of this group's needs, vulnerabilities, and spatial relationships to industrial areas. As a result, the representation of industrial workers within the analysis remains more generalized compared to that of local residents, potentially overlooking important internal differences within this community.

A second limitation relates to the use of assumptions in long-term projections. The project operates within a future-oriented framework, extending approximately 50 years into the future. In order to construct a coherent timeline and phasing strategy, a number of assumptions were made regarding technological development, policy evolution, energy demand, climate change and spatial transformation. These include assumptions about the expansion of renewable energy systems, the evolution of industrial processes, and the development of mobility infrastructures. While such assumptions are necessary in strategic spatial planning, they introduce a level of uncertainty. Future developments in energy technologies, economic conditions, and political priorities may diverge significantly from the projected scenarios, potentially affecting the feasibility or relevance of certain proposed interventions.

A third limitation concerns the depth of quantitative analysis within the project. Due to time constraints, the research primarily relies on qualitative and spatial analysis, supported by conceptual and strategic design. While this approach is appropriate for exploring complex spatial relationships and generating integrative visions, it limits the precision of certain aspects of the proposal. In particular, a more detailed quantitative assessment of energy production and demand would strengthen the robustness of the strategy. For example, further analysis could include precise calculations of energy capacity, demand distribution, and system efficiency within both the proposed mobility-energy hubs (M.E.H.) and the multiple-regional energy zone (M.R.E.Z.). Without such detailed modelling, the project remains at a strategic and conceptual level, rather than a fully operational or implementation-ready plan.

Related to this, the research is limited by the absence of in-depth technical and economic evaluation. Energy transition processes are highly dependent on technical feasibility, infrastructural capacity, and economic viability. While the project acknowledges key issues such as grid congestion, infrastructure expansion, and renewable energy integration, it does not include detailed technical modelling of energy systems or cost-benefit analysis of the proposed interventions. Similarly, economic aspects such as investment requirements, operational costs, and financial feasibility for stakeholders are not explored. This limits the ability to assess the practical implementation potential of the strategy in real-world conditions.

Finally, a broader limitation lies in the complexity of the energy transition itself as a multi-scalar and multi-actor process. The project attempts to integrate multiple systems, energy, mobility, industry, and delta landscape, within a single spatial framework. However, such integration inevitably requires simplifications. Not all actors, governance structures, and sectoral dynamics could be fully represented or analysed. Additionally, the interactions between local, regional, and national scales introduce further complexity that cannot be fully resolved within the scope of this research.

In conclusion, while the project provides a comprehensive and integrative spatial strategy, it remains exploratory in nature. The identified limitations highlight the need for further research that combines spatial design with detailed quantitative modelling, technical analysis, and socio-economic evaluation. Addressing these limitations would enhance the reliability, applicability, and impact of the proposed approach, and support its potential translation into policy and practice.

Recommendations for further investigation

After reflecting on the final outputs and research, our group has identified several gaps in specific areas. With additional time, further investigation would focus on the following aspects:

Quantitative Energy Assessment

Economic Feasibility and Phasing

Environmental and Landscape Impact

Mobility Behavior and User Patterns

Further research is required to quantify the balance between energy production and demand within the proposed system. This includes assessing the capacity of renewable sources (offshore wind, solar, tidal, and kinetic), the energy demands of industry and mobility systems, as well as the feasibility of hydrogen storage and distribution. Such analysis would strengthen the technical validity of the M.R.E.Z and M.E.H. strategies.

In addition, a more in-depth economic analysis would be valuable to evaluate infrastructure investment costs (including M.E.H., transport networks, and energy systems), long-term economic benefits such as job creation and regional growth, and potential financial models and funding mechanisms.

A deeper examination of the ecological impacts of energy infrastructure, particularly in offshore and coastal areas, as well as its effects on landscape quality and tourism, would contribute to a more balanced approach between energy production and environmental preservation.

Finally, a more detailed analysis of daily mobility flows, user preferences for shared and public transport, and the adoption rates of new mobility systems would help refine the design and spatial distribution of M.E.H.

These further investigations would enhance the technical, social, and institutional feasibility of the proposal, supporting its transition from a strategic vision into an implementable framework.

Values, ethics and societal relevance

For this research, the point of view from the community is particularly important. With this project we tried to represent the wishes and concerns of the community. Their standpoints are represented based on research that was conducted. However, we cannot speak for those communities since we are not a part of them. We believe that most of our design is based on assumptions that are related to the research, but sometimes it was noticeable that we let our own wishes take over those of the community. This is something to be mindful of.

The standpoint of the communities influenced the design process and decision making. By including the voices of the community, there is a more bottom-up approach towards the design process. This makes the process more ethical, especially related to the spatial implications of energy infrastructure and mobility networks.

The core values of our research are protecting the local identity of Zeeland, representing the hopes and dreams of the community, and improving the accessibility of the region. These elements were things that came forward from the community research and were kept in mind during the entire process. By continuously reflecting on these elements, we kept the core of the design aligned with the core values.
An important part of the research is that it must happen ethically. By not only looking at the communities but also doing research about the involved stakeholders and including their opinions in the design process we made the research and design ethical.

Societal relevance and potential impact

As mentioned before, the fragmentation that is created by lack of an integrated spatial approach is also seen in places besides Zeeland. In other port-industrial regions in Europe this fragmentation is also present, like in Rotterdam and Antwerp.

In this project we tried to reduce Zeeland's fragmentation. This project therefore contributes to a broader debate on sustainable energy landscape in peripheral territories. By implementing a M.E.H. and M.R.E.Z. we tried to create an understanding of how the energy transition can reshape rural and semi-urban regions. The approach that we took also promotes a multi-scalar perspective that integrates energy systems, mobility infrastructure, and landscape design within a single spatial framework.

The impact of this project is to make people understand that the energy transition can be something more than a purely technical operation. It can be a spatially just and territorially cohesive process. If approached in the right way it can strengthen regional identity, reduce environmental pressure, and support long-term resilience in peripheral industrial landscapes.

Implications for democracy, governance, and implementation

Urban planning and design can be an instrument for the strengthening of democracy. This can happen if in the process there is transparency, citizen participation, co-creation, and inclusion of vulnerable voices. In this project we tried to include this as much as possible. Since actual citizen participation was not possible for this project we tried to stimulate citizen participation by voicing the support and concerns of the stakeholders. Vulnerable voices were included in the process by the choosing of two communities, in which fears, hopes, and dreams are represented.

The combination of mobility hubs with energy generation is a form of energy democracy. It is a way to pair the energy transition with the efforts to democratize the production and management of energy resources. There is an expansion of public participation in policy making and a decentralized energy system (Stephens, 2019). With our strategy Zeeland is not used as an extraction site for the production of national energy needs, but as a place where the endogenous energy production is experienced as an improvement of daily life.
There is a wide variety of stakeholders involved in the strategic development of our vision. Within those stakeholders there is the case of multi-scalar governance. There are regional, provincial, national, and even international needs. The needs across the different scale are equally important and there needs to be a fair way to incorporate those. We tried to figure out a way to mediate between the different stakeholders and work out the conflicts. There is also cross border governance, for example between the Netherlands and Belgium in relation to the new train line. Also, between the EU and the Netherlands for climate change goals. There is also a connection between governance and economy. The new facilities that are necessary for the energy transition create job opportunities, which is important for the local economy but also for the industrial workers and the youth.

For the implementation of the strategy a timeline and phasing plan is made. In this plan the various levels of governance come forward; regional, national, and international. We looked at what stakeholders are important for which elements of the phasing. By making this timeline, it became clear what kind of role the different stakeholders and levels of governance play in the strategic development. It was also a particularly useful tool to help us realize how much stakeholders participate in such a large-scale transition.

Individual reflections

Alex Wilson

Going into this project, I did not fully understand what an urbanism project around a sustainable energy transition would look like. My background in civil engineering, architecture, and now urbanism made the energy transition feel abstract and technical at first, far removed from social questions. I assumed technical optimisation was neutral or inherently beneficial, something that did not have to be negotiated with communities. That changed as I researched the subject and the site. The turning point was writing the positioning paper from the perspective of local environmental activists, which connected the technical side of energy transition with the lived reality of communities who bear its costs. It made me realise that technology and society are not separate, and I became more aware of how negotiation strengthens a design.

What I did not expect was how spatially and socially impactful energy infrastructure can be. Zeeland produces energy at a national scale but bears the full spatial, environmental, and social costs of that production. I became aware of a tension between wanting to propose ambitious spatial interventions and recognising that these interventions could reproduce the same top-down dynamics I normally critique. It forced me to confront the realization that “good design” can still be unjust if it does not take the most affected into account.

Technical feasibility remained important in how I tackled this course, but it became inseparable from questions of spatial and environmental justice. Taking responsibility for the energy analysis, the M.R.E.Z. strategy, and the stakeholder mapping taught me to translate technical needs and social demands into spatial choices. The stakeholder analysis helped me see how power is distributed and how the communities are positioned within decision-making.
Working in a group of five also became part of my learning process. I normally work best in isolation, where I can go deep and maintain control. Constant negotiation challenged that, and made me aware of how much I rely on autonomy and how difficult collective decision-making can feel. At the same time, it showed me that letting go of control can open space for perspectives I would not reach alone.

Looking ahead, I want to work as an urbanist who keeps feasibility central while meaningfully including underrepresented and affected communities. I do not want to resolve complexity too quickly and to treat community knowledge as equally important as technical expertise.

Wesley Thomas

For me this project has been quite a new experience, especially designing and planning on such a large scale, especially coming from an architectural bachelor. Working at this scale let me realize the importance of larger systems beyond the building, neighborhood or even city scale.

In this project I particularly focused on diving into and analyzing the communities and industries. What I found most interesting was exploring what the communities truly wanted and needed, which gave me a completely different perspective on resident participation in the design process. I think it was very important directly creating a vision on behalf of the communities because I think that in practice, urban designers should ideally represent the communities they design for. In this quarter I also became more aware of the responsibility urban designers have to include community perspectives and address inequalities and justice.
Also my contribution in writing the vision and forming and visualizing the large-scale strategy helped me understand how to translate the community's wishes into a spatial proposal. Creating the historical analysis gave me a good background to understand how past developments shaped Zeeland's current urban landscape and social dynamics.

I also learned a lot about energy systems, how they function, the different types of renewable energy, and how the energy transition can be applied to achieve social community goals which in this case was related to mobility alternatives. Understanding this connection between energy and community needs has been a valuable lesson.

Working in a group was also very different from previous quarters. I realized how useful it was to make use of everyone's unique talents. I think this is something that is very relevant for real world professional practice. On the other hand, I noticed that I was sometimes a bit hesitant and didn't fully push my own ideas in the group. This is something I want to improve next time by being more proactive and contributing ideas from the start.

Overall, this project has taught me the importance of community centered designing and planning large scale systems. The knowledge I gained about energy and energy production are incredibly valuable because I think energy is a very central part of urbanism. This project also brought me more awareness for community needs, which I will use in future urban design projects.

Lotte Boerkamp

At the beginning of this quarter, I had set myself a learning goal with respect to teamwork. This was related to setting boundaries. When it is needed, I like to help people. But during groupwork assignments in my bachelor's degree, I often crossed my own boundaries to help others. For this quarter I wanted to try to still help people, when it is needed, but keep my own boundaries in mind. I feel like I have been able to achieve that. When help was needed, I offered to do certain things, but keeping my own boundaries and capabilities in mind. I am very happy with this, but sometimes I do notice that I forget myself a bit. So, this is something I will also take with me for future teamwork.
Besides the goal I had set for myself I feel like I learned a lot about the energy transition, and the methodology course gave me a lot of new insights to research and how you can approach certain things. The methodology course was a good preparation for graduation, and I will be taking the things I learned there with me to the second year.

The scale of this assignment is something new for me. I struggled in the beginning to get a grasp of it, because in earlier projects and with my bachelor's degree I have never worked on such a large scale before. Especially during the fieldwork, I found it difficult to understand what to look for and what to do when you are working with such a large scale. During the quarter I got a better understanding of the scale, and I enjoyed working with it. This process is very insightful for my learning process.

I feel like my contribution to the teamwork was good. I attended every lecture (except one SDS & Capita Selecta lecture) and every tutor session. We distributed the workload of assignments, and everyone did their own parts. When discussions were held some team members and I took the lead, while others stayed silent.

With the experience of the first three quarters of this year, I am looking forward to learn more about climate change related design and going aboard to Morocco to learn more about international urbanism and architecture, and about culture and diversity.

Anne-Moon Toen

I entered this course with relatively few assumptions, as it was my first subject in the master's program. Having completed my bachelor at the same faculty, I expected a similar approach, which was not completely the case. The master is designed to find your own way through the projects and dive deeper into things you find interesting, this openness of the project was initially verry challenging.

My familiarity with Zeeland was limited but I grew up geographically close, in a village underneath Rotterdam, which helped me relate to the spatial issues. However, I realized I carried a bias: I assumed residents were resistant to change, shaped by a “not in my backyard” mentality. Through the project, I began to understand this attitude differently, recognizing it as a response to an already disproportionate burden of industry and wind turbines in the region.

This course expanded my understanding of urbanism beyond design. I became more aware of the ethical responsibility urbanists have in shaping not only physical environments but also social behavior. The realization that spatial interventions influence how people move and interact made me reflect on the ethical implications of design decisions. I also experienced tension between my own design preferences and the needs of the community, which required a shift from a designer-centered to a more inclusive perspective.

A key part of my learning process was navigating the vagueness of a broad and big project. Initially, I struggled with the lack of clear direction, which led to frustration. Over time, through discussions with tutors and group members, I learned to identify the core of the problem and structure a coherent narrative. These moments of uncertainty ultimately pushed me to develop a more focused and critical approach.

Looking ahead, this experience has made me more aware of the importance of collaboration and community perspectives. At the same time, I recognize that I work better with more clearly defined frameworks. In the future, I aim to find a balance between addressing complex urban challenges and working within a more focused scope as an urbanist.

Maria Angeliki Karagkouni

During Q3, I felt that I had grown significantly both as a designer and as a team member. The transition from working independently to a highly collaborative process was challenging at first, but ultimately proved to be one of the most valuable lessons of the quarter. Through collaboration with my team, I learned to manage time and workload, to delegate responsibilities, and to trust others.

One of the most impactful experiences for me was engaging with the communities affected by our design. Through the interviews, I realized how important it is to listen to real voices rather than design solely based on theoretical assumptions. This changed the way I approach design, making it more human and less abstract.

Regarding the group work, I believe my contribution was primarily practical and visual. Because of my ability to work quickly, I took on a large part of the material production, transforming ideas and data into diagrams and visual representations. This helped me better understand how important visualization is in communicating an idea, especially in a complex large-scale project like this one.

The most important insight I've gained is the need to put myself in other people's position. By trying to set aside my own values and perceptions and understand different perspectives, I felt that I broadened the way I think and plan. At the same time, the concept of strategic planning for the future was a challenge that I found difficult, but it also helped me understand the importance of planning not only for the present but also for long-term scenarios. Zeeland helped me find aspects in the urban design that I could not imagine before. Searching for the location's identity helped connect the spatial and social problems in my mind and together with group, create a unique strategic vision that would advocate for the transitional communities.

Overall, Q3 was an intense experience with a heavy workload, but at the same time it gave me the tools and confidence to move on to the next stage of my studies, with a more mature and conscious approach to design and methodology research.

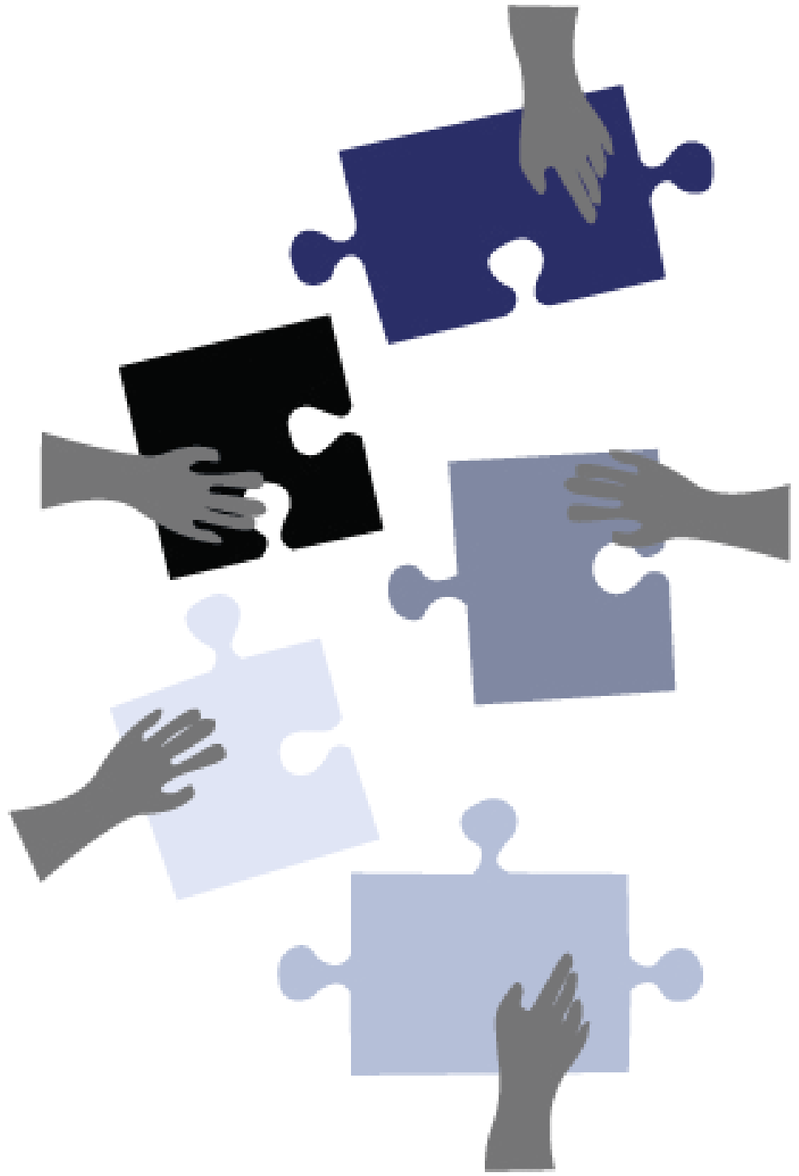


Figure 6.2-Jigsaw puzzle metaphor

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Disclaimer: the front and back page image of the report was produced by the group as collage and then edited in chatgpt with the following prompt:

"Aerial coastal landscape of a large-scale industrial and energy region (inspired by Zeeland), including offshore and onshore wind turbines, ports, canals, ships, and industrial clusters. Maintain the spatial composition and perspective of the reference image.

Style: soft architectural illustration combined with semi-realistic rendering. Slightly abstracted forms, reduced detail, smooth surfaces, subtle linework, and light sketch outlines. Add a gentle watercolor-like effect with soft blending and minimal grain.

Ensure cohesive lighting and atmosphere: consistent light direction, soft shadows, and atmospheric depth (distant elements slightly desaturated and bluish). Improve realism by blending all elements seamlessly.

Color grading: cool monochromatic blue palette — deep navy (#2C2C67) in shadows, muted blue-gray (#8087A2) in midtones, and soft pastel blue (#DFE6FF) in highlights and sky. Smooth gradient from bright sky to darker sea.

Clean, minimal composition. No text, no labels. Calm, futuristic, professional architectural visualization style. High resolution, suitable for A3 landscape report cover."

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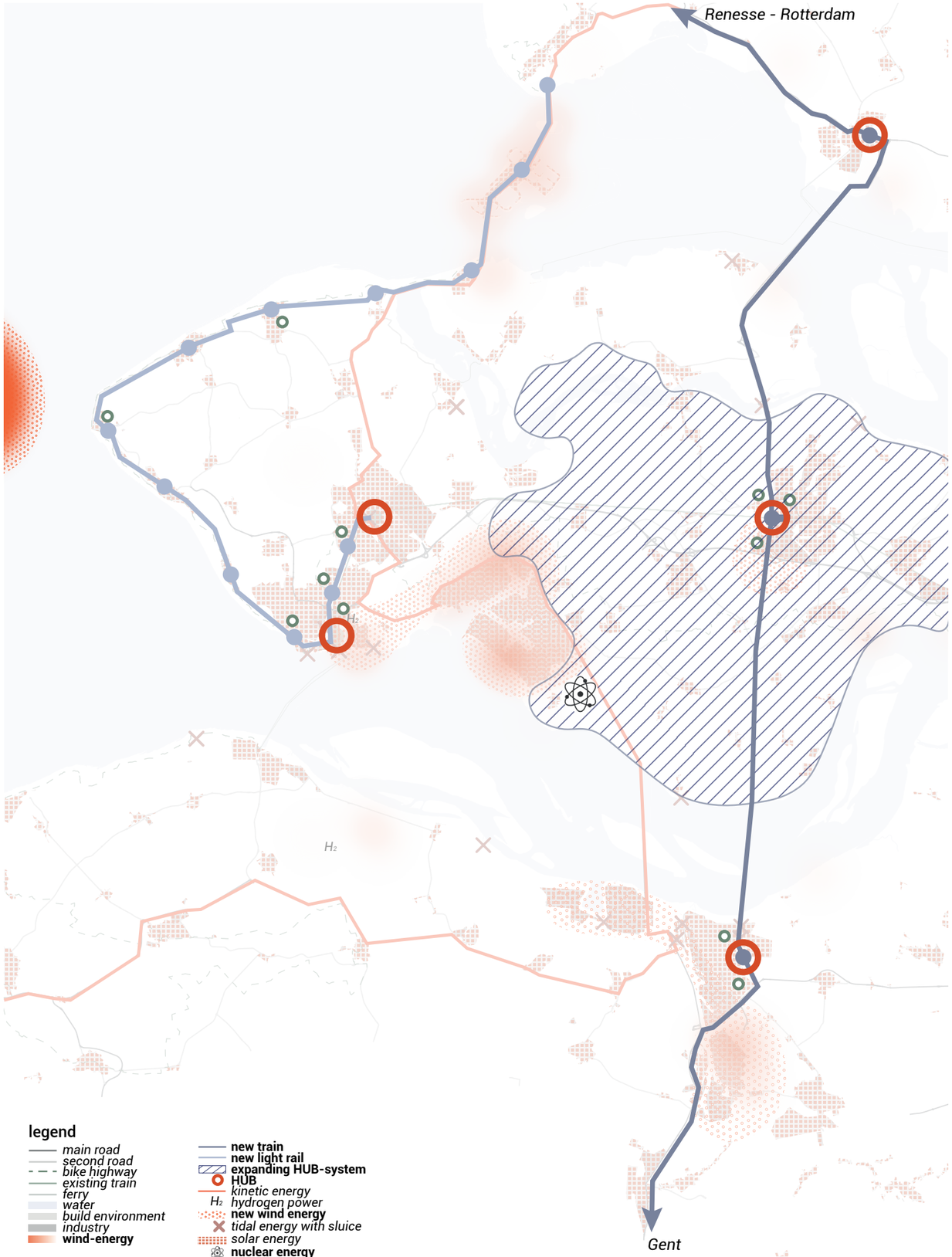
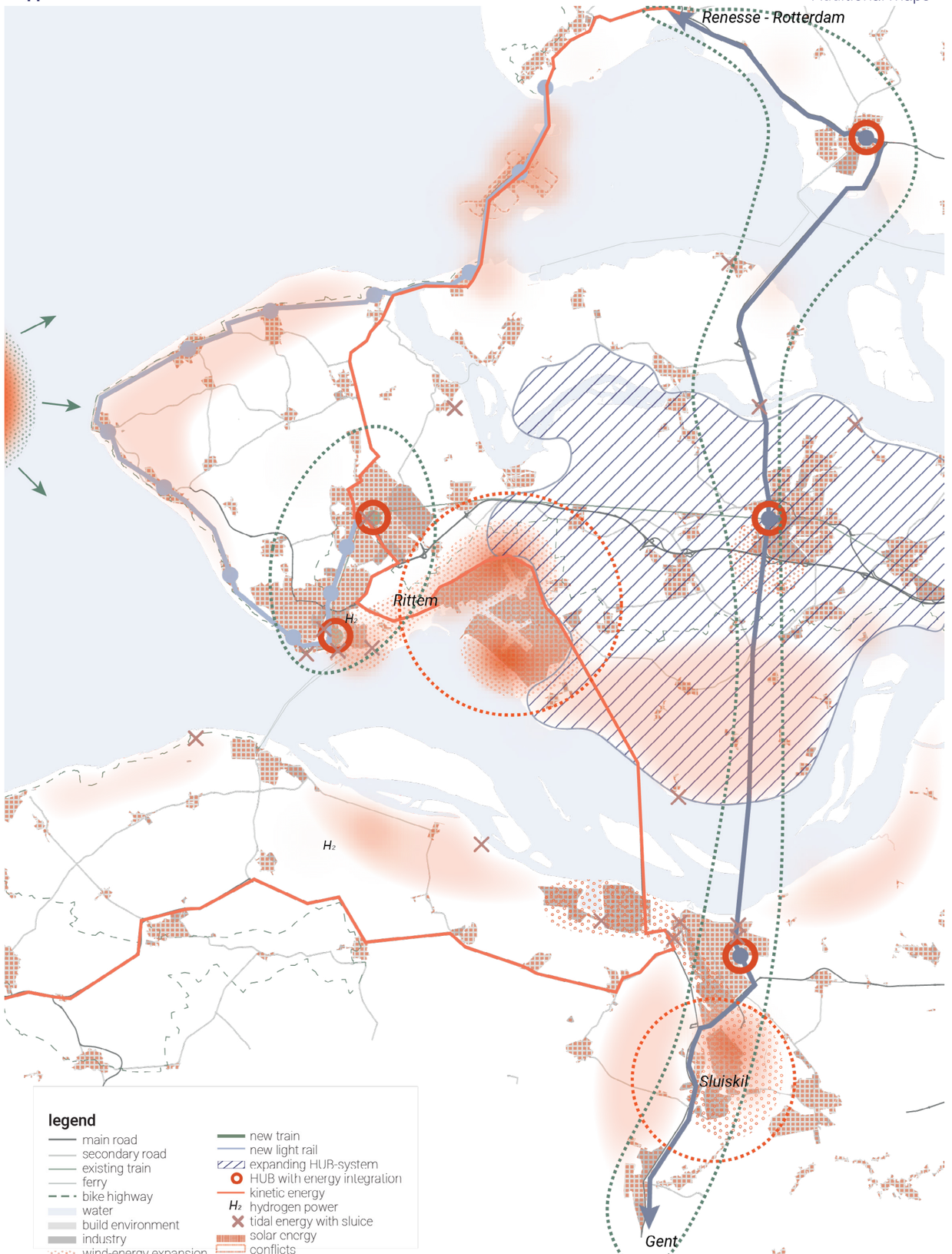
Appendix


Renesse - Rotterdam
H₂
Gent
legend
main road
second road
bike highway
existing train
ferry
water
build environment
industry
wind-energy
new train
new light rail
expanding HUB-system
HUB
kinetic energy
hydrogen power
new wind energy
tidal energy with sluice
solar energy
nuclear energy
education and culture


Renesse - Rotterdam
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existing train
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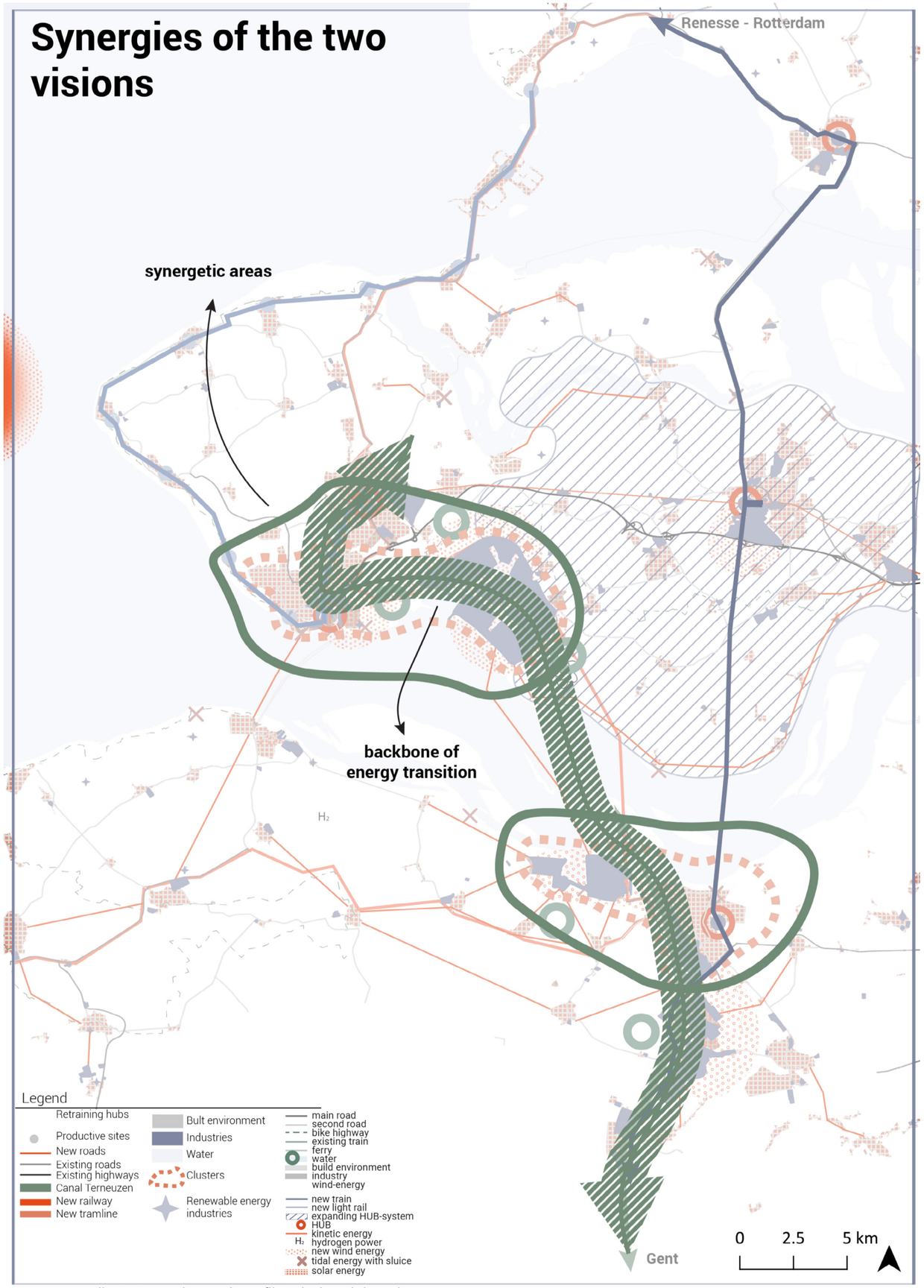
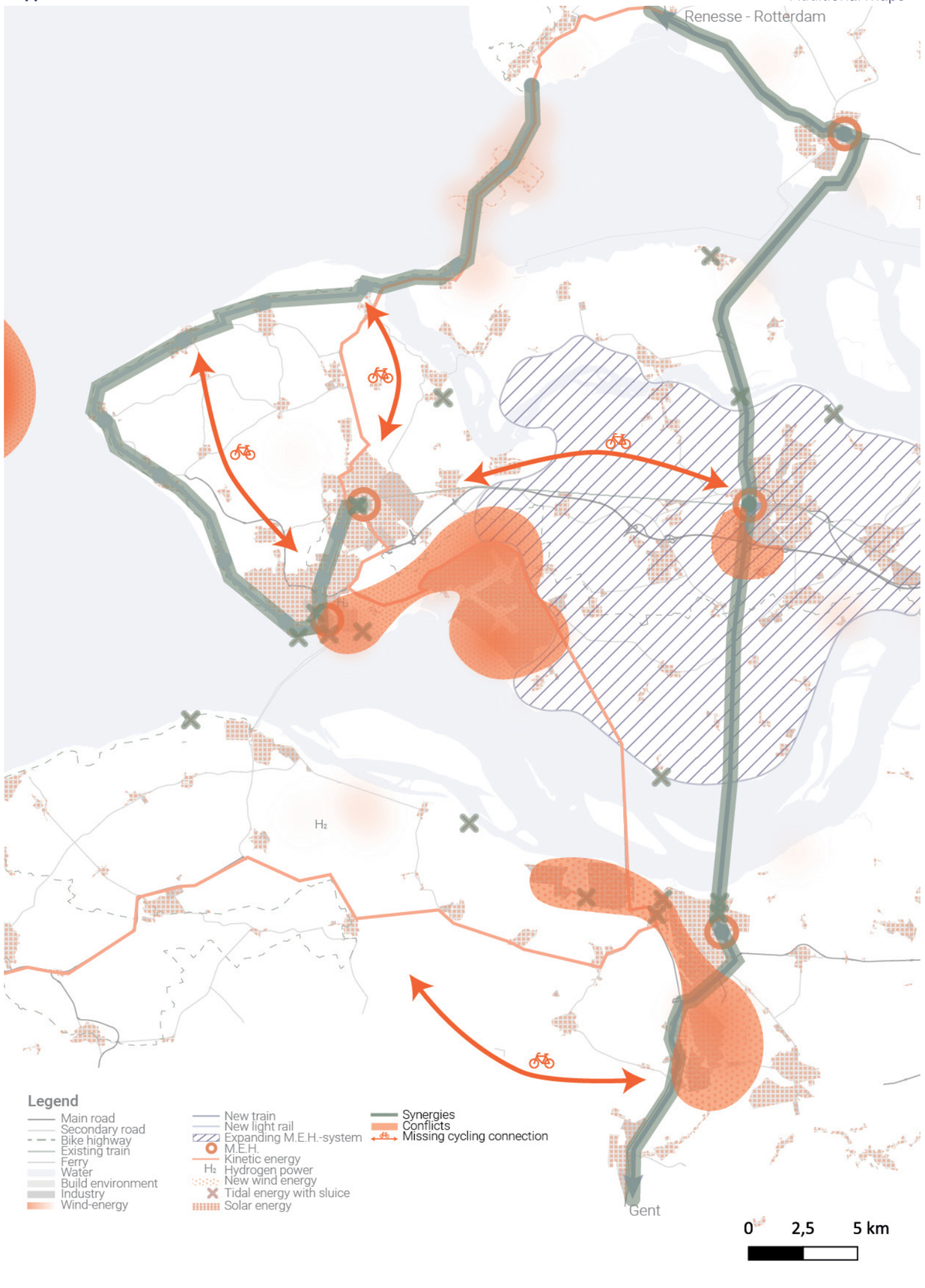
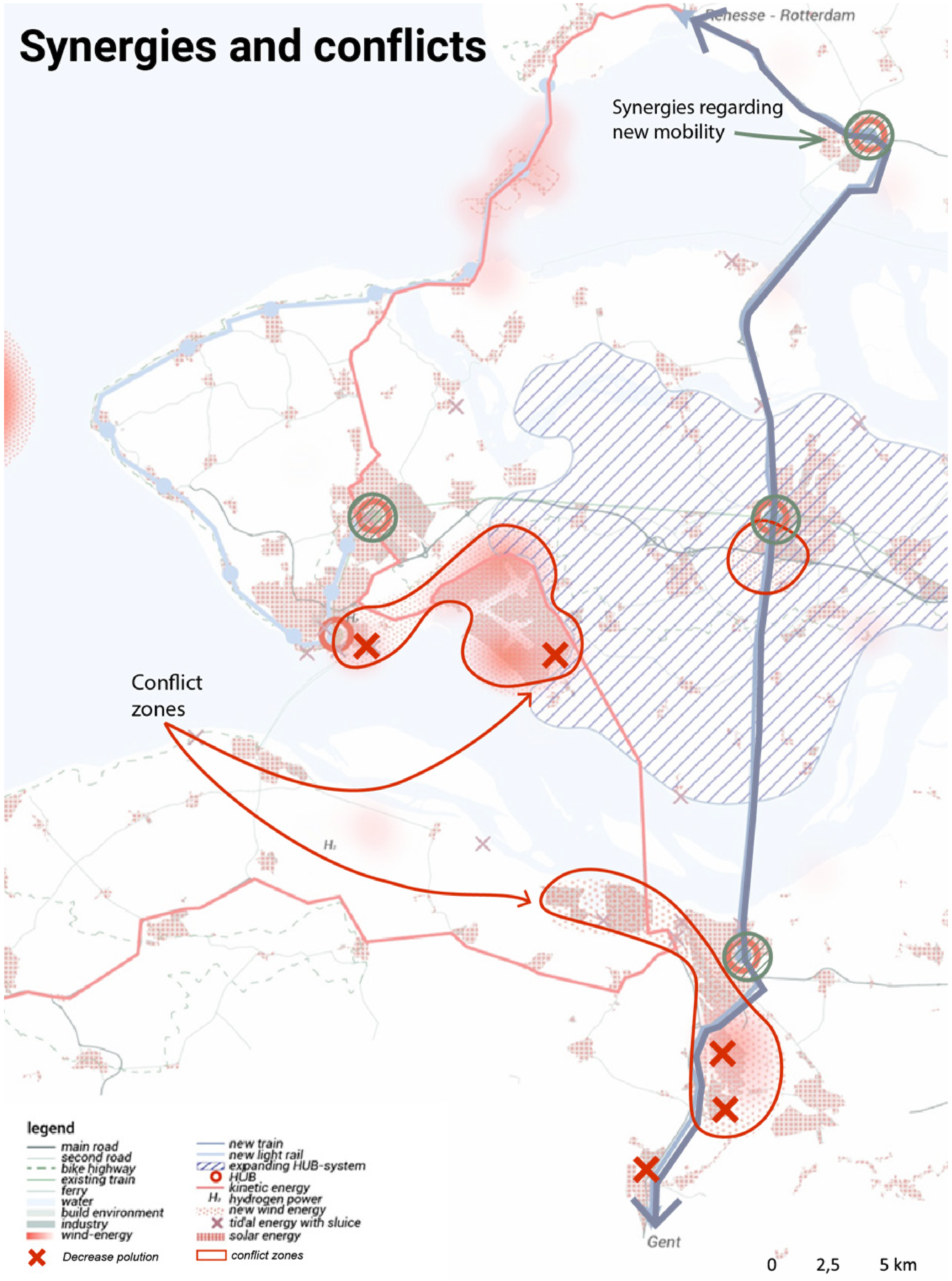
build environment
industry
wind-energy expansion
sea wind-energy expansion
sea wind-energy extended expansion
new train
new light rail
expanding HUB-system
HUB with energy integration
kinetic energy
hydrogen power
tidal energy with sluice
solar energy
conflicts
support
protected area
Existing wind-energy infrastructure

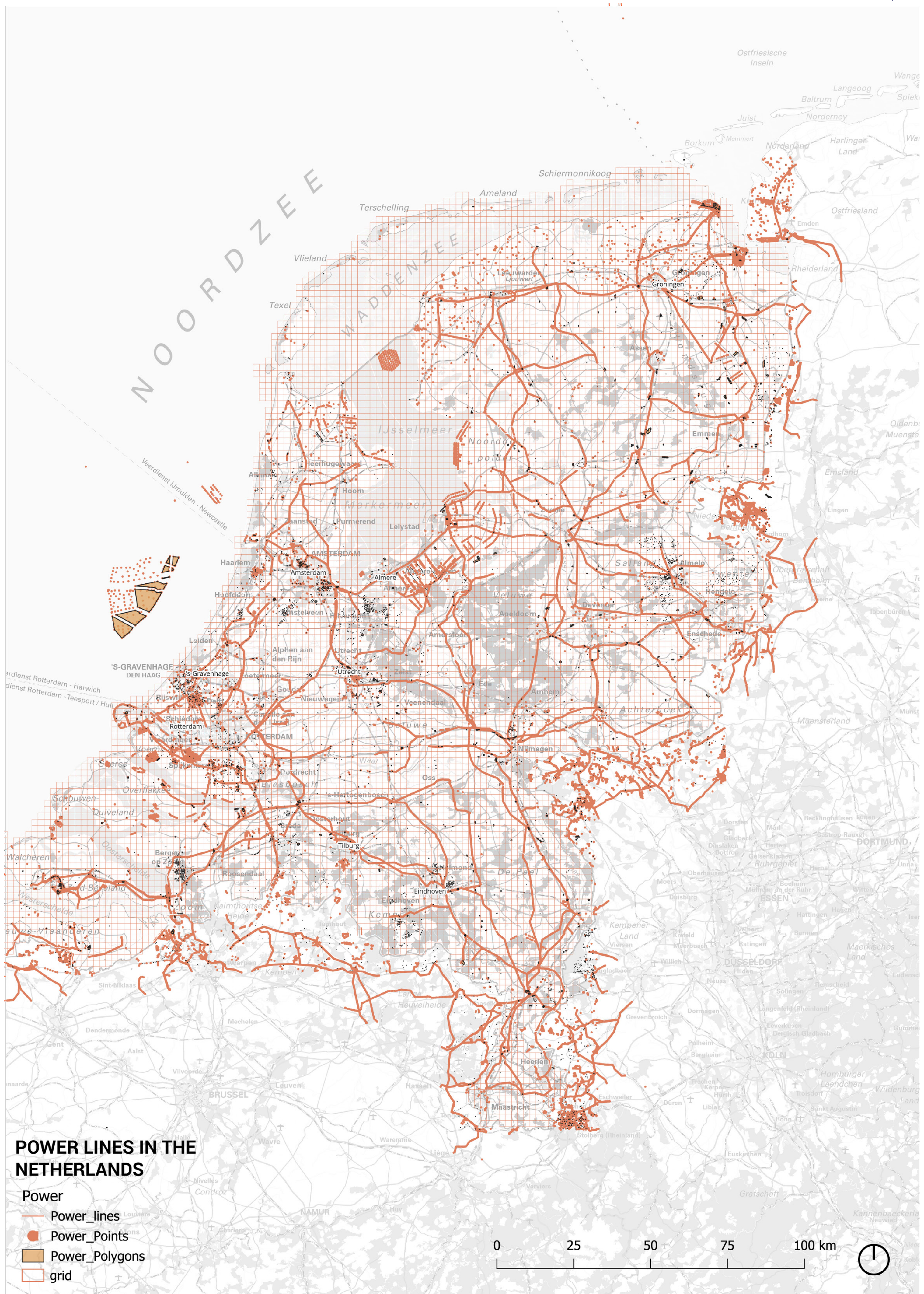
Synergies of the two visions



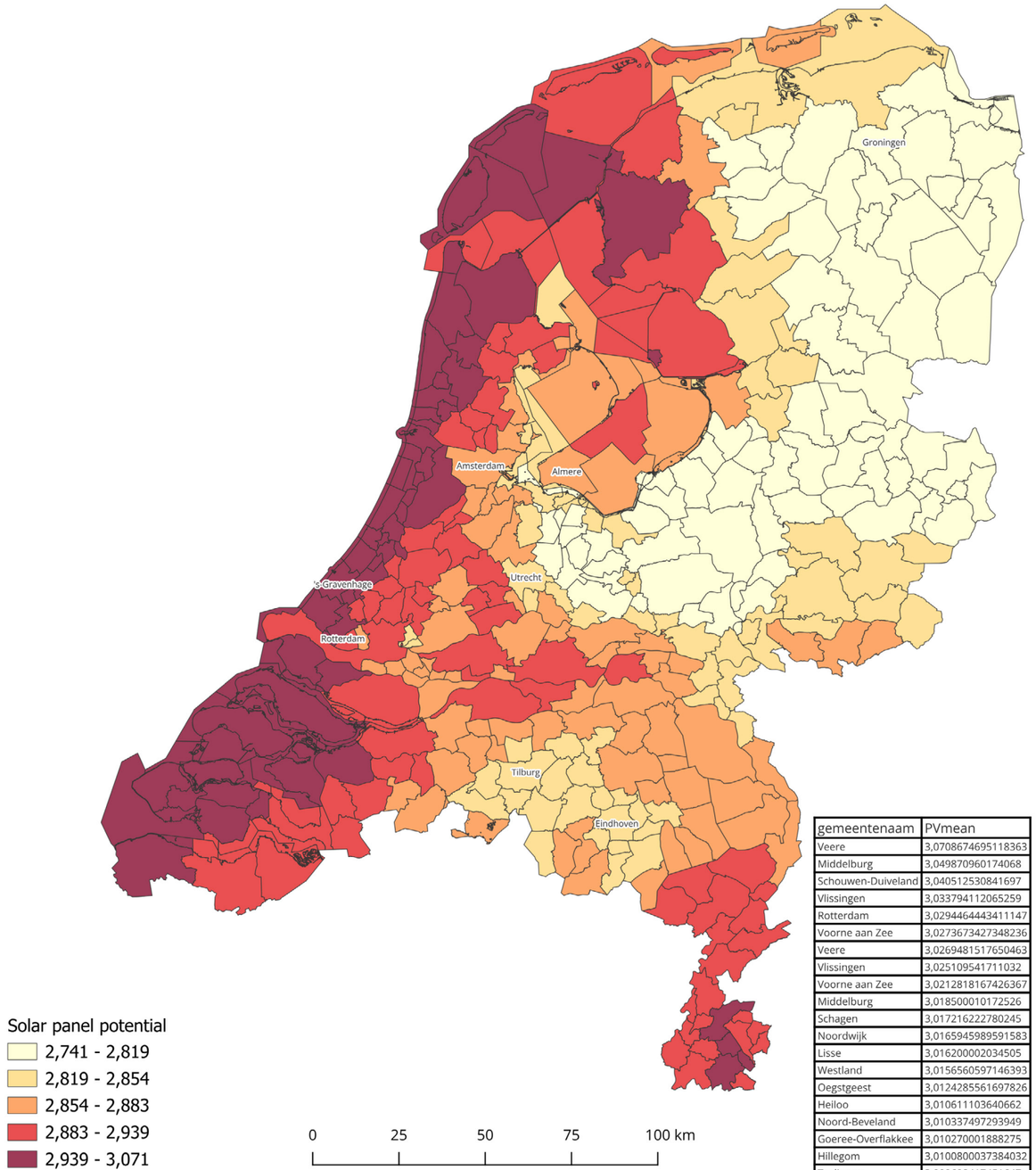




Appendix 5-Synergies and conflicts residents living near industrial sites

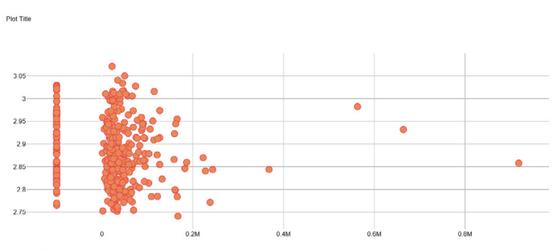


Appendix 6-Power lines in the Netherlands



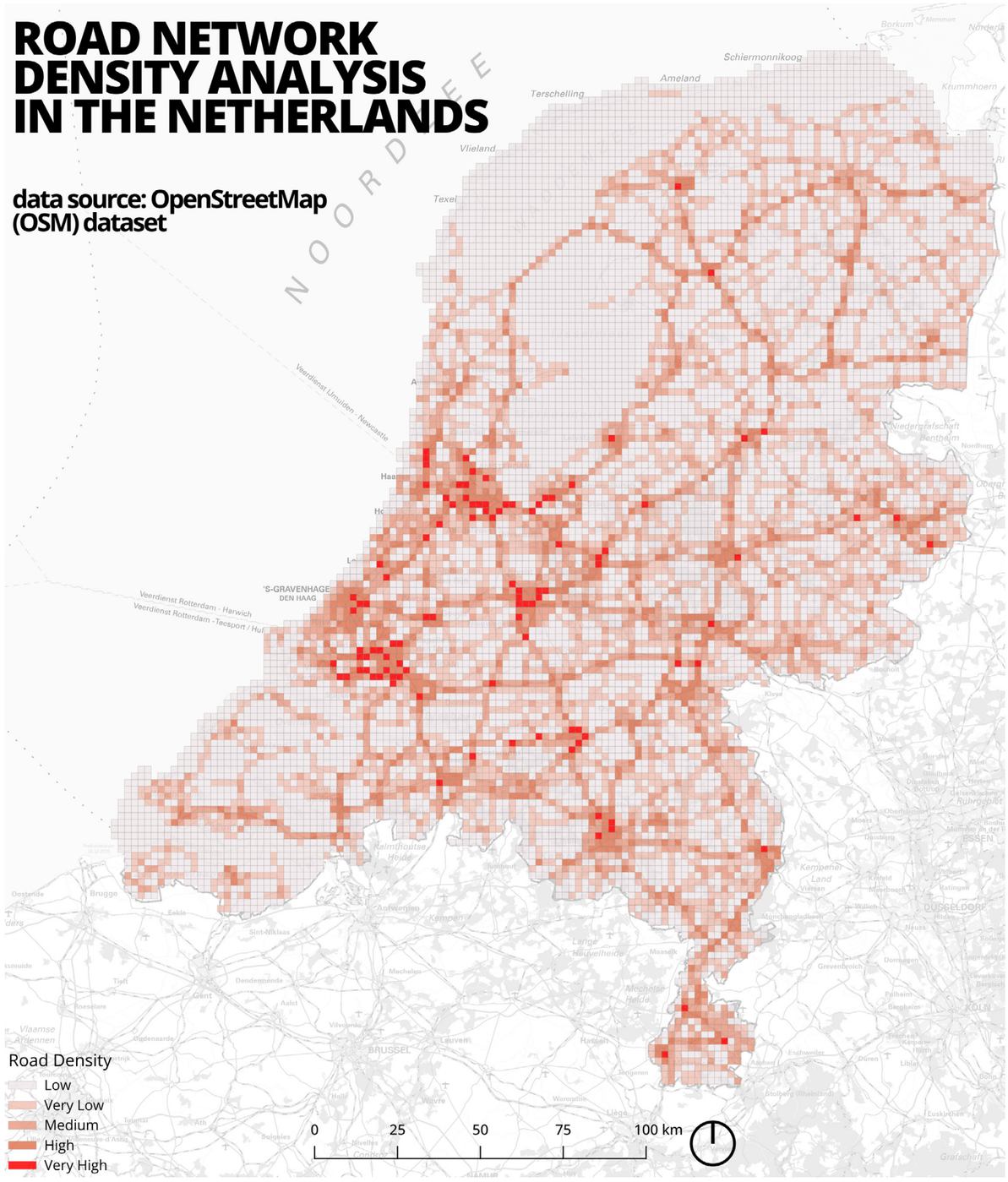
gemeentenaam	PVmean
Veere	3,0708674695118363
Middelburg	3,049870960174068
Schouwen-Duiveland	3,0405125308841697
Vlissingen	3,033794112065259
Rotterdam	3,0294464443411147
Voorne aan Zee	3,0273673427348236
Veere	3,0269481517650463
Vlissingen	3,025109541711032
Voorne aan Zee	3,0212818167426367
Middelburg	3,0185000101725526
Schagen	3,017216222780245
Noordwijk	3,0165945989591583
Lisse	3,016200002034505
Westland	3,0156560597146393
Oegstgeest	3,0124285561697826
Heiloo	3,010611103640662
Noord-Beveland	3,010337497293949
Goeree-Overflakkee	3,010270001888275
Hillegom	3,0100800037384032
Teylingen	3,009698417451647

Solar Panel Potental per municipality size (n. of inhabitants)

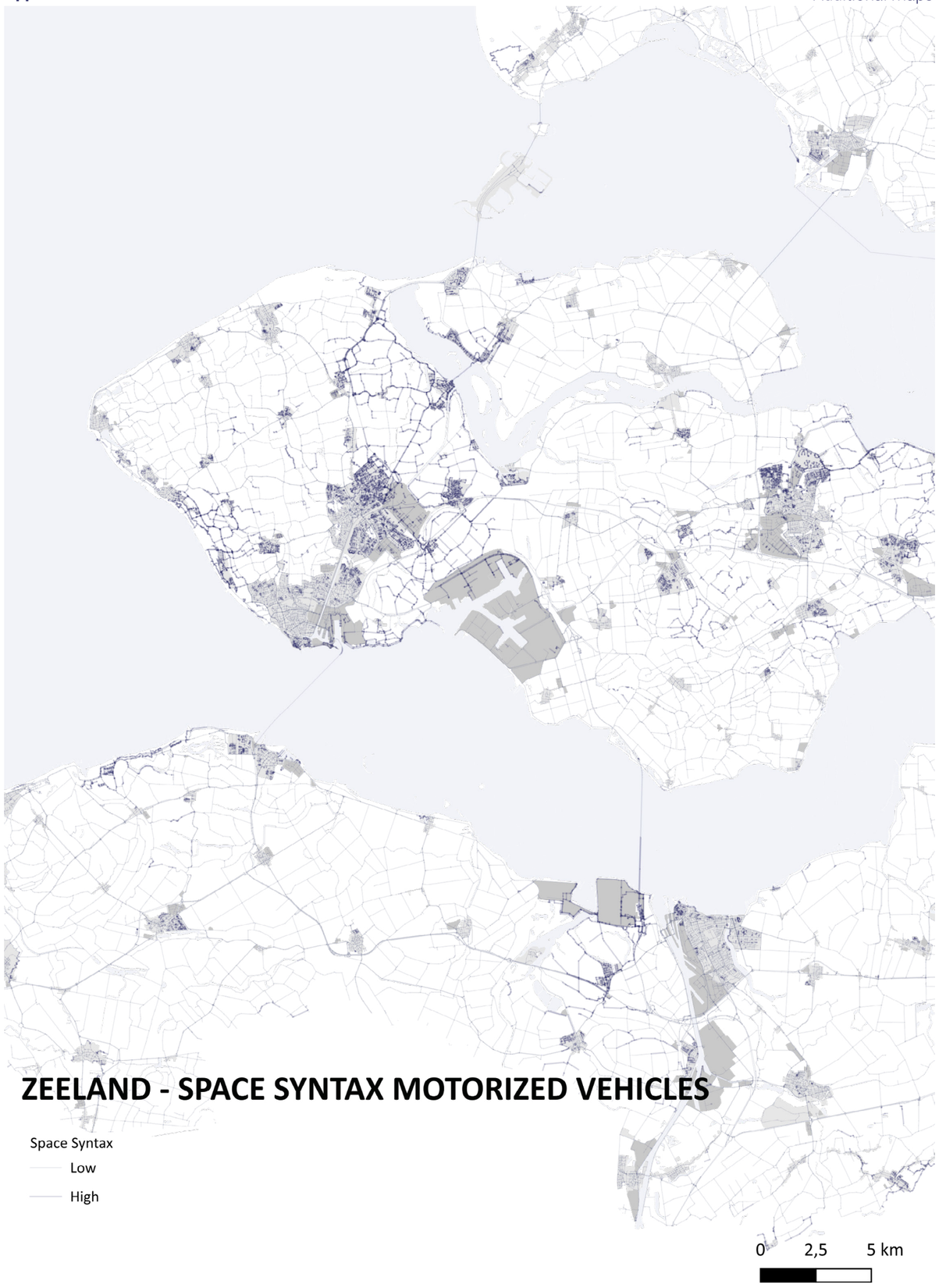


Appendix 7-Solar panel potential

Appendix 8-Wind potentials in the Netherlands



Appendix 9-Road network density analysis in the Netherlands



Appendix 10-Space syntax motorized vehicles

Complete text of interviews

Middelburg

Man, middle aged, living in Middelburg

-How is connectivity for you and what modes of transport do you use? What do you miss?

-Bad, I don't own a car and I only use public transport. I am dependent on NS. I regulary work in Etteleur and I don't use busses that much. The connection to Vlissingen is fine.

-If you could choose a place with better connectivity, where would that be?

Vlissingen

-If I could chose something to improve, it would be more trains. I don't visit villages within Zeeland, but I assume if I take the bus from the station it would be fine.

Young man (age: around 20 years old) – spoken in neighbourhood

-Where do you work and live?

-I work and live nearby.

-How do you get to work?

-I use my bike to get to work.

-Do you use public transport?

-Yes sometimes I use public transport. I study part-time in Rotterdam. I use the train to get there.

-What do you think about the public transport connection?

-It is not to bad. But the trains used to get cancelled a lot, but lately it has been less. The bus is really unreliable and often does not drive, so I have to take the bike or the car to get to the train station.

Older gentleman (age: 60+) - spoken on a square in a neighbourhood

-Do you live here?

-Yes, I do.

-How long have you been living here?

-I have been living in Zeeland for quite a while.

-What modes of transportation do you use?

-I mainly use the bike. I live in the city centre and I don't need a car when I live there, because everything is nearby. Also a car is very expensive. When the car doesn't drive it is a lot of money, about 3000 euros a year, and if the car does drive it is even more.

-Do you use public transport?

-No, I don't use public transport. I haven't used public transport in over 10 years. I enjoy cycling, it is good to get some exercise. I don't need the train, I don't need to go far away from Vlissingen.

-How do you feel about living here, in Vlissingen/ Zeeland?

-I have been living in the Netherlands for 54 years, I came here in 1972. I have lived everywhere, in Utrecht, in Rotterdam and in other places. I came here, because Vlissingen used be a beautiful, nice, little city. Now it is no longer beautiful, there are a lot of ugly buildings. Like this one, that is falling over.

-How do you feel about the industry that is close by?

-I don't mind the industry. I have worked for a long time in industry, throughout the entire country.

Two colleagues, a man (age: around 35 years old) and a women (age: 50+) – spoken on a parking lot

We started with asking if we were allowed to ask them some question and if they had a few minutes available for us. They said yes, but not to many question because they should be getting back to work.

-How do you get to work?

Women: I use the car to get to work.
Man: I use my bike to get to work.

-What do you think about public transport here in Zeeland?

Man: The public transport is really shitty, but the bike lanes are pretty good. I live in Vlissingen.
Women: And I live in Middelburg. The public transport is pretty bad, and it is not getting any better. If I want to take public transport to get to work, it takes me twice as long to get to work, because the bus connections are terrible.
Man: If you are depended on public transport to get somewhere it will be very difficult to get to that place. There are to little trains from ns. The busses take way too long to get somewhere. If you are lucky you will have two train per hour, but that is way to less. You would need at least four trains per hour.

-If public transport would be better, do you think people would be willing to not have a car?

Women: I find it difficult to say that if our public transport is better, that people would less likely to take the car.

Borssele

Man: There are also these new hubs signs throughout the city, I have no idea what they mean (see picture for hub).

How do you guys get to the university, how it the public transport there?

Anne-moon and Lotte: We take public transport. We don't even have to look at the NS-app before we leave our faculty. There is always a bus going and we don't have to wait too long.

Man: Exactly, waiting for 15 minutes is not that bad, but one bus that only drives ones every hour is just not enough. To much waiting time for public transport does not help the connectivity. My wife works in Goes. She goes by car, because Goes is to far away with just public transport. The bus and the train are not connected to each other, so if she would take public transport her journey would be three times as long, compared to going by car.

Man, around 40

-How is connectivity for you?

-The trains are not great. I mostly move around by car. That is okay but it is long drives.

-What modes of transport do you use?

-Mostly car.

-How do you get to work?

-By car, I don't work near where I live.

-
If you could choose a place for better connections, where would it be?

-I miss a better train connection to larger cities, like Rotterdam and Amsterdam.

-Do you know what kind of energy is produced here? Do you produce any yourself?

-Nuclear energy, solar energy, wind energy.

Terneuzen

-Do you see the energy facilities, and if so, which ones?

-I see a lot of wind turbines.

-Do you experience any disturbance from industry?

-No

Older couple (age: 70+), the man mainly spoke – at the edge of the village (near the church)

-How long have you lived here?

-We have lived here our entire lives. We don't know anything else. We grew up here and have been living in this village for almost 80 years. And we have been living in this house for about 35 years.

-What do you think about the public transport here?

-We can still drive a car, so we don't need the bus.

-How do you feel about the nuclear power plant in Borssele?

-The power plant does not bother us. More can come here I don't really mind, as long as they adhere to the conditions for the power plant here in Borssele.

-Do you think people in this village are against extra nuclear power plants?

-No I don't think so. We don't really care about what they do, at least the original inhabitants of this village. The new people coming here, I don't know how they feel about it.

Side note: When walking through the village we noticed that people had flyers in their windows which where against cooling towers for nuclear energy. So we assume that the village is divided on this topic.

A gentleman (age: 50+) – spoken in the neighbourhood, next to a construction site for dwellings

-What do you think about the public transport in Zeeland?

-It is complete poverty here. There is no connection, no nothing. What is there is just a very sad connection. And you can see that the older population is growing here and that there are less and less young people. The youth will go away for their studies, cause there is not a good university here, and then stay where they studied and look for a job. They get their diploma there and stay there to look for work. They will not be coming back here.

-How do you feel about the sustainable energy production in Zeeland?

Alex Wilson

A Region, Not a Resource: Ensuring a Just and Balanced Energy Transition

Who We Are

Borsele Tot De Kern is a citizen initiative founded in 2022 in direct response to national plans to expand nuclear power infrastructure at the existing site in Borssele. We represent over 400 registered supporters existing within the municipality of Borsele and the province of Zeeland. What unites us is not a single ideological position on nuclear energy, but a shared commitment to protecting the land, health, safety, and quality of life of the people who live here, and of those who will inherit this region (Borsele Tot De kern, n.d.). From that foundation, we have expanded our concern beyond the question of nuclear power to encompass all large-scale energy infrastructure that threatens Zeeland's environment, landscape, and communities (Borsele Tot De Kern, 2024). We speak not as an institutional partner, but as a social actor embedded in this region. We operate through public pressure, civic dialogue and media engagement.

Where We Stand on the Vision

We welcome the proposed spatial vision for Zeeland as it reflects a serious commitment to an endogenous sustainable energy transition, multimodal mobility, and the inclusion of residents in decision-making processes. Our spatial priorities are illustrated in Figure 1, which maps the areas where we consider energy-transition infrastructure appropriate and aligned with the proposed vision, as well as the areas we want to protect and where we aim to restrict further expansion. These are the conditions under which communities like ours can remain liveable, coherent, and resilient. In the following sections, we elaborate on our position.

We are particularly encouraged by the vision's offshore wind expansion, that includes the extension of the Borssele wind park at sea (figure 1). This is exactly the kind of development we can support. Offshore wind turbines are less constrained by noise limits, visual obstruction, space limitations, and objections from nearby neighbours compared to onshore wind turbines (Kaldellis et al., 2016). It generates clean energy at a large scale without consuming the landscape and without putting further pressure onto communities that are already dealing with large industrial presence. We would like offshore wind expansion to not be treated as one option among many, but as the primary spatial implication for Zeeland's energy future.

We are also genuinely supportive of the vision's openness to emerging and innovative energy technologies, like tidal energy that is integrated into existing sluices, kinetic energy harvested from road infrastructure, and solar panels embedded in the built environment. These approaches reflect a different spatial implication, one that works with the existing infrastructure of the region, as seen in figure 1, rather than imposing new and extended industrial fields. We want residents to feel connected to the systems that power their lives, and integrated technologies make that connection possible in a way that large scale industrial installations never can.
We find the vision's inclusion of mobility hubs that integrate energy generation promising. Connecting smaller villages to urban centres through shared mobility, like bicycles, scooters, electric vehicles, while integrating energy infrastructure within the everyday urban fabric is a way of transition that does not treat the region as a sacrifice and extraction zone for national energy targets, but as a place where transition can be experienced as an improvement in daily life. This is a form of energy democracy: it pairs the renewable energy transition with efforts to democratize the production and management of the energy resources, that includes social ownership of energy infrastructure, decentralization of energy systems, and expansion of public participation in energy-related policymaking (Stephens, 2019).

We support the planned hydrogen facilities and consider them important to a successful sustainable energy transition, alongside other generation methods (Otte, 2024). We advise expanding their role, as seen in figure 1, so that hydrogen infrastructure works in collaboration with the broader sustainable energy plans for the region. Hydrogen development should remain within the industrial area and not expand into surrounding communities or nature.

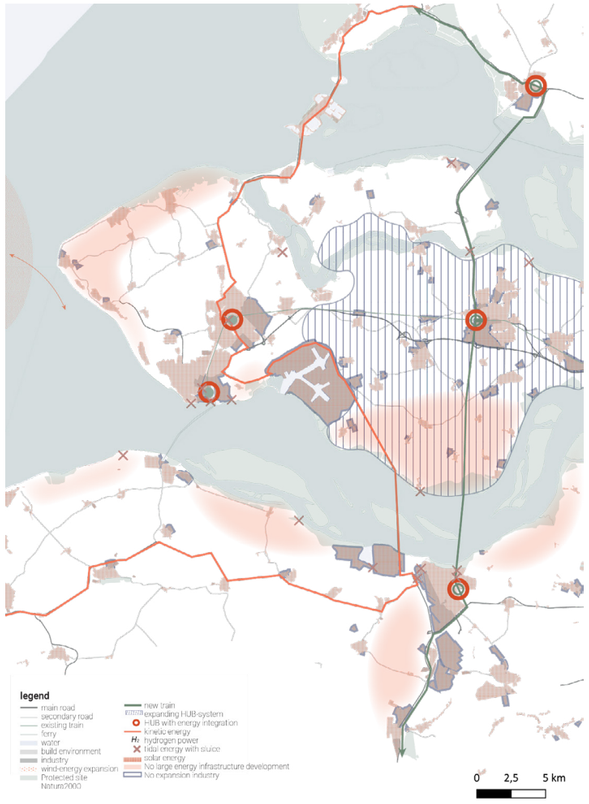


Figure 1 Borsele tot de Kern's Spatial Priorities (own work, data: PDOK, OSM)

Where We Raise Concerns

Our support for the vision's direction is real, but it comes with conditions that we consider non-negotiable.
We remain concerned about the expansion of energy infrastructure on land and its national extraction that is still present, and particularly about plans that would extend industrial energy corridors into areas near residential areas, natural landscapes, and the coastline. The proposed connection between energy infrastructure at Vlissingen and the industrial zone at Vlissingen-Oost shows this concern precisely. As shown in figure 2. this corridor would dominate the shoreline, affecting the beaches that serve as public recreational space, historical forts, and the small village of Ritthem that lies right in this energy corridor. The residents of Ritthem, like the residents of Sluiskil who already bear the burden of industrial proximity are people whose quality of life is directly affected by these plans. Adding wind parks or cabling infrastructure to areas already saturated with industrial impact is not equitable spatial planning, it is the further concentration of putting a burden on communities that have already given enough.

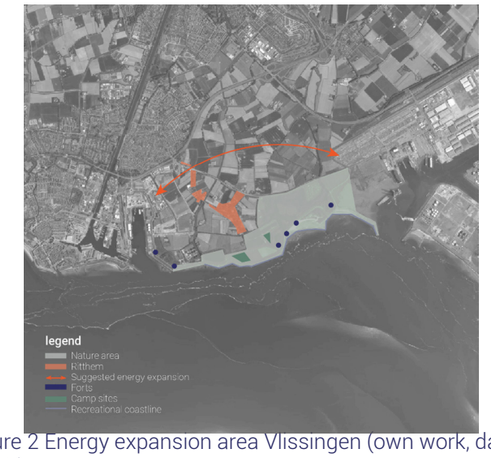


Figure 2 Energy expansion area Vlissingen (own work, data: PDOK)

This is a matter of distributional justice. Zeeland should not function as the energy production zone while its residents bear a disproportionate share of visual disruption, landscape fragmentation, and environmental strain. Renewable energy can have negative impacts in a habitat or a community, like bird mortalities, noise and visual impact caused by wind turbines, should not be ignored (Dai et al., 2015). A balanced energy transition means that no single region, and no single community within that region, should absorb more than its fair proportion of the national energy infrastructure. The vision must be more explicit about this principle and build it into the spatial criteria that govern where new infrastructure can and cannot be located.
Citizen participation cannot be a procedural formality in the decision making of the vision of Zeeland's energy transition. It must be structural, early, and binding in meaningful ways. The vision's stated commitment to resident involvement in decision-making is welcome. We will hold it to that commitment.

Our Position

We do not oppose the core of the vision of Zeeland to the energy transition. We welcome the continued expansion of offshore wind at sea, the development of hydrogen infrastructure within existing industrial zones, the integration of energy generation into mobility hubs and the built environment, and the exploration of innovative technologies such as tidal and kinetic energy, as seen in figure 3. We support energy production methods that work with existing infrastructure rather than against it. These are directions we are prepared to advocate for alongside other stakeholders.

As illustrated in figure 3, we will not accept any spatial plan that extends industrial energy infrastructure into residential areas, coastal zones, or landscapes already bearing a disproportionate industrial burden, which includes the corridor between Vlissingen and Vlissingen-Oost, the area surrounding Ritthem and Sluiskil. We will not support any vision that treats Zeeland as a national sacrifice zone. These are not negotiating positions.

The vision for Zeeland has the potential to be genuinely transformative, since it demonstrates that transition and justice can be planned together. We remain engaged, critical, and committed to ensuring that the residents of this region are not just spectators within that process.

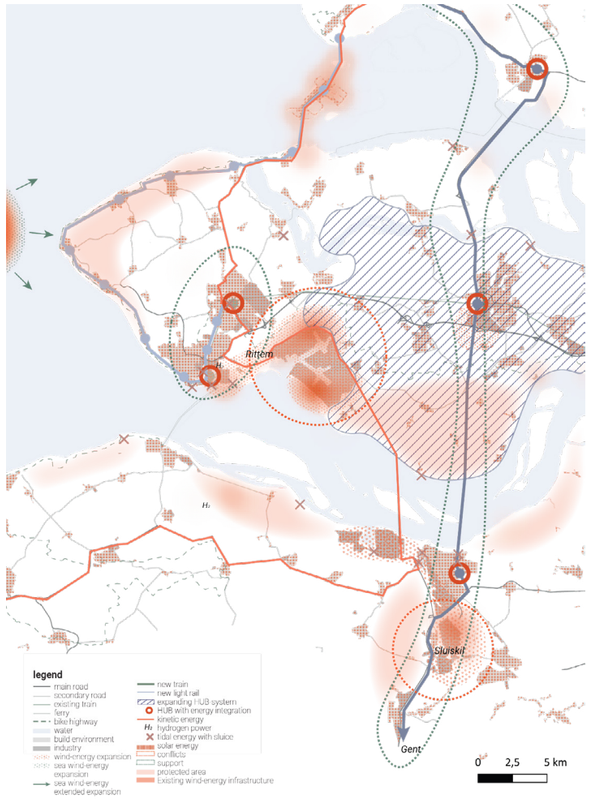


Figure 3 Position on the proposed vision of Zeeland (own work, data: PDOK, OSM)

Alex Wilson

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This position paper was written by Alex Wilson. AI tools were used for grammar checking and light editing. All arguments, positions, and judgements expressed are the author's own.

Wesley Thomas

Living near industry
A Resident Perspective on Spatial Justice and the Energy Transition in Zeeland

Introduction

Our group as residents living near industrial sites in Zeeland plays a very important role in the region's energy transition. Our proximity to industrial sites brings issues such as, noise pollution, odor disturbance and safety risks. That's why we as a community are at the forefront of experiencing the impact of potential transformation in the industrial landscape.

The current communities vision envisions a future where the energy transition will enhance wellbeing by introducing renewable energy industries and improving mobility. This includes new train connections, mobility hubs, and new tram networks. Our position is positive about new mobilities. However, we question whether the interventions regarding new energy will bring visible improvements and bring spatial justice. To us, concerns about health, safety, and living conditions matter more than the energy transition. We are cautious about new energy industries, especially if it's located nearby, and would rather see a reduction of the current industrial activities.

Identifying the stakeholder

We are residents living in the immediate proximity of Zealand main industries, which are mostly concentrated in the municipalities of Vlissingen, Borsele, and Terneuzen and are part of the north sea port region. The industries in Zeeland include large-scale port infrastructure, energy production facilities, and a large petrochemical industry. The Sloegebied (Vlissingen–Borsele) is characterized by steel industry, energy generation, and logistics, while the Kanaalzone near Terneuzen is more dominated by heavy petrochemical production and port activities. Because of the close proximity to surrounding residential areas, the people living near these industries are directly exposed to both noise pollution and odor disturbance of these industries.

When looking at the demographic our communities are characterized by an ageing population and a relatively low share of highly educated residents. This reflects a broader regional trend in Zeeland of “brain drain.” This is when young and highly educated people leave a region to study or for better job opportunities.

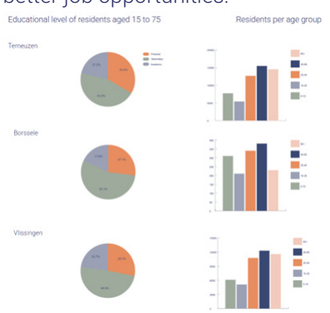


Figure 1Source: allecijfers.nl

Research indicates that people living near industrial sites have a larger chance of health related issues such as birth defects, childhood cancers, chronic respiratory and cardiovascular diseases. (Johnston & Cushing, 2020). People living near industrial sites are often poorer and face more stress, which makes these health risks even worse.

These health risks are especially likely in proximity of Petrochemical industries like the Sloesgebied (near Borsele) and Kanaalzone (near Tererneuze). Residents living near these areas have a higher risks of brain cancer, leukemia, and asthma hospitalizations due to emissions of toxins. (Brender et al. 2011) In Zeeland, neighborhoods near the Sloegebied and the Kanaalzone are there for the most vulnerable groups within our stakeholder group.

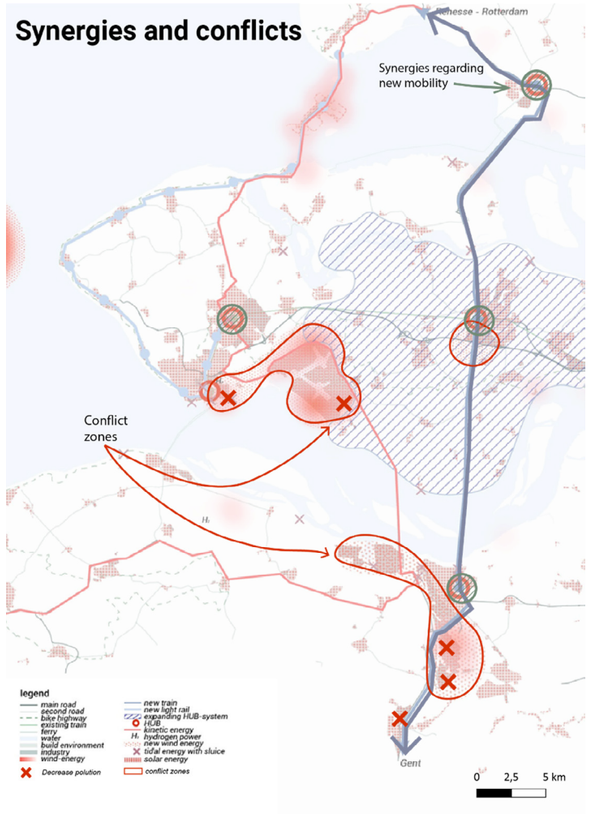
Furthermore, we also have a higher risk for acute exposures resulting from events such as flooding. Due to climate change and Zeeland’s vulnerable location, these risks can disproportionately affect our communities

Our concerns and expectations

We have several concerns regarding the current and future situation. Interviews and newspaper reports show that many of us feel our regional identity is under pressure as industrial areas expand. Limited mobility options and a strong dependence on cars contribute to a sense of isolation from the rest of the country. In addition, we worry about the noise and air pollution from the industries, along with health and safety risks because of that. We are also concerned about industrial expansion even if it's for renewable energy. We actively resist against new large-scale energy projects when they add to existing industrial burdens such as new wind energy parks or the plans for a second nuclear power plant.

From these concerns, we can articulate expectations for future urban development. We hope for Improved health conditions and better wellbeing, enhanced feeling of community, Improvement of mobility alternatives and Just and equal energy distribution and distribution of amenities.

In terms of the energy transition our stance is more cautious. Interviews indicate that energy transition are not a huge priority in our communities. The residents are generally skeptical against all types of industrial expansion even for renewable energy. We would only back new renewable energy expansions if it directly improves our living conditions and promotes social justice.



Our stance on the vision

The regional vision includes renewable energy expansion, mobility improvements, and mobility hubs connecting energy and transport systems. New renewable energy include tidal energy at existing sluices, clustered and expanded wind parks (Vlissingen–Oost, Goes), solar integration in the built environment, experimental kinetic energy along main roads, and hydrogen projects at existing sites. Mobility projects include a train route connecting Zeeland to Rotterdam and Ghent, a coastal light rail, expanded hubs, and large integrated hubs combining transport, energy, solar panels, and charging stations.

Mapping the vision against our wishes shows synergies in the new mobility alternatives: which are very beneficial for us. Making us less car dependent and better connected to the region and the rest of the Netherlands, which lowers the spatial inequality and bring a sense of spatial justice. However conflicts arise with the expansion of the renewable energy industries in already heavily burdened environments Tidal, kinetic, and solar projects are largely accepted because of the small spatial impact they have. However the expansion of wind clusters raise concerns about noise, visual impact, and further industrialization. Specifically the new clusters between Vlissingen and Vlissingen-Oost and the one in near Sluiskil.
The vision also does not propose a clear reduction in industrial activity and industrial pollution, which are our main wishes and a non-negotiables to improve our wellbeing and health.

Conclusion

We demand a spatial plan that not only improves mobility but also actively reduces industrial pressures near our homes. We will only support the energy transition if there is a measurable reduction of existing industrial impacts, no increase in local environmental burdens, and visible improvements in health, safety, and daily living conditions. Without these conditions, the communities vision reinforces existing spatial inequalities rather than resolving them.

Wesley Thomas

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Lotte Boerkamp

Stakeholder: local touristic business owners

The touristic sector is a particularly important part of the economy in Zeeland. Zeeland has around three million tourists who stay around nineteen million nights in the province. There are twenty-six-million-day tourists and the Zeeuwen partake in about thirty million recreational activities in their own province. All these people together spend around 1,8 billion euros in Zeeland (Nijland, 2023). One in eleven jobs in Zeeland is related to the leisure sector (HZ Kenniscentrum Kusttoerisme, 2025). Because of its importance in the economy of Zeeland, the local touristic business owner is one of the stakeholders that will be discussed for the vision.

Our hopes and wishes (those of the local touristic business owners of Zeeland) are represented in this paper. We discuss what we find important for the further development for our sector and our stance towards the community vision, see figure 1. Each local touristic business owners has different wishes and demands, the combined wishes and demands of our sector are voiced by Toeristisch Ondernemend Zeeland (TOZ). Our own main points are combined with some important topics selected from the TOZ to support our arguments for our position towards the vision.

Figure 1: Community vision

The main points that are important for the further development of the tourism industry are employment and economy, local businesses and their impact, boosting local business and enhancing the connection between small and medium enterprises, increasing our control over municipal policies and voicing our unique needs, benefits for both residents and visitors, respecting the natural environment and creating a connection with the Delta landscape, improving the accessibility of Zeeland & improving the image of Zeeland (ATLAS.ti) (Provincie Zeeland; Gemeenten; Toeristisch Ondernemend Zeeland; Toeristische Uitvoeringsalliantie, 2019) (Provincie Zeeland; de Zeeuwse gemeenten; Impuls Zeeland; HZ Kenniscentrum Kusttoerisme; Toeristisch Ondermend Zeeland, 2022) (Campus Zeeland, sd) (Omroep Zeeland, 2020). By working on these topics, we believe that the tourism sector in Zeeland will be a sustainable and reliable sector in 2100.

Our main spatial interest lies in the cycling infrastructure, the nature/forest and recreational areas and the public transport. A few important cycling routes we want to point out are the LF Coast route (Nederland Fietsland, sd), the Bunker route, the Panorama route and Around the Veerse Lake (Zeeland.com, sd). The nature/forest and recreational areas along the coast are important for the tourism industry. Enhancement of the public transport is important for us. Currently 95% of the visitors of Zeeland arrive by car (Korteweg Maris, Bijl, IJben, & Tempelman, 2020). To make touristic locations more accessible and reduce hindrances that are created by the car and experienced by residents, expansion of public transport facilities in Zeeland is needed. Our spatial interests are shown in figure 2.

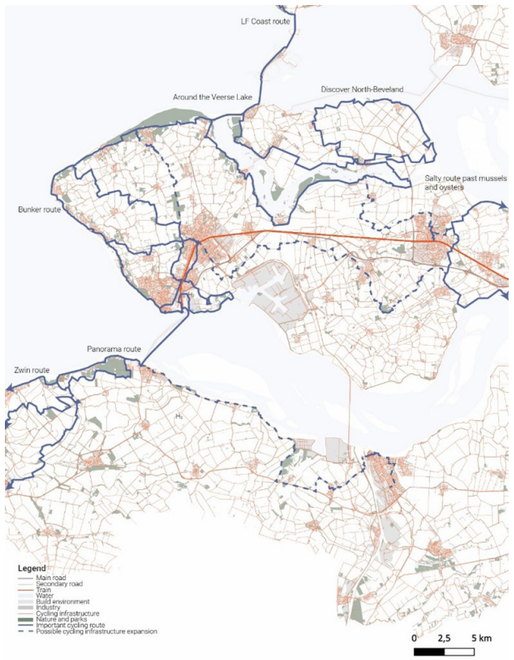

Figure 2: Our important spatial elements

There are certain aspects of the vision that we support, but also aspects that we oppose of. We like the enhancement of the public transport, especially the light rail along the coast. We think the improvement of the mental and physical well-being of both the tourist and the resident is important. We also like that the vision appeals to Zeeland's heritage with the endogenous Delta energy production and that local recreation offers are aligned with resident demand. But we think it is very troubling that there are no tourism related policies in the vision. We are against the expansion of the energy landscape, and we think that there is not enough focus on the cycling infrastructure.

We support the enhancement of public transport because the tourism sector is heavily affected by the bad accessibility of the province. A lot of tourists come by car, which creates traffic congestions, pollutions, and an overflow of parked cars in residential areas (Korteweg Maris, Bijl, IJben, & Tempelman, 2020). By enhancing the public transport touristic attractions become more accessible and it is possible to reach these places in a more sustainable way.

By building a light rail along the coast the wishes of the tourist and the resident are aligned. The main touristic location of Zeeland, the coast, is now more accessible and better connected with the bigger cities, Middelburg and Vlissingen. For residents, this light rail is positive, because it makes it easier to commute and reach other places in the region. We see a lot of potential to combine cycling infrastructure with the light rail and other forms of public transport, to encourage people to leave the car at home.

By switching from a fossil fuel-based resource to sustainable energy source the pollution will reduce, and the air quality will improve (Kelfkens, Ruyssenaars, & van der Ree, 2021). This improves the physical well-being of both residents and tourists. More and better public transport can also help with the improvement of mental and physical well-being. People who use the train are often more active, and people who commute by car have higher stress levels (den Hertog, Kruize, & Linde, 2018).

In the vision the Delta landscape of Zeeland is used for endogenous energy production. We are against the expansion the energy landscape. But this approach allows the energy production to be connected to Zeeland's Delta landscape and heritage. This might help the tourist to better understand the culture and history of Zeeland, which we find important (Vleuten, Erfgoed lokkertje van Zeeland, 2018).

We are not content with the fact that there are no clear policies related to the tourism industry. This gives us uncertainty for the future of our sector. For us it is important that we are included in future policy making processes.

The existing cycling infrastructure of Zeeland is already quite good, but we want to promote Zeeland as a cycling destination (Vleuten, Wielerevenement zoekt de wind op, 2017). For this to happen the cycling infrastructure needs to be expanded. It would be beneficial to have a cycling connection with the new public transport and to connect cities with the existing cycling routes.

The conflicts and synergies our wishes and demands have with the community vision are shown in figure 3.

Figure 3: Conflicts and synergies with community vision

Like we mentioned before there are certain aspects of the vision that we support, but also elements that we oppose of. We have a conditional support for the vision. We understand that the expansion of the energy landscape is inevitable, and that is why we will support this vision if we are included in the decision making process for tourism related policies and that there is something added to the vision to improve the image of Zeeland as a cycling destination.

Lotte Boerkamp

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Anne-Moon Toen

Position Paper: Youth in Zeeland and the Energy Transition

Introduction

Young people in Zeeland, ranging from practical students to young urban professionals between the ages of 15 and 30, represent a crucial stakeholder group in the region's future. As the next generation of workers and residents, we will play a key role in shaping Zeeland's economic resilience and social fabric. However, Zeeland has fewer young people compared to the rest of the Netherlands, and the region is facing a structural "brain drain," where higher-educated individuals move toward the Randstad. Statistics indicate that Zeeland has approximately 10% fewer highly educated residents than the national average, as well as significantly lower numbers of HBO and WO students. This is shown in figure 1, 2 and 3 (alle cijfers, 2026). This demographic trend poses a serious challenge for the region's long-term development, making it essential to understand and address the needs and perspectives of us young people.

Figure 1 – age groups
Figure 2 – number of students
Figure 3 – educational level

Position

Our positions can be divided in four main issues including, the energy transition, accessibility, housing, and quality of life. These challenges not only shape our daily experiences but also influence our decision to either stay in, or leave the region. As such, our perspective aligns closely with the broader vision of creating a future in which the energy transition contributes to wellbeing, accessibility, and social justice, rather than reinforcing existing inequalities.

Energy transition

One important aspect concerns the development of energy infrastructure. Wind farms, for example, have a negative impact on landscape quality (Wind Turbine Visibility And Impact On Visual Amenity, 2025). This is particularly relevant in a region like Zeeland, where open landscapes and coastal environments are an important part of the local identity. Therefore, it is better to cluster the windturbines in one place than to have them scattered around the province and impacting the whole landscape quality.

At the same time, there is a relatively positive attitude toward nuclear energy compared to older generations. We view nuclear energy as a necessary component in achieving climate goals (Akinci, 2025). However, this support is not unconditional. Our concerns remain about long-term issues such as nuclear waste management and the spatial impact of energy infrastructure. In conclusion, we are not opposed to the energy transition itself but rather advocate for solutions that balance environmental goals with quality of life and spatial considerations.

Mobility

Another major issue affecting our quality of life is the limited availability of public transport. Zeeland's mobility system is fragile, with only a single railway line connecting the region to the rest of the Netherlands. For example, the announcement that trains would not run for four months in 2029 led to protests among students, highlighting the extent to which we depend on this infrastructure (Wisse, 2024). In addition, the current rail network does not provide direct connections to key urban centres, nor does it effectively connect the different islands within Zeeland. This lack of accessibility limits educational, professional, and social opportunities, contributing to a sense of isolation. During meetings we have expressed a clear desire for improved connections, such as a railway linking Zeeland to both Ghent and Rotterdam, or alternative transport solutions like water taxis (Lelieveldt, 2025).

Housing

Housing affordability is another challenge that we, as starters in the housing market, not only in Zeeland, are facing. In recent years, house prices have increased significantly throughout the whole of the Netherlands, making it difficult for starters to obtain a house also in this province. Although the causes of this trend are complex, the growth of second-home ownership, particularly in tourist areas such as Renesse, plays a significant role in Zeeland. Properties are often sold at higher prices to non-local buyers, reducing the availability of affordable housing for permanent residents. At the same time, the social structure of these areas is changing, as fewer families live there year-round and local facilities are forced to scale down (Bollen, 2022). This dynamic not only affects housing accessibility but also undermines community cohesion, making Zeeland less attractive for us to settle down and start a family.

Overall quality of living

These issues are closely connected to broader concerns about quality of life in the region. Taking in consideration all the things mentioned before, we tend to leave Zeeland because of the overall feeling caused by bad mobility, a lack of facilities, limited educational opportunities, and a lack of social and cultural activities (Van Maarschalkerweerd, 2011). Together, these factors create an environment in which we feel to have limited opportunities for personal and professional development. As a result, many choose to relocate to more urbanized regions, further reinforcing the cycle of demographic decline. The map below, figure 4, shows the only railway and the few education points available in Zeeland. It becomes very clear that especially Terneuzen lacks both education and accessibility. The figure also shows that most young people live around the bigger cities or near industries and not near the coast, which is also because the accessibility is less and there are less facilities.

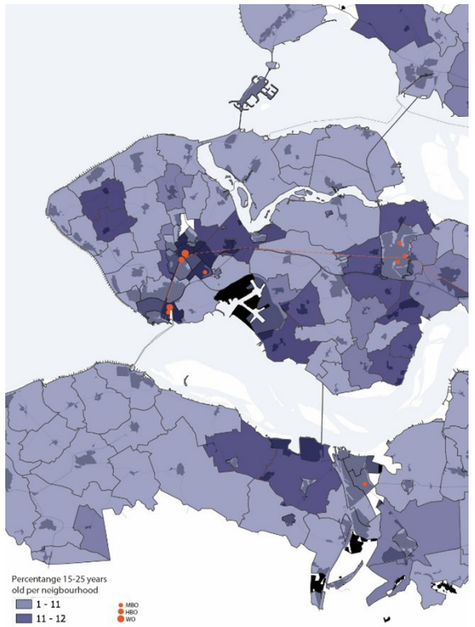

Figure 4 – spatial factors youth

View on the vision

What we really like about the vision is the clustering of the windmills. It is important that there are enough windmills to provide the energy needs of Zeeland. However, Zeeland should not become the battery of the Netherlands. There are also other suitable places for wind turbines. For example, the wind farm 'Borselle' on sea could be expanded, it does not affect the landscape quality.

Another great aspect is the addition of the train track connecting Gent to Rotterdam. As previously mentioned, this is something we really miss and would also make the lower island more accessible. The addition of the light rail could also make the coastal area more attractive. The connection to Vlissingen and Middelburg would make it possible for people to live near the coast and work or study in these bigger cities. The big HUBs would be a good way to connect both the energy and the mobility. Together with the smaller flex points this really connects the whole vision.

However, with enhancing the tourism sector it gets even more attractive to buy a second house in Zeeland which would make it even more difficult to buy a house as a starter. There should be better regulations around this topic to protect the residents from this.

We also think that there could be more emphasis on the addition of education and cultural activities. With the mobility being enhanced it makes it easier to live in Zeeland and do your activities elsewhere, but we would also like to have more options close by and having other people come to us.

This is concluded in figure 5. It shows the important points highlighted: public transport in all kinds and the wind energy. Furthermore, the nuclear energy that is already there is added, this can stay but does not need to expand. And some places for education and culture. There are no big issues with other proposed aspects of the vision other than some, not spatial, factors.

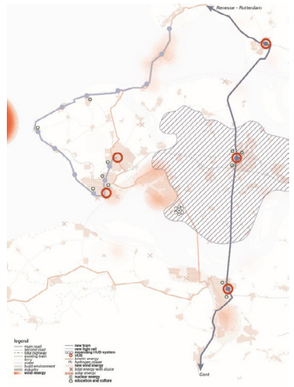

Figure 5 – Vision youth

Figure 6 – Original vision

Conclusion

Ultimately, we are not only affected by current challenges but are also a key to the region's future. Our perspectives reveal critical gaps between existing conditions and the desired future outlined in the vision. Addressing these gaps requires targeted interventions that improve accessibility, increase housing affordability, and create more opportunities for education and social engagement. At the same time, it is essential to actively involve young people in decision-making processes, ensuring that our needs and aspirations are reflected in policy development. By aligning the energy transition with the needs of its younger residents, the region has the potential to create a more sustainable, inclusive, and attractive future.

Anne-Moon Toen

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Maria Angeliki Karagkouni

A Just Transition for Whom? Industrial Workers in Zeeland's Energy Transition

1. Introduction: Position & Framing the Conflict

The ongoing energy transition in Zeeland is reshaping the region's industrial landscape through the transformation of energy infrastructures and production systems. Our group as industrial workers represent a key stakeholder, directly dependent on heavy industry and port-related activities. While this transition is promoted at national and European levels as a pathway toward sustainability, it generates significant tensions at the regional scale, where local economies and community stability are at stake.

In the societal arena of Zeeland, multiple stakeholders (including youth, residents living near industrial sites, environmental activists and local businesses) hold conflicting visions regarding industrial expansion, nuclear energy and tourism development. Positioned at the center of these tensions, we face the consequences of these claims. From this perspective, the current transition risks producing uneven spatial outcomes and must be reassessed through the lens of socio-environmental justice.

2. Stakeholder Role, Interests & Stakes

We constitute a central socio-economic group within Zeeland, directly sustaining the region's industrial production, port logistics and energy systems. Concentrated in areas such as Zeeuws-Vlaanderen and the Canal Zone, our livelihoods are closely tied to industries, including the chemical and manufacturing sectors, which form a significant share of regional employment (UWV, 2025; CBS, 2024).

Our concerns revolve around employment security, income stability and the long-term viability of regional industry. Our systemic values are centered around economic resilience, social stability and fair participation in decision-making processes. However, our influence within planning and policy-making remains limited, positioning us as a vulnerable stakeholder in the transition process.

What is at stake is not only employment, but the broader socio-spatial fabric of the region. The potential decline or relocation of industrial activities threatens to destabilize the entire local economy of Zeeland.

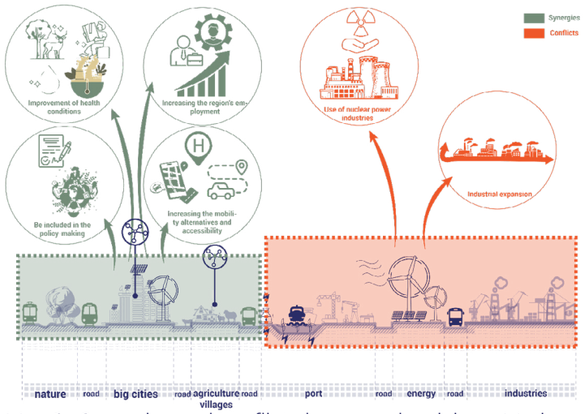
3. Defining the Contested Spatial Development

The contested aspect of the envisioned development lies in specific spatial reconfigurations of Zeeland's industrial and energy landscape as it can be seen in the Map 1. We agree with the rest of the stakeholders in the majority of the vision's proposals, such as:

1. Improvement of health conditions
2. Increasing the region's employment
3. Be included in the policy-making
4. Increasing the mobility alternatives and accessibility

However, there are some aspects that need to be reconsidered. This involves a shift toward new energy infrastructures and potentially also nuclear facilities alongside with the restructuring of existing heavy industry. Regional industry actors have already raised concerns about increasing pressure on existing industrial systems and the risk of economic decline if transitions are not carefully managed (Impuls Zeeland, 2025; Smart Delta Resources, 2024). At the same time, residents and environmental groups oppose further industrial expansion and nuclear development (something that would be beneficial for us, if new job positions are created).

As a result, overlapping spatial claims converge within the same territories, positioning us at the center of a conflict in regional development.

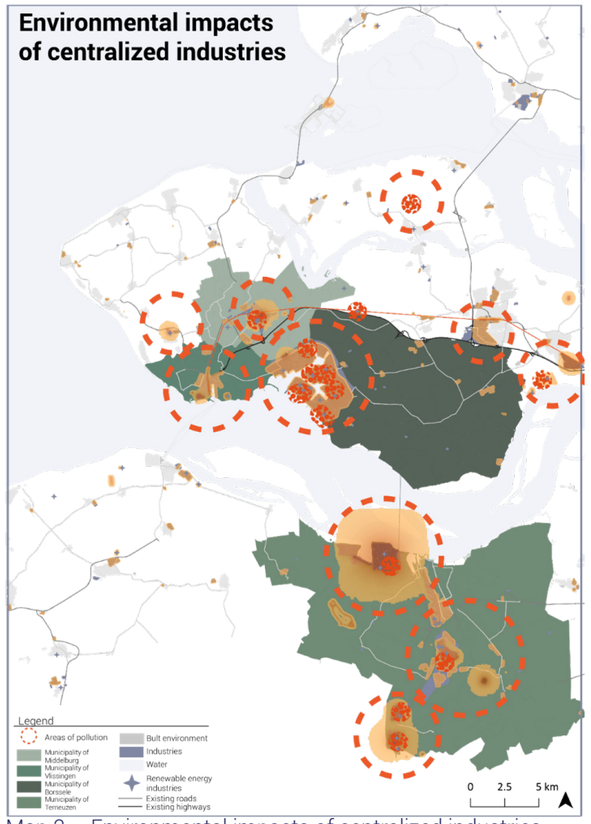


Map 1- Synergies and conflicts between the visions, Maria Angeliki Karagkouni, March 2026

4. Argumentation: Extent & Implications of the Position

4A. Spatial & Environmental Impacts

The energy transition in Zeeland produces uneven spatial impacts, concentrating environmental and infrastructural pressures within industrial regions such as Zeeuws-Vlaanderen. These areas already host dense industrial activities, leading to increased land-use competition and environmental stress. At the same time, industrial restructuring is creating spatial instability, as declining production and job losses leave parts of these landscapes underused or in transition (UWV, 2025). For us, this results in a concentration of both environmental burdens and economic risks as illustrated in Map 2 below. This reinforces an unequal spatial distribution of impacts and challenging the principles of a just transition (Moodie, 2025).



Map 2 – Environmental impacts of centralized industries, Maria Angeliki Karagkouni, March 2026

4B. Social & Inclusive Planning Impacts

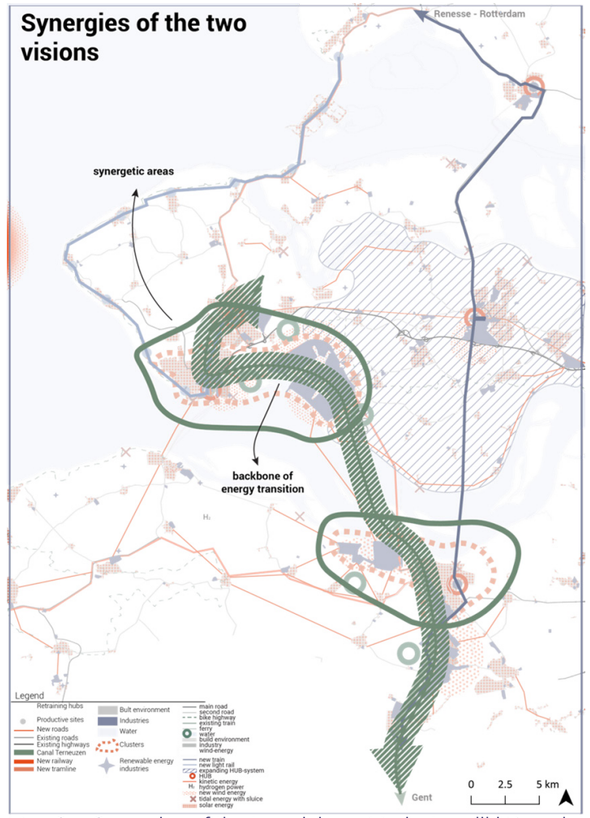
Despite being directly affected, we have limited influence over how the transition is implemented. Planning practices remain largely top-down, with national policy goals overriding lived experience. As a result, we are positioned as passive recipients rather than active participants in shaping our own future. As Arnstein (1969) would say: "participation without power redistribution risks becoming a tokenistic process rather than a mechanism for real change".

4C. Governance & Multi-scalar Implications

Furthermore, national and European policies prioritize rapid decarbonization, not always aligned with the industrial reality we experience. For us, this means that our livelihoods are increasingly shaped by decisions taken at higher levels. At the same time, rising energy costs are weakening the position of Zeeland's industry, with companies warning of declining demand, production cuts and potential relocation (UWV, 2025; Impuls Zeeland, 2025).

5. Preferred Development / Alternative Direction

From our perspective, the energy transition should not be rejected, but reoriented toward a more socially just and regionally grounded pathway. We believe that a gradual transition is needed, ensuring that existing industries are supported and not erased. Safeguarding jobs and preventing regional economic decline must be a central priority (UWV, 2025). This includes long-term accessible retraining programs, enabling us to transition into emerging sectors such as hydrogen.
We demand that we are equally involved in decision-making. Moreover, as map 3 represents, the new spatial strategy should distribute both the benefits and burdens of the transition more equitably, avoiding the concentration of negative environmental impacts in already vulnerable industrial regions.



Map 3 – Synergies of the two visions, Maria Angeliki Karagkouni, March 2026

Maria Angeliki Karagkouni

6. Spatial Implications & Representation

Our position yields specific spatial implications across Zeeland, particularly within key industrial and infrastructure zones. These are translated into the following spatial strategies:

1. Industrial Retention Zones
2. Industrial Transformation Corridors
3. Decentralized Energy Nodes
4. Spatial Redistribution of Impacts
5. Community–Industry Interface Zones
6. Reskilling & Transition Hubs
7. Strengthened Accessibility Networks

The summarized vision can be seen in Map 3.

Map 4 - Vision of industrial workers, Maria Angeliki Karagkouni, March 2026

7. Conclusion: Position in the Deliberative Arena

In the context of the societal arena in Zeeland, we occupy a critical yet vulnerable position within the energy transition. While acknowledging the necessity of environmental transformation, we cannot support a development that is not characterized by socio-environmental justice for us. Our position calls for a rebalanced approach, where our voice is being heard and our demands fulfilled.

Within the deliberative arena, this translates into a conditional stance: we support the transition only if it is implemented through socially just, place-sensitive and inclusive strategies. Without such adjustments, the current vision risks undermining its democracy, which depends on its ability to be justified to those most affected (Lafont, 2015).

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