From rust to revival

Urban revitalisation in the context of maritime industrial heritage complexes

Figure 1. Maritime industrial heritage and the surrounding urban districts (own work, 2024)

This research paper explores spatial strategies for the revitalisation of industrial heritage sites, focusing on the transformation of the Nedstaal steel factory in Alblasserdam, which has been left vacant. The paper employs a literature review to examine the potential urban revitalisation strategies for maritime industrial heritage. Subsequently, a case study analysis is conducted to investigate the applicability of specific strategies for the revitalisation of the Nedstaal industrial complex. The outcome of this study is a toolkit that presents a range of strategies for implementing the various spatial guidelines.

Keywords: Maritime industrial heritage, urban regeneration, revitalisation, spatial guidelines

Research for design
Revitalizing maritime heritage
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1. Introduction

The cities around the area of De Waterdriehoek have been shaped by a combination of urban development, ecological forces and the placement maritime industry. From the beginning of the twentieth century, these cities showed the ability to adapt to evolving environmental, economical and industrial demands (Rutte & Abrahamse, 2017). Specifically the area along the river Noord, including the city Alblasserdam has undergone a transformation driven by both peat reclamation efforts and modern industrialisation (Den Boer, 2021). Settlements were initially built around these reclaimed peatlands and waterways, because of economical advantages. Industrial complexes were developed next to these settlements, including factories and shipyards, because of their proximate location to the existing labour market and infrastructure (Douet, 2012).

However, the closure of industrial facilities such as the Nedstaal steel factory in Alblasserdam has resulted in the underutilisation of portions of these industrial complexes. In addition, the European Union's dedication to sustainable urbanisation, with objectives such as "No net land take by 2050", has intensified the imperative on municipalities to densify existing urban zones rather than expand into greenfield locations (European Environment Agency, 2023). This gives rise to considerable challenges for towns like Alblasserdam, where former industrial complexes have the potential for urban revitalisation.

The European Union's push towards sustainable urbanization in combination with the closure of industrial complexes like the Nedstaal steel factory underscore the pressing need for strategies for urban revitalisation of industrial sites. While municipalities struggle with densifying urban zones and repurposing industrial complexes that are underutilized, traditional urban planning approaches prove insufficient addressing the complexities of contemporary urban industrial heritage transformation (Oevermann and Mieg 2014, Sun & Chen, 2021).

In contemporary academic literature, a distinction has been made between traditional urban planning and planning for urban revitalisation (Preite 2012, Alpopi, 2013). While traditional urban planning is characterised by a top-down model with a hierarchical decision-making process, intended to produce an overarching plan, urban revitalisation is characterised by a less linear process. In urban revitalisation, the final plan is often formulated after the transformation process has already started. In the majority of transformational cases, individual projects are driven by a vague long-term vision, which often serves as a framework for the programme, incorporating less rigid guidelines (Kungzmann, 2004).

According to Preite (2012), in the context of urban transformation cases, there are two interventions that facilitate the success of the revitalisation of industrial urban areas. The first one being the initiation of a flagship project: A high-profile, large-scale initiative which serves as a catalyst for a multiplier effect, potentially stimulating the development of additional projects that also repurpose industrial heritage, as they provide a visible sign of change and investment. It is considered to be an efficient and rapid method of physically transforming derelict and neglected parts of the city (Loftman and Nevin, 1995).
But while the success of urban revitalisation, often realised with the absence of a strict urban plan, is facilitated by a flagship project, Preite states that it is equally true

that the success has been facilitated by interventions that convert free areas for new use as public spaces. According to Preite, the true catalyst for urban revitalisation is the appropriation of these free spaces by the local community. He stresses that urban revitalisation begins from the redesign of the spaces, instead of the redesign of its solid volumes.

Besides the existing framework of the utilisation of flagship projects and the transformation of free spaces as catalysts for industrial urban revitalisation, there is a gap in the implementation of these design strategies to achieve desired outcomes, because of the lack of in-depth specific case study analyses (Zhnag & Ren, 2024).

The objective of this study is to contribute to the evolving discourse on the urban revitalisation of industrial heritage. This contribution will be twofold: Firstly, the current framework is to be broadened (the horizontal axis in figure 2), with the aim of researching additional strategies that could be used for urban revitalisation. The literature review will be the basis for this second objective.

Secondly, the study will seek to deepen the knowledge on these strategies (the vertical axis in figure 2) by researching methods on how to achieve them, and which strategies could be useful for the revitalisation of Nedstaal. The second section will be performed by a case study analysis that continues on the literature review.

In order to develop the case study analysis, four projects were selected for comparison with the area of the Nedstaal complex: The Meelfabriek (Leiden), Nordhavn (Copenhagen), the Kabeldistrict (Delft) and Willemsoord (Den Helder). The selection of these cases is based on three different characteristics: The presence of a water network along the building, the former presence of an industrial function and the proximity to a neighboring city. Moreover, the selected projects exhibit a variation in scale, thereby incorporating the broadest possible range of contexts. More extensive background information on the case studies can be found in the appendix.

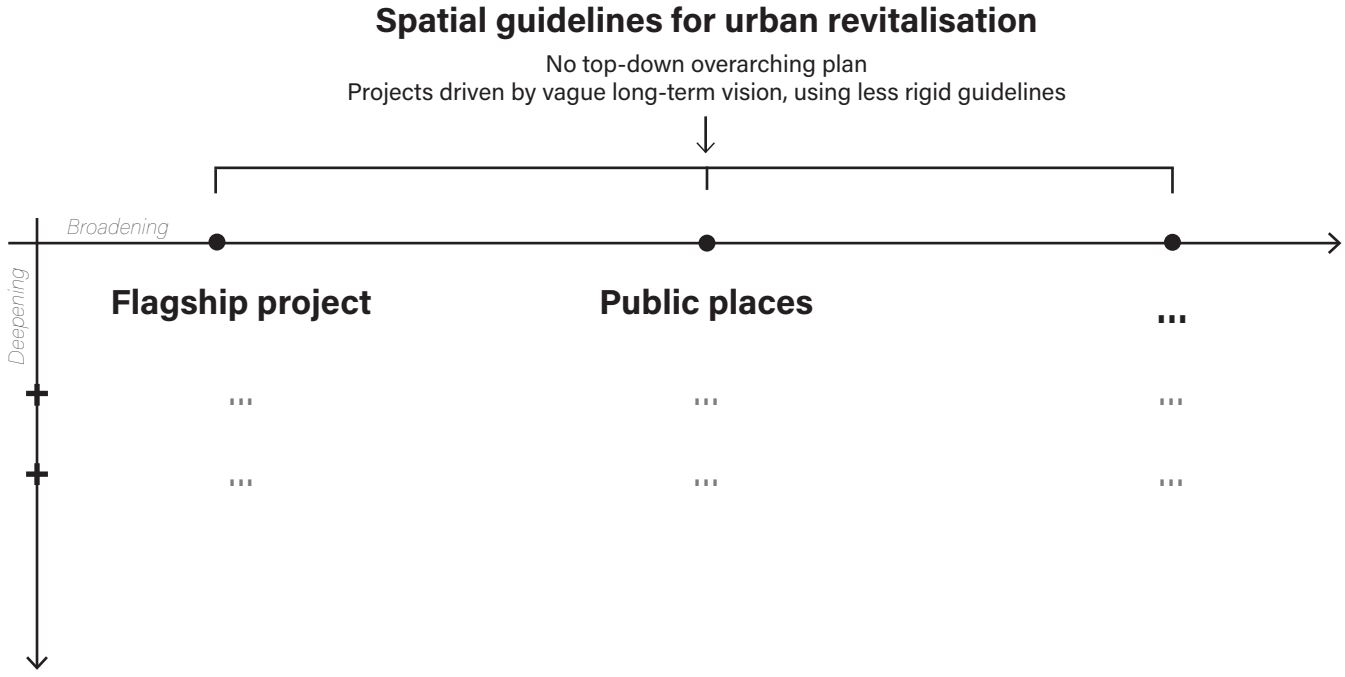


Figure 2. Framework and its upcoming additions (own work, 2025)

2. Revitalisation strategies

Different order
As previously stated, a distinction has been made in the literature between traditional urban planning and planning for urban revitalisation (Preite 2012, Kungzman 2004). One thing most projects within urban revitalisation have in common is the fact that the order of development is reversed: The projects are developed prior to the formulation of the urban plans in greater detail (Preite, 2012). Instead, they are guided by less rigid spatial strategies. In the following section, additional spatial strategies that can guide this reverse urban revitalisation will be explored in more detail.

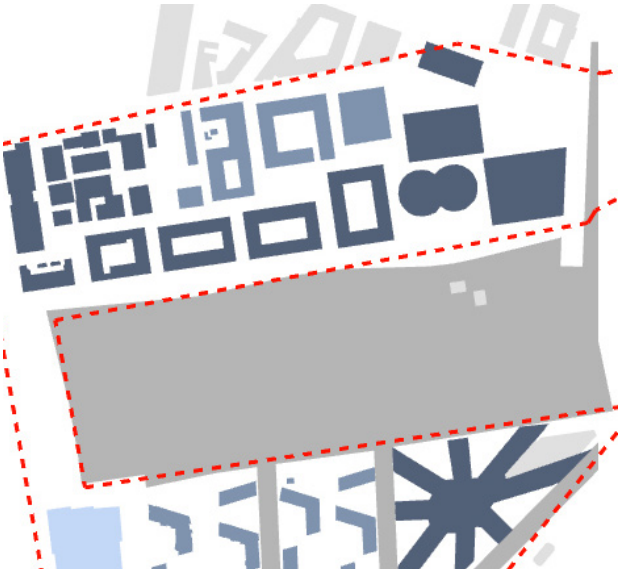
Phased development
The reversal of traditional planning order in urban revitalisation connects directly to phased development strategies, as seen in the Nordhavn project. An analysis of the Nordhavn case study reveals that the developed area is part of a much larger industrial zone that is yet to be revitalised as part of a unified revitalisation plan scheduled for completion in 2050, in which the current development is considered to be only in its initial phase (illustrated in figure 3). Each subsequent phase is being informed by the previous phase and current demands of the market and society (Cobe, 2020).

The capacity for future decision-making in situations that cannot be foreseen in Nordhavn lies in the flexible grid. This will provide space for multiple mixed functions and can adapt to changes over time. The scale of operation is diversified, ranging from extra-large (a combination of districts), to large (local plans and building structures), and to medium (the design of streets). The 'extra large' scale is developed into a set of principles, used as a broad strategic vision, while some of the medium scale parts of this vision are further developed in detail (Cobenotes, 2023).
In a similar case, the Kabeldistrict in Delft has not yet finalised its zoning plan. The future plan is being developed through the concept of 'organic urbanism', and it is anticipated that the area will gradually transform into a district over the course of approximately fifteen years (Amvest & Kondor Wessels vastgoed, 2022).

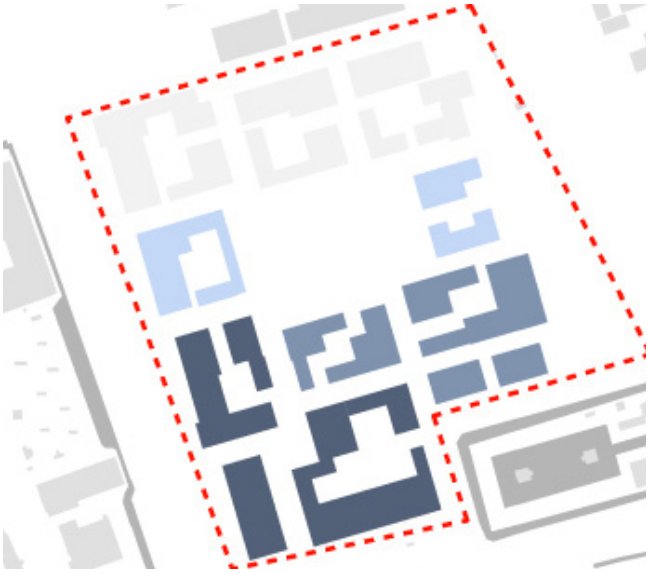
In contrast to the earlier examples, the redevelopment of the Meelfabriek was completed within a period of three years, commencing with the initiation of construction. (Studio Akkerhuis Architects, 2023). The underlying motivation for this phased approach was to stimulate further investment and allow for adjustments based on emerging needs and feedback (Akkerhuis, 2015).

In considering the scale of the Nedstaal industrial complex, which shares similarities with the Nordhavn and the Kabeldistrict cases, it is rational to implement a similar strategy of phased development, extending over a longer time period. In this approach, each phase is informed by both the previous phase and the contemporary demands of the market. This phased development can be guided by an outline plan, thereby ensuring flexibility while still maintaining certain spatial guidelines.

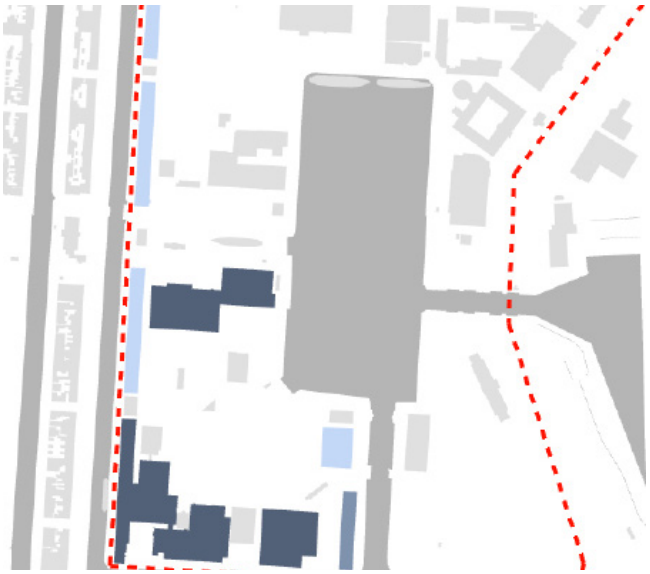
Urban connectivity
As previously stated, the urban revitalisation of industrial heritage sites is often characterised by a phased development due to the lack of a final urban plan. The analysis of the cases, however, revealed similarities in the first phase of development.
In all cases, with the exception of the Meelfabriek, redevelopment began with a focus on connecting the area to the existing ur-



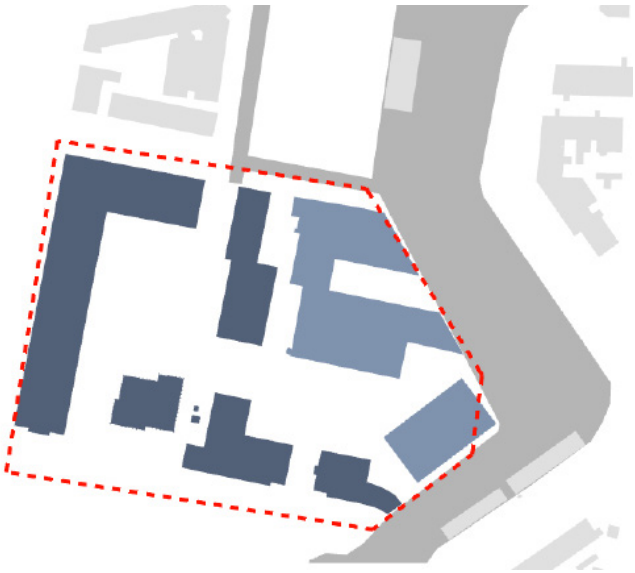
1. Nordhavn, Copenhagen



2. Kabeldistrict, Delft



3. Willemsoord, Den Helder



4. Meelfabriek, Leiden

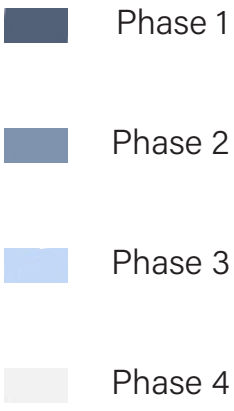
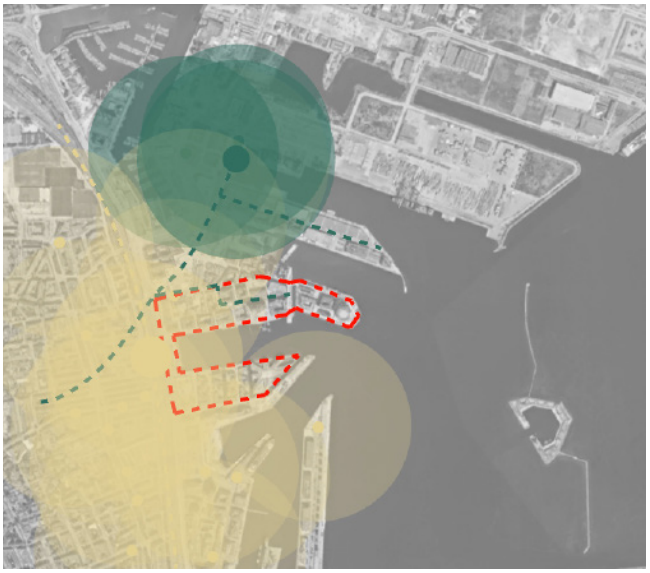


Figure 3. Case study analysis, phased development (Google maps, 2025. Elaborated by author)

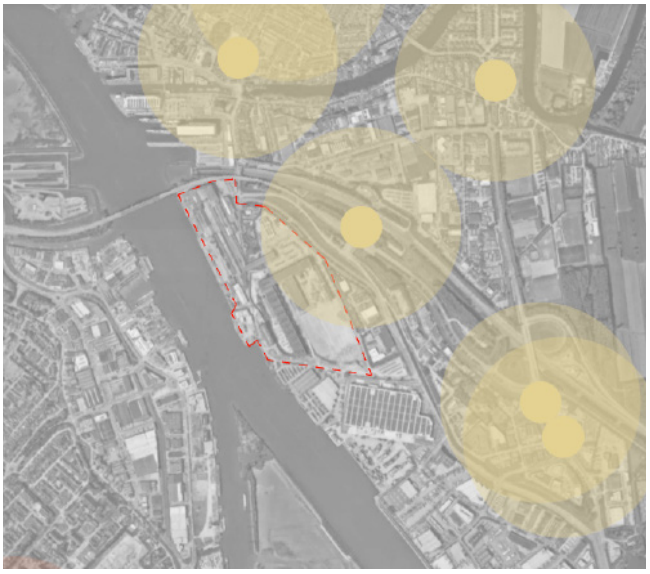


1. Nordhavn, Copenhagen

2. Kabeldistrict, Delft

3. Willemsoord, Den Helder

4. Meelfabriek, Leiden



5. Nedstaal, Alblasserdam

Old public transportation network

Added public transportation network

Figure 4. Case study analysis, urban connection (Google maps, 2025. Elaborated by author)

ban fabric (illustrated in figure 4). This was achieved by integrating the public transport and road networks with the industrial heritage area (Amvest & Kondor Wessels vastgoed 2022, West 8 2012, Cobe 2020). This distinct approach for the Meelfabriek is arguably logical given that it is already well connected to the urban fabric, facilitated by the presence of bus stops and road networks in the nearby area. The initial phase of development in the other cases involved the extension of metro lines in Nordhavn (Graham, 2021) the installation of bus stops (Amvest & Kondor Wessels vastgoed, 2022) and the connection of (internal) infrastructure through additional entrances in close proximity to the recently build bridges to facilitate the connection between the city and the Willemsoord area (Van Dongen-Koschuch, 2015).

The Nedstaal site shares characteristics with both larger and smaller case studies. In terms of scale, the 12-hectare complex is similar to Nordhavn, requiring a comprehensive connectivity strategy that addresses both internal circulation and external urban connections. This could include multiple modes of transport, potentially taking advantage of its proximity to the River Noord. In addition, the north-western façade of Nedstaal is directly adjacent to the urban edge of Alblasserdam, similar to the situation in Willemsoord. This boundary provides an opportunity to create new entrances that respond to existing pedestrian routes from the city centre, transforming this edge into a permeable zone that encourages movement between the city and the former industrial site.

Defined program

While urban revitalisation is characterised by a lack of rigid guidelines (Kungzman, 2004), all cases include specific figures on functions in their programme. The architects of Nordhavn give the specific number of 40000 inhabitants that will live there in the coming years, with completion expected within several decades (Sarda, 2024). And while the urban design firm for the Kabeldistrict initially states that the Kabeldistrict will not function as an isolated city centre, it also notes that it will be a self-sufficient district, with key facilities such as food, childcare, education and leisure already in place (Aemsen, n.d.). The other two cases of the Meelfabriek and Willemsoord, both of which started with the design of one or a few buildings, made their programme even more specific, as their initial development phases focused mainly on fewer buildings rather than a wider urban fabric (De Meelfabriek n.d., Architectenweb, n.d.).

A similar approach could be applied to Nedstaal in Alblasserdam by aligning the redevelopment programme with the municipality's current needs, namely the provision of more housing, cultural places and sports facilities (Gemeente Alblasserdam, n.d.). By following the strategies seen in the Meelfabriek and Willemsoord, where development started on a smaller scale, the first phase of Nedstaal's transformation could focus on several key buildings, such as a residential complex combined with sports and leisure spaces, laying the groundwork for further expansion in the future. This approach ensures that the site remains adaptable to evolving urban needs while providing immediate benefits to the municipality.

Added strategies

In urban revitalisation, flexible guidelines often replace rigid plans, with flagship projects and public space design serving as catalysts (Preite, 2012). Case studies highlight key strategies such as strengthening urban connections, phased scenario-based development, and defining phase-specific programs, illustrated in figure 5. The next section will explore how these strategies can be applied to the Nedstaal complex.

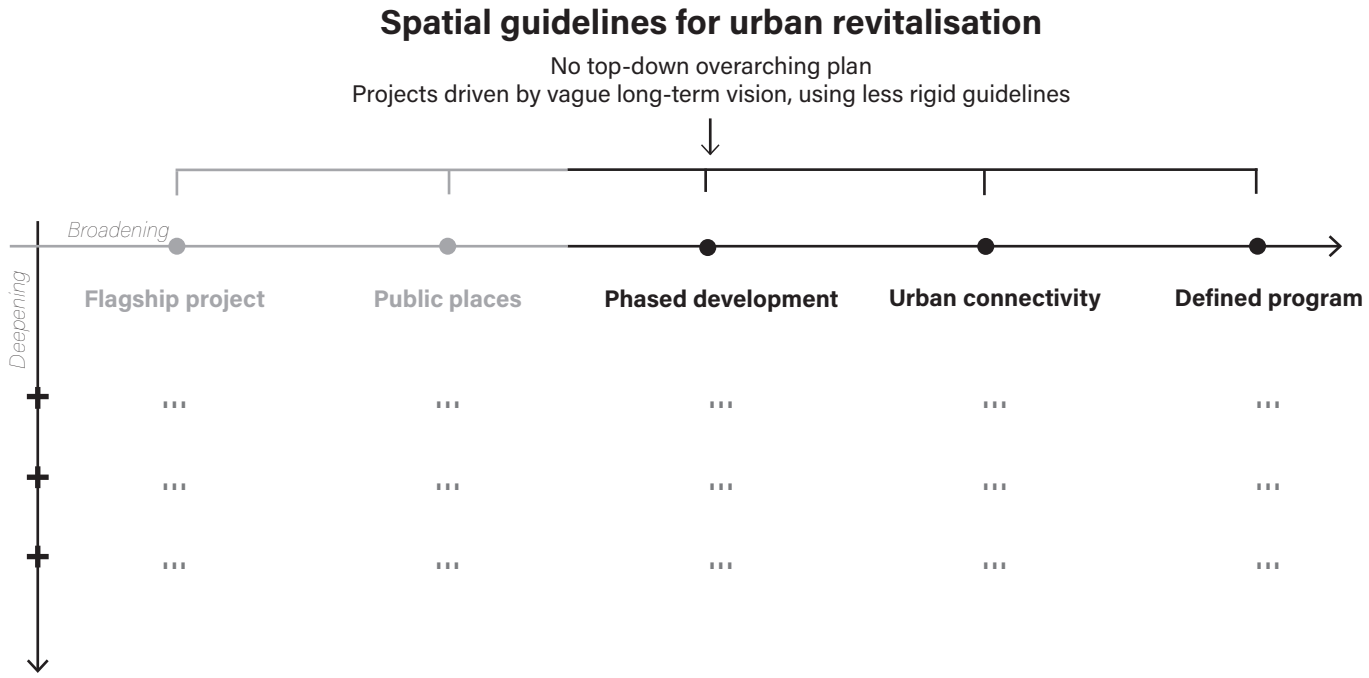


Figure 5. Extended framework and its upcoming additions (own work, 2025)

3. Spatial methods

In the context of the urban revitalisation of industrial heritage, academic literature frequently examines interventions across three spatial scales The urban scale, the site scale (also referred to as the industrial complex scale), and the building scale (Añibarro et al., 2023; Gu et al., 2024; Zhang & Ren, 2024) This study will use these scales to address the previously mentioned strategies for developing industrial heritage, ensuring that these interventions are suited to each scale.

Phased development

The previous chapter acknowledged that urban revitalisation frequently adopts a phased strategy rather than adhering to a rigid master plan. Typically, urban design firms shape only portions of a site, leaving other areas less defined. This approach fosters diversity as distinct districts emerge at different times, shaped by evolving needs and feedback (Carmona, 2021).

Current literature emphasizes this role of diverse neighborhoods in enhancing navigation within cities, often through the creation of urban villages—cohesive yet distinct micro-environments that preserve historical identity. Adaptive reuse plays a key role, with former industrial zones repurposed for workshops or offices, reinforcing district character (Tibbalds, 2000; Shane, 2011; Grecchi, 2022). Large-scale examples, such as the Kabeldistrict and Nordhavn, demonstrate how building plots can develop unique identities based on surrounding programs and contextual qualities (Amvest & Kondor Wessels Vastgoed, 2022).

However, this strategy is less applicable to Nedstaal, a single industrial structure rather than a collection of distinct buildings. While separate structures can develop unique identities, Nedstaal's transformation must work within one overarching framework. Yet, its varied typologies, each historically serving different functions, offer opportunities for subdivision. Instead of creating disconnected zones, the design could emphasize historical layering, ensuring diverse functions coexist within a cohesive spatial structure.

On an architectural scale, phased development is also evident in building adaptability. The Meelfabriek, for instance, features an external load-bearing structure, allowing flexible interior layouts and future modifications (Muis, 2019; Meelfabriek, 2024). Similarly, Nedstaal's subdivision could follow its historical typologies, where varying grid dimensions enable each area to maintain flexibility for future adaptation.

The flagship project

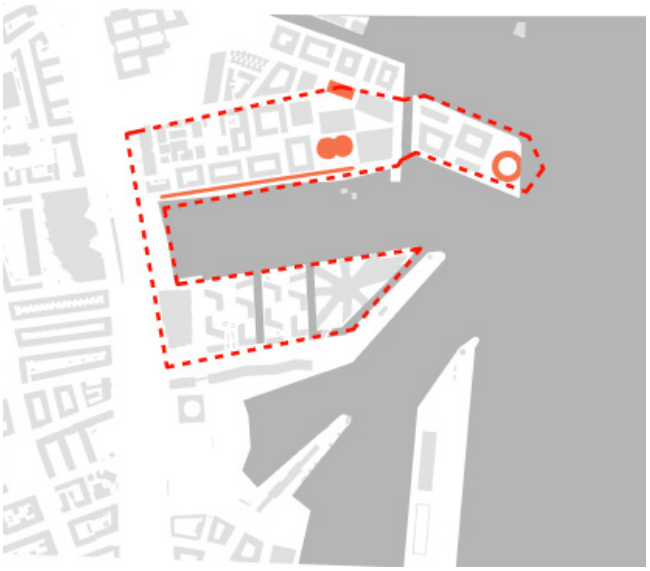
Building upon these ideas, flagship projects play a significant role in the revitalisation of larger industrial areas, by not only serving as a catalyst for the transformation of industrial spaces, but also by contributing to the distinct identities of the district within the broader urban context (Preite 2012, Koolhaas & Mau, 1995). It symbolizes transformation, and attracts visitors to the project (Legner, 2009).

In industrial heritage sites, technical structures, in this context also known as landmarks, such as power plants and metalworking sites function effectively as focal points due to their striking visual qualities, making them suitable for for serving as the flagship within the project (Fragner, 2012). Their prominence in the urban landscape,

as seen in figure 6, allows them to act as navigational anchors, guiding movement within both the industrial complex and the broader city (Lynch, 1960). The Kabeldistrict exemplifies this through the retention of its historic chimney, reinforcing the area's identity (Muis, 2020). Nordhavn, by contrast, emphasizes public use, with its waterfront functioning as a flagship project featuring docks, public facilities, and a promenade (Cobe, 2020). These water elements are particularly effective in attracting visitors and fostering interaction (Whyte, 1980). Similar strategies are evident in Willemsoord, where the renovated boiler plant serves as a cultural focal point, anchoring revitalisation (Rijksdienst voor het Cultureel Erfgoed, 1998).
In contrast, the Meelfabriek lacks a single flagship project but stands out due to its scale within the urban fabric.
The Nedstaal complex, similar to the Kabeldistrict and Nordhavn, could benefit from a flagship project to symbolize transformation and attract visitors. Like the Kabeldistrict, where the preserved chimney reinforces the district's industrial identity, Nedstaal could highlight a key technical structure to serve as a visual and cultural anchor.

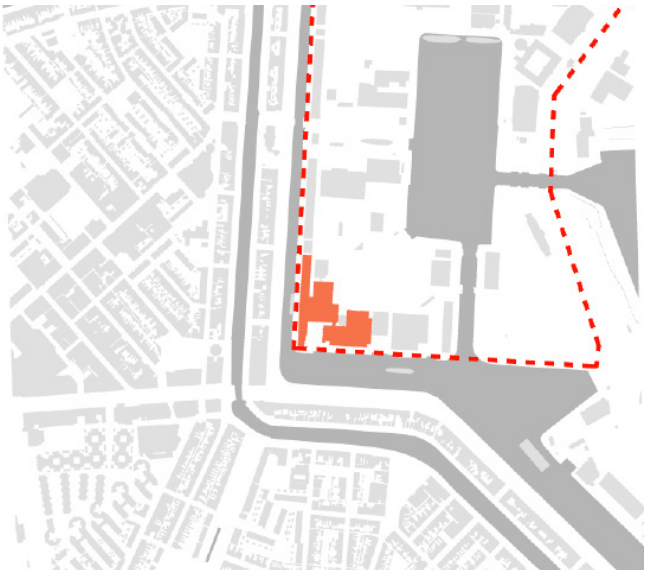
Research highlights the role of flagship projects in hosting cultural programs (figure 7), such as exhibitions, festivals, and creative education spaces, which integrate different urban areas (Labadi, 2015; DCMS, 2004; Bianchini & Parkinson, 1993; Shane, 2011). Florentina-Cristina et al. (2024) further suggest that incorporating practical schools within industrial heritage sites preserves historical character while addressing contemporary educational needs.
The Kabeldistrict exemplifies this approach, as long-vacant buildings now house cultural creators, including artists, musicians, and furniture makers, who are transitioning to permanent spaces (Amvest & Kondor Wessels Vastgoed, 2022). Willemsoord, by contrast, integrated cultural facilities post-redevelopment, transforming warehouses into museums, galleries, and theaters. In addition, larger industrial grids, as seen in Nordhavn and the Meelfabriek, accommodate major cultural venues that complement smaller spaces, enhancing the overall cultural landscape (Annibarro et al., 2023).
While Nedstaal currently lacks temporary cultural facilities, it has the potential to house large-scale venues, strengthening the Waterdriehoek's cultural network. These could include practical schools or other educational functions aligned with the area's industrial heritage.

Specific program
In addition to the use of cultural programming within flagship projects, a number of publications have highlighted the value of a mixed-use program in wider industrial areas as a valuable strategy that fosters urban vitality and economic stability for sustainable urban revitalisation (Schrenk et al. 2011, Han et al. 2024). This aligns with post-war critiques of modernist planning, which emphasize integrating functions within a site to promote dynamic use throughout the day (Jacobs, 1961; Cullen, 1961; Gehl, 1971). Jacobs further argues that urban manufacturing, when non-pollutive, should coexist with residential areas to strengthen local economies.
The cases of Nordhavn, Meelfabriek, and Kabeldistrict demonstrate this principle by integrating residential, commercial, and recreational spaces alongside creative

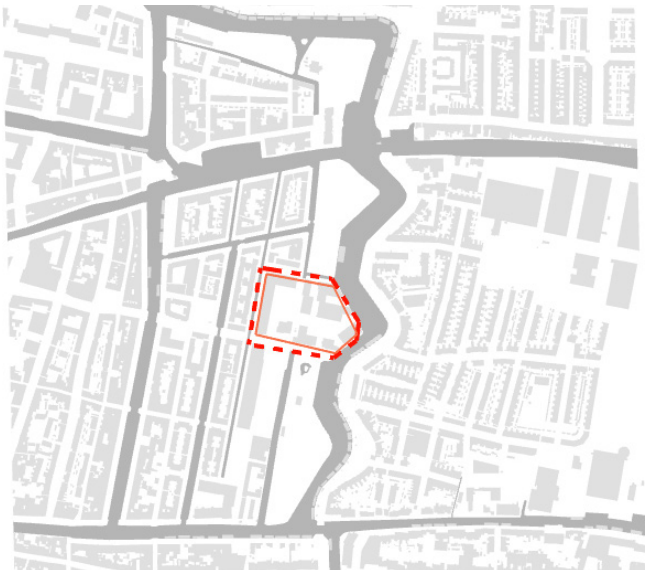


1. Nordhavn, Copenhagen

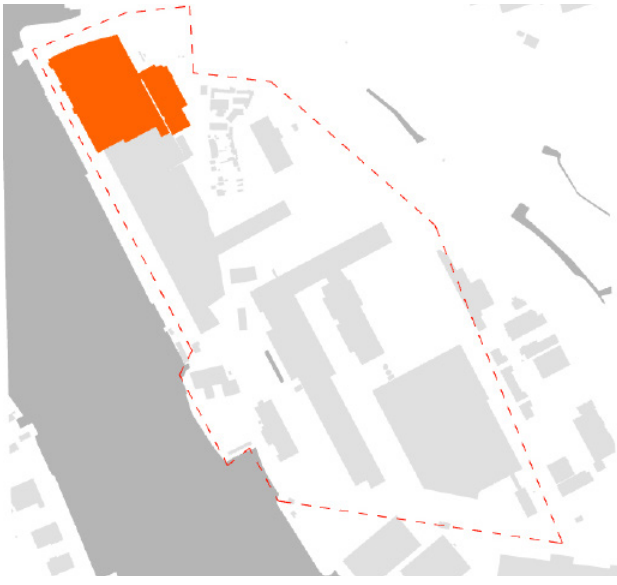
2. Kabeldistrict, Delft



3. Willemsoord, Den Helder



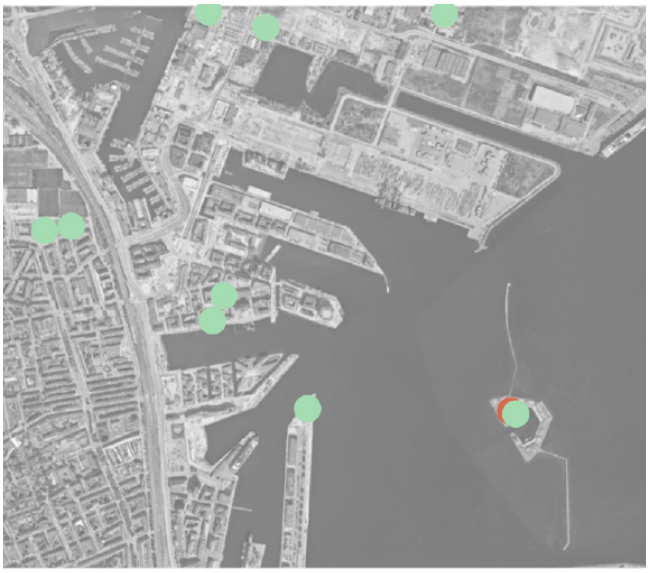
4. Meelfabriek, Leiden



5. Nedstaal, Alblasserdam

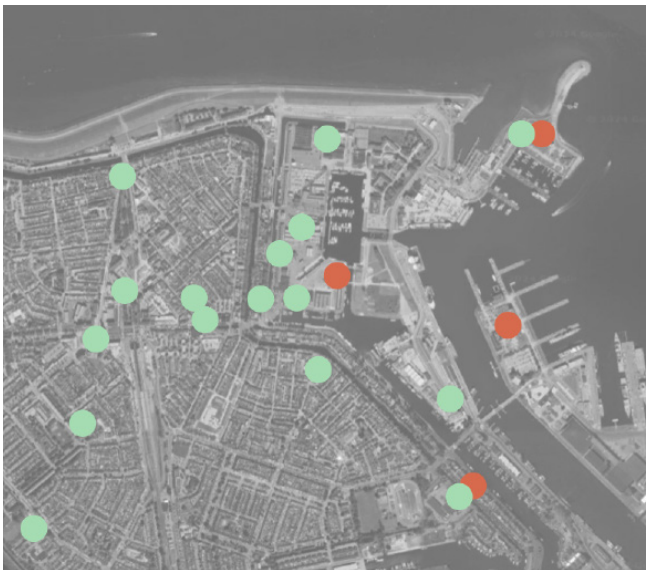
Landmark

Figure 6. Case study analysis, landmarks (CadMapper, 2025. Elaborated by author)



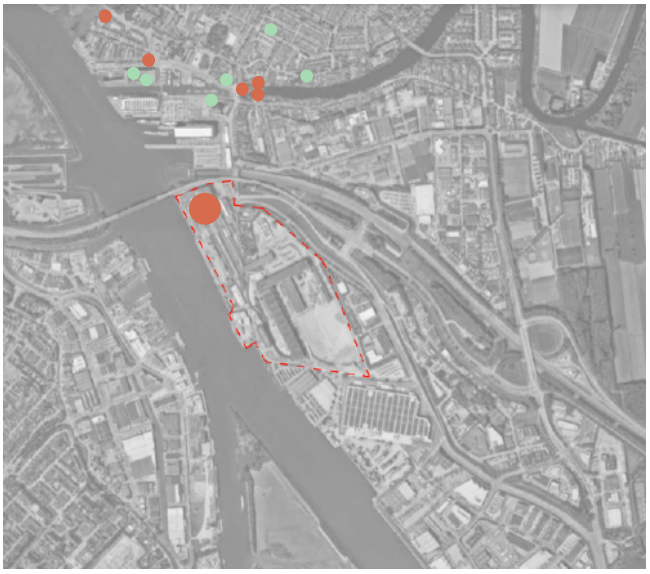
1. Nordhavn, Copenhagen

2. Kabeldistrict, Delft



3. Willemsoord, Den Helder

4. Meelfabriek, Leiden



5. Nedstaal, Alblasserdam

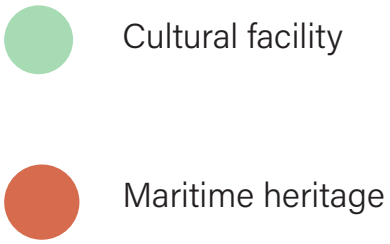


Figure 7. Case study analysis, networks of culture and heritage (Google Maps, 2025. Elaborated by author)

workshops and small-scale production. Nordhavn's recycling plant exemplifies an adaptive industrial function that aligns with sustainability goals (Justensen, 2016). Willemsoord, by contrast, initially focused solely on cultural programming, later incorporating a town hall to enhance daytime activity and attract municipal visitors (Van Emstede, 2015; Weessies, 2024).

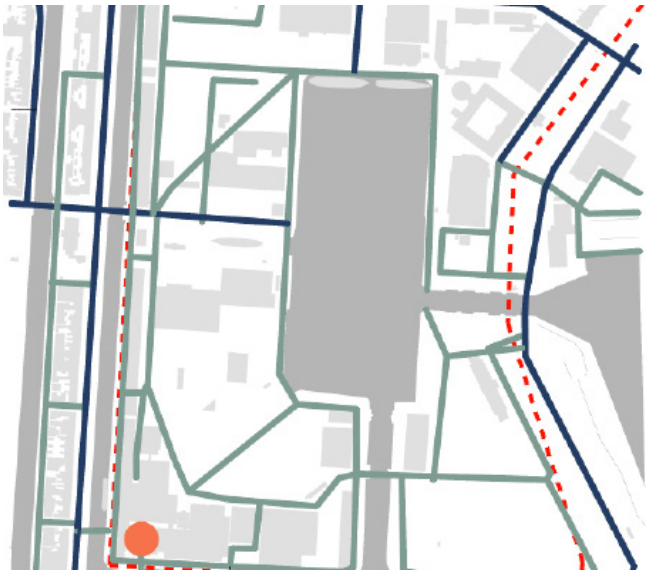
The redevelopment of Nedstaal, which is comparable to the redevelopment of other sites that resemble a neighbourhood as opposed to a single building, has the potential to implement a mixed-use approach that could effectively address Alblasserdam's identified needs for housing, cultural venues, and sports facilities (Gemeente Alblasserdam, n.d.).
The main production hall, with its voluminous spaces, is well-suited for sports and cultural functions requiring generous dimensions, while the administrative buildings could be repurposed for housing or community services. Incorporating light industrial or creative workshop spaces would maintain continuity with the site's heritage while generating employment opportunities. This functional diversity would ensure activity throughout different times of day, enhancing the site's vitality while establishing Nedstaal as an integrated, multifunctional district within Alblasserdam's urban fabric.

Urban connectivity
Urban connectivity has been a priority in all case studies from the start, using both physical infrastructure and cultural venues to link industrial areas with the urban fabric, as illustrated in figure 8.
Within these industrial sites, Gehl & Mortensen (2001) distinguish primary streets—which prioritize movement and circulation—from secondary streets, which foster human-scale activity. The case studies show a clear pattern: public nodes are connected by secondary streets, and are enclosed by primary streets. Larger projects, such as Nordhavn and Kabeldistrict, also include intermediate streets that blend both functions. Notably, no primary streets are positioned along the waterfront in any case.
For Nedstaal, establishing a hierarchical street network could improve integration of the site. Unlike larger projects that introduced new infrastructure, Nedstaal's single-building typology requires working within its existing spatial structure. Repurposing former internal corridors as pedestrian pathways can enhance accessibility, while strong links to primary roads can embed the site into Alblasserdam's urban fabric.
Simultaneously, Koolhaas (1995) introduces the multi-scalar city for architectural scale, where different movement patterns coexist within buildings. Reusing industrial remnants—such as old tracks or machinery—as visual cues can aid navigation within these internal pathways (Grechhi, 2022). For Nedstaal, smaller pathways can facilitate movement between distinct typologies, while larger circulation routes—around the exterior or through major halls—can function as primary connectors.
The Nedstaal site's single-building typology limits the ability to introduce expansive new infrastructures, such as the large roads and public nodes seen in larger projects. The implementation of secondary streets or corridors should prioritize integration with existing internal routes instead of creating new primary streets

Public space (figure 7 & 8 & 9)
The last strategy that will be mentioned is the conversion of free areas into public spaces, which was stated before to be the real catalyst in urban revitalisation (Preite, 2012). Public spaces serve as connectors between industrial heritage sites and the surrounding urban fabric, enhancing social interaction and accessibility (Grecchi, 2021). Lynch (1960) emphasizes that well-placed public nodes—ideally spaced 200-300 meters apart—improve walkability by

1. Nordhavn, Copenhagen

2. Kabeldistrict, Delft



3. Willemsoord, Den Helder

4. Meelfabriek, Leiden

5. Nedstaal, Alblasserdam

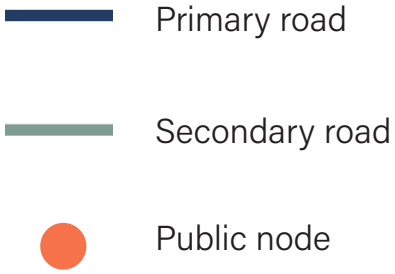


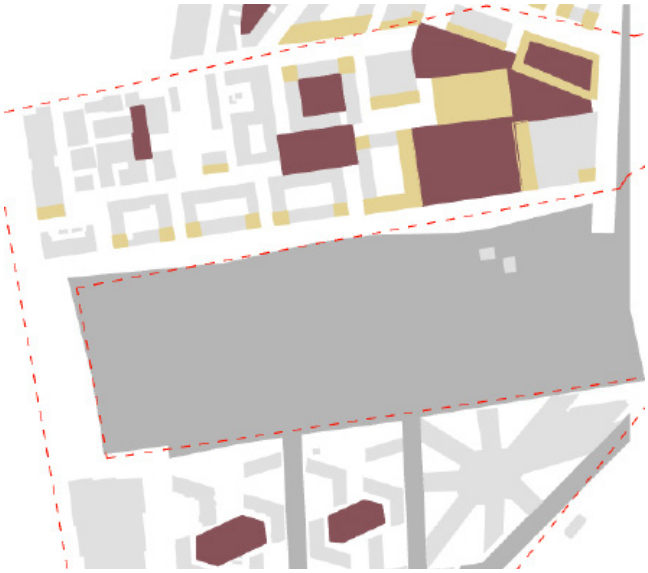
Figure 8. Case study analysis, streets (CadMapper, 2025. Elaborated by author)

creating intersections where paths and activities converge (Sim, 2023).
Whyte (1980) highlights that dividing large spaces into smaller, human-scaled areas fosters engagement and comfort of these public spaces. However, Papmehl-Dufay (2015) argues that maintaining original building forms preserves historical narratives. To balance these perspectives, Koolhaas (1995) suggests integrating both monumental industrial structures and smaller interventions, preserving heritage while ensuring usability.
In Meelfabriek and Willemsoord, preservation dictated volumetric dimensions, with internal subdivisions creating smaller, functional spaces. Nordhavn and Kabeldistrict, by contrast, used historical grid patterns to shape newly built public spaces. The Nedstaal complex aligns more closely with Meelfabriek and Willemsoord, as it retains existing buildings with varied typologies. To integrate public functions while respecting historical scale, larger spaces can be subdivided while maintaining key industrial elements.

On an architectural scale, Sim (2019) identifies building corners as vital for public activation of public spaces. serving as orientation points and hubs for public activity, which is also evident in the case study analysis in figure 9. In Kabeldistrict, Nordhavn, and Meelfabriek, most corners house active public functions, especially nearby outdoor public spaces. Willemsoord followed a similar strategy by prioritizing revitalisation at the site's edge to establish engagement.
At Nedstaal, the southwest corner facing the River Noord presents an opportunity for a public landmark, visible from both land and water. Like Willemsoord, it could act as a flagship project that signals the site's transformation while strengthening its connection to the waterfront. Additionally, within the building, the corner strategy can be extended by designing prominent entry points or open communal areas at key corners, such as where different typologies meet. These areas could be adapted to foster interactions and house public functions, further reinforcing the building's integration with the surrounding urban fabric.
Earlier was stated that the cases are predominantly surrounded by primary streets, which serve as defining edges of the areas. In contrast, Shane (2023) posits that in industrial heritage areas, these edges often take on a different role, functioning as zones for transitional activities, such as markets, outdoor seating and green buffer zones. The blending of boundaries in large industrial spaces, by allowing the diffusion of rigid separations between public and industrial zones, creates a blending of urban and industrial elements, which encourages interaction between workers, residents and visitors (Koolhaas, 1995).

However, these transitional spaces are particularly evident along the waterfront edges, as seen in the redevelopment of Nordhavn and the Kabelfabriek (see figure 10). In the case of Kabelfabriek, the activation of the waterfront as a zone for transitional activities serves to blur the boundary between the Kabelfabriek site and the industrial area across the water.

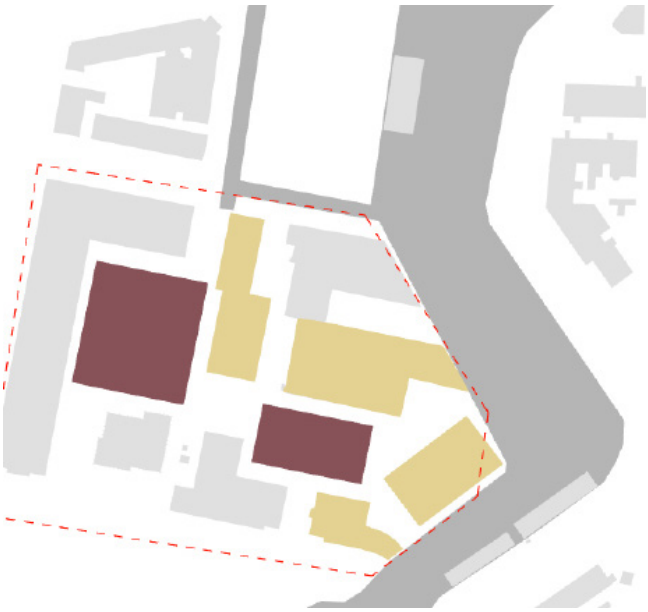
For the Nedstaal site, the introduction of green spaces as part of the public realm could be an essential strategy to better integrate the site into the surrounding urban environment. This approach would create inviting public spaces that connect the site to its surroundings, encourage social engagement, and support future densification. By converting sections of the Nedstaal site into green zones, Nedstaal would also contribute to the EU's objective of "no net land take by 2050," effectively returning parts of the site to a green environment while preparing it for possible future development.



1. Nordhavn, Copenhagen

2. Kabeldistrict, Delft

3. Willemsoord, Den Helder



4. Meelfabriek, Leiden

5. Nedstaal, Alblasserdam

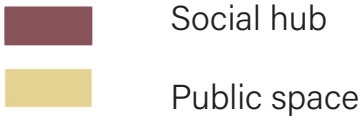
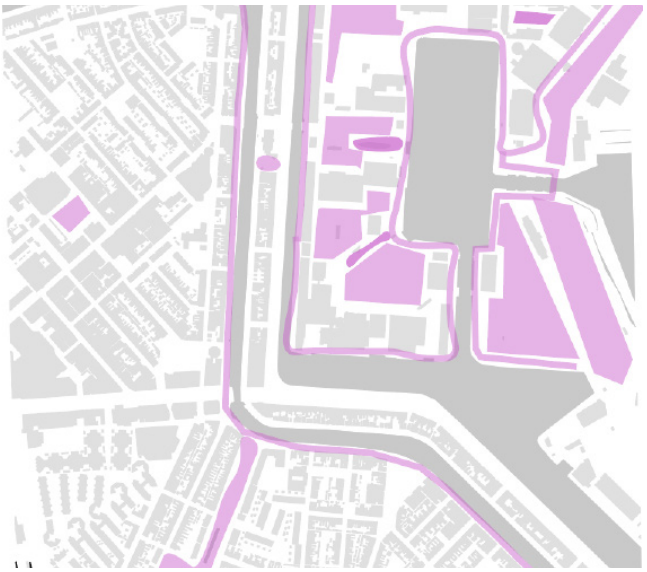


Figure 9. Case study analysis, multifunctional spaces and social hubs (Google Maps, 2025. Elaborated by author)

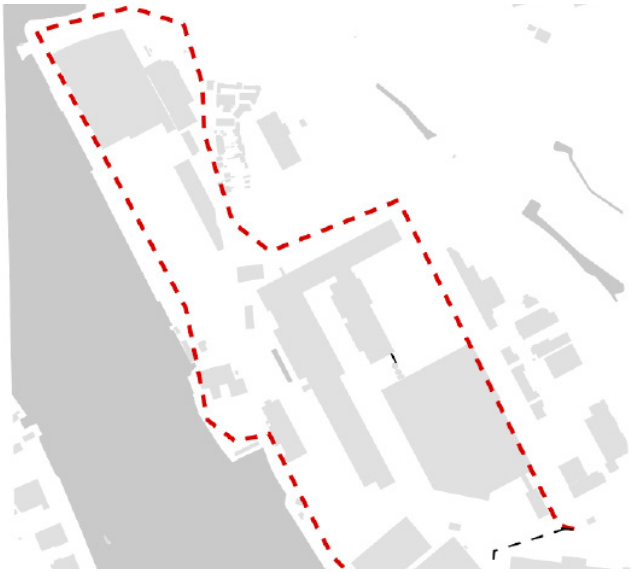
1. Nordhavn, Copenhagen

2. Kabeldistrict, Delft



3. Willemsoord, Den Helder

4. Meelfabriek, Leiden



5. Nedstaal, Alblasserdam

Newly activated public space

Figure 10. Case study analysis, public spaces (CadMapper, 2025. Elaborated by author)

4. Conclusion

Toolkit: From research to design

This study contributes to the urban revitalisation discourse by developing guidelines for the revitalisation of industrial heritage sites, with a particular focus on the Nedstaal factory in Alblasserdam.The study identified multiple strategies and organised these into a visual matrix (see figures 11-12), which is intended to serve as a toolkit for future projects of a similar nature. With regard to Nedstaal specifically, the key recommendations emphasise phased development in view of the site's size and complexity. The strategies prioritize integrating green and public spaces alongside flexible, mixed-use programming, with the potential to transform the Nedstaal complex into a flagship project for Alblasserdam's transition from an industrial site to a sustainable urban area.

Discussion

The findings of this study contribute to the current framework, yet they require further expansion and diverse perspectives. The limited case studies restrict the generalisability of the results, as additional examples might reveal different findings. While the study focuses on the positive effects of flagship projects, it does not address negative impacts such as gentrification and displacement, which are important considerations for future research. Further research could also analyse the relative importance and implementation difficulty of various spatial interventions, as some may be easier to execute but less impactful, while others might be more challenging but transformative. Such an analysis would create a more comprehensive industrial maritime heritage revitalisation framework."

Figure 11. Toolkit of spatial guidelines (own work, 2025)

Spatial guidelines for u

No top-down over
Projects driven by vague long-term vi

Broadening

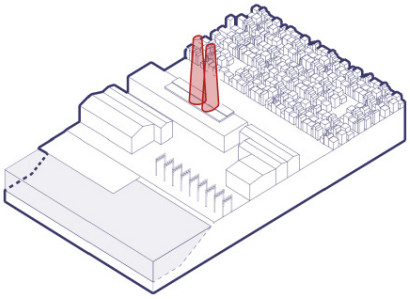
Deepening

Flagship project

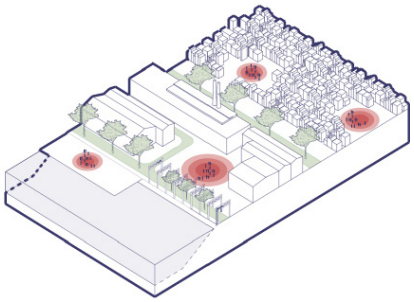
Public places

Phased

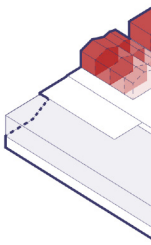
Urban scale



Landmark as anchor within cityscape
(Preite, Koolhaas, Boelsums, Legner, Lynch)

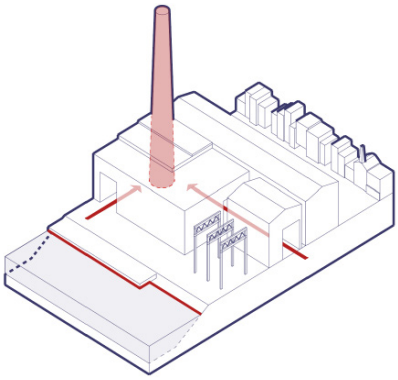


Green edges and corridors & nodes at invervals of 200 m
(Shane & Grecchi, Lynch)

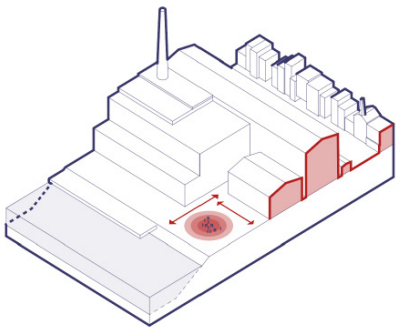


Space for con

Industrial complex scale



Water features & focal point
(Whyte & Lynch)



Nodes: ratio 3:1, max 80 m & juxtaposition of architectural scale
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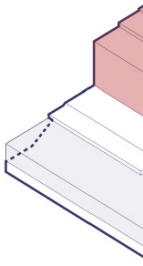
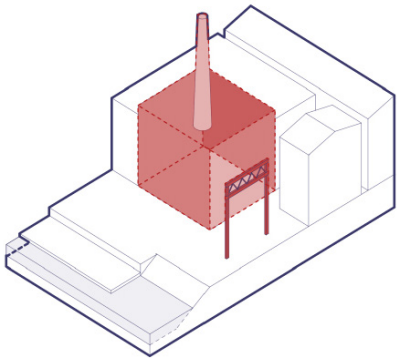


Distinct chara
(Tibbalo

Architecture scale



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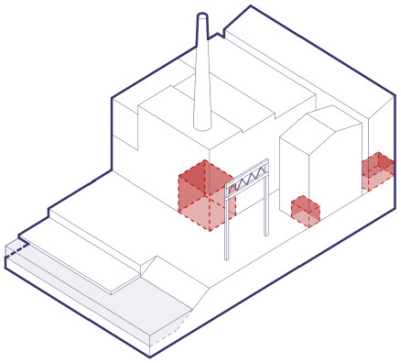
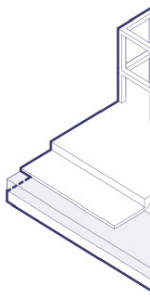
(Fragner & Labadi , jowell, Bianchini and parkinson, shane,)



Public corners
(Sim)



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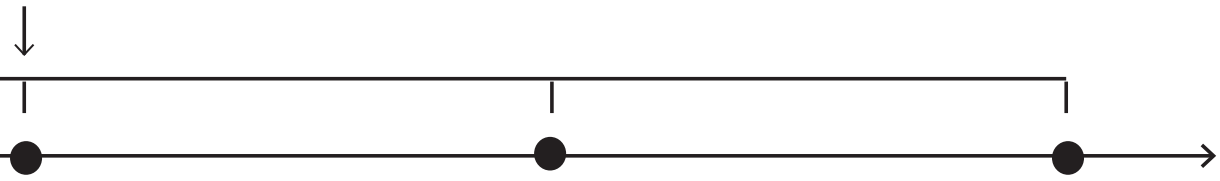

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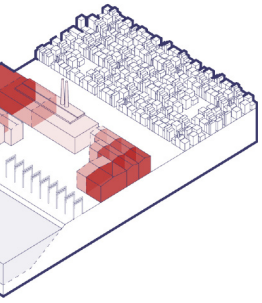
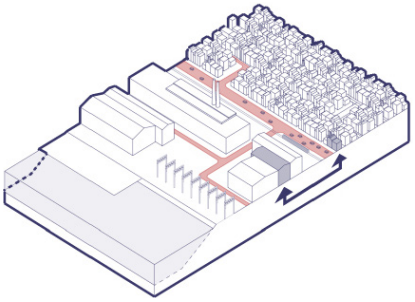


tinuation, scenario based plan
(Fragner)

Urban connectivity



Linking culture + heritage & infrastructure
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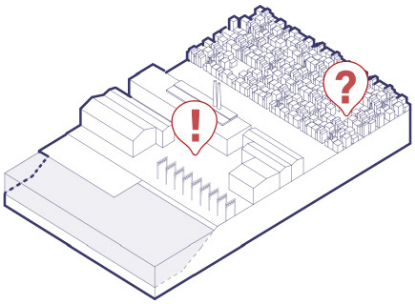
Defined program



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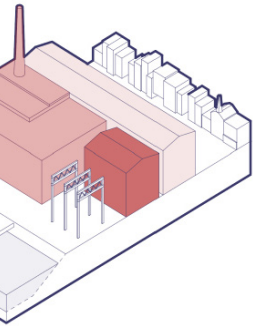

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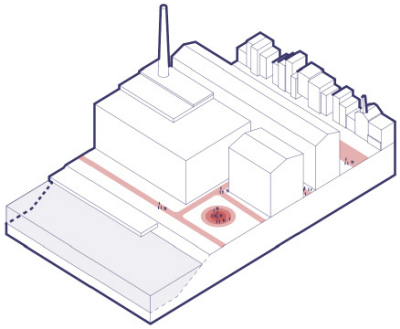
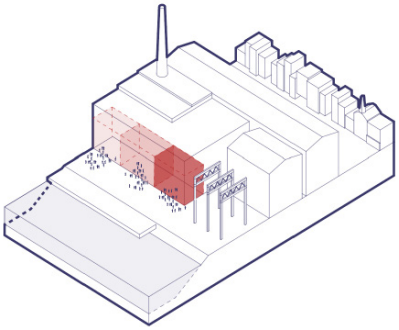
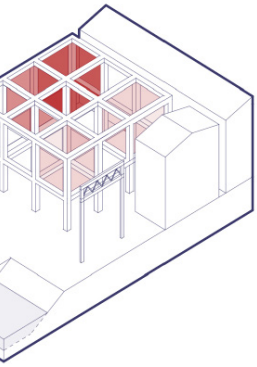
ds.., Shane, grecchi)



Primary roads as edge, secondary roads as connector nodes
(Gehl)



Program in harmony with character of heritage
(Jacobs)



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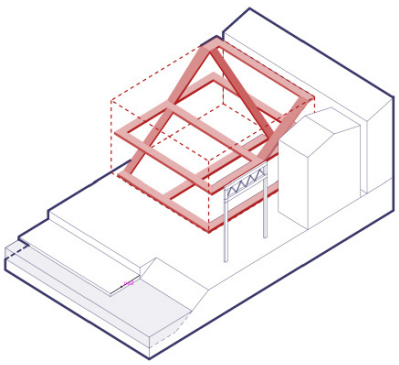
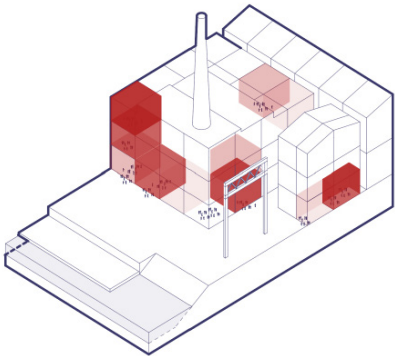
(Fragner)



Multiscalar internal streets
(Koolhaas, Grecchi)



Mixed-use program, specifically made for dynamic use troughout the day
(Schrenk et al., Han et al., Jacobs, Cullen, Gehl, Reisto)

Figure 12. Toolkit of spatial guidelines
Specifically for Nedstaal, Alblasserdam
(own work, 2025)

Spatial guidelines for u

No top-down over
Projects driven by vague long-term vi

Broadening

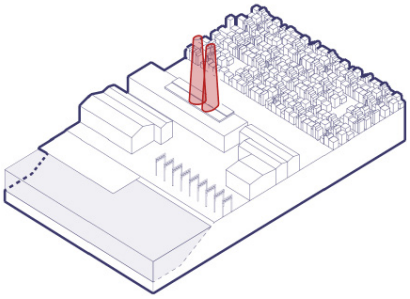
Deepening

Flagship project

Public places

Phased

Urban scale



Landmark as anchor within cityscape
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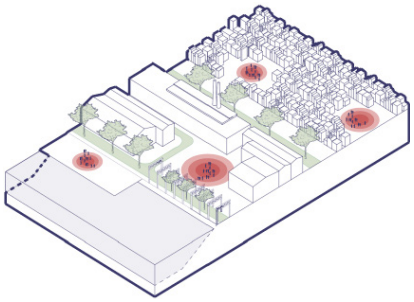
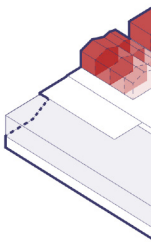
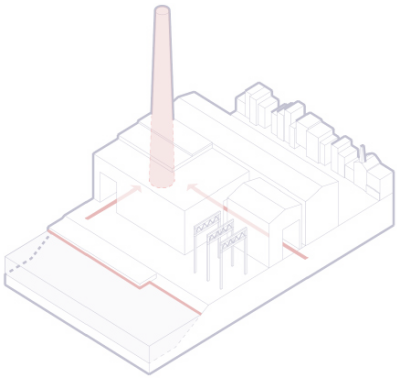


Green edges and corridors & nodes at invervals of 200 m
(Shane & Grecchi, Lynch)



Space for con

Industrial complex scale



Water features & focal point
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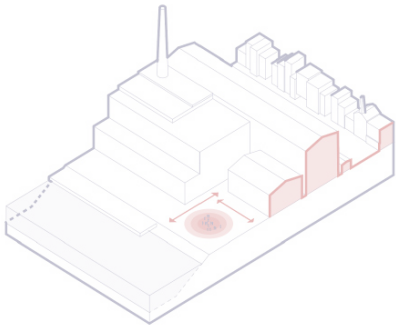

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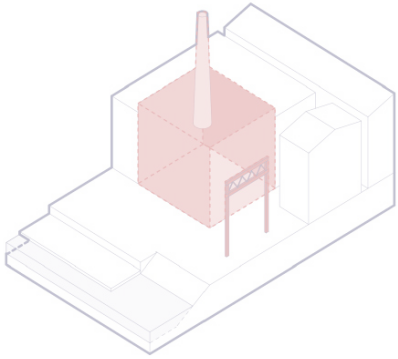

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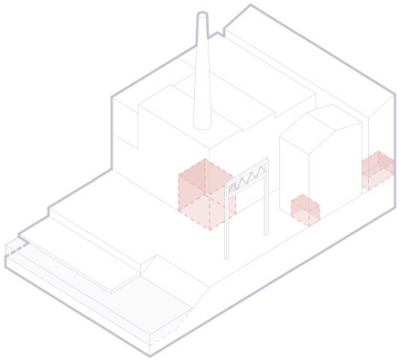

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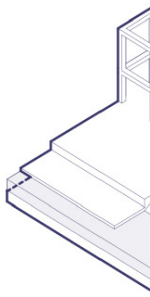

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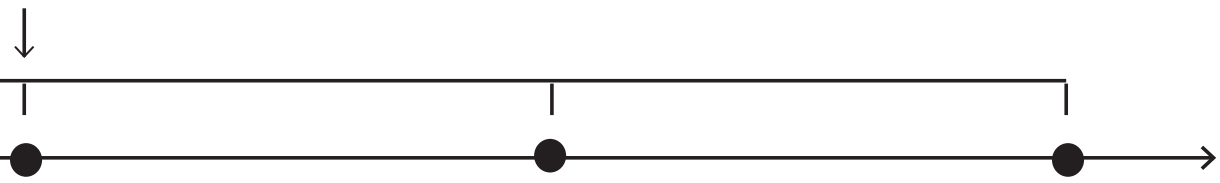

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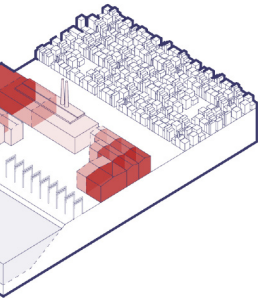

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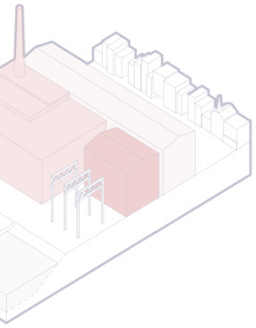

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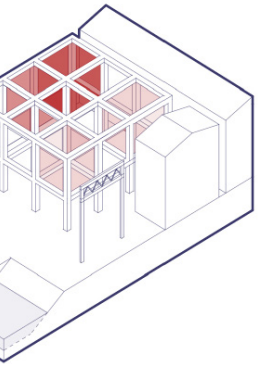

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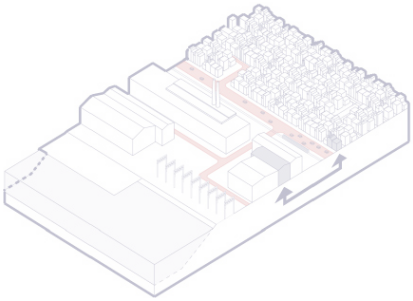

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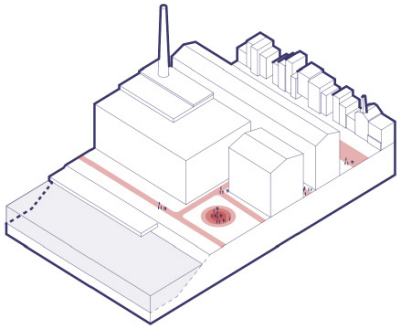

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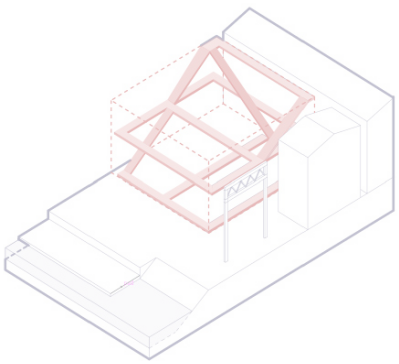

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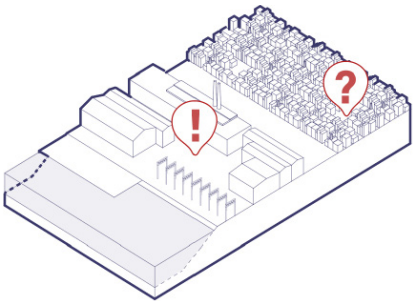

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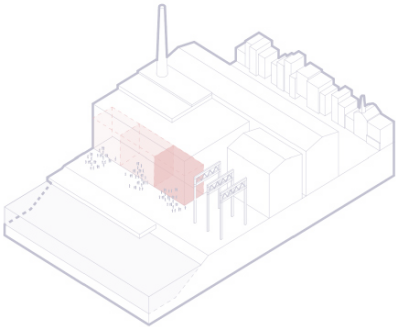

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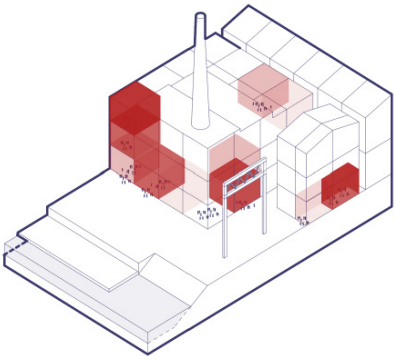
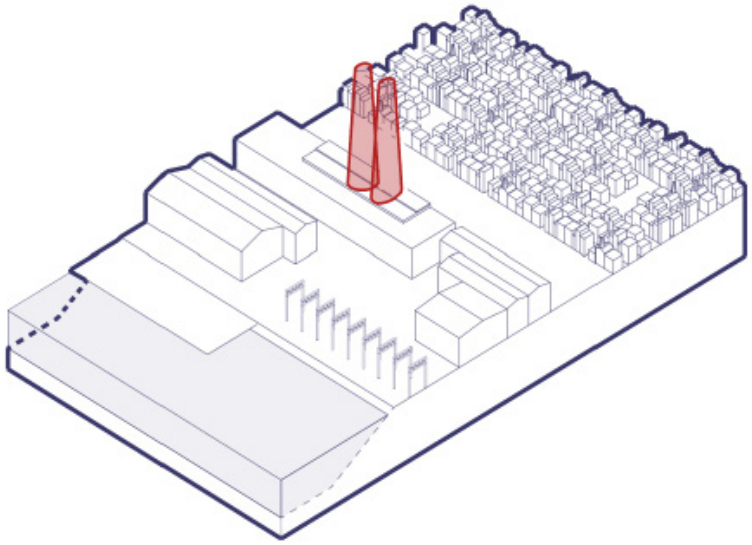
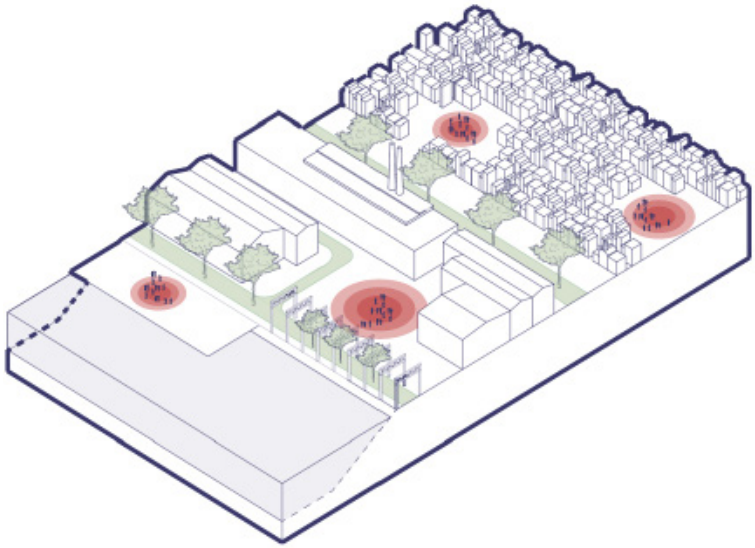


Mixed-use program, specifically made for dynamic use troughout the day
(Schrenk et al., Han et al., Jacobs, Cullen, Gehl, Reisto)



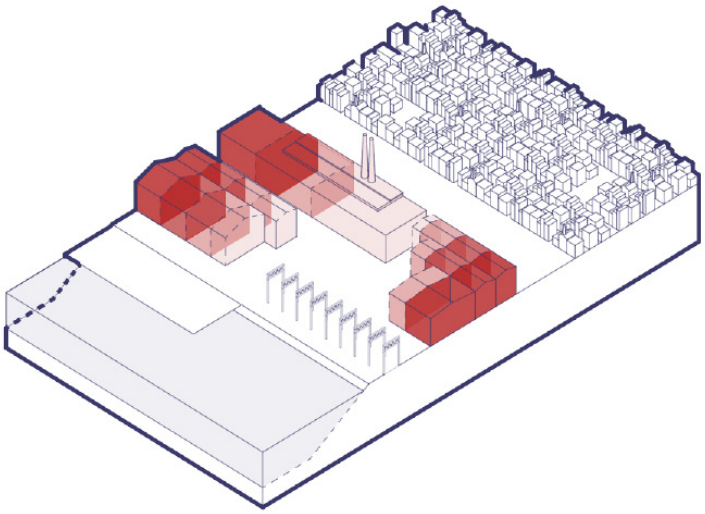
Landmark as anchor within cityscape
Urban scale

The case studies demonstrate that creating a flagship project or landmark serves as an anchor point in revitalization efforts, signaling the transition from industrial to urban use, as shown in Nordhavn and Kabeldistrict.
(Preite, Koolhaas, Boelsums, Legner, Lynch)



Green edges and corridors & nodes at invervals of 200 m
Urban scale

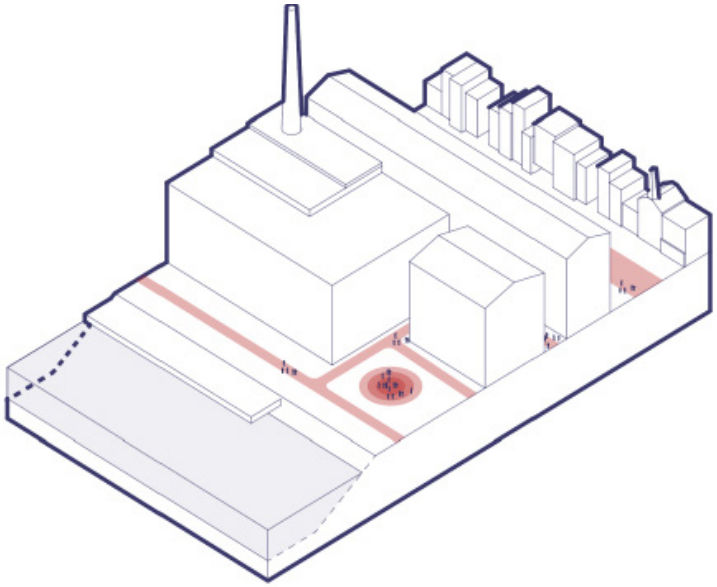
Public and green spaces, as demonstrated in the Meelfabriek and Willemsoord case studies, would enhance Nedstaal's environmental quality while promoting social interaction and human-scale connectivity within the broader urban context.
(Shane & Grecchi, Lynch)



Phased development (based on scenarios)
Urban scale

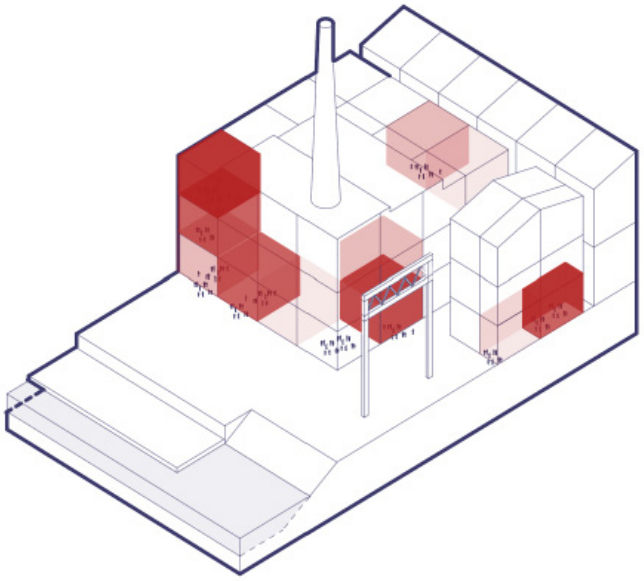
Phased development, crucial in Nordhavn and Kabeldistrict, allows large-scale sites to develop in stages, with each phase building on previous outcomes while adapting to evolving market and community needs, ensuring greater flexibility and sustainability.
(Fragner)

Figure 13. Specific spatial guidelines that are useful for the redesign of Nedstaal (own work, 2025)



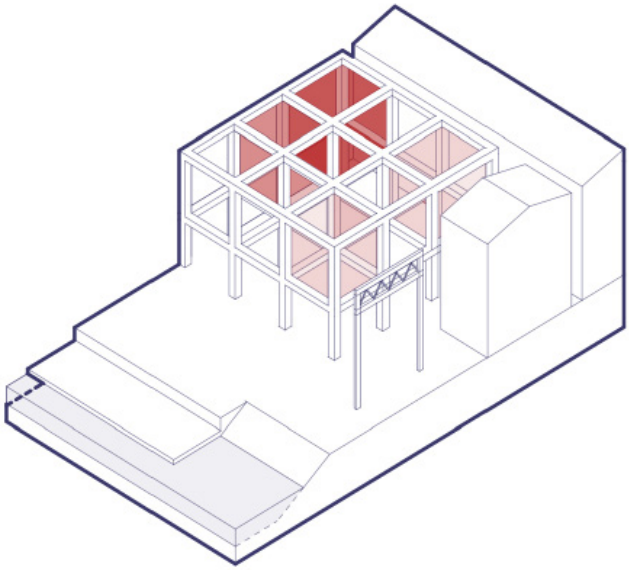
Primary roads as edge, secondary roads as connector nodes
Industrial complex scale

Primary roads functioning as edges define the industrial complex's boundaries, while secondary roads serve as vital connector nodes, creating an integrated circulation network that facilitates movement between distinct zones while preserving the site's historical organization .*(Preite, Koolhaas, Boelsums, Legner, Lynch)*



Mixed-use program, specifically made for dynamic use troughout the day
Architectural scale

Mixed-use programming, which proved successful in Nordhavn and Kabeldistrict, could transform Nedstaal into a vibrant urban environment that accommodates diverse activities and users throughout the day and night.. *(Schrenk et al., Han et al., Jacobs, Cullen, Gehl, Reisto)*



Flexible layout, space for continuation
Architectural scale

Flexible spatial layouts, proven effective in other case studies, enable fluid reconfiguration as new uses emerge. For Nedstaal, this approach would facilitate phased transformation while ensuring seamless integration of future changes. *(Fragner)*

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Images

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Figure 17.
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Figure 20.
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Figure 24.
Google maps. (2025). Map of Den Helder used for the analysis.

Figure 25.
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Figure 26. Alblasserdamnieuws.
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Google maps. (2024). Map of Alblasserdam.

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Figure 29.
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Figure 30.
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Figure 31.
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6. Appendix

6.1 Definition of terms

Revitalisation
The process of redeveloping and improving urban areas, often focusing on underutilized or neglected spaces to enhance their economic, social, and environmental value.

Densification
A planning strategy that increases the intensity of land use by adding more housing, infrastructure, or public spaces. This can occur within existing urban areas (urban infill) or through expanding development into new areas (greenfield densification) (Lehman, 2009).

Waterdriehoek
The Waterdriehoek is a region in the South Holland province of the Netherlands, known for its historical, ecological, and industrial significance. The term "Waterdriehoek" translates to "Water Triangle," referring to the triangular area formed by the cities of Alblasserdam, Dordrecht, and Sliedrecht. (Provincie Zuid-holland, n.d.)

Flagship project
A high-profile urban intervention that serves as a catalyst for further development in an industrial revitalisation process (Preite, 2012).

Greenfield development
The construction of new urban areas on previously undeveloped land, often in contrast to brownfield redevelopment, which focuses on repurposing existing sites.

Brownfield development
The redevelopment of previously industrial or contaminated sites for new urban uses, often requiring environmental remediation before construction.

Sustainable urbanisation
The practice of developing cities in an environmentally, socially, and economically sustainable manner, ensuring long-term livability and minimal ecological impact.

Organic urbanism
An approach to urban development in which growth happens gradually and adaptively over time, rather than being dictated by a rigid, pre-established master plan.

6.2 The Meelfabriek, Leiden

Figure 14. The Meelfabriek, Leiden. From '*De Meelfabrie*k', by De Meelfabriek, 2022 (https://demeelfabriek.nl/leiden/)

Figure 15. Map of Leiden used for the analysis (Google Maps, 2025)

Figure 16. Map of Leiden, used for the analysis (Cadmapper, elaborated by author, 2025)

The Meelfabriek is an old flour factory located within the historical city centre of Leiden. The complex consists of multiple industrial buildings that have now been converted for residential use.The Meelfabriek and the Nedstaal complex have multiple similarities, chiefly the presence of multiple typologies that form one large complex of buildings.The scale of the Meelfabriek complex is of such magnitude that it is effectively a self-contained neighbourhood.

6.3 Nordhavn, Copenhagen

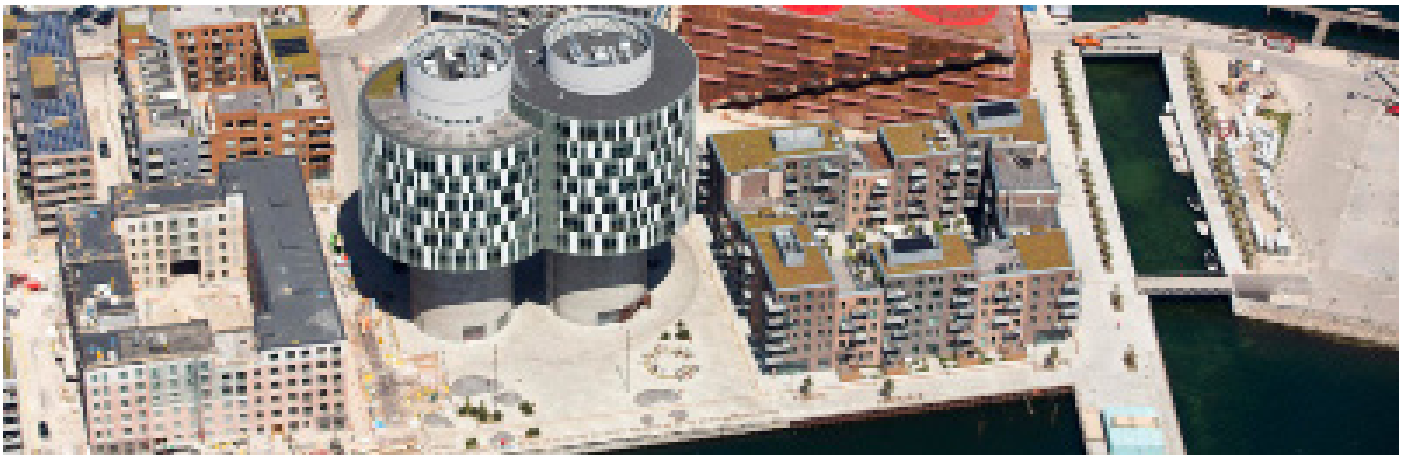


Figure 17. Rhusgadekvarteret. From 'Stateofgreen', by Stateofgreen, 2022 (https://stateofgreen.com/en/news/nordhavn-take-a-tour-of-an-urban-area-of-the-future/)

Figure 18. map of Copenhagen used for the analysis (Google Maps, 2025)

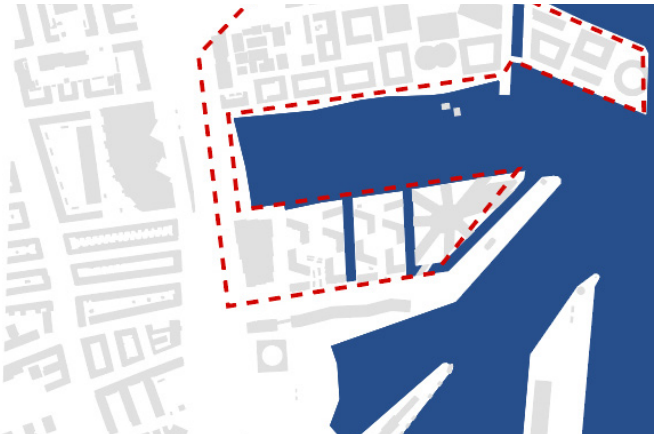


Figure 19. Map of Copenhagen used for the analysis (Cadmapper, elaborated by author, 2025)

Nordhavn is a large district that was formerly a harbour in close proximity to the city centre of Copenhagen. It is currently undergoing a transformation into a mixed-use area.The primary similarity is the scale of the location: both Nedstaal and Nordhavn are larger districts that are almost the size of a small city, but are located in close proximity to a larger city (Copenhagen and Alblasserdam).

6.4 Kabeldistrict, Delft

Figure 20. Kabeldistrict. From '*OmroepDelft*', by Bureau Mei, 2022. (https://www.omroepdelft.nl/omroepdelft/nieuws/veelzijdig-kabeldistrict-wordt-groen-technisch-hoogstandje)

Figure 21. Map of Delft used for the analysis (Google Maps and Mei Architecten, 2025)

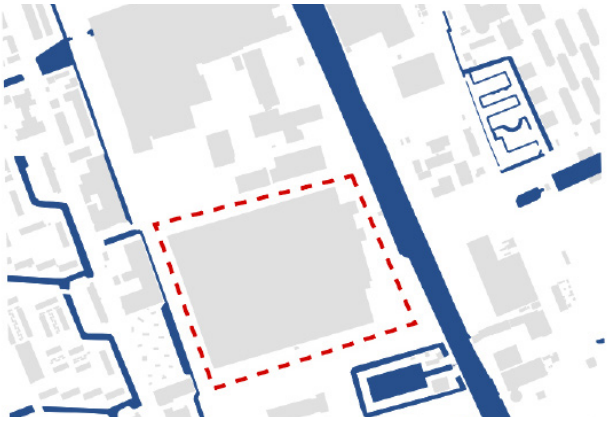


Figure 22. Map of Delft used for the analysis (Cadmapper, elaborated by author, 2025)

The Kabeldistrict is an area of former steel cable manufacturing facilities. The Nedstaal factory in Alblasserdam is a Kabeldistrict branch, and there are several similarities between the two complexes due to their shared history. Both are old steel cable factories, characterised by large scall spaces and a distinct separation between the water and the quay, where ships were once docked. The Kabeldistrict is located in close proximity to the city centre of Delft, yet there is a lack of direct connectivity between the two.

6.5 Willemsoord, Den Helder

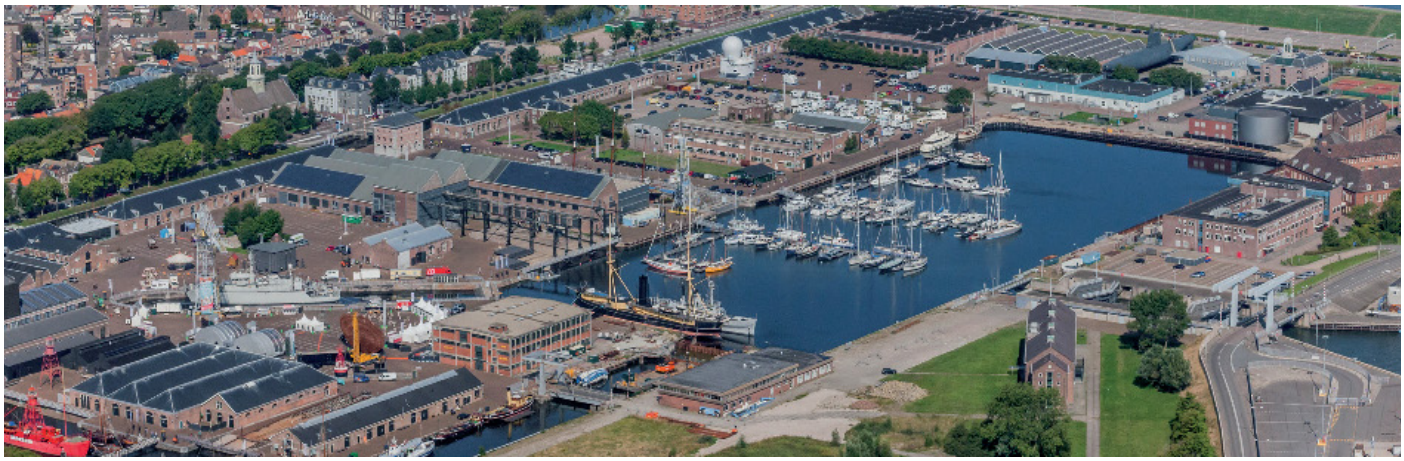


Figure 23. Jachthaven Willemsoord. From '*Dehavengids*' 2022 (https://dehavengids.nl/wordpress/havens/den-helder-jachthaven-willemsoord/)

Figure 24. Map of Den Helder used for the analysis (Google maps, 2025)

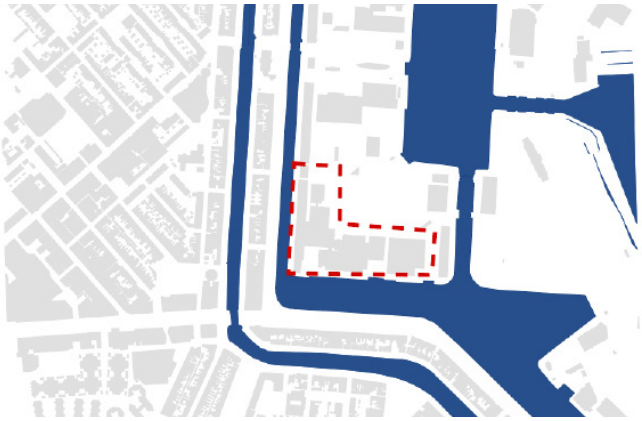


Figure 25. Map of Den Helder used for the analysis (own work, 2025)

The transformation of Willemsoord from a previously inaccessible wharf into a vibrant cultural hub has been a significant development in the area's recent history. The revitalisation project has encompassed the establishment of a theatre, a town hall, and various other cultural facilities, contributing to the enhancement of the local infrastructure and the promotion of cultural activities. Prior to this development, the area was characterised by its inaccessible layout, which hindered its potential as a public space. However, the transformation has effectively converted the wharf into a large public space, thereby revitalising the area and enhancing the quality of life for the local community.

6.6 Nedstaal, Alblasserdam

Figure 26. Nedstaal in Alblasserdam. From 'Ablasserdamnieuws', by Alblasserdamnieuws, 2013. (https://www.alblasserdamsnieuws.nl/wordpress/2013/09/16/nestaal-in-alblasserdam-mag-asbesthoudend-staal-gaan-smelten/#google_vignette)

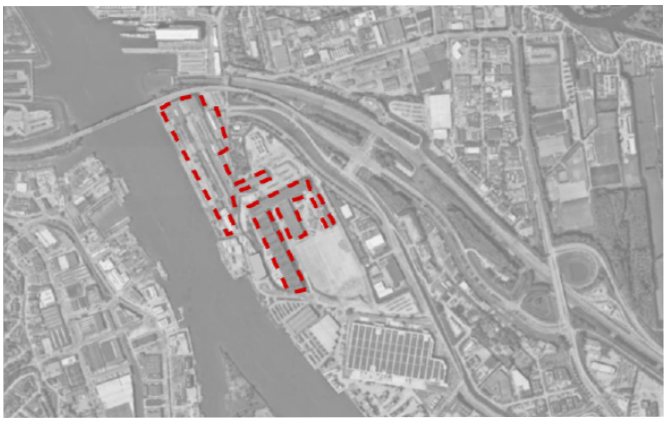


Figure 27. Map of Alblasserdam (Google Maps, 2024)

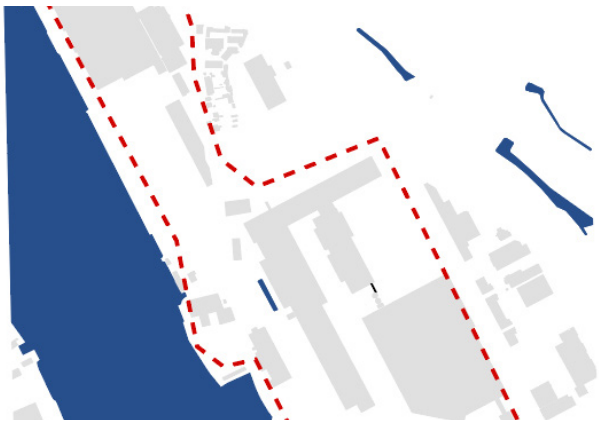
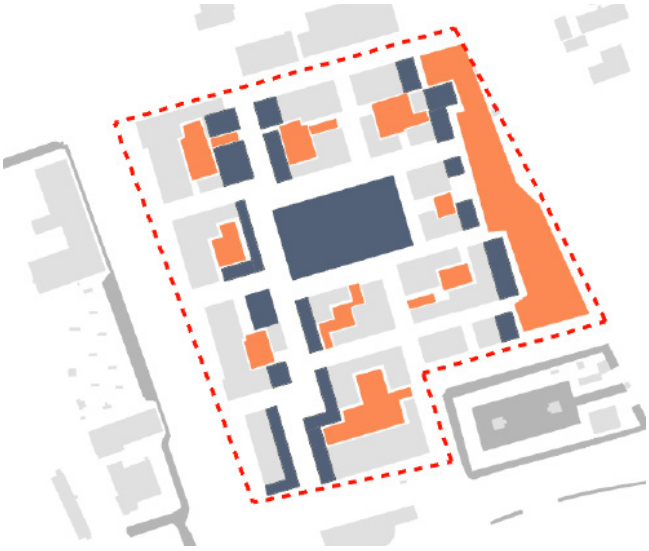


Figure 28. Map of Alblasserdam (Cadmapper, elaborated by author, 2025)

The Nedstaal building is a vacant steel cable factory. This complex is part of a larger area which mainly contains other industrial buildings. The area is notable for its large scale and its longitudinal character along the water.

6.7 Case study analyses not utilised in this study.

1. Nordhavn, Copenhagen



2. Kabeldistrict, Delft

3. Willemsoord, Den Helder

4. Meelfabriek, Leiden

5. Nedstaal, Alblasserdam

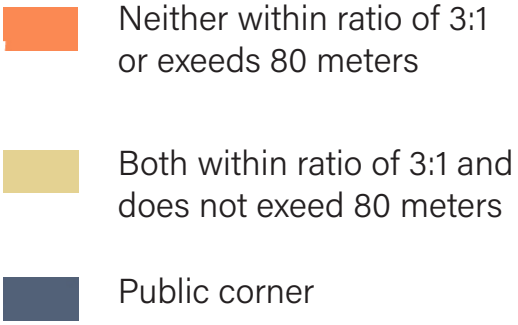
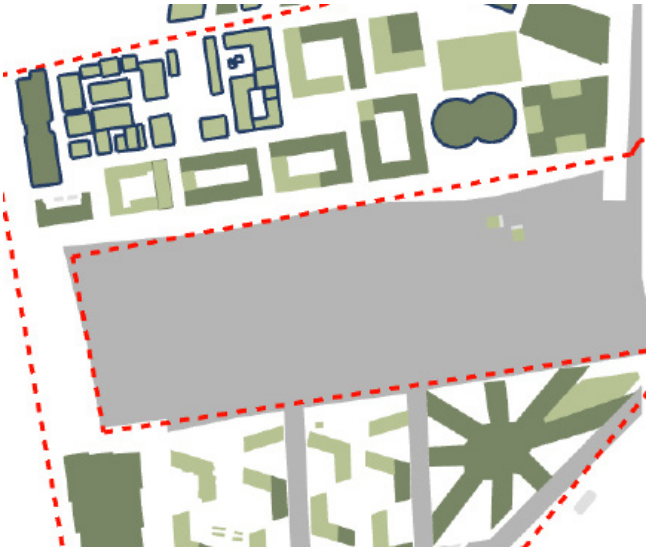
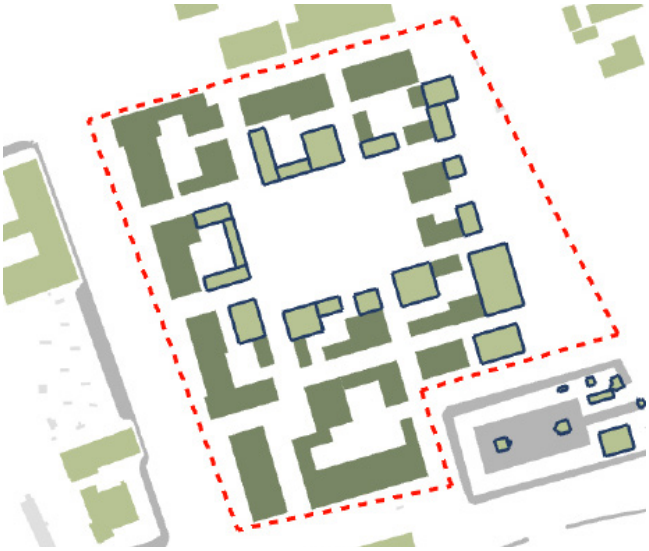


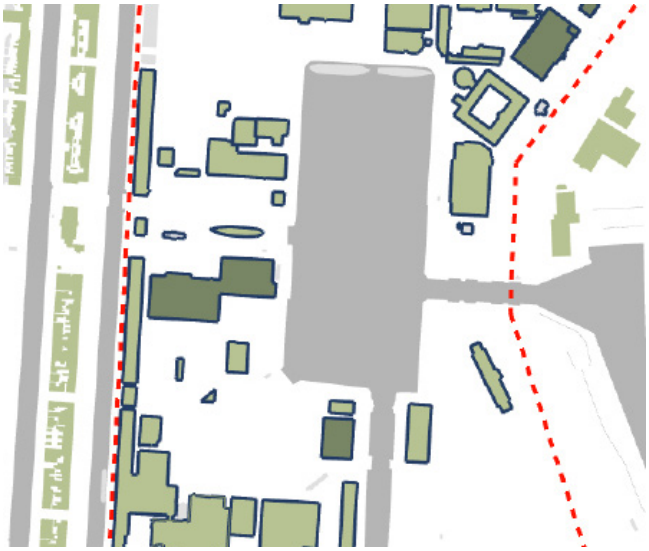
Figure 29. Case study analysis, public square dimensions and adjacent public corners (CadMapper, 2025. Elaborated by author)



1. Nordhavn, Copenhagen

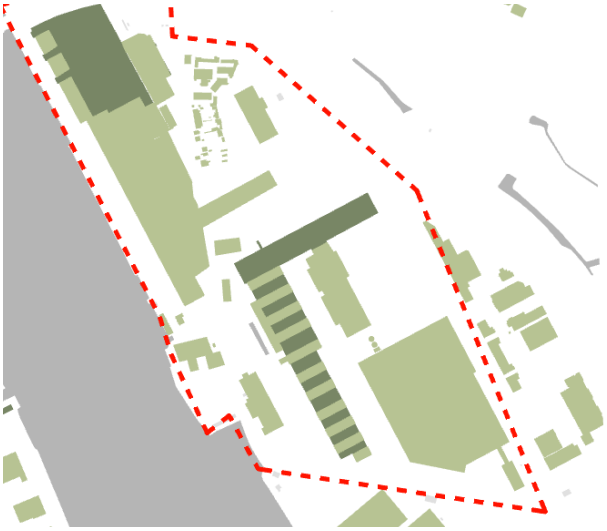


2. Kabeldistrict, Delft



3. Willemsoord, Den Helder

4. Meelfabriek, Leiden



5. Nedstaal, Alblasserdam

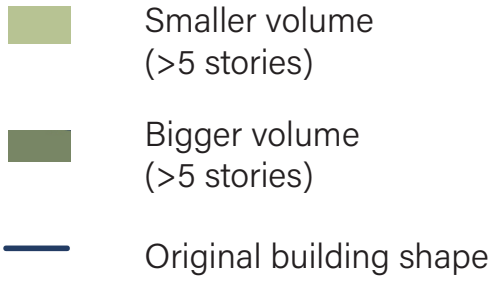
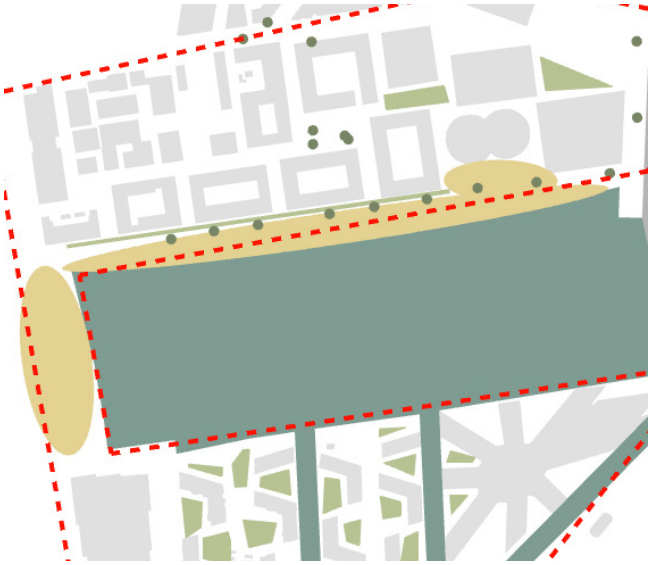
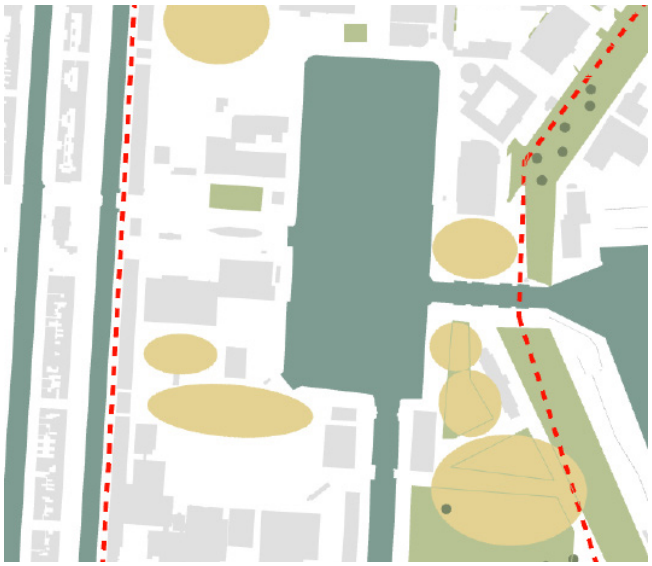


Figure 30. Case study analysis, building height and shapes (CadMapper, 2025. Elaborated by autho

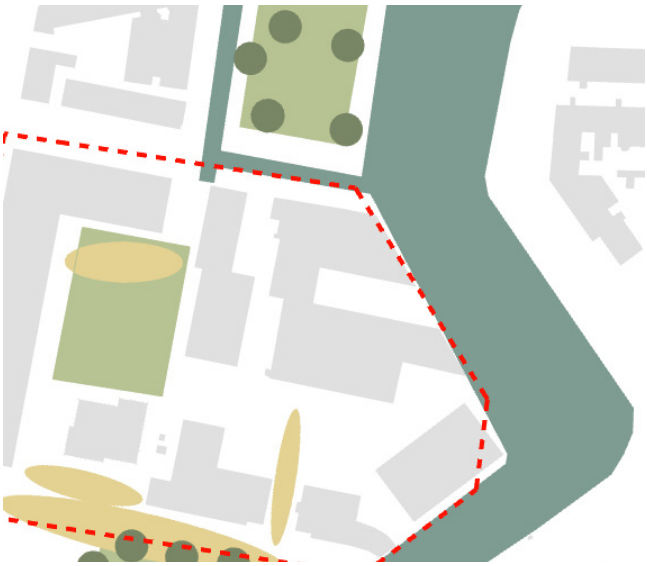


1. Nordhavn, Copenhagen

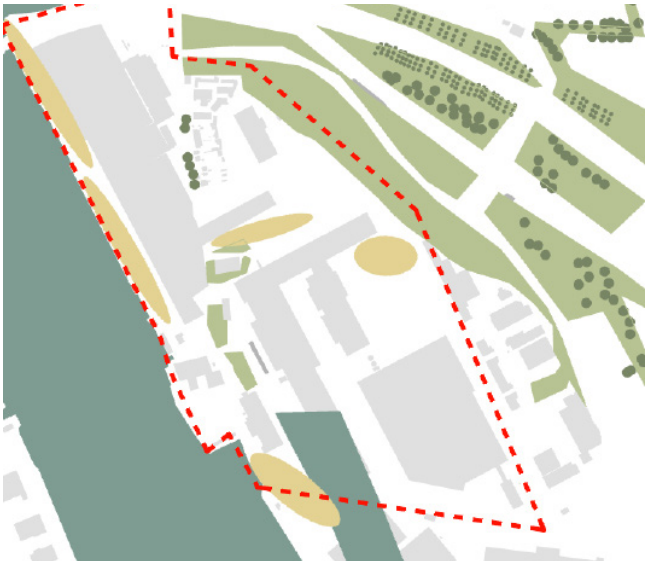
2. Kabeldistrict, Delft



3. Willemsoord, Den Helder

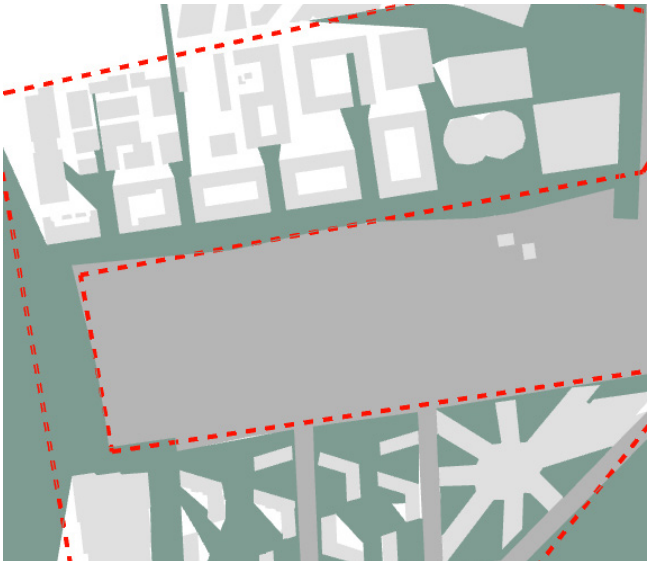


4. Meelfabriek, Leiden

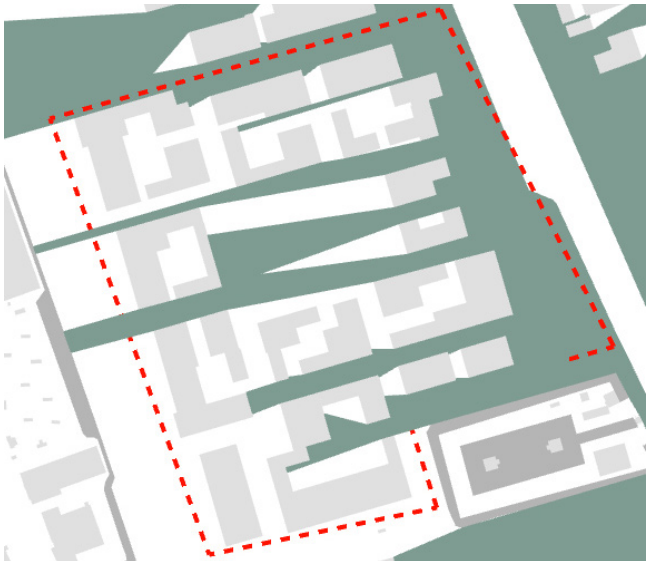


5. Nedstaal, Alblasserdam

Figure 31. Case study analysis, greenery and sun (CadMapper, 2025. Elaborated by author)

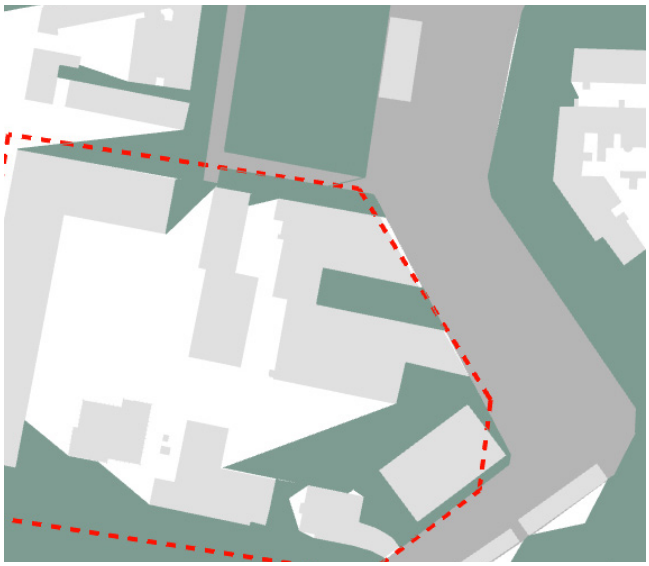


1. Nordhavn, Copenhagen



2. Kabeldistrict, Delft

3. Willemsoord, Den Helder



4. Meelfabriek, Leiden

5. Nedstaal, Alblasserdam

Figure 32. Case study analysis, sightlines to waterfront (CadMapper, 2025. Elaborated by author)