



Resilient Delta City

Designing integration of natural dynamics of Dutch river delta landscape as flood defence and climate adaptation measures within the urbanised delta city of Dordrecht

Timothy Djagiri - 4568700

Master Thesis

Chair of Landscape Architecture

Flowscapes Studio

Mentors:

Denise Piccinini

Fransje Hooimeijer

--This is an excerpt from graduation thesis report--

Summary

A landscape architecture graduation research-by-design project which looks into the urbanised river delta of the Netherlands facing the problematique of collision course of urbanisation process, water safety, and climate adaptation. This project seeks to design adaptive green and blue network for the city of Dordrecht in order to increase the city's resiliency towards climate change and to challenge the monofunctional and nonadaptive measures of water safety in Dutch river delta landscape as well as evoking new landscape qualities in the urban fabric of Dordrecht. This design project challenges the idea of building with nature and nature based solutions to seek balance between urban and nature through the design of a new landscape composition which presents the new perspective of living on the river and with the river.

Dordrecht represents the ongoing relationship of man and nature as a palimpsest of past processes and exchanges between the two. Here, the amalgamation of urbanisation and natural processes results in spatial separation of what is inside and outside the embanked landscape. Water safety infrastructure separates the two processes. To understand the landscape, lenses of landscape as palimpsest and landscape as process is used as main point of view of the research. Looking into practices of climate adaptation measures and case studies as well as landscape structures of the site, design framework is produced as the cornerstone of the design outcome.

The design solution seeks a balance of re-connecting the river dynamics of the rivers through the city of Dordrecht, which not only re-establish the river as part of the city, but also to develop new ecological values. The concept of "living on the river" guides the urban processes on the newly established riverscape, and the concept of "living with the river" provides open-endedness of the landscape with the dynamic of the river continuously shaping and reshaping the landscape overtime. This landscape redefines not only the urban processes, but the economic value, ecology and water safety as part of the adaptive system.



CONTENTS

Fascination

- I. Introduction
- II. Theoretical Framework
- III. Understanding the Landscape
- IV. Experimenting the Landscape
- V. Designing the Landscape
- VI. Reflecting the Landscape

References

VI. REFLECTING THE LANDSCAPE

The graduation studio “Flowscapes” and graduation project

The landscape architecture graduation studio Flowscapes focuses on research by design approach on the discourse of landscape as “carrier” of flows where flows of materials, energy, resources, and other components are accommodated, diverted, or enhanced through landscape architecture. The theme of “landscape as infrastructure” and “infrastructure as landscape” is discussed more specifically and is used as starting points for students to find his/her own interest in exploring particular issues. The self-defined graduation project looks through 4 possible lenses of landscape architecture; landscape as process, landscape as palimpsest, landscape as spatial-visual structure, and/or landscape as scale-continuum.

In this graduation project, I started my research-by-design process from the problematique of the non-adaptive water safety infrastructures in the Netherlands. What are seen to be technological marvel, man over nature, can no longer sustain the changing climate and uncertainty of the future. The awareness of this problematique evolves from my previous studies and more importantly from being and learning about such objects in my first year in the Netherlands. I spent most of my first months of the research to learn the logic and the system of Dutch water safety, in particular in the river delta, which in turn changed into never ending discoveries of new knowledge for the most part of the year.

As was mentioned, the project is self-defined and with help of my mentors, I can slowly piece together and shape my project throughout the year. Starting from own fascination is good to really explore our own take on issues, however, a well defined sub-studios within the graduation studio which grouping together students with similar interests can help in the early stages of the projects. Discussions, critiques, and feedbacks from conversation with my mentors has helped me substantially in the research-by-design process, to expand or narrow my focus and my approach. Furthermore, interest from the municipality of Dordrecht has brought me valuable insights on the matter at a hand.

The theme “landscape as infrastructure” in this research-by-design evolves into the exploration of re-connecting the natural dynamics within the embanked landscapes of Dordrecht and seeing the possibilities of spatial integration of urban and natural processes. The “new landscape” will, therefore, becomes “soft” water safety infrastructure to adapt the city to uncertain change.

Graduation project and developed methodology

In this graduation project, the chosen methodology is expanded based on the “Design-related research in landscape architecture” by TU Delft’s Steffen Nijhuis and Inge Bobbink. The methodology presented in the paper focused on the combination of design research (analytical precedent study) and research-by-design (design experiments and design outcome). However, in order to get into the design research process, it is necessary to shape and formulate research framework which in the case of this research is started with expanding three statements in relation to the Dutch river delta, and research of the logic and structures of underlying layers of history and processes.

Therefore, in this research, exploration of the problematique gives way to three starting statements which later shape and frame the necessary research to understand the landscape before starting the experimentation. In addition to desk studies, excursions to the site and discussions with urban planners, policy makers and hydrology engineer from the municipality of Dordrecht adds more insights and values to the research process. The advantage of this addition of prior research is to understand the possibilities and limitations as well as strength and weaknesses of the landscape. However, due to the complexity of the site as research subject, the issue is time available and expertise. Therefore, a few assumptions and logical decisions and considerations are taken.

The experimentation process starts with analysing precedent case studies in terms of its key design elements, drivers, and impacts to spatially and systematically. Later, the outcome of this case study analysis provides inspires design decisions on quick sketch designs. Key design principles based on these sketch designs starts the exploration design outcome. This method complements the preceding research and understanding of the landscape which influence later stages of design. While looking for possibilities of application of these principles, design framework is developed for the bigger scale of intervention. The design decisions are mostly based on the logic river morphodynamics, where its capability of sedimentation and erosion, and carrying ability of valuable ecology are used as the main driver and structuring element within the intervention to create adaptive new landscapes. In this later stages, the design and the research are intertwined in a back and forth “conversation” within the process which is an interesting part to be in.

In terms of collecting data, thanks to the open data from various organisations, such as the municipality of Dordrecht, Rijkswaterstaat, Hollandse Delta waterboard, DINOloket, as well as research repository access of TU Delft library, necessary information are available and accessible. The municipality of Dordrecht, especially through the Dordrecht Living Lab, more necessary information can be requested and obtained. The most challenging part is to process this expanse of information and narrow down to the ones valuable and necessary in the design process.

Graduation project and the societal context

The lowland landscape of the Netherlands is defined by its necessity of water safety with most of the country sits below sea level. In the past, these measures of water safety implements static control of landscape systems and processes. Measures were built at the expense of nature and ecology to maximise the anthropogenic utilisation of the landscape. In the case of the the Dutch river delta, the landscape has been diked, reclaimed, and regulated in order to cultivate the peat and alluvial sediment landscapes over the most part of the millenia, with systematic reclamation and poldering started as early as 800 AD. In turn, these measures limits the dynamic qualities of the river landscape and losing the “room” for the river to “hurdle” as it flows towards the sea.

Today, as the processes of urbanisation grow in the economically valuable delta landscapes, the measures of water safety can no longer be separated. Adding to this, is the accelerated rate of climate change which ask for a new developments which combine measures of flood defence & water safety, urban development, and address both environmental and economic issues. This has been an issue that the people and the municipality of Dordrecht is addressing as they organised collaborations, research labs, and workshops which I am priviledged to be involved. In particular, the loss of the “feeling” of being a river city with lack of spatial connections and orientations towards the river further inland as the landscapes are highly structured and rationalised. Issues of climate adaptation towards extreme river water conditions as well as cloudburst flooding shape the agenda of the green and blue planning of the municipality.

Paradigm change of building with nature and nature based solutions over the past four decades, notably with the Room for the River projects, has brought different perspectives towards a more balanced developments which seek balance of anthropogenic programming and the natural processes. However, the issue remains clear that these measures are limited to applied into the rural landscape and integrated into agriculture. This research-by-design project builds up on and expands these new paradigm with exploring the balance of creating adaptive, resilient, and open-ended landscapes with the principles of urban processes.

The design outcome of this project “invites” the dynamics of the river inside the embankments or Dordrecht as new green and blue network which brings fort the landscape qualities of the river landscapes closer to the urban structures of the city as well as increase the city’s adaptivity towards extreme conditions. It will become new destination for recreation and conservation as it establishes creeks, marshes, and woodlands that connects the existing fresh water tidal landscapes of the Dordtse Biesbosch. By allowing the natural dynamics to have room and to slowly shape the landscape, the design is open-ended and highly resilient towards the uncertain changes with respect to new way of “living on the river.”

Ethical issues and dilemmas

Whilst expanding from the paramount necessity of integration of water safety, climate adaptation, and urban delta developments today, the design soultion in this research-by-design project provides radical solutions for new and adaptive landscapes. It seeks large scale intervention and space availability. Here, the solution is to transform the existing low-lying polders to be de-poldered and exposed to the open water of the river landscape. Therefore, in the design solution it is decided to sacrifice agricultural polders in favour of safety and ecology.

From a landscape point of view, the this is justifiable through re-structuring and depoldering subsiding landscapes with high risk of flooding, high ground water condition, and high seepage condition which needs high maintenance and regulation to keep it productive. The landscape is vulnerable to extreme conditions as well as the growing urbanisation from the suburbs nearby. This approach asks for farmers and owners of the agricultural polders to move their businesses and income elsewhere which will bring the moral and ethical dilemma of implementing the new design. Similar issue has been experienced in the neighbouring de-poldering project of the Noordward polders which needed 10 years of negotiations, and a number of protests.

In this research-by-design, however, the intervention will come in different phases over the course of a century. During this 100-year implementation period, it is assumed with a scenario that the climate adaptation agenda has become high national importance due to the accelerated rate of climate change. Increase in sea level, and discharge of the rivers, as well as increasing high costs to maintain subsiding polders, farmers would cooperate to “give up” their land for the continuity and resiliency of the city of Dordrecht overall. The landscape will then shift the economic value of the previously agricultural landscape into real estate, recreation, nature conservation, and wetland and summer polder agriculture.

Overall, the new proposed design will ask for a shift in priority agenda within the embanked urbanised river delta towards higher safety against climate change and open-endedness. Although it will be a slow transformation as was mentioned and suggesting a more top-down approach due to its necessary scale, in order to solve the moral dilemma of such intervention, this design will require on-going communication between stakeholders. To make people aware of the project and the long-term benefit of it would be an important aspect in successfully implementing such approach. Design in this scale requires an open-ended design framework and principles so that the outcome will achieve the original design goals whilst details of the implementation and structures can be altered overtime. Therefore, it is worth to promote a dicussion in regards to new adaptive landscape, indeed needs adaptive attitude of the people as well.