Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	**Christel Diana Voncken**
Student number	5653118

Studio		
Name / Theme	Metropolitan Ecologies of Places	
Main mentor	Luca Iuorio	Environmental Technology and Design
Second mentor	Laura Cipriani	Landscape Architecture
Argumentation of choice of the studio	The studio Metropolitan Ecologies of Places focuses on socio-economic and ecological transitions, centring on the relationship between designed spaces and life itself. Within this studio, there are three key approaches: designing places, designing space and life, and designing processes. In my thesis, I reimagine flood defences to challenge the current coastal design paradigm and rethink prevailing flood management strategies that have entrenched the existing urban form. I aim to explore how this shift in flood management approach will unfold as a process, alongside the spaces and organisational structures that need to be designed to facilitate this transformation across various layers of values and systems of coastal management. By employing scenario thinking and systematic analysis, I will highlight both the limitations and potentials inherent in the existing framework and envision a new direction. The results from the scenarios will demonstrate tidal- and climate-responsive urban forms and landscape systems, which can inform the creation of a climate-adaptive strategy for the Scheldt Estuary, looking towards 2100 and establishing guiding principles for the future. This approach not only addresses immediate concerns related to flood management but also fosters a deeper understanding of the interconnectedness between ecosystem health and community well-being in a delta region.	

Graduation project	
Title of the graduation project	**Facing the Tide**
Goal	
Location:	Scheldt Estuary
The posed problem,	The quote “God created the world. The Dutch created the Netherlands” highlights the Dutch people's remarkable ability to reclaim and transform landscapes. The Scheldt Estuary is a perfect example of this transformation. What was once where marshes with fragmented islets has been reshaped into larger islands that now support urbanisation, intensive agriculture, and international ports (Meyer et al., 2015). As a result, the region has been a driver of economic growth and prosperity. However, the natural system has been altered to suit human needs, functioning more like a mechanical system. This has created the illusion that rivers and deltas can be controlled and streamlined like industrial machines—an illusion now crumbling in the face of climate change (Meyer et al., 2022). **[A] Mechanisation of the Delta** The method of flood risk management in the delta has diminished the resilience of the natural system by introducing hard coastal dikes. These may protect reclaimed land from the sea but also remove the delta’s natural capacity to adapt and grow with rising sea levels. The mechanisation of the delta into a production landscape has prevented natural systems from sustaining their nutrient cycles by reducing habitat variation and tidal movements (Meyer et al., 2022). **[B] Ill-Preparedness of Settlement** The conditions created by flood defences have supported a landscape design that is static and mono-functional (White, 2010). Settlements and industries have been shaped by these mechanised conditions, leaving them ill-equipped to handle flooding events. The changing climate now poses significant challenges to these vulnerable traditional settlements and their water defences (Veerbeek et al., 2012). **[C] Coastal squeeze and the Scheldt Estuary** Coastal dikes face "coastal squeeze," caused by rising sea levels and erosion, increasing the risk of dike failure (Doody, 2004; Berendse et al., 2015). Erosion is worsened by declining biodiversity, weakening soil integrity as fewer plant roots hold the soil together (Berendse et al., 2015; Sharma & Birman, 2024). More frequent droughts also weaken dikes and increase salinisation risks (Ritzema & Van Loon-Steensma, 2017). Rising sea levels will drive demand for sand, gravel, and clay to strengthen dikes, but these resources are becoming scarce, and their extraction harms marine ecosystems (De Groot, 1979; Phua et al., 2002). This threat is particularly urgent in the Scheldt Estuary, where tidal movements can vary by up to 5 meters due to its direct connection to the sea (Depreiter et al., 2014), and the flood defences are not as extensive as in densely populated areas like Rotterdam (Kok et al., 2017).

	Paradigm Shift in Coastal Management Despite a growing shift from static to dynamic coastal management (Brand et al., 2014), flood risk management remains heavily focused on flood prevention (Wesselink et al., 2007; Kok et al., 2017), relying on scarce resources while avoiding the greater challenge posed by climate change. The emerging field of Delta Urbanism seeks to change this approach, advocating for a more 'Darwinian' strategy that emphasises the evolutionary nature of delta regions. It promotes adaptability, rather than prevention, as the primary survival strategy (Meyer, 2020). This approach suggests a shift from flood prevention to living with the tide, representing the next step in coastal management—from dynamically building with nature to fully coexisting with it. **Living with the delta** The aim of this thesis is to challenge the prevailing perspectives on flood risk management that have "locked in" landscape design and coastal management practices in the Netherlands (Van Buuren et al., 2016). By re-imagining the existing flood defences in the Scheldt Estuary, this study seeks to offer insights into an alternative approach inspired by Delta Urbanism and Evolutionary Resilience. This research will demonstrate how to restore the natural resilience of the delta system, explore the potential for human and non-human symbiosis in landscape design, and assess the potential of this approach to enhance local preparedness and reintroduce sensitivity into design solutions. **Problem statement:** The current flood management approach is unsustainable in the face of climate change and rising sea levels. [A] The mechanisation of the coast has hindered the Estuary's natural ability to adapt and grow with the changing climate conditions and sea level. [B] This transformation has stabilised the landscape and encouraged the development of static, monofunctional spaces disconnected from their environment. [C] Consequently, settlements are ill-equipped to tolerate flooding, and a dike breach could result in catastrophic damage to both people and the environment. These challenges indicate a growing need for [D] a paradigm shift in coastal management. This moving from the locked-in flood prevention measures to a more [E] responsive and adaptive approach that advocates coexistence between human and non-human processes.
research questions and	RQ: How can (1,2) the re-imagining of existing flood management in the Scheldt Estuary (3) inform landscape design enhancing deltaic and climate adaptivity and (4) promotes symbiosis between human and non-human ecosystems? SRQ 1: What are the historical and social precedents that need to be redefined in rewriting the Dutch flood risk management paradigm? SRQ 2: What deltaic conditions arise in the Scheldt Estuary when the flood defences are deactivated?

	SRQ 3: What are the landscape designs in which different forms of flooding events in the delta can be reframed from a risk to an opportunity? SRQ 4: Which strategies will accommodate deltaic conditions in the Scheldt Estuary while realising a symbiosis between human and non-human systems?
design assignment in which these result.	**The Project Aim** The aim of this research is to challenge the prevailing perspectives on flood risk management that have "locked in" landscape design and management practices in the Netherlands. By re-imagining existing flood management in the Scheldt Estuary, this study seeks to offer insights into alternative approaches to flood management and urban forms, inspired by Delta Urbanism and Evolutionary Resilience. By exploring these alternative directions, the project aims to advocate for synergies between human and non-human processes, emphasising the potential of reconnecting with our environment for both urban flood resilience and the regeneration of socio-ecological systems. **The Project Outcomes and Products** Each of the four sub-research questions guides the process, helping to achieve the set trajectory, complexity, and planning of this project. The outcomes resulting from the research questions and their products are listed below. At the bottom is a framework that shows how the research results are interrelated, the scale at which they are approached, and the methods used. SRQ 1: A geosynthesis as the critical justification to shift away from the current flood management system, through showcasing the limits and risks of the conflicting landscape dynamics. 1. Timeline and map reclamation of the Scheldt landscape. 2. Map relating the estuary to the basin and its influences. 3. Maps indicating the flood response of the region. 4. Maps and section of flood management influence on urbanity. 5. Maps different subsystems and their conflicting processes. SRQ 2-3: A strategic framework at a macro scale to coexist with the deltaic conditions in the Estuary. 6. Narrative of the Scheldt Estuary through the lens of the inhabitants which can be connected to landscape tiles or sites. 7. Geomorphological and hydrological layers for the base map. 8. Meteorological and climate data projected in space for the base map. 9. Deltaic condition base map for scenarios and strategy. SRQ 3-4: Site interventions at macro and meso scales enhance the response-ability of the estuary by composing and decomposing subsystems..

10. Scenario's Tidal Urbanism in section and map.

11. Design principles of delta tidal urbanism through tiles.

SRQ 3-4: Proposal for a form of landscape design that re-imagines flood management transform flooding to a potential, to harmonises human and non-human processes.

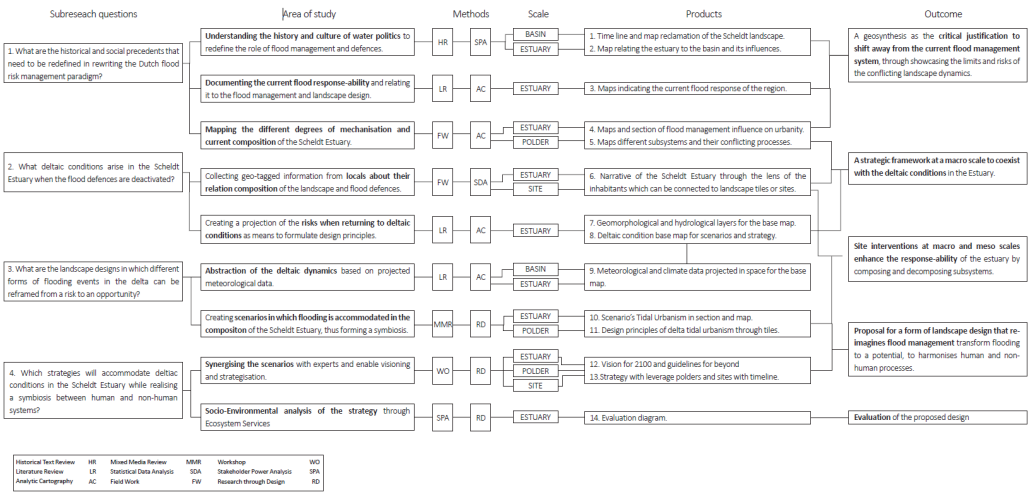
12. Vision for 2100 and guidelines for beyond.

13. Strategy with leverage polders and sites with timeline.

SRQ 4: Evaluation of the proposed design

14. Evaluation diagram.

5.1 RESEARCH FRAMEWORK



Process

Method description

To gather the necessary information, various methods will be employed. Initially, to understand the history and culture of water politics, historical and spatial power analyses will be conducted. Analytical cartography and fieldwork will be utilised to map the varying degrees of urbanisation and mechanisation in the region. These methods will also provide insights into the relationship between urban form and flood management practices. The vulnerability of the estuary's spatial organisation will be documented through literature reviews and analytical cartography. These resources will help identify areas that may have been neglected in current flood management strategies or that could present risks under altered management practices.

Qualitative data will be collected through informal interviews with local inhabitants. During multiple field trips to the region, I aim to engage with locals and explore their relationships with, and perspectives on, the landscape and flood management practices. By geo-tagging these conversations, it will be possible to connect the results to specific locations. Certain landscapes may evoke distinct responses, offering valuable local perspectives to inform a regional project.

To establish a framework for scenarios and strategy development, I intend to produce a deltaic conditions map. This map will form the foundation for research-by-design, illustrating the landscape that emerges when flood defences are deactivated and highlighting the deltaic conditions that design interventions must address. It will incorporate geomorphological, hydrological, bio-physical, and climate-meteorological themes. The map will be created using analytical cartography and literature to model potential flow and climate patterns. Additionally, it will identify risks and conflicts associated with reintroducing tidal landscapes.

The scenarios and design principles will visualise cross-scale approaches to flood management that accommodate tidal and other deltaic conditions. To inform potential directions, a mixed media review will be conducted. This will examine global projects with comparable design principles, alongside unconventional sources of inspiration such as art and video games. Together with the deltaic base map, these insights will serve as a foundation for experimentation and sketching. Research-by-design will be employed to formulate potential future directions for the estuary.

Before reaching the P3 milestone, I aim to involve stakeholders such as municipalities, provincial authorities, water boards, and local research institutions in discussions of the scenarios. A workshop will be organised to encourage participants to share their knowledge, perspectives, and feedback on the scenarios. Their input will help identify the limits and potentials of the proposed designs while fostering greater awareness of their values and relationships with the landscape.

With refined scenarios and design guidelines, I will develop a strategy for the Scheldt Estuary in 2100 and beyond. This will involve experimenting with scenario combinations and integrating systems through the design principles. The outcome will include a regional strategy map, highlighting leverage points, polders, and specific sites, alongside a timeline for phasing the transition with strategic milestones.

To conclude and reflect on the design, I will conduct a socio-environmental analysis. The strategy will be evaluated based on the availability and accessibility of ecosystem services. This analysis will be supported by spatial power assessments and mapping the distribution of resources.

Literature and general practical references

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Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

In my thesis project, I challenge prevailing perspectives on flood management, thereby questioning one of the most prominent elements shaping Dutch urban planning and design. This project opposes conventional approaches to regional development and emphasises the need for systemic change in framing the identity and cultural evolution of the Netherlands. By reconsidering reliance on dikes, which aim to control water and shield us from confronting the realities of sea-level rise, I explore alternative pathways. These alternatives highlight opportunities and potential, as well as the principles that must be relinquished. The proposed approach to flood management acts as a catalyst for new forms of urban living and spatial configurations.

Metropolitan Ecologies of Places (MEPS) serves as a platform for exploring systemic transformation. The studio encourages participants to translate theory into practice, spanning across scales and dimensions of space and time. A cross-scalar and holistic approach lies at the core of the studio's

philosophy. In my project, this approach examines the relationship between urban form and flood management. Embracing flooding as part of the landscape would necessitate not only new modes of living but also water-tolerant industries and mobility systems. For instance, elevated pathways might become essential, altering our interactions with the environment due to the increased distance between streets and the ground. A single variable change within a system can trigger a domino effect across the whole. MEPS provides the framework for investigating this transformative process.

My project integrates research, design, and governance. The theoretical foundation of my research necessitates the collection and translation of data through analytical cartography to render the topic tangible. The variables identified through this process form the basis for experimentation and research-by-design. It is through iterative testing and reframing that new insights and understandings of contemporary living emerge. The complexity of systems, the dynamic interplay of socio-ecological flows, and the urgency of climate challenges make my topic particularly relevant to urbanism. It combines knowledge-driven inquiry with design-oriented solutions.
Through fieldwork and workshops, I aim to incorporate qualitative data into the project. Engagement with local communities and governmental organisations provides fresh perspectives alongside specific and contextual information. This is essential for integrating human and cultural dimensions into the work.

The master's programme equips us with an understanding of existing systems and their origins while providing the tools to shape the future of our environment. In my thesis, I strive to comprehend the intricacies of flood management systems, their shortcomings, and their potential. The next step is to envision and articulate potential futures that are sustainable, equitable, and honest about the sacrifices that may be required.

2. What is the relevance of your graduation work in the larger social, professional and scientific framework.

The project addresses multiple areas of significance. Firstly, it examines the Dutch approach to landscaping, which prioritises controlling natural systems rather than working in harmony with them. This approach seeks to minimise uncertainties to the greatest extent possible, yet fails to adequately address how to cope when unforeseen events occur. For example, instead of accommodating regular, minor flooding events that cause manageable inconveniences, the system aims to create a scenario where there is only a 1:300,000 chance of a flood. However, if such an event does occur, it is likely to result in a catastrophic disaster. This mindset transforms flooding—a natural phenomenon—into a potentially devastating event.

When flooding does occur, it is most likely to affect rural or peri-urban areas. Flood defences are typically designed based on the socio-economic value of a location, meaning that 'low value' areas are at a greater risk of being affected. These areas often lack the resources, mobility, and safe spaces for evacuation that larger metropolitan regions possess. This raises important questions of social justice. The fact that an individual resides in a rural area should not imply a reduced entitlement to flood prevention measures. While it may be economically rational to calibrate flood defence thresholds according to the value of an area, it is ethically problematic not to adequately prepare these settlements and their inhabitants for the heightened risks they face.

Finally, the project provides insights into landscape designs that facilitate ecological remediation of polluted areas while also enhancing climate resilience on a regional scale. The mechanisation of the Netherlands has exerted significant pressure on its biodiversity and its capacity to adapt to changing climatic conditions. This project seeks to inform landscape design practices that are responsive to deltaic dynamics and adaptive to climate challenges, reimagining flood management in the Netherlands to align with these objectives.