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	Xinjian Jiang
Student number	5527228

Studio		
Name / Theme	Water Landscape of Crisis & Hope	
Main mentor	Laura Cipriani	Landscape architecture
Second mentor	Peter Herman	Ecological Hydraulic Engineering
Argumentation of choice of the studio	There are two main reasons for choosing the WL Lab. The first reason is my interest in learning the large-scale design approach and exploring how to match the top-down territory design principles with the small-scale design method. In this lab, we will learn how to use the cross-scale approach to push our design. Another reason is the attractive site of this lab, the Wadden Sea. It faces many challenges, such as climate change, energy transition, and habitat loss, but also a place with hope and unique value. Therefore, I would like to learn more about this land.	

Graduation project	
Title of the graduation project	Unpaving Nature - Restoring Balance Between Nature and Infrastructure in the Wadden Sea
Goal	
Location:	Wadden Sea
The posed problem,	The main problem is the conflict between human infrastructure development and nature conservation in the Wadden Sea and the North Sea area in the context of climate change. The problem can be divided into three themes: climate change, habitat loss, and human activities. These three themes are closely related and influence each other, and they all significantly impact the site's sustainability. **Climate Change** Past and, to some extent, present interference with the natural dynamics of the Wadden Sea system means that it has lost much of its resilience and flexibility to adapt to the

	impacts of climate change, including rising sea levels, temperature change, and natural disasters including the flooding of sandbanks and salt marshes, all of which is already occurring. Climate change, and in particular the associated sea level and temperature rise, is considered the biggest threat to the Wadden Sea in the long term, with the potential to have a severe impact, potentially up to the destruction of the key values of the World Heritage site (Heron et al. 2020). **Habitat Loss** Although there is no indication of significant change in species richness in the Wadden Sea area, critical subtidal habitats such as Sabellaria reefs, mussel banks, and seagrass banks continue to be missing almost wholly, just as fishes such as rays, small sharks, and seahorses are missing. There needs to be more comprehensive data on beach and dune systems, but there are indications that this ecosystem is under pressure. Some salt marshes, particularly on the mainland coast, are in a rather bad shape, in particular, due to heavy coastal engineering impacts such as robust drainage systems. Restoration projects are required for those sites as part of the daily management of the competent authorities, which can increase species richness and return to a more natural state. **Human Activities** Various human activities are taking place in the Wadden Sea area, such as fishing, shipping, and construction of wind farms, etc. They all have different degrees of impact on the ecosystem of the Wadden Sea. As for fishing, the site contains many essential fisheries, the most prominent of which are blue mussel and brown shrimp, with the cockle fisheries having been significant in the past. A legacy of the bottom-dredging fishery (the mechanical Dutch cockle fishery in particular) has destroyed biodiversity-rich communities, including the disappearance of the intertidal mussel beds in some areas of the site (Ens et al., 2004). The area of mudflats containing sufficient shellfish for feeding knots decreased by fifty-five percent between 1996 and 2005. During the same period, knot numbers decreased by forty-two percent (Kraan et al., 2009), and was also attributed to the loss of 15,000 oystercatchers (Ens et al., 2004). The shrimp fishery, which has been increasing for

	many years, is also responsible for a significant bycatch of young fish, young shrimp, and other invertebrates. It is also a possible reason for some fish species with slow growth (rays and sharks) and reef-building animals, such as Sabellaria, having disappeared in the Wadden Sea (IUCN Consultation, 2017). As for shipping, international and smaller ports and harbors directly adjacent to the World Heritage site and shipping lines close to and through the site open up a threat of maritime pollution. Furthermore, the deepening of the navigation channels also impacts the site, which should be kept as small as possible. Due to intensive wind farm development in the North Sea outside the Wadden Sea, there is an increase in the risk of shipping accidents which would then impact the site. Industrial plants, such as power or chemical plants, are close to the site in some areas. As for wind farm construction, no new wind turbines are allowed within the World Heritage site, although a barrier of offshore wind farms is present and being further developed outside of the site. In a few cases, the wind farms are even quite close. Submarine cables to the wind farms are also placed within the site. Due to the dynamic nature of the area, there is the risk that frequent repair will be required, causing additional impact. All in all, the region around the Wadden Sea can provide large amounts of renewable energy. However, it is essential to do this with careful planning, respecting all the natural values, and preserving the landscape integrity (WWF, 2012).
research questions and	How to balance the human infrastructure development and nature conservation in the Wadden Sea and North Sea area in the context of climate change? Sub research question: - How to lower the impact of offshore wind farms and their cables on the seabed habitat. - How to design integrated wind farms including production, nature-inclusivity, circularity(resources and nutrients) and climate resilience. - Explore the possible ecological use of abandoned offshore platforms. - How to reduce the impact of climate change on the ecology of the Wadden Sea during the process of building the integrated wind farms and protecting seabed habitats.

design assignment in which these result.	The design assignment will focus on how the ecosystem and natural habitat in the Wadden Sea and the surrounding North Sea area can be protected in the face of climate change and sea level rise, especially under the threat of increasing human activity. The result of this design assignment will be as follows: - An analysis of various infrastructure construction and natural condition of the Wadden Sea area and the relationship between nature and these human activities. - A series of multi-scale strategies based on the research to balance human activities and nature in the threat of climate change. - A vision for the Wadden Sea development on habitat protection and economic development. - Specific site design of a chosen area translating the territory design principles to a site-specific scale.

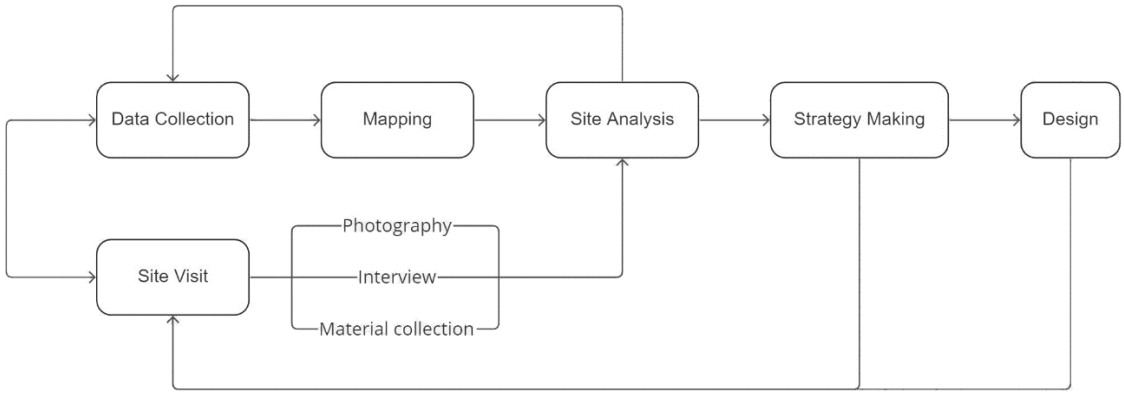
[This should be formulated in such a way that the graduation project can answer these questions.
The definition of the problem has to be significant to a clearly defined area of research and design.]

Process

Method description

This project will adopt the research-by-design method in which the design is taken as a research strategy for approaching the challenges in the Wadden Sea.

- Collecting all kinds of resources including GIS date, historical maps, photographs and regulations to analyze, synthesize and identify the infrastructure construction process and ecosystem of the Wadden Sea, which act as a basis for the design.
- Mapping the selected data in different layers, such as natural elements, infrastructures, Natural 2000 areas, to better understand the site will contribute to building up the research interest and design proposal.
- Site visit to Friesland.
- Talking with Stephan Smeijers, the landscape and spatial quality consultant of Friesland.
- Drawing tables and diagrams of different topic to better understand the landscape process of the site.
- Making different scenarios to support the decision-making processes in issues with high uncertainty.
- Making territorial strategies and detailed strategies according to them.
- Making a series of drawing from regional scale to site-specific-scale to show the design principles.



Literature and general practical reference

[The literature (theories or research data) and general practical experience/precedent you intend to consult.]

Data and maps:
European Marine Observation and Data Network (EMODnet)
https://emodnet.ec.europa.eu/en
Data and Information on the Dutch Subsurface (DINOloket)
https://www.dinoloket.nl/en
GeoSeaPortal
https://www.bsh.de/EN/DATA/GeoSeaPortal/geoseaportal_node.html
National georegister
https://www.nationaalgeoregister.nl/geonetwork/srv/eng/catalog.search#/home
Dutch Offshore Wind Atlas
https://www.dutchoffshorewindatlas.nl/
Public Services on the Map
https://www.pdok.nl/
Open Infrastructure Map
https://openinframap.org/

Papers and reports:
Wadden Sea Quality Status Report
https://qsr.waddensea-worldheritage.org/
Out of the Blue: The Value of Seagrasses to the Environment and to People
https://www.grida.no/publications/479
RWS_Lichtkogel_2020-2_Seaweed
https://www.northseafarmers.org/public/media/RWS_Lichtkogel_2020-2_Seaweed.pdf
Wadden Sea - 2020 Conservation Outlook Assessment
https://worldheritageoutlook.iucn.org/node/1110/pdf?year=2020

Websites:
Wadden Academy

https://www.waddenacademy.com/
Wadden Sea world heritage
https://waddensea-worldheritage.org/
Niedersachsen
https://www.niedersachsen.de/startseite/
Offshore Wind Energy-Wageningen University & Research
https://www.wur.nl/en/research-results/research-institutes/marine-research/themes/offshore-wind-energy.htm

Books:
Koppen, H. (2017). Friesland Vandaag.
Ruyter, P. (2020). Vloeiend Landschap. Over de toekomst van het Friese landschap.
Provinsje fryslân. (2014). Grutsk op 'e Romte! Structuurvisie 2014.
Barends, S. et al. (2005). Het Nederlands landschap. Een historisch-geografische benadering.
Steenbergen, C. (2008). Ontwerpen met Landschap. De tekening als vorm van onderzoek.
AMO, 2020. Countryside, A Report.
Lemaire, T. (1970). Filosofie van het landschap.

Reference projects:
Plan de Paysage sous-marin du Parc national des Calanques - Coloco
Oyster-tecture - SCAPE Landscape Architecture

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)?

   This project is part of the Water Landscape of Crisis & Hope Lab in the Flowscape studio as the graduation studio of the MSc Landscape Architecture. The Flowscape studio focuses on integrating spatial design with the landscape processes, the continuation of spatial quality, and the cultural identity of the landscape. The studio specifically discussed 'infrastructure as landscape' and 'landscape as infrastructure', in which the research project addresses regional and small interventions interrelating and being part of the territorial transformation processes. While my graduation topic is to bridge the gap between human infrastructure development and nature conservation in the Wadden Sea and North Sea area in the context of climate change balancing the pursuit of nature and social economic interests and strengthening the site's resilience.

   The Master's Program in the Landscape Architecture track trained students in systematic thinking, ecological design, and cultural literacy to provide a holistic approach to protecting and enhancing the living environment. The track teaches students to transform and create compositions 'through' scale, time, and as a process through critical academic research. My graduation project will be on multiple scales and involve a phasing design plan, taking into account cultural,

ecological, social, and economic conditions. Particularly, the design will also show the intersection between engineering ecology, and landscape to create a system of integrated infrastructure development and ecology protection.

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

   The research and design strategy will be a contribution of new knowledge to the fields of society, landscape architecture and science, providing a new perspective for addressing climate, ecological and social issues in the Wadden Sea. 'Research by design ' is a powerful research approach in which complex issues can be resolved by spatial design. The research methodology with site specificity and complexity, is a collection of related knowledge that can be applied to other similar projects worldwide. The design proposal itself may also be applicable to other sites with similar conditions and issues. In addition, the research responds to the needs of society and the environmental challenges. The project explores the spatial, societal, and environmental issues through design research and made design proposals addressing the above issues. Besides, the professional field of landscape architecture has diversified from working multi-disciplinary to preparing strategies within legal frameworks, advising on policymaking, and master planning for development and regeneration schemes. My graduation project is an integration with the landscape, ecology, and engineering disciplines.