

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examcommissie-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	Samuel van Engelshoven	
Student number	4589580	
Studio		
Name / Theme	Transitional Territories / Inland – Seaward. The form of time and the politics of space.	
Main mentor	Ir. Leo van den Burg	Urbanism (section of Urban Design)
Second mentor	Denise Piccinini	Urbanism (section of Landscape Architecture)
Argumentation of choice of the studio	<p>Motivation: Climate mitigation and adaptation by innovative nature-based solutions is my main interest. Pollution in every aspect should be stopped to create a healthy and livable world in which the natural systems can flourish once again. I want to bring together my adoration for the natural landscape and livable cities.</p> <p>Direction: There are two directions within this interest that I would like to follow, the first (second direction for second choice of studio) is the regional scale in which is dealt with water related issues in communities, circular flows, and the revival of the natural systems.</p> <p>Goal: The products I'm striving for is a research that leads to a regional vision with local strategic projects.</p> <p>How this studio could help me fulfill this: I believe this studio offers a fresh look on how the post-accumulation world looks like with a focus on water/nature-based design. As I grew up and still partly live next to a downstream part of the Rhine, the Rhine basin is a very appealing location to work on. Especially in the light of the recent floods at the upstream part of the river.</p>	

Graduation project	
Title of the graduation project	Symbiotic Waterscapes. Interdependent water management in the urbanized and cultivated landscape of the Rhine basin.
Goal	
Location:	Northern Upper Rhine Valley
The posed problem,	<p>Problem statement summarized version:</p> <p>The common paradigm on flood prevention is based on fear for water. We protect ourselves by designs which are based on this fear. However, this is not a sustainable solution for floods. We cannot keep strengthening our dykes forever. Therefore, designing from a fresh perspective is necessary. A perspective in which socio-ecological symbiosis is central to make us live in harmony with the water. Secondly, downstream communities are highly dependent on how water is managed upstream. There are multiple problematic types of water management that can increase floods and pollution downstream.</p> <p>Problem statement long version:</p> <p>General introduction to the sustainability crisis</p> <p>Planet Earth is enduring a tumultuous period from the perspective of its ecological system. Earth was going through a relatively balanced period of more than ten thousand years, called the Holocene. The circumstances were perfect for life to flourish, particularly human life, which was able to evolve into the species we are today through this balance. Recently a new geological epoch has manifested itself, the Anthropocene. There is still doubt on when this period began, but the truth is, it identifies the period in which humanity has made a significant impact on Earth's climate and ecosystems (National Geographic,</p>

2019). Humanity has impacted its home to such an extent that the balanced climate that made us thrive is gone. Unfortunately, our impact goes beyond that. The climate and ecosystems are affected to such a degree that it jeopardizes its ability to support human life and many other forms of life. This makes it a necessity to act, to keep Earth livable for humans and other organisms. Transforming a planet's environment to be habitable for humans is described as the act of terraforming.

The flooding problem of Rhine basin

In the past century, many engineering works have been done in the Rhine basin, most of which had the purpose of supporting economic growth, forgetting about any environmental concerns. This has caused the relationship between humans and the water to degrade. Due to human activity, the force of water has hurt us to an increasing extent. This has led for our relationship with water to be based on fear as we can see for example in the construction of dykes, which are made from the fear of flooding. Due to climate change extreme rainfall events will be more severe and happen more often. Our current paradigm tells us to heighten the dykes endlessly, this isn't a sustainable solution, we cannot keep going into this direction. It will cause a lot of pain for humans and their environment. Water is the essential element for life to be possible, we need water to sustain us and all other forms of life, now and in the future. To live with water in a sustainable matter, a new balance must be sought in the socio-

ecological relations in the Rhine basin. It is time for a new narrative in which we respect the water and natural processes (socio-ecological symbiosis) and make the basin a place for humans to thrive instead of a place that is making us fear. Water is a beautiful thing.

Specific problem

Floods are generated by two processes, melting snow and glaciers and rainfall. The process of melting is a relatively stable yearly re-occurring event. Nevertheless, this process is significantly altered by climate change. The amount and moments of snowfall are changing, the moment of large-scale melting is beginning at an earlier stage of spring, and glaciers lose more mass throughout the year due to higher average temperatures. These changes lead to two main focal points, timing and amount of melting-water discharge. The impact of melting-water of flooding primarily affects the main branch of the river Rhine. The main problem for this process is how to prevent this causing floods without being able to tackle the source of the problem. The second process, rainfall, is less predictable than melting water. Due to climate change, the total rainfall will increase in the Rhine basin, but the main problem is the increased occurrence of extreme rainfall events, leading to floods in the whole Rhine basin. Climate change is making this problem worse, but the source of this problem is not only of climatic nature. Land use, urban areas in flood plains, and anthropic elements in the river are all part of the source of the problem. In

July 2021, parts of the Rhine and Meuse basin were flooded due to extreme rainfall. Most damage was done in the middle stream of the river where most rain fell which caused dramatic flash floods. Downstream areas of the rivers were spared from flooding. However, rainfall in upstream and middle stream parts of the river could lead to floods downstream in the future. Downstream floods could happen if a larger part of the basin receives significant rainfall or the rainfall coincides with a peak of melting water. A stressing example are the floods of 1995 when extreme rainfall and some melting water caused extreme high-water levels downstream the Rhine and Meuse rivers. The Netherlands was on the verge of a disaster. Fortunately, dykes were able to keep the urban areas dry at most locations. But a worse flooding event could breach the dykes, a disaster that is becoming more likely due to climate change. Therefore, an intervention in the hydrological situation of the Rhine basin is necessary. Interventions in the elements which cause the problem, could lead to other problems, most important of which are food- and energy security. Therefore, any intervention needs a broad scope to reach an integral solution for the flooding problem.

Socio-ecological symbiosis

The limits of large-scale engineering projects are known. Theoretically, extensive engineering works could protect people from floods. However, this method has many drawbacks. Environmental concerns are the most prominent drawback; every

	<p>hard engineering work disturbs ecological habitats. Economic concerns are explained by the story of the little Dutch town of Valkenburg. Here a small river runs through the city center, which makes it a popular tourist destination. Engineering works would conflict with the tourist industry. Therefore, it is not preferred by many locals to engineer our way out of the flooding problem. Lastly, there is a socio-ecological problem. Increasingly large engineering works affect people's perspectives on water. These fear-based designs cause a break between people and the natural world. Therefore, a method that deals with these challenges in an integrated manner would lead to a more satisfactory result. This research proposes the method of socio-ecological symbiosis as a paradigm to manage flood risk. This method entails a system in which the symbiosis between humans and their environment is the starting point.</p>
<p>research questions and</p>	<p>Primary research question: How could floods and pollution downstream be prevented by upstream design interventions in the northern Upper Rhine Valley, based on methods in which socio-ecological symbiosis is central?</p> <p>Secondary research questions:</p> <ol style="list-style-type: none"> 1. How can upstream design interventions prevent pollution and floods downstream?

	<ol style="list-style-type: none"> 2. How can downstream hydrological consequences of upstream interventions be measured? 3. Which social-spatial alterations are needed in upstream communities, and how can communities upstream be persuaded to change their surroundings to aid downstream communities? 4. How do the flood and pollution prevention measures spatially represent themselves on a regional and local scale? 5. What are symbiotic socio-ecological water management methods, and what are their advantages? 6. How could the strategic masterplan be translated to other locations? 7. Why is the northern Upper Rhine Valley a location of interest for this research? 8. What synergistic water management approaches can be identified for the northern Upper Rhine Valley? 9. What are the limits of the proposed strategic masterplan?
<p>design assignment in which these result.</p>	<p>The design assignment is based on the hypothesis that design interventions in the cultivated and urban landscape on both a local and regional scale can reduce flood risk and pollution in downstream communities. As the symbiosis between humans and nature is at the project's core, the assignment can be defined as a design</p>

project in which nature-based solutions are essential to establish a sustainable equilibrium between the natural and human systems.

The analysis has brought forward three types of conflicts to research in further detail. The distinct types are explained below.

The natural flood plain and dykes

The Upper Rhine Valley has an extensive natural floodplain. Humans have taken away this natural flood plain by the construction of dykes close to the riverbed. Together with the rectification of the river, this means the river has lost a lot of space. Therefore water is forced to flow downstream faster with an increased discharge peak. This means the human interventions upstream have put pressure on the hydrological system downstream, thus endangering downstream communities. Giving more space to the river again could relieve some stress for downstream communities. The design assignment that follows from this is how to accommodate more water in space which is permanently used for cultivation or urbanization nowadays.

Land-use transformation

Land-use is an essential factor in the hydrological system. In the past much land has been transformed from forest to cultivation and urbanization. This has dramatically increased water run-off and decreased water infiltration. This means water is transported to the river faster; in the case of a heavy rainfall event, this leads to a higher peak of water discharge, and therefore the chance of a flood is higher. The design assignment is to discover alterations to the land to increase its water regulating capacity while acknowledging current and future demands for space.

Water-buffers

The northern Upper Rhine Valley is experiencing problems with floods and droughts. During droughts, there must be enough water reserves but during extreme wet periods space is needed to discharge abundant water. This brings forward the third design assignment; to make the valley more resilient to extreme hydrological circumstances.

Process**Method description**

There are multiple methods of research and design which differ depending per researched topic. The main methods are research by design, literature studies and spatial analysis.

The spatial analysis is conducted in the form of monographs. The central topics within the graduation studio Transitional Territories are the notions of accumulation and clearance. In the first set of monographs, accumulation is analyzed within four lines of inquiry: matter, topos, habitat, and geopolitics. Drawing upon this analysis, the notion of clearance is regarding projecting a future in which problematic accumulation has been cleared. This is again constructed from four lines of inquiry. This method has helped with the definition of the project and location.

Knowledge regarding the historic development of the Rhine is essential to understand how the river functions and how it has changed. Literature studies and studying historic maps are the prime tools for this research. Literature studies are also of great importance to understand general hydrological problems and methods to design with.

The predicted outcome of this project is a strategical masterplan, focusing on long-term developments. The methods to create is masterplan is research by design and literature studies. As the project is bound to a specific location, creating a positive feedback loop between research and design will help to implement theories into praxis. The goal of this strategic masterplan is not only to develop the specific site (northern Upper Rhine Valley), but additionally to make the strategy suitable to implement elsewhere.

Literature and general practical preference

Theories:

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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)?

The graduation project focuses on the question of how we live with water. The graduation studio Transitional Territories is researching the notions of accumulation and clearance within territories in crisis and transition. It holds a focus on riverine territories with a particular focus on the Rhine river basin. The project is nested within the studio by researching how multiple crises are affecting or changing the riverine territory. It is connected to the Urbanism master track as it involves the spatial representation of hydrology, the use of land, climate change, and policies. The urban might not be the primary territory researched in this project; nevertheless, traces of the urbanized world are found everywhere as most land serves the urban. The project is a spatial master-plan that projects a future in which humans live in symbiosis with the river and nature in general. It connects to MSc AUBS as the project is a projection of how people are related to space.

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

Social relevance

We are experiencing an enormous environmental crisis which is affecting how we live and work. The accumulation of damaging matter from the modern world is changing the planet. Climate change is just one of the consequences. The urbanized and cultivated landscapes in riverine territories are experiencing these problems at first hand, an example is the floods in the Rhine and Meuse in July 2021. Therefore, there is need for a changing understanding of how we live, work and use space in these territories. The project's goal is to reach sustainable water management with a focus on both water quantity and quality. It constitutes to the greater goal to let us and future generations live a comfortable and healthy life, without fear for floods, drought or pollution.

Professional relevance

There is much research on separate topics of the economic, energetic, hydrological and ecological aspects of rivers and also specifically for the Rhine. However, there is a lack of an integrative design approach in riverine development. Lacking integration in projects often leads to missed opportunities in the development of the riverine territory. Within the scope of the Master Thesis a complete integration of all these professional fields within the project is not possible. Nevertheless, by proposing an integrative, slightly idealist, design project, the discussion could be started how the integrative approach could be implemented more thoroughly in the professional field.

Scientific relevance

The expected outcome of the research is a strategic masterplan in which upstream interventions help to prevent flooding and pollution downstream. Additionally, a framework

will be proposed on how to implement this strategy elsewhere. This framework can be used by professionals or can be expanded or used in further research.