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	Jolt Wiersma
Student number	4719379

Studio		
Name / Theme	Design of the Urban Fabric	
Main mentor	Gerdy Verschuure-Stuip	Landscape Architecture
Second mentor	Leo van den Burg	Urbanism (Urban Design)
Argumentation of choice of the studio	I have a creative side and a technical side. On the one hand I enjoy telling stories and escaping into new worlds. On the other hand, I appreciate analytical insight and practical problem solving. I can combine these two personal characteristics in the Landscape Architecture design studio 'Design of the Urban Fabric'. Every landscape, including the urban landscape, has a culturally historical narrative that has shaped its form. The urban form is also shaped by the complex systems of infrastructure that cities functionally require. Within the field of Landscape Architecture, I am fascinated by how to integrate stories from cultural heritage with design of public space. In the studio "Design of the Urban Fabric" I can explore the principles attached to this concept.	

Graduation project	
Title of the graduation project	Title: Resilience flows beneath the city Topic (subtitle): The capacity of the historic canal system beneath Antwerp in spatially mediating the city's underground and aboveground space shortages so ensuring future environmental and social resilience.
Goal	
Location:	Antwerp (city center)
The posed problem,	In the future, cities will face urgent issues like climate change, an environmental challenge, and densification, a social challenge. Harsh

	summers and winters amidst climate change will contribute to unprecedented heat stress and flood risk. Over-crowding and over-renewal amidst densification will contribute to unprecedented public space strain and identity depreciation threat. There is a tendency for residual space in the urban fabric to take the role in addressing the challenges by means of introducing infrastructure systems underground and aboveground. By planting trees and buffering water, cities are introducing more green-blue systems underground. At the same time, by redeveloping nonspaces and preserving heritage, cities are introducing more place-memory systems aboveground. Nevertheless, the shortage of available space both underground and aboveground is triggering priority conflicts with other infrastructure systems. Since the urban underground and aboveground worlds are inherently interdependent, careful handling is needed. Cities must work toward infrastructure implementation for the future without impeding infrastructure functionality of the past. To ensure environmental and social resilience, the green, blue, place, and memory systems that exist from the past must be reappropriated. This provides an opportunistic framework for the mediation of the underground space shortage with the aboveground space shortage. The resulting spatial synthesis ultimately facilitates a larger infrastructural capacity in a smaller amount of space. Antwerp is a harbour city located in the Belgian province of Flanders along the Schelde river. This context has influenced the city's environmental and social stance throughout history. Antwerp is therefore seeing all four environmental and social challenges simultaneously: heat stress, flood risk, public space strain, and identity depreciation threat are all urgencies that are mentioned in local articles and evident in data (see analysis). Antwerp is combating these issues with underground green-blue systems as well as aboveground place-memory systems. Regardless, the responses are without integral success: there are spatial conflicts when trying to plant trees, buffer water, redevelop nonspaces, and preserve heritage (see analysis). Nevertheless, an investigation of the historic development of Antwerp reveals that the city has an unused infrastructure system that can provide an opportunity in mediating the spatial issues underground and aboveground: a network of decommissioned canals beneath the city's surface that carry an intrinsic 'green', 'blue', 'place', and 'memory' component (see analysis). The landscape architectural reappropriation of these historically intrinsic components within the contemporary urban context will help in the fight against the future issues of climate change and densification.
research questions and	The research question aims to find a hybridized solution to the problem of space shortage in both the urban underground and the urban aboveground. More capacity is needed in order to work toward environmental and social urban resilience for the future. In Antwerp, the enclosed historic canal system with its intrinsic environmental and social

	qualities provides an opportunity. **Research Question:** How can the reappropriation of the underground historic canal system in Antwerp spatially mediate the city's future environmental and social challenges? **Sub-questions:** 1. What is the context of the future environmental and social challenges in Antwerp? 1a. Where does heat stress and flood risk (the missing green-blue links) occur? How? 1b. Where does public space strain and identity depreciation threat (the missing place-memory links) occur? How? 2. What is the context of the underground historic canal system in Antwerp? 2a. Where do the canal's intrinsic environmental components (green-blue qualities) occur? How? 2b. Where do the canal's intrinsic social components (place-memory qualities) occur? How? 3. What are the potentials in the canal system for green-blue-place-memory links?
design assignment in which these result.	To answer this question, a design brief must be developed. Each sub-question has an associated research objective that builds upon the framework: 1. Provides insight into the locations and circumstances of missing green-blue-place-memory links in the city. • Per theme, the product is a series of maps and inventory of features. 2. Provides insight into the locations and circumstances of the intrinsic green-blue-place-memory components of the enclosed historic canals system. • Per theme, the product is a series of maps and inventory of features. 3. Overlay of product 1 and product 2 provides insight into opportunistic locations and circumstances of the canal system for green-blue-place-memory interventions. • Per theme, the product is a vision that depicts the maximized (extreme scenario) of that theme

	After *maximization* of each theme to create independent visions, the themes will be *optimized* by looking for elements that strengthen each other. The result is a set of reinforced concepts. The eventual *integration* of the concepts into the context of the urban fabric leads to a final masterplan that answers the main research question. The three plans – visions, concept(s), masterplan – are associated with three scale levels – city scale, neighborhood scale, street scale – focusing on the role of the system, spatial situation, and detailing. Be that as it may, there will always be actions that work throughout the scales.

Process

Method description

In responding to the research question and design assignment I will utilize various research techniques embedded within research methods. These techniques and methods stem from overall research strategies.

Research Strategies:
The research strategies are the overall systems of inquiry that guide the way to toward an outcome. In this project there are three leading strategies (research *for* design, research *about* design, and research *by* design) with various sub-strategies rooted inside them ranging from description, modelling, experimentation, classification, interpretation, evaluation, engaged action, design projection, to logic systemization (figure 1). These strategies are useful for this research project because they provide a logic to identifying missing links and finding new knowledge.

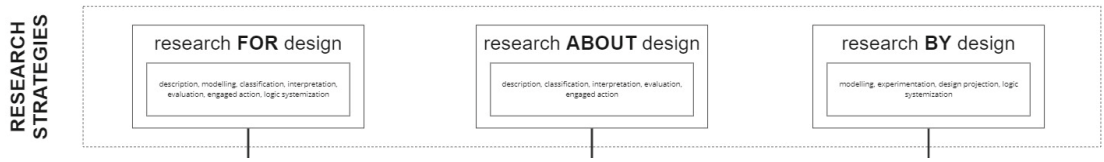

Figure 1: research strategies

Research Methods:
The research methods are the context for approaching the research strategy. In this project, each strategy leads to a fitting method ranging from fieldwork study, precedent study, literature review, policy review, to scenario building (figure 2). These methods are useful for this research project because they offer a framework for qualitative, theoretical, and conceptual analysis.

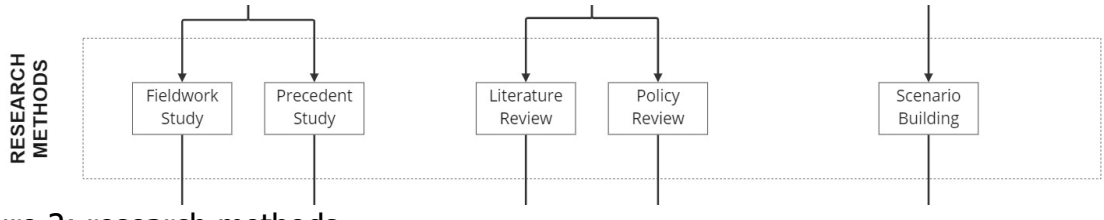

Figure 2: research methods

Research Techniques:
The research techniques are the tools and instruments applied within the research method. In this project, each method has its own set of techniques that are aligned to the research question. The techniques range from photographing and drawing, ethnographic (user) observing, green mapping, hydrological mapping, porosity/morphological mapping, biographic/historic mapping, defining terms, establishing theoretical gaps, identifying practices, outlining municipal visions, variant designing, sketching, to criteria/parameter searching (figure 3). These techniques are useful for this research project because they give specific insight into knowledge relevant to the research question.

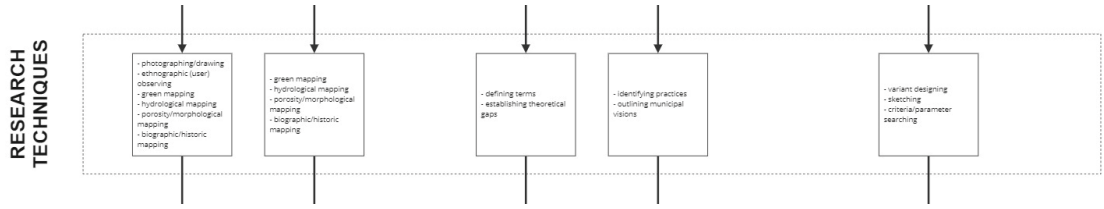

Figure 3: research techniques

Research Questions:
The research questions, specifically the sub-questions, are answered by the research techniques. In this project, each technique can be aligned with a particular sub-question. Sub-questions 1 and 2 requires, among others, many mapping techniques during fieldwork study. Sub-question 3 requires, among others, experimentation techniques and criteria outlining during scenario building and policy review. Sub-question 4 requires, among others, many mapping techniques and theoretical analysis during precedent study and literature review (figure 4). Together, the main research question is answered.

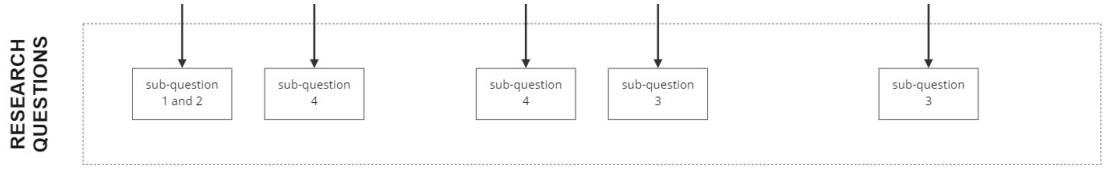

Figure 4: research questions

Literature and general practical reference

Literature:

Buchholz, T., & Younos, T. (2007). *Urban Stream Daylighting: Case Study Evaluations*. Virginia Water Resources Research Center. https://vtechworks.lib.vt.edu/bitstream/handle/10919/49482/VWRRC_sr20073 5.pdf

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Delmastro, C., Lavagno, E., & Schranz, L. (2016). Underground urbanism: Master Plans and Sectorial Plans. *Tunnelling and Underground Space Technology*, *55*, 103–111. https://doi.org/10.1016/j.tust.2016.01.001

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Labbé, M. (2016). Architecture of underground spaces: From isolated innovations to connected urbanism. *Tunnelling and Underground Space Technology*, *55*, 153–175. https://doi.org/10.1016/j.tust.2016.01.004

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Pinkham, R. (2000). *Daylighting: New Life for Buried Streams*. Rocky Mountain Institute. http://www.wetlandstudies.com/s/Daylighting_NewLifeForBuriedStreams-5ooi.pdf

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Sinclair, C. (2012). An Exploration of Stream Daylighting and Urban Attitudes Towards the Environment. *Trail Six: An Undergraduate Journal of Geography*, 68–79. https://web.archive.org/web/20130527061106id_/http://ojs.library.ubc.ca/inde x.php/trailsix/article/viewFile/183281/183244

Sterling, R., Admiraal, H., Bobylev, N., Parker, H., Godard, J. P., Vähäaho, I., Rogers, C. D. F., Shi, X., & Hanamura, T. (2012). Sustainability issues for underground space in urban areas. *Proceedings of the Institution of Civil Engineers - Urban Design and Planning*, *165*(4), 241–254. https://doi.org/10.1680/udap.10.00020

Von der Tann, L., Ritter, S., Hale, S., Langford, J., & Salazar, S. (2021). From urban underground space (UUS) to sustainable underground urbanism (SUU): Shifting the focus in urban underground scholarship. *Land Use Policy*, *109*, 105650. https://doi.org/10.1016/j.landusepol.2021.105650

Von der Tann, L., Sterling, R., Zhou, Y., & Metje, N. (2020). Systems approaches to urban underground space planning and management – A review. *Underground Space*, *5*(2), 144–166. https://doi.org/10.1016/j.undsp.2019.03.003

Wang, X., Shen, L., & Shi, S. (2023). Evaluation of underground space perception: A user-perspective investigation. *Tunnelling and Underground Space Technology*, *131*, 104822. https://doi.org/10.1016/j.tust.2022.104822

Wild, T. C., Bernet, J. F., Westling, E. L., & Lerner, D. N. (2010). Deculverting: reviewing the evidence on the 'daylighting' and restoration of culverted rivers. *Water and Environment Journal*, *25*(3), 412–421. https://doi.org/10.1111/j.1747-6593.2010.00236.x

Precedents:

Sint Jansbeek, Arnhem (Buro Poelmans Reesink Landschapsarchitectuur, 2016)

Fleet River, London (Nature is under your feet, Charlotte van der Woude, 2020)

Ladegårdsåen, Copenhagen (N. Anglin, A. Hassan, S. Ruddy, 2012)

De Binnendieze, 's-Hertogenbosch (Gemeente 's-Hertogenbosch, 1998)

La Bievre River, Paris (L'Ecologie pour Paris, 2020)

Underground City, Montreal

PATH Mall, Toronto

Analysis:

Databank Ondergrond Vlaanderen (Kaarten | DOV (vlaanderen.be))

Geopunt Vlaanderen (Geopunt Vlaanderen)

Provincie Antwerpen (Digitale kaarten - Provincie Antwerpen)

Stad Antwerpen (Open data | Antwerpen.be)

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)?

   Project > Lab > Studio > Track > Master
   Antwerp > Design of the Urban Fabric > Flowscapes > LA > MSc AUBS

   My graduation project is ultimately about the integration of environmental and social resilience within a culturally and historically meaningful setting. The topic stems from an interplay that exists between a technical side and a creative side that I have. The graduation lab "Design of the Urban Fabric" provides a fitting framework for testing these personal characteristics. A city's fabric builds upon the cultural narratives of the past but also works toward the utilitarian needs of the future. Both aspects must work together in forming a coherent landscape. Such a hybridized and interdependent landscape is the basic starting point for the Landscape Architecture studio "Flowscapes". Herein we explore infrastructure beyond the limits of only functionality and allow imaginative landscape design to gain operative force in the transformation process. This again facilitates my personal fascination in combining technology with creativity. In the end, my graduation project is therefore situated firmly within the field of Landscape Architecture. The new insights that come to light as a result of this project will expand the theory on how the built environment should be shaped. In this way, my graduation project is applicable to research within the MSc Architecture, Urbanism and Building Sciences.

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

   Societal Relevance:
   The societal relevance is about how my graduation project can provide new insight into the resilience aspects of landscape architecture. Part of this project is to respond to the environmental and social challenges of the future, including climate change and densification. The project therefore expands on the major goals of cities regarding climate adaptivity and living vitality.

   Scientific Relevance:
   The scientific relevance is about how my graduation project can provide new insight into the theoretical aspects of landscape architecture. Part of this project is about the mediation of space shortage in the urban underground and urban aboveground. The project therefore expands the research that exists about the infrastructural capabilities of the underground of cities.

   Professional Relevance:

The professional relevance is about how my graduation project can provide new insight into the practice related aspects of landscape architecture. Part of this project is about the integration of different infrastructure components into a single system. The project therefore expands the practical and instructive abilities for projects involving integrated urban infrastructure implementation.