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	Farrah Jacobs
Student number	5213827

Studio		
Name / Theme	City of the Future	
Main mentor	Agnes van der Meij	Architecture
Second mentor	Ruurd Kuijlenburg	Architectural Engineering + Technology
Argumentation of choice of the studio	I chose this studio because of the freedom you have to do your graduation project on a topic of your own interest (within the thematic framework of the studio). This offers a diverse range of topics among the students from the studio and a more independent approach to your graduation project in which you can show what you have learnt during the Master studies.	

Graduation project	
Title of the graduation project	Invisible waters in a sinking city: Exploring Adaptive Strategies for Jakarta Amid Land Subsidence
Goal	
Location:	Muara Baru - Jakarta, Indonesia
The posed problem,	[Problem Statement from Draft Research File] Jakarta, the capital city of Indonesia, is sinking at an alarming rate. Unlike many other coastal cities grappling with rising sea levels due to climate change, Jakarta's subsidence stems primarily from a lack of access to clean piped water, which forces residents and industries to rely heavily on groundwater extraction (Goh, 2019). The colonial history of Jakarta and the rapid expansion of the population and city have led to a poor and unfairly distributed water infrastructure (Colven, 2020). In response to these mounting pressures, the Indonesian government has decided to relocate the

	capital to a newly planned city called Nusantara. This move, however, risks leaving Jakarta's most vulnerable communities behind—those who cannot afford to leave, stranded in a sinking city (Widodo, 2017; Siriwardane-de Zoysa et al., 2021). Jakarta has an uncertain future ahead if measures are not taken immediately (Erkens et al., 2015). References: Colven, E. (2020). Subterranean infrastructures in a sinking city: the politics of visibility in Jakarta. *Critical Asian Studies, 52*(3), 311–331. https://doi.org/10.1080/14672715.2020.1793210 Erkens, G., Bucx, T., Dam, R., de Lange, G., & Lambert, J. (2015). Sinking coastal cities. *Proceedings of the International Association of Hydrological Sciences, 372,* 189–198. https://doi.org/10.5194/piahs-372-189-2015 Goh, K. (2019). Urban waterscapes: The hydro-politics of flooding in a sinking city. International Journal of Urban and Regional Research, 43(2), 250–272. https://doi.org/10.1111/1468-2427.12756 Siriwardane-de Zoysa, R., Schöne, T., Herbeck, J., Illigner, J., Haghighi, M., Simarmata, H., Porio, E., Rovere, A., Hornidge, A.-K., & Magar, V. (2021). The 'wickedness' of governing land subsidence: Policy perspectives from urban Southeast Asia. *PLOS ONE, 16*(6). https://doi.org/10.1371/journal.pone.0250208 Widodo, A. (2017). Analyzing Indonesia's NCICD project to stop the capital city sinking. *Otoritas: Jurnal Ilmu Pemerintahan, 7*(2), 54–66. https://doi.org/10.26618/ojip.v7i2.769
research questions and	Main research question: What (design) strategies might support part of Jakarta's coastal urban landscape and community in a speculative future, enabling it to adapt to the pressures of ongoing land subsidence?

	1. Background: Why is Jakarta sinking? 2. Which communities or neighborhoods are expected to experience the greatest challenges due to land subsidence and flooding, and what are the key vulnerabilities within these areas? 3. What are the current adaptive strategies employed by the city and its communities to address land subsidence and flooding, and how effective are they? 4. What adaptive strategies have cities, other than Jakarta, employed to deal with land subsidence and flooding, and how effective would these strategies be in Jakarta? 5. What innovative solutions are being explored for land subsidence and flooding? 6. What speculative futures could arise for Jakarta's urban landscape and community under worsening land subsidence?
design assignment in which these result.	The design assignment will be to create a coastal community in Jakarta that learns how to become resilient against flooding and become adaptive to land subsidence through different strategies without being entirely dependent on the government. The building that I will design in detail will most likely be a community research center focused on mangrove reforestation and flood-resilient construction in order to create a central place where the local coastal community can learn about these practices. This coastal community will be located in Muara Baru, which is the fastest sinking area of Jakarta that borders a long seawall that will temporarily protect the community from the sea.
The **first** research question will answer how Jakarta has come to a point of having become the fastest sinking city of the world. This will provide context on the history of the city and on the original landscape of Jakarta. The **second** research question will give me insight on which community I could focus on for my graduation project. The **third** research question serves as an overview of the effective and ineffective strategies that are currently used to combat land subsidence and flooding. From this overview I will be able to decide which of the strategies I could further build up upon.	

The **fourth** research question exists to do short case studies of different cities that are dealing with the same problems as Jakarta such as land subsidence, groundwater overextraction, and flooding. The approaches of these cities might inform what Jakarta could do (better) to address these issues.
The **fifth** research question serves to find out what innovative solutions have been made to combat land subsidence and flooding. The findings of this research question can further inspire me what to do with my own graduation project.
The **sixth** research question serves to formulate different scenarios of what could happen to Jakarta in the future if measures aren't taken seriously to stop land subsidence. (One of) these scenarios will be used as context of my graduation project.

The **main** research question will be answered through these research questions and form the graduation project as I am planning to design a coastal community that can serve as an example for other coastal communities to become flood-resilient and adaptive to land subsidence through the strategies that I have found in my research.

Process

Method description

[A description of the methods and techniques of research and design, which are going to be utilized.]

For my graduation project on Jakarta's land subsidence problem and the design of a flood-resilient, adaptive coastal community, I will employ a combination of research and design methods.
A **literature review** will provide a foundation by exploring academic papers, reports, and policies to understand expert perspectives and historical context. **News articles** and **documentaries** will help analyse current events, government initiatives, and community responses to land subsidence and flooding. Additionally, I will review **recent government plans** and **community-led projects** to evaluate practical strategies already in use. **Case studies** and **reference projects** from other cities addressing similar challenges will inform innovative and adaptable design solutions. These methods will guide the development of the research and design.

Literature and general practical references

Theoretical frameworks

- Research on urban resilience and climate adaptation, particularly in coastal and sinking cities, to inform strategies for designing adaptive and inclusive communities and buildings.
- Theories on nature-based solutions, such as mangrove forestation, and their role in flood mitigation and environmental restoration. This will be primarily necessary for the design phase.

Research data

- Studies and reports on land subsidence, flooding, and sea-level rise in Jakarta to understand the environmental, social, and infrastructural challenges in the area.
- Government policies, initiatives, and recent projects aimed at addressing these issues
- Case studies of other sinking cities, such as Shanghai, Taipei, Tokyo, Venice, Bangkok and more, to learn from their approaches to land subsidence and flood resilience.

Practical experience/precedents

For the design phase in particular I aim to use the following practical precedents:

- Reference projects incorporating mangrove reforestation and flood-resilient architecture, such as the Muara Angke fishermen's village in Jakarta or the mangrove park open to eco-tourists in coastal West-Jakarta.
- Examples of multi-functional seawalls or dykes that integrate public spaces or educational centers to combine flood protection with community engagement.

For the research and contextualization for the design I aim to use documentaries, news articles, and local insights to gain a nuanced understanding of how these challenges affect daily life in Jakarta's coastal communities.

Below are some references that I have used the most so far:

Aqil, A. M. I. (2018, 5 december). Jakarta sinking fast: Experts. *The Jakarta Post*. https://www.thejakartapost.com/news/2018/12/05/jakarta-sinking-fast-experts-subsidence.html

Batubara, B., Kooy, M., & Zwarteveen, M. (2023). Politicising land subsidence in Jakarta: How land subsidence is the outcome of uneven sociospatial and socionatural processes of capitalist urbanization. *Geoforum, 139.* https://doi.org/10.1016/j.geoforum.2023.103689

Colven, E. (2020). Subterranean infrastructures in a sinking city: the politics of visibility in Jakarta. *Critical Asian Studies, 52*(3), 311–331. https://doi.org/10.1080/14672715.2020.1793210

Erkens, G., Bucx, T., Dam, R., de Lange, G., & Lambert, J. (2015). Sinking coastal cities. *Proceedings of the International Association of Hydrological Sciences, 372,* 189–198. https://doi.org/10.5194/piahs-372-189-2015

Goh, K. (2019). Urban waterscapes: The hydro-politics of flooding in a sinking city. International Journal of Urban and Regional Research, 43(2), 250–272. https://doi.org/10.1111/1468-2427.12756

Kooy, M., & Bakker, K. (2008). Technologies of Government: Constituting Subjectivities, Spaces, and Infrastructures in Colonial and Contemporary Jakarta. *International Journal Of Urban And Regional Research*, *32*(2), 375–391. https://doi.org/10.1111/j.1468-2427.2008.00791.x

Pham, H. G., Saowiang, K., & Hai Anh, N. T. (2021). The role of groundwater and land subsidence analysis for sustainable development of infrastructure in some SE Asian cities. *Springer Series in Geomechanics and Geoengineering.* https://doi.org/10.1007/978-3-030-61118-7

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

1. My graduation project addresses the pressing challenge of land subsidence in Jakarta by proposing the design of a flood-resilient and adaptive coastal community. This aligns with the City of the Future studio, which focuses on designing attractive, inclusive, and sustainable urban environments while tackling urgent urbanization challenges such as space shortages, displacement, and environmental pressures. My project contributes to these themes by exploring how coastal urban areas can be transformed to withstand environmental challenges while fostering social and economic inclusivity.
   As a student in the Architecture track of the MSc Architecture, Urbanism and Building Sciences programme, my project topic tries to embody the programme's commitment to blending design practice with physical and social sciences, technology, and engineering. By integrating architectural design with urban resilience and environmental systems, my project reflects the multidisciplinary and innovative characteristics promoted by the programme.

2. Socially, the project empowers vulnerable communities by incorporating a community research center focused on mangrove reforestation and flood-resilient construction, fostering local engagement and awareness. Professionally, it contributes to architectural and urban planning practices by demonstrating how natural and built environments can be harmonized to enhance resilience in sinking cities. Scientifically, the project explores interdisciplinary strategies for mitigating land subsidence, generating insights that can inform future research, policies, and adaptable solutions for similar challenges worldwide.