Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (<u>Examencommissie-</u> <u>BK@tudelft.nl</u>), 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	Kim My On
Student number	4643887

Studio		
Name / Theme	Climate Design	
Main mentor	Dr. Ing. Thaleia	Energy upgrades, Circular
	Konstantinou	Renovation, Industrialization
		(Building Product Innovation)
Second mentor	Dr. Ing. Martin	Heat and moisture transfer, New
	Tenpierik	Materials, Energy concepts for
		Buildings, Room acoustics
		(Building Physics and Services)
Argumentation of choice	Interest in the Thermal Comfort of Amphibious Housing,	
of the studio	designing for flooding and hot climates.	

Graduation project				
Title of the graduation project	Low-Cost Amphibious Housing that offer Flood resistance to Rural Areas and Reduce the Energy Demand through Passive Cooling			
Goal				
Location:		Mekong Delta, (Ho Chi Minh City)		
The posed problem,		Lack of flood-resistant housing and high energy demands for cooling		
research questions and		How can amphibious housing techniques lead to passive cooling to lower Energy Demands and create Flood-resistant housing? (Vietnam)		
design assignment in which these result.		How can Amphibious housing integrate passive cooling techniques?		

Process

Method description

- 1. Literature Research
 - a. State-of-the-art Amphibious Housing What Materials are used? What structures are there? Also depending on the type of context (climatological & geographical).
 - b. Vernacular Housing in Vietnam

What are the current vernacular housing typologies in Vietnam in Rural Areas(Mekong Delta) and how do they provide Thermal Comfort. Are there passive strategies to reduce the Energy Demand or how can it be incorporated.

- c. Flooding in Vietnam; Mekong Delta How do Floods happen in the Mekong Delta? How often, heavy and where exactly?
 <u>Goal</u>: to find Key Characteristics & Indicators of Amphibious Housing, Potentiality of Traditional Methods to reduce the Energy Demand for Cooling and to design appropriately for the Flooding situation in the Mekong Delta.
- 2. <u>Propose Design Concepts</u>
- 3. <u>Test & Evaluate</u> Test Thermal Comfort of the Design Proposals in Design Builder in the Vietnamese Climatological context. Evaluate Results: Lessons learned for Further Developments
- 4. Adjust Design proposals for Final Design
- 5. <u>Conclusion</u>

Based on Literature Review of Amphibious Housing, Vernicular Housing Characteristics in the Mekong Delta, their methods in creating Thermal Comfort and examining the way floods occur in the Mekong Delta. To create well-fitted Design Proposals of Energy-Efficient Amphibious Housing for Rural Areas against flooding in the Mekong Delta. To Evaluate the Design Performance, the Proposals will be tested by calculating the Thermal Comfort with the Climate Properties of the Area.

In chapter 3 the concept of Amphibious housing is examined and supported by State-Of-The-Art projects. Including the following aspects: thermal comfort, cooling, affordability, quality and flexibility.

Chapter 4 and 5 will be more specified in the context of the Mekong Delta; In chapter 4 the Vernacular Housing Typologies in the Rural Area is examined and reviewed in creating Thermal Comfort and in chapter 5 will be there to understand what aspects to taken into account when designing for a Floodzone as the Mekong Delta.

Following, in chapter 6 a chosen site and context in the Mekong Delta will be discussed and what Design Strategies will be taken account off to move to chapter 7 where design proposals will be made and evaluated and tested on their performance of Thermal Comfort in chapter 8.

The thesis closes with a final design and a conclusion where the research questions are answered, and recommendations for further research are provided.

Literature and general practical references

a. State-of-the-art Amphibious Housing

Ahmed, I. (2023). Amphibious housing as a sustainable flood resilient solution: case studies from developed and developing cities. In *Elsevier eBooks* Chapter 17 (pp. 349–370). <u>https://doi.org/10.1016/b978-0-323-95336-8.00011-1</u>

Barker, R., & Coutts, R. (2016). *Aquatecture: Buildings and Cities Designed to Live and Work with Water*. Riba Publishing.

Ham, P. (2016). The design of a modular, amphibious structure for a flood and typhoon-prone municipality: Hagonoy, the Philippines. *Master thesis*. <u>https://repository.tudelft.nl/islandora/object/uuid%3Acd8fce02-5a6c-4d87-b52f-c820438b9684</u>

Nillesen, A. L. (2022). Designing and building flood proof houses. In *Elsevier eBooks* (pp. 329–339). <u>https://doi.org/10.1016/b978-0-323-85251-7.00024-x</u>

Nopia, J. R. C., & Sedano, M. A. N. (2021). AMPHIBIOUS HOUSE: a DESIGN STRUCTURE IN FLOOD PRONE AREAS. *ResearchGate*. https://www.researchgate.net/publication/354643260

Tiwari, A., Biswas, R., Prajapati, V. K., Chaudhary, U., Verma, A., & Haider, A. A. (2023). Designing and estimating an amphibious house using lightweight materials to mitigate the devastating effects of floods. *Materials Today: Proceedings*. https://doi.org/10.1016/j.matpr.2023.06.358

b. Vernacular Housing in Vietnam (Mekong Delta)

Hạnh, V. T. H., & Duong, V. (2018). Morphology of water-based housing in Mekong Delta, Vietnam. *MATEC web of conferences*, *193*, 04005. https://doi.org/10.1051/matecconf/201819304005

Pham, P., Ha, X., Hoang, H. T., & Trung, L. (2023). Sustainable architectural characteristics of housing in Vietnamese Mekong River Delta. In *Lecture notes in civil engineering* (pp. 157–164). <u>https://doi.org/10.1007/978-981-99-7434-4_17</u>

Pham, Phuong. (2022). Genotype of Spatial Configuration in three Ethnic Housing-Vietnamese Mekong River Delta. (PDF) Genotype of Spatial Configuration in three Ethnic Housing-Vietnamese Mekong River Delta (researchgate.net)

Tran, T., Nguyen, D. K. T., Tran, T. T., Hauglustaine, J., Michel, O., & Bouland, C. (2023). Indoor environmental parameters are related to house typology in the south of Vietnam. *Research Square (Research Square)*. https://doi.org/10.21203/rs.3.rs-2559340/v1 c. Flooding in Vietnam; Mekong Delta

McElwee, P., Tuyen, N. P., Le, H., & Vu, H. (2016). Flood vulnerability among rural households in the Red River Delta of Vietnam: Implications for future climate change risk and adaptation. *Natural Hazards*, *86*(1), 465–492. https://doi.org/10.1007/s11069-016-2701-6

Ngo, L., Kieu, L. T., Hoang, H. Y., & Nguyen, H. (2020). Experiences of housing adapted to sea level rise and applicability for houses in the Can Gio District, Ho Chi Minh City, Vietnam. *Sustainability*, *12*(9), 3743. https://doi.org/10.3390/su12093743

Nguyen, M. T., Sebesvári, Z., Souvignet, M., Bachofer, F., Braun, A., Garschagen, M., Schinkel, U., Yang, L. E., Nguyen, L., Hochschild, V., Assmann, A., & Hagenlocher, M. (2021). Understanding and assessing flood risk in Vietnam: current status, persisting gaps, and future directions. *Journal of Flood Risk Management*, *14*(2). https://doi.org/10.1111/jfr3.12689

Tran, D. D., Thien, N. D., Park, E., Dan, T. N., Anh, N. P., Vo, T. T., & Hai, A. N. (2023). Rural out-migration and the livelihood vulnerability under the intensifying drought and salinity intrusion impacts in the Mekong Delta. *International Journal of Disaster Risk Reduction*, *93*, 103762. https://doi.org/10.1016/j.ijdrr.2023.103762

Reflection

1. <u>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)?</u>

The courses during the BT Master Programme like Climate Design teach the students about Thermal Comfort, Indoor Environmental Quality and how to use programs like Design Builder. Another BT Course, Circular Product Design, teach students about the importance of the durability of materials, the choice of materials and sustainability. The Graduation Topic is a way to apply this knowledge to reality, to a problem with a specific context by for example working with programs like Design Builder and proposing and testing new design concepts, besides Literature Review. And to know what important aspects to consider when designing for case.

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

Providing Design Guidelines of Energy Efficient Amphibious Housing for designers when designing for Flood resistance in Hot Climates and making sure it is affordable and climate-friendly.