

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	Yi Lu
Student number	5561043

Studio		
Name / Theme	Resilient coastal landscapes	
Main mentor	Steffen Nijhuis	Landscape Architecture
Second mentor	Daniele Cannatella	Urbanism
Argumentation of choice of the studio	I feel the most motivated to choose the pearl river delta as my research area, where I was grown up, spent my 5 years of bachelor's study, and witnessed how people failing to live with nature due to rapid urbanization. I would like to focus more on the environmental degradation, industrial loss problem in rural areas with polder system, which I think is with lots of potential. I am interested in how 'landscape as basis' works in this context.	

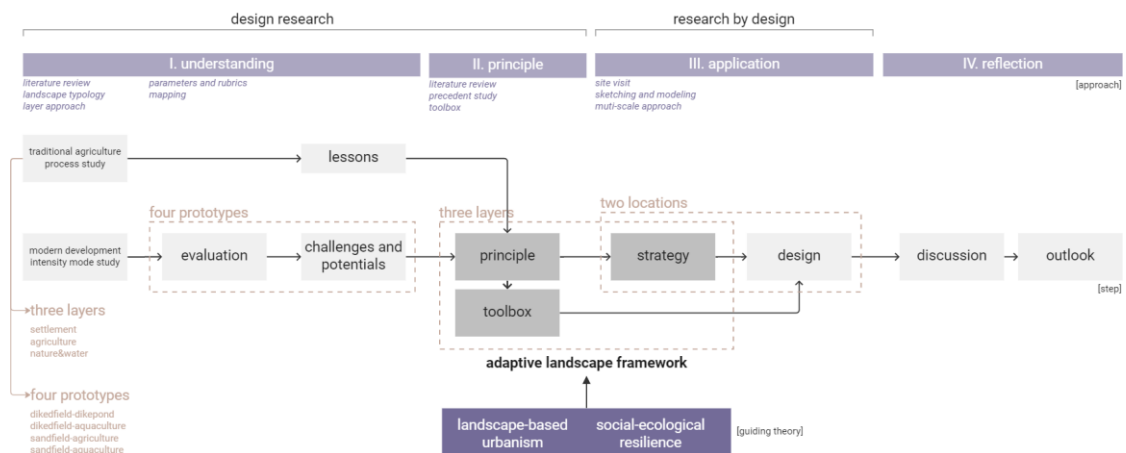
Graduation project	
Title of the graduation project	From the water: towards an adaptive landscape framework for sustainable agriculture in the PRD
Goal	
Location:	West side of the Pearl River Delta
The posed problem	The Pearl River Delta, the largest alluvial plain in southern China, is formed by the sediment brought by rivers and the millennial agricultural reclamation by the local peoples. Before the reform and opening up policy of China (1978), agriculture has always played a dominant role in the Pearl River Delta. The continuous evolution of agriculture since the Song dynasty (960AD) has illustrated the adaptability and sustainability of the system. Today, one of the most populous and economically growing city groups in the world is standing on this agriculture-based land. In the past 40 years, the urbanization rate in the Pearl River Delta has jumped from 16% to 87.5%. Using arable land as cheap land to attract investment is one of the most common ways for urbanization. In this

	process, more than one-third of cultivated land has been converted to built-up areas. Problems, therefore, arise with the transformation. This kind of economy-oriented development only focused on maximizing the land profits, while its value of resilience, ecology, spatial quality and culture were greatly destroyed. Industrialization and the intensification of agriculture have resulted in increased flooding risk, soil and water pollution, habitat loss, and landscape homogenization in the Pearl River Delta. Although many planning and water resource management measures in the Pearl River Delta have addressed these issues at the regional level, there is a lack of coordination between planning, environmental management, and hydraulic engineering (Qu, 2014), and the single evaluation method is often used in the current land zoning (Gao, 2019), which might make the area lack resilience and fail to deliver diverse and sustainable ecosystem services. Therefore, while facing greater climate challenges and further development of the Greater Bay Area, an adaptive landscape framework is needed to balance social and ecological aspects in the uncertain future transformation. ‘Landscape-based urbanism’ is adopted to provide a supplementary perspective to the current planning approach. In this case, physical landscape structures and associated natural processes are seen as fundamental to creating favourable conditions for future development (Nijhuis, 2022, p249). Based on the landscape framework, the project will provide sustainable development models for the urbanization and agricultural intensification of agricultural land in the Pearl River Delta from the dimensions of nature and water, agriculture, and settlement.
research questions and	How to support the sustainable development of the agricultural area on the west side of PRD by applying an adaptive landscape framework? SQ1: How to understand the formative power of agricultural practice on the west side of PRD, and the challenges and potentials of different agricultural typologies? SQ2: What principles could be set to form an adaptive landscape framework? SQ3: How to apply the principles to local-scale design on the west side of PRD and bring social and environmental benefits to the area?

	SQ4: What experience could be learnt through the project in order to serve the objective better?
design assignment in which these result.	Development of an adaptive landscape framework for the agricultural area in PRD; Two local-scale design explorations with design principles, which help to support and interpret the framework. Regional scale: By understanding the challenges and opportunities faced by different agriculture typologies in the PRD, visions are provided for the future development of different agricultural areas on the regional scale. Local scale: Two sites (Gulao town and Wanqinsha town) are selected corresponding to different agricultural types for local-scale design. To examine how the design principles of landscape framework work, how to balance and enhance local socio-ecological benefits, and how the spatial effects will be.

Process

Method description



Design research:

1. Understanding stage

- 1.1 Literature review: By understanding the concept of the **social-ecological system, social-ecological resilience, ecosystem service, adaptive cycle and panarchy**, I can better compare and assess the transformation of different agriculture typologies, and understand the system across time and space scales. (Related literature is listed in the next column)
- 1.2 Landscape typology: Four main agriculture typologies are made based on the study of their incremental developing process and their current landform.

1.3 Layer approach: For each typology, I decomposed the physical landscape into three layers, namely the **nature and water layer, the agriculture layer and the settlement layer**. By understanding the transformation of each layer and the relationship between them, further evaluation of their ecosystem service could be made.

- a) Nature and water layer: this layer contains the analysis of topography, basic soil and hydrological condition of each typology, and the impacts of human activities on the PRD's water structure.
- b) Agriculture layer: this layer contains the analysis of agriculture and water technique of each typology, and the effects of agricultural intensification.
- c) Settlement layer: this layer contains the analysis of the layout of settlement of each typology, and the effects of urban expansion.

1.4 Parameters and rubrics: The concept of **ecosystem service** is used to evaluate different typologies from the aspect of **provision, regulating and cultural services**.

1.5 Mapping: A structure map will work as a **conclusion** of the understanding of upcoming challenges and potentials by mapping several essential elements. The mapping information includes:

- a) Ecosystem services provided by different agricultural typologies (based on the evaluation)
- b) Urban expansion: the data comes from the article 'Multi-scenarios Simulation of Urban Growth Boundaries in Pearl River Delta Based on FLUS-UGB' by Xinxin Wu et al.
- c) Ecological protection area: the data comes from the article 'Sustainable use zoning of land resources considering ecological and geological problems in Pearl River Delta Economic Zone, China' by Lin Gao et al.
- d) Flood-prone area: the data comes from <https://coastal.climatecentral.org/map>

2. Principle setting stage

2.1 Literature review: By going through theories on resilience, and nature-based design, mature ideas and principles can be learnt and adapted. (Related literature is listed in the next column)

2.2 Precedent study: Precedent study is complex description through which experience could be gained. On the one hand, I would study the research on **traditional agricultural techniques** (including water technique and reclamation technique) in PRD to learn how the former people worked with nature. On the other hand, I would learn from **existing design cases** on flood risk management and agriculture transformation. (Related precedents are listed in the next column)

2.3 Toolbox: The toolbox will work **as an intermediary between principle and design exploration**. It will contain **several solutions** toward different layers (nature and water/ agriculture/ settlement) in adaption to different development conditions.

Research through design:

3. Design exploration stage

3.1 Site visit: The site information will be collected online, including information from google maps, google earth, google images, and official websites (<https://www.octgulou.com/>).

3.2 Sketching and modelling: during the design process, sketches and digital models will be made to help me visualise and iterate my ideas.

3.3 Multi-scaler approach: the design principles and exploration will be conducted through different scales: Meso scale (regional vision), micro scale (blue-green structure) and nano scale (spatial experience).

Literature and general practical preference

Theory on Landscape-based urbanism, resilience, social-ecological system and ecosystem service:

Ahern, J. (2011). From fail-safe to safe-to-fail: Sustainability and resilience in the new urban world. *Landscape and Urban Planning*, 100(4), 341–343. <https://doi.org/10.1016/j.landurbplan.2011.02.021>

Birgé, H.E. et al. (2016) “Adaptive management for Ecosystem Services,” *Journal of Environmental Management*, 183, pp. 343–352. Available at: <https://doi.org/10.1016/j.jenvman.2016.07.054>.

Chelleri, L., Waters, J. J., Olazabal, M., & Minucci, G. (2015). Resilience trade-offs: Addressing multiple scales and temporal aspects of urban resilience. *Environment and Urbanization*, 27(1), 181–198. <https://doi.org/10.1177/0956247814550780>

Foley, J., Defries, R., Asner, G., Barford, C., Bonan, G., Carpenter, S., Chapin III, F. S., Coe, M., Daily, G., Gibbs, H., Helkowski, J., Holloway, T., Howard, E., Kucharik, C., Monfreda, C., Patz, J., Prentice, I., Ramankutty, N., & Snyder, P. (2005). Global Consequences of Land Use. *Science (New York, N.Y.)*, 309, 570–574. <https://doi.org/10.1126/science.1111772>

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, 16(3), 253–267. <https://doi.org/10.1016/j.gloenvcha.2006.04.002>

Nijhuis, S. (2022). Landscape-Based Urbanism: Cultivating Urban Landscapes Through Design. In R. Roggema (Ed.), *Design for Regenerative Cities and Landscapes* (pp. 249–277). Springer International Publishing. https://doi.org/10.1007/978-3-030-97023-9_11

Development and planning study on the PRD:

Gao, L., Ma, C., Wang, Q. et al. (2019). Sustainable use zoning of land resources considering ecological and geological problems in Pearl River Delta Economic Zone, China. *Sci Rep* 9, 16052. <https://doi-org.tudelft.idm.oclc.org/10.1038/s41598-019-52355-7>

Hehl-Lan, S. and Eckart Lang (2019) "The Big Picture: Landscape Dynamics in the Pearl River Delta," *fengjingyuanlin*, 26, pp. 23–30. Available at: <https://doi.org/10.14085/j.fjyl.2019.09.00>.

Nijhuis, S, Xiong, L & Cannatella, D 2019, 'Towards a Landscape based Regional Design Approach for Adaptive Transformation', *Landscape Architecture (Fengjing Yuanlin)*, vol. 26, no. 9, pp. 8-22.
<https://doi.org/10.14085/j.fjyl.2019.09.0008.15>

Sepúlveda Carmona, D., Qu, L. and Tai, Y. (2014) "Towards a livable urbanized delta region. spatial challenges and opportunities of the Pearl River Delta," *Revista M*, 11(1), p. 8. Available at: <https://doi.org/10.15332/rev.m.v11i1.949>.

YANG , R. and CHEN , Y. (2019) "Evolution and regional model of rural development in the Pearl River Delta Region, China, under rapid transformation development," *geographical research*, 38, pp. 725–740. Available at: <https://doi.org/10.11821/dlyj020181092>.

Traditional agriculture experience in the PRD:

Sun, C., Nijhuis, S., & Bracken, G. (2019). Learning from Agri-Aquaculture for Multiscale Water-Sensitive Design in the Pearl River Delta. *LandscapeArchitecture (FengjingYuanlin)*, 26(9), 31-44.
<https://doi.org/10.14085/j.fjyl.2019.09.0031.14>

Weng, Q. (2007) "A historical perspective of river basin management in the Pearl River Delta of China," *Journal of Environmental Management*, 85(4), pp. 1048–1062. Available at: <https://doi.org/10.1016/j.jenvman.2006.11.008>.

Zhou Qing. The Local and Traditional Development Model and Historical Experience of the Ecological Civilization Based on Flooding Adaption in the Guangdong-Hong Kong-Macao Greater Bay Area. *TROPICAL GEOGRAPHY[J]*, 2019, 39(5): 701-710 doi:10.13284/j.cnki.rddl.003187

Project:

Room for the River Programme

Planning of MiddenDelftLand

Quzhou Luming Park

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 flowscape studio (design studio in Msc3&Msc4 of landscape architecture) aims to develop innovative spatial armatures that guide urban and rural development through landscape architectural design. In my project, I take landscape as the starting point and approach, focusing on the future development of agricultural land in the Pearl River Delta by shaping the landscape framework.

For the connections of my project to the resilient coastal landscape studio: From the perspective of landscape-based urbanism, the biosphere works as the context for social and economic development. Therefore, in my case, the 'delta' plays an important part as a kind of coastal landscape. At the same time, low-lying agricultural land often faces greater flooding risks during development, so resilient thinking is also important in the project.

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

In the planning of the Pearl River Delta, top priority has always been given to economic development, and there is a lack of cooperation and coordination between planning, environmental management, and hydraulic engineering (Qu, 2014). At the same time, single evaluation method is often used in the current land zoning (Gao, 2019). My project aims to take the perspective of landscape architecture, and regard 'nature as basis' to provide an integrated framework for ecological and water resilience, where ecosystem services of the area will be evaluated to ensure its multifunctionality.

This landscape-based approach not only complements the current planning perspectives but also benefits the social dimension. As mentioned, the biosphere can serve as the basis for a well-functioning socio-economic. The safety of the natural environment should be ensured instead of lagging behind, especially for a region with rapid socio-economic development. Therefore, to cope with future uncertainties, an adaptive landscape framework is provided to support the sustainable development models in the pearl river delta in my project.