

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	Maozhu Zhang
Student number	5531829

Studio		
Name / Theme	Circular Water Stories lab Graduation studio Landscape Architecture: Flowscapes	
Main mentor	Ir. I. Bobbink	Landscape Architecture
Second mentor	Ir. E.H. Gramsbergen	Architecture
Argumentation of choice of the studio	Learn from the traditional water system and apply the idea of past to face the challenges today.	

Graduation project	
Title of the graduation project	Catalyst for slow landscape transformation- Reviving the Bagmati River in the Kathmandu Valley

Goal	
Location:	Kathmandu Valley, Nepal
The posed problem,	<p>Quick city expansion in 21st Century cause a lot of problems in Kathmandu Valley-water shortage, water pollution, public space littered with garbage, river bank invaded by squatter settlements, flooding and urban waterlogging. Due to these problems, the sacred Bagmati River, cultural heritage and open green space of the Kathmandu Valley has been severely damaged and some traditional religious festivals have also been stopped due to the pollution of the river.</p> <p>The government is currently taking a number of measures to address these issues separately. But, these measurements alone not enough. The water supply diversion pipeline, which took twenty-three years to build, was damaged by flash floods in the first year of construction, two-thirds of sewage cannot be treated due to insufficient</p>

	<p>capacity of wastewater treatment plants and lack of electricity and dismantled squatter settlements reappeared within a short period of time etc. And as a large region with complex environmental issues, it is difficult to achieve change all at once. Therefore, more efforts need to do to improve the living quality of Kathmandu Valley. This project will explore the role of landscape architecture in this assignment to integrate the separated technique measures with the landscape spatial design to improve the living quality of Kathmandu Valley.</p>
<p>research questions and</p>	<p>Based on the posed problem, the research questions were formulated.</p> <p>How to revive the Bagmati River by spatial design to stimulate the living quality improvement in the entire Kathmandu Valley?</p> <p>Sub-questions:</p> <ul style="list-style-type: none"> -How to revive Bagmati river to restore its culture and nature? -How to integrate the separated technique measures of water supply, water purification and garbage management with the landscape spatial design? -How the spatial design stimulates the change in the entire Kathmandu Valley?
<p>design assignment in which these result.</p>	<p>As mentioned in the posed problem, the existing technique solutions not function well, additional landscape design approaches are needed. The Kathmandu Valley, as a large region with complex environmental issues, is difficult to achieve living quality improvement of the entire valley at once through urban renewal and large-scale redevelopment projects.</p> <p>Therefore, “Urban Catalyst” is chosen as the framework of the project. With the intervention of catalyst point which in landscape design are spatial designs to promote positive changes and chain effect to the surroundings beyond the boundary of the development site to regenerate the area (Koichiro, A., & Takafumi, A. 2014). And the “urban metabolism” is chosen as the design</p>

	<p>framework to guide the generation of spatial design strategies by analyzing the flows in the development site.</p> <p>Therefore, the design assignments are elaborated on different scales:</p> <ol style="list-style-type: none"> 1. Development site scale: <ol style="list-style-type: none"> 1.1 Selection of development site base on the analysis of posed problems. 1.2 Analysis of existing situation. (architecture, landscape, human activity) 1.3 Selection and analysis of flows based on the posed problems. 1.4 Overall conceptual design and spatial designs (landscape and architecture). 1.5 Detailed spatial designs (catalyst points) integrated with existing technique solutions 1.6 Residence involvement design 2. Bagmati scale and Valley scale <ol style="list-style-type: none"> 2.1 The application of catalyst points 2.2 Residence involvement design
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[This should be formulated in such a way that the graduation project can answer these questions.

The definition of the problem has to be significant to a clearly defined area of research and design.]

Process

Method description

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

From literature study, it appears that today, Kathmandu is facing more challenges than ever before due to urban sprawl, severely damaging nature and culture. The major challenges are water pollution, poor garbage management, river bank invaded by squatter settlements, monsoon flooding and urban waterlogging, and water shortage. First, the data obtained were organized to create maps of river pollution (Baniya, B. 2019) and WWTP distribution (Shrestha, S. 2005), garbage management, squatter settlement distribution (Shrestha, P. 2019), cultural heritage distribution, monsoon water logging area and riverbank inundation area. Other information of garbage management and water shortage were analyzed by iconography, and the extent of water shortage was quantified by drawing a discounted graph and a sectoral statistical graph.

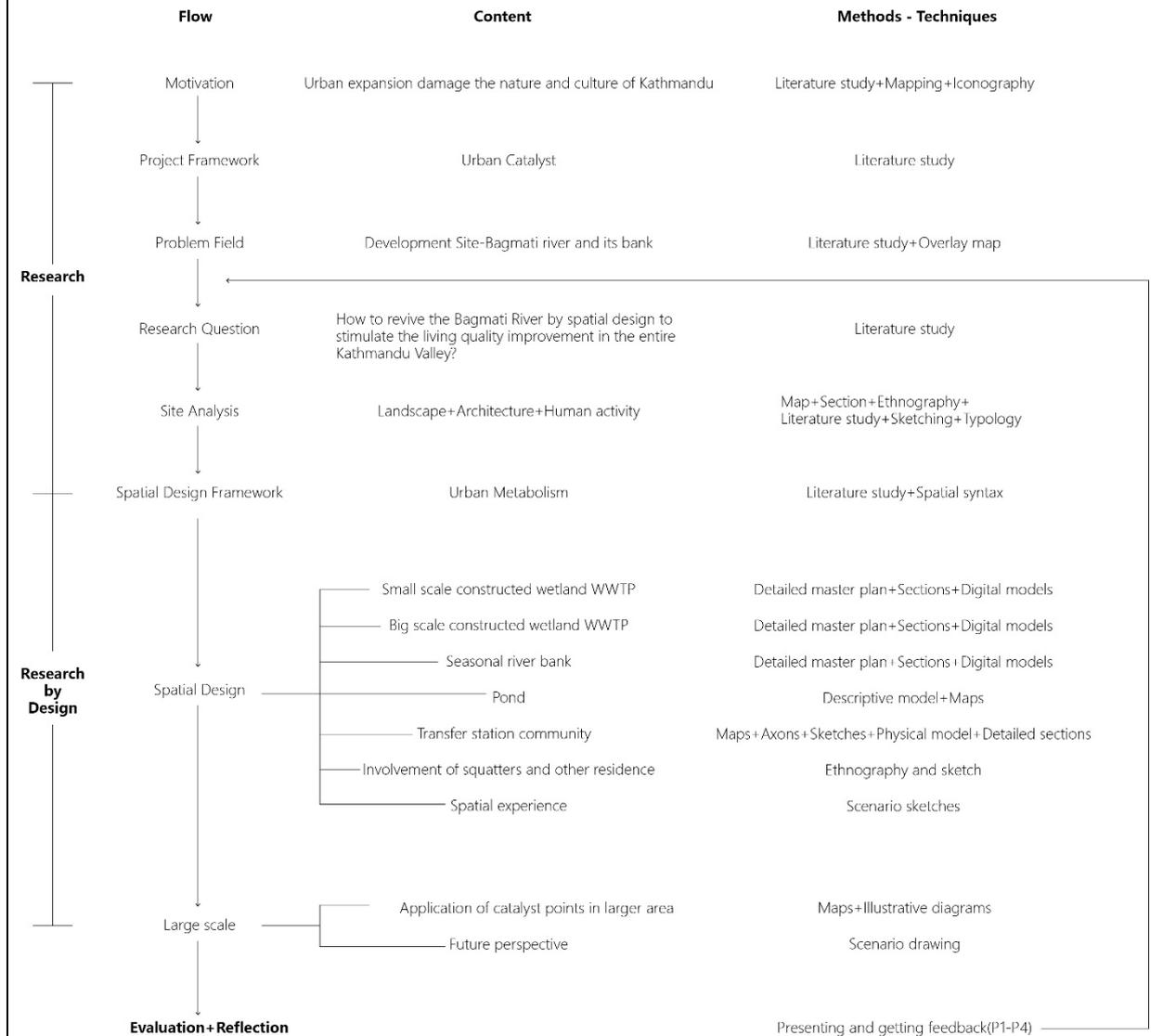
Considering these complex environmental issues and the large scale of Kathmandu Valley, it is very difficult to achieve improvement in the living quality of the entire valley through urban renewal and large-scale redevelopment projects as this kind of redevelopment

strategies have often jeopardized the vitality of downtowns (Cermetrius, L. B. 2004). Therefore, through the literature study, "urban catalyst" was used as the framework of the whole project. "Urban catalyst" is defined as a catalyst promoting positive changes and chain development to the surroundings beyond the boundary of the development site and most likely regenerate the area (Koichiro, A., & Takafumi, A. 2014). After overlaying all the challenge mapping together, the Bagmati river and the bank area, where all the problems were located, were selected as the development site to promote the revival of Bagmati river and stimulate the living quality improvement throughout the Kathmandu Valley.

The first phase of the chain development is the formation of urban catalyst through the intervention of catalytic points in the development site, which in landscape design are spatial designs. For the urban catalyst to respond to its setting, the catalytic points must possess a strong sense of place and authenticity (Cermetrius, L. B. 2004). Therefore, the existing situation of landscape, transfer station, squatter settlements and human activities in the development site will be first analyzed using literature study, map, section, sketching and ethnography, and then classified by typology. Based on these analyses and literature study, urban metabolism is used as the spatial design framework to guide the design of catalytic points. The flow of water and energy (garbage management) was analyzed by graphing the spatial syntax of urban metabolism. The analysis of urban metabolism has resulted in spatial design strategies - different scales of constructed wetland WWTP, seasonal river bank, waste transfer station design and pond design. Seasonal river bank that includes water catchment clusters design are similar to constructed wetland WWTP design in that they need to deal with terrain elevation differences. Therefore, in addition to a detailed master plan, sections and digital models are needed to show the relationship of the landscape to the topography. Ponds are located in urban area and the descriptive model will be used to show the complicate waterflow in this area that associated with the designed ponds in addition to maps. Due to the limited space in the Kathmandu Valley, the relocation of the squatters will be combined with a new waste management system. It is hard to relocated squatters who live along riverbank to new residence in a short time. Therefore, the relocation of squatters is in stages. In the first stage, the existing transfer station will be redesigned and the surrounding community will be reorganized, existing private segregated shops will be integrated with the transfer station and the new settlement for squatters will be constructed on the site of the segregated shops to join the existing residence. This new community will be self-sufficient in energy and water, so maps, axons, sketches, detailed sections and physical model will be made to show the relationship between the different functions of the buildings and the small wetland WWTP and how this community become self-sufficient. The second stage is the start of the relocation of squatters and the landscape design of river bank where the squatter settlements located to prevent the reappearance of new squatter settlements. Detailed master plan, sections and digital models will be produced to show the topographic design of this area. Ethnography and sketch will be used to show the involvement of squatters and other residents who, serve as one of the catalyst points to stimulate change in the Valley by participating in garbage management and environmental improvements in the transfer station, which is a necessary part of the urban catalyst formation. A series of scenario sketches will be created to demonstrate the spatial experience in the development area.

In the second and third phase of the chain development, maps and illustrative diagrams will be drawn to show where and how the catalyst point are applied in larger area to promote the chain development to revive Bagmati river and improve living quality of Kathmandu Valley.

In the end, scenario drawings will be made to show the future perspective.



Literature and general practical preference

[The literature (theories or research data) and general practical experience/precedent you intend to consult.]

Baniya, B., Khadka, N., Ghimire, S. K., Baniya, H., Sharma, S., Dhital, Y. P., Bhatta, R., & Bhattarai, B. (2019). Water quality assessment along the segments of Bagmati River in Kathmandu valley, Nepal. *Nepal Journal of Environmental Science*, 7, 1–10.

<https://doi.org/10.3126/njes.v7i0.34314>

Bohannon, C. L. (2004). *The Urban Catalyst Concept*.

Gurung, J. K., Ishiga, H., Khadka, M. S. & Shrestha, N. R. (2006). The geochemical study of fluvio-lacustrine aquifers in the Kathmandu Basin (Nepal) and the implications for the mobilization of arsenic.

Aitani, K., & Arima, T. (2014). *Urban Catalyst: Regeneration of Downtown Area Through Community Development*.

Dowse, L., Holland, G., Johnson, R., Li, R. & Winter, J. A. (2014). *Scoping Kathmandu: Exploring settlements, the city and the valley*.

Frelin, O. & Holm, J. H. (2016). *Healing Bagmati - Revitalizing the riparian zone of the Bagmati River*.

Molden, O. C. (2015). *Traditional Infrastructure, Modern Flows: Cultural politics of Modernization in the Kathmandu Valley*. Oregon: Unpublished Thesis.

Pandey, V.P., Shrestha, S. & Kazama, F. (2012). *Groundwater in the Kathmandu Valley: Development dynamics, consequences and prospects for sustainable management*.

Li, R., Sivasanthran, P., Tang, B., Holmes, F., & Pechova, N. (2014). *The March of the City: Architecture Exchange: London, Kathmandu, Kigali*.

Shrestha, P. (2019). Mainstreaming the 'Brown' Agenda † (Rep.). Retrieved 2022, from <https://www.mdpi.com/2071-1050/11/23/6660>

Shrestha, S., Deshar, R., Joshi, G. R., & Pandey, S. (2005). Efficiency of the wastewater treatment at Guheshwori, Kathmandu Valley (Rep.). Retrieved December, 2022, from

https://www.researchgate.net/publication/346013924_EFFICIENCY_OF_THE_WASTEWATER_TREATMENT_AT_GUHESHWORI_KATHMANDU_VALLEY

Shrestha, S. R. & Shah, S. (2014). *Shallow Aquifer Mapping of Kathmandu Valley*.

Marin, V. A., Amir, S. Manna, A. K. & Matton, I. (2015). *Landscape Urbanism Explorations for the southern fringe of Kathmandu Metropolitan area, Kathmandu Valley, Nepal*.

Chauhan, V. (2022). *City and its Water: Defining Multifaceted Infrastructure using Traditional Water Network in Patan, Nepal*.

徐云曦 (2012). “触媒式”旧城改造与更新的实践探索——以四川宜宾中国酒都特色街区南区规划为例. 重庆大学硕士学位论文. 重庆.

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 topic of my graduation plan and studio is both about water. The concepts of traditional water construction analyzed in the studio were applied in the graduation project. From traditional water system analysis, the ancient Nepal people use the characteristics of the site - natural topography, climatic and soil conditions to make design and solve the water shortage problem they faced. In the face of today's more complex environmental issues, the characteristics of the development site - the flow of water and energy – are also taken into account when developing spatial design strategies. The landscape spatial design skills learned

from the LA master track and master programme are used in the project to integrate the design of space which is related to and contributes to people with the separated technique measures to solve the complex environment problems.

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

Larger social

Base on the principle of urban catalyst, the development site does not exist just for itself, but acts as a catalyst, promoting positive changes and chain effect to the surroundings beyond its boundaries (Koichiro, A., & Takafumi, A. 2014). Therefore, the catalytic points of development site can be applied to larger areas along the Bagmati River basin and entire Kathmandu Valley to revive the whole water basin and improve the living quality of the whole valley.

Professional

The project reasonably considers the responsibilities of landscape architects in this type of urban environment improvement projects. In a series of chain designs, the landscape architect is primarily responsible for the design of the urban catalyst which serve as the starting point, and it is usually the restoration design of the most affected river areas, as it epitomizes the problems of the urban environment. Some of these strategies and ideas stimulate and guide the subsequent urban design projects on a larger scale.

Scientific framework

The design frameworks, principles and strategies can be informative when applied to other countries with similar problems. Many countries are facing similar challenges as Nepal, especially developing countries. Rapid urban development brings problems that end up destroying culture and nature, and the area suffers most are always the important rivers, which become muddy and full of garbage. For example, the Ganges River in India, the Majia River in Heilongjiang Province of China, the Pasig River in the Philippines, the Citarum River in Indonesia, the Mekong River in Myanmar, etc. The similar problems and causes, as well as the similar results, make the framework, design principles and strategies used in this project highly informative when doing living quality improvement projects in these cities.