

# **upwards** along the pipes

*utilizing the recyclable potentials of local organic waste  
to revitalize the Cikapundung river area*



**graduation project reflection**



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Architectural Engineering  
Graduation studio 21  
  
Master of Architecture, Urbanism  
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## The relationship between research and design

I started off with this graduation project by specifically choosing for the Architectural Engineering graduation track, as research plays an important role in the graduation process and I sympathised with the idea that students are challenged to integrate technological innovations with architecture. Additionally, with my general interest in foreign cultures, I considered the Shared Heritage Lab to be a suiting graduation studio.

Initially, my project was majorly focused on a research based approach. By analysing the existing situation in Tamansari in Bandung, I soon developed a fascination for several environmental problems which came to light while visiting the site ourselves. My initial research was therefore a solution oriented approach, in which my problem statement of a polluted Cikapunding river directly lead to my main research topic: wastewater treatment.

During this preliminary research phase I focused on the general technical background of decentralised wastewater treatment systems. First of all to understand how the current sanitation system in Tamansari was not working properly, and secondly to obtain knowledge what kind of technical elements within a decentralised wastewater treatment system were possible to implement within a dense kampung to prevent this direct pollution of the Cikapunding river.

During that phase I had quite some troubles not to lose myself into the technical information about the treatment systems too much, as I felt the need to understand all of it before allowing myself to imply it in a design in a later phase, while some of the information was not specifically relevant for my role as an architect. Therefore I tried to make the shift from a purely technical research approach on the waste water treatment systems towards the use and application of water treatment within a dense community, in which the quantities, dimensions and management aspects of the treatment systems started to play a major role integrating the research and design processes.

Meanwhile, the research on water treatment systems started to directly influence the subsequent design phase as its results gave me insight in the possible side benefits from treatment processes for the project site by the outcome of biogas and bio fertilizers. Combining the earlier contextual cultural and social research with the conclusions from my technical research, I determined that a food market could be a well fitting public function within the site location, as it could stimulate an investment in tackling the environmental issues, as the beneficial side effects from the treatment systems have potential to simultaneously boost the economical and physical circumstances of the Tamansari district.

After the program was determined, my research started to diverge into several subtopics. . To integrate research and design within my project resulting in a comprehensive building which fits the local culture, it was necessary to do more research into these specific cultures, especially the food culture. It was important to understand the role of food within their daily routines of the kampung inhabitants, with relating items like the preparation process, necessary ingredients, etc. This directly influenced the design of the food market by for example determining which crops would be relevant to grow within the market, the spatial configuration and size requirements within the building, etc.





## **The relationship between the graduation project topic, studio topic, master track architecture and the master programme**

First of all, the studio topic was mainly focused on the shared heritage which the Netherlands and Indonesia share originating from previous colonial times leaving some physical debris in the city of Bandung. This shared heritage can mainly be found in colonial buildings, which were not included in my project topic. The shared heritage my project included was the development of the kampung areas around the Cikapundung River area, which in colonial times was supposed to become a major green and healthy lung throughout the city, but instead got increasingly inhabited and densified by urban kampungs. My project focused on the revitalization of these areas around the Cikapundung River while taking the contemporary kampung residents in consideration, meanwhile seeking for elements in the current existing culture and past “forgotten” habits which had any potential to stimulate environmental improvement.

Secondly, as my graduation topic mainly focused on how wastewater treatment could be integrated with an architectural intervention, adding social and spatial value, I can say the topic was really diverse, therefore touching many other fields within the master programme Architecture, Urbanism and Building Sciences. It slightly entered the field of Landscape Architecture whereas it examined the local organic waste streams, the treatment possibilities and the benefits which could be obtained from it focusing on a circular waste stream.

In addition to that, the project aimed to develop an intervention which was able to have a positive influence on a bigger urban scale within the city, by considering how the borders between the kampung and the formal city could be blurred by providing the food market function which brings people together and includes a major element in the local Indonesian culture: food.

In conclusion, the graduation project’s topic closely interacts with the Building Technology field whereas the building system had to be developed in a smart way so the design was affordable for low-income areas and easy applicable onto the existing urban and topographical conditions of the kampung and the Cikapundung river, while it is easily replicable on other locations slightly varying in circumstances.





### **The research method and approach chosen by the student, in relation to the graduation studio methodical line, reflecting upon the scientific relevance of the work**

The Architectural Engineering studio is generally split in two parts: the initial research and the subsequent design phase.

Within my personal project, I tried to keep hold on this provided structure by first of all giving myself some time to do general research on Indonesia and Bandung, as this was an unfamiliar context to me. In the following phase, after visiting Bandung ourselves, I determined a specific technical research topic: the application of decentralised wastewater treatment systems. This was purely an outcome of the analysed context and the formation of a problem statement, as I did not have a specific architectural function in mind yet.

In that sense, it was easy to stick to the AE methodical approach. But despite my theoretical ambition to focus on research first and leave any design considerations for a latter phase, I noticed that in practice I automatically started thinking in solutions, and therefore unconsciously already started designing. These were not necessarily architectural design solutions, but rather more urban and civil engineering solutions to the river pollution problem with an additional architectural twist. I do not want to claim that research and design should be split, as I am convinced that integrating and interchanging between these processes will create the optimal results, but I noticed that my premature design inspirations often lead myself into specific directions which in fact were not fully backed up yet.

Initially, I focused too much on solving water pollution and therefore understanding wastewater treatment systems, while not having an architectural function in mind yet. This made the transition from research to design phase quite difficult, as I did not have a definite program in mind for a long time during my research. But in the end, this helped me to focus on my research subject and to get a better understanding of the topic, which eventually showed me the supplementary benefits of biogas and bio fertilizers coming along with wastewater treatment systems. Eventually, it made the final chosen architectural design program of a food market a highly rational and logical outcome.

When considering the scientific relevance of the project, I feel it strongly fits within the Architectural Engineering methodological approach of integrating technology with architecture. The project does not specifically contain new scientific discoveries and/or innovations, but tries to merge the different technical, cultural and spatial fields into one comprehensive design application. Its scientific relevance can therefore be found in a practical implementation method of technical water treatment techniques in a social environment. The project shows how local inhabitants can be stimulated to invest in a decent waste water treatment system, leading to an improvement of their living environment, and how this can simultaneously have social, spatial and economical benefits.







## **The relationship between the graduation project and the wider social, professional and scientific context**

The graduation project providing a decentralised wastewater treatment system easily applicable onto an existing informal settlement can be relevant all over the world, as in developing countries still over 90% of the sewage is being disposed untreated and therefore polluting rivers, lakes, coastal areas, etcetera (Langergraber & Muellegger, 2004, p. 433). Similar to Bandung, everywhere around the world cities are growing and getting denser. This means innovative solutions have to be found to use the limited space in an optimal way, and the implementation of a wastewater treatment system in this space is a very relevant outcome of the project to be applied elsewhere around the world.

Next to the environmental improvements due to the wastewater treatment system, the combination of an integrated architectural program which is beneficial to the needs of the local community makes the project very relevant in a wider social context as well. The designed prototype of a bridge structure which could have several spatial configurations and extensions and therefore different architectural usages could possibly be applied to other locations with similar cultural and environmental characteristics, adjustable to the local needs.

The project shows that an investment in environmental improvements can be socially and economically beneficial for communities, whereas it provides communal gathering places, jobs, self sustainability in terms of self grown food, cooking fuel and general awareness of what benefits proper wastewater treatment can provide.





## The ethical issues and dilemmas in doing research, elaborating the design and potential applications of the results in practice

Even though I tried to look into new treatment technologies, I wanted to appreciate the local existing culture. It felt controversial to consider the current situation within the RW's within the kampungs as worthless, as the RW's already have a quite decent working social structure, and are already trying to take initiatives themselves to improve their living environment and deal with the current waste and other environmental problems.

It would feel like some form of arrogance to think that the current population has no knowledge or awareness considering the current unpleasant circumstances. Therefore, my research was not directly focused on what high-tech Western solutions are available to implement in this "undeveloped" kampung area, but instead I tried to look at current well-working examples closely related to the Tamansari situation and culture, or "forgotten" techniques and cultural habits which might be useful to implement.

After I determined the program of my graduation project to become a food market, I noticed that I often relapsed in habits to design with a Western culture in mind, based on my own experiences and demands considering the design and use of a food market. I often had to make myself aware that the Indonesian culture is very different in many ways, in particular the food culture, as it plays a major role in their overall culture. It resulted in the dilemma that I was aware that I did not have enough knowledge and experience of the daily routines of (street) food preparation, the methods and habits, the used ingredients and recipes, the social aspects of dining, etcetera.

This resulted in a necessary additional research which looked more into these cultural aspects relating to the program and the use of my design. Nevertheless, while taking the existing local habits in consideration, as a designer I tried to look for innovative spatial, material and programmatic configurations which would be an improvement for the current situation. This led to a constant struggle between the proportions of retaining to the 'already existing' and introducing 'the new'. Therefore, despite my efforts to obtain as much cultural knowledge as possible, it would still be very interesting to see if the design would actually work in real life within the Tamansari kampung, and if it would be accepted and integrated within the cultural habits of the inhabitants.

It often came to mind that as a designer you might have a specific image in mind how your building could or should be used by the future users, while in real life this might turn out really different. Therefore, I tried to retain a specific level of flexibility within the design, so the users can find their own way to deal with the provided structure by me, the architect. Former architects Bernard Rudofsky and Gordon Cullen state that people always need time to learn how to use the built environment. Every innovation by definition does not precisely match with the existing habits. The object itself and the way it is used evolve - in an unknown direction - while this evolution will always require time to process. I tried to design my project in such a way that it will allow the building and its users from the Tamansari kampungs to evolve from their existing habits towards an improved situation, by gradually introducing innovation in the form of wastewater treatment facilities with additional benefits, and giving the inhabitants the freedom and time to get used to the changed circumstances and find their way to work with it.