



Subsiding industrial buildings on an industrial estate.

SINKING CITY

Students of Landscape Architecture and Urban Design studied the water management of Semarang. The assignment was part of the Water as Leverage for Resilient Cities Asia project, coordinated by special water envoy Henk Ovink.

Text/Photos HEIN COUMOU

Amsterdam group at the campus.



In the first week of March, a group of Landscape Architecture and Urban Design students visited Semarang in Indonesia as part of design studio P6. Thanks to the Cascading Semarang project Markus Appenzeller's MLA+, among other offices, is working on, one of the two P6 studios was about Semarang. This city is a participant in the Water as Leverage for Resilient Cities Asia programme (WAL) in which interdisciplinary teams attempt to come up with innovative and inclusive answers to urban, water-related questions. The aim of this P6 studio is for students to make their own discoveries and create designs that can strengthen the WAL project.

Prior to the trip, the group had four weeks to analyse local water problems, the city of Semarang and its surrounding landscape. The city is located on the north coast of Central Java. Its urban area has a population of around 1.8 million inhabitants and the city faces urgent, complex water issues. Most of Semarang is located on a thick layer of clay full of freshwater. In the seventeenth century, Sunna Amankoeat II of Mataram transferred control of the fishing village along the Semarang River to the Dutch East India Company as part of a repayment agreement. The Company cultivated the surrounding land and built fortifications. Further urbanization led to the disappearance of the mangrove forest, which meant that the natural transition between sea and land was lost. Due to the long and heavy rains during the rainy season for one thing and because the distance between the sea and the stratovolcano (2,200 m) is only 25 km for another, the river quickly and often overflows its banks and subsequently floods the city.

Around 1890 the Dutch dug the West Canal, which is still in use, to prevent the city from flooding. Today's Semarang has a complex system of rivers and canals. Prior to the field trip we had already found out that the water challenge Semarang faces is fourfold. First, the city is sinking. Some parts subside from 8 to 15 cm every year. One reason the city is sinking so rapidly is that industry pumps water from the already soft soil. The impact on the city's buildings and infrastructure is considerable. In the second place, the rivers and canals are silting up. Due to natural sedimentation processes and poor maintenance, the rivers and canals are quickly being filled with silt. Third, the natural sea walls have disappeared due to large-scale urbanization and aquafarming. In combination with subsidence, silting and the rise of the sea level, this can lead to the complete flooding of a large part of the city. Finally, Semarang also faces deforestation and landslides. Owing to suburbanization and the consequential urbanization, the quantity of paved surface increases. As a result, there is less rainwater infiltration capacity and the natural flow of groundwater is limited. This leads to even more flooding and a greater risk of landslides.

Lecturer Jandirk Hoekstra and I arrived in Semarang a few days before the rest of the group and decided to visit the Gedong Songo temples on the Gunung Ungaran volcano. We were immediately confronted with the extreme rainy season. As we enthusiastically arrived at the first of the nine temples it started to rain so torrentially that in a few moments, the footpaths had turned into swirling rivers. We had to abort our visit. The next day we decided to visit the aquafarmers on the outskirts of the city. They use mangrove trees to create ponds for fish farming. Smiling men stood in the water up to their armpits, shovelling buckets full of fish. This is where we found out that conditions in Semarang are totally unlike those in Amsterdam. I can still recall the smell of the river: the once-clean mountain water was pitch-black by the time it left the city. The smell reminded Jandirk of an open sewer. The men never once stopped smiling amicably.

We hoped to visit Diopnegoro University (UNDIP) for a day of knowledge exchange. Prior to the field trip we contacted Wiwandari Handayani, or more colloquially Wiwi, who is a professor at the Department of Urban and Regional Planning. We were in luck: that same week ten students from the Radboud University Nijmegen and a group of students from Yogyakarta also came to visit and Wiwi managed to whip up a week-long joint course in Promoting Disaster Resilience in Urban Waterways.

As the week comprised an intensive programme with students from UNDIP, Yogyakarta, Nijmegen and Amsterdam we got to know the city, the culture, the challenges and the developments. The first highlight was our visit to the UNDIP campus. Here, Semarang's water challenges seemed far away.

While all students donned UNDIP uniforms to have their passport photos taken, we feasted our eyes on all the beautiful greenery on the campus. There were so many trees whose names we did not know!

Semarang is currently constructing a polder system to limit flooding. The Banger Polder is a good example of this. Roy-Kraft van Ermel (honorary citizen of Semarang) showed us around. The Dutch Prime Minister Mark Rutte officially opened the pumping station in 2016. The polder is the result of a Dutch trade mission to Semarang that involved various Dutch water boards. In addition to the functional realization of the Banger Polder, Semarang's first water board was established at the time as well. As a result, no more floods have occurred since 2016, which allowed investments in the public space. The system is expected to protect the polder from flooding for the next 20 years.

North of Banger Polder, surrounded by industry, is the fishing community of Tambak Lorok. Here, despite efforts to reduce the risk of flooding, we saw the harsh reality of a rapid subsidence of up to 15 cm per year. The streets and quays were being raised with the financial aid of world banks and the neighbourhood was provided with running water a year ago. But people who do not have any money see their dwellings sink faster and faster, until they are uninhabitable. Waste is collected for use as a foundation for new dwellings. Anyone with sufficient capital will invest in a dwelling, but the roof will most likely be the floor in a few years' time.

Another good example is the Jatabarang Reservoir in the Nonko Sawit region. The dam limits the flood risk of the river. In addition, plans are being made to turn the water into drinking water. In Nonko Sawit, we took a beautiful walk along the network of canals and irrigation systems that supply the rice fields around the villages with water. The villages have had septic tanks buried under ground for a few years now, to ensure their pitch-black water is not discharged directly into the surface water.

The extremely rapid urbanization of the city and the region is striking. The informal economy plays a major part along almost every infrastructural line. The spaces between the commercial buildings in industrial areas are used for informal settlements. Outside

the city, developers build suburban settlements that are devoid of any landscape context and do not make a positive contribution to the water challenge. During our visit it became clear that the city has been legally obliged to have a zoning plan for 20 years, but no zoning plan has ever been made. One painful consequence of this is that new port developments are planned on the west side of the city, where the mangrove landscape is currently being restored. Wiwi repeatedly argued that the city has an urgent need for a proactive long-term perspective at the regional level. The WAL project is a first attempt in that direction.

The final workshop on Thursday and Friday exemplified the added value of international study projects. The different cultural backgrounds and disciplines (planning, research, designers and policy-makers) resulted in a diverse mix of people. A workshop is a place where students can quickly test and discuss their initial ideas and strategies. In this case, students were confronted with alternative views, lines of thought and realities. It also turned out that the Dutch often took the lead in the discussion and talked rather loudly, while the Indonesian students were more modest and inclined to wait to see which way the wind would blow. The student who had climbed the stage on the first evening to sing for everyone during dinner, for example, turned out to be a lot quieter during the workshop. But when he was given some elbow room, we found he had sharp and specific ideas. Leaving me chock-full of impressions, the week flew by. As every visit during the field trip, the entire joint course group was photographed after the final presentations.

Pumping station in the Banger Polder.



Land sinking in Tambak Lorok.



Clean Water as Leverage
A strategy towards a future-proof Semarang

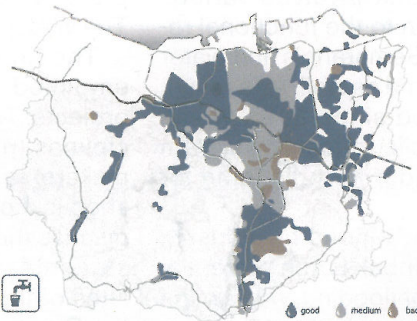
Student Niek Smal
Project P6 Semarang
Presentation date 04 June 2019
Teachers Jandirk Hoekstra, Hein Coumou

The city of Semarang (3 million inhabitants), located on Java, Indonesia, is facing a large number of water challenges. There is a lack of clean water and groundwater is therefore extracted from aquifers on a large scale. This causes parts of the city to sink by 10 to 18 cm per year, which further increases the flood risk. The realization of a clean water supply is the key to success. The implementation of a new polder system (using adjusted green, water and road structures) will compartmentalize the densely populated, low-lying part of the city. Clean water flows

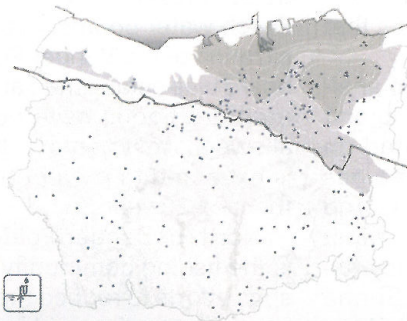
in from the mountains and is then pumped through the polder ditches. In the lowest part of the polder, the water is purified and clean water is either pumped back to a storage basin or used to refill the pumped-out aquifers. This restructuring of the city will achieve a safe and clean water supply. Clean Water as Leverage.



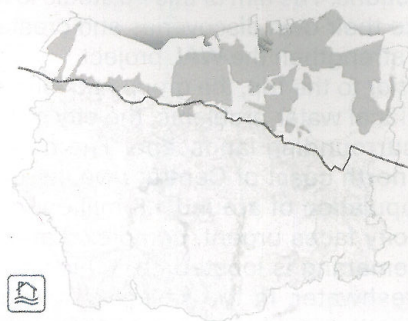
The shoreline has moved 5.5 km since the ninth century, resulting in a strong division between high, rocky land and low, clayish soil.



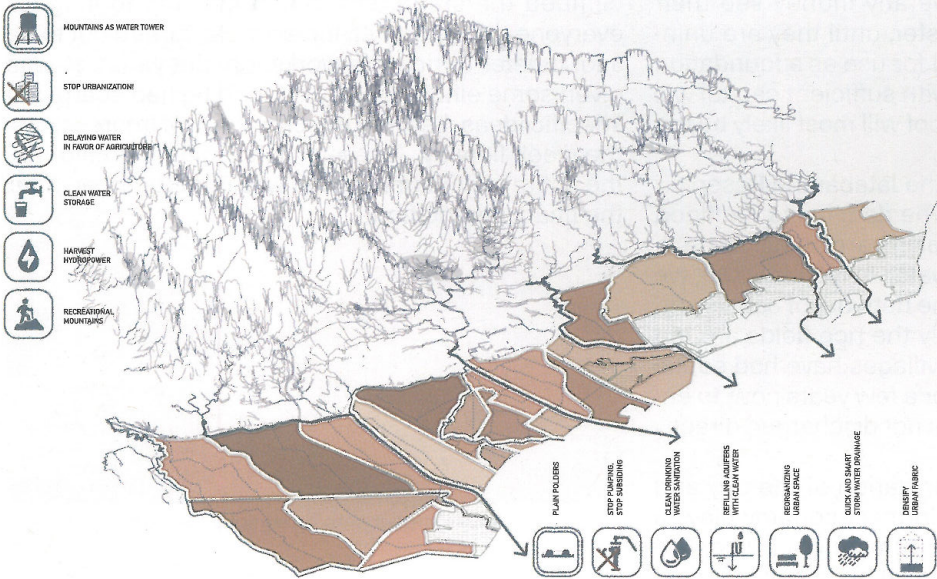
Semarang has a bad drinking water supply network, causing low-quality drinking water that's made worse by flooding.



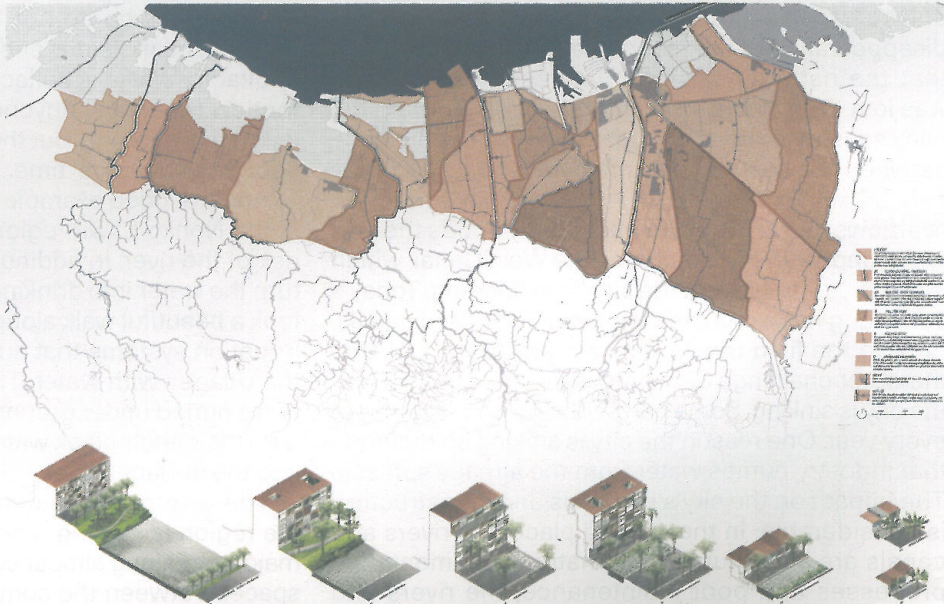
Pumping up clean groundwater is causing subsidence.



Due to subsidence, the frequency of flooding is increasing.

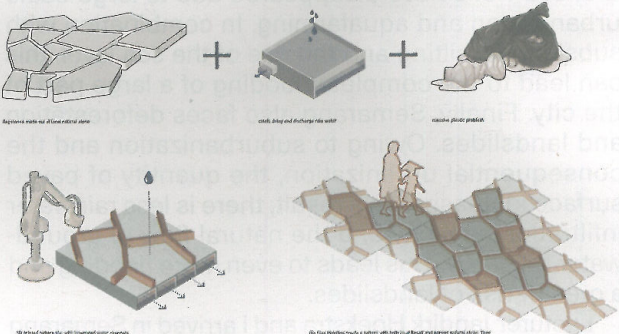


Vision: clean water as leverage.



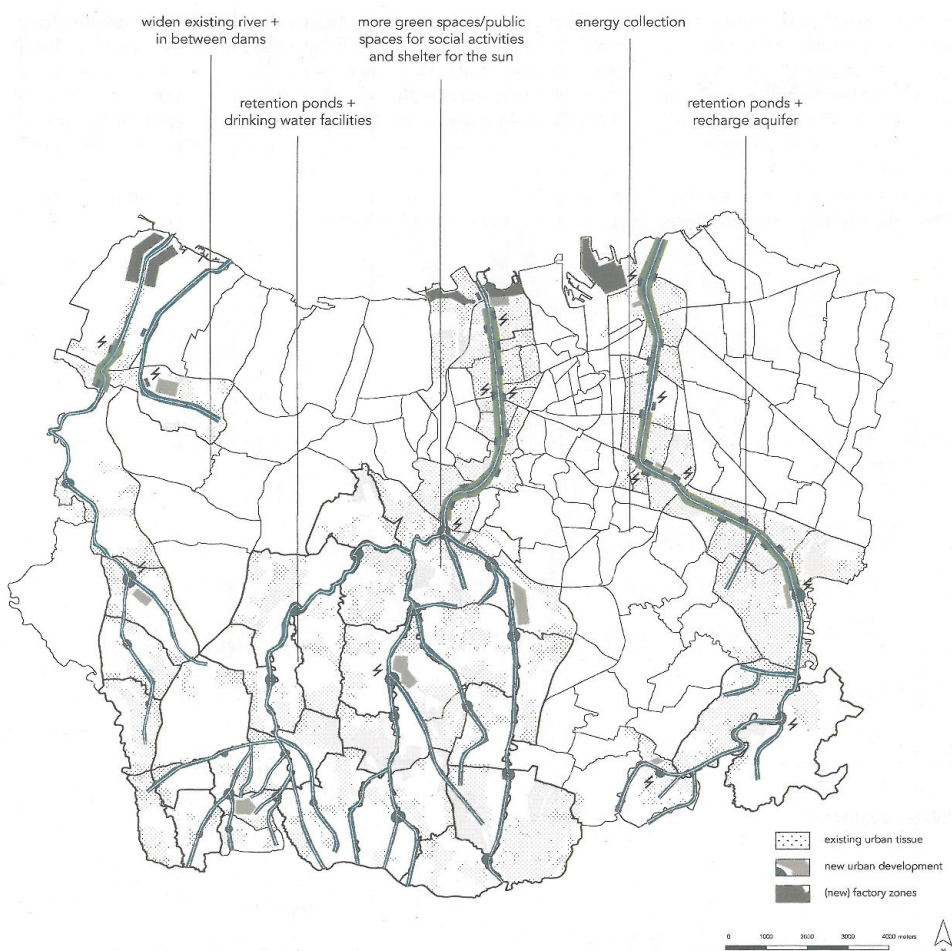
Overview of the new polder system.

Pavement comprised of both local basalt and porous natural stone creates a recognizable image typical of Semarang.

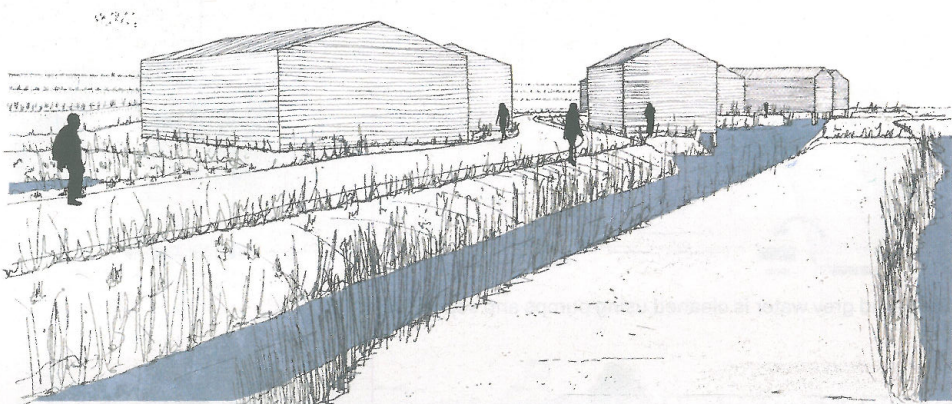


Master plan: the strategy applied to Kota Lama (old town).

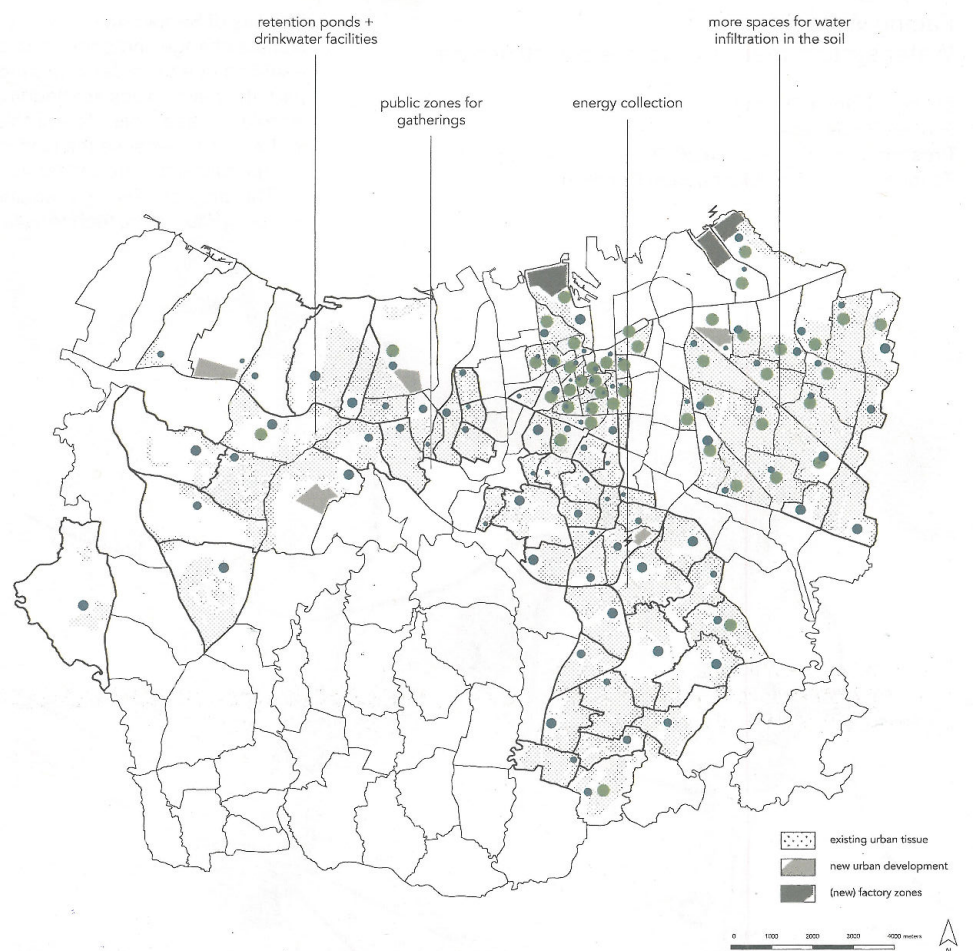




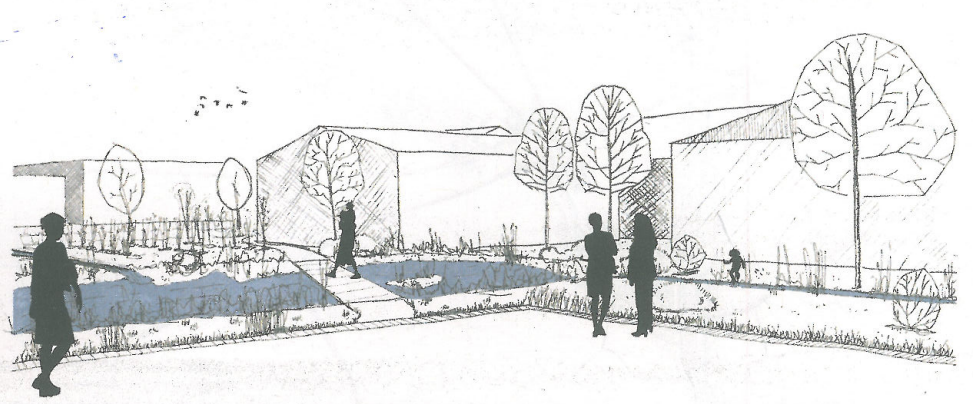
River system, using the existing river.



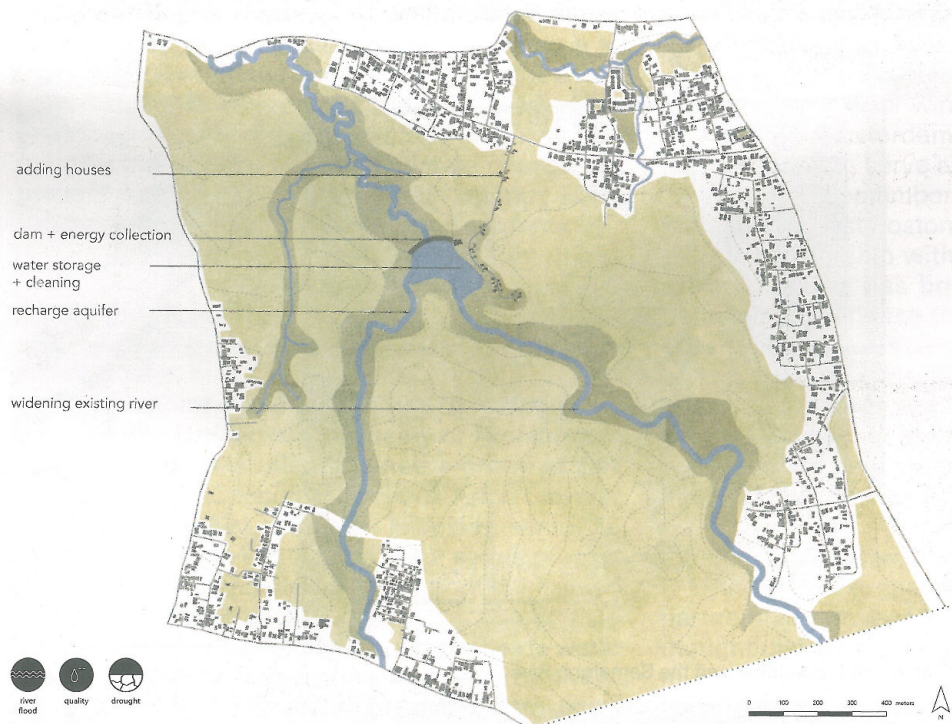
New structures together form a kampong along the river.



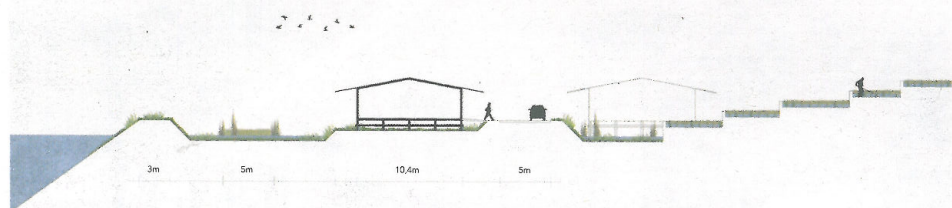
Local water system that makes use of rainwater.



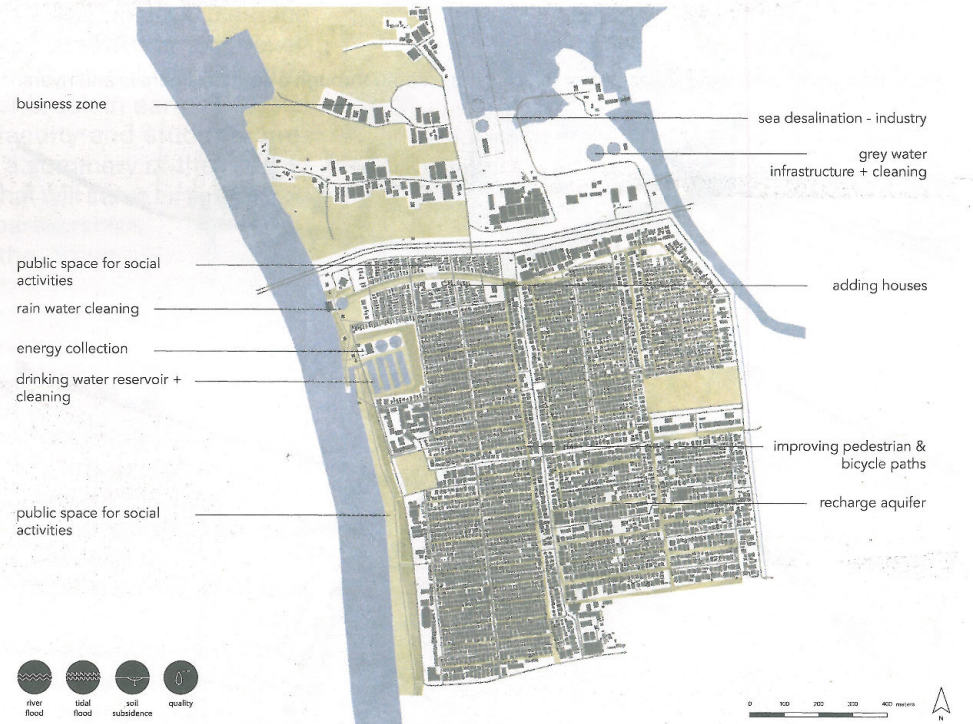
Small infiltration gardens improve the water quality.



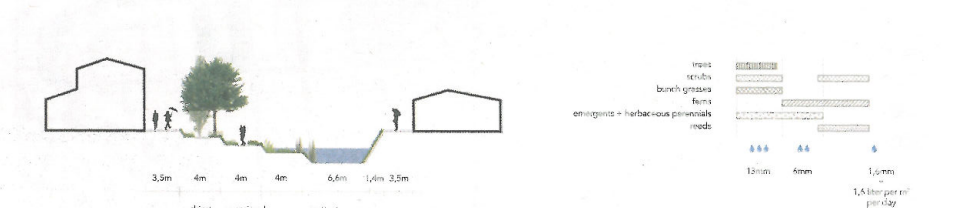
Urban plan for the northern part of Ngadirgo, a rural municipality just outside Semarang.



Cross section over the water reservoir, the new neighbourhood and the rice fields.



Urban plan for Panggung Lor, a borough in downtown Semarang.



A waterway for rainwater.

177 Approaches

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Project P6 Semarang
Presentation date 04 June 2019
Teachers Jandirk Hoekstra, Hein Coumou

The city of Semarang, located on Java, Indonesia, has about 1.5 million inhabitants. It has 16 districts and 177 subdistricts. Each district and subdistrict has its own spokesman. That means there are almost 200 people in charge. Aside from that, the city has six different water-related issues: river floods, tidal floods, soil subsidence, water quality, drought and landslides. These need to be addressed in order to prevent disasters. Because of the city's difficult political situation, this project suggests addressing the water issues locally. Each subdistrict

has to fix its own water-related issues, which results in 177 approaches. There are two different kinds of subdistricts: ones that are located along a natural river and can use the existing river and those that are not. The aim is to make the water as visual as possible in each subdistrict to create an awareness and a sense of responsibility and to fix the local water issues.

Facing Water Water system merged into the city structure

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The city of Semarang is dealing with mayor problems concerning climate change and population growth. In the hills, the land is sliding due to unstable ground and deforestation. In the lower part, the main issues are flooding by rivers after heavy rainfall and flooding by sea water. The problems will become more extreme in the future, because the land is subsiding because water is pumped from the ground for industries and households.

This project offers four solutions to these problems: creating a spongy mountain, rechannelling the city, feeding the industries

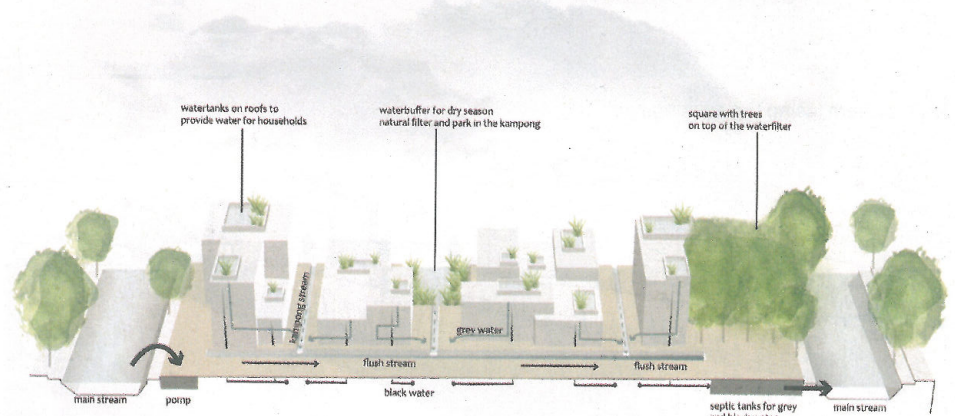
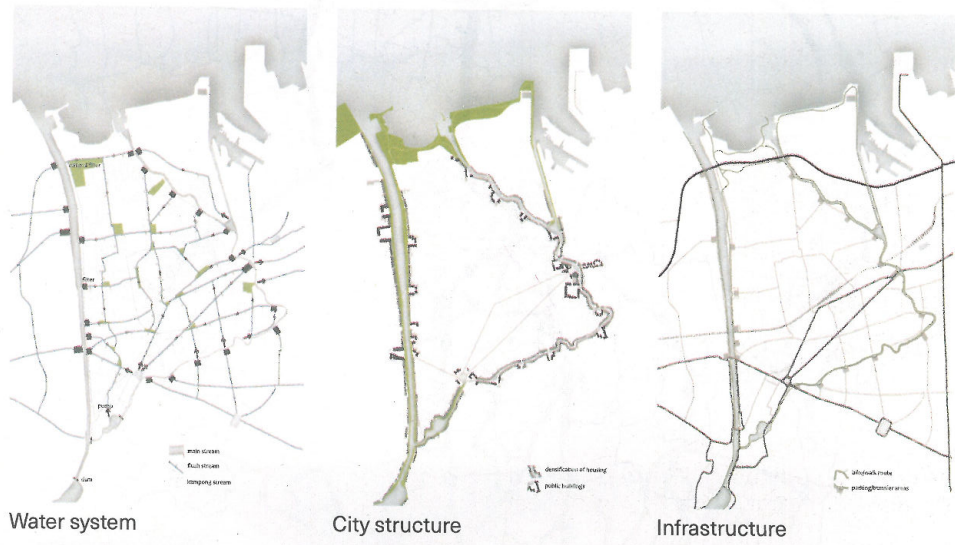
and recharging the aquifers. However, solving these issues does not add any quality to the water and the life in the city. The city of Semarang contains many waterways, from small ditches in the street to canalized rivers that move through the city. Their qualities are now unseen. Open water is used as an open sewer. You can compare it to Amsterdam 100 years ago. The beautiful canals we see today were very dirty back in the nineteenth century. By building a good sewer system and letting the water move, the canals were flushed clean.



When clean water enters the lower part of the city, it is steered through a couple of canals and rivers.



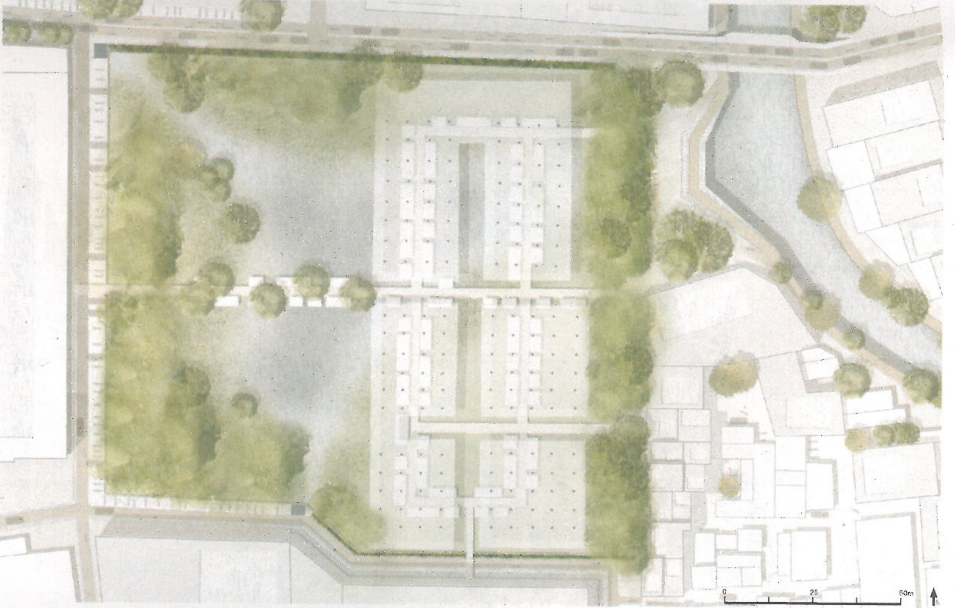
The Semarang River will become a comfortable public space in the city, characterized by water, green and public squares.



Black and grey water is cleaned using pumps and septic tanks.



Cross section over the Pasar Johar and the Semarang River.



Plan of the Pasar Johar and the Semarang River.



The Pasar Johar market hall is currently abandoned, but will be turned into an open, green space combined with a constructed wetland, partly covered with wide walkways.