REFLECTION PAPER

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Title: Regenerative Ruins
Sub-title: : Re-evaluating the value of historical and natural fresh water system for the urban context of Willemstad, Curaçao

Research domain: Make and Flow
Epistemes: Ecology (natural environment) and Morphology (shape, form)

Aspect 1 the relationship between research and design.

The research paper on implementing the hydrological cycle in the built environment has very much informed my design process and overall graduation project. *How can a decentralized, circular water system (inspired by Closed city concept, HIDS and NBS) be implemented to provide freshwater in a urban neighbourhood in Willemstad, Curaçao?*

The interest that has grown over time is to analyse how technical solutions in the built environment can help harvesting and reusing water in order to relieve the pressure on freshwater demand in semi-arid climates, like that of Curaçao. To be honest the first approach was to research how Curaçao could become less depended towards the import of food. Parallel to the design process, while writing the research paper, this stuck to my mind. Born and raised in Curaçao, I was always staggered by the high prices for fruits and vegetables. Growing up I realized that these products where all imported from different countries, like that of Venezuela, America and the Netherlands. The reason why agriculture did not flourish was for me a mystery, because of the rich plantation history. When conducting research on this topic, via literature, the conclusion came that Curaçao actually never really flourished in the agricultural sectors. Looking at the heritage and present day, agriculture on the island did and does not flourish for many reasons like governmental interest and legislation, dry climate with long drought periods and short burst of rainfall, erosion of soil, groundwater salinization and the adequate knowledge.

Through interviews and literature review I also concluded that the urbanization and expansion of the city Willemstad had been depleting the natural recourse and destroying ecosystems. How to treat water properly is an urgent challenge that many Small Island Developing States (SIDS), such as Curaçao, face, especially if they are largely urbanized. I was and still am interested in exploring how to respond to this challenge from the perspective of architecture. The conventional building structures have tended to draw down on natural capital, like the hydrological cycle, whereas ecosystem thinking and looking at nature as examples provide opportunities to do the opposite. Architectural structures should not solely fulfil a functional purpose for human beings, but help regenerate the environment where they are built in. If we increasingly shape the built environment with this in mind then (I believe), over the next few years, we can create spaces that are healthy and regenerative for their inhabitants and infrastructure that becomes integrated with natural systems.

The design project is therefore a holistic idea of creating a new urban farm typology, on dilapidated monumental sites of the island, using decentralized water harvesting systems for enough, affordable and mineral-rich water. I later conducted more in-depth, specific researches into the vernacular architecture and appurtenant passive climate solutions.

Aspect 2 the relationship between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS).

Graduation topic: *Heritage and nature based spatial planning for decentralization of water systems in the urbanized region of Curaçao*
Studio topic: *Shared heritage and Harvest*
Master track: *Architecture*
Master programme: *The MSc Architecture, Urbanism and Building Sciences*

The Architectural Engineering studio focusses on the approach of architecture in a more technical perspective. Circularity, materialization and construction techniques are examples of themes that are touched upon in the studio. As stated in my research paper, graduation plan and aspect 1 of this reflection paper, architectural structures should not solely fulfil a functional purpose for human beings, but help regenerate the environment where they are built in. For this reason choosing this studio was not a hard one to make. In my opinion architects could and should show the aesthetics of technical solutions in innovative design approaches, in my case decentralized water harvesting and reusing techniques in the built environment.

Alongside the graduation year my interest of using heritage and nature based solutions started increasing. The synergy between heritage, culture, economy and ecology for me became a fundamental thread in my research and design decisions. The topic of community based circularity is very relevant nowadays within the realm of architecture and the built environment. Architectural Engineering for me was and is the studio that response to this relevant trend.

Aspect 3 Elaboration on research method and approach chosen by the student in relation to the graduation studio methodical line of inquiry, reflecting thereby upon the scientific relevance of the work.

Overarching methodology:
For this project is *scenario planning*. Inspired by the 'Closed City concept' described by Hooimeijer et al (2019), scenarios are imagined relying on the ideas of decentralized water management system and circular economies. In order to formulate scenarios that assisted me in gaining knowledge for the research, as well as for the design, the theory of heritage and nature-based solutions where studied.

Defined scenario for the thematic research:
Where decentralized closed water systems are implemented as part of an advanced circular approach to relieve the pressure on freshwater availability in Curaçao. This scenario shifts the emphasis from current conventional centralized water management to technical and practical challenges of the transition into a decentralized closed water system where building construction are needed to be designed as part of an advanced regenerative circular economy. Allowing exploration in techniques of freshwater harvesting and wastewater treatment.

Disciplinary relevance:
Circular water treatment is one of the key elements in order to tackle the contemporary issue of climate change and consequent changing of the hydrological cycle in urban areas. In Curaçao water processing companies and wastewater treatment facilities have already made steps in order to down the pressure on freshwater resources, like desalination reverse osmoses plant and waste water treatment plants. However, these processes are characterized by linear, centralized, polluting, costly, time and energy consuming and does not contribute to cultural value.

Societal relevance:
The project is also of great societal relevance, in my opinion, because currently, many residents are not aware of the importance of creating closed water cycles in the urban context. In order to realize the circular hydrological cycle in urban areas, community involvement and awareness can be a crucial part. A closed hydrological cycle is not only beneficial for the quantity and quality of fresh water resources but also beneficial for providing a healthy living environment. Residents will have more possibilities to work together with their communities on treating the freshwater and wastewater from their neighbourhoods. This would enhance the cohesion in the sprawled neighbourhoods of Curaçao which is missing at this moment.

Aspect 4 Elaboration on the relationship between the graduation project and the wider social, professional and scientific framework, touching upon the transferability of the project results.

The initial goal was to tackle relevant societal and environmental challenges on the island of Curaçao. Since the city of Willemstad is coping with the need for water treatment, there are plans to tackle these issues by upscaling the current production of the desalination plant and wastewater treatment plants. However, this solution in my opinion is not adequate.

The larger overarching challenge I want to address, is the current issues that urbanised areas, on SIDS, have relating to the interference on the *hydrological cycle* and therefore on both the quantity and quality of water resources. The framework for the project integrates the principals of decentralized water management systems, like the Closed City concept, explained by Hooimeijer et al (2019), the principals of nature-based design principals (which offers a more ecologically-oriented approach) and heritage inspired design solutions (which offers a more cultural-oriented approach).

Aspect 5 Discuss the ethical issues and dilemmas you may have encountered in (i) doing the research, (ii, if applicable) elaborating the design and (iii) potential applications of the results in practice.

(i) The main ethical issues starting the parallel process of research and design for the context of Curaçao was that at first I did not consider the island boundaries, its cultural value and communities. During my internship we sometimes had to create concept, where the sky was the limit. This led at first to big scale and high-tech solutions. A choice had to be made if the project would become a conceptual and farfetched utopian idea or a holistic and realistic one.

(ii) Firstly as stated above the design was a big scale intervention, located on a plantation in the peri-urban zone of Willemstad. After the P2 I went back to my home island, where I met and talked with allot of inhabitants. After the travel to Curaçao I realized that the problem I was tackling was of value to the people, but the scale and site in which I was trying to solve it was too big and farfetched.

(iii) Due to the realization and change in focus of the design process I came to a more low-tech approach of tackling the problem stated in my research paper. The idea is that the project could be repeatable in other neighborhoods and SIDS.