

Reflection – Wietse de Haan (4562410)

MSc Architecture, Urbanism and Building sciences - Building Technology

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## Floating Classroom, The Philippines

*“Design a classroom for students living in a typhoon and flood sensitive area in South- East Asia that can withstand the impact of typhoons and floods to create a safe learning environment”*

### Mentors:

Climate design: Eric van den Ham

Structural design: Peter Eigenraam

External supervisor: Pieter Ham



# Graduation Process

## Selection of the research topic:

When I heard about the floating house project of the Finch Floating home, I was immediately triggered by the ambition of the project, to offer affordable housing in a sustainable way to residents that are affected by typhoons and floods. Pieter Ham told me about a request to make a design for a floating classroom and asked if I was interested in developing such a design as a graduation project. I knew immediately that this was the topic, I was looking for.

## Formulation of the research topic:

The stated assignment from Pieter Ham had a clear goal, the conducted research should result in a design for a floating classroom. This goal helped me to define the research question for my graduation research project.

"How to design a classroom that offers students living in a typhoon and flood sensitive area in South-East Asia a safe learning environment."

A risk of the research question posed was that it was quite broad, which could lead to an overload of information on multiple topics without clear direction and goal. Defining design criteria gave me direction and helped me to collect and filter the information for specific areas that were relevant to the design. Sub-research questions were formulated for each design criteria in order to collect the required information needed to find solutions for these criteria.

## Process between P1 and P2:

The process of the P2 was described as the "background phase" which consisted of collecting essential background information needed as input for the design. This phase was a literature study and two case studies on floating homes. Looking back at the information collected during the literature study and the case studies examined, I could have been more focused on the important topics. For example, the literature study on the school system in the Philippines was quite extensive which has given me more insights about the school system itself, but for the actual purpose of designing a classroom, the value of the input was limited. Although, it gave me a very good insight in the local situation which was of value in making the design. With the case studies, some aspects were researched into too great detail, where less detailed analysis would have been sufficient.

From this phase I learned to describe and formulate more clearly which information a literature research need to deliver and what input does the information contribute for the overall design. Spending too much time on details was one of the observations from the mentors after the P2 presentation.

### Field visit and P3:

In the period between P2 and P3, there was a field visit of one month at Macabebe, The Philippines, together with Reji Benoy. The goal of this visit was to study the floating house, being an example for floating construction and to collect information on the local situation. Reji researched the indoor environment quality of the floating house. During the field visit, many site visits were made to local schools, contractors and local suppliers of building products. Many of those visits were arranged on-site in consultation with counsellor Bembong Balgan. Due to Bembong's local position, broad network and knowledge it was relative easy to arrange the visits. Lesson learned is to contact Bembong in before the visit to coordinate everything more in advance, which will save much time on the location itself. The questionnaires conducted in the schools went very smooth, and in conjunction with the measurement of the conditions in the classrooms, this gave a good idea and relevant information of what the students thought of the current classrooms and what they would like to see differently. The interviews with the teachers were also very informative, often the focus was more on a problems at the school administrative and political level. With hind sight I realize that more specific questions could have been asked to get more design-substantive answers from the teachers. The visit to Macabebe was the first time that I had to consult and work with people from a completely different culture and who are used to a different approach of working, this was an enjoyable and educational experience in itself.

### Process until P4:

Until P3, the focus was mainly on gathering information that can serve as input for a final design for the classroom. After the P3, I found it difficult to convert all the collected information into a design. By breaking down the design in subparts I created more focus, first on the construction of the classroom, it gave me more guidance to start designing.

For the structural design I had chosen to split the design into several aspects such as the shape, foundation and superstructure at the time, this made every aspect more accessible but looking at the final design some elements could have been more interwoven at the beginning stage of designing.

After P4, I finished the drawings and detailing along with a stepwise build sequence for local builders.. Further I validated the software calculations by manual calculation.

### Conclusion:

In conclusion, this research has given me more insight into the design of structures that must be resistant to extreme environmental conditions, high wind speeds and floods. I learned a lot about the working methods, cooperation and interaction with people from a different culture. Finally, my awareness increased that everyone, who want to commit, can contribute to improve the living conditions of other people.

# Societal Impact

## The relationship between design and research:

This research arises from a request by the principal of the San Lorenzo School in Macabebe to Pieter Ham to design a floating classroom. Macabebe is a region in the Philippines where many floods occur that impact education. Classrooms are often unusable because they have been flooded or damaged as a result of a flood. The ultimate goal of the research is to design a classroom for the Macabebe region that is resistant to floods and typhoons.

The following steps were taken to create a design for the floating classroom:

- Setting up design criteria and strategies based on a literature study on typhoon resiliency, indoor comfort, schools designs and analyzing two case studies. (research for design)
- Field trip to Macabebe, The Philippines, where interviews and questionnaires with students and teachers were conducted to learn what they prefer in terms of indoor comfort. Visiting local suppliers to gain knowledge on materials available for the design. And visitation of the project location to determine the local characteristics.
- With the input from the literature study and the field research, a pre-design was made, which was further structurally analyzed and designed with the aspect of prefabrication. During the analysis of the design, new design and constructive challenges came up that have been solved and incorporated into the design (research by design)

During the design, it was sometimes challenging to base every design decision on research facts, some choices came from within, e.g. subjective.

## Relationship between the topic and track (Building Technology)

The graduation project, the floating classroom in the Philippines, is related to the climate design and structural design chair of the sustainable graduation studio of the building technology track. Sustainability and technology played a big influence on the process of the design and the final design. Within the design, these topics touch upon sustainability: focused on using locally available materials, maximizing the structural use of materials that are being used, implementing of passive design strategies in the design to save energy and reusing of materials as input for the design.

The aspects of the design that touched the technology track are; the design and calculation of a floating foundation, the structural analysis of the building against typhoons and the design of easy connections for the prefabricated process.

### The relationship between the project and the wider context.

The whole of south-east Asia is facing problems caused by floods and typhoons. The classroom is designed for a school in Macabebe, The Philippines, but it can be applied to other countries in South East Asia with the aim of providing continuous education during a natural disaster. No disruption of the education will have a positive effect on the well-being of students and teachers and ultimately lead to a higher education level of the students.

If the educational level increases, this will even have a positive influence on society in the longer term with a higher number of high educated people in the country.

### Relevance in the field of research

The floating classroom offers multiple aspects that may also be relevant to other studies. The design of a floating school can contribute to floating architecture studies. The applied ideas and strategies to make the classroom typhoon resilient can be used in studies on typhoon resilient architecture. This Research can also contribute to Pieter Ham's Research into sustainable amphibious houses for flood-prone areas in South East Asia.

### Future steps

Further research to improve the design and how to apply in a broader context. In addition to the Flinch floating home and the classroom, floating house communities can also be researched and how this can be developed on a larger scale.