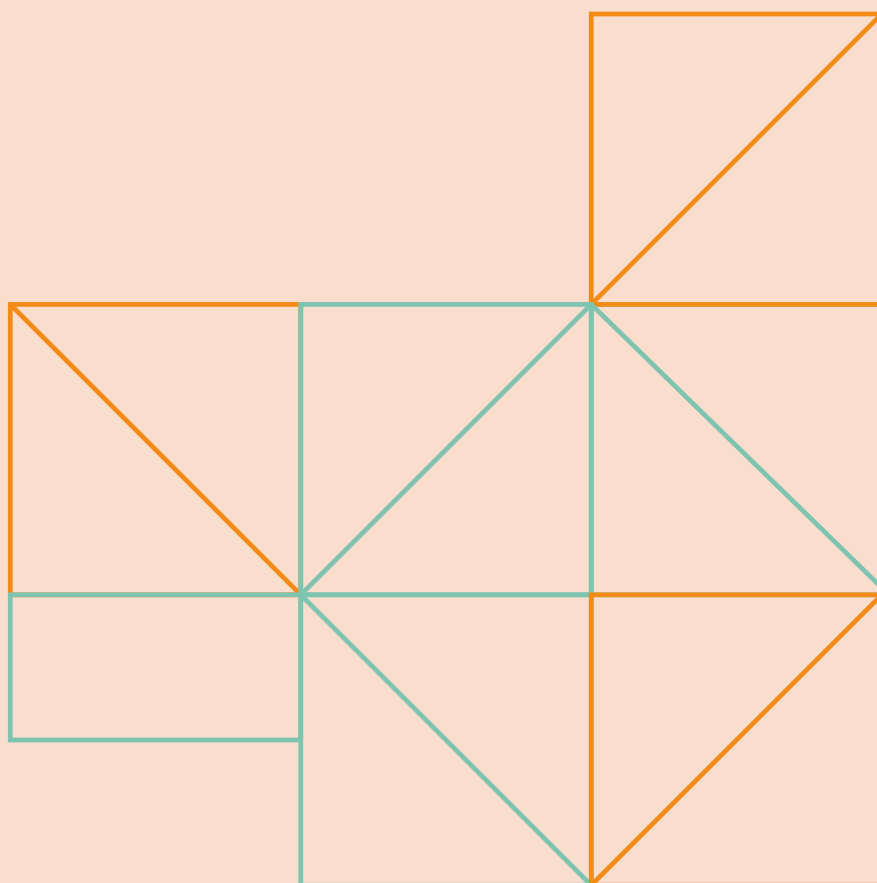


GRADUATION PLAN

A RESILIENT COMMUNITY
HOUSING FOR SINT MAARTEN

MSC 3 & MSC 4



2019-2020
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RESILIENT HOUSING FOR SINT MAARTEN
CREATING A LOCAL INCOME GENERATION

CHOICE FOR STUDIO

Architectural Engineering brings spatial, functional, social and technical developments together in its integrated design projects. In this, the studio offers an opportunity for the students to formulate their own research led by their own technical fascination.

The research by design approach of the studio gives the change to look further into product design. Coming from applied science, I like to think practical. I believe that architecture does not exist without engineering.

As an architect I like to be socially involved in a building process. Furthermore, I think that everyone deserves a good quality of life and an aspect of that is to have a safe home. The houses on Sint Maarten are put to test because it deals with hurricanes and earthquakes. Houses are often not built in a correct way to guarantee safety. People do not have money for contractors or the right materials. I would like to find a way to make resilient housing affordable on Sint Maarten. I think the studio 'EXTREME' offers an interesting architectural inside on solutions for worldwide disasters.

PROBLEM STATEMENT

Sint Maarten is an island in the Caribbean which lies in the North Atlantic Ocean. The capital of the island is Philipsburg and is the second most visited port in the Caribbean. Yearly, Sint Maarten receives 1.7 million cruise visitors and 530.000 stopover visitors. These visitors combined spend about 820 million a year (Williams, 2018), making the commerce and tourism the most dominant sources of income and employment.

Sint Maarten lays in one of the six main tropical areas of the earth where hurricanes can develop each year. In 2017, the hurricanes Irma and Maria overwhelmed the island, leaving 90% of buildings damaged. The recovery of the island is essential for the tourism sector in order to receive visitors on the island. In 2019, 2 years after Irma and Maria, the island is still not fully recovered. The recovery period has a negative impact on Sint Maarten's income and employment rate, which is too dependent on tourism.

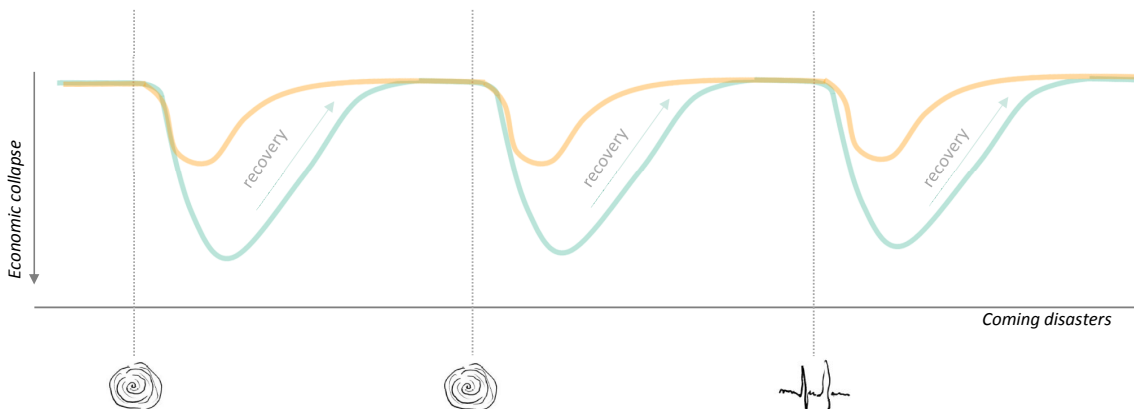


Figure 1. Economic collapse. (Own work)

OBJECTIVE

The goal of this project is to provide a local income source and create hurricane resilient housing on Sint Maarten. The research aims at developing resilient plastic building elements which can be built locally. This way the economic recovery period after a disaster is shortened and future recovery of housing is minimized, seen in figure 2.

Plastic is the main marine litter in the Caribbean. 80% of the litter found in the Caribbean Sea is plastic. This mainly comes from poor household collection services. An estimated 322,745 tons of plastic goes uncollected each year in Caribbean (World Bank Group, n.d. p. 15). The idea is that Sint Maarten will collect plastic out the region and make resilient roof elements out of the waste and with that create jobs. The architect will fulfil the role of facilitator and provides the technical knowledge about how to build with plastic waste. Eventually, in the future, the local community guides the process.

To conclude, the project aims at combining the three pillars of sustainability; social, environmental and economic.

Design question:

"How do we solve the need for resilient housing on Sint Maarten and create a local income source?"

The sub-questions are divided in the three pillars of sustainable design.

1. Social:

- How are Caribbean houses organized?
- How can the government design a waste collection system?

2. Environmental:

- What are the influences of hurricanes and earthquakes on housing?
- Which structures can withstand hurricanes and earthquakes?

- What are the influences of tropical climate on the liveability?

3. Economic:

- What are the most affordable materials and methods used locally?
- Which machines are necessary to create a plastic waste factory?

Research question:

"What are the potentials of HDPE plastic waste as material for hurricane resilient sandwich panels that improve the insulation value on Sint Maarten?"

The sub-questions for the research are:

- What makes a roof resilient to hurricanes?
- Which roof structures are most common on Sint Maarten?
- How to create captures still air in a roof panel with recycled HDPE?
- How to connect a plastic sheet to a cavity layer, which can wind-stand weather conditions?

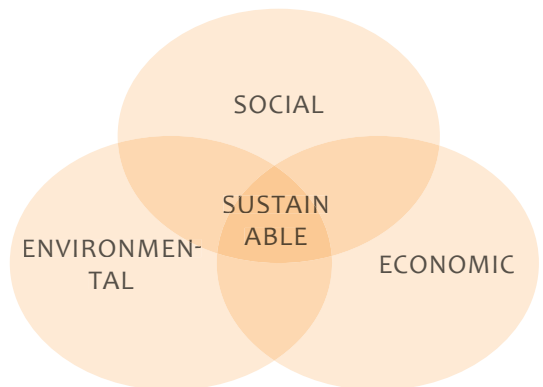


Figure 2. Three pillars of sustainability. (Own work)

METHODOLOGY

The research is supplemented with a field research of 3 weeks to the island. This research consists of interviews, analysis and drawings. This gives an overall inside on local needs, main problems with roofs, government needs and waste management. This field research formed the starting point of defining the problem and refining the research question.

The research is further divided into two parts; literature research and experimental research. First a thorough literature- and analysis research will be done to have a good grip on the effect of high wind speeds on roofs. From this research a set of criteria for the recycled HDPE roof panel can be established.

Secondly, a low tech experimental research will be conducted on plastic roof elements. During this process the criteria for designing with plastic will be sharpened and a first prototype will be developed.

From the research phase forward, the design will be developed by model making. This way the feasibility of the product will be tested.

Going into a worldwide corona crisis in early 2020 forced the design phase to focus more on the digital presentation. Going towards P4 a set of 3D models will help to understand the building order.

RELEVANCE

Since natural disasters like hurricanes can not be stopped and are a worldwide problem, innovative solutions are needed to make resilient housing. After all, a house is one of the basic needs for a human being.

This graduation project will form an example on how to build with plastic waste and create income generation. Only 9 percent of the primary plastic no longer in use has been recycled since 1950. Worldwide the population increases which adds to more waste. This is alarming because most developing countries lack a good working waste management (Our World in Data, n.d).

I believe that we should all share our knowledge and ideas to make the build environment more sustainable. Looking at the sustainable goals that are developed by the United Nations, this project comprises 4 goals (United Nations, 2020).

- Goal 8. Decent work and economic growth
- Goal 9. Industry, innovation and infrastructure
- Goal 11. Sustainable cities and communities
- Goal 12. Responsible consumption and production

PLANNING

The site visit has been planned before P1 to have a good grasp on the context early on. The research will be mainly conducted before P2. The period from P2 towards P4 will be used for designing.

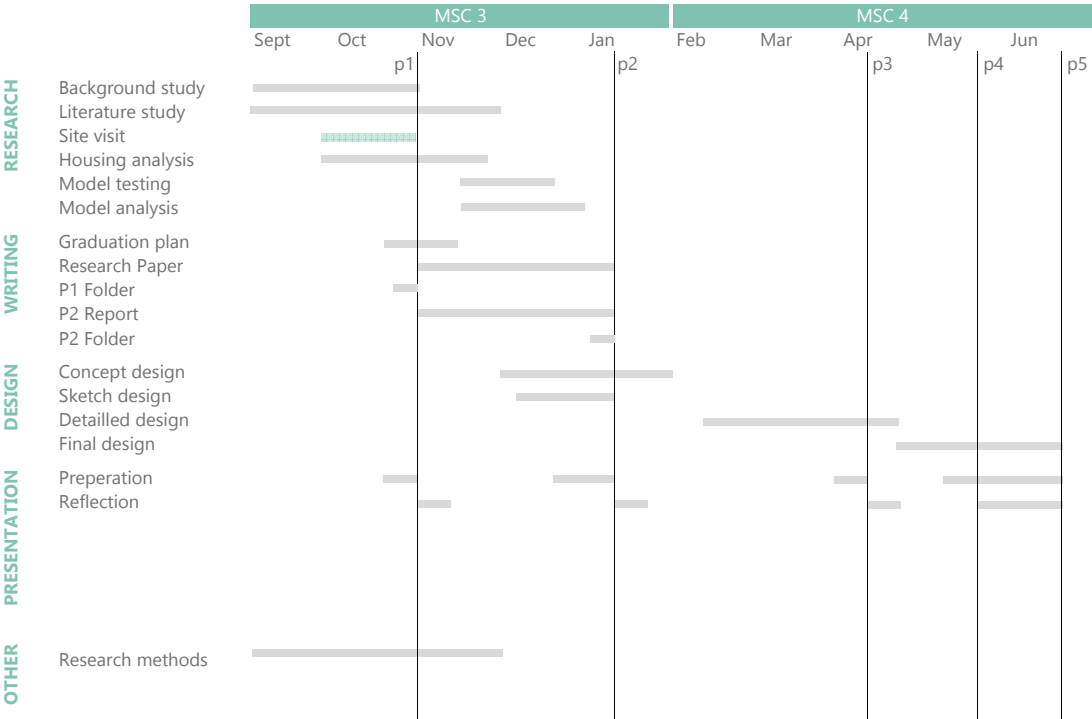


Figure 3. Timetable graduation project. (Own work)

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FIGURES

1-3 Houterman, M.M. (2019). Own work [Diagram]

