# REVITALIZE PHILIPSBURG

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## *ABSTRACT*

*In 2017 the island Sint Maarten was hit by hurricane Irma. Ninety-one per cent of the houses were damaged. Now three years later, there are still a lot of abandoned houses and vacant lots in the residential area of the capital city Philipsburg due to the destruction of Irma. This, in combination with population growth, results in a housing shortage on the island. To rebuild after a natural disaster, self-building was commonly used within the local building culture. However, this tradition got lost for the last three decades. This research is looking for opportunities to reintroduce a form of self-help housing to contribute to the answer against housing shortage and turn this district into a lively neighbourhood again. Historical research has been done to create a foundation of knowledge to comprehend the current situation. Literature study, interviews with officials, experts and residents have been conducted to investigate the traditional and contemporary building culture of Philipsburg's domestic architecture. Case studies into rebuilding after a natural disaster indicate that organised self-help housing was a sustainable way to make a community resilient. This research proves that applying organised self-help housing reduces the housing shortage in a culturally appropriate and community-based way.*

## *KEYWORDS*

*Philipsburg, self-help housing, resilient community, natural disaster, traditional domestic architecture, contemporary domestic architecture, local building culture, community based reconstruction.*

## I. INTRODUCTION

Sint Maarten, a small island in the Caribbean that has only been independent for nine years, is an important tourist destination that attracts many people from the region to come and work here. Due to immigration and the birth surplus, the growing population is confronted with a significant housing shortage. (Persaud-Hickinson, 2017) Located in a hurricane zone, Sint Maarten has to cope with large devastations regularly. Ninety-one per cent of all houses were damaged by hurricane Irma in 2017 making the already existing housing shortage urgent. (de Vries, 2017) The government has insufficient financial resources and knowledge to play a leading role in housing needs. After hurricane Irma, international financial assistance became available through the World Bank. Due to the strict rules of the World Bank for tendering and a shortage of acceptable projects, a part of the funds are not used. (Algemene Rekenkamer, 2018) Non-governmental organisations (NGOs) like the Red Cross provides aid in rebuilding damaged houses but are confronted with the problem of shortage of experienced contractors, skilled craftsmen and rising prices of building materials, making construction slow. (de Vries, 2018) The urge to develop new affordable houses and repair damaged ones remains. This major task does not go hand in hand with the current building culture on the island based on small scale private initiatives, usually to build one's own home. Due to the lack of craftsmanship and financial resources, self-reliance and resilience of the inhabitants is low in terms of housing. The quality of houses is poor, making them not resistant to hurricanes and not suitable for the tropical climate. The current building culture and the building organization is discussed in this research to gain insight into the reasons why there is a problem in speeding up the development and construction of new houses. In the past the inhabitants were also confronted with a shortages of money, materials and craftmanship, nevertheless houses and even cities were build. This proved to be possible through simple building methods and the joint effort of the entire community. Therefore it makes sense to look

at the past, both the traditional and the contemporary way. Organizing housing with the help of the community seems to be in line with a kind of organization of self-help housing (SHH). At the moment, there is no incentive or motivation that triggers the activity of communities or organizations to break the stagnation with regard to housing. In this research the main question will be investigated: *what can be learned from the local building culture and -history of Philipsburg to fulfil the current need of affordable housing while taking natural disasters and self-help housing into account?* This to determine what preconditions a building system, suitable for self-help housing, should meet and which organizational form fits in with it.

### 1.2. Methodology

Qualitative research is implemented in this paper to find answers to the previous question asked. Although literature study is the method which forms the bases throughout this paper, additional research methods have been applied, such as field research and case studies, see figure 1.

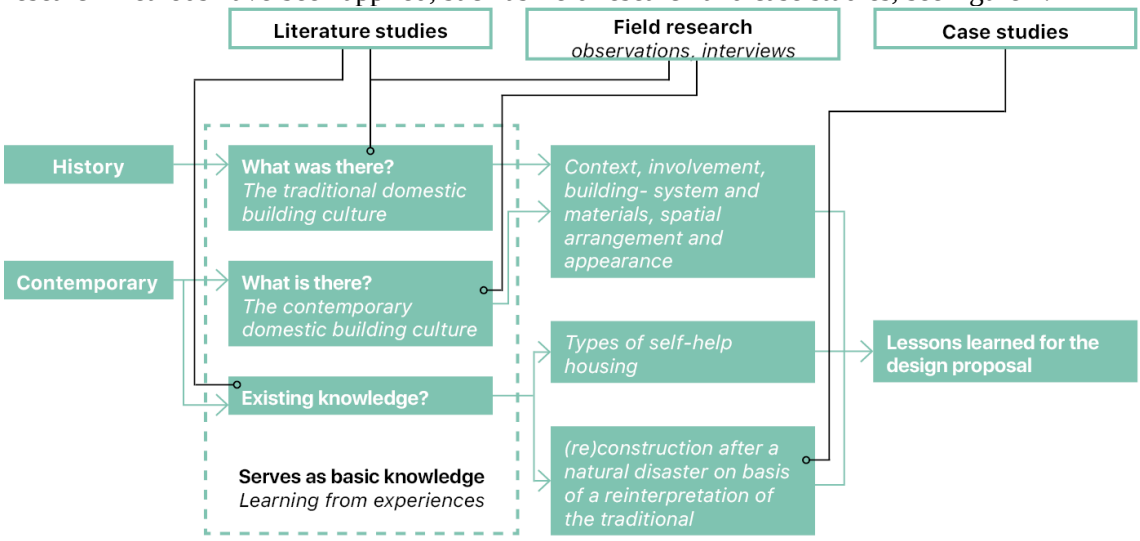


Figure 1: Overview of the applied research methodology (Own work).

First, the traditional domestic architecture of Philipsburg was described in chapter 2.1., which is carried out by consulting archives. Subsequently, contemporary housing was analysed in chapter 2.2. To find a tendency within the characteristics of the contemporary domestic architecture of Philipsburg, there has been a field trip to the island of Sint Maarten. Insight into the current housing situation is acquired by observations and interviews. The island is still suffering from the aftermath of hurricane Irma, and although NGOs started implementing reconstruction by self-help housing, progress is stagnating. To obtain knowledge about the possibilities of self-help housing chapter 2.3. provides a definition and an overview of types of self-help housing as a result of literature studies. To understand how self-help housing can contribute in rebuilding the housing and the community after a natural disaster, some cases are described as examples in chapter 2.4. Even though the circumstances of these projects are not entirely the same, they provide insight into how it could have functionated in Phillipsburg. The findings are indicated, compared and discussed within the conclusion. Based on interviews and observations is concluded why self-help housing did not work in Phillipsburg after the natural disaster and what the conditions are to make self-help housing a success in the future. Thus resulting in lessons for the design proposal within the design studio Architectural Engineering, Shelterlands Sint Maarten.

## II. RESULTS

### 2.1. What are the characteristics of the traditional domestic architecture of Philipsburg and what is the role of self-building in it?

#### 2.1.a. What is the definition of traditional?

The general meaning of the term ‘traditional’ is: “following or belonging to the customs or ways of behaving that have continued in a group of people or society for a long time without changing” (Cambridge Dictionary, z.d.). The way someone describes traditional architecture differs per society. Each place has its history that influences the development of what is considered traditional. Keeping this in mind leads to the central question of this chapter: *What is the traditional domestic architecture of Philipsburg?* As Joan D. van Andel describes in her book *Caribbean traditional architecture*: “The traditional architecture of Philipsburg has developed after its foundation, during the eighteenth and nineteenth century. Since the end of the nineteenth century this architecture has hardly undergone any changes” (van Andel, 1985).

### 2.1.b. What are the conditions that have influenced the historical development of the traditional domestic building principle of Philipsburg?

Various population groups have inhabited Sint Maarten. The island, known for its salt ponds, had several colonial powers that fought over the power on the island, each bringing their building materials and principles to the island. However, it appears that not every building culture is suitable on the island as a result of the natural disasters Sint Maarten has to deal with. This also applied to the Dutch who introduced brickwork and red tiles roofing. On 21 September 1819, the built environment was devastated as a result of a hurricane in combination with an earthquake. It turned out that the Dutch building culture could not resist this type of conditions (Sint Maarten National Heritage Foundation and Museum, 1933; van Andel, 1985). The island did not have enough materials to reconstruct, so the islanders started to import building elements from the United States (U.S.) in change for salt (van Andel, 1985).

During this period the ‘Balloon Frame System’ was a commonly used construction method in the U.S. for residential buildings. The Balloon frame system (see appendix A for a general structure of a Balloon frame system) consists of a wooden skeleton with standard-sized boards, continuous studs from foundation to roof, floors hung upon the studs, and everything nailed together. The system made it possible to build new houses quickly, and there was a catalogue available that offered a couple of different Balloon frame systems and parts of houses such as doors, windows and shutters. The houses were shipped to various places around the world as a numbered kit, making them quick to assemble. The adoption of the system in warmer climates has created new spaces such as a porch, often encountered in Phillipsburg. (Pizzi, 2003)

### 2.1.c. What are the main technical-, architectural- and urban characteristics of the traditional domestic architecture of Philipsburg?

Because the Balloon frame system could be buildup easily and rapidly, people without building knowledge could put it together. The low income and lack of skills and materials were the reason for simplicity. Slaves did the construction work, but after the abolishment of slavery in 1863, the residents started doing it themselves or with the help of a carpenter (Hartog, 1981; van Andel, 1985).

The traditional domestic architecture in Phillipsburg existed out one or two-storey detached houses along the Front- and Backstreet with alleys in between (see appendix B). Originally the alleys were used to take the salt from the ‘Great Salt Pond’ as quick as possible to the Great Bay (see appendix C to see Philipsburg´s first infrastructure). Furthermore, they were used by pedestrians to go to the backyards. Additionally, these pathways allowed the sea wind blowing cool air through the city. Trees and vegetation in the backyards provided shade and extra cooling. The one storey house was the most common and is known as the ‘Lil house’. The two-storey houses, known as the ‘Great house’, used to have stone walls on the ground floor and a wooden construction above. The ground floor was used for commercial space, and the residential area was on the floor. (van Andel, 1985)

Van Andel (1985) notes that the basic form of a traditional house as rectangular with the long side parallel with the street. She continued that the use of wooden prefab-constructions resulted in standardized dimensions with the smallest module being three by three metres. Common was

a length that was twice the width and a floorplan measuring three by six metres. When a family grew, the need for a larger house was met by adding new modules at the rear. Many of these annexes have an appearance that differs from the main building. The veranda, being an important part of the house, is a kind of annexe because it is not a part of the main structure.

The spatial layout of the traditional domestic architecture is described by van Andel (1985) (see appendix D to get an overview of the characteristics of the traditional houses). The house was meant for privacy and a place to sleep. Within the spatial concept of the traditional domestic architecture of Phillipsburg, the role of outside life was decisive, therefore the surrounding space is a significant part of the inhabited space. The front façade was the place to socialize (see appendix E) and served as a showcase for people passing by. It was painted in bright colours and decorated with gingerbread fretwork underneath the roof. There is often a veranda with columns, balusters, plants and flowers that served as an intermediate area between the indoor and outdoor life. The backyard was used for daily functions such as cooking, washing and gardening.

With the resources available at that time, the design took into account protection against natural disasters and the harsh climate, according to van Andel (1985). The raised substructure, preferably made out of stone, gave stability and protected the wooden construction against termites, fire, and flooding. The wooden Balloon Frame structure composed of wall posts and beams strengthened with diagonal stays was strong enough to withstand gale winds while being flexible enough to withstand earthquakes. Vertical or horizontal weatherboarding, sometimes covered by shingles, are used on the facades. Façade openings are alternately doors or windows with standardized dimensions since they are placed between the wall posts. The hipped roof had a slope between 35- and 45 degrees in order to guide the strong winds across and to collect rainwater using gutters into the cistern. The cistern was a stone reservoir in the backyard containing a large water supply that is vital in the harsh climate. Originally the roof was covered with wooden shingles. However, due to the arrival of new materials, these were replaced by red coloured corrugated iron which simplified and strengthens the roof structure. With the open roof structure, hot air could rise and cross ventilation could dissipate the heat.

### 2.2. What are the characteristics of the contemporary domestic architecture of Philipsburg and what is the role of self-building in it?

#### 2.2.a. What caused the traditional domestic architecture to be abandoned?

After the Second World War, the way of life changed, not only in the Caribbean but all over the world. Modern equipment like a washing machine and indoor kitchens with build-in stoves and sinks made life more comfortable. The previously described outside life turned inwards. Daily functions such as cooking, washing and socializing moved inside. Even the cistern became unused as a result of water coming out of the tap now (van Andel, 1988). The traditional domestic architecture no longer met the contemporary way of life. Author J. Hartog (1981) concluded that the traditional architecture reminded the islanders of the time of slavery, and they did not regret moving to a new architecture with America as an example. Van Andel (1985) notes that the residents of Sint Maarten have no interest in the disappearance of old buildings and the attention to monuments comes mainly from Dutch researchers. Additionally, van Andel (1988) noticed that the architectural change is strengthened by land speculations, project development and new concrete architecture. However, the main influence came from the rising tourism that stimulated the preference of ‘the American way of life’. The idea of progress in a modern society no longer coincided with the way of living in traditional houses, so the type of houses and how they were built, are adapted to the demands of modern times (see appendix F).

#### 2.2.b How is contemporary housing realized in Phillipsburg?

The houses built after the Second World War are mainly one floor detached concrete houses. As before houses of the more fortunate residents or business owners have two floors. The houses were built by the landowner together with family and friends. In an interview with Yuri Dael (see appendix G for the interview with Mr Dael), the director of ICE, former structural engineer and

project manager, he describes the building process as a small party. According to Deal, the men started building while the women prepared the dinner. This process resulted in a house being ready within a day. After hurricane Luis (1995) people became more individualistic, and the principle of building houses together with the whole community was lost. The few apartment buildings are projects of wealthy private investors. These buildings, with a maximum of four floors, are built by contractors. Homes built on behalf of the government through a social housing program are not present in Philipsburg.

On the one hand, the islander's needs have changed, which has led to changes within the building culture. But on the other hand, some needs remained the same. Due to a lack of experienced people, who have learned how to build, there is still a demand for simplicity within the building system. Compared to the traditional way, the new simple way is very different in form (see appendix H to get an overview of the characteristics of the contemporary houses). The transformation of the building system, no longer based on the prefabricated dimensions of the Balloon frame system, led to a change of the spatial layout. The strict traditional rectangular floorplans are replaced by random ones that meet the wishes of the resident. The floorplan became larger as there are more functions in the house itself. The laundry should be kept indoors because hanging it out to dry is for the poor. "Hanging clothes outside looks ghetto!" according to Damien Richardson, an architect on the island Sint Maarten (see appendix I for the interview with Mr Richardson). Nowadays, a common manner to build the walls of houses is with concrete masonry units (CMU) (see appendix J) on a substructure of cast-in-situ reinforced concrete. In this way, the walls can follow the shape desired by the resident. Hollow stacked concrete block are joined with a mortar, and the cavities are filled with concrete and vertical rebars for the reinforcement. These concrete blocks, which are made on the island itself, "virtually revolutionized construction on the island" according to author Jean Glasscock (1985). Some islanders are buying block by block until they have enough to build their own house. The concrete walls are finished with plaster and painted, preferably in bright colours. "Bright colours are more expensive than white and Antilleans like to show that they have money", according to Richardson. Dael noticed that after hurricane Irma the majority of inhabitants preferred a concrete house. He continued that from their point of view concrete has proven itself by surviving Irma. This means that concrete meets the most important climatic challenge, namely hurricane-resistant construction. However, this does not change the negative aspects of a concrete house such as heat accumulation and non-earthquake resistance. Heat accumulation of concrete is still a challenge according to Dael. Most residents of contemporary houses still require a veranda to sit covered in the cooler outside air. When placing facade openings posts and diagonal stays are no longer decisive due to the contemporary building system, different dimensions are possible and the strict order in the facade has been released. Richardson stated the following: "Although large bay windows are possible, small windows are usually chosen because of sun exposure, safety and lower costs." Roofs in various forms, both flat and saddle or hipped mainly have a timber structure mostly is clad with plywood or oriented strand board (OSB) and finished with a roof covering of corrugated galvanized iron (CGI) or zinc. From Dael his experiences people prefer a concrete roof if they have the financial means. Expansions can take place on each side of the home according to the desires of the resident. This emphasizes the random shape of the home even more.

### 2.3. What types of self-help housing methods are there?

#### 2.3.a. What is the definition of self-help housing?

As mentioned in the previous chapters, the custom to build a house yourself is widespread on Sint Maarten. This research explores the possibility to use this custom of self-help housing as a way to reduce the housing shortage on Sint Maarten.

Ivette Arroya (2013), project-coordinator at Department of Architecture and Built Environment at Lund University, defined self-help housing as: "a process that involves the community's active participation and decision making in planning, design, self-construction, and post-project activities with technical assistance of a facilitating organization". Additionally, in the book 'Self-

Help Housing, Support locally driven housing solutions' a distinction is made between self-help housing and self-build housing "Self-help housing involves groups of local people bringing back into use empty properties that are in limbo, awaiting decisions about their future use, or their redevelopment. It differs from self-build housing which involves constructing permanent homes from scratch" (Pattison, Strutt, & Vine, 2011). Three main aspects are distinguished by Pattison et al. (2011) to make self-help housing work, each requiring different actions from individuals, communities, authorities and others (see appendix K):
-First for the adoption of SHH, it is necessary to make the benefits visible. To make SHH successful, a group of committed people is needed to respond to the problems they see around them. They respond to local priorities and create support within the community.
-Secondly, the process of SHH will bring the project into contact with other organisations. A strategic partnership between the local group involved in SHH and the local authorities, housing associations, private owners or developers could deliver mutual benefits such as obtaining properties, security, diminish vandalism, transfer of skills and knowledge.
-Finally, SHH encounters barriers created at a national level such as tax laws. The central government can develop supportive legislation to encourage SHH and make financial support accessible.

However, Pattison et al. describe the situation of SHH in England. Because Sint Maarten is a small new country, national and local authorities are more or less the same and legislation is evolving. Because there are many different names and interpretations for the term self-help housing, the most common are discussed in the following section, and current developments are explained.

### 2.3.b. Which types of self-help housing are there?

Self-help housing itself knows multiple variations see figure 2. Different types distinguished by Arroyo (2013) are: spontaneous self-help housing, self-managed self-help housing, aided self-help housing, assisted self-help housing and organized self-help housing, have been used in practice. (Arroyo, 2013)

| | SPONTANEOUS | SELF-MANAGED | AIDED | ASSISTED | ORGANIZED |
|---|---|---|---|---|---|
| **Approach** | community based | bottom-up | top-down | bottom-up family-based | bottom-up community based |
| **Developer** | Owner/community | owner | goverment or international agencies | owner | Community |
| **Investor** | Owner/community | owner | goverment for the aid and owner for the rest. | micro-credit | micro-credit organized savings |
| **Builder** | Owner/community | technical assistance from NGOs and paid skilled labour | owner with technical assistance from the coverment or NGOs | owner with technical assistance from NGOs | Community with technical assistance from NGO's or CBOs |

Figure 2: Types of self-help housing according to Arroya (Own work).

Spontaneous self-help housing is the type where people themselves self-build their own entirely new permanent house without technical assistance and thus producing shelter with a high risk being affected by natural disasters. State assisted self-help housing, or aided self-help housing is initiated by governments to provide shelter and reduce poverty or repair damage after wars or natural disasters.

The community only participates in self-construction activities. A specific top-down aided approach "sites- and-services" was implemented by U.S. Aid and the World Bank and provided plots and infrastructure for the poor in developing countries. Assisted self-help housing is family-based and has a bottom-up approach. With this, technical assistance and micro-credit are provided

by facilitating organisations such as NGOs and CBOs. Nowadays the most frequently used type is organised self-help housing (OSHH) where the process is led and organised by the community itself with only technical assistance. Dwellers control provides higher satisfaction because affected families have contributed to housing design, procurement and self-construction process achieving better quality housing. This process also helps to improve community skills and local construction techniques. OSHH has been combined with other support tools such as microcredit or organized savings, production of construction materials, and training. It contributes to building the capacity of the community and therefore, in increasing their resilience with facing natural disasters. Some governments are reluctant to include OSHH in their housing policy. They have doubts about the quality of the houses, the duration of construction, the small scale, the savings made and the lack of knowledge about the development of the community in the long term. Despite these doubts, studying practical cases show that it is an effective approach for developing new housing areas and upgrading informal settlements in developing countries. (Arroyo, 2013)

### 2.4. What can be learned from self-help housing projects developed after a natural disaster about the design and building process?

Devastation after natural disasters occur in many places on the planet and first aid usually comes from governments and NGOs. After this phase, the rebuilding of homes and communities starts, with various forms of SHH being applied. This research explores the possibility to use SHH as a way to reduce the housing shortage on Sint Maarten, partly caused by hurricane Irma. The following case studies have been chosen because of their relevance regarding the (re)construction after a natural disaster on the bases of local building principles through an organized self-help housing project.

#### 2.4.a. Nqibikan Village

Disaster: On the 27th of May 2006, the small village Nqibikan near Yogyakarta in Indonesia was hit by an earthquake which resulted in the built environment being devastated. The inhabitants joined forces and (re)constructed their village together (Adiyanto, 2017).

Building process: The community leader Maryono together with architect Eko Prawoto have developed and managed the building process. The lack of construction knowledge within the community forced Maroyono to split up the group of fifty people into smaller groups, each with a specific task and supervised by a skilled builder. As a result, the people could focus on one specific part and became experts which accelerated the process. Financed by a local newspaper, the villagers were able to make sixty-five houses within ninety days. (Prawoto & Luo, 2011)

Design: The village had adopted a western architectural style that was not suitable for that area, resulting in a destroyed village after the disaster. By this reason architect Prawoto has based the new houses design on the regional traditional ‘Limasan house’ (see appendix L.1. and L.2. to get an overview of the characteristics of the Nqibikan Village houses). The traditional houses are developed, taking into account the natural conditions. However, due to new technical possibilities, a reinterpretation has taken place. (TheAgaKhanAward, 2011)

The design exists out of a timber structure made of local wood fixed on aconcrete with iron foundation. Wooden elements which have survived the disaster, such as doors and window frames, have been re-used. Also, bricks were cleaned and re-used for the lower part of the walls. To improve quality, traditional wooden walls are replaced by fibre-cement panels which are not made in the region.

Despite the standardisation, the inhabitants could adapt the house to their needs due to a flexible floorplan of 7.2 by 6 meter. Additionally, the residents were able to make the design more personal with their own facade design. (Adiyanto, 2017)

Self-help housing: This funded reconstruction knows a bottom-up approach developed and build by the community itself with technical assistance from an architect. This (re)construction project

does not fit entirely to one specific type of self-help housing, as mentioned before; it is more a combination of several types.

Lessons and challenges: Although the community had a lack of knowledge, it was possible to (re)construct the houses in a short time. However, guidance by a skilled person was needed. The community has become more resilient through the acquired knowledge, and the sense of community is strengthened. Now the houses are likely to withstand future earthquakes. The realisation of the project was possible through funding, but funding is not always available, and improving earning capacity and saving remains a necessity. By re-using materials as much as possible, a sustainable solution has been found.

### 2.4.b. Banda Aceh

Disaster: On the 26th of December 2004, the region Banda Aceh on the island Sumatra in Indonesia was hit by a tsunami. A second tsunami followed on the 28th of March 2005. Destruction was all that was left. (Steinberg, 2007)

Building process: A reconstruction programme from Uplink Banda Aceh (UBA), a non-profit organisation which operates independently (NGO), made it possible to rebuild 23 villages in the region by international funding. Although communities were scattered, they came together to decide about their needs and priorities, and to choose a member representing the community in the overall consultations. The community participated in mapping, village planning, house design, and construction. The community-led mapping provided accountable information about ownership and families. Streets layouts were maintained but improved by taking into account the risks of future disasters. The participation of community members in a design workshop resulted in two types of dwellings. Because of a lack of building skills and knowledge among the residents, they are trained in construction basics and earthquake safety. For a fair distribution of building materials, homeowners could obtain them with coupons. Full-time technical support was provided by young engineers who stayed in each village. Every village had set up its own building team which was directly in contact with Uplink. This community-based approach resulted in 3.500 houses being built within two years. Additionally, public and commercial spaces are developed. "Reconstruction is about lives, not just houses, and can be taken as an opportunity" (Uplink Banda Aceh & Sauter, z.d.).

Design: The new design of the houses, made by Uplink together with the community building teams, are based on the regions traditional 'Stilt House' (see appendix M.1. and M.2. to get an overview of the characteristics of the Banda Aceh houses.). Because these houses are lifted from the ground, it provides the residents with a flexible space underneath the house. A couple of floorplans are suggested, the residents could choose the one which suits their preferences. A second type of house is based on the conventional ground house; both types provided a footprint of 36 m2. (Fitrianto, 2012; Uplink Banda Aceh & Sauter, z.d.)

The new 'stilt houses' are made of strong, reinforced concrete columns. The wooden structure above is made to be earthquake resilience. The ground-based houses have horizontal reinforced-concrete bands and a facade constructed with compressed soil-cement blocks made by the community themselves. Within the project, local materials are used to support the community's economy, and contractors are avoided. (Steinberg, 2007)

Self-help housing: The (re)construction initiative did not come from the community itself, but came from UBA, resulting in being a top-down approach. On the one hand, the process is comparable with the aided self-help housing. On the other hand, it is not the same because the community could make decisions within the design. Additionally, the project is paid by international funding which is not an option within the mentioned self-help housing types.

Lessons and challenges: In the event of a natural disaster, it is essential to use and strengthen existing social and cultural infrastructure (Fitrianto, 2012). UBA focusses on community development and believes their role is facilitating. They provide communities with legal and

logistical advice and technical support for architecture, engineering, water and sanitation installations. After a major natural disaster, three phases of assistance can be observed: emergency response, integrated reconstruction and community development. After the tsunami, much funding was available for the first and second phase, while the third got almost no attention. However, other NGOs than the UBA were under pressure to spent funding quickly in order to show results. This rush led to a physical reconstruction by contractors with little influence of the community. It is a challenge to change the attitude of NGOs to emphasize the importance of community development. Otherwise one can question the funding effectiveness and long-term sustainability (Uplink Banda Aceh & Sauter, z.d.). On the long run, there is a need for a good quality of housing, integration of housing with residential infrastructure and additional livelihood support, not only habitat matters but also reconstruction of lives and communities. Community-driven development forms the core of a sustainable effort by the people themselves (Steinberg, 2007).

## III. CONCLUSIONS

Two hundred years ago, the building system that can be regarded as the traditional domestic architecture of Philipsburg was introduced. It was a prefabricated wooden Balloon frame system that had to be imported from America, due to a lack of building material on the island and the need to build houses quickly. Both the structure and parts of the house could be chosen from a catalogue and came in standard dimensions. This traditional house took into account the local circumstances with storm winds, a hot tropical climate, temporary flooding and vermin. The simplicity of the system allowed unskilled people to build it, making homes accessible to low-income households. Until the abolishment of slavery, slaves did the construction work; later it was done by the residents themselves. This early kind of SHH is strongly associated with traditional housing.

The way of life changed after the Second World War and so did the way houses are designed. Daily functions moved from the outside to the inside, thus creating a need for larger homes. The building materials also changed because people prefer concrete houses since they have proven themselves by surviving hurricane Irma. However, concrete houses have problems with heat accumulation and non-earthquake resistance. Floorplans and façade openings no longer are bound by catalogue dimensions and design freedom has increased. Up to 1995, it was common-use a house was built by the owner together with friends, family and support of the community. The building system is still simple so that less skilled people can build parts of their own house with some help of craftsman. This form of SHH reduced building costs. The last thirty years, people became more individualistic, and the principle of building houses together with the whole community was lost, thus changing the building culture and building organization. Nowadays, most residents have lost the few building skills they had and must rely on expensive contractors.

Since SHH had been common in Sint Maarten there is likely a possibility to revitalise it, but it would require a change of mindset of the stakeholders. Different types of approach can be distinguished for SHH. A top-down approach works well in the first phase after a disaster. The bottom-up approach of organised self-help housing (OSHH) seems to be the most suitable for the long run. Studies of practical cases show that it is an effective way to develop new homes and improving informal settlements. OSHH is combined with other support tools such as micro-credit or organized savings, production of construction materials, and training. This process also helps to improve community skills and local construction techniques. It contributes in building the capacity of a sustainable community and therefore, in increasing their resilience with facing natural disasters. Because no one else is taking responsibility to build new houses in Sint Maarten, neither the government or NGOs, the initiative will have to come from the population, making is a bottom-up approach. However, this will not be possible without professional help in the field of training, management, finance and legal matters. A form of OSHH adapted for Sint Maarten and the appropriate NGO that senses what the real needs are for the long term needs to be sought. One could think of an NGO such as Uplink in the case of Banda Aceh. The role that an architect

can offer within this program is to act as an initiator, an intermediary between various stakeholders and to create a design that is in line with the culture and needs of Sint Maarten based on SHH.

In response to the central question: "*What can be learned from the local building culture and -history of Philipsburg to meet the need for affordable housing, taking the natural disasters and self-help housing context into account?"* it is possible to conclude that Sint Maarten has a shortage of affordable homes, and now no organization present can introduce SHH again. That organizational form must be added to make OSHH work. With training, technical-, financial- and legal support combined with a simple building system communities should be able to make SHH a success. At present, the sustainability of the island community is weak because a lack of craftsmen and financial resources means there is no resilience to cope with the consequences of a natural disaster.

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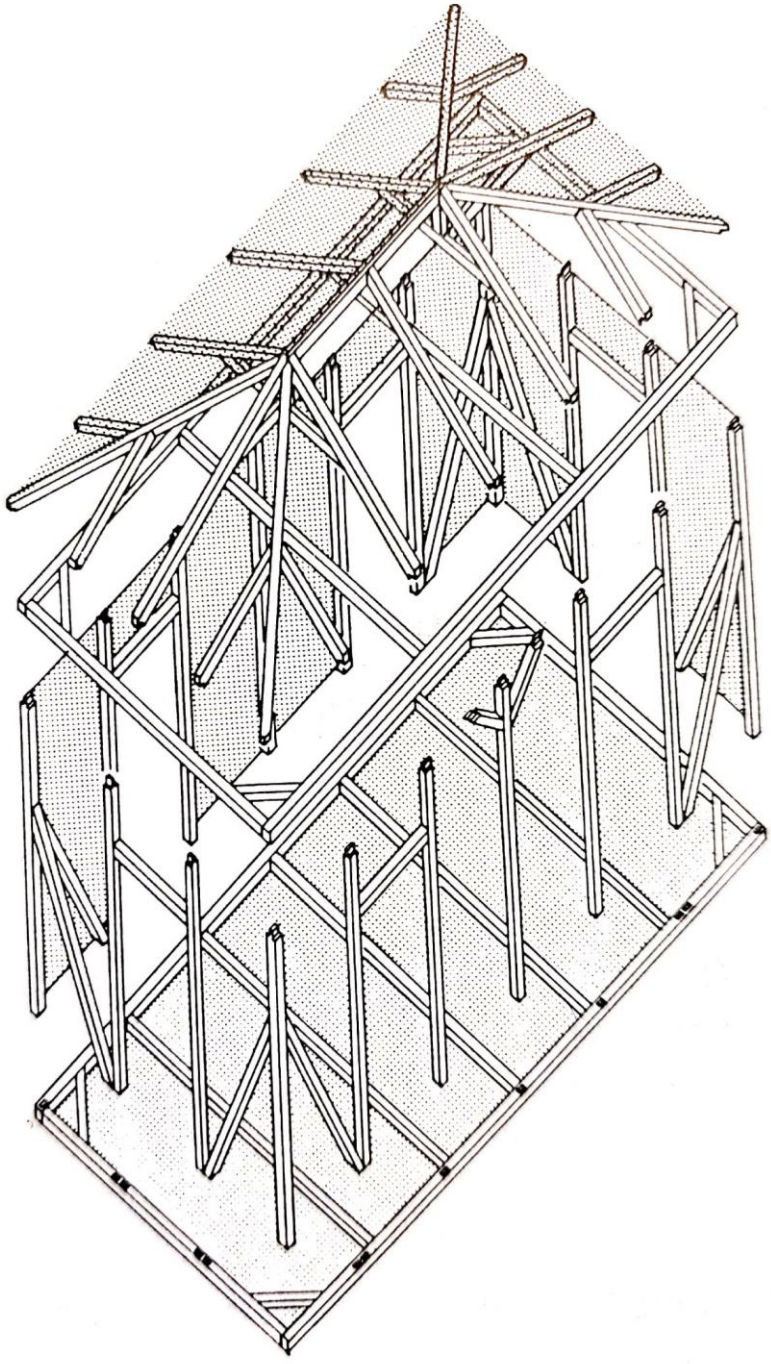
# APPENDIX A

Drawing of the structure of the “Balloon Frame System” (van Andel, 1985)



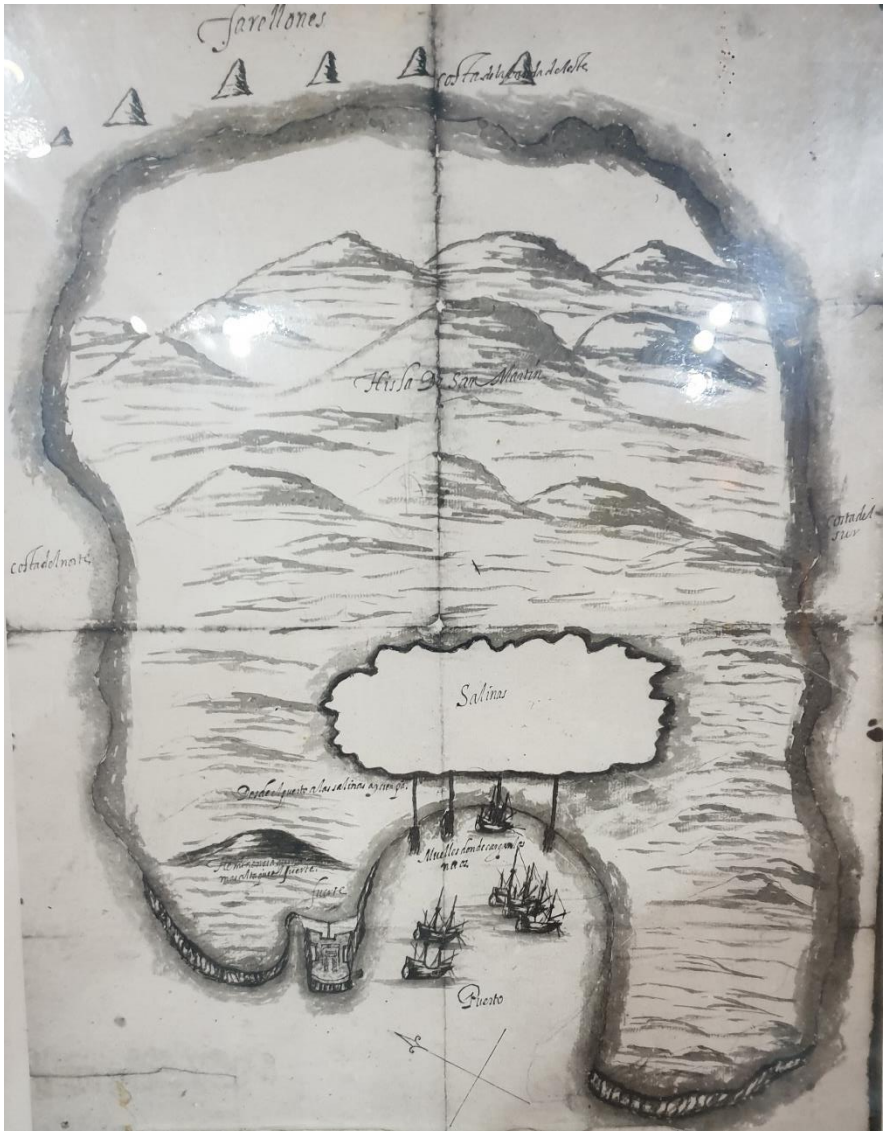
## APPENDIX B

A photo showing traditional one and two storey houses at Back Street in Philipsburg (Lawson, 1964).

A photo of traditional one and two storey houses at Front Street in Philipsburg. (Johnson, 2016)

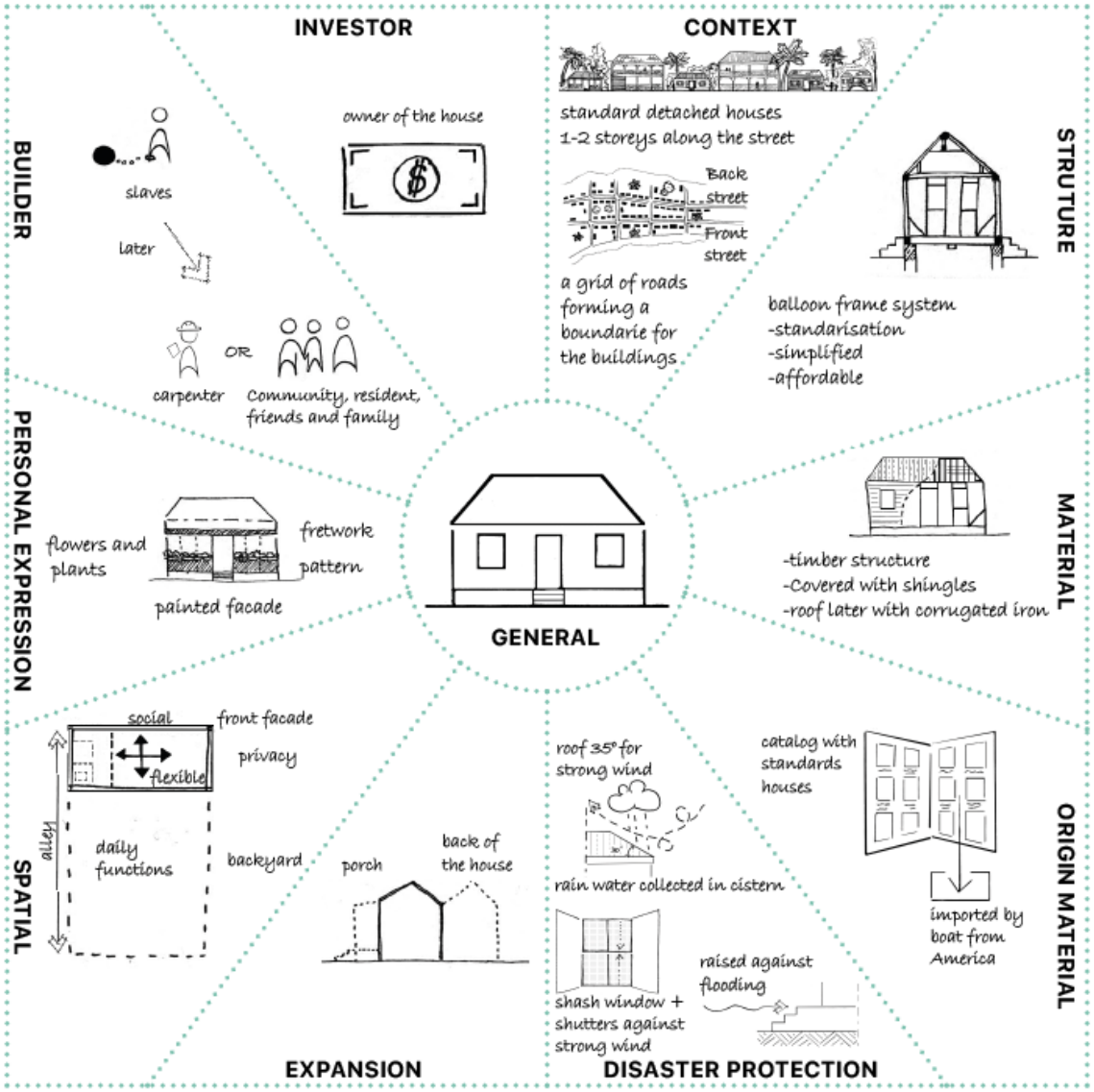
## APPENDIX C

d“Spanish manuscript map of the island of St. Maarten, from 1632: The great Bay area with the Saltpond is the only part of the island that is represented in detail: “Salinas” stands for Saltpond. On the beach of the Great Bay (designated “Puerto” or Harbour) three “Muelles donde cargan las naos” or “Piers” where the ships are loaded” are shown. At the time this map was made the Dutch were in possession of St. Maarten, having taken it from the Spanish in August 1631.” (Sint Maarten National Heritage Foundation and Museum, 1933)



# APPENDIX D

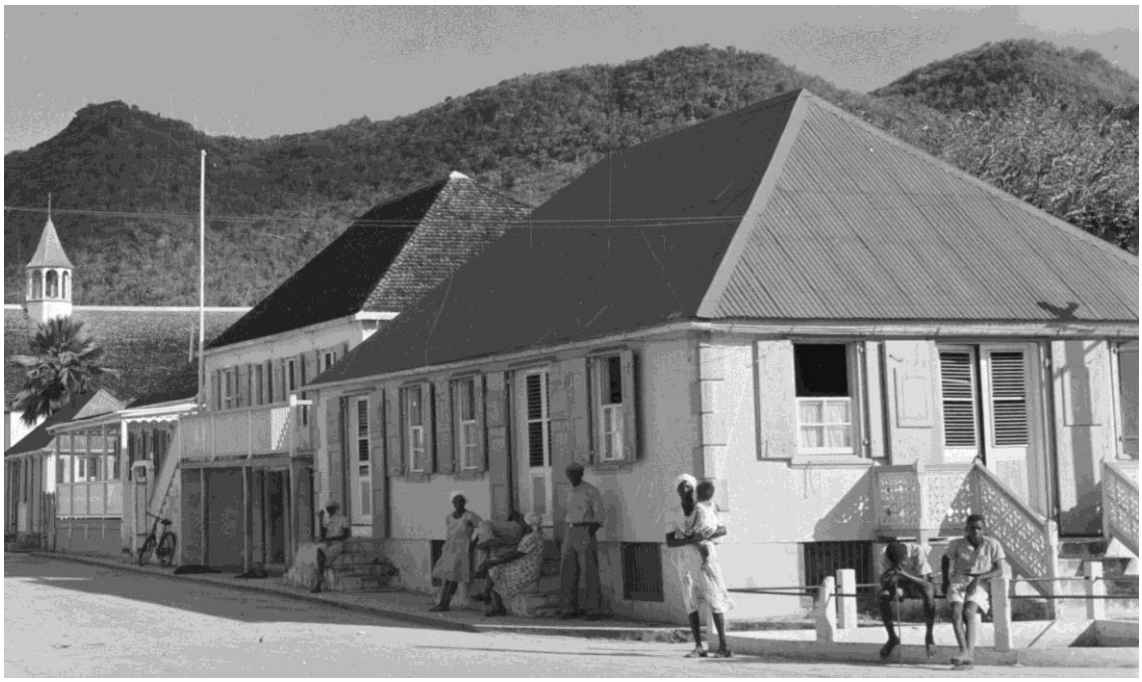
Overview of the characteristics of the traditional domestic building culture of Philipsburg (Own work).



## APPENDIX E

A photo showing a traditional streetview of Backstreet in Philipsburg. The residents sit on the staircases in front of their houses. (“Backstreet Philipsburg Sint Maarten”, 1910)


A photo of Frontstreet in Philipsburg. The residents using the frontfacade as meeting place. (Poll, 1947)



# APPENDIX F

Photos of one storey contemporary domestic architecture in Philipsburg. The daily functions are taken place behind the concrete walls, which are covered with plaster and painted. The veranda and outdoor spaces are behind fences which forms a barrier to the streets.

# APPENDIX G

Interview with Yuri Dael the director of ICE, former structural engineer and project manager. Date: 30-10-2019.

Ons bedrijf is al sinds 1952 gevestigd hier op het eiland. Wij doen structural engineering, civil engineering, taxaties, project management en al dat soort dingen. Orkanen en ook aardbevingen dat rekenen wij gewoon uit wat nodig is. Gewoon constructief ontwerpen. De meeste mensen die hier werken in civiel komen ook uit Nederland. De jongens die wij hier hebben werken bij constructief en civiel hebben gestudeerd in TU Delft of aan de TU Eindhoven, ik heb zelf aan de TU Eindhoven gestudeerd. Bij een gebouw van 21 lagen hoog gebruiken wij de Euro code. We gebruikte eerste de Amerikaanse maar de Euro code is meer up-to-date dus gebruiken we dat aan de Franse kant. Maar daar wat er maat gevend is, zijn niet de windkrachten maar zijn eigenlijk de aardbevingen. Bij zo een hoge toren denk je al snel dat die gaat omvallen, maar die krijgt allemaal ankers onderin.

**Waarom wordt er toch vaak gekozen voor lagere bouw?**
Ja, de toepassing van zo een hoge toren is wat nieuws. Why not, hoe dichter bevolkt het word hoe meer mensen de lucht in gaan en dat is wat er nu gebeurd. Dat is wat je nu ziet in Cupecoy, heel wat van die hoge gebouwen.

**In Cupecoy zien wij voornamelijk hogere bouw voor de toeristen, is er ook hogere bouw voor de bewoners van het eiland?**
Ja voornamelijk condos, mensen investeren erin om zwart geld er in kwijt te kunnen en dan gaat het daar naartoe.

**En in al deze hogere bouw worden dan ankers toegepast?**
In het gebouw die we nu maken van 21 lagen is het eerste gebouw waar ankers worden toegepast omdat het zo lang en dun is. De andere torens hebben allemaal hun eigen gewicht. Het gebouw die wij hebben gemaakt aan de klif is een heeft een stalen constructie met staalplaat beton vloeren en die heeft een kelder van twee lagen beton, dus dat gaat nergens naartoe.

**In jullie afbeeldingen van de toekomstige toren van 21 lagen hoog zagen wij veel glas oppervlak. Hoe gaan jullie daarmee om wat betreft orkanen?**
Ja dat glas moet allemaal orkaan bestendig zijn. De dikte van het glas is afhankelijk van de grootte van het oppervlak. De oppervlakte bij de balkons zijn wel 3 lagen glas, dat is 12 mm, die berekend zijn op orkanen. In Coevorden zijn mensen die gespecialiseerd zijn in alles orkaan bestendig maken. Dus dat glas kan er ook tegen als er dingen tegenaan vliegen en dat soort dingen. Wat wij veel hier toepassen zijn aluminium ramen en deuren die verkocht worden door Europese manufactures. Die jongens komen hier met een leuk verhaal dat het allemaal orkaan bestendig is. Maar eigenlijk is dat helemaal niet zo. Het is bestendig tegen winden in Nederland en Frankrijk. Dus wat wij doen als ze langs komen is vragen naar waarvoor hebben ze een certificaat. Dan laten ze zien dat ze bijvoorbeeld een certificaat hebben voor 75 km/u, maar dan is het raam wel 4 meter breed. Dan gaan wij het narekenen, en dan komen we erachter dat hij bijvoorbeeld bij 2 meter nog steeds wel oké is bij een sterke orkaan. Dat is dus hoe wij dat hebben opgelost met alle projecten van de Wereld Bank. Zij mogen niet een specifieke code aanschrijven. Wij schrijven gewoon aan see Miami-Dade County Florida voor die building code voor ramen en deuren want zij zijn specialisten erin en zij doen dat heel specifiek. Dat mag niet van de Wereld Bank, zij moeten omschrijven no 185 miles/h, wat is dat. Dat gesprek houden wij steeds met mensen, maar dan houden we het simpel en zeggen wij oké dan zit je op 185 miles/h geen gust- en safety factor, that is it. Dus alles hangt er vanaf wat je op papier zet.
Maar voor de rest hoe wij da uitrekenen, de meeste gebouwen hier zijn gemaakt van block work, betonblokken zijn dat. Je hebt je fundatie, daarop je vloer en daar bovenop stapelen we dan die blokken. En dan rekenen wij gewoon uit hoeveel wapening je nodig hebt. Die steek je gewoon door en dan berekenen we hoeveel wapening je erin moet steken voor de stabiliteit van het gebouw. De meeste gebouwen is het meest maatgevende de aardbevingen. Voornamelijk op de plekken waar het een zachte ondergrond heeft is dat zeer waarschijnlijk het meest maatgevend.

**Maar aardbevingen krijgen jullie niet vaak hoorden wij.**
Eén keer in de 400 jaar zeggen ze. Ja af en toe voel je wat, maar geen grote. Ik hoop dat ik dat nooit zal voelen.
Voor het algemeen hangt het af hoe diep de harde laag is. De meeste mensen willen bouwen op de harde laag, soms kan dat niet en dan ga je minder diep. Maar we hebben ook een floating foundation of een mad foundation. Dus als het allemaal hard is heb je geen palen nodig. Op bepaalde plekken heb je wel palen

nodig, bijvoorbeeld in Philipsburg en Simpson Bay, daar hebben ze een harde limestone laag. Maar naast de brug bijvoorbeeld heb je kans op liquefaction. Als alles heen en weer wordt geschud en je hebt zand en een bol water dan zal dat gewoon weg zakken. Alles op Pond Island is op palen gebouwd. Mijn broer gaat nu iets in Nederland bouwen, een klein huisje en dat moet dan direct op palen gebouwd worden, dat vinden wij echt grappig. Dat is echt raar haha.

**Wij hadden gezien op jullie website dat jullie bezig zijn met testjes met beton, zou je daar iets meer over kunnen vertellen?**
Nou wat wij doen is gewoon testen aan beton. Dus als je beton gaat storten dan moet je kubussen maken. Die kubussen gaan wij dan pakken en dan kan je kijken hoe sterk die kubussen zijn. Dus de beton fabrikant in Nederland bijvoorbeeld word constant getoetst, dan krijg je een komo-certificaat. Hier heb je dat niet. Dus dan kan je de kwaliteit niet meteen controleren. Dus dan heb je wel een slechte kwaliteit beton. En wij testen dus het beton wat wij gebruiken.

**Wordt het steeds getest omdat de stenen die jullie gebruiken voor in het beton van andere plekken komen?**
Alles ingrediënten om beton te maken word geïmporteerd, wij zijn lui joh op dit eiland. We verdienen zoveel aan toeristen. Je koopt steeds zand van Martinique en als dat op is moet je weer zand halen van Guadeloupe, dat is ander zand. Daardoor moet het steeds gecontroleerd worden. Maar soms willen mensen een ander type beton toepassen voor een project  voor de sterkte van het beton, maar dat hangt af van wat de mensen willen. We stellen meestal voor C30/C37, hou het simpel. Je kan wat geld sparen als je C25/27 gebruikt.
Wat wij voornamelijk hebben gedaan na de orkaan, wij zijn door het Rode Kruis gevraagd om een soort brochure te maken hoe men nou fatsoenlijk kan gaan bouwen. Hoe ze dat horen te doen met de materialen die we gewoon gewend zijn te gebruiken en dat is wat nu veel mensen gebruiken. Dit is voor de zelfbouw, maar ook de normale bouwer die kijkt dan naar welke schroeven die bijvoorbeeld waar het beste kan gebruiken. Dus het is voor de zelfbouw, aannemers maar het word zelfs gebruikt door de Wereld Bank.

**In de brochure staat bijvoorbeeld dat een dak onder een hoek van 30 graden gebouwd moet worden, maar veel mensen weten niet precies hoeveel 30 graden is. Hoe bepalen jullie wanneer iets te technisch word voor de mensen en wanneer niet?**
De mensen moeten kunnen lezen en schrijven, de meeste mensen hier kunnen dat wel. Maar ze moeten ook zeker kunnen meten. Maar dat is wel een goede vraag. Afgelopen week zat ik namelijk bij een cursus dat heet Help-Safety en daar stond een voorbeeld van een trap. En er stond de trap moet zoveel graden zijn. Maar hoe bepaal je dat dat dan zoveel graden is, hoe weet men dat. Vanuit ons perspectief is dat heel logisch, maar voor anderen totaal niet.
Maar die 30 graden heeft te maken met de spat krachten. Zo is er minder kracht op de wanden.

**We zien ook veel platte betonnen daken,  hoe zit dat dan?**
Ja iedereen stapt tegenwoordig over naar beton. Ik moet ook van mijn vrouw een betonnen dak gaan maken. Ze zei het dat is oké, maar als wij hier blijven wonen wil ik een betonnen dak.

**Hoe worden de betonnen daken gemaakt die onder een hoek van 30 graden staan?**
Wat ik heb thuis is een houten dak met zinc platen. Maar als je beton wilt hebben haal je die zinc platen weg, dan zet je er een wapeningsnet op en die zet je dan zo vast dat de schroeven een beetje uitsteken en dan stort je beton eroverheen. De bekisting zit er al onder en die laat je ook gewoon zitten. Er zijn ook veel platte daken gemaakt van beton, maar dat is echt heet. Dan moet je er weer een verlaagd plafond eronder zetten, dan is het wel oké met de warmte.

**We zien dat er veel dicht en monoliet gebouwd word, is het niet beter om te werken met natuurlijke ventilatie?**
Wat je ziet bij de oude bouwstijl van vroeger zijn grote ramen. Die kunnen ze open zetten voor natuurlijke ventilatie, maar die sluiten ze als er een storm aankomt, tijdens een storm kan je ze niet open laten want dan komt de wind naar binnen. En je krijgt overdruk en dan krijg je problemen met je dak. Hoe meer gewicht je hebt op je dak hoe beter het is eigenlijk. Daarom zetten mensen vaak zonnepanelen op hun dak, dat is eigenlijk voordeliger, maar die moet je dan wel goed bevestigen zodat ze niet wegvliegen. Mijn collega keek laatst een video van het Telem gebouw. Er werden allemaal foto's achter elkaar gemaakt en de ene foto zie je dat de deur eruit vliegt en de volgende foto zie je dat het hele gebouw weg is, zo snel gaat dat. Het was een staal gebouw, en je ziet nu dat al die domme Fransen het zelfde weer bouwen. Weet je wat voornamelijk een groot probleem is, moet je wel uitkijken met de Amerikanen, je gaat naar een Amerikaan toe en zij moeten verkopen want zij moeten verkopen om geld te verdienen. En zij gaan

elke millimeter uitsparen, dat doen ze in Nederland niet. Dan vraag je om een warenhuis die tegen categorie 5 kan, dan zeggen ze ja is goed here you go. Maar wat zij doen is, zij volgen de Amerikaanse norm en in de Amerikaanse norm staat oké 155 mile/h including gust- and safety factor. Maar dan heb je de gust- and safety niet. Wat er gebeurd dat heel veel van de gebouwen weg vliegen. Al zeggen we steeds tegen mensen dat ze daarmee moeten uitkijken.

**Om staal hier te krijgen is toch lastig?**
Ja als het aan mij ligt moet het een regel zijn dat alles in beton gebouwd moet worden. De gebouwen die gemaakt zijn van staal zijn echt ellendig, dat werkt hier niet. Ze gebruiken vaak ook lichte wanden, oké die kunnen wel wat hebben. Maar als er ook maar iets binnen breekt dan komt er water binnen, dan komt het water bij het staal, dan gaat het staal roesten. Dus voor mij werkt dat gewoon niet.

**Maar als je liever met beton bouwt hoe hou je dan rekeningen met de aardbevingen?**
Dat maakt mij niet uit, ik betaal er wel extra voor.

**Hoe houden jullie rekening met zoute lucht in combinatie met beton?**
Dan moet je ten eerste een dikkere laag neer zetten. Ten tweede je moet het wel schilderen en een goede kwaliteit beton gebruiken. Wat ze vroeger deden was het gebruiken van het zand uit de zee om de beton mee te mixen, maar dan gaat het allemaal weg roesten natuurlijk. Je moet het wel goed onderhouden. Maar wat ik zeg tegen mensen dat voor mij, vooral warenhuizen, moet de regel zijn dat alle wanden van beton zijn. Dat kost een beetje meer, maar dat is echt de moeite waard. Dan heb je een zeer stijf gebouw dat nergens naartoe gaat. Heel veel oppervlakte heb je weggehaald dus als er iets tegen aan vliegt maakt het niet uit. Kijk als je een dak van staal doet, dat begrijp ik, want dat kost ontzettend veel geld om van beton te maken. De overspanningen voor een warenhuis zijn gewoon te groot tenzij je allemaal kolommen neerzet, maar niemand wilt kolommen.

**Hoe houden jullie constructief rekening met stabiliteit?**
Een kern alleen is niet voldoende, we gebruiken ook de wanden. De buitenkant moet stijf zijn, je moet de volle wanden gebruiken. Maar ook een kern erbij. Dat gebouw van 21 lagen is in dit opzicht en een rot project. Het zit echt helemaal vol met wapening. Daarbij zijn dikke tussen pendanten toegepast van 30 cm dik. Het is echt een gevecht met architecten om meer vlees erbij te krijgen, dat is niet prettig.

**Maken jullie ook gebruik van isolatie?**
Nee dat word bijna net toegepast. Maar dat is dus best wel rot want het kan echt heel warm worden als de zon op de gevel staat. Bij sommige projecten worden foam panelen gebruikt en dat blijft lekker koel. Dus ik denk dat je het slim moet aanpakken, dat de woningen die veel zon op de gevel hebben van die panelen maken.

**Waarom maken jullie geen overstekken om de gevel te beschermen tegen de zon?**
Mensen bouwen het liefst zo klein en compact mogelijk, anders vangt het zoveel wind.

**Ervaren jullie lasten van het steeds vallen van de regering?**
Ja je raakt eraan gewend. Maar je raakt natuurlijk wel een soort van gefrustreerd dat het steeds blijft vallen. Maar je weet dat het gaat vallen. Bijvoorbeeld het ziekenhuis, daar willen ze volgende week beginnen. Dat hoop ik ook want daar werken wij ook aan. Maar omdat we weten dat het gouvernement gaat vallen hebben ze alles opzij gezet zodat het gouvernement er niets meer over te zeggen heeft. Ze kunnen wel gaan blèren, maar alles is al geregeld. Dit is precies hetzelfde met het vliegveld, Juliana airport. Ik kan echt niet geloven dat ze dat gaan aanpassen. Ze hebben een gouden deal van Nederland ontvangen en dan willen ze idioten deal? Omdat ze alleen maar vingers in de pap willen hebben. Zo regelen ze dat hier, echt niet dat de nieuwe beter zijn als de vorige, ze zijn precies hetzelfde. Je hebt bijvoorbeeld negen mensen van de overheid, parlementsleden, maar er zijn er dan drie die vervelend zijn. Het zijn er altijd drie, en dan valt het. Vervolgens gaan die drie weer naar een andere groep en gebeurd hetzelfde. Het dan zijn dezelfde drie die het verpesten. Het merendeel zijn wel goede mensen, ze willen wel goede dingen, maar ze moeten steeds werken met een paar idioten.

**Met het veranderen van het gouvernement veranderd het regelement dan ook?**
Nee joh, daar zijn ze veelte lui voor. Het regelement dat nu word aangehouden komt uit 1930, dat is echt heel oud. Ze zijn bezig met een nieuwe sinds ongeveer begin 2018. Wij hebben ze aangegeven om de Europese eisen aan te houden zoals aan de Franse kant, daar kunnen we eindelijk gebruik van maken en niet die van de Amerikanen. De Fransen komen steeds hier naartoe om werk te pikken. Plus iedereen die studeert in Nederland leren Europese wetten en dan komen ze hier en dan kennen ze die wetten.

**Is er behoefte aan scholing hier op het eiland?**

Het eiland is daarvoor te klein. Mensen gaan wel bijvoorbeeld naar Curaçao. Maar 80 procent blijft in Nederland die daar gaat studeren. We hebben ook wel een zogenoemde 'brain drain'. Dat is wel een probleem. Momenteel hebben wij genoeg mensen, maar als we een groot project hebben moeten we allemaal mensen uit Nederland halen.

**Hoe word er op het eiland rekening gehouden met duurzaam bouwen?**
Niet, we dumpen alles op Pond Island. Maar dat ligt allemaal eigenlijk aan onze gouvernement. Ik kreeg gister toen ik wat ging eten op het strand allemaal plastic erbij. Dat moet eigenlijk gewoon allemaal worden afgeschaft, wegwerp dingen mogen gewoon niet meer. We hebben containers nodig die gewoon afbreekt zonder problemen. Als je het afschaft gaan er wel mensen klagen, maar dan het moet gewoon worden afgeschaft. Alles komt hier binnen, we produceren niets, maar we gooien het allemaal weg.

**Hoe kijken jullie naar het beton gebruik, wij zien in Nederland beton als iets niet duurzaams?**
Dan zeg ik toch gebruiken. Na zo een orkaan, bijvoorbeeld na Luis in 1995 en Lenny in 1999, kwamen heel veel mensen naar het eiland toe met: ik heb een goed product voor jullie om mee te bouwen, snel op te bouwen en goedkoop, blablabla. Maar we geloven dat verhaal niet. Na zo een orkaan stap je naar buiten en zie je allemaal puin. Je kijkt naar welk huis is blijven staan en je zegt dat je zo een huis ook wilt. Iedereen wilt een betonnen gebouw momenteel, ze zeggen dan ik heb het zelf gezien dat die overeind bleef dus dat wil ik ook.

**Hoe reguleren jullie de veiligheid wanneer mensen zelf hun daken maken?**
Er zijn echt heel veel mensen die zelf een betonnen dak proberen te maken, ook van die lokale jongens. Ja ze doen maar wat. Maar het is heel normaal, vooral met de lokale families, dat wanneer ze gaan bouwen dan hebben ze een soort van klein feestje. Dan komen er allemaal familie leden bijeen en dan gaan de vrouwen vaak koken en alle mannen gaan dan klussen aan het huis en aan het einde van de dag gaan ze met ze allen eten en dan is het huis klaar. Ik heb het nooit zelf mee gemaakt, maar veel vrienden en kennissen van mij zeggen dat ze dat altijd zo deden. Bij mij in de buurt zijn een paar huizen in aanbouw, en daar is één huis waarbij direct na 5 uur één mannetje naartoe komt om zijn huis te bouwen en dan zit hij daar tot 9 uur aan zijn huis te bouwen, met de lampen van zijn auto daarop om licht te hebben.

**Mogen de mensen zelf bepalen waar ze een woning gaan bouwen?**
Nee ze moeten een stuk land kopen en wanneer ze willen bouwen moet je een bouwvergunning indienen. Zoals als je tekenwerk en berekeningen die niemand controleert. Niemand maakt eigenlijk berekeningen, behalve wij.

**Maar als niemand berekeningen inlevert hoe krijgen ze dan een bouwvergunning?**
Die negeren ze gewoon. Daar kijken ze niet naar. Bij een groot gebouw vragen ze wel om de berekeningen, maar bij een woning niet.

**Is er geen behoefte om een nieuw systeem te hebben om de woningen te koelen?**
Ja, maar iedereen gebruikt een airco en wilt een betonnen dak sinds de orkaan. Wij kloppen vaak dan aan en vragen of we hun daken kunnen verven, naja verven het is meer een soort coating die de warmte reduceert met 20 procent en hij is wit en dat weerkaatst de zon weg. Maar het is ook mogelijk om een houten onderlaag onder je betonnen dak te hebben. Je hebt een houten bekisting die stort je vol met beton en de bekisting laat je gewoon zitten. Dat helpt ook om de warmte af te laten nemen, ik heb dat ook bij mij thuis. Hout isoleert best goed en maakt wel een verschil. Ik denk dat dat één van de belangrijkste dingen is, hoe houd je een gebouw koel op een normale manier. Want dat witte spul is niet voldoende overal. Ik woonde in een huis in Simpson Bay, en dat was echt niet te doen. Je hebt niet altijd genoeg plaats om een verlaagd plafond te maken. Je hebt beton en dan is dan wit geschilderd. Maar dat is niet alleen het dak, maar dat zijn ook de wanden. Maar zolang het niet weg waait tijdens een orkaan is het belangrijkste.

**Waar was jij tijdens Irma?**
Ik was gewoon thuis, wel beneden natuurlijk aangezien ik twee verdiepingen heb. Het terras dak vloog weg, maar het dak van mijn woning bleef gelukkig wel zitten. Het is echt dood eng om mee te maken. Al mijn ramen zijn Miami-Dade, ze kunnen dus tegen orkanen maar ik heb ook shutters ervoor. Ik heb een grote sliding door, en ik kon echt niemand vinden die een orkaan bestendige grote sliding door kon maken, dus dan moet je het doen met iets dat minder is. Dus mijn sliding door ging een beetje kapot, maar ik heb hem weer terug geduwd en hij werkt weer.

**Je ziet voornamelijk op het eiland losse woningen, is het samen clusteren van woningen niet verstandiger?**
Je bedoelt een appartementen complex?, Ja dat lijkt mij zeker verstandiger. Je zou denken dat als je één

groot gebouw hebt het makkelijker is om te beschermen. Bij kleine huizen zijn er allemaal mensen die hun eigen ding doen. Maar je ziet het steeds meer opkomen en populairder worden. Eigenlijk is het net zoals Nederland, eerst woonde ook iedereen in een boerderij, maar land word schaars en dan gaan er steeds meer mensen in appartementen wonen. Dat is wat wij ook merken. Mensen kopen zelfs appartementen, dat was 10 jaar geleden nog niet zo. De meeste mensen die appartementen kopen zijn momenteel nog veel Amerikanen en Europeanen. Lokalen deden dat eerst nog niet maar nu zie je daar langzamerhand verandering in komen. Dus dat word momenteel wel steeds meer geaccepteerd. Daarnaast is het ook meer orkaan bestendig.

**Hoe denken jullie over het bouwen met prefab elementen?**
Wij vertrouwen dat niet. De reden daarvoor is omdat de verbindingen goed moeten zijn. Als die niet correct gedaan worden dan komt er lekkage en dat is echt rot. Het is een algemeen probleem met prefab, maar hier haten we dat. Dat is het ten eerste, ten tweede is het dat iemand begon hier met een prefab business hier en zei dat je het idiot proof kon maken and still it will not work. Om er geld mee te winnen moet je er mensen aan laten werken die zo min mogelijk geld ervoor vragen. Dat zijn natuurlijk niet de slimste dus het is hoofdpijn. Het medical centre, het ziekenhuis wilden ze ook prefab wanden van maken. Maar toen was iedereen daar tegen, zelfs de minister.

**Aan de Franse kant zie je wel vaker prefab bouw**
Ze doen het wel op bepaalde plekken aan de Nederlandse kant. Aan de Franse kant kinnen ze meer geld vragen voor labour. Mensen worden daar meer betaald, dus daar kan je hogere kwaliteit maken. Maar het is niet hogere kwaliteit als aan de Nederlandse kant. Als je aan de Nederlandse kant gaat bouwen, en je goed wilt bouwen, dan heb je iemand die die aannemer controleert, die persoon werkt dan voor de opdrachtgever. Aan de Franse kant zegt de aannemer dat hij verantwoordelijk is en geen controle nodig heeft. Maar dat is natuurlijk onzin. Dus altijd als wij met een Franse aannemer werken zien wij hoe slecht het eraan toe gaat. Ze houden zich niet aan de regels en als wij hun erop wijzen dan zeggen ze: wij hebben niets met jou te maken en het komt wel goed. De kwaliteit is niet goed, maar ze kunnen wel veel beter met prefab werken. Ze hebben de tekeningen van de wapening en maken alles aan elkaar, brengen ze het naar het gebouw en plaatsen ze het.

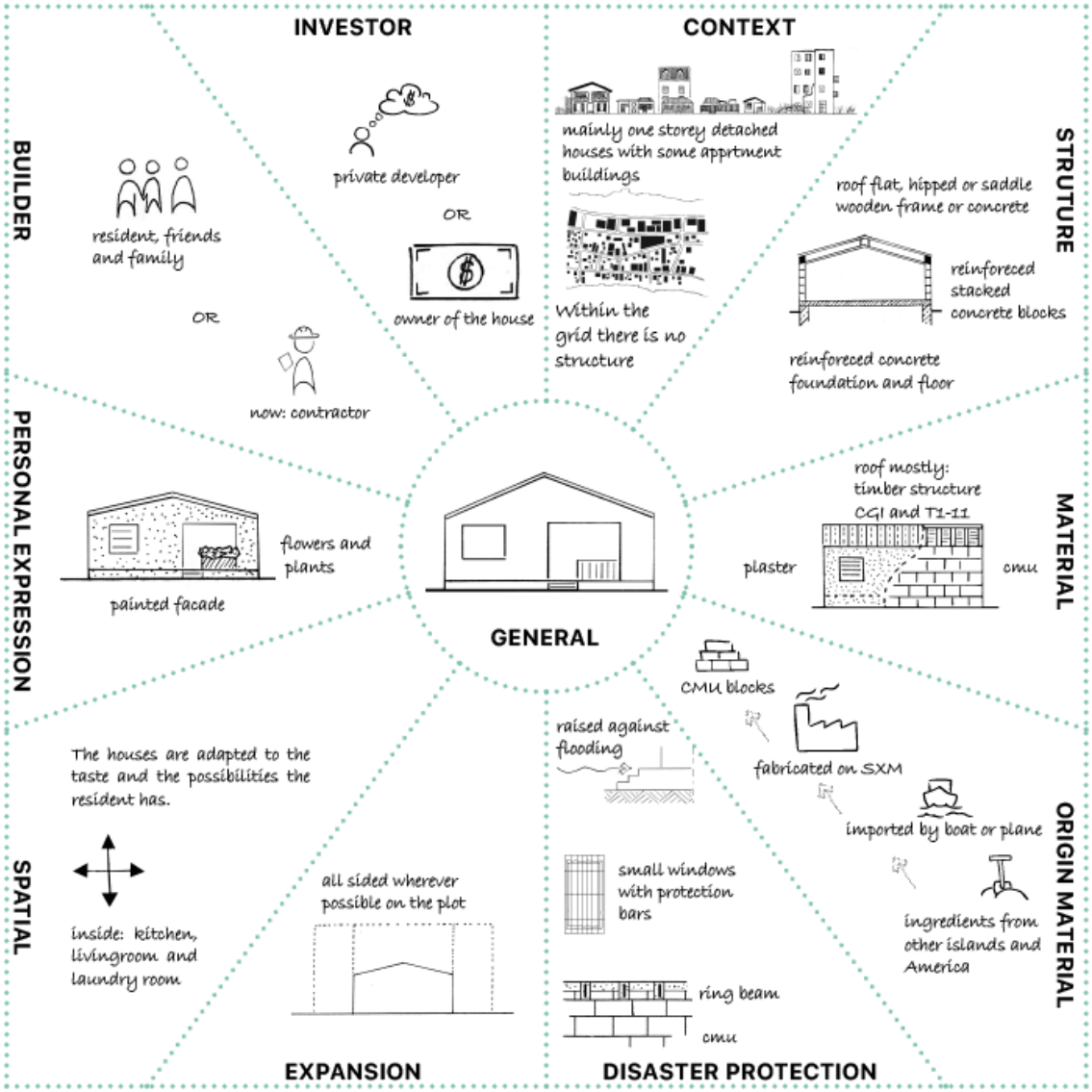
**Zouden prefab elementen de wederopbouw kunnen versnellen?**
Dat weet ik niet. Het geld is gegeven aan de Wereld Bank. Een project bij de Wereld Bank duurt vaak 5 jaar, dus het is niet raar dat veel mensen nog zonder woning zitten. De mensen hebben natuurlijk wel alle recht om te klagen want ze hebben geen woning of schade. Maar het geld is gegeven aan de Wereld Bank en dat is de keuze van Nederland geweest. Ik als bedrijf ga daar niet over klagen. Voor mijn bedrijf is het beter dat het via de Wereld bank gaat. Omdat de Wereld Bank de kansen eerlijk verdeeld om iets te mogen bouwen. Hoe het vroeger werkte was dat Nederland geld gaf en dan kwamen er Nederlandse bedrijven hier en dat werk werd verdeeld over de Nederlandse bedrijven. Dus er is wel een beetje voordeel aan de Wereld Bank. Maar toen de Nederlanders hier waren ging het wel echt mega snel. Dingen die hier nu snel gaan zijn meestal door corruptie. De openheid is voor ons fijner, het duurt wel langer en is wel veel papier werk, maar we krijgen wel werk. Maar ik denk dat dat op de hele wereld zo is. Als ze in Nederland iets snel willen hebben dan gaan ze ook niet eerst een hele tender uitschrijven. Ze kiezen gewoon een aannemer en dan word het gebouwd. Het is misschien dan wel een beetje corrupt en oneerlijk, maar dan gebeurd het wel snel.

**Dan nog een vraag over de daken, moeten daken niet zoals vliegtuigen die veel wind vangen zo een vorm krijgen?**
Misschien, maar het is nogal kut om te bouwen. Een gewone dak is zo veel simpeler, en wat spaar je met zo een bol vormig dak? Het is moeilijker te bouwen en het kost meer tijd om te bouwen.

**Hoe doen jullie de afwatering, vangen jullie dat ergens in op?**
We hebben systemen langs de weg en dat gaat allemaal naar de pond toe, het moet ergens naartoe. We hadden vroeger veel meer mensen met cisterns, een soort waterbak die iedereen had, dat was normaal. Maar toen kregen wij zelf water uit de kraan en langzamerhand gingen we leven zonder water bak. Ik heb het zelf ook niet, het kost geld en je moet er een pomp bij zetten, dus dan doe je het al snel niet. Maar na zo een orkaan denk je wel van oh dat had wel gemoeten.

# APPENDIX H

Overview of the characteristics of the contemporary domestic building culture of Philipsburg (Own work).



# APPENDIX I

Interview with Damien Richardson, architect on the island Sint Maarten. Date: 30-10-2019.

I am working on my projects together with my mother. My mom is now 77 years old, but she has 55 years of experience as a builder. I am an architect and this project were we are right now is one of our projects. This building exist out of multiple apartments. There are three types of apartments in this building. A studio, a two rooms and a three rooms apartment. But I am designing everywhere in the Caribbean and I have also some international projects.

**Why does this project has multiple types of roofing?**
Because to make all the roof structures out of concrete it will be too expensive. Moreover a pitched roof looks better. So you have to choose where you find the balance. I choose to give the kitchen area a wooden roof. But the rest of the house, there were all the bedrooms are, has a flat concrete roof. So to protect yourself you go to the back of the house because a concrete flat roof is saver.

**Why is a wooden roof not save?**
A wooden roof will be punctured. If something is flying through the air and it will hit the roof it punched. If I will sit underneath this roof during a hurricane an object will go right through the roof and it will hit me.

**What do you do to make the wooden roof not flying away?**
Normally you put the screws every two feet, but you can do it in half. By doing so you make it a bit tighter. And then you make sure you protect your edges. On the outside there is a short edge, maybe thirty centimeters. That is intentional, because normally it comes further. So what we do is designing a so called second skirt. This comes now on the outside of the apartment. If the hurricane comes it will take that and will not affect the house.

**Why do you design something which can fly away and hit someone else?**
What you do is anchored the second skirt as well. By doing so there will be a couple of columns holding it down and bolting it to the wall. But in the end it depends on the hurricane. Because sometimes it survives and sometimes it is gone.

**Do you only design for hurricanes, or also for the earthquakes on Sint Maarten?**
Yes most of the times I focus on the hurricanes in my design. The major issue is not with earthquakes. Sint Maarten does not have it as much. There are some, but in most of our property we have never seen a heavy impact from earthquakes. There are cracks, but that can be because of the foundations which are done not properly. This mainly depends of the width of the foundation. They make it smaller because it costs less money.

**What type of building material do you use to protect the residents for the hurricane?**
I use concrete, concrete is a common used material for buildings on this island. In other places such as Miami they use wood, in some places they use bricks. But, when a hurricane comes they are not prepared well. By this reason we do not use wood. So in these types of environments it is better to use concrete. We use hollow concrete blocks with steel bars in it and filled with concrete. So we use one layer of concrete with a finishing. The block we use are made on Sint Maarten itself. These blocks are mainly made on the French side of the island. But the concrete which we use to fill the block or to make the floors we buy from locals.

**Do you have already tried to use another type of material or building system?**
I use concrete . But there are others who tried to use something else. For some buildings they are using foam-crete right now. Basically it is a foam wall and on the wall they made a steel mesh. It is an Italian company and they claim that it can handle the hurricane. But from my point of view it can handle wind. So it is save as long it is wind. But if an object comes straight it will be punctured and you can forget it.
Another thing they use are forms, so not blocks. You have two pieces of plywood in which you put your steel and piping and then you just fill it with concrete. By doing so you get completely solid walls. It seems cheaper because your able to get finish faster. But at the end the price is similar. This due to the type of concrete. The only way you save money is to use 6 inch instead of 8 inch.
On the French side they are using prefab elements. For them it feels better because the steel is all uniform etcetera. But it is just a decision. We on the Dutch side do not like it. It is about the connections. It is not about what is on the outside but what is on the inside. You better have your structure well on the inside. After the hurricane hits you could see where the problem was. Lots of people did not have used steel. Or

they had used steel but no concrete in their blocks. If you cut corners you will see when the storm reach us. In my buildings I put everything a bit extra. It cost a bit more but my buildings are here already over 40 years and it still being used.
But they are checking out new materials and technics on the island.

**Could 3D-printing be an option to use as an innovative system?**
I know the Dutch people use it and they think they can go to space with it. But here on Sint Maarten they are not using it yet.

**Out of what type of material does the ground exist of?**
It depends what area you are. Sometimes it is rocky and sometimes it is clay. Cul du Sac was in the past a farmland. So it has good soil, but if the water comes down you get a problem with erosion. We use lots of retaining walls to protect against the earth which is falling down.

**Is there a difference between making a design for Sint Maarten compare to another island in the Caribbean?**
I am not designing a Zaha Hidid. She designed a building in Dallas Cay, one of the Islands in the Cape Canary. If the hurricane would have come there her building would have been wiped out basically. This because she used a lot of glass and whatever formats. But it is still a Zaha Hadid. Architecture such as a Zaha Hadid or a Frank Gary is not what you going to see here. This is not the style from Sint Maarten and not what the people of this Island like. So nobody is going to pay for it.

**Many of roofs are flat as you said, is it not smarter to design you building as an airplane which is resistant against lots of wind?**
It could, but it does not suits the classical appearance which people on the island prefer. We do not have a *Welstand* as in the Netherlands, for example everyone can paint their house how they want to. In Sint Maarten there is no rule for this. Once you get your permit you can do whatever you want. Build building for example a dome structure or a different form cost more money so they will not do it.

**What if you build something in a dome structure and you will prove it is cheaper?**
There are some buildings that had this frame out of a sort resistance galvanized steel, these guys did some stuff. So okay you did it, but that does not mean that I can do it. I just cab do what I normally does because my lot is so big, I only has so much money and I do not have time for making this dance because the bank has to be paid. I just need a house with a room and some spaces for to do what I need to do. Maybe when I win the lottery I have time to play that game. So people will not invest in this.

**Is that not a cultural thing?**
Economical speaking, people just want four walls and that is it. In the Netherlands is similar, it is only the commercial buildings which they give maybe another shape, but not people their homes. In most places houses are just a square like a ‘doorzonwoning’ with a view on the garden or what else you might want. But there are of course some of the other guys like UNStudio for example, they are doing some cool brickwork stuff. But these are mainly commercial space, but no apartments. The government gather spend their money on practical stuff. But if you want to do some cool things that everybody come and see and it is cool whatever kind of experience. Like I made different proposals for Sint Maarten but they are not looking for it. They say ‘Oo cool! Wonderful’ but dan houd het daar op. The community center for South Reward I made a cool design idea for them, a concept because I am not going to put money and time for these type of things because they are not paying for it.

**If you always stick to the classical appearance do you design what you as an architect ecstatically like?**
No, it is just designing practical. There is an apartment and you need to live in it. So there is a person who needs to take care of his family, needs to have a parking space, a laundry space, an extra space for some storage, a kitchen, a living room and some bedrooms. That is what the people what and that is what the people get. So in the end I am designing for the people.

**What type of people do live in this building?**
People like me, I will live in this apartment because my mom lives across the road. So I always can look to my mom. I see her and she sees me.
But for now this is what I am doing. You cannot make too much expressions because at the end of the day people need to pay for it. So I am not going to make too much weird dances over here. Because then people going to charge me and then? You see that apartment on the hill over there? He is charging for a two bedroom apartment 1400 dollars with a big kitchen, nice big porch overlooking the valley. So when

someone comes for a three bedroom house, how much are you going to charge? 1800, 2000? It is not going to happen, you understand? So you have to be wise in what you put in your building and for what reason. So I am going to do my home and it going to be sexy or whatever that is my business. But if I am going to build for someone else to rent it, I need to be smart in what I am going to invest my money. You can put too much money into something that you know at the end of the day you will not be pay for.

**Sint Maarten has hills, but is it also allowed to build on them?**
There are hills where we build on, but we have the hill site policy. This policy says you cannot built in certain areas. 15 Meters away from the top. But there are some build already on top so they cannot stop them to build there because they already let them. Before the policy they gave already some approvals. *Ze kunnen nu niet achteraf zeggen dat ze daar niet mogen bouwen*. They have made the regulations, but they already broke them.
Do you see those floors? In Holland you have certain things to make sure there is no noise. But here we do different things. Just putting the concrete, two levels of steel inside of the floor. You have a half inch steel and then you put a chair, a piece of steel that is bend in a certain way, to make it to have a distance from each other and then you put another one on top of it. So you create a space between the two. And below it you put some rocks to keep it off the ground, like an inch away from the floor so that the concrete can fill the space along the steel. And then you have your floor. And the only thing you put on of that *zijn tegeltjes*. And that is an 8 inch floor, like the size.
So now we are in a two bedroom house. All of these houses have on the inside this type of white finish. White walls, tiles and cabinets because you want to give them the space to do what they want with the apartment. But when they give it back, it has to be the same way as they got it.
So this building went through the hurricane, all the windows were exposed as the way it is now and nothing happened. The wooden sheeting is not needed with these type of windows because there is a bar inside of the and that is enough. They exist out of smaller pieces of glass and they are anchored to each other. The majority of people there homes, the hurricane has pulled out their windows because the screws they had used are very short. So I put 8 of them, nut when it is up to me I should put two more the be sure. But each of those screws cost money, imagine that all of these windows needs them. So what a lot of people do is to reduce the size of the windows to also reduce their amount of expenses. One of the windows I use cost maybe 2/3/4/5 hundred dollars.

**How do you decide the colour of your designs?**
The owner decide what ever colour they want. I make all my designs purple and white because everybody knows it's from her, my mom, it is her signature. So when we build this one, we said this will be purple to. I know you have other properties on other parts on the island and they have their own colour. Some of them are very light grey or crème, or even bone white, you know the ones in Guina Bay along the beach? There is another type, they call it villa or something. Those are white with some colour roof. It looks good, when the sun hits it, it looks very bright. In Anguilla they do the same but then with an relief. When the sun hits it you get a sort of ocean effect. The sun gives it a nice sort of shimmer. So that is der addition to the discussion. But in general it is that people can do whatever they want, so it is open. Bright colours are more expensive than white and Antilleans like to show that they have money.

**In which part of the design do you save money because you do use the more expensive frames?**
What is important is you can choose. If you going to put these type of windows or you going to put others that is maybe not like this. Then I have to invest more money to put bars and other things to protect the apartment. So you choose to invest in the good windows so you do not have to spend on the protection, because that cost a lot.
The weak spot of this windows is glued on the inside so it can come out. However, you can take one part out easily and buy just one new on the island and put it back in. But in general we do not have a lot of problems with these type of windows. With these type of windows you do not need to have bars in front. Those other windows are totally made of glass with a slide. They only have the halve of the window which can be opened. The windows I use I get complete access to the air. I do design with cross ventilation, but I want to get the benefit from the whole view. Although large bay windows are possible, small windows are usually chosen because of sun exposure, safety and lower costs.

**Do the bars also have another function?**
you have a couple of reasons why this works. One of them is also protect the residents against criminality. Do you see these edges? It looks decorative, but actually it is to stop the rain water.

**Do you put in all the apartments an air-condition?**

I do not put the AC. The landlord does not put the AC, we put the outlet for them. The residents can put it if they want to. Sometimes they choose to put a fan instead.

**How do you deal with these systems hanging outside?**
Some, such as the design for the Gordan Towers, have a certain area where they intended where they put all the AC's there and then they cover it with certain kind of effect. But they put it in the AC itself, but they buying the AC's themselves. If you have to maintain that AC, you need to take of all that infrastructure and all that craziness. Very nice design I must say, but practically *hoe werkt dat nou eigenlijk?* So here I tell the people the people to put there AC's down, but some does not listen and put it up. If you put it up, the water will fall down, but if you put it down you will not have the **problem.**

**Why do you not knock on the door and tell them to put it down?**
I do not because I let them enjoy themselves. I do not need to worry about that. Where I am more worry about are there clothes. They will not let them put it up. They have those low racks to hang their clothes. That for me is worse than the AC's. Hanging clothes outside looks ghetto! For us, when you see the different ghetto areas, that is how they do that. When you do that with your property you get a certain kind of tendency. Right now I get young professionals, teachers and parents with children because of the schools in this area.

**Do you also design for social housing?**
No, these are apartments. Most of the rooms here we made them big enough. Because what I try to do is, because you do not want people to come and leave. You want them to come and let them feel: this is my home here and I have to stay. Majority of the time people leave because the rooms are too small. They do not have enough space to do what they need to do. And then they got to go.
The majority of the people in this building have a contact of five years.

**Do all your apartments have the same number of rooms?**
No, some of them are one bedroom, some of them are two and some of them are studio's. In this building are then apartments, but they have different sizes.
A lot of times it looks like there are cracks in the walls, but it is not. It is the plaster which is coming off as a result of sinking.

**Do you also calculate the building itself for the sinking etcetera?**
No you do not. Normally what you do is for instance ICE. Every company is you get a loan from the bank they have a company assigned to evaluate every phases of your construction. So ICE just happened to be the company who was assigned to this building. They come and will make sure that your building is fine. They come and check it and at the and they come again because the bank does not give you the money if it is not build in a certain way. But they do not check that what you just said. Other buildings in town or something they will be required to do something like that *kracht calculatie* or something like that. Sometimes you have an environmental report that you have to get some company to do an environmental check on your property. But in these situations, because everything is kind of straight forward like a regular ground, you have a guy or company come to put pesticide for the insect into the ground. You do that all around the property before you build it. So you are prepared.

**Why if the foundation is made of concrete?**
We have wooden frames or anything, so it just to be prepared. So you make sure. And it is also a good thing to let them come every now and then to let them spray them around the edges to keep it.

**You do design for people who can afford it, do you also design sometimes for the poor?**
Yes, normally you design for them but it does not get build. Because they cannot afford it. You can make the proposal but they does not get it. For instance what they have done in the past. They have made social housing and they put them on people's property from who they rent them. In the period of time for the people who do not have homes transition. Because the government says okay we going to building these different places for all those poor temporary houses. But then 10 a 20 years later the people are still in those temporary houses.
In Ebenezer they have built a lot of these cheap houses by an Italian company. But, when Luis came they were all wiped out. While they were meant to help the community.

**Is it not smart to build something which the residents can quickly rebuilt after a storm?**
But then they lose everything inside. And that defeats the purpose. Unless you built a solid bunker element and then on top of that you built whatever you want to build. So the bunker would have a cistern, a generator and a room or two and everything else goes on top of that. Everything on top can be replaced. So you have

the key elements which are needed in a place to live. But that is expensive. And that is why the government is making social housing. On the French side they have social housing as well. When you see those houses you think: Woow, that is good quality housing! But those are built by European funds, through France and they are able to build that. But here on the Dutch side it is another game. We are getting some money, but at the end of the day it is coming out of our own pocket. So it is a little different story. So for those projects it takes a lot longer. They are busy with a project already for maybe then years and it is still not done yet. But they keep talking: Oo yeah we are making progress. How long has someone wo is homeless or poor has to wait. They all say: I am on the list. On what list? They are on fifteen different lists before they get a home. They children are already done with collage before they get it and by that time they do not need it anymore.

**But where do these people live right now?**
Everywhere and nowhere. By families, friends and where ever else till they can get something for themselves. Because also in terms of jobs an all those things like that are a big problem. How can I earn a certain amount of money to have a property. In Belvedere they have social housing were people have a 3 bedroom house. They rent it through the housing foundation of Belvedere. The housing foundation has to manage the income but sometimes people cannot afford it.
But if you defining the poor people, who is that actually? Right now there is, we call it shanty towns but we also have the more generic word that is not shanty towns, there is another name for it but I do not know it at the moment. For these type of homes. You do see the shanty towns on different parts of Sint Maarten. But you do not see the poor who are living in other houses. People build inside of their homes a couple of apartments and they rent it. That is the little machine to have a little income on the side. And who needs to know, that is my little business. And then the people who are having a couple of dollars are paying the owner 100 or maybe 200 dollars for a studio, apartment or something like that. With water and electricity included. They go for it because they do not have another choice. To build for poor people on Sint Maarten, you have to come up with a good project you need to get land for it. And on Sint Maarten they have to get land form someone who choose to give them their land to use it to do that. So they have to lease that from that person. So they have to telling them: we are going to pay you a certain amount of money to have your land and to make a project.

**Can you just buy a piece of land and built your own project?**
You can. A lot people are doing that. But you see for example here in Cul du Sac, Ebenezer, Betty's Estate, Retreated Estate and Sint Johns are private owned South Reward, St. Peters and Saunders are all government land. That is the way of merging private and government land. You have to know where you can do your dance if it comes to buildings. But then again you can do social housing and things like that you try to build for a certain group of people. You try and you come up with something and it looks good and then they goth somebody to pay for it. It goes worldwide, they build one and then maybe four, but after that what happens with those thousand other people who have nothing? They do not have the benefit of it. So if you want to do it, you do it, but you ae not being consistent so what is the point? It stays a conflict. It is not that people with these people are doing bad they mean well, they trying at least. But then the circumstances defeats it. It is making it impossible. So then again you need to choose in what direction you want to go.
So in informal settlements, that was the name, is what they call them. Informal settlements has gone by the point behind properties, but they are everywhere. They are no longer in a identified location. People are just doing to make money on the side.

**We heard that people prefer to stay in their homes when a hurricane comes. Is it not a good idea to use some kind of centres in a neighbourhood as a shelter?**
What you are saying is correct. I have made a proposal with the schools, called Ritthem Park. I asked the schools if it was okay to use their rooftops to create a park. Because the locations of these guys is exactly where a park should be in this community. There is no parks in this neighbourhood. So I told them I will make a car free bike area. That is going from up there all the way to the Fresh Pond above and on top of the different schools creating experiences. They loved it. And then over the trench I wanted to create a walk or bike path and then inside the space I created I will then incorporate some storage and bunker points. But then all of the schools will become a bunker location. For example with St. Peters collage they are investing maybe one point something million on redoing all of their roofs. So if you spent that amount of money on the roof I told them: why not making an infrastructure above it that also protects your roof, comes on a certain height which creates more functional spaces, comes down with columns and then your be able to extend them for the future. They loved it. But now I have to find an investor who want to give money to put that concept together to get it done. But 30 percent of the people in the area is able to reach the shelter.

70 percent of the people is living somewhere where they do not want to leave their houses or are not able to leave. People are afraid as well for looting after the hurricane. But you have to choose, live or stuff. By creating a shelter like I mentioned you can at lease save 30 percent. The shelters right now do not have these amenities. They do not have a generator, at least the most of them, and they do not have enough food supplies to keep people for a certain period of time. So the majority stays home.

**But if you put everything up in the sky, what is happening with ground level? It can become unsafe.**
That is right but every situation ask for different solutions. In this area you see those houses. But they are living there with their whole family, so you are talking about nearly 45 thousand or more people in this area who are coming home from work or something else and then? They come home sit inside and use their phone. They do not move, they do not want to leave their house. So how do you get them out of their house. You got need to get a safe area as a park or amenities that will cause them to leave as they not leaving their house. So this is now the biggest problem within this context.

**Why do you have not inland more touristic spots, since the fact tourism is a major source of income?**
Have you seen Simpson Bay, where all the tourist are right now. There are no pedestrian paths. If you want to go somewhere you need to walk on the roads, it is not safe to do. They do not make it even for the tourist, so for sure not for their own people. They wanted to make a sort of monument on the hill, so people could go there. But then I told them, you have to make a way for the people to come there. Then they say we do not want to pay for that. We want to pay for that item, which becomes an isolated item, but how do people come there? They can drive, but what is they want to walk? *Dat kan niet dat kost te veel*.

**Is there not a certain transportation system which can bring the people?**
The best transportation system on the island are the busses which do whatever they want. So everyone has a car, you need it. At the end of the day a lot of people are using the busses, efficient or not people use them to get them to go were ever they have to go because there are so many of them. In fact a lot of tourist stops taking the taxis and start taking the bus.

**But integrate the parking spaces as well in your design?**
Yes, every house has one parking space. But the rules are changed and every house needs two parking spaces.

**Is that the reason you made this inner space, to hide the cars?**
Actually, that is my mom's porch and she wanted to have a nice view. It is all for her.

**Why did you just build three storeys?**
Because of governmental rules. But also erosion. Because if you built on those properties you cut of those hills. The hills were all meant for planting before, so the land is really soft. So over time what they are not seeing, that retaining wall is good right now, but if ground water goes into the bottom of that retaining wall and they did not build a good foundation it happened on the property over there. What happened was they had a nice retaining wall, but the steel was not good enough and whatever else. The insurance company had to pay them out. But when they were assets, the steelwork for the foundations and everything, it was not tight well and it was cheap and whatever else they lose the case and they did not got the money. What happens is that the water takes the soil underneath the wall. The wall is ending up not being well and the whole building is coming down. The retaining wall over here is around over 60 thousand dollars. When you use the property up there you only have 40 percent you can put your building on, the rest has to be green or something else. To build on the hills cost more. You always need to cut the land, fix it, make a road to access and do a lot to make the land ready to build on, so that is mainly why people do not build on the hills. They rather do that, to save money.

**There is not much land left to build on new, so why not build on other places?**
There is land left, but a lot of the government land is given to people who do not live on the island but they still own it. So now I cannot get it from them to give it to someone else because it is from them. And there is no policy yet, to take it back and give it to someone else. So there is a lot of land, but it is just occupied by others.

**Are there some retirement homes?**
There is by the red and yellow cross and there are a lot of people talking about that for many years. But it does not meant that it has be done. It does not fit in our culture. The elderly stay home. they like their own environment. Like my mother is 72, she worked her live and she is relaxing on her porch. She has her kitchen and her stuff and she is relaxing. When she becomes older and needs it, nurses can pass by. Right now we have someone who is cleaning her house, but when she is older she gets a more dedicated nurse or

I will spend more time with her home or something like that. The majority of the people on Sint Maarten prefer to take care for their elderly at home. There are some who place them in a elderly home, but I would say 80-90 percent of them stay home. And in fact, some of them build their home in preparation for when they get older to stay home and relax and not to have to be somewhere else. So they build for retirement. They are building homes for the people lower down so they can reach them easily and take care of them instead of going up in the hills. So they encourage them not stay in the hill and come and live down here.

**Is it not smart to build elderly homes and make space for the younger once to get a house?**
Actually the elderly own the property and they are not giving it away to nobody. And lot in Philipsburg for example is 350 thousand dollar for a small lot. They are sitting on valuable land so they are not get up and walk away. They have children and they are going to use the land and sometimes when they get desperate enough they would sell it and a developer will develop it. And the developer gave them a rooftop terrace home to live for free in a 2, 3 bedroom house. They live for free, but the first three floors are for commercial or whatever else and that is the agreement they have. But there are different approaches to deal with this problem.

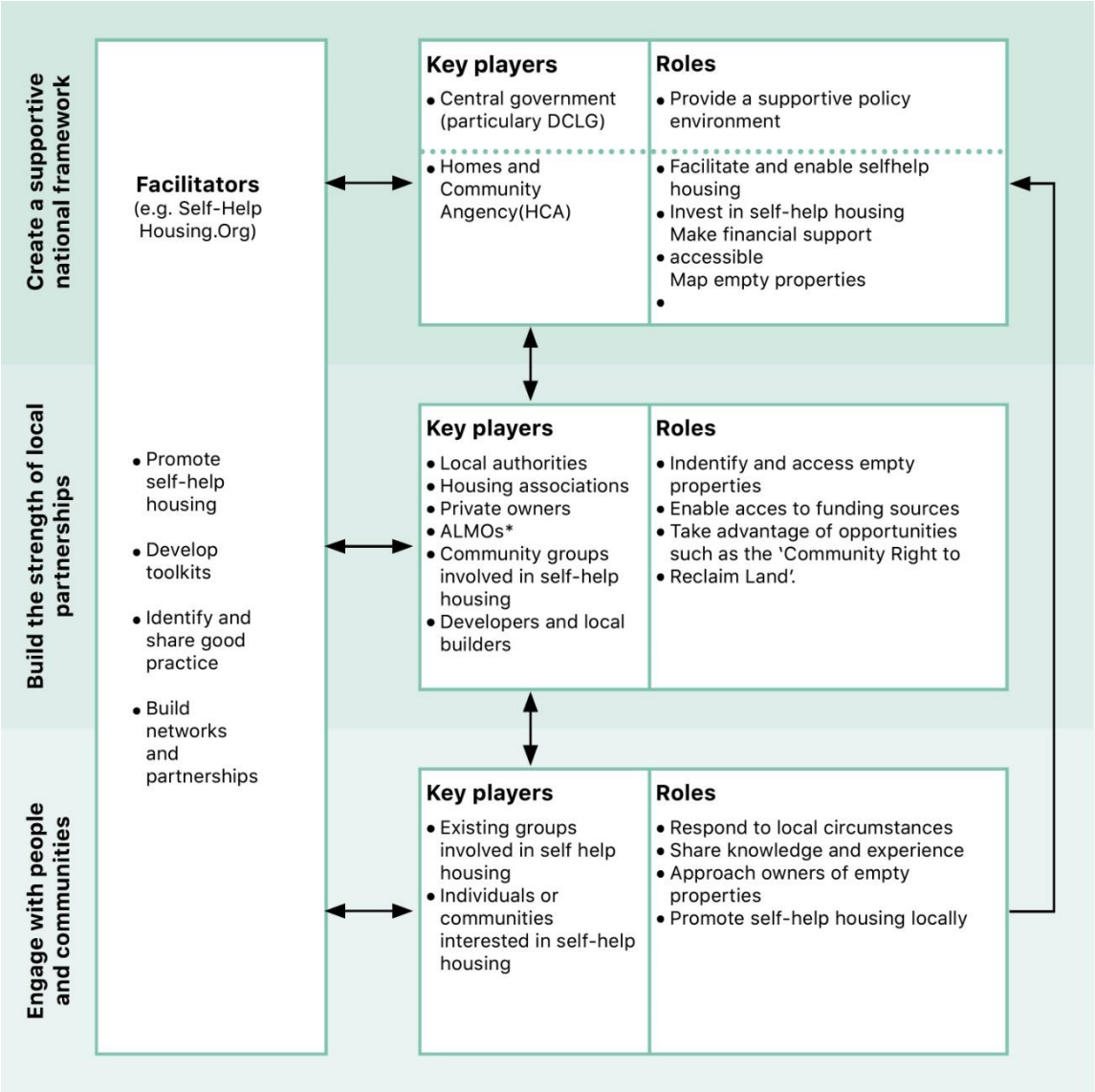
## APPENDIX J

Photo of a contractor making a house with walls of CMU blocks (Own image).

Photo of a house made of CMU blocks (Own image).

## APPENDIX K

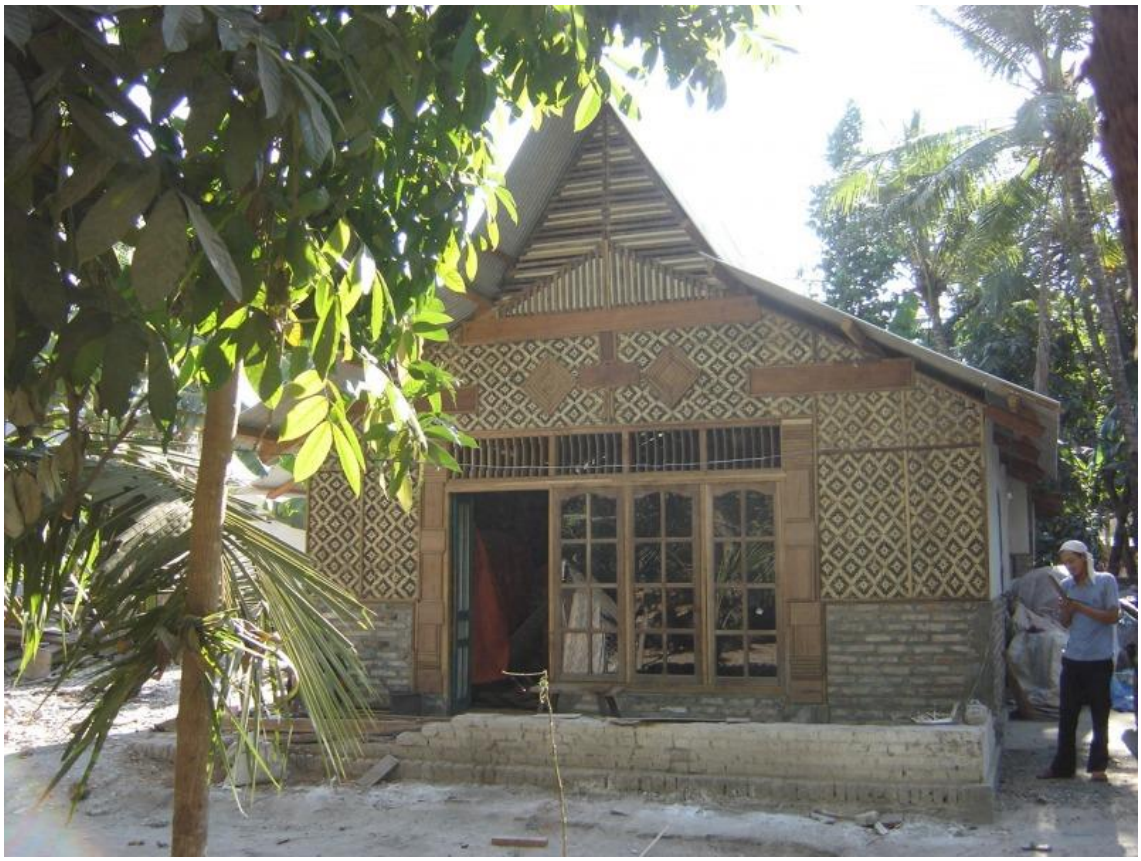
The key ingredients for self-help housing according Pattison et all.(2011).



## APPENDIX L.1.

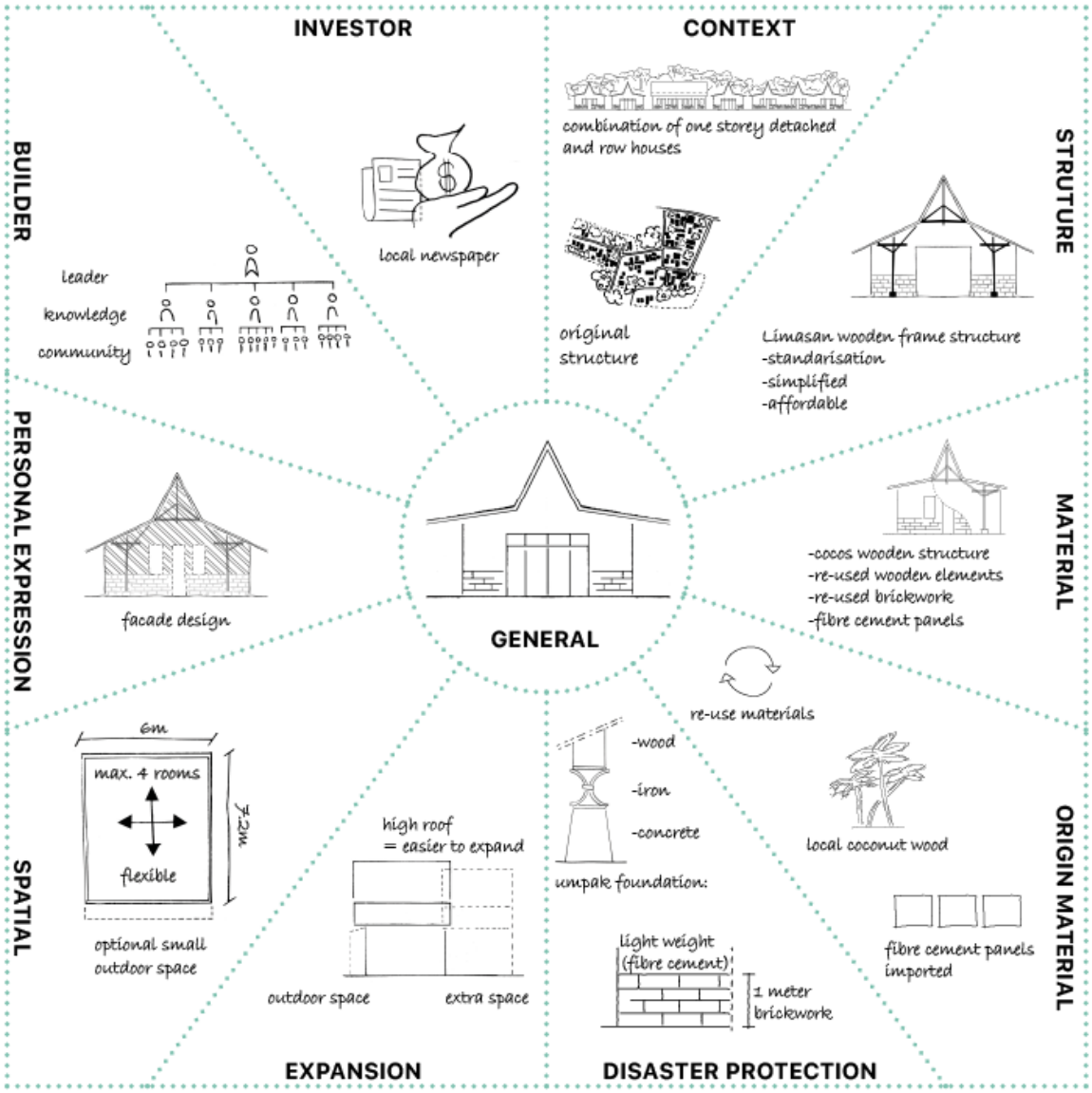
Photos of the Nqibikan Village (re)constructed houses on bases of local building principles. A row of houses (“Reconstruction of the of Ngibikan village”, 2006).

A detached house with a personal expression in the facade (Luo & Prawoto, 2011).



## APPENDIX L.2.

Overview of the characteristics of a Nqibikan Village (re)construction domestic building (Own work).



## APPENDIX M.1.

Photos of the (re)constructed houses in Banda Aceh, Indonesia (Uplink Banda Aceh, z.d.).

## APPENDIX M.2.

Overview of the characteristics of a contemporary domestic building in Banda Aceh (Own work).