

CREATING A NEW BUSINESS MODEL FOR SHANTYTOWN CAY HILL IN SINT MAARTEN

Danique Landburg

Faculty of Architecture & the Built Environment, Delft University of Technology

Julianalaan 134, 2628BL Delft

D.G.S.Landburg@student.tudelft.nl

ABSTRACT

On September 6th of 2017 Sint Maarten got struck by Hurricane Irma, which caused severe damage to the houses. Sint Maarten is an Caribbean island with a rooted past from its history that has caused severe economic difficulties. Along with, a high amount migration that has been common among the surrounding islands the island has a tourism-led economy. In turn, the hurricane also affected the tourism-led economy as many visits to the island declined. This paper aims to propose an alternative business model for people living in a shantytown, also known as shacks. This study is investigating the current business model of merging shantytown housing and cultural tourism into an economic opportunities for the locals.

KEYWORDS: *St. Maarten, business model, business model canvas, informal settlements, shantytown, tourism*

I. INTRODUCTION

On September 6th of 2017 Sint Maarten got hit by Hurricane Irma. Until today, people are still trying the rebuild their houses. Post Irma, Sint Maarten's unemployment rate increased from 6.2 percent in 2017 to 9.9 percent in 2018, with youth unemployment at 17.9 percent in 2018. Especially micro, small, and medium enterprises (MSMEs) have significant financial losses due to the impacts of the hurricane. Households need access to financing to rebuild homes and make a full return to economic activities (World Bank, 2019).

Sint Maarten is part of the Caribbean islands and has a rooted past in labor and economy. Nisbeth (2006) explains that in the 15th century, the Caribbean region was a lively economy with fishing and agricultural communities. After the introduction in 1648 of African slave labor, it became an plantation based economy (Nisbeth,2006). After the abolition of slavery on the Caribbean islands there was a shift in the availability of labor force. Some islands were forced to depend on the immigrant laborers from the surrounding islands(Nisbeth,2006). After this period of time, migration became very common in the Caribbean. Many people migrated in a search of a better life.

The opening of the Princess Juliana airport in 1943, created a possibility for tourism on the island(Nisbeth, 2006). In the last 70 years, Sint Maarten has changed from a small Caribbean island where fishing was common to a cosmopolitan nation featured in many fancy travel magazines, explains Nishbeth (2006). Sint Maarten has completely changed in to a tourism-led island. Today, with tourism as its main source of income, Sint Maarten continues to attract people from throughout the Caribbean region to search for a better livelihood(Nisbeth, 2006). With the change from agriculture to tourism, the island has an average of 1.7 million cruise ship passenger each year and around 40.000 passenger arriving each month(Worldbank, 2019). The hurricane also affected the tourism-led economy as many visits to the island declined and so the third of the population who worked in the tourist industry lost their jobs. Many hotels and recreational occasions had to close, which caused high unemployment on the island(Worldbank, 2019).

Nowadays, the housing sector in Sint Maarten continues to outweigh its supply (Nisbeth, 2006). It becomes difficult for people who immigrate for work to obtain affordable and suitable housing. The monthly rental cost of a legal one-bedroom apartment ranges from \$400-\$1,200 (Nishbeth, 2006). As a result of lack of suitable housing and high rent, the immigrants began to settle on lands where the ownership is not clear. These settlements of land are inexpensive to rent, sometimes for as little as \$200 per month (Nishbeth, 2006). Immigrants began to settle and build shelters. Today, the settlements have spread to the island and are known as shantytowns, informal settlements or shacks. The shantytowns have created a problem for the island. There is no accountability for these land, even though the landowners or other people are collecting rent for these type of houses. In this way, the ownership of this homes are not clear. An example of such a shantytown on Sint Maarten is called Cay Hill, also known as Haitian Town (Figure 2).

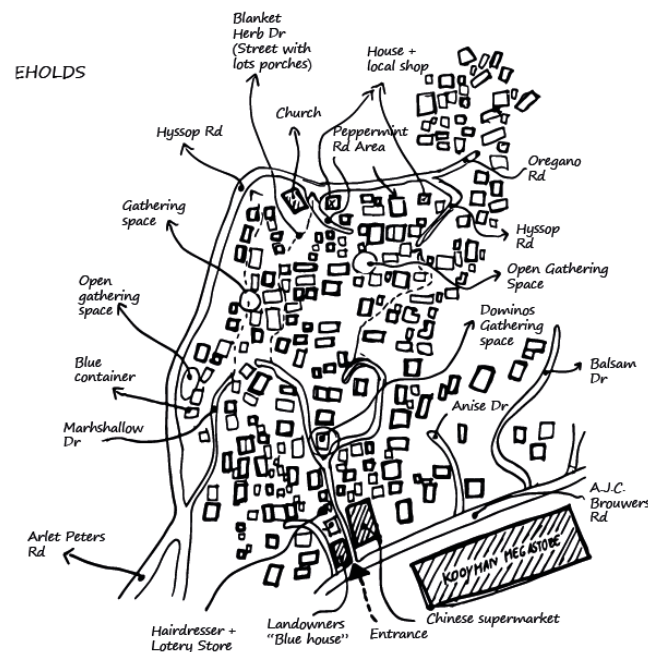


Figure 2: Sketch project location informal settlement Cay Hill, Sint Maarten (Own work)

1.2. Research aim

The aims of this thesis are three-fold:

- 1) to investigate the current business model of a household in a shantytown on Sint Maarten
- 2) to propose an new alternative business model
- 3) to learn from other business model examples of practices as inspiration

1.3. Research questions

This paper will answer the following research question:

Which business model creates new economic housing opportunities for the people of Cay Hill's shantytown, taking into account the tourism-led economy?

Through answering the main research question the following sub-questions will be answered:

- How does the current business model work?
- What can we learn from possible examples of practices?
- What are the gaps and limitations of the current business model?

II. METHODOLOGY

In this paper, a new business model will be developed. This idea of using a business model has not yet been very common in the field of Architecture. With this type of approach, the research tries to fill the gap of knowledge using the business model to create a new housing. Rather than designing for a fictional user, it is better to understand the current ways of living and business activity of the locals. (Pike, 1967).

For this research a framework developed by Alexander Osterwalder and Yves Pigneur(2010) known as the business model canvas will be used, in which the researcher gets an overview and a better understanding of the activities and daily life of a local person. The business model canvas(BMC) is used as a visual layout and emphasizes functional fields of daily activities and insights of a business (Farren, Kinney, Crotty, 2017). With this method, the actions and needs of a local will be intensively studied. To create a picture of the local user the researcher should spend a certain amount of taking interviews, talking to the locals and observing their behavior. Which is also known as, ethnographical research. For this method, the researcher needs to do an active and passive observation of the culture and activity of the people(Linda, 2013). This will be done through a fieldtrip, observations, documenting, interviews, conversations, literature and collecting date.

Lastly, several case studies will be discussed and compared to find new business model strategies. The case studies will be placed into the business model framework to give a better insights of the used strategies and what we can learn from them.

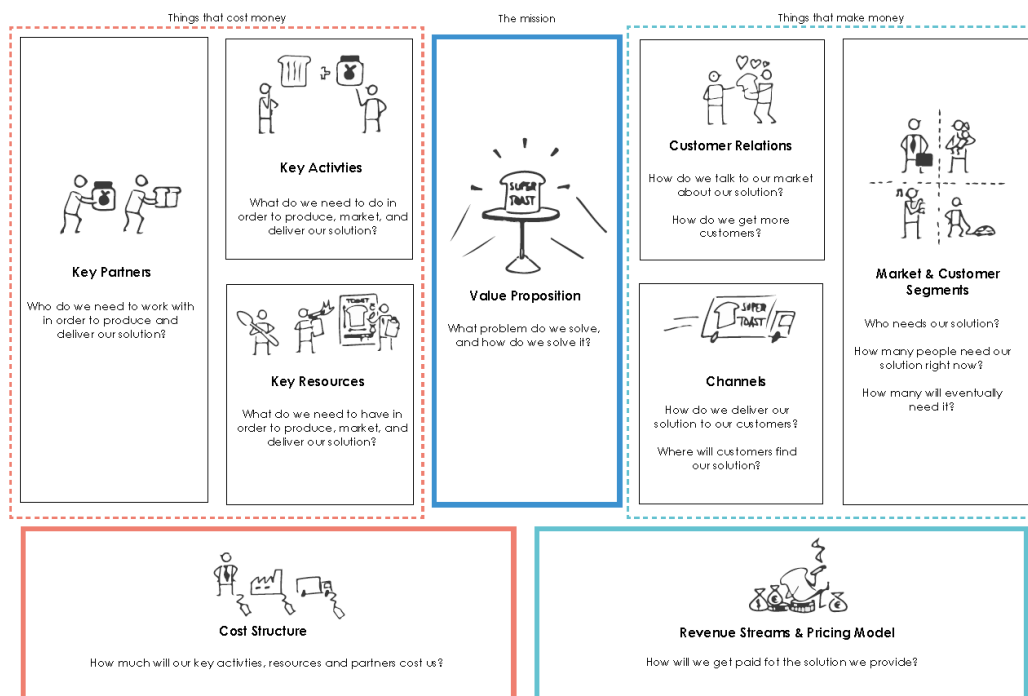


Figure 2: Business model canvas, Osterwalder and Pigneur, 2010

2.2. Business model canvas

The business model canvas shown in figure 2, is simple and clearly showing how this strategy is centered around nine key building blocks, and more importantly encourages the researcher to ask questions, think about why these interactions occur and what their consequences could be. The nine-building blocks of the BMC include (figure 2); Customer Segments, Value Proposition, Customer Relationships, Channels, Revenue Streams, Key Resources, Key Activities, Key Partners and Cost Structure (Osterwalder and Pigneur, 2010). Using this business model canvas as a strategy tool aims to give a picture of the local current ways of living and to discover the needs and wishes (Osterwalder and Pigneur, 2010). Figure 3 illustrates the business model in a simple and engaging way.

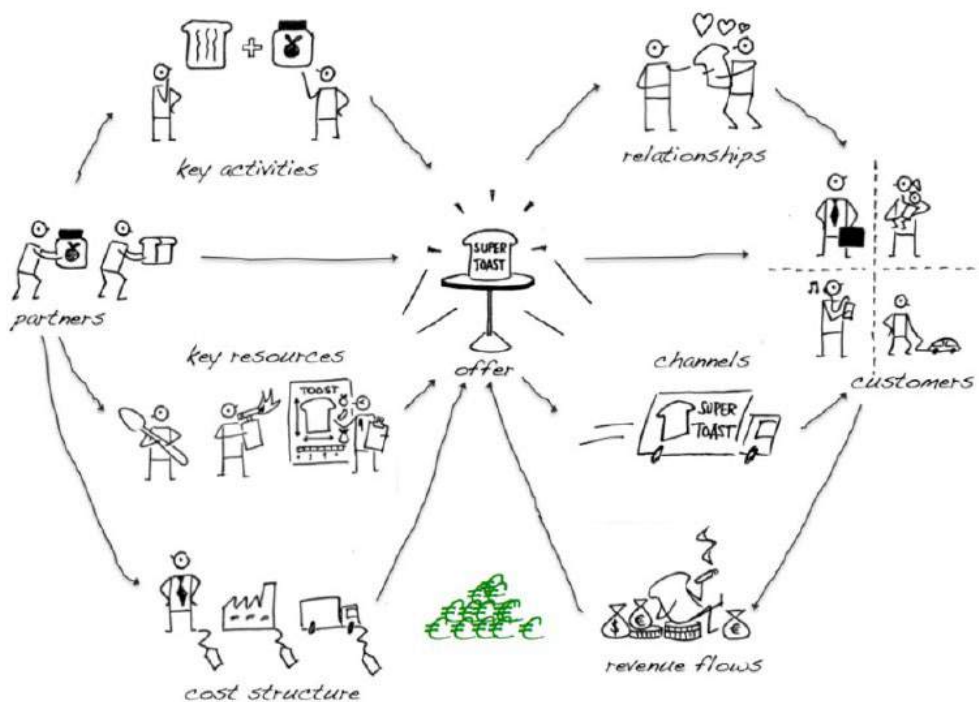


Figure 3: Sketch of the business model strategy, Osterwalder and Pigneur, 2010

III. THE CURRENT BUSINESS MODEL

In the previous chapter, the idea of using a business model canvas is explained. This chapter will show how the current business model on Sint Maarten works. Through explaining each of the nine building blocks and relating it back to the situation on Sint Maarten. The current business model is explained based on the Sint Maarten fieldtrip, mostly through ethnographic research and interview. It is meant to give an insights on how the current system functions. The business model canvas of the current strategy is documented in appendix B.

3.1. Value proposition

The Value Proposition can be seen as the main important part of the business model. It is the offered product that creates value. (Osterwalder and Pigneur, 2010). In this case, the product that the household offers is a room to rent or sells local fruit in front of their house to make an extra income. The rooms to rent are mostly provided on short-term basis. Most of the locals do not own the house, but have to pay rent to the landowner (Kim, 2019). To make extra income when living

in a shantytown, some people either divide their meager living quarters or erect units for rent. (Nisbeth, 2006). Most of the dwellings are considered inadequate. They are mostly build from vulnerable materials and lack basic commodities such as running water and electricity, and graywater. Since the people who live in these areas have come from worse living situations, they are satisfied with their living arrangements as long as they have shelter. They are less concerned about the amenities of life and the environment and more concerned about simple survival (Nisbeth, 2006).

3.2. Customer Segment

The Customer Segments shows the type of people or groups the model tries to provide service for and reach (Osterwalder and Pigneur, 2010). For this several questions need to be asked. For who are we creating value for? Who are there most important customers? In this case, a household living in a shantytown wants to attract tourists and other locals to rent out parts of their homes or buy fruits and goods.

The largest group tourists are arriving mostly cruise tourist arriving from the North of America. Next to the cruise tourism on Sint Maarten we can find the stay-over tourism. The stay-over visitors are mostly arriving by air. The island is trying to promote different kinds of activities attracting a more diverse group of people, such as regional visitors from other islands. The number of tourists arriving by air are about 500.000 per month. (World Bank Group, 2018)

The type of tourist staying at a local household is mostly stay-over tourists. They stay for a few days to a week maximum. They stay-over tourist come mostly regional, from the Caribbean islands. 80 Percent of the tourists are Caribbean, 10 percent European and 10 percent American.(Kim, 2019)

The stay-over visitors are mostly arriving by air. The island is trying to promote different kinds of activities attracting and more diverse group of people, such as regional visitors from other islands. The number of tourists arriving by air are about 500.000 per month. (World Bank Group, 2018) These type of tourists differ from the cruise ship passengers who most of the time stay and sleep on the cruise ships. Sometimes homeowners make guests pay a contribution or a certain amount per night so they can cover themselves. (Kim, 2019)

3.3. Channels

The Channels explains how the customers are being reached to create and deliver the value proposition(Osterwalder and Pigneur, 2010). Osterwalder and Pigneur(2010) explains that be creating a mixture of how different channels want to be approached will be fundamental in bringing value. To find the right ingredients on how to integrate them for a good customer experience is the key.

Currently, the most common channels for a household to reach tourists is through social media, such as Couchsurfing. It is used as a tool to attract tourists who want to stay at affordable places. Couchsurfing has been used for years as a medium to connect locals with renters (Kim, 2019). Furthermore, the local homeowners and street sellers have their own network. They work together with local taxi drivers, tour operators, tour guides, airlines. It depends on what the customers need is at that time. (Kim, 2019)

3.4. Customer Relationships

The Customer Relationships explains the different kinds of relationships business model the developer needs to create with the customer. The question is which kind of relationship does each of the customer expects to be created? (Osterwalder and Pigneur, 2010). The method used for the local household, spoken out of experience, is most of the time either assistance or self-service. The customer has the chance to directly reach the household they stay-over at, which can be seen

as personal assistance. The homeowner could also completely set the value propositions beforehand so that the tourist has the ability to self-serve. Sometimes the local homeowner will give up their own private spaces to provide service, such their living room. This is sometimes in conflict with the locals living situation (Kim, 2019).

3.5. Revenue Streams

The Revenue Stream describe how much will be earned from each customer. In this case, the family rents out an house or room to a tourist or sells fruit in front of their house. During the fieldtrip to Sint Maarten from the 1st of May till the 23rd of May, through my own experience it became clear that most of the stay-over tourists pay an amount of about \$20 to \$30 dollars per night to the household. In addition, Couchsurfing is free that means sometimes the household don't receive an extra income. Furthermore, the minimum wage of people in Shantytown is less than \$500 dollars per month(Nisbeth, 2006). Typical rentals for approved apartments cost between \$400 and \$1,400 per month, so these people clearly cannot afford housing in the regular market. The \$200 per month shanty rental is all they can afford. (Nisbeth, 2006) It is not clear how much the street sellers earn with selling fruit. The fruit that the locals sell on the street mostly comes from the other surrounding islands, such as Saba and St. Eustatius. Most of the time they have connections with friends or family on the surrounding islands. Or they crop and produce the fruit in their own backyard. But they mostly don't sell the crops coming from their own garden (Kim, 2019)

3.6. Key Resources

The Key Resources show the important assets that are needed to create a business model. They could be based on for example, final or human-based resources. (Osterwalder and Pigneur, 2010). The most important task for the household is to provide a decent place for the tourist can feel comfortable in(Kim, 2019). By creating an online account on one of the social media platforms the household has an easy way of reaching its customer. If this is not done properly, the chances of getting bad reviews or the customers not paying the rent could become higher. In term of the fruit, the homeowner needs to crop their fruits or use their local network. Since most of the fruit comes from the regional island. (Kim, 2019)

3.7. Key Activities

The Key activities show the tasks that need to be done to make the model work. The activities could be seen as creating production, solving a problem or creating a network(Osterwalder and Pigneur, 2010). In this case, offering a room to rent and collecting fruit to sell could be seen as an activity. Another important task for the household is eventually to pay the rent of about \$200 - \$400 dollars (Nisbeth, 2006) to the landowner of the shantytown. The delivery time or date could become a problem for the activities, because they are based on human skills.

3.8. Key Partnerships

The Key Partnership explain a network of stakeholders and different kind of partners who are offering supplies(Osterwalder and Pigneur, 2010). In this case, the local family doesn't have partnership in particular. Their own local network, such as the taxi drivers and friends providing for fruits could be seen as their small local network. The locals do share the infrastructure around their houses with the neighbors. Which could be seen on a scale of economic partnership to reduce costs. The household does not need to pay for creating a social media account, which keep partnership with other stakeholders or parties to a minimum.

3.9. Cost Structure

The Cost Structure gives a description of all the cost needed to create a business model. It explains how to create value, while working with the guidelines of a business model (Osterwalder and

Pigneur, 2010). A full comprehensive document of the total cost of the new housing model is documented in appendix I.

The rent of people living in a shantytown needs to pay varies between \$200 - \$400 dollars. (Nisbeth, 2006) The average construction cost for the lowest residential building is \$100 dollar per m². In Cay Hill it is about \$75 - \$85 dollars per m². (Nisbeth, 2006)

A financial calculation has been made to give an estimation of the financial cost. Since Sint Maarten is part of the Caribbean island and most of the tourists see it also as a hub to visit other island it is assumed that 90 % of the tourists visiting the island will spend about of two nights on the island. Sint Maarten is visited by about 2.000.000 tourists each year (Worldbank, 2019). It is important to know that a big part of this tourist are cruise passengers. The average number of cruise tourists is 1.700.000 people per year. The average amount of stay-over tourists are 500.000 tourists each year (Worldbank, 2019).

If we assume that, in ten years an extra 30% of the cruise tourists will be staying-over on the island. That means there will be 510.000 tourists extra tourist staying in either a hotel, hostel or with a local. So in ten years, if we take the 500.000 tourists that are staying over + the 510.000 extra tourists = 1.010.000 tourists staying over on the island each year. This means that every night for a full year 2.770 tourist be stay over on Sint Maarten. Too go further with this calculation an assumption was made that 33% of those tourist would be accommodated by a local host.

After the fieldtrip it became clear that, a tourist pays about \$20 - \$30 dollars per night for a basic hostel. About \$40 - \$60 dollars per night for van average hostel and an about \$80 - \$100 per night for decent hotel. For the shantytown the prices are be a bit lower around \$10-\$20 dollars per night. (Nisbeth, 2006). For this calculation the average price of \$15 per person per night is used. So if we say that a room for a tourist is used 50% of the year, which are 183 days. It would generate (183 days x \$15 = \$2.745/ year for a room – 20 % of maintenance costs) = \$ 2.196 of yearly income.

3.10. Construction cost

The average construction cost for the lowest residential building is \$100 dollar per m². In Cay Hill it is about \$75 - \$85 dollars per m² (Nisbeth, 2006). So for this calculation we take \$80 dollar per m². Let's say that we take 3/1 as an proportion for the local home and guesthouse. The local home would be for example 75m² and the guesthouse would be 25m².

If we take the 155 household in Cay Hill + 35 guest units(25% of the households will own a guesthouse) it would cost about \$80 x (155+35) = \$15.200.
\$15.200/\$ 2.196(of yearly income) = 7 years for the loan to be paid off.

So let's say a local family buys a home from the a cooperation that agrees to renting out the rooms or houses. The house will cost \$5000 and will be paid off in 20 years. That means the family needs to pay \$5000 / 20 years = \$250 per year to cooperation. That is about \$20 per month. The average rent for a house/shelter in shantytown costs about \$200 - \$400 dollars. A minimum wage of people in Shantytown is about \$400 dollars per month. If they rent out their home they can easily payed to the new cooperation.

A full comprehensive document of the total cost of the new housing model is documented in appendix H.

IV. EXAMPLES OF PRACTICE AS INSPIRATION

This chapter shows examples of the practice that can serve as an inspiration for the new business model. Creating a new business model can be a challenge. Therefore, the case studies will be analyzed and categorized by using the business model canvas and a strategy. This is useful for the thematic research as well as for the design research. The strategy is based on four principles described by The United Nations (Economic, U. N., & Council, S, 2015);

- (a) Environmental protection, such as compact housing settlements
- (b) Economic effectiveness, such as flexibility between owning and renting
- (c) Social inclusion and participation, such as housing that support social justice
- (d) Cultural adequacy, such as housing that takes into account the culture of inhabitants

A full list of examples of the principles are documented in Appendix B.

Using the four principles will give a better overview of the differences between the case studies. As mentioned before, the case studies are meant to give insights and possibilities of how the new design could be improved.

4.2. Casa Particular

In Spanish, Casa Particular literally means 'private home' and is established in 1997. The Cuban government allowed the Cuban families to register their house as a privately owned business and rent out their homes or room to tourists. This created a new source of income for the Cuban family (Hunt, 2016). This also created an opportunity for the Cuban families to pay of their debt. Which created economic freedom. The families who own a Casa Particular have to pay a certain amount of tax to the government. The salary of a Cuban is about \$20 dollars. If the owners rents out his or her room it can generate twice amount in one day. The homeowner needs to pay a fixed price to the government. Which is a minimum of around 170 dollars per room per month. To recognize these house, the owners are need to advertise their home by putting a small sign on the door with 'two blue triangle roof' (Borkowicz, Scheerlinck, & Schoonjans, 2016). See Appendix D for the principles and business model.

4.3. Rumah Tambah

The expandable Indonesian house, Rumah Tambah, shown in image 01, Is designed as a response to the rapid developing cities and climate change. It solves the challenge of housing. The expandable house is made to be flexible (Castro, 2018). It can change to the resource consumption, size and economic income of its residents, for example transform into a small shop or expend its size. This means the designers had to understand the pattern of the household income generation and water, energy and food consumption. As well as their way of living. The fact that each household had different results it was important that this house could be a dwelling and income generation unit that manages its own waste, water and energy at the same time (Castro, 2018) See Appendix D for the principles and business model.

4.4. Aravena Half A House Project

The Half a House is designed by architect Alejandro Aravena. It is an example of self-help housing (Zilliagus, 2016). Half of the house is intended to be left open, shown in image 2. It allows the low-income class to build their homes themselves when you save enough money. In this way each house will becomes also unique in aesthetics ways. They were asked to develop a set of typologies within the current housing policy. That created Fondo Solidario de Vivienda with two types of units. The first one has units up to 600 UF or US\$25,00 to 1,000 UF or US\$40,000 with a bank loan. Zilliagus, 2016). See Appendix D for the principles and business model.

4.5. Results and proposition for the new model

Studying these examples gave new insights on creating design possibilities. They all use the four principles of the United Nations in their own unique way. Each of the examples had their qualities and focus. Casa Particular is mainly focused on tourism. Rumah Tambah managed to improve the local's way of generation income. Aravena keeps in mind the slow process of extending the house when there isn't enough income for a family to extend. In Appendix E the gaps and limitations of the current business model are explained. By using the principles of sustainable housing by United Nations, it is possible to create new economic and sustainable solutions, explained in Appendix E. The proposition is meant to serve as a guideline for the research and design. In Appendix F the new business model for Cay Hill can be found.

V. CONCLUSION AND RECOMMENDATIONS

This paper answer the research question, which was formulated in section 1.3:

Which business model creates new economic housing opportunities for the people of Cay Hill's shantytown, taking into account the tourism-led economy?

To answer this question, the well-known business model canvas designed by Osterwalder and Pigneur(2010) was used. This paper tried to figure out the current business strategy used by a local homeowner on Sint Maarten. By using the business model canvas as a tool and through comparing examples of practices it gave new insights.

The findings from the examples of practices helped with describing a proposition for the new model, which is based on the four principles of Sustainable housing, created by The United Nations. The new proposition can be used as tool to provide new sustainable and economic housing opportunities for the shantytown Cay Hill, while creating an alternative for the tourism-led economy. It offers new housing to homeowners that want to generate an extra of income, but in a sustainable way.

Using the business model as a tool to create also had its limitations during the process. When trying to fill in the business model canvas it was uncertain from which viewpoint the business model canvas had to be filled it in. In a new model different customer segments should be illustrated. To give an even more clear overview of the needs to create a new business model.

This paper has looked into a conceptual solution to create a new architectural typology. Further studies in terms of creating an architectural by using a business model could help creating an innovative design and creating a circular economy. This research was created as a guideline about on how a new architectural typology. Lessons learnt from other researchers, such as Noor, about creating a business model are important to for forming the "The Open Shack" business model.

For the future I hope to see a development in the use of a business model as a tool to create new sustainable housing.

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Appendix

Appendix A

Kim | Local host interview

Originally from St. Lucia. Has been living in Sint Maarten for 15 years. Owns a travel agency. She organizes local tours, flights, accommodation in the Caribbean area. She rents out her house in the area Cole Bay to tourists for extra income.

How are you related to tourism?

I own a travel agency, called Caribbean Travel Movement. It is kind of a travel consultant. We organize everything travel related, tours, flights, accommodation, almost everything. 80 Percent of my tourist are Caribbean, 10 percent European and 10 percent American. We organize trips to almost all the Caribbean islands and most of it is arranged online. I work together with basically all tourism related services provides, taxi drivers, tour operators, tour guides, airlines. It depends on what the customers need is at that time.

What is your general opinion about tourism on this island?

I think it is good for the island. It's good because it has a small economy. How it is managed is a different story. The island is open and duty free. How it is managed by the government that is a totally different thing. I would say 50 % is managed in



a good way and the other 50% is very bad. There are a lot space and areas for improvement and there a lot of spaces and areas that are doing good.

What could be a good improvement for the tourism industry?

The government should train people. There is a need for customers service at different institutions like resorts and hotels. Six different cruise ships dock on the island and then you just have the few small stores next to the beach. Sint Maarten lacks good customers services. You have very few people who take there time to know and understand the history of the island. People who don't know the history are given wrong information.

If a tourist arrives and has questions about the island, they may be giving wrong information about the island. Even though it is a quick answer, the tourist will remembers it. The answers should be correct for example, in Sint Lucia with tour guides for my company in Sint Lucia, they have to go through a certain training program or you don't work for me. Cause I need to know that you are representing the island properly. Even the few drivers that I have here, I didn't give them a training. If they don't have knowledge about the island I wouldn't work with them, cause at the end of the day you are not just representing my company. I think the history of the island plays and important part. Tourist should not only consume, but also give something back.

You are also renting out your house to tourists, can you give an insight on how it works?

We use couchsurfing as a tool to attract the tourist to create affordable places to stay at. My husband and I travel a lot and we know what traveling is like and how expensive it can get. I have been on couchsurfing for years and we have host a lot. We also use couchsurfing for our home in Sint Lucia. In Sint Maarten there are a lot more tourist then in St. Lucia. In St. Lucia we may get 1 or 2 person per week and in St. Maarten it is constantly. I rent both of my houses. I rent them from someone else. I don't know if they own the land, but I do know that they own the house and I have to pay them around a certain time. That why I sometimes make guests pay a contribution or a certain amount per night so I can cover the expenses on the other house. So in my house and in the other apartment we constantly have tourists over. Last week I had you students from the Netherlands, a girl from the United States, someone else from Holland and another guy from France in our house.

Since you were in the other apartment, I had to give up my own home to the other tourists. The thing with couchsurfing is that there are a lot of emergencies, so sometimes somebody may need somewhere to sleep just for the night. I know what it's like to travel and I have kids, so I don't like to say decline my clients. I leave it up to the person to say no, for example if I had one person in my house, my son would give up his bed. And that is teaching him something about life. That he had to give up his bed. Other times, when he is sitting on the couch. A new client entered and so he had to give up the couch and slept in my room. It is constant. Which he finds difficult. Sometimes I feel like the tourist industry and couchsurfing is too much for my son. For me it is okay cause I have traveled a lot. All over the world. Same counts for my husband. My oldest son also traveled a lot. For my youngest son and for my daughter definitely not. I just feel like sometimes it is too much for my son that people are in his space. So that is the reason that I now have the other apartment around the corner. Some people are coming in and out. It is close enough for me to get there and if they need me I am right here. They can come and go as they please. Sometimes they go in and out or others want to come home late. In the end I want to make the tourists feel comfortable and at the same time balancing what happens in my house.

With how many people do you live in this house?

Right now at this moment we live with 3 people in the house. At 5 o'clock this afternoon it will be full of people though, because my brother is coming back from France. So I am very open to people. Even before couch surfing, I kept that apartment for visitors, such as extended family members. At one point; here in my house was just totally a full house. It just too much. Overwhelming.

Where does the fruit come that locals sell on the street? And how much do they earn?

The fruit that the local people sell on the street mostly come from the other surrounding islands, such as Saba and St. Eustatius. Most of the time they have connections with friends or family on the surrounding islands. Or they crop and produce the fruit in their own backyard. But they mostly don't sell the crops coming from their own garden.

How would you like to live in the future if you would still be doing this work?

Having my children in mind, I would like to keep it separate. My intention within the next 24 months is to buy an apartment building, not a house. So I can cut out the expenses on rent in that way and I will be easier for me. But I would still like to keep it separate, just to maintain a certain amount of normalcy within my home for my son and my husband.

What do you like the most about your house, this neighborhood Cole Bay and Sint Maarten?

That I live in Cole Bay. It is different from middle region or Simpson Bay. Middle region is very residential. Cole Bay has more of a town feeling, it is a mix of residential. You have everything here. Simpson Bay is extremely expensive. For example a doctor's visit for somebody that does not have residency would cost 30 to 35 dollars here in Cole Bay. In Simpson Bay you are looking at 300 dollars. So Simpson Bay is very fancy. So I like my Cole Bay. I would never ever stay in Middle Region. Cole Bay is in

between. During the day Philipsburg is busy, but in the evening, it goes quiet. Just a few spots are open while Cole Bay is still active. Philipsburg needs a whole face lift. If I could demand what needs to be done. I would have all buildings painted, all. It is very dirty and yuck, no maintenance. They don't care, as long as their businesses are open. They really don't care what the place looks like. You have thousands of tourists going in and out every day, and it still looks like this. In St. Lucia... Have you ever been to Sint Lucia? Sint Maarten is dry, we have sun every day. Sint Lucia is green, but also has sun every day, because it has another tropical climate. Sint Lucia is beautiful and warm and friendly. You would walk on the streets and somebody would offer you a ride, because the sun is hot and you are going to a certain point. In Sint Maarten people only care about themselves. Nobody offers each other a ride, because they are scared that somebody might kill them. It wouldn't actually happen, but the nature of Sint Maarten has kind of a selfishness. That is disturbing in a way. Maybe because I am from Sint Lucia and we are not like this in Sint Lucia. Sint Maarten is supposed to be the friendly island, but it is not really. Because everybody only cares about themselves. I told my son this morning. It is not home, Sint Lucia the warm and friendly island, is home to me. You can still sit under a mango tree even if it doesn't belong to you and it fills your belly. Here in Sint Maarten if you want to sit under a mango tree they shoot you. God created a tree. Sint Maarten is Sint Maarten. It is what it is and accept it for what it is. Some people tried to make it friendly, but it is a never ending battle. o



House damaged by hurricane Irma situated in Cole Bay next to local host Kim. Image by Danique Landburg

Appendix B

Things that cost money



Key Partners

The owners have a network of friends that help each other out. They have friends on other islands where they buy the fruit from. This also means they need to rely on friends. Or social media platforms to connect with tourists.



Key Activities

- offer bedrooms to other locals or tourists
- provide for fruits and good for locals and tourists



Key Resources

- the homeowner provides house or room for where the tourists or stayovers
- the homeowner orders food from other Caribbean islands to sell

The mission



Value Proposition

the family is offers room. It is mostly provided on short term basis.

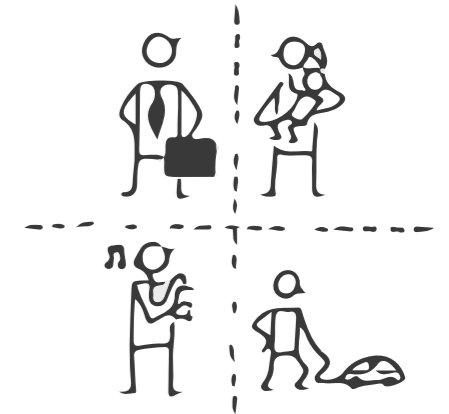
Family sells fruit or goods in front on the house.

Things that make money



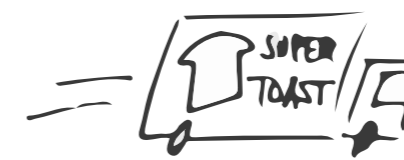
Customer Relations

- Short stay-over tourists.
- new customers every week



Market & Customer Segments

- locals
- tourists



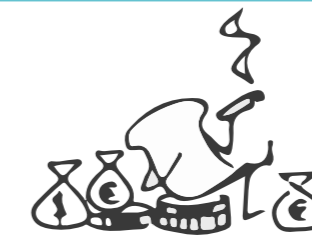
Channels

Couchsurfing



Cost Structure

The rent that a homeowner living in a shantytown needs to pay varies between \$200 - \$400 dollars. (Nisbeth, 2006) In Cay Hill it is about \$75 - \$85 dollars per m2. A tourists pays for the shantytown around \$10-\$20 dollars per night. How much they pay for fruits and goods is unsure.



Revenue Streams & Pricing Model

During the fieldtrip to Sint Maarten it became clear that most of the stay-over tourists pay an amount of around \$20 dollars per night to the household. Couchsurfing is free that means sometimes the household don't receive an extra income. The minimum wage of people in Shantytown is less than \$500 dollars per month (Nisbeth, 2006).



key activities

- Owners an upside down anchor sign outside of their house to show registration with the government as a casa.
- pay tax the government
- offer bedrooms and meals for tourists.

relationships

- Short stay-over tourists.
- new customers every week

partners

- The Government
- An architectural office
- Students and Lecturer of University
- The land owner
- The local people

key resources

- local has a house or room available where the tourists or travelers can stay in.

offer

1. Stay in an apartment your-self.
2. Stay in a room with a host family.
3. Stay alone in private room.

channels



Couchsurfing

customers

- locals
- tourists

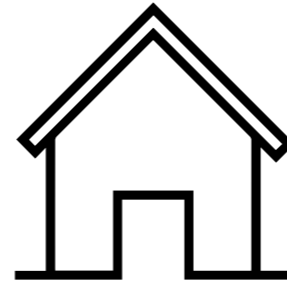
revenue flows

stay-over tourists pay an amount of about \$20 to \$30 dollars per night

The rent that a homeowner living in a shantytown needs to pay varies between \$200 - \$400 dollars.
 In Cay Hill it is about \$75 - \$85 dollars per m2.
 A tourists pays for the shantytown around \$10-\$20 dollars per night.
 How much they pay for fruits and goods is unsure.

The minimum wage of people in Shantytown is less than \$500 dollars per month

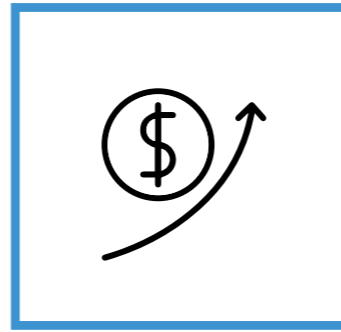
Appendix B



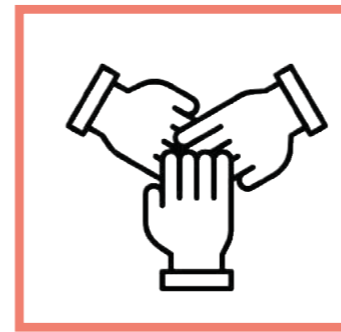
SUSTAINABLE HOUSING



Environmental protection



Economic effectiveness



Social inclusion and participation



Cultural adequacy

PROPOSITIONS FOR THE NEW BUSINESS MODEL



Environmental protection

Reduce, reuse & recycle

Improve environment & energy performance

Resilient urban settlements

Efficient use of resources

Resilient to natural and human-generated hazards

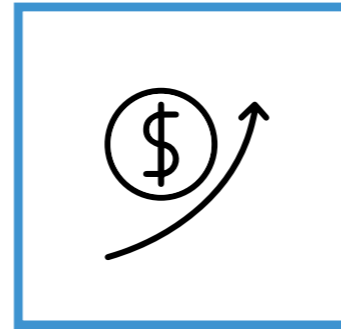
Green spaces around and within housing areas

Compact housing settlements with planned growth

Waste management treated as integral part

Encouragement of healthy living through

Existing houses that are retrofitted, as much as possible, for the efficient use of resources



Economic effectiveness

Flexibility between owning and renting

Local solutions, labour and local materials

Appropriate technologies in such a way as to generate employment

Housing construction performed based on the use of building codes & standards and support building safety

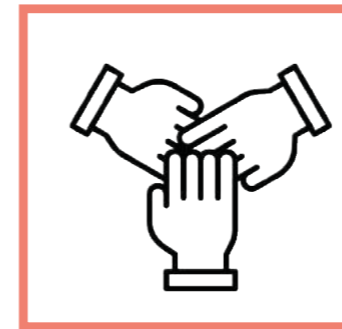
Combat energy poverty by supporting energy efficiency

Increased investment in sustainable housing promoted through private and public investments

Compact housing settlements with planned growth

Waste management treated as an integral part

investment in housing and the promotion of secure land and housing tenure



Social inclusion and participation

Support for adequate housing solutions for people affected by natural & human-made disasters

Adequate, healthy, safe and affordable housing, including access to basic utilities and services

Promote social cohesion and contribute to meeting the housing needs of various social groups

Increased availability of housing options, particularly affordable and social housing

encourages socially mixed communities

Research and exchange of knowledge on all aspects of sustainable housing

Effective, clear, and transparent governance at all levels

Housing that support social justice



Cultural adequacy

National housing policies that support the protection and enhancement of landscapes, heritage and culture

Emphasizing the development of public spaces for cultural and social activities;

Housing that takes into consideration the background and culture of inhabitants

Houses designed and actively maintained in order to enhance emotional wellbeing, including by involving local communities in this process.

Appendix D

Rumah Tambah

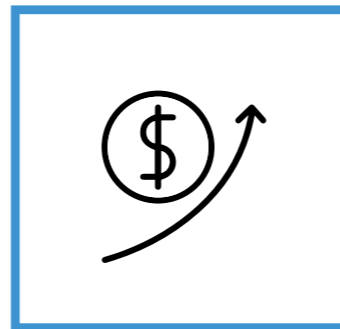
The expandable house, also known as Rumah Tambah in Indonesia. Is designed as a response to the rapid developing cities and climate change. It solves the challenge of housing. The expandable house is made to be flexible(Castro, 2018).

It can change to the resource consumption, size and economic income of its residents, for example transform into a small shop or expend its size. This means the designers had to understand the pattern of the household income generation and water, energy and food consumption. As well as their way of living. The fact that each household had different results it was important that this house could be a dwelling and income generation unit that manages its own waste, water and energy at the same time (Castro, 2018).



Environmental protection

- Resilient urban settlements
- Green spaces around & within housing areas
- Efficient use of resources
- Resilient to natural and human-generated hazards



Economic effectiveness

- Local solutions, labour and local materials
- Appropriate technologies in such a way as to generate employment
- private & public investments



Social inclusion and participation

- Housing solutions for people affected by natural & human-made disasters
- Adequate, healthy, safe & affordable housing +access to basic utilities &services
- availability housing options



Cultural adequacy

- protection of landscape
- development of public spaces for social activities
- Housing takes into consideration the background and culture of inhabitants

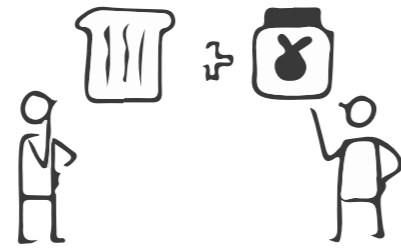
Things that cost money



Key Partners

- The Government
- An architectural office
- Students and Lecturer of University
- The land owner
- The local people.

(Urban Rural Systems, 2019)



Key Activities

The local people need to keep being active with providing supplies in their local shop and maintaining their garden.
(Urban Rural Systems, 2019)



Key Resources

- House uses concrete bricks or Batako as the main source of wall material.
- The locals bought these materials directly from a handmade brick maker. In a village not far from the location called Kampung Melayu.

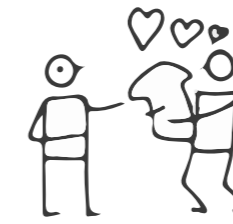
The mission



Value Proposition

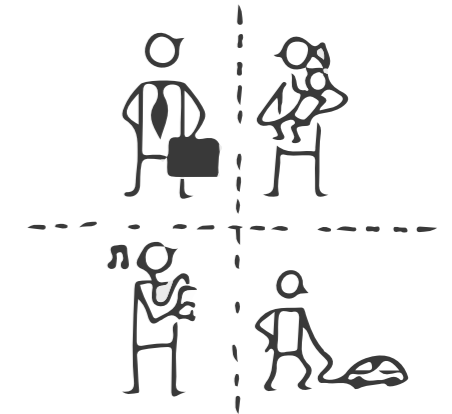
- Expandable house
- created to be flexible
- ability the size, height and transform into any kind of small business

Things that make money



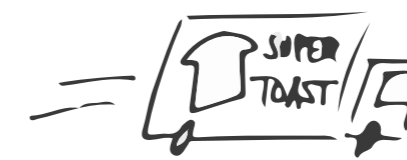
Customer Relations

Locals have established a relationship with the government, an architectural office and the landowner.



Market & Customer Segments

local people living in the fishing village, Batam.



Channels

The Local people bought directly from Handmade Brick maker and local shop around.



Cost Structure

- The dimensions for the brick are 280 x 135 x 60 mm
- The costs for the brick are based on IDR 1.200,00/Brick (SGD \$0.12/Brick)
- The times based on 60 to 120 s / brick. Which makes for 200 bricks > 3 hours of work.
- Man needed is 1 person.
- Method needed is bricking casting and hand pressing.(Urban Rural Systems, 2019)



Revenue Streams & Pricing Model

- Creates flexible financing
- A developer creates and gives the roof + foundation
- Locals fill in the rest of their house acquired to their budget.
- Creates flexible by income generating such as a shop, or café (Castro, 2018)



key activities

- brick casting
- brick hand pressing
- locals being active with providing supplies for local shop & garden maintenance

relationships

- the government
- architectural office
- the landowner

partners

- The Government
- An architectural office
- Students and Lecturer of University
- The land owner
- The local people

key resources

- concrete bricks or Batako for wall material
- handmade bricks

channels

- Handmade Brick maker
- locals wood shops

customers

- locals of the fishing village, Batam.

offer
Expandable house

revenue flows

- Creates flexible financing
- A developer creates and gives the roof + foundation
- income generating such as a shop, or café

cost structure

- The costs for the brick are based on IDR 1.200,00/Brick (SGD \$0.12/Brick)
- The times based on 60 to 120 s / brick. Which makes for 200 bricks > 3 hours of work.

Half a house Aravena

The Half a House project is designed by architect Alejandro Aravena. It is an example of self-help housing (Zilliacus, 2016).

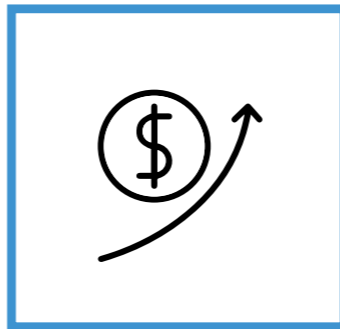
Half of the house has been built by the architect already and the other half is left open. It allows the low-income class to build their homes themselves when they save enough money. In this way, each house becomes also unique in aesthetic ways. They were asked to develop a set of typologies within the current housing policy. That created Fondo Solidario de Vivienda with two types of units. The first one has units up to 600 UF or US\$25,000 without debt and the second one has units up to 1,000 UF or US\$40,000 with a bank loan. (Zilliacus, 2016).



Environmental protection

Resilient urban settlements

Compact housing settlements with planned growth



Economic effectiveness

Flexibility between owning and renting

Housing construction performed based on the use of building codes & standards and support building safety



Social inclusion and participation

housing solutions for people affected by natural & human-made disasters

Adequate, healthy, safe and affordable housing, including access to basic utilities and services



Cultural adequacy

Emphasizing the development of public spaces for cultural and social activities;

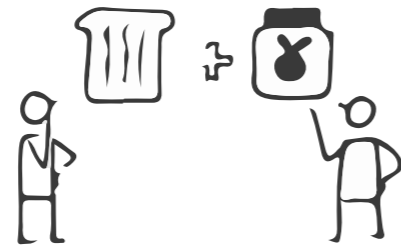
Housing that takes into consideration the background and culture of inhabitants

Things that cost money



Key Partners

- The Government
- The Architecture office Elemental



Key Activities

The homeowners are expected to only give their attention, time, labor and provide for extra materials.
(Zilliacus, 2016)



Key Resources

- The first floor has a finishing made of concrete.
- The second floor has finished made of unfinished plywood.
- Concrete foundations, plumbing, and electricity is all provided for the family.
(Zilliacus, 2016)

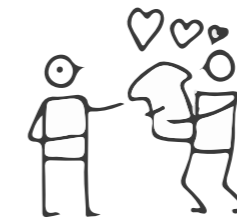
The mission



Value Proposition

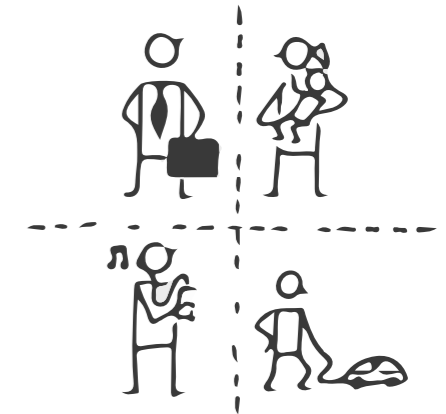
- Two storey community housing
- One side of the house is fixed.
 - The other side of the house is a framework around a void.
 - This area waits to be fill by the homeowner.
(Zilliacus, 2016)

Things that make money



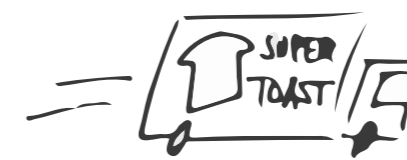
Customer Relations

The homeowners can join building workshop of the housing cooperation Elemental.
(Zilliacus, 2016)



Market & Customer Segments

The houses are designed for low-income and middle-class households.



Channels

No data available



Cost Structure

- The first type of house has units that go up to \$25000 USD without debt.
- The other type has units for \$40000 with a given bank loan.
- The government pays to fix the infrastructure, such as roads, sewage, garbage collection, busses etc. To create a stronger community.
(Zilliacus, 2016)



Revenue Streams & Pricing Model

The cost of construction for social housing in Chili is \$500 per m2.
The houses are cheap, practical and have good insulation.



- The first type of house has units that go up to \$25000 USD without debt.
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The cost of construction for social housing in Chili is \$500 per m2.
 The houses are cheap, practical and have good insulation.

Casa Particular

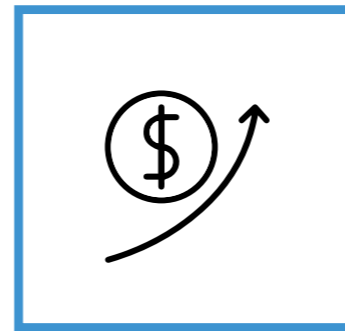
In Spanish, Casa Particular literally means 'private home' and is established in 1997. The Cuban government allowed the Cuban families to register their house as a privately owned business and rent out their homes or room to tourists. This created a new source of income for the Cuban family (Hunt, 2016). This also created an opportunity for the Cuban families to pay of their debt. Which created economic freedom.

The families who own a Casa Particular have to pay a certain amount of tax to the government. The salary of a Cuban is about \$20 dollars. If the owners rents out his or her room it can generate twice amount in one day. The homeowner needs to pay a fixed price to the government. Which is a minimum of around 170 dollars per room per month. To recognize these house, the owners are need to advertise their home by putting a small sign on the door with 'two blue triangle roof' (Borkowicz, Scheerlinck, & Schoonjans, 2016).



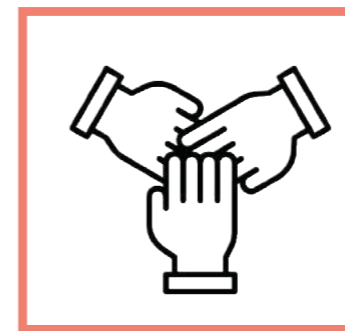
Environmental protection

Existing houses that are retrofitted, as much as possible, for the efficient use of resources



Economic effectiveness

Flexibility between owning and renting



Social inclusion and participation

Promote social cohesion and contribute to meeting the housing needs of various social groups

encourages socially mixed communities



Cultural adequacy

Emphasizing the development of public spaces for cultural and social activities;

Housing that takes into consideration the background and culture of inhabitants

Things that cost money



Key Partners

The owners have a network of friends that help each other out. Who own a casa. Once in a casa. The owner will suggest where to stay in the next town. This also means they need to rely on friends.



Key Activities

- Owners an upside down anchor sign outside of their house to show registration with the government as a casa.
- pay tax the government
- offer bedrooms and meals for tourists



Key Resources

It is important for the homeowner to have a house or room available where the tourists or travelers can stay in. Sometimes the rooms isn't always available. The visitors will find it out at arrival

The mission

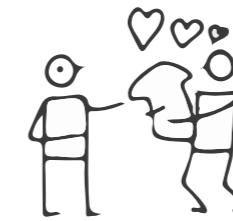


Value Proposition

the family is offering their house or room. It is mostly provided on short term basis.

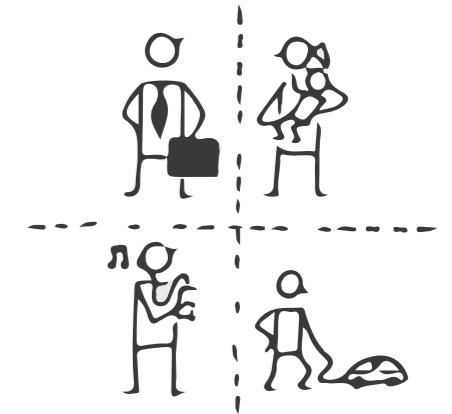
- It has three options:
1. Stay in an apartment yourself.
 2. Stay in a room with a host family.
 3. Stay alone in private room.

Things that make money



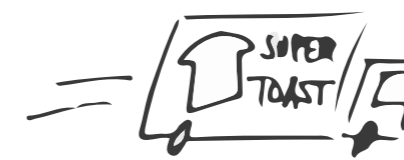
Customer Relations

Short stay-over tourists.



Market & Customer Segments

The Casa particular is focused on locals and tourists.



Channels

.Social media, such as Airbnb or Tripadvisor.



Cost Structure

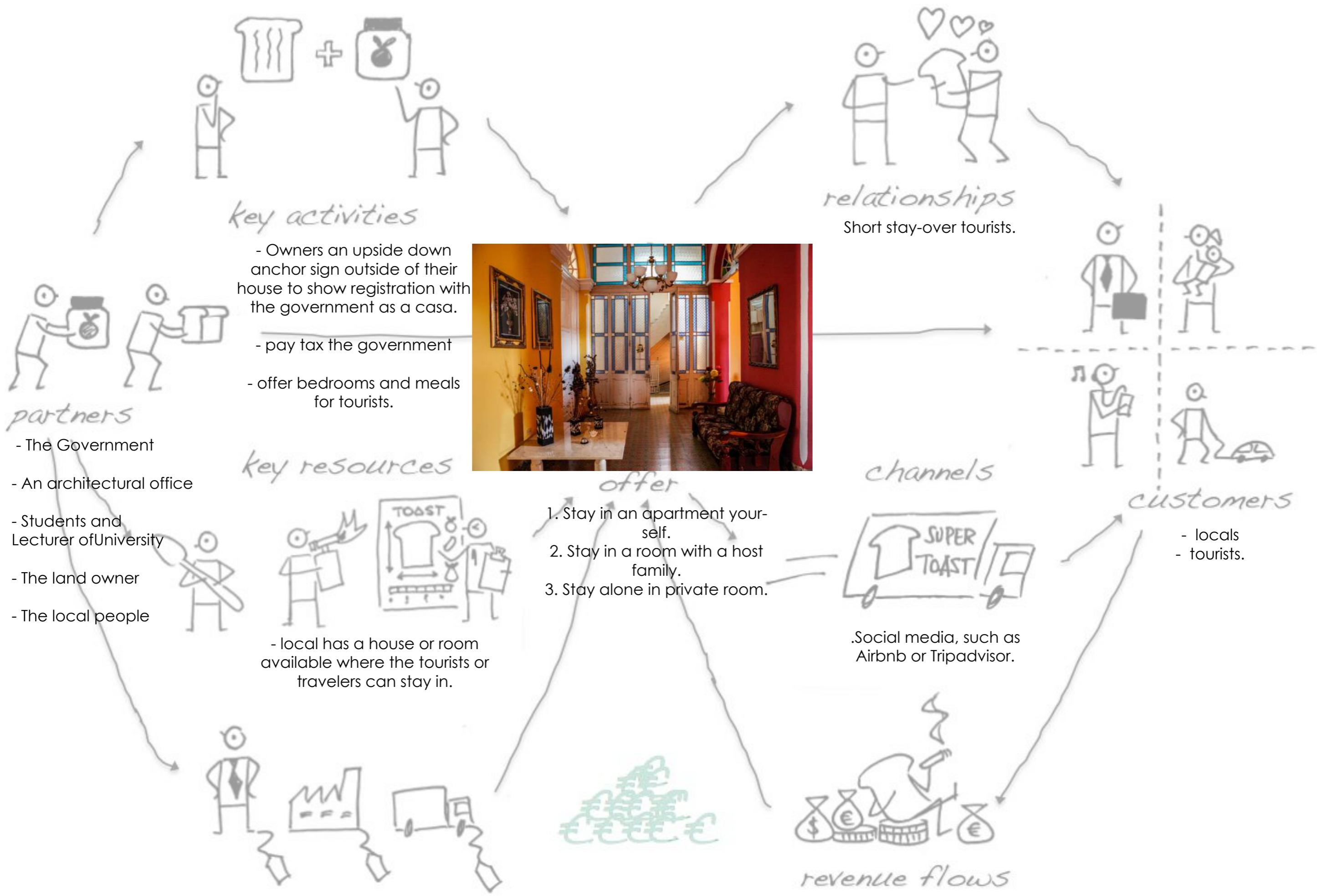
- The homeowner needs to pay certain amount of steady tax to the government. It is not influenced by the amount of money generated by a family.
- The minimum that an owner needs to pay is around 170 dollars per room per month. It varies between location, size or quality of room.
 - A square m of housing cost about \$1000. An amount of income is used to pay of their loan.



Revenue Streams & Pricing Model

They prices mostly differ from \$ 10 - \$30 dollars. Private apartment: \$30, Private room: \$ 20, With a family: \$10, The meal offered by the family most of the time costs:\$1-\$2 dollars. Making dinner, doing the laundry might increase the price.

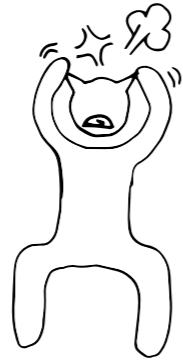
Average rent of Cuban person is \$20 dollars



owner needs to pay is around 170 dollars per room per month. It varies between location, size or quality of room. A square m of housing cost about \$1000. An amount of income is used to pay of their loan.

They prices mostly differ from \$ 10 - \$30 dollars. Private apartment: \$30, Private room:\$ 20, With a family: \$10, The meal offered by the family most of the time costs:\$1-\$2 dollars . Making dinner, doing the laundry might increase the price.

Appendix E



GAPS AND LIMITATIONS OF CURRENT MODEL

VP	The current business model only delivers offers a house only on short term basis. Some house are not meant for tourists.	Not flexible enough
		One fits all system
		Only short stay visitors
CS	The current business model focuses mostly on stay-over tourists for a few days up to a week. It doesn't provide room for long stay-over tourists. Or for other types of people. It has one design fits all system.	No relationship with users
CR	The current business model does not establish a relationship with its customers. They connect when the tourist arrive, but most of the time the tourist leaves without coming back.	Work as individuals
RS	The current business model uses social media as a tool to attract tourist, but this is also used very minimal. The prices for tourists are not fixed. And the prices are not too high, but are creating a little extra source of income.	No fixed price
CS	The current business model shows an unsure cost structure. Some homeowners have a higher amount of wage, while other homeowners need to pay a higher amount of rent to their landowners.	Difference per household
KR	The current business model has a social media account to reach it visitors, but it is not very popular yet. The homeowner also doesn't have a standard provided for the tourist to stay in. Which can differ in each house.	No fixed channels
C	The current business model most important channel is social media, but it doesn't have specific name or channels to create.	No partnerships in particular
KP	The current business model doesn't have partnership in particular. They do share the infrastructure around their house, but not on a scale of economic partnership to reduce costs. The household does not need to pay for having an account of Social media, which keeps the partnership to a minimum.	Only cost-driven
KA	The current business model the delivery of the quality and quantity of the rooms or house, could become a problem and the services are based on human skills.	Rely on human skills

PROPOSITIONS FOR THE NEW BUSINESS MODEL



Environmental protection

Reduce, reuse & recycle

Improve environment & energy performance

Resilient urban settlements

Efficient use of resources

Resilient to natural and human-generated hazards

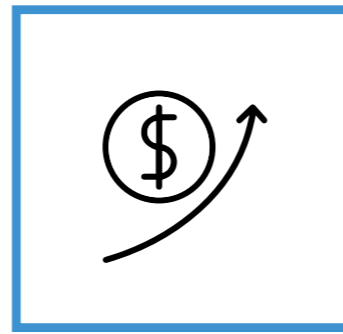
Green spaces around and within housing areas

Compact housing settlements with planned growth

Waste management treated as integral part

Encouragement of healthy living through

Existing houses that are retrofitted, as much as possible, for the efficient use of resources



Economic effectiveness

Flexibility between owning and renting

Local solutions, labour and local materials

Appropriate technologies in such a way as to generate employment

Housing construction performed based on the use of building codes & standards and support building safety

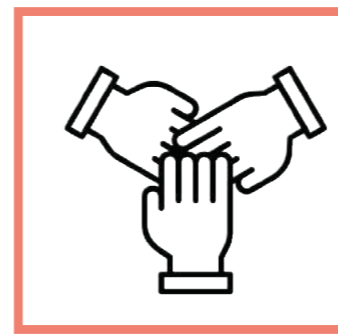
Combat energy poverty by supporting energy efficiency

Increased investment in sustainable housing promoted through private and public investments

Compact housing settlements with planned growth

Waste management treated as an integral part

investment in housing and the promotion of secure land and housing tenure



Social inclusion and participation

Support for adequate housing solutions for people affected by natural & human-made disasters

Adequate, healthy, safe and affordable housing, including access to basic utilities and services

Promote social cohesion and contribute to meeting the housing needs of various social groups

Increased availability of housing options, particularly affordable and social housing

encourages socially mixed communities

Research and exchange of knowledge on all aspects of sustainable housing

Effective, clear, and transparent governance at all levels

Housing that support social justice



Cultural adequacy

National housing policies that support the protection and enhancement of landscapes, heritage and culture

Emphasizing the development of public spaces for cultural and social activities;

Housing that takes into consideration the background and culture of inhabitants

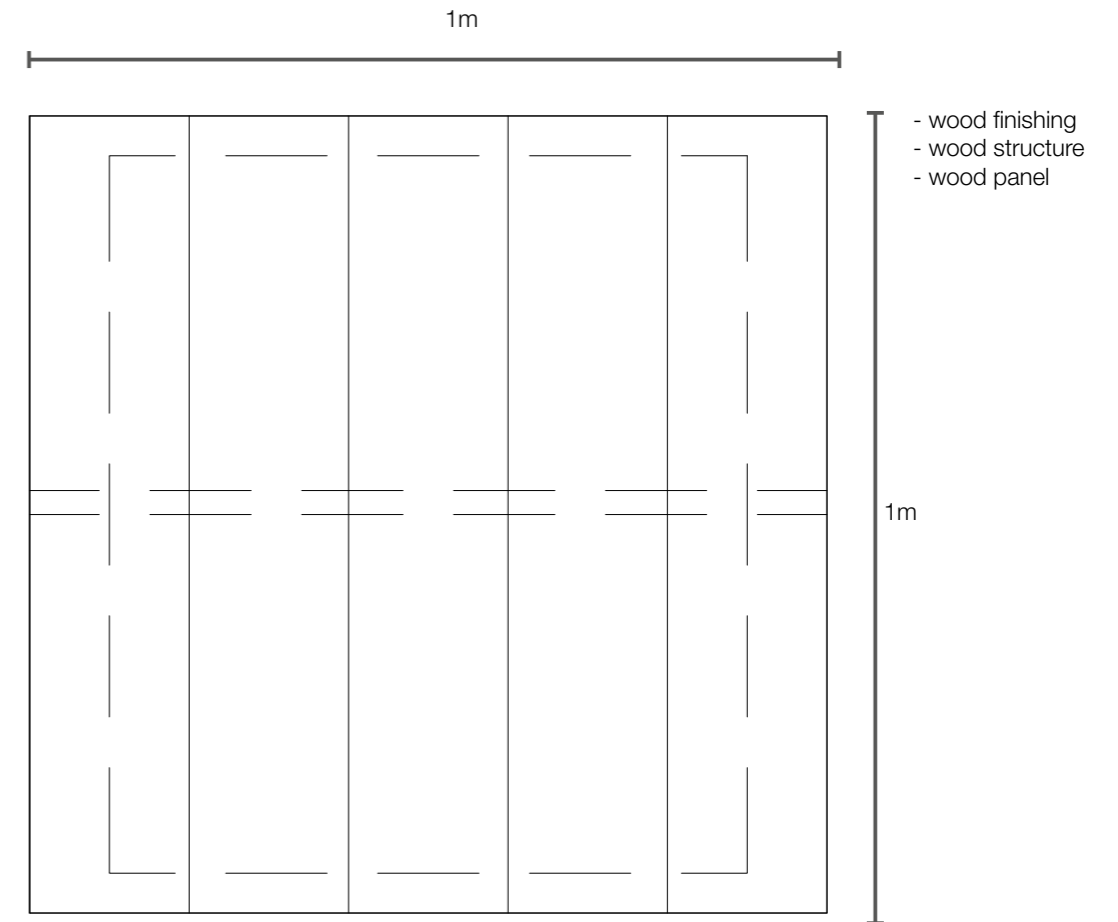
Houses designed and actively maintained in order to enhance emotional wellbeing, including by involving local communities in this process.



Appendix F

Appendix G

Item	Size	Amount	Ace Hardware store (\$)	Kooyman (\$)
Roof nail	3" 7,6 cm		2.8	8.99
Exterior screws	6" 15,2 cm	177	45.95	47.99
	5" 12,7 cm	213	43.95	46.99
	3" 7,6 cm	347	39.95	41.99
Rafter tie	ESR-2523		0.6	0.99
Plywood	2,4 X 2,4 m		46.95	44.99
Roof felt	3x144'		28.95	29.99
Lat 2x4"	10'		7.25	8.99
	14'		10.50	12.59
	20'		16.15	17.99
Rafter 2x6"	12'		11.80	14.99
	16'		16.50	19.99
	20'		20.25	24.99
Rafter 3x6"	12'		23.25	24.29
	16'		29.95	32.39
	20'		39.50	41.99
Zinc 24 Gauge	18'x33.5" (DxW)		58.50	
	20'x33.5" (DxW)		65	
	14'x43" (DxW)		45.50	41.99
	20'x43" (DxW)		65	59.99
Ridge Cap	10'		15.50	29.99
Flat strap			1.3	1.29
Facia board 1"x 8"	16'		14.75	17.59
Ridge beam 2"x 8"	20'		27.95	31.99
Cement	21.25 kg			4.19
Sand	50 lb (22.7 kg)			5.99
Gravel	50 lb (22.7 kg)			7.99
Rebar	3/8"		4.15	3.76
	1/2"		7.40	6.67
	5/8"		11.55	10.42



Element cost summary of 1 m² shophouse

1 m² plywood = 2,4 x 2,4 = 5,76 m² = \$ 44,99 / 5,76 = \$7,8

1 m² finish with paint = (1gal= 3,78 liter covers 100ft²= 9,3m²)

3,78/9,3= 0,4 liter/m²

3,78 liter= \$44,99

0,4 / 3,76 * 100 = 10,6 %

\$ 44,99 * 10,6 % = \$ 4,77

2 m¹ of construction wood = Lat 2x4" =10' = 3,48 m = \$ 8,99

8,99 / 3,48 = \$ 2,58 / m¹ * 2 m¹ = \$ 5,17

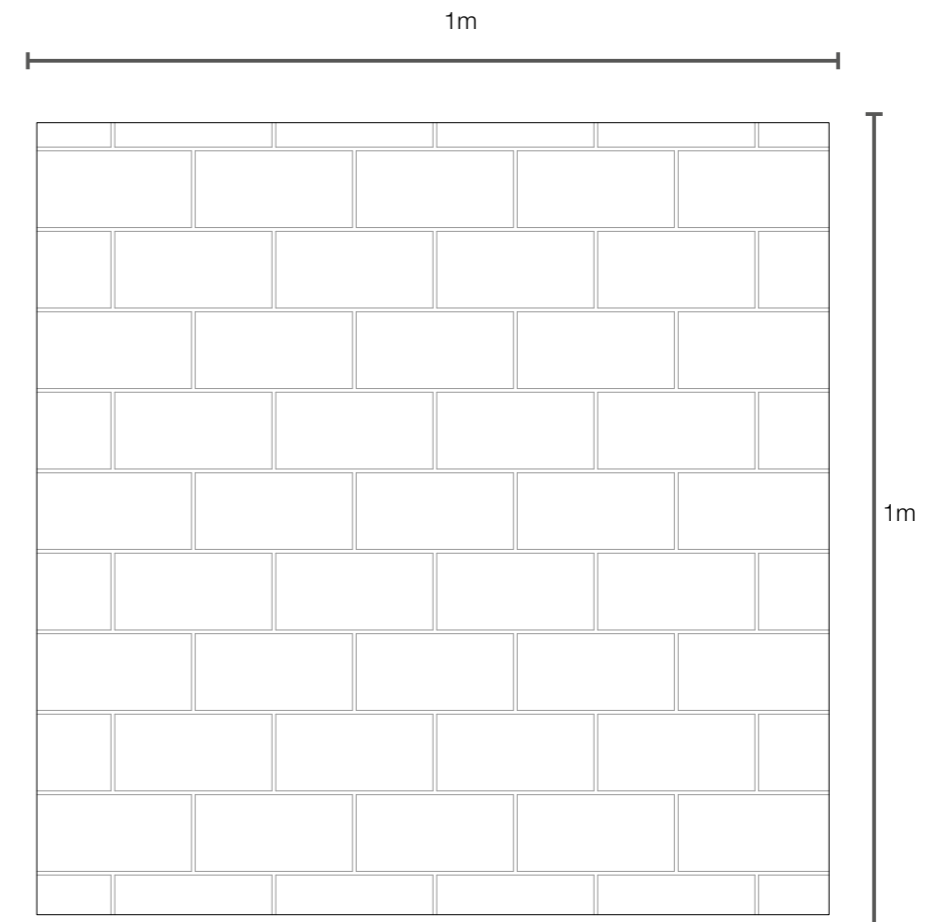
total costs m² facade shophouse = 7,8 + 4,77 + 5,17 = \$ 17,75

Prices building based on Red Cross fieldtrip

Masonry	Unite	Price USD
Ringbeam concrete 150x225 mm including shutters	m1	39
columns concrete 200 x 200 mm including shutters	m1	44.5
Bricking walls	m2	38
Bricking gable	m2	24.5

roof price labor m2 \$	gable roof	hip roof	shed roof
Zinc sheets	31.5	44.5	23.5
Zinc sheets + lats	34	47.5	25.5
Zinc sheets + lats + rafters	41	54.5	29
Zinc + lats +felt + plywood + rafter + wallplate	51	69.5	35.5

Windows and doors	price range in USD: from - to
Windows	55 - 118
Double windows	55 - 140
Single door	55 - 150
Double door	55 - 175



Bricking walls = 38 \$ / m²
 Double wall system = 38 x 2 = 76 \$ / m²
 Amount of bricks
 1 brick = ca. 0,21 x 0,05 m = 0,0105 m²
 1 m² / 0,0105 = ca. 96 bricks

This is a typical bonding used on Sint Maarten. I make use of the rat trap bond. Which uses 25% less stones. So it had 78 bricks 1m2

Appendix H

Table for Prices

Item	Size	Ace	Kooyman
Roof Nail	3"	2.8	8.99
Exterior Screws	6"	45.95	47.99
	5"	43.95	46.99
	4.5"	42.95	44.99
	4"	41.95	43.99
	3"	39.95	41.99
	2.5"x9	38.95	39.99
	2.5"x10	39.95	40.99
	1.25"	38.95	8.99
Masonry Screws	3 1/4"	39.95	36.00
Galvanized Zinc Screws	3"	0.35	0.29
	3"	74.40	68.88
	3" color		27.56
Strap Tie	LSTA18	1.3	1.29
Rafter Tie	ESR-2523	0.6	0.99
Plywood	3/4" 4x8'	46.95	44.99
Plyform	18mm	29.95	28.99
T1-11	5/8" 4x8'	39.95	46.99
Roof Felt #15	3x144'	28.95	29.99
Lat: 2x4	10'	7.25	8.99
	12'	8.95	10.79
	14'	10.50	12.59
	16'	11.95	14.39
	18'	14.25	16.19
	20'	16.15	17.99
Rafter: 2x6	12'	11.80	14.99
	14'	13.70	17.49
	16'	16.50	19.99
	18'	19.00	22.49
	20'	20.25	24.99
Rafter: 3x6	12'	23.25	24.29
	14'	27.10	28.35
	16'	29.95	32.39
	18'	35.50	37.79
Zinc 24 gauge	20'	39.50	41.99
	18'	58.5	0.00
	20'	65	0.00
	6'		15.99
	8'		20.99
	10'	32.50	25.99
	12'	39.00	
	14'	45.50	41.99
	16'	52.00	47.99
	18'	58.50	53.99
20'	65.00	59.99	

	18	58.50	53.99
	20'	65.00	59.99
Zinc (Colored)	14'		41.99
	16'		47.99
	18'		53.99
	20'		59.99
Ridge Cap	10'	15.50	29.99
Ridge Cap TRAP	10'		40.21
Aluzinc Verge	10'	18.50	24.99
Verge TRAP	10'		45.24
Flat Zinc (Flashing)	10'		39.99
	100'	325.00	
Expansion Anchor		2.95	1.99
Flat Strap		1.3	1.29
Nails	3"	7.00	9.99
Facia Board: 1x8	16'	14.75	17.59
Ridge Beam: 2x8	20'	27.95	31.99
Wall Plate: 4x4	16'	27.25	30.39
Cement	21.25 kg		4.19
Quikrete	40 lb		7.99
	60 lb		9.49
	80 lb		10.99
Sand	50 lb		5.99
Gravel	50 lb		7.99
Rebar Wire Tie	1/4"		2.43
	3/8"	4.15	3.76
	1/2"	7.40	6.67
	5/8"	11.55	10.42
	3/4"		15.94
	16 ga.	3.75	5.49
Blocks	15cm	N/A	N/A
Sika Crackfix	10 oz	8.95	11.99
Sealant Crackflex	10 oz	10.95	11.99
Henry White Roof Coat	1 gal(3.5L)		49.99
	5 gal (19L)		179.99
Black Jack White Roof Coat	1 gal(3.5L)	24.95	
	5 gal (19L)	92.95	
Roofchoice	5 gal (19L)	52.95	64.99
Batuband Alum	15x10	23.95	27.99
	7.5x10	13.5	17.99
			0.00
Widows WMASTER	18x48		194.99
	24x22		119.99
	24x34 7/8		195.99
	24x41.5		229.99
	24x49		249.99

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roof price labor m2 \$	gable roof	hip roof	shed roof
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Single door	55 - 150
Double door	55 - 175

Local contractors

- Apro BV
- Topbouwers B.V.
- Wiretech
- Nandy Trenching BV
- Strond and Solid NV
- Bouwbedrijf Guribaldi
- Smooth Finishing NV

Cost Estimation Cay Hill housing

Average income Cayhill resident for rental house

Data

A single house in shantytown	15 \$/PP
2 person occupation annually	50%/year
Maintenance annually	20%/gross income

Calculation two person house for rent

Gross income full occupation
(15x2)x364 days = \$ 10.920

Gross income 50% occupation
\$ 10.920 x 0,5 = \$ 5.460

Netto income - 20% maintenance
\$ 5.460 - (5.460x0,2) = \$ 4.368

Calculation one person house for rent

Gross income full occupation
15x364 days = \$ 5.460

Gross income 50% occupation
\$ 5.460 x 0,5 = \$ 2.730

Netto income - 20% maintenance
\$ 2.730 - (2.730x0,2) = \$ 2.184

Average cost Cayhill resident for house property

Data

Case grid house	7,41 x 9,0 meter
Height average floor	3,73 meter

Data case house

Concrete foundation

Slabs

(7,41x2) + (9,0x3) = 41,82 m1

Total: 41,82 x 0,5 x 1 = 20,9 m³

Concrete ground floor

Total: 7,41x 9,0 x 0,2 = 13,3 m³

Concrete wall against slope

Total: 9,0 x 3,7 x 0,2 = 7,0 m³

Four sided wooden columns

1 side 0,075 x 0,075 meter

Total 1 four sided column floor

3,73 meter x 4 = 14,92 m1 of a 0,075 x 0,075 meter wooden beam

Single floor 12 columns

Total 0,075 x 0,075 wooden beam 1 floor

12 x 14,92 = 180 m1

Total two floors: 180 x 2 = 360 m1

Wooden floor

Wooden beams 0,275 x 0,085 meter

Each gridline 1

4 beams each floor

First floor 4 x 6,8 = 27,2 m1

Attic 4 x 5,1 = 20,4 m1

Total: 27,2 + 20,4 = 47,6 m1

Wooden roof

Wooden beams 0,275 x 0,085 x 7,5 meter

Each gridline 1

Total: 4 x 7,5 = 30 m1

Supportive structural wood roof

Wooden beams 0,20 x 0,075 x 9,0 meter

6 pcs each roof

Total: 6 x 9,0 = 54 m1

Facade brick

Ground floor (2 x 7,1 x 3,7) + (9,0 x 3,7) = 85,8 m²

First floor and attic (2 x 7,1 x 5) + (9,0 x 4,35) = 110,15 m²

Total minus 30 m² frames: 110,15 - 30 = 80,15 m²

Facade wood

Total first floor: 3,8 x 9,0 = 34,2 m²

Interior walls

Ground floor (5,8 x 3,1) + (2 x 3,1 x 3,1) = 37,2 m²

Total minus 5 m² doors: 37,2 - 5,0 = 32,2 m²

First floor (5,8 x 3,1) + (2 x 3,1 x 3,1) = 37,2 m²

Total minus 5 m² doors: 37,2 - 5,0 = 32,2 m²

Total two floors: 32,2 x 2 = 64,4 m²

Frames windows and doors

Double windows each floor 4 pcs

Double door each floor 1 pcs

Total double windows: 8 pcs

Total double doors: 2 pcs

Finishes floors

Ground floor wooden finish 7,41 x 9 = 66,7 m²

1/3 ground floor = terrazzo 22 m²

First floor wooden finish 5 x 9 = 45 m²

First floor terrazzo 1,7 x 9,0 = 15,3 m²

Total wooden finish two floors: 66,7 + 45 = 111,7 m²

Total terrazzo finish two floors: 22 + 15,3 = 37,3 m²

Finishes roof shingles

Total: 7,5 x 9,0 = 67,5 m²

Average cost Cayhill resident for house property

Concrete	41,2 m³	10,99 \$/36,3kg	452,788 \$
0,075 x 0,075 wooden beam	360 m1	4,1 \$/m1	1476 \$
0,275 x 0,085 wooden beam	77,6 m1	6,63 \$/m1	514,488 \$
0,20 x 0,075 wooden beam	54 m1	6,63 \$/m1	358,02 \$
Brick ca. 78 bricks/m²	80,15 m²	38 \$/m²	3045,7 \$
Wood facade	34,2 m²	17,75 \$/m²	607,05 \$
Interior walls	64,4 m²	17,75 \$/m²	1143,1 \$
Double doors	2 pcs	97,5 \$/pcs	195 \$
Double windows	8 pcs	115 \$/pcs	920 \$
Wood finish floor	111,7 m²	15,62 \$/m²	1744,92 \$
Terrazzo finish floor	37,3 m²		0 \$
Roof finish	67,5 m²	15,62 \$/m²	1054,45 \$

Total: 11511,5 \$

With this calculation model the investment of the materials is payed off within 2 1/2 till 5 years depending on the occupancy.