

RECONSTRUCTING THE COMMONS

THE POTENTIAL OF ECOSYSTEM SERVICES ON THE ISLAND ST. MAARTEN

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Abstract

In support for my graduation project, this research investigates the potential of ecosystem services on the island of St. Maarten in order to create a regenerative relationship between the users and the island. The first part of the research is based upon data and literature, providing information about the development of the island over time, concerning the ecosystems and inhabitants. Secondly, case studies are analysed by their strategies towards ecosystems and tourism.

Keywords: St. Maarten, Ecosystem services, Conservation, Tourism, Regenerative, The commons

I. INTRODUCTION

St. Maarten is one of the islands forming the inner arc of the Lesser Antilles, situated within the hurricane belt of the Atlantic Ocean. In september 2017, the Caribbean island was hit directly by a category 5⁺ hurricane called Irma, causing widespread damage to its economy, culture and nature. This was a strong reminder of the urgency to preserve the natural buffers that protect our islands from storm damage, such as coral reefs and mangroves, and increase their resilience.

As many other Caribbean islands, St. Maarten is highly depending on tourism as an income. Since the 1960s, its nature, better known as ‘sea, sand & sun’, created a high economic value. Old plantages, salt winning, fishing and cattle slowly disappeared to maximize the tourism. Additionally, the island has become one of the most dense islands of the world: 1159 persons per square km. Over the last decades, the development into mass-tourism and overpopulation generated a high barrier between the inhabitants and resources, with all its consequences. The economy is for 85% dependent on tourism, resulting in a lack of economical diversity. Almost 95% of all food is imported and its waste is not controlled, leaving the island with a huge landfill. The fast development of resorts and villas caused a giant destruction of nature. In short, the product which made the island so popular is in danger. The research paper is in search of the utilization and management of the (natural) resources of commons. Cultivating these commons could possibly transform the high barrier into a powerful relationship accommodating resources like territory, time, material, skills. This paper is an opportunity to find out what potential the use of these resources of the ecosystem of the island, the ecosystem services, has on St. Maarten. Therefore, the thematic research question is:

Which services can the ecosystem provide for a regenerative relationship between inhabitant and the island, taking the economic dependency on tourism into account?

The thematic research question is investigated by several subquestions:

1. *What are the existing ecosystems on St. Maarten and how are these developed through time?*
2. *What are ecosystem services? What ecosystem services have been used on the island and how are they influenced through time?*
3. *Is there an existing relationship between the inhabitant, the ecosystem and its services? If yes, how could this be regenerative?*
4. *What has been the role of tourism within the relationship of inhabitant and ecosystem services?*

The thematic research question quoted above is rather practical and could be based on scientific data about the ecosystems of the island and its services. Yet it is important to also get a grip on how people perceive the natural environment and how is it reflected in their actions. To understand the powerful relationships and as a countermeasure of today's digitalised work, techniques and tools within the ethnographic realm will be used as well during the fieldtrip.

II. METHOD

Starting the graduation project, I was deeply inspired by the use of an ethnographic method by Tsukamoto. The Japanese architect used ethnography in order to reconstruct the lifestyle of the fishermen in a village in Japan which got completely destroyed by a tsunami. Through site visiting, interviews and studying the history he and his studio came across the as called 'commons' and thereby discovered a network of things around architecture and life in the village (Tsukamoto, 2018). Finally, the studies were documented in one large map as a synthesis. These informative architectural drawings can be seen as a way of processing comments and narratives.

The process of the research will be done in the following steps:

1. Gathering literature and data
2. Fieldtrip:
 - i. Observations
 - ii. Interviews and surveys
 - iii. Conversations
3. Documenting by drawing and writing, using (narrative/mental/network) maps and sketches
4. Casestudies
5. Exploring concept strategies

The clear boundaries of St. Maarten can extremely benefit the context-led research process, starting with the importance of the physical, social and historical setting. The research will not only be carried out on local scale, but also on regional and global scale (figure 1). Data about the ecological structures and tourism in general can be found mostly digital. The information can be documented in diagrams. Literature will be the common thread through the whole research and design process. As Pallasmaa addressed, "literature is important along with understanding the history and culture of a place"

(Havik et al., 2013). The fieldtrip is a way to investigate the subquestions concerning the relationship between inhabitant and island. Are the inhabitants already making use of ecosystem services? If yes, in what way? How would they change the natural environment to make it better? Furthermore, several case studies will be investigated. All case studies are using the ecosystem in a regenerative way as a fundament for community or tourism. Finally, the experiments of documentation will form a way to explore the connections between nature, place, memory, narrative and networks.

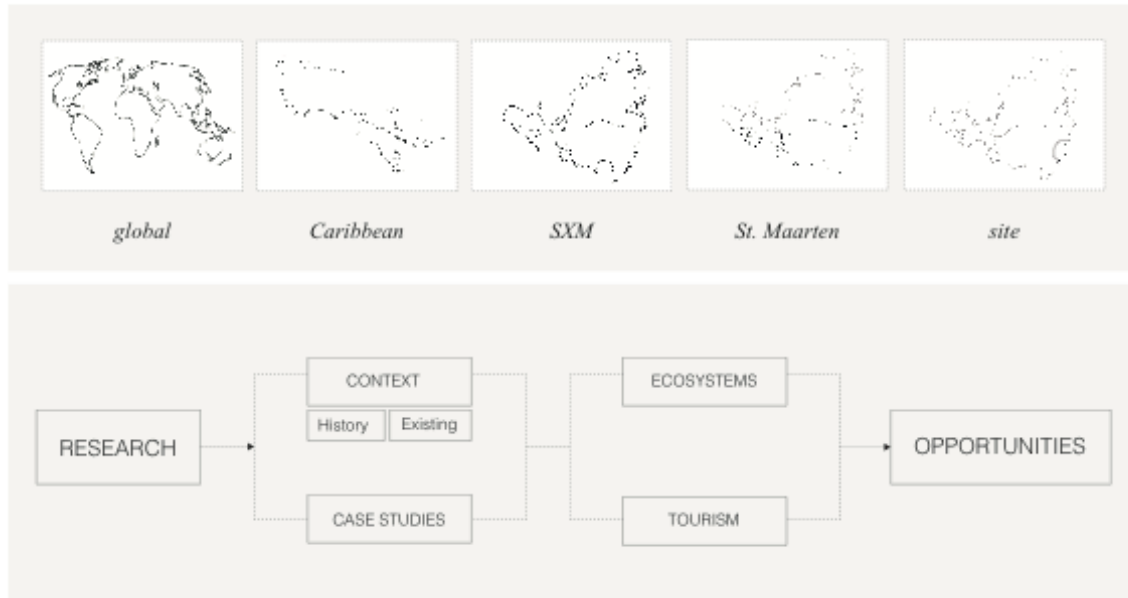


Figure 1. Range of scale & Research process. (own image, 2019)

III. RESULTS

3.1. The ecosystems

Except for the lowlands in the west, St. Maarten is hilly. The east end has a range of conical hills, covered with evergreen forests, mixed thorn woodlands and succulent scrubland. The numerous bays and lagoons along St. Maarten's coast give the island its irregular shape (Rojer, 1997). The west end is dominated by Simpson Bay Lagoon, one of the largest lagoons in the Lesser Antilles. The lagoons are home to the island's largest mangrove forests, shaping an ecosystem which serves as a nurserie for sealife and as coastal defense. Seagrasses, another ecosystem of the island, are found mainly along the southern and south-western shores. The rest of the coastline, which measures in total 27 km², is made up of steep rocky cliffs and white sandy beaches. The island is surrounded by a number of small uninhabited islands such as Pelican Rock and Molly B'day. These offshore islands are, beside the forests and scrublands, important nesting sites for migratory and resident seabirds and have been listed by Birdlife International as Important Bird Areas (DCNA, 2017). According to the system of Köppen the climate of Maarten falls between a savanna and mon-soon climate. Furthermore, the island is surrounded by a very important and endangered ecosystem: the coral reefs. The islands ecosystem is represented in diagram and section in Appendix A and B.

3.2. From Soualiga to Seascape

Around 800 AD, most Caribbean islands were settled by Arawak Indians who arrived from South America to settle down to a life of fishing, hunting and farming. However, in the 14th century, the cannibalistic Carib Indians followed the Arawak Indians. They named St. Maarten as Soualiga, which means “Salt Island”. This was due to its main mineral deposit, where from the remains are still visible today. After changing hands between powers sixteen times, the Dutch and French finally settled on the island around 1630. The Dutch settlers continued with the harvest of salt. Therefore, not only the ponds were essential, but a dry climate as well. This resulted in an early environmental disaster: the destruction of almost all forests on the island.

In the past St. Maarten was also an island of plantations, where mainly sugarcane was cultivated, but other crops such as cotton, indigo and tobacco as well (Rojer, 2017). The plantations reached high up the slopes, which is still apparent from the stone walls that served as dividing lines, called the ‘slave walls’. Agriculture remained the most important economic activity until around 1960. There was some cattle breeding, particularly of cows and sheep. Lobster could be found in high numbers in the lagoons and were exported to Curaçao (Figure 2). When slavery was abolished in the mid-19th century, the plantations closed down and St. Maarten's prosperity ended. For the next one hundred years, the island sank into an economic depression.

The situation changed in 1939, when all import and export taxes were rescinded and the island became a duty free port. Princess Juliana International Airport opened in 1943, and four years later the island's first hotel, the Sea View, welcomed its first guests. The island turned into an exclusive destination of famous writers, artists and politics. In the next few decades, St. Maarten boomed as a trading and tourism center as the ultimate seascape, easy accessible.



Figure 2. Catching lobster at Simpson Bay Lagoon (Van de Poll, W. *Nationaal Archief*, 1947)

3.3. Destruction

At the moment many areas in the valleys, which were intended for agriculture, have been released for housing construction. Agriculture is very limited and is practiced only on small scale for own consumption. From this it may be apparent that over the centuries humans have used almost the whole of the island of St. Maarten intensively. The least disturbed parts are the hilltops in the middle part of the island and the hilly part in the east. Originally seasonal forests covered the two hill ranges in the middle part of the island. Remains of the original forests can only be found on top of the highest hills. However, parts are now disturbed by the Rainforest Adventures park; a zipline park owned by a cruise line. Over the past 50 years they suffered much damage from tourism development and population increase. For example, hotel growth is associated with landscape and wetland alteration, deforestation of buffer zones, pollution of rivers, lakes and beaches, and changes in wildlife behaviour.

On top of that came the devastating impact of the hurricanes. For the island, the coastal vegetation can be considered rare and endangered (Rojer, 1997). The mangroves in the lagoons were severely damaged by the hurricane Irma as well. However, most seedlings that were planted just before did survive which can in the long run develop into a new forest.

Bats are the only native mammals in St. Maarten. All other wild mammals, such as dogs, cattle and monkeys are imported by humans. After hurricanes the populations of insect-eating mammals and birds are usually decimated, resulting in an increase in the number of insects. Under normal conditions it would be expected that the balance between insects and insect-eaters would re-establish itself. In St. Maarten however, several insect-eaters were already in decline from other causes, before the hurricane. Further destruction of habitat as a result of urban expansion certainly is the most important threat to the island's flora and fauna. Coastal habitats are in danger of disappearing, and their specific plants and animals with them. Especially seabirds and temporary visitors such as ducks and sea turtles use these habitats. In short, disappearance of these habitats will result in a great loss of biodiversity in St. Maarten and cause severe damage to its ecosystems (Rojer, 1997).



Figure 3. Mangrove forest before and after hurricane Irma, the white pvc pipes contain seedlings. (Gilders, K. *EPIC*, 2017)

3.4. Preservation

In order to prevent the disappearance of habitats, parts of the island needs to be preserved. The French part of the island recorded several areas for preservation; most ponds and marine areas are protected under the name 'reserve naturelle'. Meanwhile, the Dutch part only has one in land and one in sea (figure 3). Veenenbos (1955) studied the suitability of the soil and the land and concluded that 30% of the area on the Netherlands Antilles side is most suitable for nature conservation and recreation, including the entire eastern ridge of Oyster Pond up to Pointe Blanche, Fort Hill, Lay Bay Hill and the Low Lands around Mullet Pond. The recommended areas for preservation purpose are indicated as dotted lines in figure 4.

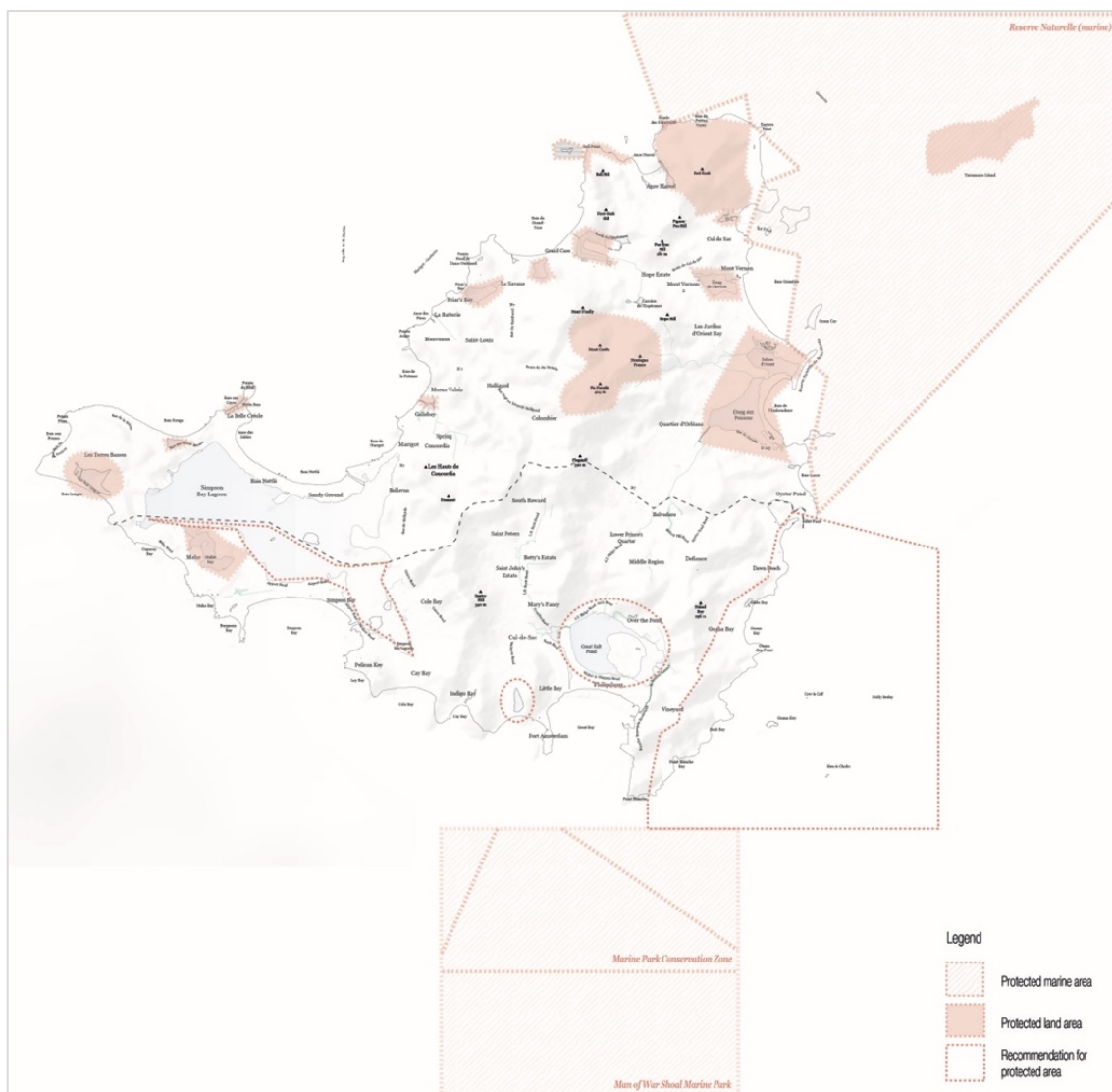


Figure 4. Preservation and conservation areas (own image, 2019)

3.5. Ecosystem services

An ecosystem is a dynamic complex of plant, animal and micro-organism communities and the nonliving environment interacting as a functional unit. They are the source of our material necessities such as food and fresh water, but also non-material such as flood protection, pollination and decomposition of organic waste. At the same time, it provides spiritual and recreational benefits. Cultural benefits of the systems largely contribute to human well-being through the beauty of nature and the identity that certain cultures derive from it (Wratten et al., 2013). All these advantages that the ecosystems provides, seen from the human perspective, are referred to as *ecosystem services*. The world's ecosystems have supported the extraordinary growth and progress of human societies. Yet the Millennium Ecosystem Assessment (MA) found that the majority of ecosystem services are in a state of decline and can no longer be taken for granted. Furthermore, it is possible that the global decline in ecosystem services is playing a role in current crises, such as global warming, food security issues and flooding and drought events. Ignoring the links between ecosystems and human well-being in public and private realm puts at risk our ability to achieve long-term development goals (Bates, 2010).

The MA, a four-year study from the UN, divided the ecosystem services into four categories:

- *provisioning*, such as the production of food and water
- *regulating*, such as the control of climate and disease
- *supporting*, such as nutrient cycles and crop pollination
- *cultural*, such as spiritual and recreational benefits

Examples of advantages per category are documented in Appendix C.

One way to reduce or reverse the negative environmental impact of the built environment, while increasing human well-being and resilience, may be to create or redesign cities so that they provide, integrate with, or support ecosystem services and therefore reduce pressure on ecosystems. The diagram of appendix B presents that ecosystem services are inherently interconnected. Showing where ecosystem services are potentially linked, particularly in terms of trade-off relationships, can give architects insights into how to select building materials to avoid or minimize negative impacts (Pedersen Zari, 2019). Another way is to come up with new strategies of agricultural research and development to increase agricultural productivity, profitability and resilience to sustainability challenges from variable rainfall, energy costs and other unpredictable events. Development of a more multifunctional agriculture can reconcile key interests of environmental, economic and agricultural sectors of society (Wratten et al., 2013).

3.6. A regenerative relationship

In order to answer the research question, it is important to analyse the current relationship between inhabitant and the ecosystems of the island. During the fieldtrip the behavior of the inhabitants towards the natural environment was studied. In addition, specific influences developing this particular behavior were investigated, such as weather, climate and religion. Findings from the fieldtrip are documented in sketches and notes on printed maps (appendix E). Joining the Red Cross for two days created the opportunity to observe

and to have conversations. Perceived during these days working as a humanitarian worker, is that the inhabitants were designated to their natural environment. The months after the hurricane there was no food available, no income and no products. Many inhabitants reconstructed their garden in order to grow their own food again for own consumption or trade with their neighbours for other products, ranging from banana trees to medicinal plants. Although the hurricane caused severe damage, it also led to a rather positive insight of the community: it raised awareness about the impact and resilience of nature. “One year after Irma, the landscape was covered in a green scenery again. We celebrated it as an anniversary.” according to Fabienne, a humanitarian worker at the Red Cross (personal communication, May 14, 2019).

The research continued through interviews with initiatives working within ecosystems and its services. Via Alex Frye from Green SXM, a dedicated group of artisans and entrepreneurs who are slowly changing towards a more sustainable lifestyle, visits were planned. According to Alex, the number of these initiatives is growing yet still very limited (personal communication, May 18, 2019). A creative example of an initiative is the intervention of Denicio Wyatte. He created an opportunity from a house damaged by the hurricane and placed a hydroponics system providing a nursery for plants which he later grows on his agricultural farm (figure 5). Les Fruits des Mer, the nature foundation on the French side of the island, is distributing free cuttings in order to activate the community to contribute to the biodiversity (figure 6). At the community centre in Philipsburg volunteer workers teach children about gardening in their little community garden. In this sense, a agricultural ecosystem is added to land, providing food, forage and pharmaceuticals that are essential to human wellbeing. These systems rely on ecosystem services provided by natural ecosystems, including pollination, biological pest control, maintenance of soil structure and fertility, nutrient cycling and hydrological services. Yet they also produce a variety of ecosystem services themselves, such as regulation of soil and water quality, carbon sequestration and support for biodiversity (Power, 2017).

However, depending on management practices and scale, agriculture can also be the source of numerous disservices such as loss of wildlife habitat, nutrient runoff, sedimentation of waterways, greenhouse gas emissions, and pesticide poisoning. This requires human beings to fully understand the natural environment and arrange production and living in accordance with the natural law of evolution; otherwise, they will be punished by the environment (Mao et al., 2018).



Figure 5. Farm with a building structure providing a nursery for plants. (Wyatte, 2018)



Figure 6. Les Fruits des Mer providing free plants (own image, 2019)



Figure 7. A volunteer teaching children about farming (own image, 2019)

3.7. Eco-Tourism

Finally, St. Maarten's tourism business needs to improve dramatically in order to reduce the negative impact. As is often noted, tourism is one of the world's largest industries and generates a high Gross Domestic Product (GDP) in St. Maarten. However, like all economic sectors, tourism is heavily dependent on ecosystem services to develop its activity. The tourism is not only depending on provisioning services to provide food and water, but it is also depending on the regulating services as the island is located in an area which is often affected by natural hazards. Therefore, ecosystems are able to mitigate risks that could affect tourism activity, risks which are expected to grow in the future due to climate change. (Pueyo-Ros, 2018) Additionally, cultural ecosystem services are crucial to visitor satisfaction as they are attracted by aesthetic or recreational experiences.

Some initiatives already started making a first step towards a form of responsible tourism, *ecotourism*, concerning the conservation of the environment and the well-being of the local people. On the French side, the Loterie farm is using the potential of the unique microclimate in the area by an eco-retreat and small adventure park. Tourists and inhabitants can benefit from the green scenery and the hike paths. Touroperators Seegrape and Trisport organise tours in the field of history, nature and sports. Ilja from Seagrape tours addressed that the bird-watching tour is the most popular. She sees bird-watching as a opportunity towards a sustainable tourism. "Mass tourism is seasonality, but ecotourism is the whole year around because of the nesting of birds". According to Chambers (2014), bird-watching is also a multi-million dollar industry and one of the biggest attractions for ecotourism. According to the U.S. census, there are estimated to be nearly 48 million American birdwatchers. "Of these birdwatchers, 42% travel to see birds, where in total 12 million dollars is being spend", confirmed Ilja (personal communication, May 22, 2019) However, even ecotourism, has been proven to generate environmental impacts, such as travel emissions or overexploitation of resources. Most of the popular eco-travel destinations have fragile ecosystems and hence it is important to maintain a careful balance between preservation and promotion in order to ensure the long-term health of both the eco-systems and the tourism economies. According to Mehrdad

Mirsanjari (2013), who examined the environmental effects of ecotourism projects, successful ecotourism projects must:

- Effectively promote the preservation of entire local ecosystems, not just individual species, vistas or sites;
- Be sustainable and economically viable in order to attract financing;
- Be well planned, financed, managed and marketed in order to meet the stringent environmental and recreational demands of true ecotourism.

Tourism can form, for example, as a tool for ecological conservation. The creation of fees and taxes for the tourism sector could be directly invested in conservation projects. Moreover, it could provide an alternative to more damaging forms of development, such as agriculture, mining or consumptive use of wildlife (Pueyo-Ros, 2018).

IV. CASE STUDIES

This research is supported by the analysis of several case studies. They are projects within the built environment or conservation. Within the search of case studies, a certain dependency on tourism is considered. The case studies will be analysed and categorized by scale, typology and strategy indicated in the table on Appendix D. The strategies could be related to the thematic research as well as to the design research for the graduation project. Next, every case study is represented in a diagram, showing aspects and actors all considered in the process of the projects.

One of the case studies is the conservation of the marine ecosystem of Raja Ampat, Indonesia. The photographer Shawn Heinrichs uses photos to protect at-risk people and places. As regards the conservation of Raja Ampat, he made a movie wherein one can see children playing conservation games, dressed in manta costumes, fishermen reaping the rewards of spillover and sasi openings and the new economic opportunities through tourism. The conservation of the area has led to education and awareness, not only locally but on a regional and global scale as well.

Another example is Potato Head Beach Club in Bali, Indonesia. The beach club is built with recycled and local materials, supporting the local economy. Furthermore, beach clean ups and sustainable workshops are given for free in order to raise awareness about the natural environment. After several years, they were able to invest in a zero-waste fish restaurant where everything is being recycled: from the plates of broken glass to candles made of used cooking oil. This project shows that, through knowledge about the production of ecosystem services and the management of these, the profit can be used as an investment into the local economy and the conservation of the natural environment.

V. CONCLUSIONS

This research is a reminder of the urgency to preserve the natural environment of the island St. Maarten. Concerning the research question, human mankind has always been depending on the ecosystems, providing us the needs such as food and support.

5.1. Ecosystems: existing and development

Concluding from the ecosystem schemes of Appendix A and B, St. Maarten has five highly interesting ecosystems all depending on each other. During the habitation of the Arawak Indians and the Carib Indians, the natural resources were used in order to survive. Dead branches of mangrove trees were used for boats, baskets and fishing nets in order to fish at sea while not placing a burden on the ecosystems. It was the settlement of the Spanish, Dutch and French which formed the catalyst towards destruction. The inland ecosystem was partly destroyed in order to cultivate crops and to harvest salt. Furthermore, cattle and other mammals which were a danger to the balance of the inland ecosystems.

5.2. Ecosystems services

It were mainly the cultural ecosystem services forming a magnet to tourism. The green scenery of the island were an inspiration for artists and the beaches created an aesthetic value for recreation. Around 1960, the demands of the provisioning ecosystem services started to increase at a dramatic pace. The catch of lobster and fish from lagoons and sea fell due to destruction of mangroves and pollution. Together with climate change and stressors such as hurricanes, they form the threats that can push an ecosystem into a less productive phase or even destroy it. Therefore, it is recommended to purpose certain areas of St. Maarten for preservation and conservation. Concluding from figure 4, untouched lagoons and coast shores should be protected from further development.

5.3. Relationship

The vulnerability caused by the hurricane raised awareness about the impact of nature. During a fieldtrip, some initiatives towards a regenerative relationship were perceived and mapped. Although the number of these initiatives is growing, more participation is needed from the government as well as the other inhabitants. As Pauli (2010) stated in his book, "from small seeds grow big trees". In this sense, small initiatives can be the catalyst of bigger projects in the field of the environment and the economy.

5.4. The role of tourism

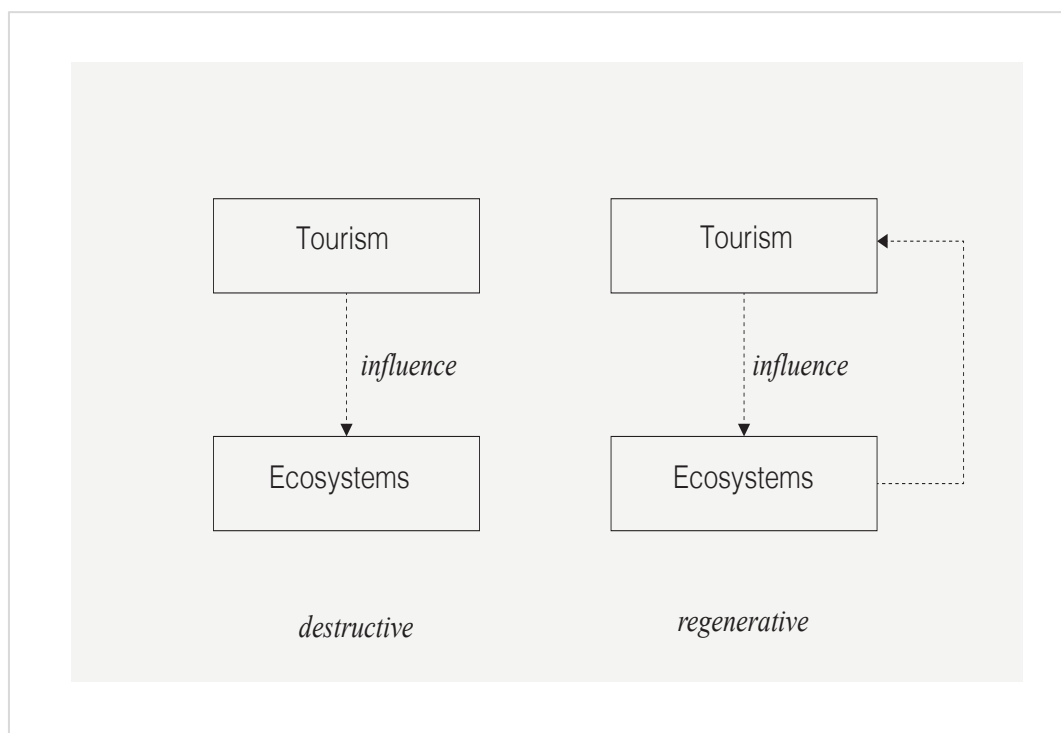
Concluding from the paper, the consequences of mass tourism are forming the biggest threat to the regulating, supporting and provisioning services of the ecosystems. At the moment, steps towards a more sustainable and responsible form of tourism are very limited. Nevertheless, St. Maarten has a great potential of creating a strategy towards eco-tourism. Within this strategy, a careful balance between using the resources and the numbers of tourists should be examined.

5.5. Regenerative process

As for St. Maarten and many other Caribbean, ecosystems form the essential base of the economy. Turning the relationship of the users towards the ecosystems from destructive to regenerative can possibly be constructed by means of incorporating knowledge of ecosystem services into designing, planning, and decision-making. In the process, the focus should be on the management and impacts, not on the demands. In this sense, the ecosystems can be an inspiration on their own, as they continuously change and evolve over time. Concerning the graduation project, a long term environmental strategy can be designed, with a possible program consisting of conservation areas, recreational places for ecotourists, environmental viewpoints or tracks. As there is a lack of sustainable funding, policy support and spatial planning, the financial resources coming from tourism and recreation could create funding of other initiatives or investments, in the field of education or conservation. This would not only protect the ecosystems, but would also support creativity and economic diversity. In addition, the concept of ecosystem services can be applied to the design and the materials within it, related to their use and disposal and possibly even contribute positively to ecosystem services provision and therefore human well-being and resilience.

5.5. Limitations

An Ecosystem Services Assessment (ESA) can help build a bridge between the development and environmental communities by providing information on the links between ecosystem management and the attainment of economic and social goals. (Bates, 2010)



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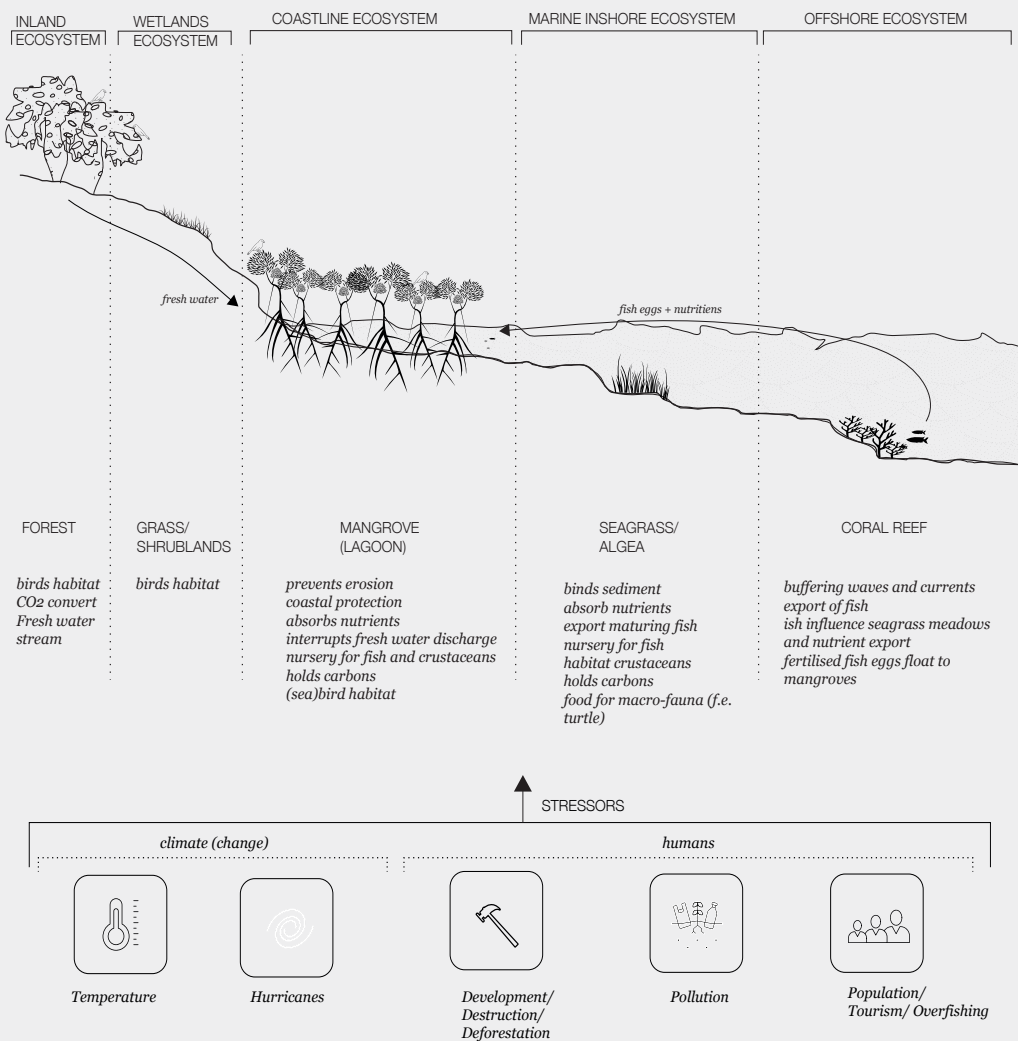
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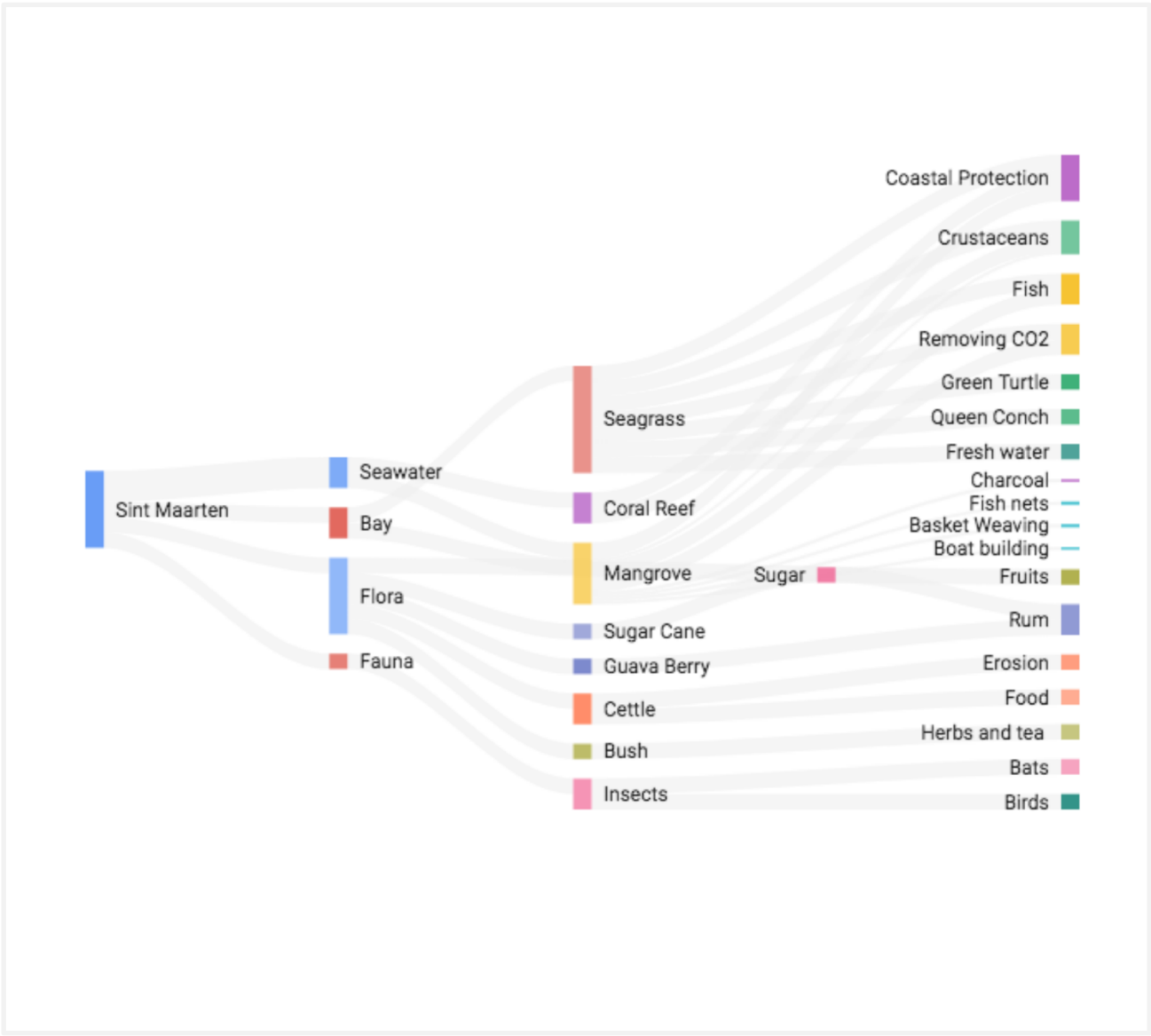
APPENDIX A

ECOSYSTEM

The ecosystem of the island St. Maarten shown in section. All ecosystems depend on each other and are threatened by human and climate influence.



APPENDIX B



Sankey diagram of the ecosystems on St. Maarten. (own image, 2019)

APPENDIX C

ECOSYSTEM SERVICES

The advantages and benefits that nature provide from the human perspective are referred to as ecosystem services. Ecosystem services can be both material and non-material, and are grouped into four categories.



APPENDIX D

CASE STUDIES

The framework¹

SCALE	TPOLOGY	STRATEGY
Global	Housing	Environmental
Regional	Tourism	
Local	Recreation	
	Community	Socioeconomic
	Objects	Aesthetic
	Human well-being	

The case studies will be analysed and categorized by scale, typology and strategy indicated in the table above. The strategies could be related to my thematic research as well as to my design research. Some examples from strategies can be: Environmental: raising eco awareness, using ecosystem services or reinterpreting landscape. For socioeconomic it could be invigorating communities, collaborating with the users, anticipating.

Next, every case study will be checked on which ecosystem services have been used. The advantages and benefits that nature provide from the human perspective are referred to as ecosystem services. Ecosystem services can be both material and non-material, and are grouped into four categories.

Finally, it is represented in a diagram, showing aspects and actors all considered in the process of the projects.

¹ This framework is inspired by the magazine of A+T. (2018) Issue 51: *Public space strategies Activators*. Amsterdam: a+t architecture publishers.

CASE STUDY I

Potato Head Beach Club, Bali, Indonesia



Environmental

Socioeconomic

Aesthetic

<u>SCALE:</u>	Regional, local
<u>TYPOLOGY:</u>	Tourism Recreation
<u>STRATEGY:</u>	Environmental Supporting local community Zero-waste
<u>ARCHITECTURE:</u>	Re-use
<u>MATERIAL:</u>	Re-used materials Recycled materials

Local craftsmanship

Potato Head Beach club is an exclusive beach club located in Bali, often called the most progressive one. The site holds several restaurants, a pool, a hotel and some sustainable shops. From the thousands of antique Javanese window shutters making up the facade to the 1.8 million hand-pressed temple bricks holding up the hotel, the materials they use are supporting the regional and local craftspeople who construct our establishments. Also, they set up a research and design workshop; Sustainism lab.

Zero-waste

It has Indonesia's first ever restaurant to follow a zero-waste-to-landfill philosophy. Making waves as the most sustainable fish restaurant around, restaurant Ijen dishes up ocean-fresh seafood caught locally using a hand-reeling process, served in an al-fresco environment that's full of recycled materials. The menus are printed on sustainably harvested paper and bound to boards made from recycled truck tyres, the dining area uses furniture made from foam offcuts and recycled wood, the floor is poured from a mix of broken plates, glasses and cement, and as for the food. The daily catch is grilled simply over an open fire.

Sustainable events

Also, temporary stages, bars and installations are made from recycled materials. For example the coconut bar, the walls are made from discarded coconuts supported by a recycled steel frame.

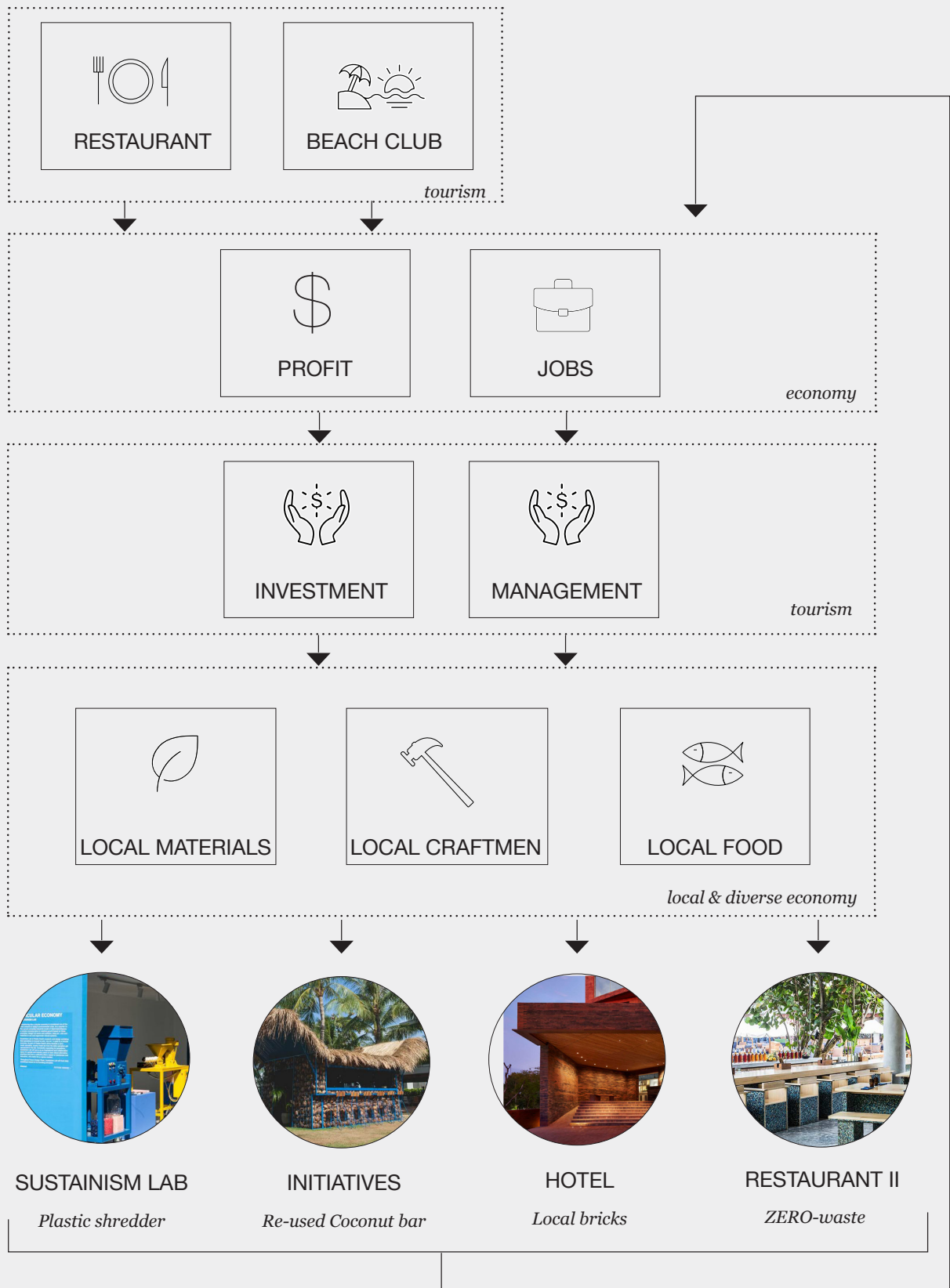
Sustainable sundays

Every sunday the club organises free sustainable workshops and events. For example beach clean ups or soap making.

ECOSYSTEM SERVICES

Potato Head Beach Club, Bali, Indonesia





CASE STUDY II

Kalabia Education for Conservation & The Bird's Head Seascape, Indonesia



Environmental

Socioeconomic

Aesthetic

<u>SCALE:</u>	Regional, local
<u>TYPOLOGY:</u>	Conservation Tourism
<u>STRATEGY:</u>	Environmental Conservation Activating community
<u>ARCHITECTURE:</u>	Low-tech, Traditional
<u>MATERIAL:</u>	Wood, palm

Community-Driven Conservation

The Kalabia's core program is a holistic youth education program which targets students in grades 4 to 6. The program combines and a strong knowledge-based curriculum with a pride-campaign and fun, camp-like atmosphere to promote environmental learning and empathy with the ocean and marine life. It allows students to explore and learn from their local natural environment in a way that is truly aligned with the Raja Ampat culture and traditions. The goal is to safeguard the regions incredible marine biodiversity in a way that empowers local communities while enhancing their food security and livelihoods.

The Guardians of Raja Ampat

Shawn Heinrichs made a movie about the importance of conservation of the area. Creating a tour showing this movie to remote communities all over indonesia, he tries to activate the crowd, consisting mostly of children. And in the community commentary after each show all spoke as one, calling for even greater protection of Raja Ampat's waters – the richest marine ecosystem on earth.

Abundance in fish

Conservation has resulted in great increases in the fish populations in the protected areas. However, this forms an irresistible draw for outsiders who sneak past the patrol boats, bringing destructive practices back to region like fish bombs and shark finning. In this sense, the conservation should continue to overcome new threats.

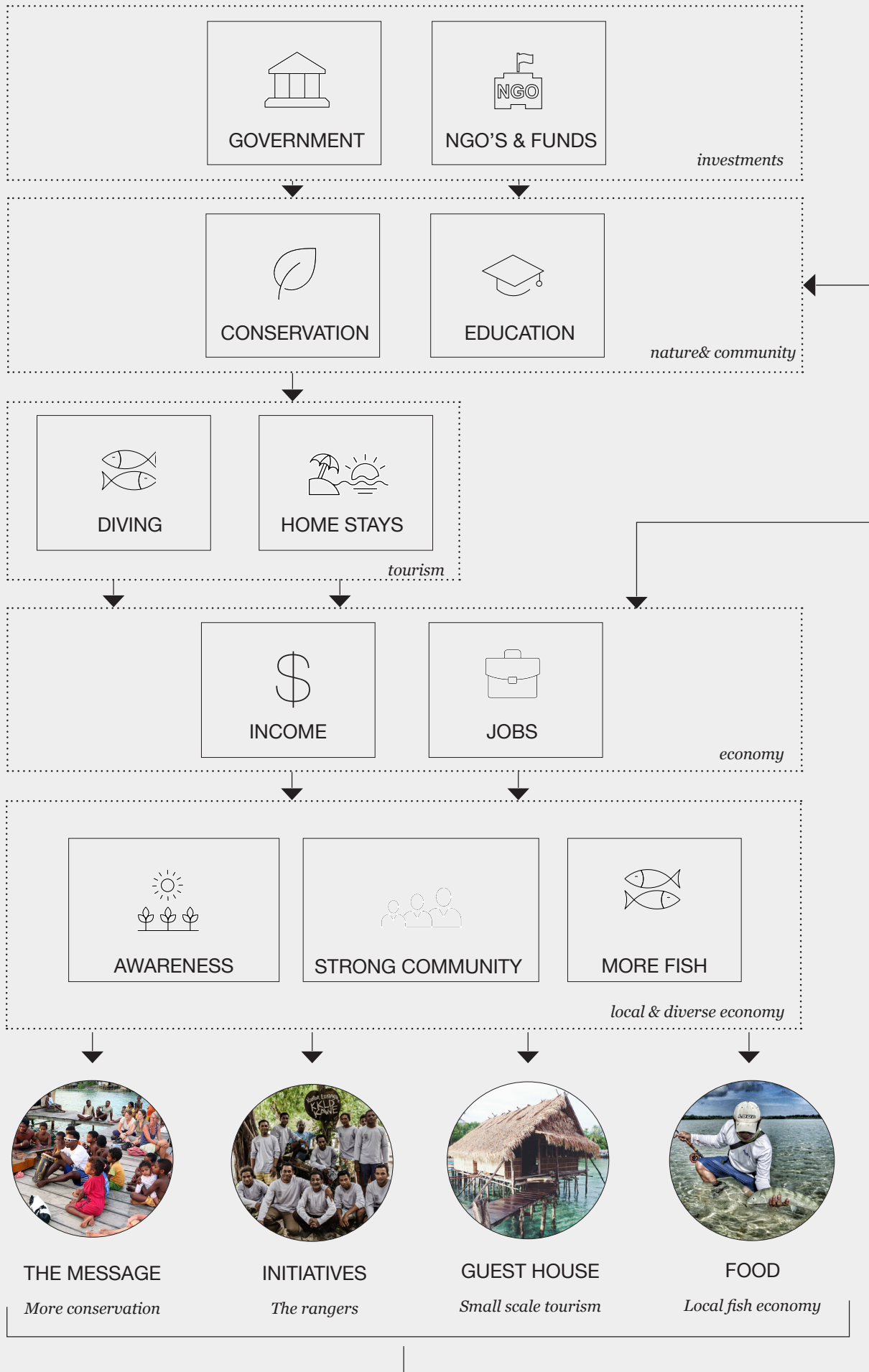
Tourism

Bird watching, kayaking, diving and trekking all support the conservation program. Also, homestays and locally owned ecotourism has been introduced. All are accommodated in traditional huts on the water.

ECOSYSTEM SERVICES

*Kalabia Education for Conservation & The
Bird's Head Seascape, Indonesia*





CASE STUDY III

Petrel Bird, EPIC, Haiti



Environmental

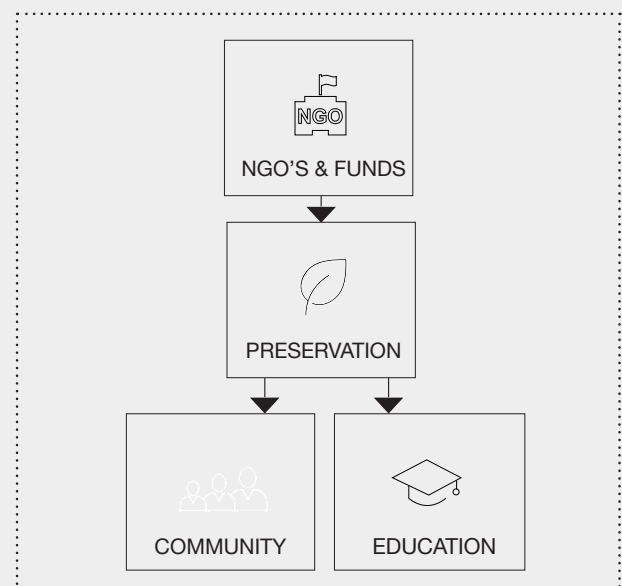
Socioeconomic

Aesthetic

<u>SCALE:</u>	Local
<u>TYPOLOGY:</u>	Objects - Green houses Human well being Pavillion
<u>STRATEGY:</u>	Environmental Deconstruction Simple suggestion
<u>ARCHITECTURE:</u>	Renovation Imagination
<u>MATERIAL:</u>	Steel structure, ruins, greenery, gravel

For years, EPIC has fought to protect the endangered Blackcapped Petrel, a species that has been devastated by habitat destruction, human hunting pressure, and predation by introduced mammals. With only three known nest areas and a current global population estimated to be as low as 1,000 pairs, conservation hinges on researchers' and local villagers' combined efforts to confront an array of challenges. The villagers, of course, have one of the most challenging tasks: incorporating new farming methods that preserve water, soil, and trees while trusting they will still be able to grow the food they depend on for survival.

To recognize and celebrate all the hard work invested in these collaborative conservation efforts, a Black-capped Petrel Festival was held. The event kicked off with an all-species parade, beginning at the schools in the lower part of the village and led by hundreds of primary-aged school children and their Blackcapped Petrel mascot. The bird even has its own soccer team. Over a third of Boukan Chat's villagers attended and engaged with the showing of a movie afterwards about the importance of conservation.



ECOSYSTEM SERVICES

Petrel Bird, EPIC, Haiti



CASE STUDY IV

Loterie Farm, St. Martin



Environmental

Socioeconomic

Aesthetic

SCALE: Local

TYPOLOGY: Tourism
Recreation

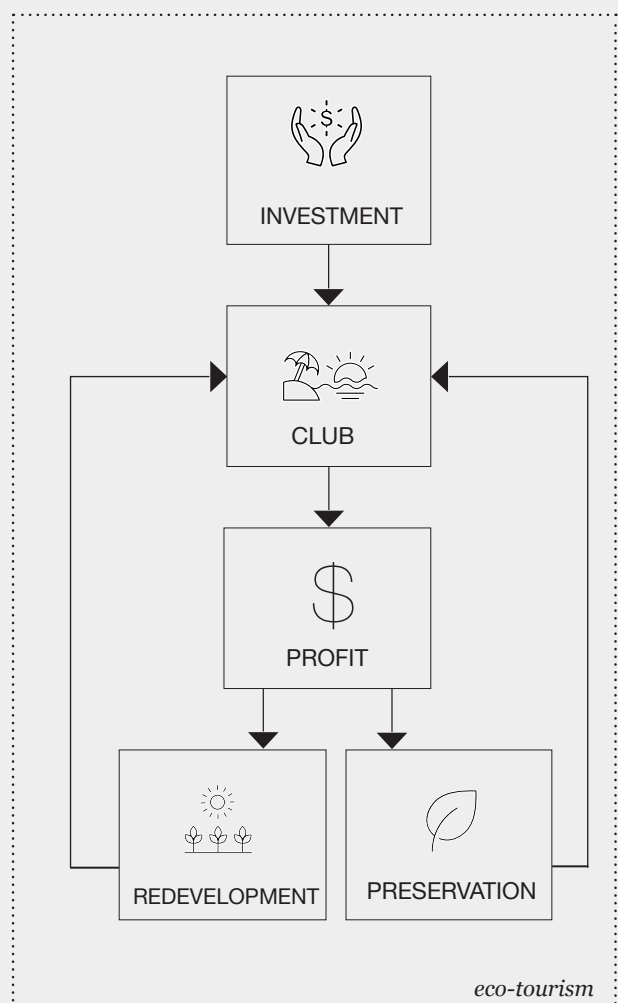
STRATEGY: Environmental
Preservation

ARCHITECTURE: Low-tech
Imagination

MATERIAL: Steel structure, ruins,
greenery, gravel

Private nature reserve

Loterie Farm made it their business to protect all 54 hectares of the countryside set deep in the interior of the island and its ruins of an old diary plantation. "Housed at Loterie Farm are the old residence of one of the former mayor's of St. Martin and the former home of L.A. Fleming. Today our purpose and goal are to safeguard the history and environment amidst abundant trees and thousands of different species. To do that, we have opened the property to the public and we invite people to enjoy the natural surroundings and participate in all the different activities we offer which covers everything from hiking our beautiful trails to riding one of our three Zip Line Adventures."



ECOSYSTEM SERVICES

The advantages and benefits that nature provide from the human perspective are referred to as ecosystem services. Ecosystem services can be both material and non-material, and are grouped into four categories.



CASE STUDY V

*Caritas psychiatric centre, Belgium
by de Vylder Vinck Taillieu*



Environmental

Socioeconomic

Aesthetic

Unplanned activity

‘Some doctors use it in a systematic and organised manner to carry out their treatment, but other people just trespass there or pass through, people from off campus stop there on a sunny afternoon for a small picnic’ says de Vylder.

Redevelopment over time

dVVT’s Venice Biennale Freespace exhibition featured the Caritas project, which in itself is in a state of flux and subject to alteration and redevelopment over time. The timber used in Venice will go back to Ghent and be used to make further repairs to the floors of the building, and there are plans to relocate greenhouses to give more internal space, and even create a small café within the shell.

Costs vs demolishing

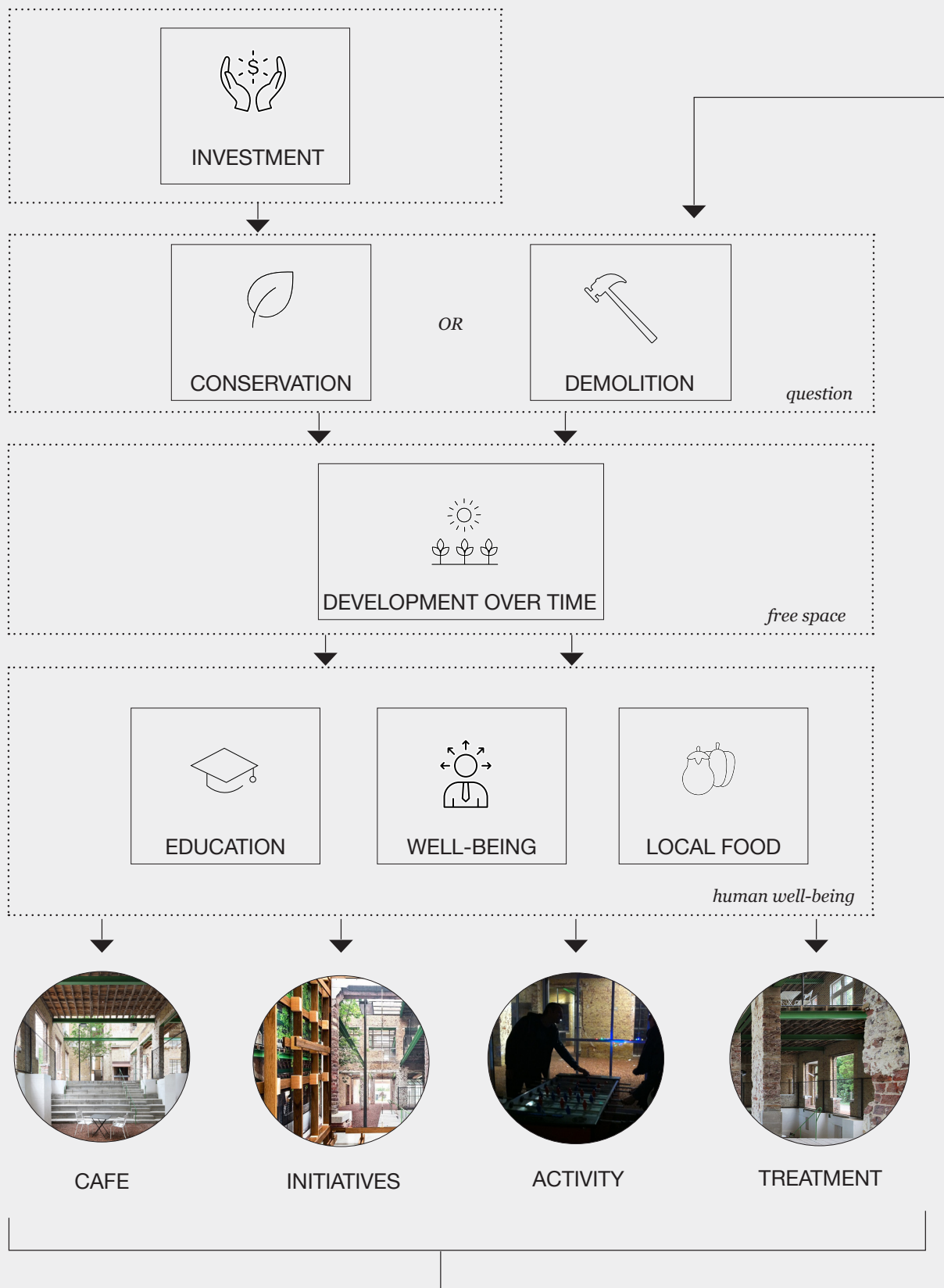
The cost falls not far above the costs of completely demolishing the original pavilion. Furthermore, the hospital has a stimulating and quite beautiful environment that is theirs to use as they see fit.

<u>SCALE:</u>	Local
<u>TYPOLOGY:</u>	Objects - Green houses Human well being Pavillion
<u>STRATEGY:</u>	Environmental Deconstruction Simple suggestion Experimental
<u>ARCHITECTURE:</u>	Renovation Imagination
<u>MATERIAL:</u>	Steel structure, ruins, greenery, gravel

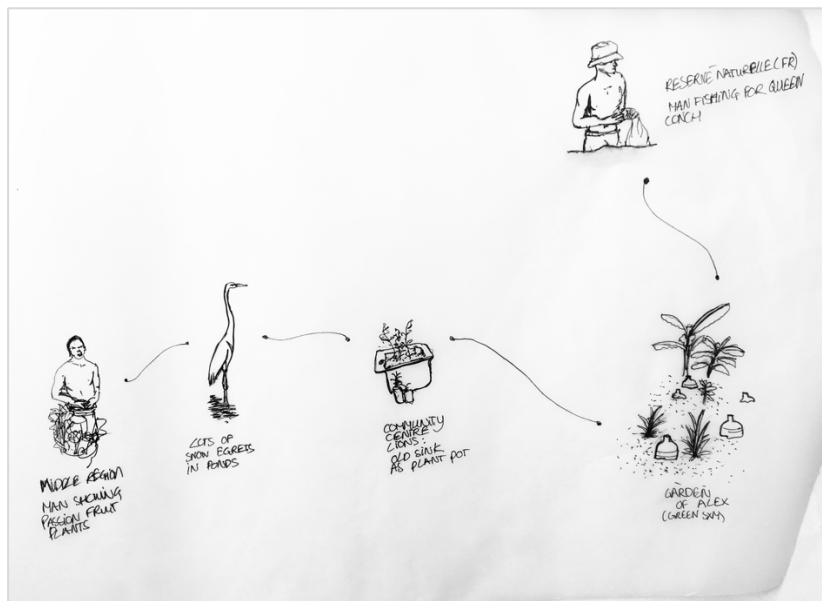
ECOSYSTEM SERVICES

Caritas psychiatric centre, Belgium

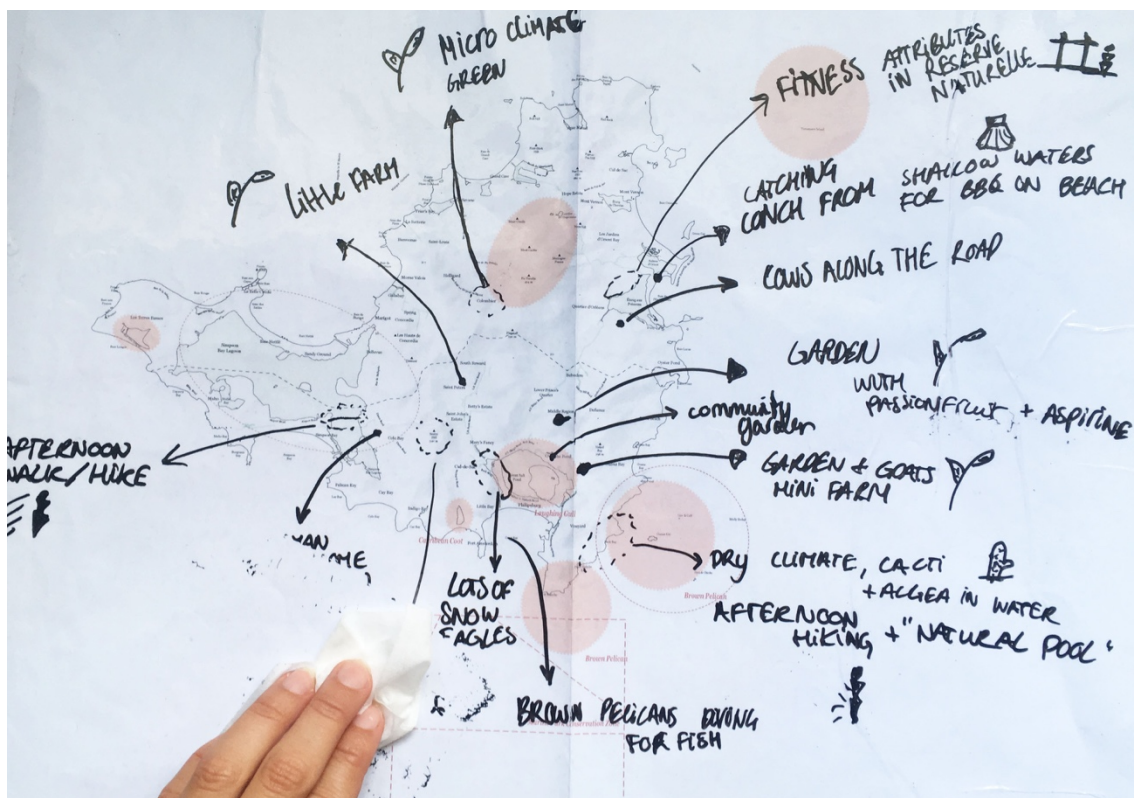




APPENDIX E



Sketches of inhabitants using ecosystem services or agriculture (own image, 2019)



Notes were made on a plastified printed map, in order to wipe them out and sketch others the next day (own image, 2019)