THE TOURISM INDUSTRY, WASTE MANAGEMENT, AND VECTOR-BORNE DISEASES: A CASE STUDY OF CURAÇAO

Master's thesis

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Abstract

This research aimed to analyze the waste management of the tourism industry and its influence on vector-borne diseases (VBDs) without ignoring sustainable tourism. The first objective of this research is to discover the current practices and stakeholders involved in the waste management of Curaçao's tourism industry. The second objective is to analyze the influence of waste management on the spread and control of VBDs and later link the practices with sustainable tourism.

The results are presented in four different topics: namely tourism, waste management, vector-borne diseases, and sustainable tourism. Across these topics, transect walks, semi-structured interviews, secondary data, and observations were held and collected.

It was discovered that the landfill system in Curaçao is indeed an effective and efficient method for overcoming the waste problem in Curaçao; however, the landfill system is not a sustainable solution for a more extended period. As the most effective method for the prevention of the spread of VBDs, there is a significant incentive to adopt advance waste management, such as recycling and reducing their waste volumes. Another result also pointed out that the tourism industry has the opportunity to become the leader in sustainable tourism following certifications. Hence, the tourism industry needs a stimulant to enforce the adoption of advanced waste management. Since waste management is one of the critical indicators in the certifications, in other words, the obtainment of the certifications will contribute to preventing the spread of VBDs. Thus, the external pressure put forward for the certifications from international travel agents has proven to be an efficient method for reconsidering sustainable tourism. Furthermore, the requirements of having the certifications in the tourism industry, such as a required permit to build a hotel or to extend the hotel's permit, were recommended.

Keywords: Waste management, small island, developing countries, public health, stakeholders mapping

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Last but not least, thank you to the beautiful people in Curaçao making me feel at home!

List of abbreviations

CDC – Centers for Disease Control and Prevention
GMN – Ministry of Health, Environment, and Nature
ISWM – Integrated Sustainable Waste Management
NGO – Non-governmental Organization
SDGs – Sustainable Development Goals
UNWTO – United Nations World Tourism Organization
VBDs – Vector-borne Diseases
WHO – World Health Organization
3R – Reduce, Reuse, and Recycling

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1 Introduction

1.1 Sustainable tourism on a Small Island

Islands are recognized as being ecologically and economically fragile, especially for small islands due to their size and the availability of natural resources. Small islands usually suffer from geographical isolation; thus, small islands are highly dependent on the mainland because of their limited natural resources (Ghina, 2003; Weisser, 2003). Due to their limited resources, small islands are heavily reliant on the tourism sector in order to support their economic development. Tourism provides one out of every ten jobs in the world; thus tourism has become one of the fastest-growing economic sectors in the world and has a broad impact on all dimensions of sustainable development (World Tourism Organization and United Nations Development Program, 2017). In line with globalization, more people come to small islands, and in order to fulfill the consumer demand, the tourism sector has expanded to a level where it can damage the islands and their local people. High dependence on imports to sustain the tourism sector, means sustainability remains merely a concept (Scheyvens and Momsen, 2008; Higgins-Desbiolles, 2018). However, despite the skepticism towards sustainability in the tourism industry, tourism is mentioned explicitly as indicators in Sustainable Development Goals (SDGs), most often in relation to Goal 8 'Decent Work and Economic Growth', Goal 12 'Responsible Consumption and Production', Goal 14 'Life Below Water' and contributing to Goal 17 'Partnership for the Goals' in general (World Tourism Organization and United Nations Development Program, 2017).

In 2003, tourism alone generated 48 million tonnes of solid waste globally (UNEP, 2003). In the same manner, Curaçao's tourism contributes to 20% of the total waste volume on the island (UNOPS, 2018). The challenge posed by solid waste management in a small island setting like Curaçao is complicated due to the limited space available on the island. Many small islands rely on the tourism sector as the basis of their income; however, tourism generated twice the amount of solid waste compared to local waste production since tourism involves a high number of the imported products to meet touristic consumption. Land scarcity and tourism-based economies add another dimension to the problems (Ezeah et al., 2015; Santamarta et al., 2014; Willmot and Gracy, 2012).

The expansion of tourism and global travel allows people to move from one place to another, thus it can also result in the emergence of an increased risk of infectious diseases. Tourists can become victims, sentinels, carriers, processors, and transmitters of microbial pathogens. During their spatial mobility, tourist can eliminate the geographical barrier for microbes and increase the potential of an outbreak, and can later negatively affect the tourism industry with the negative impact of the diseases (Wilson, 2003; Baker, 2015).

During the past decades, mosquito-borne diseases are a significant public health concern in the Caribbean since the number of outbreaks continues to increase. Islands usually focus on the community to control and prevent the spread of vector-borne diseases (hereafter VBDs) by eradicating the breeding sites (Leslie et al., 2017). There are several disease research and control centers located in the Caribbean to help the islands combat mosquito-borne disease, and in collaboration with the World Health Organization they launched several programs to raise the awareness of MBDs and prevent a further outbreak (WHO, 2016). Curaçao is one of the islands in the Caribbean that suffers from VBDs, and in 2014 3.045 people were infected by VBDs such as malaria, dengue fever, yellow fever, Chikungunya, and Lyme disease with 20 daily cases of Chikungunya. In January 2016, the first case of Zika appeared in Curaçao, which increased drastically to 300 cases in July 2016 (Caribisch Netwerk, 2016; Caribisch Netwerk, 2014). Along with Bonaire and Saba, Curaçao launched a capacity building

program for mosquito-borne diseases (Mobocon) with the support of the Dutch Ministry of Health, Welfare and Sport. Though several programs have been launched to eradicate mosquito-borne diseases, the government is still seeking other alternatives to effectively reduce the spread of the diseases (Caribisch Netwerk, 2017).

1.2 Small island vulnerabilities from Vector-Borne Diseases (VBDs)

Good health and well-being are part of the Sustainable Development Goals meant to shift the world onto a sustainable and resilient path. One of the indicators in goal number three, targeted in 2030, is that the world will be free from malaria and neglected tropical diseases. However, in 2016, 1.5 billion people were treated for the neglected tropical diseases, in which 216 million of the cases were malaria (United Nations, 2018).

Vector-borne disease accounts for 17% of infectious diseases worldwide, with most burdening tropical areas, particularly small island regions (WHO, 2017). From an ecological perspective, small islands are at risk of vector-borne disease because they are more affected by warm temperatures and precipitation, which is worsened by a lack of waste management strategies, water supply, and sanitation alongside the local government having limited capability and capital to implement vector control and manage the outbreak. The spread of VBDs is a complex process that relies on demographic, environmental, and social conditions. Moreover, behavioral change is one of the most crucial elements for the control of VBDs, combined with access to sanitation and water as well as proper waste management (Bangert et al. 2018; De Groote et al., 2018; IPS News, 2013).

Earlier studies have demonstrated that small islands are vulnerable to natural disasters, let alone climate change; thus, it can affect the spread of the VBDs. Climate change can cause more heavy rainfall especially in a warmer climate; without the necessary infrastructure, it can create small puddles of water that can turn into larval habitats (The Guardian, 2011; Gubler, 2011).

Islands with tourism-based economies always receive high numbers of tourists from all over the world, making the island particularly susceptible to new diseases. In early 2015, the first instance of the Zika virus was detected, and around the same time the next year; Curaçao reported the first local incidence of the Zika virus. This proves that VBDs can travel rapidly across geographical locations. The small island also worsened the situation due to limited access to advance health care, and it can cause a delay for further necessary treatments (Kindhauser et al., 2016).

2 Theoretical framework

2.1 Sustainable Tourism

One significant factor that can change the nature of tourism is the introduction of the concept of 'sustainable development'. After first being introduced in the Brundtland Commission's report (World Commission on Environment and Development, 1987) entitled 'Our Common Future,' sustainability has become a new trend in every sector, including tourism. Defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs,' by the World Commission on Environment and Development in 1987, the concept of sustainable development has become the basic concept for sustainable tourism. Sustainability has been viewed as

a promising concept to tackle the negative impacts of tourism and promoting the option of long-term viability (Liu, 2003).

For the last two decades, many researchers have adopted the term of sustainable tourism in various contexts, namely the local economy; natural capacity; ecosystem; local population; social organization. Coccossis (1996) suggested four different ways to view tourism in the context of sustainable development: a sectoral viewpoint (e.g., economic sustainability); a long-term viability viewpoint (e.g., the competitiveness of destinations); an ecological viewpoint; and a viewpoint of accepting tourism as a strategy for sustainable development. Bramwell et al. (1996) added onto those viewpoints by proposing other dimensions of sustainability: environmental, cultural, political, economic, social, managerial, and governmental. Later, in 2003, Liu explored six issues in sustainable tourism that have often been overlooked yet are essential and should be addressed in research and studies, including: the role of touristic demand, the nature of tourism resources, the imperative of intergenerational equity, the role of tourism in promoting socio-cultural progress, the measurement of sustainability, and forms of sustainable development. The definition of sustainable tourism remains varied based on the fact that it is indefinable and parties have involved it in their agenda. Thus, the effects of sustainable tourism are firmly tied only to the physical environment and economy compared to the local communities; whereas the impact of tourism depends on the volume and characteristics of the tourists (Hardy et al., 2002; Davidson, 2008)

Through the growing debates surrounding the concept of sustainable tourism, Butler (1993) first defined it as 'tourism which is in a form which can maintain its viability in an area for an indefinite period of time'. Later, The World Tourism Organisation (WTO, 2001) chose to define sustainable tourism development as '(*to) meet the needs of present tourists and host regions while protecting and enhancing opportunities for the future. It is envisaged as leading to the management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity, and life support systems.*'

To achieve sustainable tourism, the balance between sustainable growth of tourism's contribution to the economy and society alongside the sustainable use of resources and environment is required; yet the measurement standards for sustainable tourism remain a challenge (Liu, 2003). Agyeiwaah et al. (2017) used a meta-analysis from 27 different studies between 2000 and 2015 to examine the dimensions of sustainability and its indicators. The identified indicators were later verified through expert opinions or by stakeholders' input in order to verify their relevance. Ten papers were used to create a baseline indicator where the rest of the papers were added later to their prospective themes and indicators and were updated if a new theme had emerged; the framework for the dimensions is displayed in figure 1.

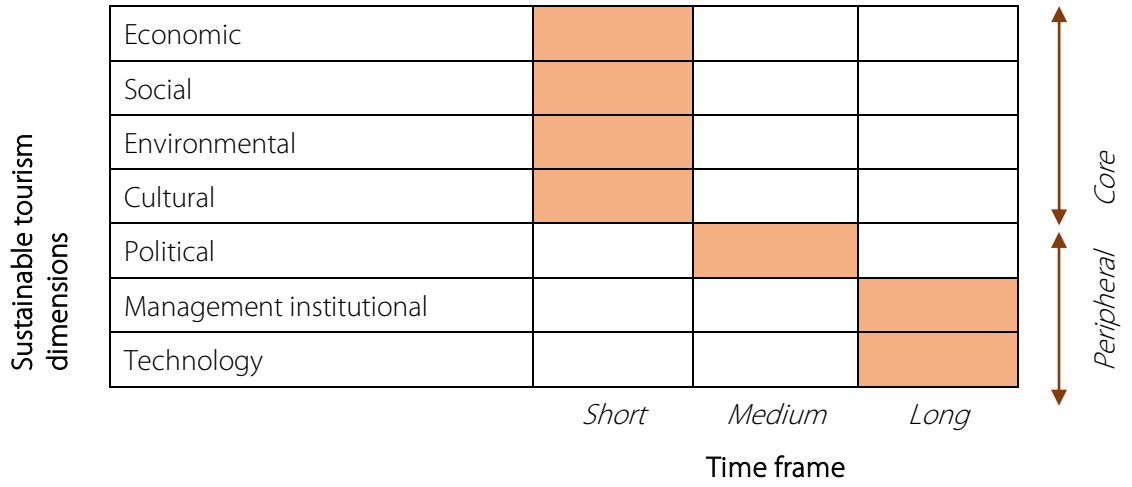

Figure 1. Sustainable tourism framework (Agyeiwaah et al., 2017)

The core dimensions are economic, social, environmental, and cultural, which have specific indicators. The most frequent indicators in the economic dimension are revenues and profitability; employment; visitor satisfaction; and the number of tourists. Meanwhile, in social dimensions, the indicators are resident involvement; congestion; and community satisfaction. The environmental dimension speaks about water management and solid waste management, whereas recycling is the only possible metric to measure solid waste management. Lastly, the cultural dimension accounted for the retention of local customs and the maintenance of the cultural site(s) (Agyeiwaah et al., 2017).

A future conceptualization of sustainable tourism is still needed, yet it needs to account for the balance between the environment, economy, and community issues (Hardy and Pearson, 2002). It is urgently necessary to develop policies that can address sustainable tourism. However, their implementation in the tourism sector with diverse stakeholders could be more difficult (Liu, 2003; Agyeiwaah et al., 2017). The United Nations and the World Tourism Organization stressed the importance of integrated approaches to sustainability indicators; thus Kristjansdottir et al. (2018) assessed 48 pieces of literature and articles published about the Integrated Sustainability Indicators for Tourism (ISIT) and found that the indicators merely focus on environmental and economic dimensions and lack the social dimensions.

Tourism is mentioned explicitly in the Sustainable Development Goals (SDGs), specifically in Goal 8 'Decent Work and Economic Growth', Goal 12 'Responsible Consumption and Production', and Goal 14 'Life Below Water', and has the potential to contribute either directly or indirectly to all of the goals. In line with that, the UNWTO and the Pacific Asia Travel Association (2015) declared that *'achieving the SDGs must now become the over-arching agenda of global tourism and tourism sector is perhaps better placed than any other industry to contribute to the cause across the board.'* The tourism industry has the potential to be the leader in the shift towards sustainability since they have the power to influence consumer behavior without compromising their main motivations through product design and persuasive marketing messages (Jones et al., 2017; Font & McCabe, 2017).

The Chengdu Declaration on Tourism and Sustainable Development Goals in 2017 mentioned the importance of a useful measurement of SDGs using agreed upon indicators that can measure tourism's impacts, whether at the national or local levels. Tourism can play a significant role in achieving the aforementioned SGDs; however, the responsibility for this needs to be shared between the stakeholders since it is necessary to align policies, business operations and investments with the SDGs (World Tourism Organization and United Nations Development Program, 2017). It is also essential to find common goals for a sustainable economy and environment that respects the needs of the stakeholders, namely the tourists, local population, the tourism industry and the government (Font & McCabe, 2017)

2.2 Solid Waste Management

Globally, waste generation rates are rising and in 2016, 2.01 billion tonnes of solid waste were generated by the world's cities with this volume expected to increase to 3.4 billion tonnes in 2050 (Hoornweg and Bhada-Tata, 2012). In most cases, the waste is 'unwanted' products or material that no longer has value for the first user (Klundert and Anschutz, 2001).

The Resource Conservation and Recovery Act (RCRA) defined solid waste as 'any garbage or refuse, sludge from a wastewater, treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, resulting from industrial, commercial, mining, and agricultural operations, and from community activities'. It must be noted that solid waste is not limited to the solid physical form of the waste; it can be liquid, semi-solid, or contained gaseous material (EPA, n.d.).

Waste management remains a problem on a small island as a result of the increase in a waste generation without any effective waste management strategy. The issues are classified into four aspects, namely, institutional, financial, technical, and educational (Mohee et al., 2015). Initially, solid waste management only aimed to eliminate waste from the household area to maintain public health. However, after realizing that free disposal can cause a bigger problem, the solution presented by the sanitary landfill was developed. Beyond sanitary landfills, global efforts are in a coalition to identify more sustainable solutions for solid waste management (Shekdar, 2008)

The waste composition can be determined by factors such as culture, education, economic status, climate change, and energy sources; with the proportion of recyclable waste being higher in developed countries compared to developing countries, whereas the degradable organic waste is higher in countries with low GDPs (Hoornweg and Bhada-Tata, 2012; Shekdar, 2008). Additionally, the separative waste behavior of citizens is more affected by the support from the stakeholders (Guerrero et al., 2013).

It is generally known that solid waste management is the responsibility of the local governments, whereas the citizens are not expected to contribute. However, the efficiency of the operational solid waste management depends on collaboration between the governments and the citizens (Guerrero et al., 2013). Since solid waste management involves a large number of people and significant resources, the design of an integrated solid waste management system is necessary. The integrated system is not only limited by the technological system, but it also deals with socio-economic conditions, the local environment, as well as the stakeholders (Shekdar, 2008). Integrated waste management aims to reduce waste at its source before the waste enters the waste stream; which can be done by treating the waste as the possible input of new processes – using everything, with nothing left (Guerrero et al., 2013).

2.2.1 Integrated sustainable waste management

Integrated Sustainable Waste Management (ISWM) is designed as a response to address the need for comprehensive waste management with appropriate technology and = an established partnership between the community and waste management authorities (Hoornweg and Bhada-Tata, 2012; Klunderst and Anschutz, 2001).

UNEP (2005) described ISWM as 'a frame of reference for designing and implementing new waste management systems and for analyzing and optimizing existing systems. Integrated waste management is based on the foundation that all aspects of a waste management system should be analyzed together since they are interrelated and developments in one area which frequently affects practices or activities in another area.'

ISWM recognized that problems in waste management are more than money and equipment alone; they lie in the behavior of citizens towards waste and managerial capacities (see figure 2). A Dutch NGO, WASTE (Klunderst and Anschutz, 2001; WASTE, 2001), developed an IWSM based on their experience with solving problems related to municipal waste in low and middle-income countries. IWSM acknowledged three essential dimensions of waste management, namely: stakeholders, waste system elements, and sustainability aspects. ISWM is based on four principles: equity for people to have the same access to waste management related to improving public health; the effectiveness of the waste management in safely removing the waste; efficiency in minimizing the costs while achieving the maximal benefits; and the sustainability of the system while being considerate of local conditions (Klunderst and Anschutz, 2001).

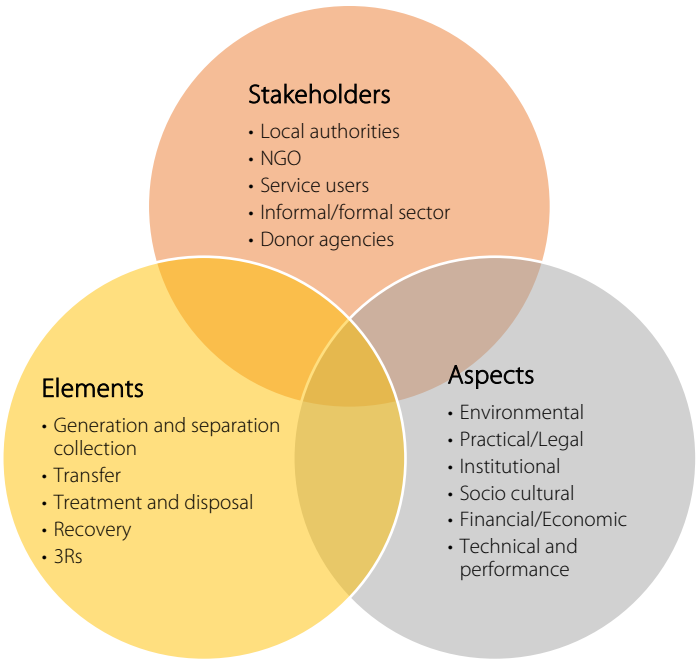

Figure 2. Integrated Sustainable Waste Management Framework (Hoornweg and Bhada-Tata, 2012)

To implement the ISWM, three significant dimensions must be taken into consideration: namely, the stakeholders involved, the (practical and elements) of the waste system, and the aspects of the local concept. The foundation of ISWM is based on the hierarchy of waste management—reduce, reuse, recycle—albeit the comprehensive framework is interconnected with two other dimensions, as displayed in figure 3. ISWM is an integrated approach, whereas those three dimensions influence one another, which will result in the sustainability of waste management (Hoornweg and Bhada-Tata, 2012; Klunderst and Anschutz, 2001).

2.2.2 Waste management hierarchy

The European Union waste policy used this hierarchy since the mid-1970s as the guidelines for better prioritizing any methods for waste treatment. The hierarchy also considered the environmental conditions when ranking the appropriate methods for waste treatment and disposal (Klunderst and Anschutz, 2001; Rasmussen et al., 2005). The concept of the waste management hierarchy is to reduce the waste rather than merely managing the impacts and then ranking the outcomes from the most desirable to the least desirable; the attributes are as follows in Figure 3:

Goal	Attribute	Outcomes
Reduce	Preventative	Most desirable
Reuse	Part preventative	↕
Recycle	Part preventative	
Treatment	Predominantly assimilative	
Disposal	Assimilative	Least desirable

Figure 3. Waste hierarchy (Gertsakis and Lewis, 2003)

However, the implementation of the waste hierarchy is a difficult job; since most of the time, the government has no control or seldom control over the decisions related to production, therefore the idea to reduce or avoid waste production is still questionable (Gertsakis and Lewis, 2003). Nevertheless, the hierarchy never considered the costs associated with disposal when ranking the outcomes; since it only used environmental desirability while ruling out other desirable outcomes (Rasmussen et al., 2005).

2.2.3 Waste management and VBDs

Development activities can easily influence the existence of mosquito vectors. For example, the amount of waste generated can stimulate the number of essential containers as a source of mosquito breeding sites. The improvement and maintenance of public infrastructure and essential services can help to reduce the existence of larval habitats, since the Aedes aegypti mosquito larvae are associated with an inadequate water supply and waste disposal services. Under the vector control topic, solid waste refers to non-biodegradable items from households, the community, and industrial waste. Effective solid waste management can result in lessening the mosquito breeding sites, albeit the advantages of having adequate solid waste management go beyond that (WHO, n.d.).

Applying the basic rule of 'reduce, reuse, recycle' can contribute significantly to reducing the larval habitats. The proper collection and disposal of solid waste should be done to prevent the development of larval habitats, such as using closable plastic sacks to collect the waste and regularly dispose of it twice a week. The frequency is essential, especially in warm climates that are susceptible to the expansion of larval habitats (WHO, n.d.).

2.3 Vector-Borne Diseases (VBDs) and the Environment

Rapid development, urbanization, and growing tourism in many developing countries, especially in tropical areas, has led to a reduced level of hygiene and increasing urban poverty. The combination of climate change, inadequate drinking water supplies, and inadequate waste management have allowed a favorable habitat for vector and communicable diseases to emerge. As a result, vector-borne diseases (VBDs) have become the major public health problem associated with crowded urban populations (Kyle and Harris, 2008; Gubler, 2011).

Dengue, as one of the mosquito-borne diseases, has increased dramatically over the past 50 years. The spread of dengue is closely related to population growth and rapid urbanization in tropical countries and evolved rapidly alongside human migration, including tourism (Martens and Hall, 2000; Kyle and Harris, 2008). If any of the mosquito-borne diseases turns into an epidemic, it will cause a huge loss for everyone since it will cost millions of dollars for the control efforts, let alone the incalculable losses due to decreased tourism and workforces (Gubler, 2011). Gubler (2011) identified four primary drivers for the increased spread of the mosquito-borne diseases, namely: a lack of effective mosquito control; changing lifestyles; rapid urbanization; and globalization.

The control of VBDs remains a difficult task; however, the combination of vector controls, drugs, and vaccines is an optimal way of controlling the VBDs. Home-based vector control was a successful way of reducing the diseases, albeit usually, it involves a chemical substance, such as insecticides, which are not environmentally friendly. The other method was the removal of larval breeding sites, such as old tires or flower vases, but this effort requires massive participation from the citizens (Hemmingway et al. 2006).

2.3.1 Environmental management of vector-borne disease

First mentioned by the WHO in 1982, vector control is the best way of preventing or reducing dengue virus transmission. Together with the development of vaccines and therapeutics, more effective control measures are still needed (Kyle and Harris, 2008). Later in 2004, the WHO endorsed Integrated Vector Management (IVM) to control VBDs globally. The WHO (2004) described IVM as 'a process for managing vector populations in such a way as to reduce or interrupt transmission of disease' by combining five essential elements, namely: evidence-based decision-making; integrated approaches; collaboration between the health sector and other sectors; advocacy, social mobilization, legislation;

and capacity building (Curtis, 2008). Hence, vector transmission can be reduced by combining three different methods: environmental management; chemical control; and biological control (WHO, n.d.).

IVM stresses the importance of understanding the way environmental factors affect the spread of VBDs and the effectiveness of control measures to reduce vector-human contact (Curtis, 2008). Environmental management proved an effective operation for eliminating mosquito breeding. With proper planning and maintenance, environmental management can offer multiple advantages with relatively low associated costs and only a slight environmental impact. Environmental management plays a vital role in vector controls since changes in the environment can reduce the contact between vector propagation and vector-pathogens by destroying or altering non-essential containers that can be turned into larval habitats. The actions of environmental management are classified into three types, as follows (WHO, n.d.):

- Environmental modification
  A form of long-term transformation of physical settings to reduce larval vector habitats such as installing secure water supplies for communities
- Environmental manipulation
  The form of temporary changes to vector habitats by managing the 'essential' containers including cleaning the water-storage vessels; covering stored tires from rainfall; compelling the disposal of containers; and close control of plans that can collect water in leaf axils.
- Changes to human habitation or behavior
  Actions related to changes in human behavior are intended to reduce contact between humans and vectors, such as using mosquito screens on windows, doors, or other entry points; and using mosquito nets while sleeping.

2.4 The conceptual model

The main concept of this research is looking at the waste management of Curaçao's industry and how it has affected the VBDs within the point of view of sustainable tourism. The grey box in figure 4 is the focus of the research to determine the sustainable tourism of Curaçao. Adapted from the ISWM framework, two main dimensions, its foundation, and associated elements will be used to measure waste management on Curaçao. Waste management intimately affects the environmental management of VBDs, whereas the spread and control of VBDs rely on environmental modification; environmental manipulation; and human behavior. Those interactions between waste management and the spread and control of VBDs contribute to one of the dimensions in sustainable tourism, the environmental dimension. The environmental dimension of sustainable tourism explicitly looks at solid waste management. The specific target, the tourism industry, is seen as a representative of the most significant economic industry in Curaçao. The waste management of the tourism industry is hypothesized to have a significant impact on the spread and control of VBDs and can lead to the sustainable tourism dimension.

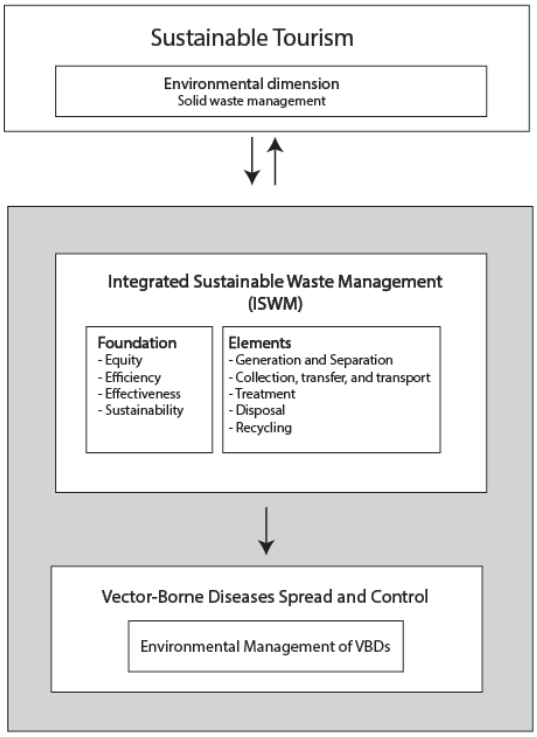

Figure 4. Conceptual framework (Personal collection)

3 Research design

3.1 Problem definition and knowledge gap

Hence, sustainable tourism remains a challenge, especially in the small island setting. Limited resources and vulnerabilities to VBDs make Curaçao an ideal place as a case study. This research will contribute to the vector-borne disease discussion, especially in small island settings that rely heavily on tourism. Studies have demonstrated that vector-borne diseases can directly affect tourism in small island regions. Bangert et al. (2018) mentioned that the risk of dengue fever lowered the Maldives' gross annual income by up to 18% per resident and suggested that the economic cost of depressing tourism as the result of the outbreak are more significant than the economic cost of the illness itself. Most of the studies only focus on communities and their participation in eradicating the breeding of mosquitoes, however in Curaçao, as 18% of the economy comes from tourism activity, the hospitality industry has an essential role in controlling vector-borne diseases.

Therefore, this research aims to address the question of *'How does the current waste management of Curaçao's tourism industry influence the spread of vector-borne disease and contribute to achieving sustainable tourism?'*

Wilmott and Graci (2012) found that the multi-stakeholder partnership approach is one of the useful models for waste management in small islands, yet the success of the partnership relies on stakeholder support and local waste behavior. They believed that solid waste management is an excellent challenge for small island tourist destinations; however, through a partnership approach, an island can improve its capacity and implement further initiatives. Ezeah et al. (2015) agreed that solid waste has continuously become a severe threat to tourist island destinations. This includes the efficient collection, transfer, and disposal of waste, climate conditions, topography, changing consumption

patterns, limited infrastructure, seasonal variation in waste quantities; with no single ideal system that can be implemented in four popular EU tourist destinations.

In 1992, Knudsen and Slooff firstly mentioned that different living situations where traditional structures are less present (e.g., urban area, tourism area) might affect vector control activities since there were no alternative community-based models for vector control. Hence, in developing countries, government-led vector control programs have been a successful technique in vector control strategies; yet, the programs have proven to be unsustainable (Kylie and Harris, 2008), particularly in developing countries, where vertical health projects have failed to serve the improvement of adequate public health, especially in remote regions. In a small island setting which relies heavily on tourism, the local community will likely be less present compared to actors in the tourism industry—therefore their role in solid waste management might have a significant impact on VBDs. The challenge remains on how to integrate those three topics within the study area.

3.2 Research objective and questions

Based on the knowledge gaps, this research aims to answer the research question by analyzing the waste management of the tourism industry and its influence on VBDs without ignoring sustainable tourism. The first objective of the research is to discover the current practices and the stakeholders involved in the waste management of Curaçao's tourism industry; with the objective being of an explorative nature based on the case study area situation. The second objective is to analyze the influence of waste management on the spread and control of VBDs. This objective will be answered by collecting information from experts and the observations in the field. The last objective is a recommendation towards control strategies for VBDs and sustainable tourism.

As such, the central research question is:

How does the current waste management of Curaçao's tourism industry influence the spread of vector-borne disease and contribute to achieving sustainable tourism?

The following sub-questions are:

1. What are the Curaçao tourism industry's current practices for solid waste management?
2. What are the challenges and opportunities in the Curaçao tourism industry's waste management practices?
3. Who are the stakeholders involved in Curaçao tourism industry's waste management practices?
4. To what extent does the waste management of Curaçao's tourism industry strengthen the control of VBDs?
5. What are the recommendations for Curaçao's tourism industry to achieve sustainable tourism?

3.3 Methodology

The majority of the data was collected during the two-month data collection period between March – April 2019 in Curaçao, during which more than 29 participants were interviewed. The background of the participants ranged from being in the tourism industry, namely hotel, restaurant, or tour agency manager/owner; government officials; Non-governmental Organizations (NGOs); and private businesses. The data was analyzed and later was written into the thesis from May to July 2019. During the data collection and writing period, this research had collected the information regarding waste management and VBDs through primary qualitative data and quantitative and qualitative secondary data. To understand the tourism industry's experiences in waste management, qualitative research is

an appropriate approach to use in this research. This approach allowed the researcher to identify the issues from the local perspective and understand the reasons for their behavior (Hennink et al., 2011).

Furthermore, the qualitative method has been used to describe various cases in waste management practices (see Streicher-Porte et al. 2005). Hence, this research used a mixture of methods across several qualitative data products, namely, transect walks, semi-structured interviews, and secondary data (more explanation on data collection). Moreover, a further explanation of the methodology used will be explained below.

3.3.1 Data Collection

First introduced in 1994 by the Food and Agriculture Organization (FAO), a transect walk is a systematic walk in the designated path along with key informants in order to explore the local situation by observing, asking, and listening (Chambers, 1994). The transect walk is the first phase of the data collection before conducting the semi-structured interview. First introduced as part of the Participatory Rural Approach (PRA) toolbox together with the interview and Focus Group Discussion (FGD) to produce a transect diagram. Streicher-Porte et al. (2005) used the transect walk method to assess e-waste processing in the informal sector in Delhi. The transect walk helped them to identify and describe the different recycling processes. Researchers also used transect walks to identify the issue that they were facing and identified their ideal situation. Additionally, Butcher et al. (2000) used this method to develop the action plan for the health care service in Nepal. During the internship (2018), the author conducted transect walks with smallholder farmers in Uganda in order to analyze the social impact of a Dutch company. Transect walks are intended to warm up the interviewees; however, several transect walks that have been conducted in regards to the primary participant occurred during interviews or at the end of interviews. As such the transect walk was not recorded, yet notes were taken during the walk.

To further understand the waste management and its effect on VBDs, a semi-structured interview was conducted to follow up the information gathered from the transect walk. A semi-structured interview is a verbal interchange meant to extract information from another person and directed by the interview guide but allowing an open response from the interviewees to maximize the knowledge-producing potential (Longhurst, 2003). Hence different interview guides (Appendix A) were used to stress the focus of the interviews on different topics, namely waste management, tourism, and health. The interview guides were designed to ensure the relevancy of the interview and to make it easy to understand for the participants. This interview technique can capture the participants' subjectivities and their role in waste management and the awareness of VBDs. The participants' recruitment was initiated by email correspondence, followed by interview requests for the participants mentioned in Table 1. During the data collection, the participants were recruited mainly via personal connection or other social contacts. With minimum connection on the island, the researcher managed to approach the necessary participants that represent stakeholders in Curaçao waste management. However, the primary participants were based on the focus on the tourism industry, such as hotels, restaurants, and tour agencies.

Furthermore, the situation of waste management on the island was comprehended with an observation. Observation is defined as the systematic observation of events and behaviors in social settings (Kawulich, 2005). This technique mainly focuses on the social interaction between different forms of social cohesion; thus, in this research, the observations were conducted in regards to the social and environmental conditions in Curaçao.

Table 1. Participant recruitment

	Tourism	Waste	Health
Government	3	1	4
Non-governmental Organizations	3	4	0
Private	- Hotels: 4 - Restaurants: 4 - Tour agency: 2	5	0

The observations were translated into a number of photos and videos that demonstrate the actual conditions in the field. Photos were taken outside of the time allotted for interviews and mostly displayed the actual condition of the waste situation on the island. Later on, secondary data regarding the waste volume and the VBDs was acquired from available publications and online media news. Hence, the data that has already been collected earlier by other researchers or has been used in other research is classified as secondary data; thus, it mostly contains quantitative data (Hox and Boije, 2005).

3.3.2 Data analysis

The data for this research was collected during the data collection that took place between March – April 2019; the methods used were namely interviews, observations, transect walks, personal communication, alongside other secondary methods. Based on Hennik et al's (2011) grounded theory approach, inductive theory-building methods were applied to this research, while following the conceptual model and analyzing the data qualitatively. Therefore, due to the explorative nature of this research, it is essential to expand the research for other issues that may arise.

Extensive notes were taken during the transect walks, interviews, and observations. Furthermore, interviews were recorded and later transcribed to ensure the data was formatted correctly and could be analyzed later in order to form the conclusion (Hennik et al., 2011). The analysis was carried out through thematic coding using NVivo software (see Appendix C for the coding book). However, different data collection methods may result in different datasets; therefore, data synthesis is needed to provide a comprehensive analysis (Kara, 2015). An overview of the participants is presented in Table 2. To guarantee the anonymity of the participants, the institutional details do not entail the quotes used. Furthermore, the pseudonyms used are fictional.

Table 2. Participant information

Number	Pseudonym	Gender	Type
1	Elena	Female	Tourism industry
2	Anne	Female	Tourism industry
3	Gerard	Male	Tourism industry
4	William	Male	Tourism Industry
5	Aryan	Male	Tourism industry
6	Samuel	Male	Tourism industry
7	Evan	Male	Tourism Industry
8	Julian	Male	Tourism industry
9	Carlos	Male	Tourism industry
10	Liam	Male	Tourism official
11	Hannah	Female	Tourism official
12	Max	Male	Tourism official
13	Jacob	Male	Public health official
14	Sara	Female	Public health official

15	Tim	Male	Waste management official
16	Lucy	Female	Waste management official
17	Mark	Male	Recycling company
18	Miguel	Male	Recycling company
19	Sophia	Female	Private company
20	Daniel	Male	NGO
21	Mason	Male	NGO
22	Ethan	Male	NGO
23	Mia	Female	NGO
24	Anthony	Male	NGO
25	Bella	Female	NGO
26	Leo	Male	NGO

3.3.3 Potential limitations

Ingrained in the other research available, the methodology used in this research has its limitations. Since this research is heavily based on qualitative data, the analysis is mostly based on the interpretations of the data collected. However, the objectivity of the results was targeted by ensuring the transparency in the data collection, analysis, and discussions. However, Hennik et al. (2011) acknowledged that each individual's perspective could influence their personal views. It is necessary to agree that researcher's background, emotions, or positions are a significant part of the process of collecting and analyzing the data.

The positionality of the researcher can lead to limitations in regards to the data collection in this research. The researcher was presented as a professional in order to match the level of the participants since most of them have essential positions. However, the participants might feel reluctant to present the actual situation, since tourism is the biggest economic pillar in Curaçao. Their willingness to share negative information or not could be a significant obstacle in this research.

The official language in Curaçao is Papiamentu, which the researcher has zero knowledge of. However, most of the local population is bilingual in a combination of either Papiamentu, English, Dutch, or Spanish (Central Bureau of Statistics Curaçao, 2019). Hence, since the researcher only mastered English and did not have any translator, only the participatory candidates that spoke English were able to be interviewed. Lastly, because the last outbreak of VBDs happened in the past, there might be a bias when recalling certain information and it is also challenging to retain old documents or other information for secondary data, which is worsened by the fact the most of the data was in either Papiamentu or Dutch. The bias mentioned above could cause a significant risk to this research.

3.3.4 Ethical review

This research discusses the challenges in waste management and VBDs; thus, negative comments and opinions might be expressed by the participant towards the stakeholders; thus, anonymity is significantly essential to assure the safety of the participants and the quality of the interviews. However, in regards to identifying the stakeholders involved in Curaçao's waste management, several key institutions were mentioned to clarify their roles; hence, the individual sources remain anonymous. Therefore, before conducting the interviews, the participants were well informed and aware of these consequences and signed informed consent forms (see appendix B).

Moreover, the recruitment of the participant encountered some difficulties since there was no budget available for this research. Their participation was purely motivated by the topic of the research since the researcher was unable to offer anything in return. This might have created a bias since the

researcher only talked with people who were familiar with the topic and disregarded those that might be affected by the topic of this research.

3.4 Regional framework

Curaçao is a small island in the Caribbean Sea (see figure 5) and part of the Dutch Caribbean region, also known as the Netherlands Antilles, which is an autonomous territory of the Kingdom of the Netherlands. It consists of four islands, namely Aruba, Bonaire, Curaçao, and the Leeward Islands (Saba, Sint Maarten, and Sint Eustatius). Compared to its neighboring islands, Curaçao is the largest island with 444 km² area and 162.515 inhabitants (Central Bureau of Statistics Curaçao, 2019). The whole Netherlands Antilles shares the same mild tropical climate with an average temperature of 27-28^{0}C; the island is also well-known for its triple "Ss" or 'Sea, Sand, and Sun' as a tropical destination. Having shifted from its previous reliance on oil refineries, Curaçao now relies heavily on tourism, with a 26% share of the total GDP. Tourism has also directly or indirectly created 23% jobs on the island, thus impacting almost every economic sector in Curaçao (Croes et al., 2015; World Bank, 2016).

Figure 5. Curaçao Island (Source: the University of Curaçao, n.d.)

After the dissolution of Netherland Antilles, Curaçao became an independent country and has faced problems related to waste. The amount of illegal dumping into the sea has increased and been worsened by the fact that the sanitary landfill location has almost reached its maximum capacity and only has a lifespan of eight years. Illegal dumping has also happened in the land area, with around 3.200 dumping sites across the island. Dengue Fever is endemic to the island and commonly known in Curaçao; with outbreaks having occurred in 2001, 2002, 2005, 2010, and 2014. After experiencing two significant outbreaks of Chikungunya in 2014-2015, and recently Zika, Curaçao still suffer from the burden of diseases (Hotez et al., 2008; Elsinga et al., 2017).

4 Results

4.1 Tourism Industry in Curaçao

4.1.1 Current situation

For years, the people in Curaçao have been economically dependent on an oil refinery known as Isla; however, since its latest problems due to the political situation in Venezuela, they have sought to find other alternatives to sustain the Curaçao economy. Therefore, the government has started to focus

more on developing Curaçao as a tourism destination. The following quotes demonstrate the realization that they cannot depend on the oil refinery any longer.

"We would expect that they will close down the refinery. The huge problem with Venezuela is that it operates the refinery, and our government is the owner, so there is no oil coming from Venezuela." Anthony, NGO

"We do tourism on the island because we do need the income from tourism. Oil is being replaced in so many ways. This is the biggest sector in the economy; they are going away. So, we have to engage in tourism because of this natural resource that we have can be an important part." Max, Tourism official

The oil used to be the most crucial sector in the economy; later, the economy shifted, and currently, tourism is the leading sector in Curaçao (see figure 6). Tourism officials realized the potential of Curaçao's nature, and they wanted tourism to be more significant for the Curaçao economy.

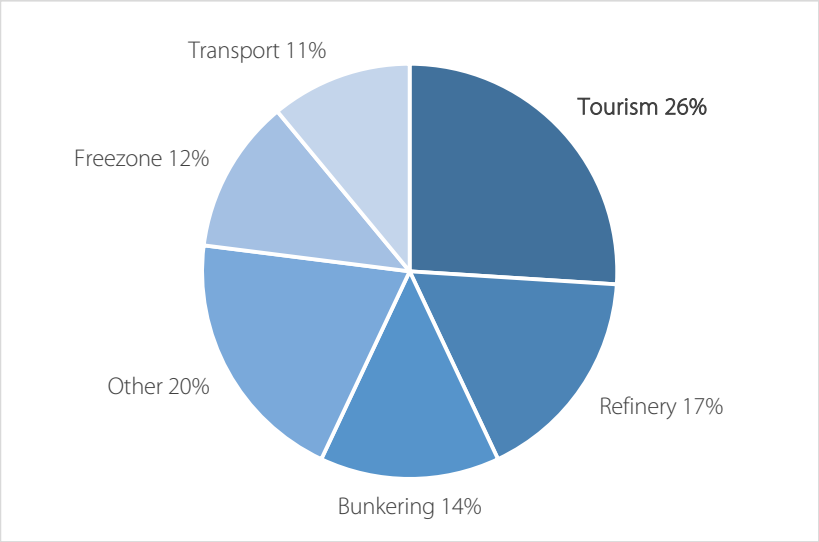

Figure 6. Contribution to Curaçao economic sectors (source: Croes, L, Semrad, K., Rivera, M.A. 2015; personal adaptation)

The Curaçao Tourism Masterplan 2015-2020 defines tourism as 'the Right Choice' for the economic growth that the island needs. The main objectives of the Tourism Masterplan are economic growth and more employment through economic growth. Curaçao faced domestic challenges that include youth unemployment and a stagnant economy. Yet in 2015, Curaçao managed to the boost tourism sector compared to other sectors on the island. Tourism has contributed over one billion NAF[1] to the economy, approximately 26% of the country's Gross Domestic Product (GDP) (see figure 6) and created 23% of its jobs being sustained directly or indirectly by the tourism sector.

Figure 7 demonstrates that the number of tourist visits to the island have been relatively stable over the years. the pattern of high season and low season are very much alike, with high season usually being during the summer and Christmas holidays, and the rest of the year being considered the low season. However, tourists visit Curaçao all year long, which brings a steady economic income. The numbers in figure 7 are accounted through the stays by tourists, transit tourists, and cruise ship tourists. The largest market for Curaçao tourism is the Netherlands, followed by North America (Curaçao Tourist Board, 2018).

"…, 225 members, from hotels, restaurants, and dive shops, we also have insurance, banks. Everyone that believes in tourism, associated with CHATA but are currently predominantly companies that are working in the tourism sector" Hannah, Tourism official.

[1] The Netherlands Antillean (NAF) guilder is the currency of Curaçao, 1 NAF = 0.47 Euro

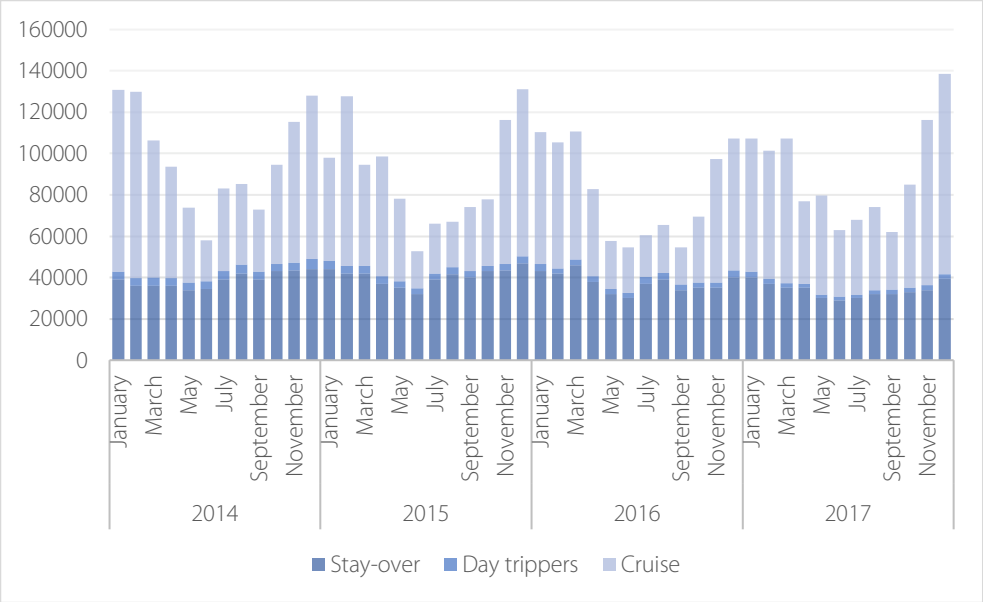

Figure 7. Curaçao visitor arrival, (source: CHATA, 2015-2018; personal adaptation)

The Curaçao Hospitality and Tourism Association (CHATA) was established in 1967 (CHATA, n.d.), and from the quote above, it has 255 diverse members in the tourism industry, such as hotels, restaurants, and tour operators, but also from another sector that has interest in the tourism industry, such as banking and insurance companies. The number does not account for the housing market and apartments that also accommodate tourists; in that sense, the number of accommodations in Curaçao may be higher than the data that CHATA has.

4.1.2 Challenges and Opportunities

In recent years, tourism has proven to be one of the pillars in the Curaçao economy, yet it still faces some challenges. Tourism officials express their worries about the awareness of the local population; they perceive that the local population has displayed a minimal interest in the tourism industry. After being dependent on an oil refinery for more than 100 years, the local population still has not realized the importance of the tourism industry for Curaçao's economy. This condition has caused (CHATA) to put in more work towards raising local awareness about the importance of tourism. The next quote demonstrates the low awareness of tourism within the local population:

"They assume that it is something that is happening naturally; they do not have to make an effort and actively participate. Because maybe they think 'Curaçao is beautiful, and the tourists will come, and they will automatically have a good time.' Then you take it for granted. I think it is a challenge for us as well to make them more aware of how important it is to contribute and participate in the tiniest form, it does not have to be enormous." Hannah, Tourism official

The shift in the economy from oil refinery to tourism is also associated with the different skills needed between those two industries. Oil refineries might need technical people; though on the other hand, tourism needs service people. Nevertheless, in term of services, there is a big gap between what the industry needs and the availability of skilled people, not only the quality but also the quantity. Next year alone, two 5-star hotels will open in Curaçao and will need thousands of employees. Tourism officials acknowledge the problems embedded in the educational system since no school provides skill needed in the tourism industry. Access to higher education in tourism is not equally available for everyone since people need to go abroad to pursue a higher level. With the upcoming five-star hotels opening in Curaçao, the management needs to find employees from outside of Curaçao.

"Because as for now we do not have a lot of hospitality schools. Not at all. We do have two courses, educational track, where you can study to become an assistant cook, assistant bartender, but it is very basic. It is kind of the

entry-level, so it is not really high skilled. So, we have a big gap between what the schools offer and what we need in the coming year." Hannah, Tourism official

The fact that the participants in this research came either from developed countries and immigrated for work in Curaçao; or they were born in Curaçao and had the opportunity to went abroad for school and work, an exhibit that they come from the higher level of education and economic. Thus, this situation leads to the case where the island left only with low-skilled population and high-skilled position mostly filled with expats. The situation also limits low-skilled people to participate more in the tourism industry; their difficulty in accessing higher education in tourism can be the explanation of this situation. Moreover, even though there are many job opportunities, Curaçao people cannot respond to the demand, as mentioned by the quote below:

"So that is the challenge that we have. We do not have enough to respond to what the industry needs, not only in terms of quantity but also in terms of quality." Liam, Tourism official

The tourism official has been noticed the education issue on the tourism industry; CHATA has been trying to arrange an educational program, funded by the government, to accommodate the local population from all economic levels. The program will focus on re-skilling people interested in working in the tourism industry and introduce them to tourism service-related. Hopefully, this program can answer the employment gap in the tourism industry.

Accordingly, Curaçao tourism official wanted to focus on expanding its tourist market in North America by getting more airlift to Curaçao (see later figure 19 for existing flights route from Curaçao).

"We are trying to attract (tourism by) increase the airlift (airlines destinations and frequencies) to the island." Hannah, a tourism official.

Meanwhile, the tourism industry expressed their objection that they are not ready for the North American market:

"Even our service is not at their level in the US market." Carlos, Tourism industry

"They have much more to offer than the neighbor like Aruba, Saint Marteen or Bonaire. I think we only do 60% of we can do with the island. The service level needs to pick up much more.". Evan, Tourism industry

Curaçao is dealing with the service level in hotels and restaurants. The tourism industry in Curaçao's quality is lower compared to neighboring islands like Aruba, Sint Maarten, or Bonaire. The ambition of tourism officials is not completed with the requirement, such as high-level service. If the service level is not improving with the same speed as the increased airlift, Curaçao will face another problem with the unsatisfied tourists.

Curaçao's economy pillar shifted from the oil refinery to tourism in recent years; thus, the government wanted to develop and gain more economic impact from it. However, Curaçao's tourism education and level of services towards American tourists are still lacking, yet, tourism officials wanted to expand their market in North America. Thus, the level of attention paid to getting more tourists and improving education needs to be the same.

4.2 Waste management

4.2.1 Waste management practices

To understand waste management practices on the island, especially in the tourism industry, it is essential to discover the waste management practices in Curaçao. Selikor, as a government-owned

company, assigned an executive power from the government and processes most of the solid waste generated on the island. The executive power encompasses the vital aspect of waste management on the island; this includes the management of the Malpais landfill, household waste, and street cleaning in the touristic areas of Punda and Otrobanda.

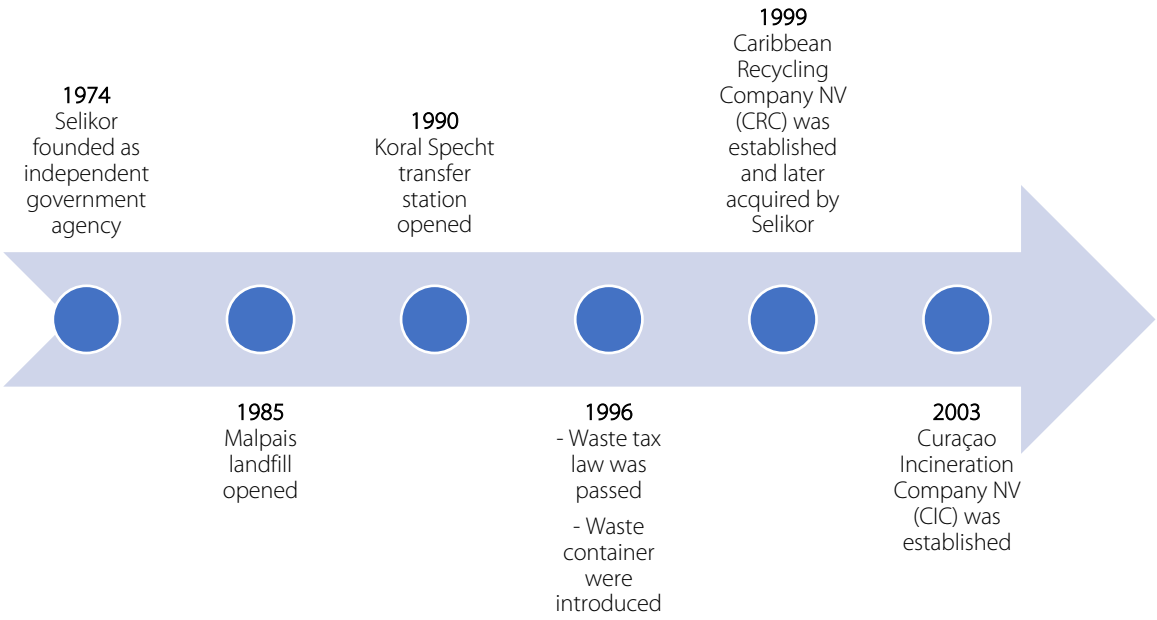

Figure 8. Selikor timeline, (source: Selikor, n.d.; personal adaptation)

Since they opened the first landfills in 1985 in Malpais (see figure 8 for the overall timeline, see figure 9 and 11 for landfill condition), with the 45-hectare area, it continues to accommodate the waste from the whole island and expects to reach its capacity in the next eight years depending on the economic growth. Selikor also owned a waste transfer station that is located in the eastern part of the island; the station facilitates people who need to bring bulky waste to the landfill since Selikor will transfer the collected waste at the transfer station to the main landfill in Malpais. Outside the landfill, Selikor provides a collection point to recycle glass, batteries, and electronic parts, but the participants question the further treatment of the waste collected.

Figure 9. Pile of glass bottles at Malpais landfill (Source: personal collection)

Figure 9 confirms the statement from Julian about Selikor's treatment of bottles. During a visit to the landfill, several piles of glass bottles were found around the area, and it shows that no treatment was done to the bottles. On their website, Selikor encourages people to bring their glass bottles to the collection point for further recycling (Selikor, n.d.). The difference between the reality and the information that was distributed creates distrust towards Selikor.

"Then we have our glass, especially being collected by Selikor; they do not do anything with it. They just put it in a big pile on the landfill. However, maybe in the future, they might do something with it." Julian, Tourism industry

The government allows private companies to take part in waste management, yet they are only allowed to work outside the executive area of Selikor. Commercial waste companies are authorized to pick up the commercial waste and deliver it to the Malpais landfill. This distrust towards Selikor has opened more of the market to private waste management companies. Several private recycle and upcycle companies are present on the island, Green Force is one of the biggest private recycling companies on the island yet it is facing difficulty in attempting to handle the demand for recycling services that mostly comes from the tourism industry.

"So, we have to make sure we have the capacity for the upcoming year because at the moment we have a waiting list of clients. This facility cannot process more." Miguel, Recycling company

"But the thing is that Green Force is the only company on the island who can recycle plastic and not all types of plastic, some types of plastic, but they are reaching their maximum capacity to be able to recycle plastics. So that is a problem, so we cannot really go to the front either. The hotels that are already doing something or are interested have joined this kind of initiative." Hannah, Tourism official

At the moment Green Force as the largest commercial recycling company on the island, handles the recycling needs of seven hotels and several companies and is responsible for recycling cardboard, three different types of plastics (PET, HPDE, and LDPE), used batteries and aluminum cans. Those materials are being sorted and exported to other countries for further use.

Figure 10. Recycle bins in the Hotel area (Source: personal collection)

Some participants[2]put some recycle bins (see figure 10) in their common area, which separates plastic bottles, aluminum cans, and general waste; some hotels also encourage their guests to separate their waste by putting a pamphlet inside the hotel room. Meanwhile, for hotels that do not have the common area, they have assigned the recycle bins inside the hotel room. They realized the importance of doing recycling since recycling is one of the requirements to obtain an international certification, such as Travelife[3].

The tourism industry is using Selikor's service to handle their solid waste, with some exceptions for the several hotels that approach Green Force to use their recycling service. Yet, restaurants are more inclined to use biodegradable utensils such as paper straws and paper boxes, instead of separating their waste even though they know the importance of recycling. They also asked the supplier of their kitchen supplies to use less packaging to prevent further waste.

"I can say that because where I am from (outside Curaçao). All the system is there; they do it 100 years behind. Unfortunately, I hate to say that, but they (the locals) need this, recycling, the straws, need to be something else…. The glass can be something else if it breaks I can make it into something else. They did not realize…We did separate glass, we separate it from other trash, but when I put it on the bag, I do not know what to do with it. … here we only put in in a bag and put it in another bin, that is it." Aryan, the tourism industry

"It has to come to me; it has to come from Selikor. They also need to give me the containers, the blue containers; then we have to supply you with all these containers." Carlos – Tourism industry

The tourism industry does realize the importance of separation and recycling. Thus, not everyone managed to pursue it. One of the reasons is the procedures for recycling are more complicated than just throwing everything in the landfill. Due to the lack of incentives and enforcement from the waste officials, the tourism industry has to approach the private recycling companies with their own initiatives. The inadequacy of recycling facilities from Selikor and the fact that private recycling companies are not visibly available are leading to landfill disposal.

4.2.2 Challenges

The government of Curaçao first recognized waste management as an urgent priority during the Third International Conference on Small Island Developing States, especially with the growing number of tourists (Ministry of Health, Environment, and Nature, 2014). However, this research found conflicting evidence, demonstrated in the following quotes:

"The problem is because that (if it) is not the priority of the people, that is not the priority of the politicians." Tim, Waste management official

"Another thing is to prioritize it because there is little money because it is not a priority. Do not get me wrong; health is a priority; education is a priority." Sophia, Private company

Five years after the government made that statement on the urgency of the state of waste management on the island, the people in Curaçao have not seen any initiatives from the government to support that statement. As mentioned above by a private company, due to the financial problem the government put their focus only on problems that need more priority, such as healthcare and education, and put waste management in second. Waste management officials also realized that waste management is not an urgent problem for today's economic situation. Moreover, the last problem with the oil refinery has made another problem for Curaçao; thousands of people are facing unemployment, thus making waste management not the priority for the government.

[2] Hotels, restaurants, and tour agents that were interviewed
[3] Travelife is a certification that requires the tourism industry to become more sustainable

Different ambitions between GMN and the parliament also cause stagnation on law related to waste behavior. Curaçao used to have a waste law, Servisio pa Kòntròl i Siguridat (SKS), but after the dissolution in 2010, the government can no longer impose fines for illegal dumping (Caribisch Netwerk, 2014); it took them five years after the dissolution to draft a Solid Waste Ordinance. In 2016, an environmental policy plan mentioned waste reduction, both landfill and illegal dumping; single-use plastic; and the management of hazardous waste. In 2018, the GMN submitted a proposal to ban single-use plastic to the parliament. However, they advised the GMN to propose a more significant law and included the plastic ban as a section within the more significant law. An environmental official pointed out the struggle within the government:

"Our view is different, it is an urgent problem, and we want to tackle this problem as soon as possible. Start small. We wanted just to create a decree and within a decree to a banned certain type of plastic. We do not have a law that makes recycle enabled or easy on the island. I am not a proponent to make a law, I am proponent to make incentives and much easier and established specific recycling programs and projects on the island." Lucy, Environmental official

Another issue resolved from the government regarding waste management concerning the political situation in Curaçao. A presidential and parliamentary election is held every four years, which resulted in a discontinuity of policy from the previous governmental period. The discontinuity transpires in every aspect, including waste management. The private sector, tourism industry, and Non-governmental Organizations (NGO) have been trying to undertake several initiatives that contribute to sustainable waste management, such as campaigns, clean ups, and education, albeit without formal support from the government, the development will not go further. The conflict between the GMN and the parliament exhibit the importance of politics in waste management; thus, it is associated with stakeholders as one of the principles that needs to be present in the ISWM (Klunderst and Anschutz, 2001).

A lack of regulation within waste management is also mentioned in the National Report of Curaçao for the Third International Conference on Small Island Developing States Curaçao (Curaçao Ministry of Health, Environment, and Nature, 2014). Effective regulations do not follow the time and resources that were spent on creating a law about waste management. The report also mentioned that regulations are not always effective because it needs adequate institutional and human resource capacities to be able to enforce the law.

Figure 11. Malpais landfill (source: personal collection)

Figure 12 displays that most of the waste generated being sent to the landfill (see landfill conditions in figure 11) and only 3% is being recycled. However, with only 3% of the waste being unmanaged or illegally dumped, this means that waste is being managed carefully. Hence, after the incinerator broke down, the waste that was intended to be incinerated goes to landfill directly.

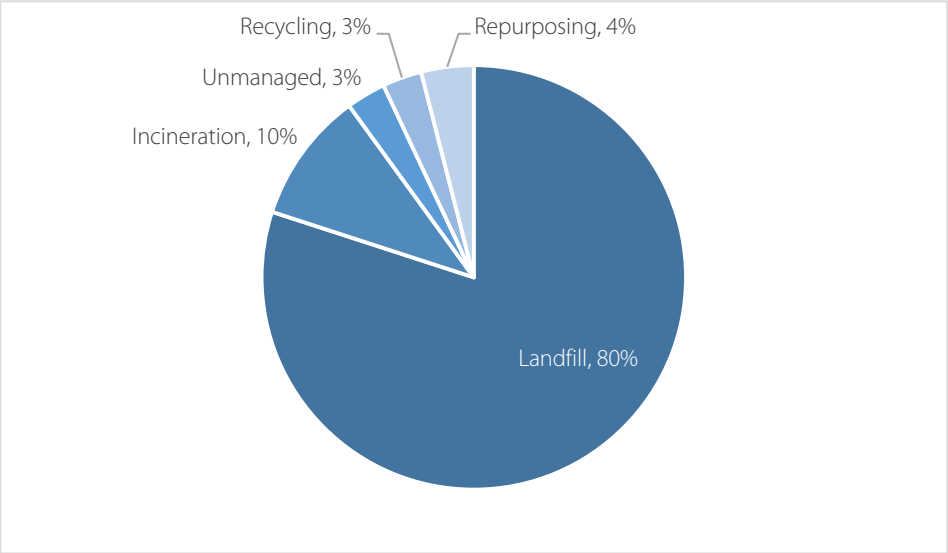

Figure 12. Contribution to waste treatment in Curaçao (Source: UNOPS, 2018; personal adaptation)

The limitation of being a small island makes Curaçao heavily dependent on imports, primarily since Curaçao's economy is based on tourism and the industry needs to cater to tourists from different countries with different rates and kinds of consumption. On the other hand, there are no regulations regarding the packaging of products that can enter the island, thus leading to more packaging that cannot be recycled on the island and 80% of the waste being generated ending up in the landfill. The low contribution of recycled waste is also worsened by the limited service offered by private companies. To use the private recycling services, the tourism industry needs to pay for pickup and separation services; however, the local population needs to bring their waste to the recycling center (Figure 14) or come directly to the recycling companies; thus requiring more effort compared to the regular disposal.

"What the (Green Force) really needs is a signature from a department to grant them a lease right to be on their premises and to measure out where they can start with their new hall, and it takes forever. You sometimes wonder whether it is a strategy to make them go away." Elena, Tourism industry

"We support other companies with the permitting process…We also support information, because not all recyclables can be recycled on the island." Lucy, Environmental official

Over the years, several recycling companies have tried to open their businesses; however, as a result of the lack of support from the government; only a few companies have remained in operation. So far, the government has been helping the recycling companies with the permitting process; however, when it comes to further expansion, the process will take longer. This situation is the reason for the delay in the further expansion that has been experienced by Green Force. That condition is also worsened by the competition between the recycling companies; the small market for recycling products leading them to work individually instead of working with one another (Lucy, personal communication, March 18, 2019). The tendency to blame the local population for the waste problem on the island can be found in the local media (see Caribisch Netwerk, 2014; 2014a; 2014b; 2018; 2018a) and has highlighted the problem with illegal dumping. It was also demonstrated during the interviews with the tourism industry and waste management officials; thus, it can be perceived from the interviews that the tourism industry is not the polluter. They think that it was related to the education that they received during schooling; since waste management was never part of the curriculum.

Nevertheless, some NGOs have initiated education initiatives towards students with support from private companies. These initiatives help to teach children how to properly recycle and to use less plastic. By teaching children about recycling, they hope the children will influence their parents on their waste behavior.

"And I bet you, you can ask ten local people 'what do plastics do to the environment?' they cannot tell you that. It is sad; you need to know what it is." Carlos, Tourism industry

"For them (locals) it does not matter if you dump it in the natural area, look how cheap it is, they do not care. They do not recycle very much; they do not take time to separate. For them, it is important that you get to pick up the garbage once a week and it is gone, after that what happens they do not care. The cheapest as possible." Tim, Waste management official

The economic situation in Curaçao has also become one of the reasons for the relatively low awareness from the local population. 25,1% of the local population is under the poverty line, and it is understandable that they might not care about waste management in the first place. The recent crisis with Venezuela has put Curaçao's economy into a budget deficit of around 127 million Florin. Besides, 3.000 people are facing unemployment due to the situation with the oil refinery (Curaçao Bureau Statistic, 2018; Antilliaans Dagblad, 2019). The connection between the economic situation and the waste behavior is stated by the quote below:

"The bigger problem is the local population not being aware, that is the biggest problem … If you have 80% of people being poor, they are in survival mode; they do not care. They are not thinking about the environment and stuff like that." Miguel, Recycling company

In 1996 Curaçao's first waste tax passed and obligated every household to pay 20 NAF per month. Waste tax is a mandatory fee for every household so the government can collect and dispose of waste generated from the households. (Belastingsamenwerking, n.d.) The money goes to the government, and later Selikor is paid by the government since the money does not go directly to Selikor. The waste tax has not changed for 23 years, and yet not everybody can afford the waste tax. People who cannot afford the waste tax, dump their waste in nature, usually called illegal dumping.

Figure 13. Illegal dumping site (Source: personal collection)

Illegal dumping sites (figure 13) are scattered throughout the island, with the total number being around 3.200 sites. The government tried to form a task force called X-Team to fight illegal dumping and environmental crimes. The team was established in 2017 by a National Decree and falls under the GMN's jurisdiction; however, due to limited capacity and staff, the illegal dumping remains untouched. (Mason, Personal communication, April 23, 2019, and GMN, n.d.)

"There is a good initiative, but it is very difficult. But also Miguel (pseudonym), he is quietly frustrated with Selikor because he would expect they would help him, but it is very difficult. So, the government is the problem in setting the waste stream processing." Daniel, NGO

Green Force, as the largest commercial recycling company on the island, has been waiting for five years to get the government's permission for a piece of land so they can expand the facility. Currently, Green Force's facility was built on the government's land, but after they secured new investment for the company, they wanted to build a new factory where they can increase their volume and accommodate more clients. This drawback prevents the recycling system from functioning effectively. If Green Force manages to build a bigger facility, it is easier to ensure the equality of access to recycling and provide people with more options for managing their waste. Thus, the access to proper waste management is in line with one of the ISWM's principles, the equality for the people to have the same access to waste management related to improving public health

"with the new investment coming, we can increase by 400% and add 16 more companies, two hotels, and three major projects. We have been waiting for five years already from the government for a piece of land, they promised us but so far no result." Miguel, Recycling company

Despite Selikor's monopoly in waste management, several private initiatives for waste collection and recycling have been conducting their business on the island (see Table 1 for a complete list). Once, GMN tried to initiate a meeting between recycling companies to observe their challenges, yet only a few recycling companies showed up. This reflects the unhealthy competition and individuality between the recycling companies since the market for recycling materials is very limited on the island. During the data collection, most of the companies in Table 4 were hard to reach, hence, except for the ones that were interviewed, their existence and scope of their work are still questionable.

Table 3. Recycling companies in Curaçao (Source: GMN, n.d.)

Company	Ownership	Type of waste stream
Greenforce	Private	Plastic, Aluminum, Beer crates
Recupal Curaçao N.V.	Private	Plastic
BioFuels Curaçao N.V.	Private	Frying oil waste
Living Green B.V.	Private	Wood and garden waste
Waste Oil Management Curoil	Private	Oil sludge and waste oil
Caribbean Recycling Company Holding (Selikor)	Government	Construction waste
Antillean Scrap Company Antillean Metal and Scrap Processing and Trading N.V.	Private	Metals and car wrecks
Jamaiquino	Private	Not specified
Sherd Express	Private	Not specified
Illegal Car Battery Collectors	Private	Not specified
Van Rumpt Recycling N.V.	Private	Paper and carton
2nd life Curaçao	Private	Not specified
Caribbean Waste Collective	Private	Not specified
Selikor Malpais/ Selikor Overslagstation Koraal Specht	Government	Plastic, aluminum, glass, beer crates
Zap Caribbean	Private	Batteries
ATCO	Private	Carton / paper
AVBC	Private	Carton / paper
CurRecycles Metals	Private	Car wrecks
Curaçao Waste Management	Private	Metal
ENI Recycling	Private	Kitchen appliances

4.2.3 Opportunities

The challenges mentioned in the previous section identified the conditions that can be improved. Selikor is focused on the idea of incinerators and turning waste into energy. Yet, the sustainability of that method is still unclear because environmental organizations have come out against that idea. In addition to the energy used, burning waste also creates carbon dioxide unless it follows the strictest European standards with high gasification systems and short trajectories. Yet, the natural conditions of Curaçao with its high humidity will cause corrosion and high maintenance, with the current economic situation regarding this idea seeming to be unfavorable. They also mention that the waste volume on the island is too low to be able to generate energy, so Selikor needs to import waste from another island in order to reach the minimum volume. Waste to energy is a sound, easy, and sustainable solution to the solid waste problem in Curaçao, yet a more comprehensive feasibility study still needed.

Figure 14. Recycle center in Curaçao (Source: personal collection)

Since Selikor did not display the initiatives for recycling, the idea of improving and ramping up the scope of separation and recycle fall on private initiatives. In three different locations, a recycle center (figure 14) was set up with the cooperation of TUI and Green Force. People can set out their recyclable goods for free and have them collected later by Green Force for further separation. With the expansion of tourism, more hotels are expected to open in the coming years. They have demonstrated the willingness to use Green Force's recycling service, yet Green Force cannot accommodate more clients. Unless the other recycling companies expand their service, their compliance to separate and recycle their waste will be left with no answer.

The government holds the power to control and strictly ban the imported products that cannot be recycled and force the customers to consume only the responsible products; thus, it will support the application of separation and recycling. This strategy will require cooperation for importers and the tourism industry to adjust their preferences.

"So, if you want to clean your island, you want people not to throw their bottles from the window or sit in their pile of garbage. Make it worth something." Tim, Waste management official

In order to prevent fewer plastic bottles from entering the landfill, the idea is to re-introduce a bottle deposit system. More than 15 years ago, the government had a pilot project to introduce a bottle deposit system. The deposit system was greatly responded to and the budget that had been intended

to last for six months, unfortunately only sustained it for two and a half months. Sadly, the response was not followed by formal law; the government officials were too afraid to make such an unpopular decision. The government never created a law to strengthen and re-introduce the initiatives, and as such it will require the private companies that produce bottled beverages to agree on the deposit amount and keep the competitiveness between them.

Since the economic conditions of Curaçao are currently in an adverse position, the government can also benefit more from the tourists and charge them environmental tax that can only be used for environmental causes including waste management; so everybody on the island can benefit from the growing tourism (Leo, social interaction, April 25, 2019).

4.2.4 Stakeholders and responsibilities

Stakeholders are an essential component to the implementation of the ISWM, together with the (practical and elements) of the waste system, and the aspects of the local concept. (Hoornweg and Bhada-Tata, 2012; Klunderst and Anschutz, 2001). To understand the stakeholders behind the waste management in Curaçao, it is essential to distinguish their roles and responsibility. Waste management in Curaçao falls under the Ministry of Health, Environment, and Nature or GMN. After the change in the constitution in 2010, the GMN was established and is responsible for the creation of policies regarding public health and environmental matters.

On the other hand, Selikor as the executive side in waste management, executed the waste handling and collection with 100% of its shares owned by the government. In 1996, the first waste tax was launched, and it has not changed since then; it goes to Selikor to fund their daily tasks. Selikor owns two subsidiaries that have handled recycling and incineration: the Caribbean Recycling Company NV (CRC) and the Curaçao Incineration Company NV (CIC). The CRC was founded in 1999 and handles the recycling of waste construction materials; Selikor owns 70% of the CIC shares, making them the main shareholder. After being established in 2003, it has continued to have deficits which has been compounded by their incinerator breaking down later due to poor maintenance (Caribisch Netwerk, 2018). Other than that, Selikor monopolized landfill management, household waste, and street cleaning in Punda and Otrobanda. Based on Selikor's tasks, commercial waste was left to the open market; since another waste handling company, such as ETCO, can collect waste from hotels, restaurants, and companies. Yet, all collected waste needs to be brought to Selikor's landfill in Malpais.

Figure 15. Green Force recycling facility

Recycling companies like Green Force are free to operate and collect recyclable materials, such as plastic, aluminum, cardboard, and batteries (see figure 15). The costs are based on the service that they provide, e.g., pick up only or separation. Households are free to drop off their recyclable materials at three different drop-off points or directly at their recycling station. Their clients range from hotels, tour agencies, and companies. Inadequate enforcement regarding waste law has resulted in low participation in separation and recycling. Thus making the existence of recycling companies based on limited business opportunities and some initiatives of people that aware of the importance of recycling.

Several initiatives related to plastic use, waste behavior, or environment are present in Curaçao. Their programs include education about waste behavior for students, clean up, awareness campaigns, or providing consultation for policymakers if needed. As NGOs, they are working based on funding from international or local donors and some volunteers. In 2012, Curaçao participated in World Cleanup Day and has been doing so since then. World Cleanup Day is an initiative started in Estonia, where the participants clean the entire country from illegally dumped waste in a few hours; thus inspiring other countries to do the same. In 2018, Curaçao Cleanup Day managed to clean 1,000,000 kilos of waste with the help of 3,000 volunteers (World Cleanup Day Curaçao, 2018).

"Personally, for awareness, the government should play an active role, but they have not, that has been done very well by the NGOs and the civil society. Personally, the government should take more approach towards that. We also apply the polluters pay principle, so in that sense, the corporate world should be more responsible for waste management and be more proactive. According to the polluter pays principle, they need to respond and play the corporate social responsibility initiatives, more actively. I cannot deny that certain companies are frontrunners, so they are proactive, but it is mostly larger companies, and for smaller companies, the environment is not their priority," Lucy, Environmental official.

"I need some meaning; I see a system that is not working. It is very difficult to initiate a change. But we need change; we need to come together …." Mia, NGO

NGOs in Curaçao have filled the gap of government responsibilities and acted out of the frustration because of the conditions in Curaçao. They work together with some private companies and tourism industries to create more impact. It is interesting to note that most NGO initiators comes from abroad and moved to Curaçao for various reasons (e.g., work, family, retirement); they possess the knowledge of more advanced waste management systems and believe they know more than the local people. However, these 'dictated' behaviors are hard to accept by the local people; resulting in no real changes in the local's behavior towards waste management (Anthony, personal communication, Aril 26th 2019)

"The Government needs to make sure that they are creating some regulations and NGOs have to keep doing what they are doing, like educating, cleaning up, and repurposing. Small companies need to keep doing what they are doing because they were demonstrating the economic value of our waste." Mark, Recycling company

"We tried, but it was a long time ago, but it only works when you do it together… However, if we are gonna be more expensive and also the moment you are gonna start with money, fraud." Sophia, private company

Meanwhile, beverage companies in Curaçao contribute as one of the polluters on the island (see figure 10), yet, they do not have policies that encourage the customers to recycle or return the bottles. One of the companies stressed the importance of doing the bottle deposit together with all the other beverage companies on the island. They cannot afford the risk of selling more expensive products on the market. She also mentioned the possibility of fraud since the bottle deposits are related to money. Therefore, beverage companies share the responsibility of managing the bottles that they have produced since they contributed to generating more plastic bottles that will end up in the landfill.

Last but not least is the tourism industry. People in the tourism industry have the means and power to apply recycling systems and use biodegradable products in their services. They acknowledged that

recycling is vital for the environment, but some still chose not to do it because there is no encouragement or enforcement from the government to have better waste management practices. For an island like Curaçao, a landfill is the most efficient method to handle the waste being generated, since it has maximum benefit with minimal cost; yet, it is not environmentally sustainable (Ministry of Health, Environment, and Nature, 2014). However, with their interactions with the tourists, they have the power to influence the tourists about separation and recycling by demonstrating the initiatives of recycling and educating them about sustainable practices.

Table 4. Stakeholders participation in waste management (Source: personal collection)

Stakeholder	Roles	Expectations	Challenges
Ministerie van Gezondheid Milieu en Natuur (GMN)	Policymakers	Better cooperation between commercial recycling companies	- Difficulties in enforcing the law regarding illegal dumping] - A different vision of the parliament appeared to be an obstacle to create a policy on plastics banned
Selikor	- Waste management executor - Managing Malpais landfill - Collect household waste - Clean Punda and Otrobanda streets	Increase waste tax Waste to energy	Perception of a low waste tax is not enough to have more advanced waste management system
Recycling companies	- Create a business opportunity from recycling material - Collect and ship recycling materials to another country	Government to provide an area for recycling stations Lower harbor tax	Minimum support from the government
Tourism Industry	- Implement separation and recycle for their waste stream - Use biodegradable products - Use less packaging/plastic if possible - Promote sustainable lifestyles	Selikor provides pick up recycling services	- Limited alternatives for recycling - Lack of incentives from the government to adopt sustainable practices
Private companies	Bottle deposit system	Law enforcement from the government	- Expensive raw materials - Difficulties in collaborating with other beverage companies regarding the bottle deposit system

The landfill is an efficient method for a small island like Curaçao, yet, it is not environmentally sustainable for the long term, where recycle, reuse, and reduce (3Rs) are more desirable for the environment. The idea of reducing the waste rather than managing the impacts of the waste generated was mentioned by Gerstakis and Lewis (2003) in order to have less impact on the environment; thus, it does not account for the financial costs that might arise from administering the 3Rs. The condition of the limited recycling infrastructure might add further complications to improving waste management on the island. Furthermore, recycling initiatives need to get more support from the government, since the capacity of the landfills will reach its maximum in about eight years. Therefore, the tourism industry has the opportunity to initiate the movement since it can bring them a better business. Table 5 displays a summary of the stakeholders in the waste management practice.

Figure 16. Stakeholders mapping (Source: personal collection)

Figure 16 illustrates the position of the stakeholders regarding their interest and power. GMN and Selikor are the key players in waste management on the island; GMN is responsible for constituting the law regarding waste management and Selikor holds the executive power of waste management. However, even though the private recycling companies have a high interest in waste management, they do not have the power to influence the policy; thus, putting their position below the governmental bodies. Hence, the tourism industry as the largest contributor to Curaçao's economy has a significant influence, yet, they need certain incentives to adopt sustainable practices. Thus, the beverage companies display less interest or power in waste management since their willingness to initiate a bottle deposit system is entirely dependent on other companies, and at this moment, the condition will not change.

4.3 Vector-borne diseases and their impact on tourism

4.3.1 Current Situation

Development activities, such as tourism, can influence the existence of Vector-borne diseases[4]. Since the amount of waste being generated can increase the number of essential containers that can be the source of mosquito breeding sites; thus, waste management is one of the most optimal ways to control the spread of VBDs. Curaçao has witnessed VBDs such as chikungunya, Dengue, and recently Zika. The last epidemic of Chikungunya occurred in 2017 and hit the island heavily, where the Geneeskundige en Gezondheidszaken (GGD) suspected that 50-75% of the population had the disease (160.000 total population). Since there were no methods to calculate the exact number of people with the disease, GGD calculated this based on the observed symptoms and sampling (Jacob, personal communication, April 18, 2019). Not long after Chikungunya, a Zika epidemic also occurred in Curaçao with fewer cases compared to Chikungunya, even though the physical manifestation was less apparent than Chikungunya, Zika received more significant attention from the international population. The WHO warned that Zika could affect pregnant women, thus affecting touristic visits in Curaçao since the disease was in the worldwide news. Several cancellations at hotels and tour agency nonetheless did not affect the general tourism in Curaçao.

VBDs mostly occurred during the rainy season, between October – February, so during the data collection, Curaçao already passed the period of VBDs. In the 2018-2019 period, no epidemics were reported, and VBD cases in Curaçao followed the average rate without any extreme cases. Vector controls were mentioned by the WHO (Kyle and Harris, 2008) as the best way to prevent transmission of the virus, this induced waste management behavior, such as regularly collecting the garbage to reduce water puddles and eliminate illegal dumping to control the vector breeding sites. However, Selikor collected the garbage once a week and displayed no differences in waste treatment during the rainy or dry season (Selikor, n.d.).

4.3.2 Prevention

During the epidemic, the government launched several campaigns on television, local radio, and in the newspaper to raise awareness about VBDs. However, after the epidemic had passed, the campaign about the VBDs also disappeared into thin air.

Hotels and restaurants are the ones that keep continuing the prevention methods since they are aware of the danger of mosquitos, and it can affect their business. They tried to prevent the mosquitos by identifying the larval habitats; with the prevention methods employed varying from mosquito traps, professional cleaning, and the planting of anti-mosquito plants.

The prevention of VBDs mainly focused on the campaign to distribute information about the diseases. During the Chikungunya outbreak, the circulation of information was not fast enough, and the disease already occurred and affected half of the island's population. On the contrary, information on Zika was extensively distributed, however since the local population did not see or feel the physical manifestation, nothing changed their behavior towards vector control (van Goudoever, 2018; Jacob, personal communication, April 18, 2019)

[4] Vector-borne diseases account for human illnesses caused by parasites, viruses, and bacteria that are transmitted by mosquitoes, sandflies, triatomine bugs, black flies, ticks, tsetse flies, mites, snails and lice. The most known vector is mosquitos that transmit infectious diseases such as Chikungunya, Dengue fever, Lymphatic filariasis, Rift Valley fever, Yellow fever, Zika, Malaria, Lymphatic filariasis, Japanese encephalitis, Lymphatic filariasis, and West Nile fever (WHO, 2017).

4.3.3 Mitigation

During the outbreak period, the health department went to houses and hotels to look for a possible breeding site and inspect the entire property. Yet sometimes, they overlooked the properties and missed the possible breeding sites, such as tires, flower vases, or a small puddle of water. Meanwhile, the population was also skeptical since they did not like having a stranger around their property, so the most natural way was to say something that they needed to hear. So, with that combination, the inspection intended to control the vectors had no significant results in reducing the breeding sites.

"The government tried with some programs 'hey clean your garden', they also checked out some stuff, they asked if they can walk around, but they cannot obligate you to clean up your premises." Gerard, tourism industry

"Somebody passed by, they were a student, and they said 'do you have puddles of water' 'no I do not have any' and then he left. I can still have them and I am not aware of it, so he should inspect it so he knows where to look." Daniel, NGO

"You do not get the garbage if you do not need to take out your garbage, your collection of water. If you continue having this breeding site. So these are issues that are localized." Jacob, Health official

One of the government's solutions is to fumigate the neighborhood and show them that the government is physically doing something to prevent or handle the epidemic. However, spraying only works for adult mosquitos, and if it is the rainy season, it becomes less effective and will not have any effect on the larva. This fumigation can also make the mosquitos resistant to future fumigation.

"But again it is just a show, politics. No one tells you what you did is effective or not; it is not important. So, everybody gears towards 'if you do not fumigate, so the government does not do anything'. If people tell me and clean their yard but if the neighbors do not do that and there is an open area that belongs to the government and people use it as illegal dumping and water collection site there and yet they go 'you are telling me this is my fault?'". Jacob, Health official

Despite the physical response to mitigation, health officials stress the importance of actually applying the preventive measures. Since vector control is something that needs to be done by everyone, local populations tend to accuse their neighbors of the mosquitos. The local population is aware of the cause of the diseases, and yet they did not do anything to avoid the possibility of having breeding sites at their properties. He mentioned that the gap between having the knowledge and applying said knowledge is enormous.

4.3.4 Awareness

During the outbreaks, the government conducted campaigns on TV, radio, and shared flyers, but the information was not received equally by the local population (van Goudoever, 2018). Yet, the tourism industry is more proactive in distributing information. CHATA in coordination with the health department and CTB created flyers (See figure 16 for an example) for the tourism industry so they can take some measurements and inform the clients about the situation.

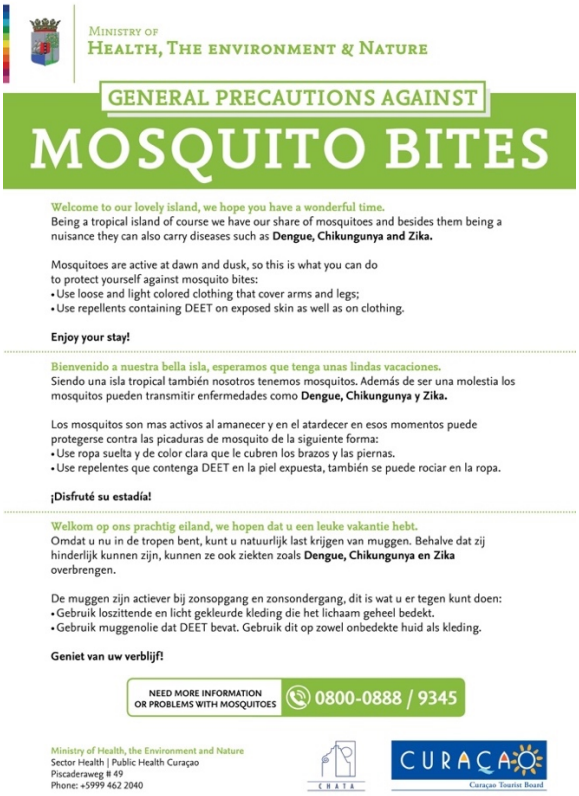

Figure 17. Flyer of general precautions against mosquito bites, (source https://antilliaansdagblad.com/nieuws-menu/12998-afzeggingen-door-zika)

People in the tourism industry realized that tourism is a dynamic business that can quickly change due to the slightest adjustment, thus making the Zika outbreak a thread to the tourism industry. They took extra measurements by hiring professional pest control and using mosquito traps and continuing doing so after the epidemic period ended. Since 2015, the worldwide media coverage reported Zika cases in South America and the Caribbean and fueled the general public about its danger without further scientific research. The perception of Zika as being highly threatening, especially for pregnant women, circulated extensively within the general public. Despite the international attention of Zika since it can affect pregnant women, during the outbreak period, Curaçao fell into Category 1 as an '*area with a new introduction or re-introduction with ongoing transmission'* of the WHO classification table which led to travel warnings from several countries (WHO, 2018). It is clear that Zika received more recognition compared to other VBDs.

4.3.5 Impact

Tourism as a form of human mobility can facilitate the spread of VBDs since it easily connects any two points in the world. It can introduce the pathogen to a susceptible population or increase the contact between infected individuals and populations; both may arise the possibility of an outbreak (Findlater and Bogoch, 2018).

The World Bank (2016) did an assessment on one of the VBD outbreaks, on the Zika Virus, and stated that the '*Initial estimates of the short-term economic impact of the Zika Virus epidemic for 2016 in the Latin American and the Caribbean region (LCR) are modest: a total of US$3.5 billion, or 0.06% of GDP. '*. For countries that are more dependent on tourism, the economic impact can be more substantial and might require additional support from the international community. Yet for Curaçao, figure 18 display that the outbreak has had no significant impact on touristic visits.

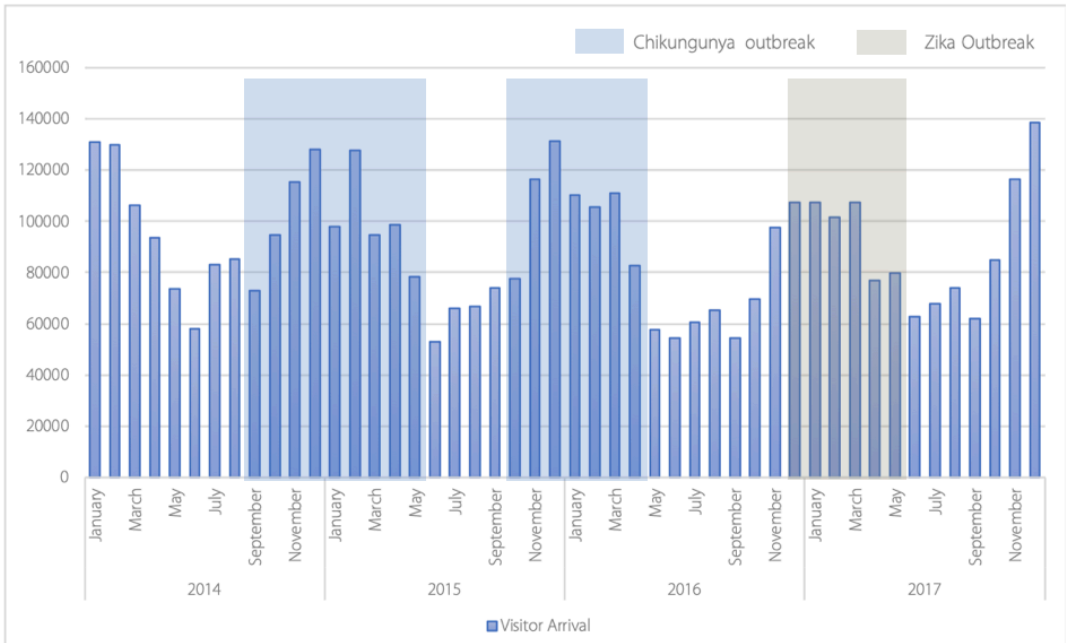

Figure 18. Visitor arrival and VBDs outbreak, (source: CHATA 2015-2018; Jacob, personal communication, April 18, 2019; personal adaptation)

During the Zika Outbreak, there is a slight difference in touristic visits since it happened during the high season. Compared to the Chikungunya outbreak that partly happened during the high season, the Zika outbreak was demonstrated to have led to fewer touristic visits during the high season. Tourism officials followed the progress of the epidemic and had taken necessary measures to address Zika. They also worked together with the health department and tourism association to come up with a concrete action plan, thus the details of the action plan were not explained further. On account of the Chikungunya outbreak that impacted profoundly on the local population, there was no significant impact on touristic visits considering its severe symptoms.

"We had some worrying emails before people had arrived, we had several cancellations because they are pregnant and did not want to have any risks, specifically when they come with a disabled child. However, it was very limited. The influence was not that big." Anne, tourism industry

"During the Zika periods we had a couple of cancellations of pregnant women who were too afraid to come, but we did not see dropped in our occupancy rate, so no, we were not affected, not in that sense" Julian, tourism industry.

The tourism industry noticed the effect of Zika since they received questions and cancellations, especially from pregnant women since they are at a higher risk. However, for the tourism industry in Curaçao, the cancellations were minimal, and they did not affect their occupancy rates. The only noticeable difference is the question regarding the safety of visiting the island during the outbreak.

Global travel has evolved significantly in the past years, and air travel has connected two or more points with ever-escalating speed, distance, and volume (Alirol et al., 2011). Figure 19 illustrates the direct flights that are available from Curaçao. The figure represents the possibility of introducing the pathogen to other locations during the outbreak; but it does not account for the travelers that come from countries outside of those depicted in figure 8. The outbreak in Curaçao can quickly become an epidemic and uncontrollable.

Figure 19. Direct flights from Curaçao (Source: Google flights, n.d.; personal adaptation)

The effect of VBDs on touristic visits depends on the exposure of international news and health organization. For the Zika virus, the sensitive at-risk population, pregnant women, also accounts for further international awareness of the disease. With the awareness of the global population, Zika has been in the spotlight of the media more than other diseases or epidemics, and within a few months of its first outbreak, the Pan American Health Organization (PAHO) issued an alert regarding the Zika virus. Later, other countries successively issued travel notices for countries with Zika virus transmissions, including Curaçao (Nelson, B. et al., 2016). Travel notices or warnings were issued by official government agencies to warn their citizens of the safety risks regarding destinations that affected by the epidemic (Ngwira, 2016). In their study, Ngwira (2016) also found that travel warnings can substantially negatively affect the tourism industry and national economic growth; and it can take a while until a country recovers from such an impact. In 2016, the Centers for Disease Control and Prevention (CDC) issued a Level 2 travel warning that tourists should '*practice enhanced precautions*' for Curaçao; with this alert meaning that additional precautions are needed to visit Curaçao. The alert was lifted in February 2019 (CDC, 2019). However, figure 18 demonstrates that it has had no significant impact on the VBDs in regards to tourists' arrival in Curaçao.

Even though studies said that the outbreak of VBDs, can negatively affect tourism in the economic development of a country, yet Curaçao's tourism industry performed normally. Zika was much more massively covered in the international news compared to Chikungunya. Regarding this, the tourism industry received several cancellations from pregnant women; however, the touristic performance remains unaffected. With exposure from other countries, Curaçao is also susceptible to new diseases or another outbreak.

4.4 Sustainable tourism

4.4.1 Tourism impact

Touristic development does not come without any consequences. In order to obtain further economic development, the environment was put at risk. The massive development of tourism comes hand in

hand with the expansion of hotels and artificial beaches. Especially after the recent oil refinery crisis, tourism has become more critical to supporting the economy of Curaçao. The government tried their best to deliver a holiday destination and sometimes goes over the protected area. Without any active supervision from tourism officials, tour operators tend to over-exploit marine protected area sand endangered nature and animals.

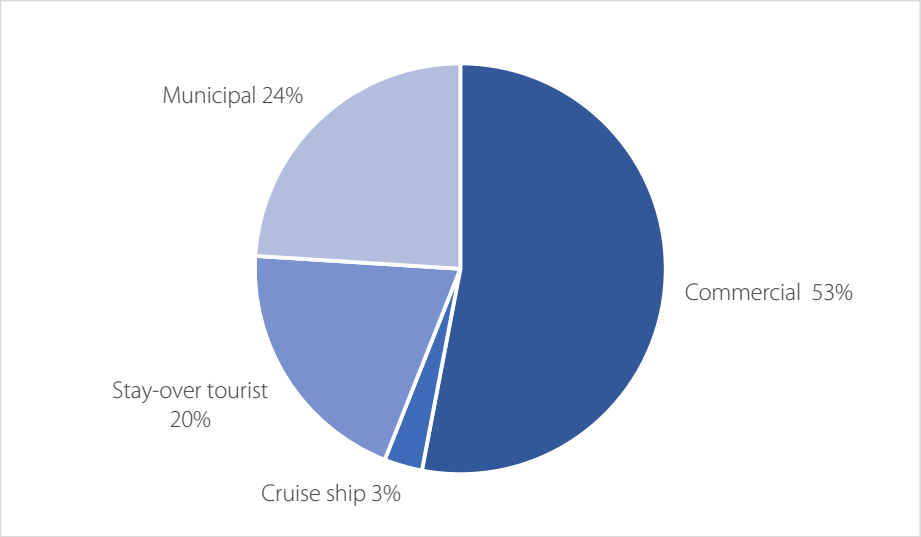

Figure 20. Contribution to waste volume (Source: UNOPS, 2018; personal adaptation)

In order to fulfill the needs of the different types of tourists that come to Curaçao, more products are being imported and produce more waste compared to the locals. Thus, more comprehensive waste management is needed to handle the growing waste volume. Waste behavior among tourists also depends on their origin, where they practice the same waste behavior they used to do in Curaçao. Tourists that come from the countries with advanced waste management are more likely to use the recycling bins available in contrast with tourists that come from countries with the same level of waste management.

"We cannot deny the effect that tourists produce more waste than the locals. It is because if they are here they tend to consume more, they eat a lot, they buy a lot, and those things produce waste. I think the more tourism grows, the more we need to have a good waste system." Max, Tourism official

Compared to other types of waste, tourism alone contributes to 23% of the total waste generated (see figure 20). With current waste management and the rapid development of tourism, this amount can quickly grow.

"… (we are) about establishing a quota in terms of the number of hotels and things like that. We waited for that and let us wait until we reach that level." Max, Tourism official

"at a certain point it is going to be over touristy, and that is the moment that people think… In high season you see that going lower and then it is flattened out. That is the level that you want to reach because you want to balance" Gerard, Tourism Industry

In the times to come, Curaçao is expected to have more investment coming in terms of the tourism industry, where several international hotel chains have built thousands of rooms to accommodate the growing tourism. Despite this growing development, at the moment, Curaçao does not have a precise number regarding its carrying capacity. The tourism officials and the tourism industry have agreed that Curaçao needs to surpass the mass tourism first to see the island's capacity. With that mindset, it is possible that Curaçao might not survive mass tourism because the necessary actions to limit the growth might be too late. This condition represents being ignorant of the negative impact that might

arise from touristic development, to the contrary to the definition of sustainable tourism (See WTO, 2001)

Table 5. The leading indicators of the sustainability certificates (Source: Green Globe, n.d.; Travelife, 2019; BPM, 2015

	Green Globe	Travelife[5]	Bedrijvenplatform Milieu (BPM)
Certification level	- Certified member: >50% indicators are achieved - Gold member: Certified for five consecutive years - Platinum member: certified for ten consecutive years	Gold certification: passed the audit and finished the improvement within six months	- Level 1 – Caterpillar: 60% of indicators are achieved - Level 2 – Cocoon: achieved 60% of 18 efforts - Level 3 – Butterfly: 60% of 20 efforts
Environmental	- Total energy consumption - Total water consumption - Water-saving - Wastewater management - Total waste production - Waste recycling - Sustainable products - Chemical products use	- Total energy consumption - Total water consumption - Total waste production - Water-saving - Waste recycling Chemical waste treatment - Sustainable products	- Waste recycling - Chemical waste treatment - Paper products - Total energy consumption - Total water consumption - Water recycling - Green roof - Environmentally friendly cleaning product - Carbon offset - Sustainable purchasing
Social/Cultural	Community commitment	Community integration	- Employment outing - Fair compensation - Price or award competition in sustainability - Community service - Disabled employees
Economy			Corporate social responsibility

Table 6 above summarizes the certifications in the tourism industry that relate to sustainability. Especially in the environmental category, the indicators are directed towards sustainability; thus, the sustainable initiatives that emerged among the tourism industry can be categorized to fulfill the certifications' indicators. The certifications in Table 3 were mentioned during the interviews, namely Green Globe, Travelife, and Bedrijvenplatform Milieu (BPM). Those three standards are based on the basic sustainability concepts of People, Planet, and Profit. That requires them to apply sustainability behavior in their practices.

To go deeper into the certifications, BPM is the only local certification curated their own Sustainability Minimum Standard (SMS). Compared to the other certifications, BPM stands out, especially in the social/cultural category. The SMS goes further and required companies to hire disabled people, which does not exist in the Green Globe and Travelife. Font (2003) argued that certifications often lack extensive social/cultural standards, which is visible in the case Green Globe and Travelife. Both terms of community commitment and community integration mentioned by Green Globe and Travelife are vague and do not explain social/cultural responsibility; they also are open to much interpretation.

[5] Obtained from Travelife Gold Standard for Small properties

Even though BPM has more comprehensive sustainability indicators, they focus more on the business platform; hence some participants are not familiar with their existence, at least compared to the Green Globe and Travelife certifications that only focus on the tourism industry. The fact that BPM is the only local certification with lesser popularity than international certifications has influenced its adoption in Curaçao; hence, the tourism industry opted to choose international certifications.

From Table 6, we can conclude that most of the standards are more focused on environmental issues; hence, waste recycling arises as a mandatory environmental indicator. A thorough environmental indicator demonstrates that being 'green' is the main focus of the certifications; except for BPM, social/cultural standards are almost unlikely, and economic standards are simply nonexistent in the certifications. The absence of economic standards might be related to the economic profit as one of the benefits of the certification itself; unless the economics revolves around social issues that fall under management (e.g., fair wages for the employees). Thus, the standardization in regards to economics might be unnecessary. The quote below supports the idea that being sustainable can also be profitable:

" *Then there are tons of studies that show, the more sustainable you are, the more profitable you are, then the more innovative you are to be in long term success." Tim, Waste management official*

Recently, sustainability certificates are required by international travel agents, such as TUI, to keep having a business and send their clients to affiliate hotels. Hence, the idea is to motivate the tourism industry to be more interesting for sustainable tourism but also gain profit at the same time; in line with the findings of World Tourism Organization and United Nations Development Program (2017) that profitability remains the primary driver of sustainability for the tourism industry. However, international travel agents can act as a source of external pressure on the Curaçao tourism industry to strive for the certifications. If the tourism industry business relies on the international travel agent, they will have no choice but to comply with the requirements, such as acquiring the certifications.

4.4.2 Competing interests

The competing interests regarding tourism are a growing case in Curaçao tourism. The arguments between the environmental side and the tourism side have occurred inside the government.

"We already have limited space, so we do not need more hotels or franchise big hotels." Lucy, Waste management official

"It (tourism) is growing, we are happy with that, but we are trying to grow, especially from the North American market. We also see an increase in average daily rate (ADR) of the hotels, so we are happy, but we have to make sure to maintain this trend." Hannah, tourism official

The quotes above point out their perception of tourism development in Curaçao. Understandably, environmental officials prefer to have limited tourism since tourism can negatively affect the environment if not managed correctly; however, tourism officials expressed the necessity of growing tourism and obtaining more profit from it. The World Tourism Organization (UNWTO, 2005) describes sustainable tourism as " *Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of the visitor, the industry, the environment, and host communities.* "In order to achieve sustainable tourism, Curaçao still needs to work on their vision of future tourism without having to sacrifice nature for its economic growth. It is crucial to find a common interest from both the tourism and environmental sides to achieve sustainable tourism.

Table 6. Stakeholders' insight on sustainable tourism

Stakeholder	Main topic	Insight
Tourism official	Develop responsibly	*"What we need to take care of is that we do not damage our ecology more. We make more use of ecology. We wanted to develop the island with more responsibility. Sometimes people still think that ecology comes in the way of development. However, when you marry them then you get something strong" - Max*
Waste management official	External pressure	*"I hope more external pressure about a sustainable destination." - Tim*
Environmental official	Increase the awareness of the tourism industry, especially tour operators	*"To increase the environmental awareness of tour operators because certain areas are protected, but they do not know the code conduct within those areas because it is very big and local recommendations." - Lucy*
Tourism industry	Use sustainable resources Educate the suppliers about sustainable packaging	*"We have three important things, which is the sun, the wind, and most of us forget the sea. I added the fourth one, which is waste. If you use the four of them which is to be sustainable." - Carlos* *"You can educate your stakeholders, your suppliers. You can inform your suppliers the way you are thinking, the way you operate, ask them to think about it and implement those rules, implement the way of thinking in their company" - Julian*
NGO	Local economy	*"It is about those big hotels. You have to work with another system, small hotels, locally owned. However, if you have small hotels, if one fails, it is not a problem." - Anthony*

Sustainability is not merely about the environment but also accounting for the local economy and its people (UNWTO, 2005). Table 7 provides some insights from stakeholders about sustainable tourism. They are aware of the importance of sustainable tourism and notice that some aspects still need to be improved. Their insight differs from the local economy regarding external pressure. If their insights are incorporated in the tourism plan or any development policies, it will make Curaçao closer to binge a sustainable destination.

Meanwhile, sustainability is not a new word for CHATA. One of their task forces focuses on sustainability. However, since it was initiated, they are still struggling to apply the sustainability standards. Nevertheless, it shows that as a tourism regulator, CHATA demonstrates their interest in sustainability.

"I have always been in the sustainability task force of CHATA, which was a challenge to hold because there were many stakeholders, and we were not aligned. So, there was a lot of discussion and meetings, but there were not any outcomes." Anne, Tourism industry

"the thing is with the sustainable taskforce it is hard to get people on board because it is not such a sexy topic, so it goes to the background really easy. So, there is more pressing stuff, and that stuff takes the foreground." Hannah, tourism official

The other tourism agency, the Curaçao Tourist Board, is busy with making a new masterplan to replace the 2015-2020 tourism masterplan. The new masterplan will consist of six Destination Management

Areas (DMA), where each DMA will receive specific attention regarding the development needed. They will use a sustainability approach to address the specific issues in each DMA. The DMA will accommodate the local environment, social, and economic issues in that area and will be handled by the management. Tourism officials realized there is a need to improve their touristic quality since tourists have become more complicated and demand more than sun, sea, and sand. The increasing demand from a tourist that wants to experience the local culture and cuisine made tourist officials include the experiential tourism in their masterplan so that tourists can create meaning through direct experiences with the locals. However, tourism officials noted that they want tourists to enjoy the island and will not be burdened by the label of sustainable tourism, therefore sustainable tourism will not be mentioned in the new masterplan.

Tourism has proven to negatively affect the environment and has increased the waste produced on the island. Therefore, the economic situation in Curaçao is still relying heavily on tourism, and they wanted to develop it to the fullest by adding more flight frequencies and destinations and attract international chain hotels. Even though sustainable initiatives were done to achieve travel awards, in the end, it will still be good for the environment and the business.

5 Discussions

The current research aimed to discover the waste management of the tourism industry and its effect on VBDs. The literature justifies the importance of waste management to control the spread of VBDs, and the effect of VBDs on the tourism industry (WHO, n.d.); nevertheless, this research demonstrates some notable findings. In the current research, the waste management practices of the tourism industry were discovered via communication with different stakeholders (the tourism industry, government officials, a private company, and NGOs). Throughout this section, the relations of the main findings will be presented, and their association with the Sustainable Development Goals will be presented; followed by a section on the limitations of the research. Following that, recommendations for further research will be presented in the following section. Finally, the results of this research will be concluded in terms of sustainable tourism as the central concept.

5.1 Tourism industry waste management and its contribution towards VBDs

The results of this research present that the tourism industry is aware of the importance of separation and recycling; thus, they are actively engaged with the recycling companies on the island. A possible explanation that arises from the results is that people in the tourism industry had been exposed to the best practices in waste management somewhere else. This exposure could explain the gap between the local and the people in the tourism industry. A lack of education on waste management in public schools can be caused by low awareness in the local population. At the same time, tourism certifications acted as the external pressure for the tourism industry to adopt sustainable practices; that includes separation and recycling in waste management. The external pressure in terms of waste management completes the lack of enforcement and encouragement from the government to apply separation and recycling. The recycling and waste management that has been conducted by the tourism industry is an essential vector control to prevent the spread of VBDs, even without knowingly understanding the connection.

The tourism industry is very vulnerable to any outbreaks that might occur in the future since the outbreaks might influence visitor arrivals on the island. This research demonstrates that the last few outbreaks in Curaçao had a minimal impact on touristic visits and the economy in general, yet studies

have stated the opposite. A possible explanation is that during the Chikungunya outbreak; the news was not circulated adequately in global news; and tourists might not have realized that Chikungunya had been circulating on the island. During the Zika outbreak, the vulnerable group was pregnant women, so the cancellations mostly came from them without affecting other groups of tourists. Yet, figure 10 illustrates the possibility of the introduction of new diseases by mapping the available direct flights from Curaçao. The literature (Alirol et al., 2011) argued that global travel could increase the risk of an outbreak due to it being fast-moving. If during the last outbreaks Curaçao tourism did not experience any significant impacts, there is always the possibility of future outbreaks. In this research, the tourism industry shows that they have the power and resources (money and people) to actively participate in vector control management without waiting for government incentives or enforcement.

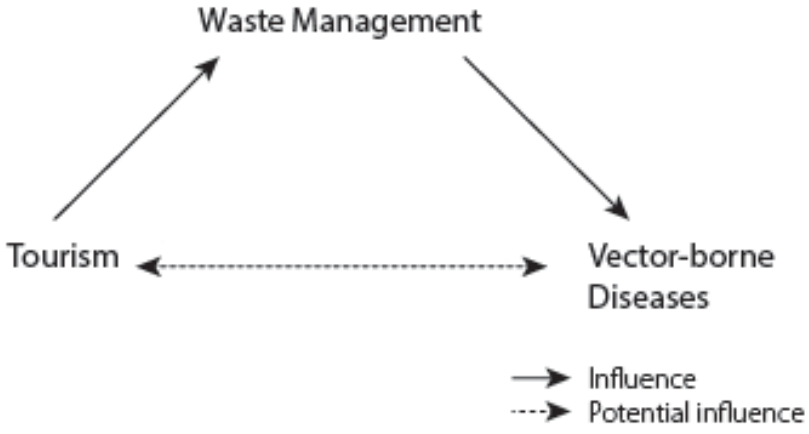

Figure 21. The relations between waste management, tourism, and VBDs (Source: personal collection)

Figure 21 displays the simplistic connection between three components in this research. Waste management as the form of vector control is the best way of restraining the spread of VBDs since it contributes to lessening the mosquito breeding sites (WHO, n.d.). Yet in Curaçao, the initiatives from Selikor as the executive waste management to link the importance of VBDs and proper waste management is lacking, especially compared to GMN or the tourism officials. The possible explanation for the lack of awareness from waste management officials is since VBDs fall under the scope of public health, and the campaign was only urged during the outbreak. The removal of larval breeding sites, such as old tires, requires massive participation from the population (Hemmingway et al., 2006), yet illegal dumping in Curaçao (figure 7) might pose a threat to the effectiveness of vector control since some possible breeding sites are left in the open. The lack of awareness regarding the reuse, reduction, and recycling (3R) of the local population has been a continued complaint of the tourism industry. The possible explanations for this regard the lack of the awareness of local education in Curaçao that the waste management might not be embedded in their curriculum; thus, it leads to uneasy access to advanced waste management, such as the 3Rs.

The connection between the outbreak of VBDs and tourism is theoretically proven (World Bank Group, 2016; Ngwira, 2016); however, in Curaçao, it was the opposite. Thus, it does not make Curaçao an exception for future damage by other outbreaks, mainly since global travel retains the possibility of another outbreak or introducing new diseases (see figure 10 for the illustration). Of equal importance, tourism as the most significant economic contributor in Curaçao which does affect waste management on the island. Besides, generating more waste than the locals, the tourism industry also has the power to influence the waste behavior; moreover, the tourism industry can control their import and use less packaging in the process by suppressing the sustainability certificates. Thus, thorough explanations of sustainable certificates will be presented in the following chapter.

5.2 Curaçao tourism and its way to sustainable tourism

In this research, sustainable or tourism certifications were mentioned as one of the reasons to practice more advanced waste management, namely separation and recycling. The certifications share the same principle of Planet, People, and Profit, as the Sustainable Development Goals (SDGs). The World Tourism Organization (UNWTO) pointed out that tourism has been included as targets in Goal 8 (decent work and economic growth), Goal 12 (responsible consumption and production), Goal 14 (life below water), and Goal 17 (partnership for the goals' in general; hence, tourism potentially contributes directly or non-directly to all of the goals) (World Tourism Organization and United Nations Development Program, 2015).

The tourism industry in Curaçao is indeed contributing significantly to Curaçao's economy and more than the oil refinery; thus representing Goal 8. This research has found that the tourism industry has the possibility to create more job opportunities; yet the local people do not have the capacity to respond to high-skilled jobs, thus ending up with low-skilled jobs. The lack of high-skilled employees might be embedded in the local education system; the possible explanations are 1) the high-skilled population usually went abroad for higher education, and they do not return to Curaçao; and 2) tourism is seen as an unpretentious industry, and they would prefer working in other sectors (e.g., doctor, banker). Nevertheless, the tourism industry has the power to merely influence the education system in order to re-skill the local population and generate a more significant economic impact.

One of the indicators of the certifications that was also stressed was the importance of using sustainable products, such as paper straws, biodegradable products, and organic cleaning products, adhering to goal 12. Nonetheless, the initiatives to use sustainable products has to come from the tourism industry itself, since the local policy has yet to exist or be implemented. Liu (2003) and Agyeiwaah et al. (2017) justified the lack of policy as a challenge due to the diverse stakeholders, this manner also having occurred in Curaçao. This research mentions different ambitions between the GMN and the parliament regarding the constitution of the banned plastic; hence portraying the diverse stakeholders' interests. It is essential to find a mutual interest in regards to enforcing the use of sustainable products in the tourism industry.

Goal 14 accounts for the impact of tourism on coastal communities, fisheries, the high seas, and coastal areas. In this research, several stakeholders expressed their concern regarding the adverse impact of tourism on the environment. It is possible that they only see the destruction of nature and do not take into account the impact on Curaçao's economy. However, to achieve sustainable tourism, it is necessary to balance the sustainable growth of tourism's contribution to the economy and the sustainable use of resources and the environment (Hardy and Pearson, 2002; Liu, 2003). To find a balance between tourism and the environment, a carrying capacity study might be necessary to prevent Curaçao's tourism from develop into a mass tourism destination. Given its focus on implementation and partnership across stakeholders, Goal 17 binds all SDGs together. To achieve sustainable tourism, the collaboration of Curaçao's stakeholders, namely the tourism industry, private companies, and government institutions is necessary.

In Curaçao's tourism industry, sustainable certifications are adequate instruments to internalize the goals and contribute directly to the SDGs. The certifications oblige the tourism industry to adopt some of the sustainable initiatives such as waste management, sustainable energy sources, and sustainable products; in other words, the certifications' indicators can possibly or partially substitute the SDGs' indicators. Thus, the certificates can be seen as the solution to achieving sustainable tourism, especially in a profit-based industry such as tourism. The opportunity to progressively encourage more members of the tourism industry to adopt the certifications lays in the hands of tourism officials. One of the solutions is to enshrine the certifications in the requirements for a business permit for the tourism industry; thus, they will comply with the requirements and apply sustainable practices. Furthermore,

waste management is also accounted for in sustainable certifications, hence contributing to controlling the spread of VBDs.

5.3 Limitations

This research faced several limitations during the process. Firstly, one limitation was the difficulty encountered when approaching the stakeholders in this research, since this is independent research. The sources for this research was approached by snowball techniques which require high motivation, and it took the most time of the data collection. Moreover, the local language in Curaçao is Papiamentu, a mix of Portuguese, Spanish, and Dutch, which the researcher does not know; thus, some translations might be lost in the way. For this reason, it was hard to approach a more diverse economic class, and the interviews were only conducted with people that spoke English. In addition to that, other informational sources such as newspapers or online news were hard to access, because the news was only appearing with Dutch or Papiamentu keywords.

Furthermore, the data collection was conducted during the dry season, when VBDs are no longer a threat to the island; it could be possible that the participants hardly recall the outbreaks and their impact. Despite this, multiple outbreaks have occurred in Curaçao; however, not all participants were present on the island during the outbreaks; thus, it might result in bias in the perception of the diseases.

5.4 Recommendations and further research

This research discovered that the tourism industry tends to blame the local population for the waste management problems, such as illegal dumping and the lack of recycling. The issues regarding waste problem are also widely reported in the local media, yet, it still lacks the local population perspective. The gap between the tourism industry and the local population's perspective regarding the waste problem on the island could be examined further.

The importance of tourism for the island has been proven by this research, yet tourism might negatively affect the environment. Another topic that interestingly might arise from this research is the question of whether the island has reached its carrying capacity. If the island has an exact number regarding its capacity, the government may be able to determine the further development of tourism. The balance between economic growth and the use of resources and the environment is required to achieve sustainable tourism (Liu, 2003), which can thus be translated into a carrying capacity study. A thorough study might be needed to determine the level of carrying capacity on the island; thus, it can also clarify the competing interests between the environmental and economic sides.

During the last few outbreaks that hit Curaçao, the repercussions of the diseases were not readily apparent in the tourism industry, even though the literature states the opposite (World Bank Group, 2016; Ngwira, 2016). Even if for the last few outbreaks the impact was minimal, Curaçao is still vulnerable to catch other outbreaks (see figure 11); and there is a chance that the next outbreaks will hit Curaçao heavily if people are careless and unaware about the situation. It would be wise to assess the impact on the last few outbreaks to calculate the damage and plan strategic scenarios for future outbreaks.

This research found that the awareness of VBDs was only carried by GMN and tourism officials, yet, Selikor as the waste management company retains the power to encourage the local population about the importance of waste management to minimize the spread of VBDs and prevent other outbreaks. Guerrero et al. (2013) acknowledges that the efficiency of the operationalization of waste

management depends on collaboration between the governments and the population. Further along these lines, Selikor can have a better relationship with another government or non-governmental institutions. Therefore, the enforcement from GMN regarding waste law is also needed to prevent the illegal dumping that has continued to occur on the island. If Selikor and GMN put their efforts together in an awareness campaign, the effect might be more significant, and well communicated within the population.

Last of all, sustainable travel certifications have demonstrated their importance in achieving sustainable tourism, especially, since Curaçao has a local certification, namely BPM, that is especially curated to fit Curaçao's business. So far, the external pressure from international travel agents plays a significant role in the adoption of sustainable or travel certifications. Furthermore, if the certification becomes one of the requirements in the tourism industry, for example to build a hotel or to extend the hotel's permit, we would expect all hotels, restaurants, and travel agents to have sustainability practices in their business; thus, it will have resulted in sustainable tourism.

6 Conclusion

A conclusion on this research regarding the waste management of tourism industry and its influence towards VBDs will be presented shortly. To understand the relationships between tourism, waste management, and VBDs in Curaçao, this concluding chapter will summarize the five sub-questions before concluding on the central research question.

Firstly, Curaçao's tourism industry relies heavily on the use of landfills, which goes the same for the rest of the population on the island. Some members of the tourism industry have approached the private recycling companies to initiate separation and recycling initiatives at their compounds; they are also actively asking the suppliers to use less packaging for raw products. Moreover, they also use sustainable products such as organic cleaning products and biodegradable packaging if possible.

Secondly, the stakeholders that are involved in tourism industry waste management vary from members/agencies of the government to the private sector (see table 2 for a summary of their roles, expectations, and challenges). Selikor handles the majority of waste management on the island, including the management of its only landfill. Selikor has executive power mandated by the GMN, which has acted as the policymaker regarding waste management. To fill the gap in the demand for advanced recycling companies, several private recycling companies are present on the island; yet, the lack of support from the government prevents them from further expansion. Beverage companies also play an integral part since they produce a massive number of bottled beverages without any deposit scheme. Of equal importance, tourism itself has a limited choice when it comes to advanced waste recycling, namely separation and recycling. Further in line, the tourism industry possesses the power and knowledge to adopt advanced waste management practices in order to be less reliant on the landfill. Furthermore, waste management is the most effective vector control to prevent the spread of VBDs (WHO, n.d.); thus, Selikor's participation, especially in VBDs, is still lacking, since actions concerning VBDs have mainly been undertaken by the GMN or tourism officials.

Last of all, sustainable travel certifications play an essential role in achieving sustainable tourism in general. The certifications act as external pressure but can also be used to substitute the SDGs. The recommendations that have arisen from this research would be to enshrine the sustainable certifications in local permits and focus on the local certifications that might have less costs attached compared to the international certifications.

The above paragraphs have been guided by the sub-questions in order to answer the central question of this research:

How does the current waste management of Curaçao's tourism industry influence the control of vector-borne diseases and contribute to achieving sustainable tourism?

After discerning the current waste management practices and the stakeholders in Curaçao, the results of this research suggest that the whole waste collection on the island is well managed by Selikor, thus private companies should have better opportunities to expand their business and offer a broader range of services. Looking back to the ISWM concept that was established with four principals—namely equity, effectiveness, efficiency, and sustainability—the landfill system in Curaçao is indeed an effective and efficient method for overcoming the waste problem in Curaçao; however, the landfill system has lacked sustainability for a more extended period, and yet the access to advanced waste management such as recycling is not equally accessible for everyone. Regarding the VBDs, the campaign had mostly been undertaken by either by the government or tourism officials and the participation from Selikor as the only government-owned company is still lacking.

Waste management is the most effective method to prevent the spread of VBDs; thus, the tourism industry, as the most prominent economic pillar on the island, has a significant power to adopt advance waste management, such as recycling and reducing their waste volumes. The paragraphs, as mentioned earlier, explain the importance of sustainable certifications as a guide to achieve sustainable tourism in general. Waste management is one of the critical indicators in the certifications, thus mentioning the importance of recycling, reducing the waste volume, and the use of sustainable products; in other words, the obtainment of the certifications will contribute to minimizing the spread of VBDs. Hence, the tourism industry has the opportunity to become the leader in sustainable tourism in accordance with the certifications; however, the tourism industry needs a stimulant to enforce the adoption of advanced waste management, as the external pressure from international travel agencies has proven to be an efficient method to reconsidering sustainable tourism.

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Appendix A. Interview guides

Interview Guide for Tourism Industry

Sustainable tourism questions

1. What are the challenges of being a famous destination?
   Probe: environmental problem; social problem; infrastructure problem
2. What potential do you see in Curacao tourism?
   Probe: any potential tourism destination?
3. Have you heard about sustainable tourism?
   Probe: concept; realization; action
4. If yes, what kind of practices that you think you can do to achieve sustainable tourism?
5. What contribution can you give to achieve sustainable tourism?
   Probe: training; publication; awareness;

Waste management questions

The common problem that comes from tourism is usually related to waste and on a small island like Curacao, waste becomes a bigger problem since the island has limited space to accommodate a huge amount of waste.

1. How does waste management work in Curacao?
   Probe: recycling; waste storage; separation technique; waste disposal; waste collection frequency; price
2. How much waste do you generate a day?
   Probe: type of waste, the composition of waste
3. Have you done anything to avoid any waste?
   Probe: Waste avoidance and reuse
4. What are the challenges in waste management?
   Probe: technical or capacity challenges?
5. What do you think is the negative effect of bad waste management?
   Probe: who's or what is going to be affected? In which way?
6. Who do you think is responsible for waste management in Curacao?
   Probe: what institution? Why are they responsible?

VBDs questions

In the past few decades, Curacao has been hit by several epidemic mosquito-borne diseases such as chikungunya, dengue, or zika.

1. Have you or your family ever got sick from diseases caused by the mosquito?
   Probe: What kind of diseases; How was the treatment?
2. Have you ever received or participated in training from the ministry of health about mosquito-borne diseases?
3. Probe: if yes, when? How extensive is the training?
4. Have you done something to minimize the transfer of VBDs?
   Probe: prevention actions;
5. What contribution that your institution can do to minimize the VBDs?
   Probe: direct contribution or indirect contribution

Closing questions

1. What aspects are still needed to improve on waste management in Curacao?
2. What is your ideal waste management?
3. How do you see the tourism industry in Curacao for the next 20 years?

Interview Guide for Health Institution

Opening Questions

1. Can you tell me a bit about this institution?
   Probe: When it was founded? why it was funded? What kind of programs?

VBDs questions

In the past few decades, Curacao has been hit by several epidemic mosquito-borne diseases such as chikungunya, dengue, or zika.

1. Can you tell me about the current situation of VBDs in Curacao?
   Probe: what are the diseases that still occur? How often do you get VBDs patients?
2. What caused the VBDs in Curacao?
   Probe: how did it spread? What is the infection rate?
3. Have you or your family ever got sick from diseases caused by the mosquito?
   Probe: What kind of diseases; How was the treatment?
4. Have you ever gave training about mosquito-borne diseases?
   Probe: if yes, when? How extensive is the training?
5. Have you done something to minimize the transfer of VBDs?
   Probe: prevention actions;
6. What contribution that your institution can do to minimize the VBDs?
   Probe: direct contribution or indirect contribution
7. What are the other effects of VBDs other than health related?
   Probe: economic effect; tourism effect

Waste management questions

Waste management plays an important role in minimizing the spread of VBDs.

1. Do you see any relationship between waste management and the spread of VBDs?
   Probe: does it directly related?
2. What do you know about waste management in Curacao?
   Probe: recycling; waste storage; separation technique; waste disposal; waste collection frequency; price
3. Have you noticed any challenges in waste management?
   Probe: financial; personnel; techniques; infrastructure
4. What do you think is the negative effect of bad waste management?
   Probe: environmental effect; social effect;
5. Who do you think is responsible for waste management in Curacao?
   Probe: institution; government; resident

Sustainable tourism questions

If we look at the bigger picture, proper waste management is an important aspect of tourism, namely sustainable tourism.

1. Have you ever done any project related to tourism??
2. **Probe**: concept; realization; action
3. Have you ever heard about the concept of Sustainable tourism?
4. **Probe:** concept; realization; action
5. If yes, what kind of practices that you think you can do to achieve sustainable tourism?
6. Will tourism brings your institution any good?
7. **Probe:** economic aspect; less waste

Closing questions

1. What are the actions needed to prevent the further spread of VBDs?
2. What aspects are still needed to improve on waste management in Curacao?
3. What is your ideal waste management?
4. How do you see Curacao tourism for the next 20 years?

Interview Guide for Waste Institution

Opening Questions

1. Can you tell me a bit about this institution?

Probe: When it was founded? why it was funded? What kind of programs?

Waste management questions

1. How does waste management work in Curacao?
   Probe: recycling; waste storage; separation technique; waste disposal; waste collection frequency; price
2. How much waste do you generate a day?
   Probe: type of waste, the composition of waste
3. Have you done anything to avoid any waste?
   Probe: Waste avoidance and reuse
4. What are the challenges in waste management?
   Probe: financial; personnel; techniques; infrastructure
5. What do you think is the negative effect of bad waste management?
   Probe: environmental effect; social effect;
6. Who do you think is responsible for waste management in Curacao?
   Probe: institution; government; resident
7. Have you done any training to resident related waste management?

VBDs questions

In the past few decades, Curacao has been hit by several epidemic mosquito-borne diseases such as chikungunya, dengue, or zika.

1. Have you or your family ever got sick from diseases caused by the mosquito?
   Probe: What kind of diseases; How was the treatment?
2. Have you ever received or participated in training from the ministry of health about mosquito-borne diseases?
   Probe: if yes, when? How extensive is the training?
3. Have you done something to minimize the transfer of VBDs?
   Probe: prevention actions;
4. What contribution that your institution can do to minimize the VBDs?
   Probe: direct contribution or indirect contribution

Sustainable tourism questions

If we look at the bigger picture, proper waste management is an important aspect of tourism, namely sustainable tourism.

1. Have you ever done any project related to tourism??
   Probe: concept; realization; action
2. Have you ever heard about the concept of Sustainable tourism?
   Probe: concept; realization; action
3. If yes, what kind of practices that you think you can do to achieve sustainable tourism?
4. Will tourism brings your institution any good?
   Probe: economic aspect; less waste

Closing questions

1. What aspects are still needed to improve on waste management in Curacao?
2. What is your ideal waste management?
3. How do you see Curacao tourism for the next 20 years?

Appendix B: Consent form

Utrecht University

Name of Principle Investigator:	Grace Damaris Suradi
Name of Organization:	Utrecht University
Name of Project:	The tourism industry, waste management, and vector borne diseases: A case study of Curacao

This Informed Consent Form has two parts:
• Information Sheet (to share information about the study with you)
• Certificate of Consent (for signatures if you choose to participate)

You will be given a copy of the full Informed Consent Form

Part I: Information Sheet

Introduction
I am Grace Damaris Suradi, student at Utrecht University. For my master degree Sustainable Development at Utrecht University in The Netherlands, I am doing research on the waste management of tourism industry and its influence towards Vector Borne Diseases (VBDs). This research has been approved by Utrecht University and is initiated in Mambo Beach. I am going to give you information and invite you to be part of this research. You do not have to decide today whether or not you will participate in the research. This consent form may contain words that you do not understand, please ask me and I will explain it to you.

Purpose of the research
Tourism plays a big part in Curacao's economy, however tourism also generated high number of waste. In small island setting like curacao, limited space available on the island makes waste management more complicated. During the past decades, there has been several outbreaks of mosquito-borne diseases in Curacao, e.g. chikungunya, dengue and Zika; and it might negatively affect the tourism. In this research, I believe you can help me by telling me about your work and experiences in this topic. I want to learn more about your practices in waste management and how it relates to the spread of the diseases. I also want to know how you see curacao tourism and your contribution towards sustainable tourism.

Voluntary Participation
Your participation in this research is entirely voluntary. You may change your mind later and stop participating even if you agreed earlier. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship you have, if any, with the researcher.

Procedures
I am asking you to help us learn more about waste management of Curacao's tourism and its relation to VBDs. Therefore, I am inviting you to take part in this research project. If you accept, you will be asked for short walk around your area of work, followed by an interview. If you do not wish to answer

any of the questions during the interview, you may say so and I will move on to the next question. No one else but the interviewer will be present, unless a translator will be necessary or you would like someone else to be there. The information recorded is confidential, and no one else except for me will have access to the information documented during your interview. The entire interview will be tape-recorded and the tape will be kept safely stored on a laptop. The information recorded is confidential, and no one else except me will have access to the tapes.

Risks

I will be asking you to share some personal experiences and your line of work. If you feel uncomfortable talking about some of the topics, you do not have to answer any question or take part in the interview.. You do not have to give me any reason for not responding to any question, or for refusing to take part in the interview.

Compensation

There will be no compensation for your participation, but your participation is likely to help me find out more about the effect of waste management in tourism to VBDs..

Confidentiality

Any personal information that could reasonably identify you will be removed or changed. The personal investigator will keep a link that identifies you to your coded information, but this link will be kept secure and available only to the principal investigator or the supervisor.

Sharing the Results

Nothing that you tell me today will be shared with anybody, and nothing will be attributed to you by name. If you like, you can receive a summary of the result once the research has ended in August. The research findings will also be shared more broadly through a thesis report.

Who to Contact

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact me on any of the following: +31 655532753 or g.gracedamarissuradi@students.uu.nl. You can also contact my supervisor Dr. Ajay Bailey on +31 643523594 or a.bailey@uu.nl.

Part II: Certificate of Consent

I have read and I understand the provided information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study.

Name of Participant_____

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

Appendix C: Codebook

First level code	Second level	Third level
Personal information		
Waste management	Solid waste management practices	Separation and recycle
		Reuse
		Upcycle
		Less packaging
		Biodegradable goods
		Landfill
	Challenges	Mentality
		Economic situation
		Education
		Government role
		Facilities
		Imported goods
		Partnership and network
		Priority and continuity
	Opportunities of waste management	Separation and recycle
		Waste to energy
		Import banned
		Plastic banned
		Bottle deposit
		New organisation
		Circular economy
		Integrated campaign
	Stakeholders and responsibility	Government
		Corporates
		Local
		Selikor
		NGO
		Recycling companies
Vector borne diseases	Current situation	Causes
		Attention
		Treatment
	Prevention	Campaign
		Site cleaning
	Mitigation	Inspection
		Spraying
	Awareness	Local
		Government Institution
		Tourism institution
		Tourist
	Impact	Tourism
		General health
Sustainable tourism	Tourism impact	Environmental degradation
		Economic development
		Culture loss
		Waste generated

		Carrying capacity
		Sustainable initiatives
	Perception	Tourism future
		Global warming