Take only pictures, leave only bubbles:

A case study of the impact of Marine Based Tourism on the reef ecosystems of Playa del Carmen, Mexico

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Suzanne Wegelin

Master Dissertation

TDM 2014-2015

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Master Dissertation

Tourism Destination Management

Suzanne Wegelin

Student at the NHTV University of Applied Science

Student – ID: 141745

Supervisor: Ton Tepe

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I hereby declare that this dissertation is wholly the work of Suzanne Wegelin. Any other contributors or sources have either been referenced in the prescribed manner or are listed in the acknowledgement together with the nature and scope of their contribution.

Signature:

Executive summary

Background: Playa del Carmen, Quintana Roo in Mexico has rapidly grown from a small fishermen's settlement to a thriving beach holiday destination for North Americans and Europeans alike. It is said to be the fastest growing town in both Central and South America. The increase in coastal tourism in this area has brought many investors, who see the economic benefits of developing real estate and tourism infrastructure. However, the economic profit of developing this area takes precedence over the environmental ramifications. With the main attractions of this destination being the beaches, the sea and the aquatic wildlife, adequately dealing with environmental issues and developing the destination in a sustainable way seem to be difficult.

Study objective and main focus: The objective of this research is to analyse the impact of Marine Based Tourism on the reef ecosystem of the Mesoamerican Barrier Reef in front of Playa del Carmen to advise and give recommendations to policy makers, tourism planners and tourism operators. The main research question that was formulated to accomplish the objective is: "What can be done to manage the anthropogenic impact of marine based tourism on the environment of Playa del Carmen to achieve a more environmental sustainable destination?"

Methodology: The basis for this study was formed by international academic literature from different disciplines. The literature consisted of articles from disciplines such as Tourism, Coastal Management and Environmental conservation. Other secondary sources such as published reports from the government of Mexico, reports from research companies and NGOs were used as well and were combined with existing strategic approaches. Field research consisted of semi-structured and unstructured interviews and structured observations, as well as reviewing digital and visual materials, which were collected for content analysis.

Findings: The findings from this study show that Marine Based Tourism has an impact on the reef ecosystems and on aquatic life. Interviewees are aware of the environmental issues that have arisen due to the rapid development and the increase of the number of tourists visiting Playa del Carmen. It seems that everyone involved wants the power but no one is willing to take the responsibility and the action that comes along with it. However, it seems that governance of the destination area is difficult due to the three different layers of government. Additionally, this research indicates that policies and regulations are not being adhered to and that there is no regulatory body that oversees this. Findings from the interviews show that there is a consensus that the destination is developing in an unsustainable manner.

Conclusions and recommendations: The overall conclusion for this study is that Playa del Carmen is growing at a very rapid pace and that it is doing so in an unsustainable way, due to the lack of enforcement of policies and regulations. Marine Based Tourism has an impact on the reef ecosystems of the Mesoamerican Barrier Reef in front of Playa del Carmen. Dive operators in the destination are aware of the issue and are trying to mitigate the impact of their activities. However, there is no association or governmental body to enforce laws, policy

and regulations and federal government actions and reactions are weak. Therefore, the following recommendations have been made:

1. At the national level the federal government could use the Green Economy approach for further tourism development and strategic planning. This approach may improve human well-being and social equity, while reducing environmental risk and ecological scarcities.
2. At state level the use of Ecosystem Based Marine Spatial Management approach could be implemented. This approach recognises the full array of interactions within an ecosystem, including human use.
3. At destination level it would be wise to establish a Destination Management Organisation. This could either be a regional Destination Management Organisation for the whole of the Riviera Maya, or, it could be a local Destination Management Organisation for Playa del Carmen. The Destination Management Organisation would be responsible for tourism management and governance, and could be a strategic leader in developing the destination in a sustainable way.

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A special thank you to my dearest friends Greg Church and Joyce Newman for their continuous support, believing in me and encouraging me to keep going. I am also grateful for having the support of- and the many conversations with Julio Gregori Martinez, whom was willing to share his insight on oceanography, his opinions and ideas with me.

Last but not least, I would like to thank my friends in Playa del Carmen for helping me make living and working here an incredible experience.

Thank you, I could not have done this without you!

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List of Acronyms

APSA	Asociacion de Prestadores de Servicios Acuaticos de la Riviera Maya
AOW	Advanced Open Water
BSAC	British Sub Aqua Club
CBD	Convention of Biological Diversity
Comupo	Consejo Municipal de Poblacion en Solidaridad
CT	Coastal Tourism
D.F.	Distrito Federal
DIE	Destination Island Effects
DMO	Destination Management Organisation
DSD	Discover Scuba Diving
EB-MSM	Ecosystem Based – Marine Spatial Management
EB-MSP	Ecosystem Based – Marine Spatial Planning
GE (I)	Green Economy (Initiative)
IUCN	International Union for Conservation of Nature
MBR	Mesoamerican Barrier Reef
MBT	Marine Based Tourism
MPA	Marine Protected Area
NGO	Non Governmental Organisation
OW	Open Water
PA	Protected Area
PADI	Professional Association of Diving Instructors
PDC	Playa del Carmen
SLR	Sea Level Rise
SOS	Saving Our Sharks
SSI	Scuba Schools International
UNEP	United Nations Environment Programme
UNWTO	United Nations World Tourism Organisation
WTP	Willingness To Pay
WWF	World Wildlife Fund

Chapter 1: Introduction

This chapter will give background information for the study. It contains contextual insight, background information on the research area, the problem statement and the research objectives and research questions.

1.1 Contextual analysis

The tourism industry in Mexico is forecasted to grow with approximately 4,6% in the next two years by the Business Monitor International Ltd. (2015). According to the Mexico Tourism Report of BMI (2015) the tourism industry is the third biggest foreign exchange earner in Mexico. The country's main tourism products are Cultural tourism, Meetings, Incentives, Conference and Exhibitions (MICE) tourism, Medical tourism, Nature-based tourism and last but not least Sun and beach tourism (Sectorial Tourism Development Plan of the Federal Mexican Government 2011-2016, 2010).

The state of Quintana Roo, which is known for both Cultural and beach & Sun tourism, is the main beach destination for both the domestic and international tourism market. The main destinations in the state Quintana Roo are:

- Cancun and Puerto Morelos
- Cozumel
- Isla Mujeres
- Chetumal
- Riviera Maya

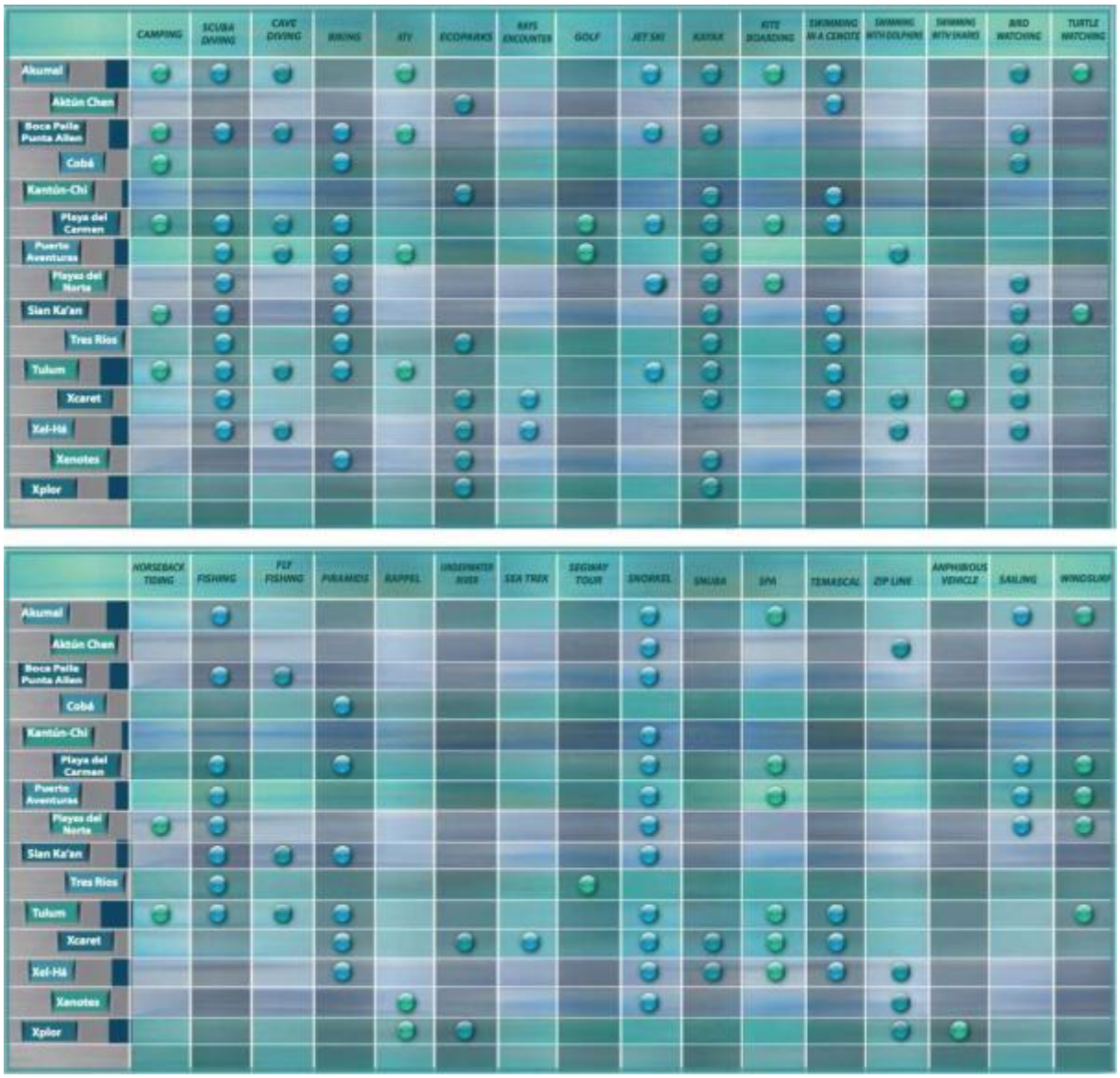
The Riviera Maya stretches from Puerto Morelos all the way to Tulum. Its main tourism hub is Playa del Carmen, which attracts tourists from all over the world. In an interview with Mexico Real Estate News & Blogs (2015) Sabido, Manager for the Cozumel and Riviera Maya tourism board, says that 27,91% of the tourists that entered Mexico, stayed in Cancun and the Riviera Maya.

Figure 1: Map of the Riviera Maya

1.2 Research area Playa del Carmen

Mexico is a country with great biodiversity in flora and fauna as well as in the underwater world. It also has a rich cultural heritage and has a varied topography and a very varied climate. Mexico is divided into 31 states. Quintana Roo is one of the Mexican states and, as all other states; this state is divided into several municipalities. Playa del Carmen (PDC), known by locals as just Playa, is located in the municipality of Solidaridad, in Quintana Roo. Playa was a small fishermen's town in the mid 80's with a population of less than 1500 inhabitants. In the past two decades it has grown to become the tourism hub for the Riviera Maya and has undergone some serious development. Currently, PDC is the fastest growing community and town in Central and South America. Besides the many tourists that visit this destination, Playa has a very resident international community with over 52 different nationalities.

Figure 2: Activity charts Riviera Maya



The charts above show activities in the Riviera Maya and also specifically for Playa del Carmen.

As a tourism destination Playa has a lot to offer. First and foremost it is a beach destination where tourists come to enjoy the white sandy beaches and the waters of the Caribbean Sea. Playa is a perfect base for a holiday where one can rest and enjoy all its splendour or book a day tour to the Ruins of Coba, the Ruins of Chichen Itza, the Ruins of Tulum and snorkelling with the turtles in Akumal.

There are approximately 15 dive sites in PDC that are used by the various dive operators in PDC. The map below shows the location of the dive sites. The reefs that are dived at most (because they are shallow reefs, and therefore good dive sites for entry- level divers) are the following:

- Moc-Che Shallow
- Cueva del Pargo
- Chun- Zumbul
- Jardines

The deeper dive sites that are dived most are:

- Barracuda
- Tortugas
- Mama Vina (wreck)

Figure 3: Map of Dive sites in Playa del Carmen

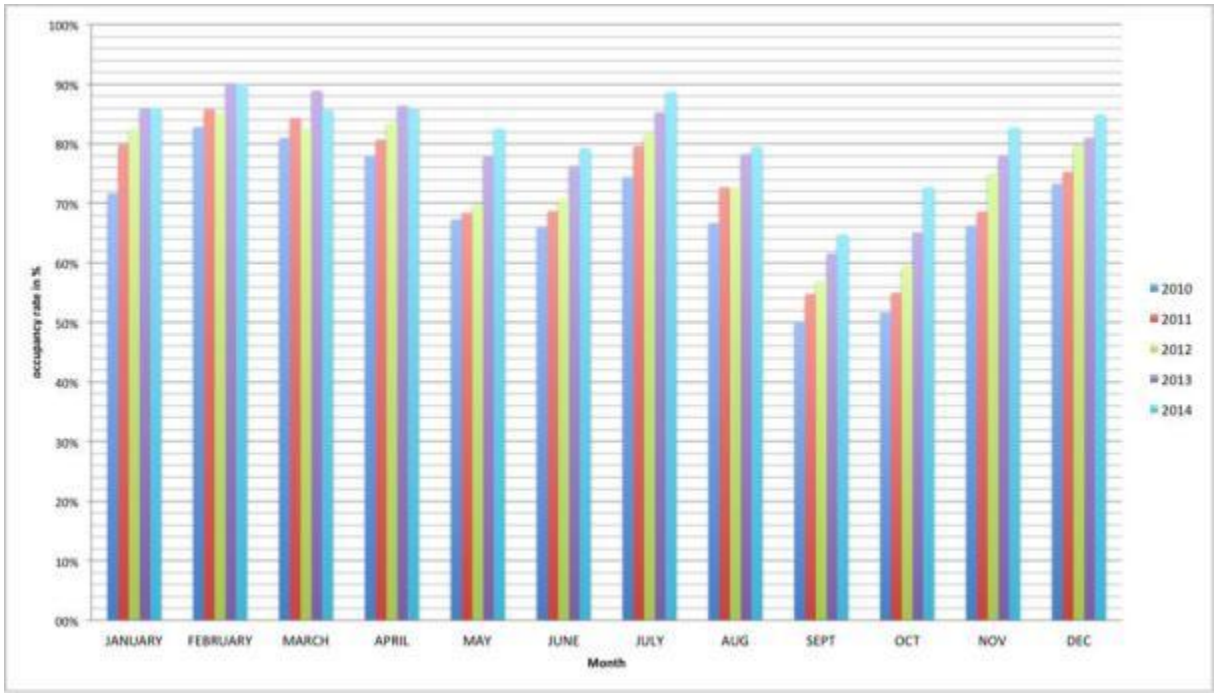
Source: Mexico Blue Dream Divers (2015)

1.3 Growth in the Riviera Maya and research area

At the end of 2014 the Municipal Council of Population in Solidaridad (Consejo Municipal de Poblacion en Solidaridad – Comupo), Quintana Roo estimated the registered population of PDC to be 206,000. State and municipal authorities say that PDC has grown within the sustained growth trend of 6% per year, over the past three years. Pedro Salazar Francisco Leal – technical secretary of Comupo says in an interview: " According to data collected by us, the State Population Council reports that in the municipality, we now have 216,730 inhabitants to date, so we are talking about a growth rate similar to what we recorded last year".

Room occupancy throughout the state is high, being 80% in Cancun and 78% in the Riviera Maya. The increased room occupancy rates just for the Riviera Maya have grown by an annual average of 4,33% during 2010 - 2014.

Graph 1: Room occupancy Riviera Maya



The room occupancy has been increasing by an average of 3,66% over the past six months compared to the same period in 2014 in the Riviera Maya.

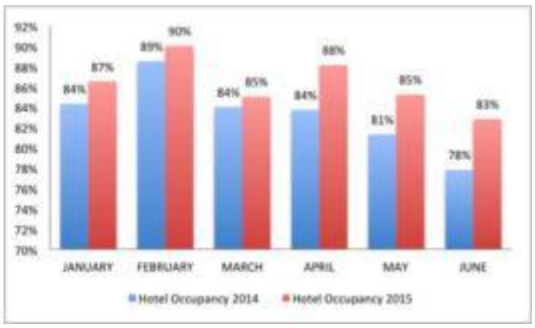
Table 1: Room occupancy Jan-Jun 2015

HOTEL OCCUPANCY 2014 vs 2015 in % Jan-Jun

MONTH	2014	2015	Growth
JUNE	77,8%	82,8%	6,43%
MAY	81,3%	85,2%	4,80%
APRIL	83,7%	88,1%	5,26%
MARCH	84,0%	85,0%	1,19%
FEBRUARY	88,5%	90,0%	1,69%
JANUARY	84,3%	86,5%	2,61%
			3,66%
Average	83,27%	86,27%	3,60%

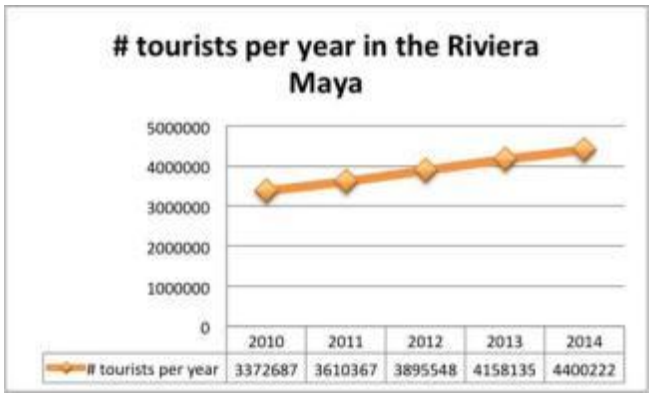
Source: http://sistemas.sedetur.qroo.gob.mx/ocupacion/ocupacion.php

Graph 2: Room occupancy Jan-Jun 2015



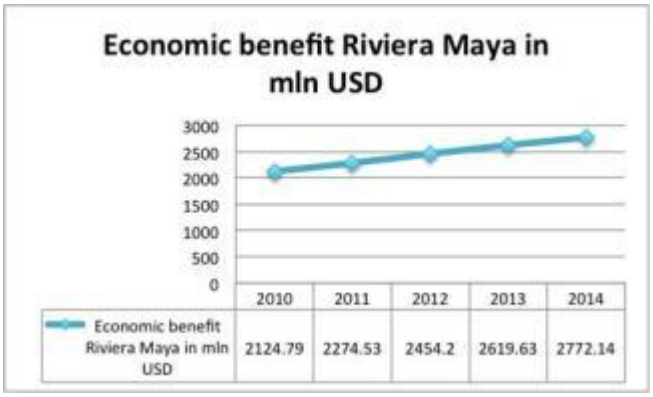
Increase in number of tourists in the state is 30,5% from 2010 till 2014, or an annual average of 6,88%.

Graph 3: Tourist per Year



Increase in economic benefit for Riviera Maya is also 30,5% from 2010 till 2014 or an annual average of 6,88%.

Graph 4: economic Benefit



According to the data from the Sedetur the average expenditure per visitor per stay has been the same over period from 2010 till 2014. The average expenditure is USD$ 630,- per tourist per stay.

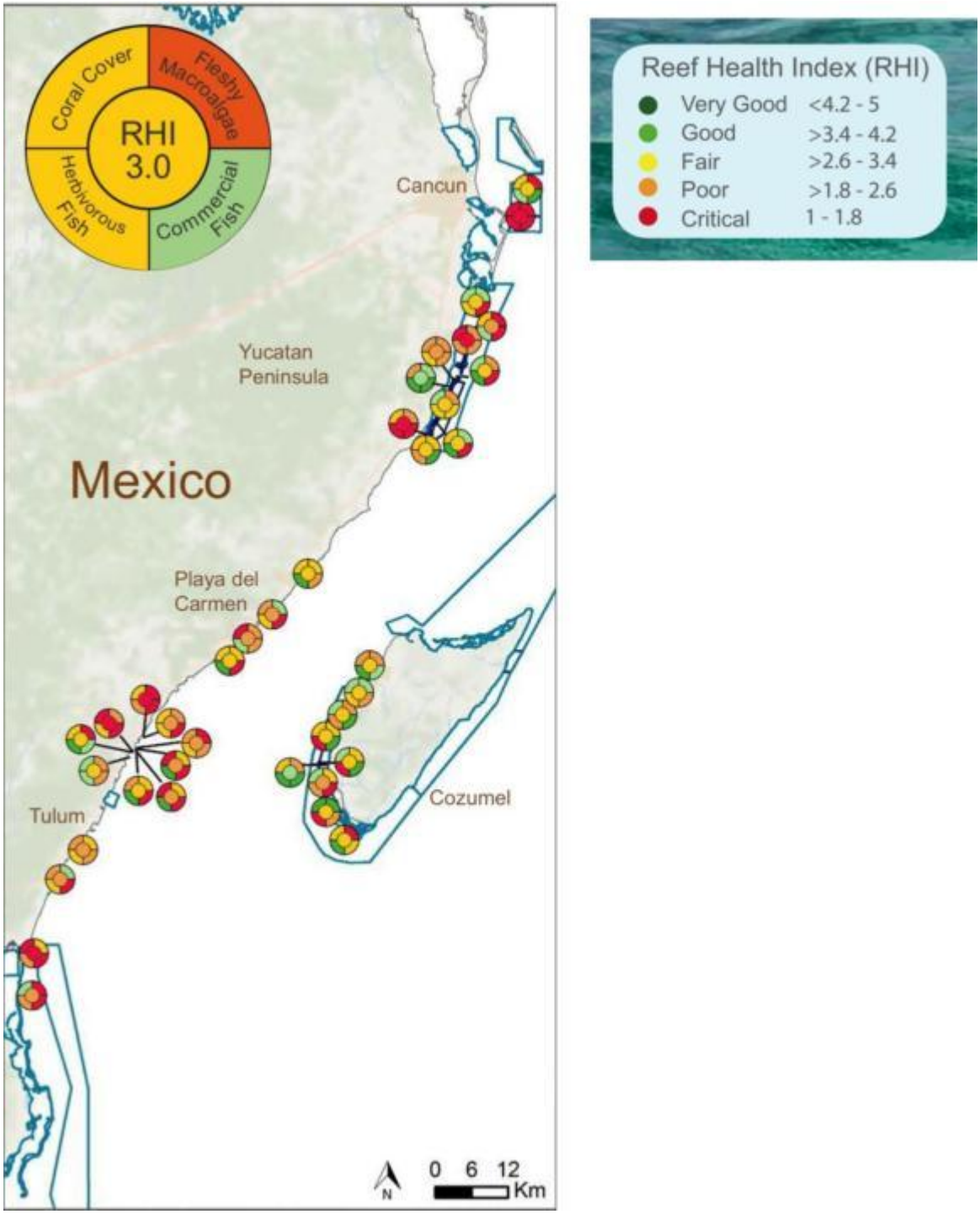
1.4 Reef health

Reef ecosystems are important for the biodiversity of the seas and also for humans as a natural resource. Healthy Reefs for Healthy People is a Non Governmental Organisation (NGO) that was founded in 2004 by the World Wildlife Fund (WWF), the Meso-American Barrier Reef System Project (MBRS), the World Bank, the Summit Foundation and Perigee Environmental. The organisation does longitudinal research on the Mesoamerican Barrier Reef (MBR) in Belize, Honduras, Guatemala and Mexico. Healthy Reefs publishes their findings in report cards. The Report Card of 2015 indicates that the overall reef health of Mexico is “fair”. However, as can be seen in figure 4, reef health in front of PDC is in poor condition according to the report. Coral cover at one of the tested dive sites is even at a critical state. With the increase of tourism activity in this area, it is important for all stakeholders involved in the area to conserve and preserve the reefs in front of PDC, as their business depends on the health and the aesthetics of the reef and its biodiversity. Chapter 2 will

elaborate on the impact of tourism on the health of the reefs. Healthy Reefs points out the following threats and human impacts:

- Inadequate sewage and waste control
- Unregulated coastal development
- Unsustainable fishing
- Insufficient enforcement and growing tourism demand

Figure 4: Reef Health Riviera Maya



Source: Mesoamerican Reef Report card, 2015

1.5 Problem statement

Due to the increase of tourism demand, Coastal Tourism (CT) is rapidly growing, also because travel has become so much easier. Coastal tourism includes both land-based and marine-based activities. The increase of tourism in coastal areas has a great impact on many different aspects of society. For example, it has an impact on the local population, the spatial area that tourists visit, the economy of the area, local politics and last but not least, it has an impact on the natural environment. Most studies undertaken and published in the tourism literature are about sustainable tourism, tourism development, branding and tourists' perceptions of a destination.

According to Honey and Krantz (2007) coastal tourism is the fastest growing sector in the tourism industry. Sanchez-Quiles and Tovar-Sanchez (2015) note that the need for infrastructural development is also increasing due to the increase of coastal tourism. Studies have shown that the development of coastal tourism can have beneficial impacts on the economical situation of the coastal area. However, Hsieh and Kung (2012) argue that most researchers in the tourism field are merely concerned about economic growth and how tourism can contribute to this. They also argue that only a few studies focus on the relation between the tourism industry and the environment. The study done by Pedrozo-Acuña, A., Damania, R., Laverde-Barajas, M., & Mira-Salama, D. (2015) confirms that due to the rapidly growing tourism demand and demand in coastal development, tourism activities have contributed to the degradation of coastal ecosystems, such as coral death, water pollution and removal of mangrove forests. They also note that these ecosystems are coming under more pressure as a result of coastal population growth, the continuous expansion of the tourism industry and the incremental incidence of extreme events such as hurricanes. They argue that because of this, anthropogenic alterations have been made where both soft engineering and short-term hard engineering measures have had to be taken to protect the coast and shoreline.

There are numerous studies that demonstrate that there is a relation between the degradation of marine ecosystems and coastal tourism. (Lucrezi, S. et al. 2013; Lamb, J. et al. 2014; Selkoe, K. et al. 2009.) However, these studies are done from an ocean and coastal management, biological conservation or marine policy perspective. The studies describe how anthropogenic activities influence the state of the frail eco-systems and what impact these anthropogenic activities have on the environment. Most studies focus on a specific phenomenon. Environmental studies show that there is a relation between the change of behaviour of pelagic fish, such as whales, sharks and dolphins, and non-consumptive wildlife-tourism (Burgin, S., & Hardiman, N., 2014). There are also numerous studies on divers' impact on coral reefs and the relation between dive tourism and coral disease (Dimmock, K., & Musa, G. 2014; Lucrezi, S., Saayman, M., & Merwe, P.,2013; Lamb, J., True, J., Piromvaragorn, S., & Willis, B., 2014).

Research, conducted in Akumal, Quintana Roo, shows that visitors to coastal areas find reef conservation very important (Herring, 2006). However, only a small proportion of the people who visit coastal zones are aware of their impact on the surrounding environment. Davis and Tisdell (1995) state that because there is no

"environmental price" to be paid, tourists in coastal areas unduly reap the benefits of this area, which may lead to overuse and degradation, such as waste pollution, water pollution and destruction of habitat for animals. Ramdas, M., & Mohamed, B. (2014) say that tourists have different behaviours towards the environment and that their behaviour is derived from different levels of knowledge and attitude. This study contends that environmental literacy is needed, where knowledge on physical and ecological systems, knowledge on environmental issues, attitudes and concern, sensitivity and motivation should be combined.

Katsanevaki et al. (2011) state that as human beings we depend heavily on ecosystems, which provide us with important and valuable resources. They also state that various business industries, coastal-defence systems, the tourism industry and marine conservation all compete for the same valuable space. Climate change makes the situation worse by influencing the structure and function of marine ecosystems. Shakeela & Becken (2013) confirm this by writing that rising ocean thermal temperature contributes to frequent episodes of coral bleaching, which contribute to further environmental and economic sustainability challenges in coastal areas whose core tourism products are often the marine environment. Coral bleaching is a process that might occur due to temperature change in the ocean, runoff water and pollution and overexposure to sunlight when the corals are in shallower waters. Corals have a symbiotic relation with the microalgae, called zooxanthellae, which live within the polyps of the coral. When coral is stressed by one of the aforementioned points, the coral will expel the microalgae. (or the zooxanthellae leave the coral) This process is referred to as coral bleaching. Coral can overcome the coral bleaching episode and recover. However, when it is continuously under this stress the coral will die eventually.

Figure 5: Coral bleaching

http://www.gefcoral.org/en-

https://microbewiki.kenyon.edu/index.php/Coral_bleaching_and_climate_change

Orams and Lück (2014) state in their study "Coastal and marine tourism: emerging issues, future trends, and research priorities" that there are several subjects and fields within the tourism field which need further research. One of the questions they pose is: "What are the environmental impacts of tourism activities on

coastal and marine ecosystems and how can those effects be managed to reduce negative consequences and produce positive outcomes?"

Based on the trends and challenges identified by Orams and Lück (2014) we can conclude that within the tourism field there are several opportunities and priorities for further research. The present research will focus on marine-based tourism and the specific activities, which go along with it, such as diving, snorkelling, boating, sports fishing, swimming etc. The research will focus on the impact of marine-based tourism on the environment of PDC.

Marine Based Tourism (MBT) is only a small part of Coastal Tourism but is heavily intertwined with the latter subject. Any development or tourism activity on land has both a direct and indirect impact on the reef ecosystems in the ocean. The following chapters will explain the bigger picture and then bring it back to MBT.

1.6 Research Objective and Research Questions

1.6.1 General objective

The objective of this research is to analyse the impact of Marine Based Tourism (MBT) on the reef ecosystem of the Mesoamerican Barrier Reef in front of Playa del Carmen to advise and give recommendations to policy makers, tourism planners and tourism operators.

1.6.2 Main research question

What can be done to manage the anthropogenic impact of marine-based tourism on the environment of Playa del Carmen to achieve a more environmental sustainable destination?

1.6.3 Research questions

1. What are the environmental impacts of tourism and specifically Marine Based tourism?
2. Which marine-based tourism activities are being undertaken in Playa del Carmen and how do they impact the natural environment?
3. How do marine-based tourism activities influence the biodiversity and aquatic life?
4. Which strategic approaches could mitigate the impact of the Marine Based Tourism activities?
5. What existing strategic approaches could be applicable to the research area to minimise the impact of marine-based tourism

1.6.4 Research Design

The study is a qualitative research with an inductive approach from an interpretevist paradigm. This study intends to use a case study. Bryman (2012) says that a case study entails the detailed and intensive analysis of a single case. In this research it will be the impact of MBT on the natural environment and the ecosystem of Playa del Carmen.

1.6.5 Research Methods

The study at hand uses desk research of the international literature. The relevant international literature that has been published within the scientific field of this dissertation is described in chapter 2. An overview of the impact of tourism and climate change, the impact of CT and the impact of MBT will be given.

The study uses three different ways of data collection, namely, through semi-structured and unstructured interviews, structured observations and content analysis. The semi-structured and unstructured in-depth interviews allow the researcher to access the reality and interpretations of the interviewees. The list of interview questions can be found in the appendix. The questions posed for the semi-structured interviews are asked in the same order and with the exact same wording. The second method of research is the structured observations. A checklist for the structured observations can also be found in the appendix. The third method is the collection of visual material for contextual analysis.

1.6.6 Limitations

As with all research, this research also has limitations that need to be taken into account. The first limitation to the research was the weather conditions. Normally, weather conditions will not necessarily be taken into account as a limitation. However, a strong El Niño has changed water temperatures, which consequently changes currents in the oceans and weather patterns such as storms and hurricanes. The second limitation to the research was the amount of Sargassum. Sargassum weed grows in a particular area of the Sargasso Sea in the Atlantic Ocean. Due to the great amount of Sargassum the initial research area had to be changed. The initial research area would have been Akumal, in Quintana Roo, Mexico. Due to the amount of Sargassum there were tourists whom had cancelled their holiday to the Riviera Maya. Interviewees and other sources say that due to this problem there were fewer tourists in the area then the previous years during the same period. This brings us to the third and final limitation that had to be taken into account and which may have affected the field research. Initially a number of 27 dives were to be observed of which nine dives with a large dive company, nine dives with a medium sized dive company and nine dives with a small dive company. Even though low season brings along smaller numbers of tourists, the number of tourists were extremely low due to the aforementioned Sargassum problem. The normal, steady flow of tourists saw a decrease which meant that especially the small dive companies and also the mid sized dive companies had less clients and were not operating their normal schedules.

Chapter 2: Environmental impacts of tourism, specifically marine based tourism

This chapter will outline the relevant international literature within the scientific field of this research. The literature review will discuss carrying capacity and perceptions of tourists, the impact of tourism on a global scale, the impact of coastal tourism and the impact of marine based tourism.

2.1 Tourist's perceptions, knowledge and behaviour towards the environment

Various studies have been conducted in different disciplines on tourists' perceptions, behaviour and the knowledge the tourists have regarding their impact on ecosystem health. Tourists visit coastal areas for various reasons, ranging from enjoying the sun, sea and the beach to actively engaging in various activities. However, most tourists are not aware that anthropogenic activity has an impact on the natural environment or the ecosystems, such as coral reefs. Tourists visit coastal areas because they have an interest in the unique ecosystems and the high quality of aesthetics, which is why especially divers, seek more remote coastal areas with coral reefs that are "untouched" by humans.

Carrying capacity also plays a role in the perceptions of tourists and when looking at carrying capacity, Goldsmith (1979) identified four categories namely, physical, ecological, economic and perceptual carrying capacity. Perceptual carrying capacity can be defined as the level of use or the amount of people that are there before a decline in the visitor's experience. We must not forget that tourism products are all about experience and that an experience can either make or break the perception of a tourist. Hillery et al (2001) point out in their article that both environmental and perceptual carrying capacity are important, but that research is often done on either one of these areas and not on the connection between the two.

Ramdas and Mohamed (2014) explain in their article that behaviours of tourists towards the environment are derived from different levels of knowledge and attitude. They say that environmental knowledge, knowledge of physical and ecological systems, awareness and attitudes are components of a wider concept, known as environmental literacy. The study done by Ramdas and Mohamed (2014) explores one of the pro-positive behaviours and aspects of environmental literacy called willingness to pay (WTP). As said before in this paper, there is competition for the same valuable space but there is no real "environmental price" to pay. The concept of WTP can be perceived as the amount or the cost that an individual intends to commit for a designated improvement or compensation. It can also be seen as a tool that indicates the measurement the tendency to act in monetary terms for an improvement or change. Ramdas and Mohamed (2014) believe that the application of WTP is able to alter the behaviour of tourists towards environmental attributes protection and conservation. They think that the value of WTP not only refers to the monetary values to enjoy the benefits of a destination but it also adds value in preserving it for future generations.

A study done by Alessa et al. (2003) says that anthropogenic activities levy a cost on ecosystems as resources are accessed and utilised at rates, which are often incompatible with inherent processes and structures. This

study also illustrates that human activities range from non-consumptive to consumptive and that tourist behaviour which are more active, such as picking up and transporting, have various purposes including curiosity, education and "fun". Most resource damaging acts perpetrated by tourists are intentional but not intended to vandalise or for the purpose of damage. They call this "depreciative behaviour". Their data shows that individuals, who have more knowledge of intertidal biology and/or ecology, will engage in a greater number of depreciative behaviours than those who do not. However, those who perceive ecosystems as fragile and highly sensitive to human activity and who personally ascribe responsibility to these activities to damaging effects, engage in less depreciative behaviour than those who do not.

2.2: Tourism and climate change

Tourism is one of the fastest growing industries in the world. Research done in the tourism field has many different aspects. Buckley (2012) has summarized them in the following categories: population, peace, prosperity, pollution and protection. In his research he says that the fundamental concern of sustainability is that aggregate anthropogenic impacts threaten the survival of humans and ecosystems on which we all depend. He concludes that within these aforementioned dimensions, tourism is 'not close' to sustainability. Gössling (2002) attempted to assess the impact of tourism on the global environment in 2000. His research indicates that, at the time, tourism was responsible for 5% of global fossil energy consumption and associated emissions of CO_2 , as well as the use of 0,5% of the world's biologically productive lands.

Gössling and Peeters (2014) developed a methodology in which they combined resource use associated with tourism consumption, estimates of resource use intensities (RUI's) and the use of the Global Tourism and Transport model (GTTM; Peeters, 2013) to assess tourism's global environmental impact. Their research is geared to estimate what the likely use of resources will be in the future. They look at what the impact has been in the past, what the current impact is and extrapolate the data to make predictions for the future. Gössling and Peeters (2014) say in their article that the insights their research has given them, emphasizes that tourism is not only a resource-intensive sector, but that it also is becoming increasingly vulnerable to resource scarcity and global environment change, given its dependency on both the availability of resources and the stability of climate conditions.

Scientific research (AR5) shows that anthropogenic activity has impacted climate change and is also affecting the speed and rate of the climate change. Moreno and Amelung (2009) say that loss of coastal wetlands and mangroves, increasing damage from flooding, such as loss of flora, erosion of beaches reducing the destination's value for tourism and damage to infrastructure, settlements and facilities that support the livelihood of communities caused by Sea Level Rise (SLR), are all impacts that are relevant to tourism. They also contend that increasing average temperatures may cause major changes in ecosystems and species and also in coral bleaching. Li et al (2013) looked at anthropogenic activity and how it affects the natural environment in tourism destinations in comparison to the transitional tourism areas and non-tourism areas surrounding the

destination. Their research shows that some environmental indexes, such as carbon and atmospheric turbidity, are much higher in the tourism destination than in the surrounding areas. Li et al. (2013) refer to the main part of the destination as an island. Their research looks at four main island impacts within a destination, namely carbon emissions, automobile emissions, anthropogenic heat and atmospheric turbidity. Their research indicates (not surprisingly) that the destination island effects (DIEs) are much higher in the main part of the destination than in the surrounding areas. Taking this into account, we can conclude that within any given destination the first three DIEs can be found. And that within any given destination the carbon emissions, gas emissions and the anthropogenic heat will have higher indexes than in the surrounding areas of the main destination.

Shakeela & Becken (2013) confirm the study of Katsanevaki et al (2011) and conclude that rising ocean thermal temperature contributes to frequent episodes of coral bleaching, which gives rise to further environmental and economic sustainability challenges in coastal areas where core tourism products are often related to the marine environment. If the core tourism products are related to healthy reefs, good water quality and abundance of fish and this disappears due to not maintaining the aesthetics of the natural environment, then less and less tourists will be drawn to that destination. In conclusion, we can see, in the bigger picture, that anthropogenic activity has an impact on climate change and visa versa, that climate change has an impact on tourism, as well as on tourism products offered in coastal and marine tourism areas.

2.3: Coastal tourism and the environment

2.3.1 impacts on land

Coastal and marine tourism heavily depend on resources from the coastal area, as well as the aesthetics of the natural environment. Due to the fact that international and intercontinental travel has become so much easier than a couple of decades ago, there has been an increase in tourism demand and coastal tourism is rapidly growing. According to Honey and Krantz (2007) coastal tourism is the fastest growing sector in the tourism industry.

Coastal tourism includes both land-based and marine-based activities. Development of coastal zones / areas has both advantages and disadvantages. One of the biggest advantages of coastal tourism is that the area will be developed, which in turn brings economic benefit (in terms of employment and income growth) with it. Infrastructure development and tourism activities bring along jobs, not only for the community that lives in the area, but also for people from surrounding areas. The economic benefit is also why tourism can be a great driver for a government to develop an area. Development brings foreign investment, jobs for locals, and expenditure from tourism. Sanchez-Quiles and Tovar-Sanchez (2015) note that the need for infrastructural development is also increasing due to the increase of coastal tourism. However, sometimes the economic benefits overshadow the consequences that tourism brings with it. In that respect, several studies also point out that the development of coastal areas has ramifications for the natural environment. The study done by

Pedrozo-Acuña, A., Damania, R., Laverde-Barajas, M., & Mira-Salama, D. (2015) confirms that due to the rapidly growing tourism demand and demand in coastal development tourism activities have contributed to the degradation of coastal ecosystems. They also note that these ecosystems are coming under more pressure as a result of coastal population growth, the continuous expansion of the tourism industry and the incremental incidence of extreme events such as hurricanes.

The study done by Gössling and Peeters (2014) shows that the amount of water and other resources needed to develop a coastal destination is very high. It shows that, due to tourism, the day-to-day consumption of water in a destination is very high as well. Other research shows that the water quality in coastal destinations is degrading. Many studies contend that development of coastal zones may be beneficial for the local and national economy but that tourism has a negative impact on the natural environment. Due to development of infrastructure these areas are also dealing with a number of issues. For instance, waste management problems, water management issues and spatial problems. In many cases we see that coastal destinations develop in an organic way, meaning that the destination develops in a natural way and that planning regulations are usually not fully adhered to. Development in these areas can also cause spatial problems, where, for example, local communities are displaced and land use is changed from agricultural land to commercial plots, resulting in much higher land prices due to real estate development and investors willing to develop land and property.

2.3.2 Impacts on water and its ecosystems

Aside from socioeconomic and socio-political issues that tourism development can bring with it, there are many people who forget the environmental ramifications of tourism. As mentioned before the massive amounts of consumption of water is an issue that a couple of destinations have to deal with. Due to development of coastal areas whole mangrove systems and mangrove forests are removed for land reclamation and also for developing tourism infrastructure. A good example of this is Bali, where mangroves have been removed for land reclamation. The resulting scandal, which occurred in Bali earlier this year, is just one of the many examples where we see that development of land carries greater weight than taking care of our natural environment. Studies also show that there is a relation between MBT and economical growth and that MBT can be sustainable when different stakeholders work together (Haddock-Frasier & Hampton, 2012). However, Doiron & Weissenberger claim that coral diving tourism can hardly be qualified as sustainable in the tourism industry, unless the health of the coral ecosystems is given priority over the short-term economic development.

Mangrove forests are extremely productive ecosystems that provide both local communities and the marine environment with beneficial services (WWF, n.d.) . Mangrove forests are home to a large amount of aquatic species, which form a food source for local communities, they provide wood and plant products, form a natural protection for the coastline and function as a natural filtering system for groundwater that is ultimately connected to the sea. By keeping mangrove forests in place and maintaining them, they can be used for

tourism purposes as well. For example, in Palawan, The Philippines, the mangrove forest is used as a tourist attraction. The community uses the mangrove forest for their livelihood; it protects the island from erosion and serves as protection from typhoons, as well as tourists who can enjoy the wildlife in the mangrove forest. In addition to the aforementioned, mangrove forests also provide many nutrients for coral reefs and marine species.

Coral reefs, like mangrove forests, are also important ecosystems for the marine environment. According to the WWF coral reefs are home to 25% of marine life on the planet. They support enormous biodiversity and are of immense value to humanity. Just like mangrove forests, coral reefs offer coastal protection. Coral reefs break the power of waves during storms, typhoons and hurricanes. By diminishing the power of waves they also acts as a natural barrier against beach erosion. Coral reefs have intrinsic value for coastal communities and their traditions and are also vital for the fishing industry. Coral reefs are also of value for tourism. In fact, tourism in tropical coastal areas depends heavily on these coral reefs and its biodiversity when talking about marine based tourism. Many people dream of the white, sandy, and unspoiled beaches, imagining themselves snorkelling or diving pristine coral reefs with lots of biodiversity. The truth, however, can be disconcerting, since in many destination areas reefs have been destroyed by bomb fishing, overfishing, climate change and other anthropogenic activities or disasters, such as oil spillage.

With the destruction of reefs either by natural disaster or by human activity, the fish population decreases as well, which makes the key attraction, namely diving, snorkelling or non-consumptive marine activities such as glass-bottom boating and whale watching, for some destinations less appealing. Hall (2001) confirms this by saying that the environmental effects of urban and resort development, land clearing and pollution are major indirect aspects of tourism's impacts on coral reefs.

2.4 Marine based tourism

As stated before, coastal tourism refers to both land-based and water-based activities. Marine based tourism, however, only refers to the activities undertaken on or in the water. In the next few paragraphs a distinction between the various activities will be made and the impact of these activities will be illustrated. There are numerous studies that demonstrate that there is a relation between the degradation of marine ecosystems and coastal tourism. (Lucrezi, S. et al. 2013; Lamb, J. et al. 2014; Selkoe, K. et al. 2009.) However, these studies are done from an ocean and coastal management, biological conservation or marine policy perspective. The studies describe that anthropogenic activities influence the state of the frail eco-systems and what impact these anthropogenic activities have on the environment. Most studies focus on a specific phenomenon.

2.4.1 Beach activities (waste pollution, water pollution due to sunscreen, and destruction of habitat for animals)

Although activities on beaches may not seem harmful to the natural environment, they do have an impact on the natural environment and on the ecosystems in the oceans and seas. Sanchez-Quiles and Tovar-Sanchez (2015) show in their study that UV-filters from sunscreen can reach the marine environment directly as a consequence of recreational water activities. According to Sanchez-Quilles and Tovar-Sanchez, the use of sunscreen became popular in the second half of the 20th century and that sunscreen organic components have been determined in various bodies of fresh water, as well as seawater. Other research has reported the organic UV-filters in open waters such as the Pacific and in tissues of natural populations of aquatic organisms such as mussels, crustaceans, eels, fish marine mammals and aquatic birds. Different studies done on fish have indicated that concentrations of organic UV-filters may induce change in genes in hormonal pathways. Studies, referred to by Sanchez-Quilles and Tovar-Sanchez (2015), also indicate that the organic UV-filters found in sunscreen has a toxic effect on the marine environment and that it induces coral bleaching and killing the symbiotic microalgae which keep the corals alive.

Some other activities that affect the natural environment are leaving behind waste, collecting shells from the beach and breakage of foliage. For instance, if waste gets left on beaches it will wash into the sea, animals might get in contact with it or eat it and what most people forget is that plastics and other inorganic materials take a very long time to disintegrate. Tourism activity and development may harm the breeding grounds and habitats of some of the indigenous animals living there.

Figure 6: Do you see the difference?

Source: Ignis Natura: Medicina Natural, Ecología y más (2015)

2.4.2 Motorised and non-motorised (boating) activities

Activities on and in the water require most of the time, motorised boats and other vessels, which affect the health of the reef, its biodiversity and both reef and pelagic fish. Even non-motorised vessels have an impact on the marine wildlife and reefs. Harriott (2002) indicates in her study that it is very hard to distinguish between tourism and recreational activity. The motorised activities produce sound pollution and exhaust fumes from

the engines. Another one of the issues that these boating activities bring with them is littering by tourists. Although most tourist briefings contain one or two sentences about how anything that is not produced by the human body should not end up in the sea, there will always be tourists who don't see the ramifications of throwing even a little piece of plastic in the sea. Other impacts, on both the reefs and also the marine wildlife, are moorings. Moorings are put in place to reduce anchor damage but they do cause local damage to benthos (flora and fauna found on and in the bottom sediment of seas, lakes or other bodies of water). Anchoring is another problem. Captains and boatmen will drop the anchor, which may harm the corals and reefs. Motorised boating and activities such as snorkelling with the whale sharks may strike or disturb the animals. The study of Burgin and Hardiman (2015) confirms this. Their study shows that behaviour of marine wildlife changes due to non-consumptive wildlife tourism and that animals are struck and harmed by the motorised vessels. Environmental studies show that there is a relation between the change of behaviour of pelagic fish, such as whales, sharks and dolphins, and non-consumptive wildlife-tourism (Burgin, S., & Hardiman, N., 2014).

2.4.3 Snorkelling and diving activities and their impact on the environment

There are also numerous studies on divers' impact on coral reefs and the relation between dive tourism and coral disease (Dimmock, K., & Musa, G. 2014; Lucrezi, S., Saayman, M., & Merwe, P.,2013; Lamb, J., True, J., Piromvaragorn, S., & Willis, B., 2014). As stated before, corals and reefs are impacted by climate change. Change in water temperature due to climate change but also due to anthropogenic activity. Various studies show that diving does have an impact on the growth and recovery of coral systems (Doiron& Weissenberger, 2013; Lamb, et al, 2014; Johanson & Koster, 2012; Tratalos & Austin, 2001; Barker & Roberts, 2004). Coral diseases, pathogens and coral death is more common in regions where reef-based tourism is rapidly growing.

Studies have been done to find out what can be done to avoid contact and the disturbance of the reef systems. Johanson and Koster (2012) compared three big scuba diver certifying bodies, British Sub Aqua Club (BSAC) the Professional Association of Diving Instructors (PADI) and Scuba Schools International (SSI), to see what these companies did to make entry-level divers aware of their impact on marine environments. All three dive-companies encourage low- impact diving, where one focuses on body position, efficient fin kicks, and neutral buoyancy. Entry-level divers are taught not to touch or harass marine and aquatic life. However, when divers are certified they are no longer reliant on a dive professional and can dive in buddy teams. Johanson and Koster (2012) furthermore state that further education would be needed to improve skills and knowledge to become a good low- impact diver. However, the majority of divers who are certified after their entry-level certification do not see the need to improve their skills or knowledge since they dive for recreational reasons. From an environmental perspective, the need to raise awareness and to further the education of divers is a great necessity.

Studies show that there is a relation between the intensity a dive site is used and the susceptibility or disease of corals (Lamb et al, 2014). According to Lamb et al (2014), recreational divers increase the turbidity and re-suspension of sediment at popular dive sites and suggest that spatial management strategies can reduce or

restrict activities that have impact on coral health. Other studies show that if the most popular dive sites are to maintain their aesthetic and biological characteristics, more management of reef-based tourism is needed. Lucrezi et al (2013) state that there is a need to formulate and implement regulatory interventions to control MBT.

In conclusion to this chapter it can be noted that tourism has a great impact on the natural environment, starting with how tourism impacts climate change and that anthropogenic activity has an impact on both reef and other ecosystems. The table below, as described by M.B. Orams (1997), shows the anthropogenic impacts and the activities that impact the ecosystems. This table refers to both CT and MBT.

Table 2: Table of Impact

Impacting activity	Impacting factors	Impacted ecosystems
Sunbathing, picnicking etc.	Litter, fecal matter	Sandy beaches, dunes: changes in plant community through eutrophication, fire hazard, threat to animals
	Trampling and breaking plants	Soil erosion, damage to vegetation
	Physical presences noise	Stressing small animal species (sea turtles laying eggs)
Swimming	Water contamination from sun-tan oil, soap	Coastal waters, lagoons: eutrophication
Non-motorized water sports: surfing, sailing, paddling	Physical presence, movement	Coastal waters, sea, beaches: stressing animal species (seals water birds)
Skin diving	Damage to corals	Coral reefs: damage to reefs, shifts in species makeup
	Underwater hunting	Decimation of fish species, shifts in species makeup
	Stirring up of sediment	Decreased photosynthesis due to clouding of water
	Touching and feeding fish	Shifts in species makeup, stressing shy fish species
	Littering	Eutrophication, threat to animals (turtles, dolphins)
Motorized water sports (motor boats, water skiing, jet skis, parasailing)	Noise	Coastal waters, lagoons, river mouths: stress to animal species (water birds, seals, fish)
	Wake waves, vibrations, stirring up of sediment	Injuring/killing animals (turtles, manatees, whales)
	Mechanical effects of propellers	Damage to shore and underwater vegetation
	Contamination by oil and petrol, anti-rot coating	Water contamination (heavy metals), poisoning of animals and plants
	Anchoring	Coral reefs, eelgrass meadows: mechanical damage
Sightseeing (with underwater or glass bottomed boats)	Wake waves, stirring up of sediment, propeller effects, chemical contamination	Coral reefs: *see motor boats*
Fishing, clam diving	Over fishing, over gathering of particularly attractive	Open sea, coastal waters, lagoons, river mouths, beaches:

	species	decimation of species
Nature observation (on foot or in boats)	Physical presence, noise	Sand banks, rock cliffs, wetlands, mangroves: stressing animal species
Walking, bicycling	*See sunbathing, picnicking*	Dunes, rocky cliff, hinterland
Sports (motor-boating, horseback riding, golf)	Noise, wake waves etc *See also motorized sports*	Mechanical damage *See also motorized sports*
Eating, drinking	Over fishing of particularly tasty fishes and seafood	Open sea, coastal waters, seafloor: decimation of fish species, lobsters, clams
Purchase of souvenirs	Corals, shells	Coral reefs, seafloor: decimation of coral and clam species
Cruises	Illegal dumping of waste, sewage, oil and petrol	Open sea: endangerment and poisoning of animals and plankton
	Anchoring (particularly by small yachts)	Coral reefs, eelgrass meadows: mechanical damage
Visits to natural reserves	*See nature tourism*	*See nature tourism*

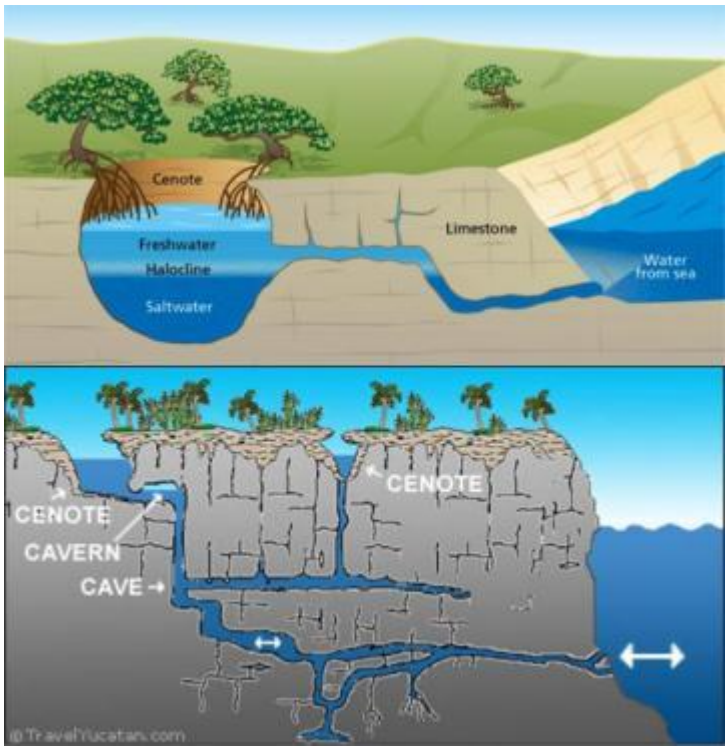
Chapter 3 Current situation of Playa del Carmen

This chapter will focus on the current situation of PDC. It will describe the current spatial situation, the way the destination is governed, the specific activities that are undertaken in the area, the current issues that this destination deals with and last but not least the importance of awareness and education in this matter.

3.1 Spatial situation

As stated in the previous chapters of this study PDC is a fast growing, vibrant tourism destination. The continuous growth of this destination means that there is also continuous development going on in the destination area. This also means that beaches, mangroves forests and jungle have to make way for this development. The state of Quintana Roo is riddled with cenotes, the underground cavern and cave system that is both directly and indirectly connected with the Caribbean Sea. The pictures below illustrate how this is connected to MBT.

Figure 7: Cenotes, cave and cavern systems



However, as mentioned before in the problem statement and the previous chapter, MBT and CT are interlinked and this makes it difficult to make a definite distinction between the damages done to the reefs from anthropogenic activity on land and in the water. As can be seen in the figures above, the cenotes lie more land inwards which means that development on land has an impact on the cenotes. In the Riviera Maya and thus in PDC it is not uncommon for real estate developers to dig into the limestone and use cement to start their building structure. Subsequently, this means that the development of (tourism) infrastructure both directly and indirectly affects the ecosystems in the ocean.

In the case of Playa del Carmen it was observed that some of the cenotes were filled with concrete so that a paved road could be built on top of it. Cenotes are also used for aquatic activities, such as swimming and snorkelling. As seen in table 2 both swimming and snorkelling have an impact on the ecosystem. Tourists visiting cenotes will both wear sun tan lotions as well as bug repellent, which both inadvertently contaminate the water and thus harming the reef ecosystem.

3.2 Governance / existing policy and regulations

When looking at governance in PDC, there are three layers of government. There is the Federal government of Mexico, which is situated in Mexico City, el Distrito Federal de Mexico (el D.F.). The other two tiers are State government and Municipal government. For all three tiers there are different election terms. The Federal Government elections are held every 6 years. The State of Quintana Roo has elections every 4 years and the Municipal government of Solidaridad holds their elections every 3 years. This means that political views, strategies and policies are rapidly changing and are changed often. When looking at the spatial governance of the destinations area the Federal government designs the law for all the beaches and oceans surrounding the country. Both State and Municipal governments will design laws, policies and regulation regarding what happens on land, such as building regulations.

However, as in many situations and in different countries we see that laws, policies and regulations that are designed from a top-down strategy, are not always implemented as they should and strategic planning does not always match State and municipal laws, policies or regulation. When looking at the destination PDC there is a divide between the governance of a relative small area. Between the land and the sea a line cannot be drawn as to separate the two. They are interconnected and with both, as seen earlier in this paper, the anthropogenic impact on land also affects the oceans and the ecosystems and biodiversity in the seas.

Figure 8: Division of laws

3.3 Developments and trends of MBT in PDC

New technologies allow consumers to have new experiences in and on the water and motorised water sports are more available and affordable now, than in the past. To name a couple of water sports that is being undertaken on the water, which is relatively new in this destination;

Paddle boarding

Fly boarding Jet

skiing Parasailing

Power boating

Then there are the sports that are now rapidly growing in popularity such as:

Snuba (activity that is like snorkelling only one has a regulator in his mouth instead of a snorkel. The regulator is attached to an air supply on a dingy)

Adventures with Sea Trek masks (Underwater walking tour, no swimming required, wearing a full face mask, which allows you to breath and see)

Tours on a sub-

marine Free diving

Spear fishing

Scuba diving

Scuba diving has seen an upward trend in the past five years. Ten years ago, scuba diving was still considered an extreme sport. However, with so many dive centres in PDC, almost all dive shops and resorts offer introductory dives in swimming pools at the resorts and Discover Scuba Diving courses (DSD). Diving has now become a “must-do experience” on many people’s list. However, due to this new technology, both Snuba and adventures with Sea Trek masks put an extra strain on the reef ecosystem. The problem with both these activities is that people engaging in these activities are not engaged with the environmental issues, which we already deal with. Even with DSDs we see that most people are more interested in taking pictures of each other and taking “selfies” than in the marine life.

3.4 Major Issues

The previous paragraphs describe the current situation in PDC. When analysing the current situation, it can be seen that all three subjects present different issues. Due to the growth of PDC it can be seen that there are some spatial issues in the destination regarding the development of infrastructure competing with the natural environment. This growth is also related to the way that the destination is governed and whether or not the destination is developing in a sustainable way. The issues are directly affecting the natural environment, both on land and in the sea, of the destination. A good example of one of these issues is that there are no policies or

regulations that prescribe/limit the maximum amount of people in the water and on the reefs. During high season, which is from the end of November until the end of March, the pressure on the reefs is tremendous, especially on the more shallow reefs. Contrary to Cozumel, which is the island just off of the coast of PDC and is a marine protected area (MPA), Playa does not have a regulatory body that patrols the waters and makes sure that the reefs are not over-dived.

Another example of one of the ecological issues is the crowding of animals during the activities that tourist undertake. The need not to harm marine and aquatic life is generally emphasized during the pre-dive briefing. A good example of this is Akumal, Mexico. Since tourism is booming in this small fishermen's town, the feeding behaviour of the green turtle has changed. Green turtles feed on sea grass during the day, but since the number of tourists is increasing the turtles are coming at night to feed. Tourists are excited to see the turtles while snorkelling, but they also touch and chase the animals. Tourists will crowd turtles to get a better look at it, while all that the turtle wants to do is take a breath of air.

Figure 9: Anthropogenic impact on aquatic animals

Studies also show that the contact with corals is less when divers are given a briefing before the dive in combination with an intervention of a dive professional during the dive. Barker and Roberts (2004) state that divers who use cameras underwater are far more likely to cause coral breakage than non-camera users due to the fact that they want to steady themselves to take a picture. Herring (2006) states in her research done in Akumal, that visitors are more concerned with seeing the reef and experiencing a positive dive than gaining knowledge on reef conservation. The divers themselves are not the only issue that the Mesoamerican Barrier Reef in front of Akumal has to deal with. Tratalos and Austin (2001) state one of the issues the Mesoamerican Barrier Reef deals with is fish feeding by divers and snorkelers. This could possibly have a larger impact on coral communities than direct contact (touching coral) or indirect contact (stirring up sediment). Feeding fish could attract more predatory fish, like sharks and barracudas, which may damage the reef when seeking prey. This is

a big problem, since the reef in Akumal already has been damaged severely. Also, the turtles that used Akumal Beach and reef as a nesting ground are rapidly disappearing due to the large amount of divers and snorkelers.

3.5 Importance of education and awareness towards a possible solution

Even though there already is more awareness regarding the importance our natural environment and ecosystems, it seems that there is still a great need for further education and more awareness. With activities such as snuba and underwater walking safaris with Sea Trek masks, there is an increase of anthropogenic activity in the sea, which in turn puts more pressure on the reefs. New technologies and new gadgets, such as smartphones with cameras and waterproof cases and relatively cheap cameras such as the GoPro, allow tourists to take pictures underwater. There have been many occasions where tourists have been observed in the water with these gadgets, completely unaware of their surroundings and their behaviour towards aquatic life and corals and thus showing damaging and depreciative behaviour. At times, groups can be more than 10 people in which case the guide or instructor will not see the depreciative behaviour and is not able to correct the depreciative and damaging behaviour of the customers, or to reinforce the rules set forth by the company.

During the research it became clear that there are stakeholders within the destination whom are very aware of the environmental issues and are trying to find a solution. It also became clear that there are stakeholders that have both education and awareness of the issue. However, monetary value and gaining economic strength are more important than dealing with environmental issues. It can be concluded that because the environmental issue is not part of and/ or does not harm their core business product, working towards a solution is not as important.

Chapter 4: Possible frameworks and approaches for best practices

This chapter will focus on international policy and frameworks. It reviews several international frameworks that may be used as possible approaches to address the current issues that Playa del Carmen faces. The chapter will first focus on a framework that could be used as a national (federal) strategic approach. Then it discusses a framework that could serve as a state level strategic approach and ending with a possible framework that could be implemented in the destination area.

4.1 General frameworks and policies

International directives give a framework for policy makers on national, regional and local levels. The environmental international directives have been set by the Convention on Biological Diversity (CBD). The CBD and its member states promote nature and human well being. The directives from the CBD can be used as a framework for the member state governments. For instance, using the international directives of the CBD, the Mexican government has designed a national biodiversity action plan (cbd.int, n.d.) and made environmental policies. To implement this international directive, Mexico has added millions square hectares of wetlands, which are of international importance, as well as ecosystems such as mangroves and coral reefs. They have made policies to conserve their environment on land and in the ocean. The CBD (cbd.int, n.d.) says:

"Mexico is regarded as a country that recognizes the value of environmental services rendered by its natural resources. In terms of benefit-sharing, the amendments made to the Mexican Constitution in 2001 recognize the rights of the indigenous peoples and communities in various areas."

Policies can be written for practically anything and cover a wide range of topics. Within the environmental approach there are many different policies. For instance, many countries with coastal and ocean zones have fishing and agricultural policies so that the industry has a framework of rules and regulations which they can use when doing business. However, policy is never static and is made and enacted in a turbulent, dynamic and competitive context (Stevenson et al. 2008). The authors of this same article state that tourism policymaking is a complex and social process involving interaction, collaboration and negotiation between different stakeholders.

Ideally, when a destination is being developed there would be a planning department involved and a destination would follow an incremental or induced path, such as Weaver (2011) describes in his paper "Organic, incremental and induced paths to sustainable mass tourism convergence". However, in most cases we see a tourism destination grow in an organic way, rather than the induced and/or incremental path.

4.2 Conceptual framework for tourism strategy: The Green Economy (GE)

The Mexican federal government could use the GE framework to design their national tourism strategy. Mexico's national tourism strategy is focused on economic growth and growth of tourism infrastructure and safety (Journey Mexico, 2013). However, when looking at the reality of the way Mexico is developing, we can conclude that it is not in a sustainable way. The Green Economy approach could support and perhaps strengthen the current tourism strategy. The following paragraphs will elaborate on the Green Economy framework.

Late 2008, The United Nations Environment Programme (UNEP) launched the UNEP Green Economy Initiative (GEI). It consists of several components of which the collective overall objective is to provide the analysis and policy support for investing in green sectors and in greening environmental unfriendly sectors. For the purpose of the GEI, UNEP has come up with a working definition, which is as follows:

> ***" To improve human well-being and social equity, while significantly reducing environmental risk and ecological scarcities."***

UNEP (2011) describes the three major pillars of the Green Economy as being: (1) low-carbon, (2) resource efficiency and (3) social inclusion. They say that the concept of the Green Economy is not there to replace sustainable development, but that there is a growing recognition of sustainability of getting the economy right.

Law, A et al (2014) say that tourism's role is conceptualised by UNEP through a framework of specific challenges and opportunities. These challenges and opportunities include the following:

1: Energy and GHG emissions
2: Water consumption
3: Waste management
4: Loss of biological diversity
5: Management of cultural heritage

Law, A et al (2014) says that opportunities are identified as sizing and growth of the tourism sector, changing consumer patterns and the potential for local development and poverty reduction. However, they emphasise that the impacts of tourism can vary significantly between destinations and that each destination should, therefore, develop its own approach, based on the characteristics of that specific destination. In their paper Law et al. present a framework for a Green Economy transformation in tourism destinations. They first framed the green economy concept and presented a model for how it may be integrated into a tourism stakeholder engagement process. The model was applied in a case study of Bali in a roadmapping approach for the destination to develop a holistic green economy strategy. The results show that their model allows the essential components of stakeholder engagement and strategic orientation to be integrated into a holistic roadmap, based on the green economy principles. They say in their conclusion that a successful Green

Economy transformation not only needs a sound concept and strategy, but also specific local conditions for success. They further say that a successful implementation is ultimately dependant on committed public and private leadership at a national, provincial and local level, as well as regular review and updating of strategies and implementation activities in the short-, medium and long-term.

4.3 Ecosystem-based Marine Spatial Management (EB-MSM)

When looking at the state Quintana Roo and the destination Playa de Carmen it can be observed that several policies by the government are not being adhered to. For instance, building regulations are being disregarded and developers are willing to pay the fines for breaking policy and regulation, rather than adhering to these policies and regulations. By ignoring these policies real estate developers as well as hotel developers choose to build and develop in an unsustainable way, which has grave consequences for the natural environment.

In the literature Katsanevaki et al. describe EB-MSM as follows:

> "Ecosystem-based marine spatial management is an approach that recognises the full array of interactions within an ecosystem, including human uses, rather than considering single issues, species, or ecosystem services in isolation". (Katsanevakis et al., 2011)

To give an example of how this framework could be implemented, the government of Barbados uses ecosystem-based measures to address reef damage and coastal erosion due to SLR. They have said that sustainable tourism is only feasible if the vulnerable coral reefs that surround the island will be preserved (Mycoo, 2014). Baine et al. (2007) state in their article that the participatory level of the stakeholders can greatly help in the implementation of policies. In the case of the Bonaire Marine Park in the Netherlands Antilles results indicated that proper management could yield both protection and development benefits although it was noted that questions of ecosystem carrying capacity and retention of the economic benefits of tourism within the country did raise important issues for longer-term sustainability of the marine- based tourism product (Hall, 2001).

The Convention of Biological Diversity (CBD) was founded in 1994 and now has 196 member states. In 2004 the CBD published guidelines for "the Ecosystem Approach", in which they say that it is a strategy for integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. The CBD has 12 principles on which they base their ecosystem approach, namely:

1: The objectives of management of land, water and living resources are a matter of societal choice

2: Management should be decentralised to the lowest appropriate level

3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems

4: Recognising potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.

5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority of the ecosystem approach.

6: Ecosystems must be managed within the limits of their functioning.

7: The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.

8: Recognising the varying temporal scales and lag-effects that characterise ecosystem processes, objectives should be set for the long term.

9: Management must recognise that change is inevitable.

10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity

11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.

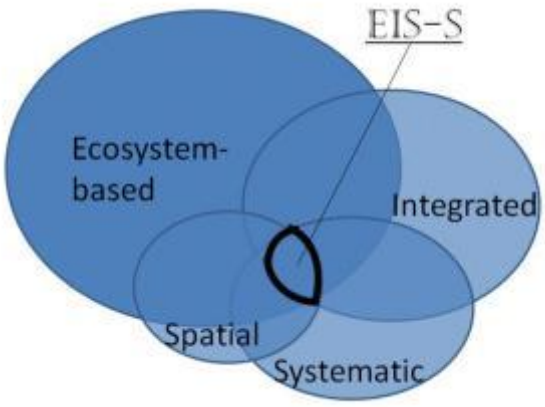
12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

In an article published on Open Channels: Forum for Ocean Planning and Management, Jeff Ardon (2012) says that there are so many acronyms for the concept of Ecosystem Based Management, that it is becoming confusing. He says that it basically comes down to the following:

Ecosystem based management is based on management in ecological realities. Integrated management (coastal zone and marine zone management) is about humans and their activities in the coastal area and how to integrate them in the planning process of the ecosystems. Ardon says that systematic planning is needed to conserve and to reach objectives and goals and that they cannot be spatial. And last but not least he talks about spatial planning (zoning) and describes it as the planning of a space and how increasing numbers in humans can utilise that space.

The figure below shows how each of these management perspectives can be combined and has an overlap, which he calls Ecosystem –based, Integrated, and Systematic, within a Spatial context (EIS-S Management).

Figure 10: EIS-S



Tourism is a complex system and managing an area that is mainly tourism driven, such as PDC, can be very difficult. When combining tourism with the abovementioned approaches, it is important that all of these approaches have a sound base. In the case of Playa del Carmen the overlapping part could, for instance, be designed as making the reef areas/ sea an MPA with areas for fishing, diving and doing research as well as building artificial reefs in order to decrease the pressure on the existing reefs. And last but not least encourage capacity building and sustainable development of the area, using tourism forecasts such as the Travel and Tourism Reports.

4.4 Destination Management Organisation (DMO)

As described in the previous chapter, research has shown that there is a gap between the federal laws in Mexico, regarding the beaches and the oceans, and the state and municipal laws and regulations, regarding the way PDC is developing.

According to the United Nations World Tourism Organisation (UNWTO)(2007) the purpose of a Destination Management Organisation is to facilitate the understanding of the full array of social and economic dimensions of tourism, in terms of demand and supply as to guide tourism policy and planning while providing a useful lobbying tool to national tourism administrators to advocate the cause of tourism. They further say that the management of a destination calls for coalition of different organisations and interests, working towards a common goal. The role of a DMO should be to lead and coordinate activities under a coherent strategy, to bring resources and expertise together and to have a certain independency and objectivity to lead the way forward. However, the DMO does not have any control over activities of its partners. DMOs were initially focused on marketing activities and are now broadening their scopes to becoming strategic leaders in tourism and destination development.

The UNWTO has defined three different categories for DMOs:

1. National Tourism Authorities (NTAs) or Organisations (NTOs), responsible for management and marketing of tourism on a national level.
2. Regional, provincial or state DMOs (RTOs), responsible for the management and/or marketing of tourism in a geographic region defined for that purpose, sometimes but not always an administrative or local government region such as a county, state or province.
3. Local DMOs, responsible for the management and/or marketing of tourism based on a smaller geographic area or city/town.

To mitigate the impact of tourism and especially the impact of MBT on the ecosystems a DMO could be established. Based on the categories the UNWTO has defined it would be possible to start either an RTO or a local DMO for either the Riviera Maya or just Playa del Carmen alone. The function of the DMO would be to work towards a more sustainable tourism destination, involving the stakeholders in the area. However, instead

of focusing on the marketing of the Riviera Maya and Playa, the DMO would focus more on coalition between the stakeholders, making sure that policy and regulations are being adhered to and making sure that the common goal of developing in a sustainable way and mitigating the impact of tourism on the ecosystems is reached.

Chapter 5: Findings field research

This chapter discusses the findings from the field research. The major findings from the interviews are summarized in section 5.1 below. The relation between the research questions and the interview questions can be found in a table in appendix 4. Section 5.2. discusses the findings from the observations made during the dives. In this section the behaviour of the observed divers was recorded and analysed. Section 5.3 dscusses the visual material that was collected for contectual analysis, and section 5.4. makes some concluding observations on other relevant information obtained during the research.

5.1 Findings Interviews with dive shops

5.1.1 Change in competition

The results from the interviews show that 7 out of 10 dive shops have experienced growth. The interviewees say that their position in the market has not changed much in the past 5 years, amongst the established dive shops in Playa. However, there is an increase in the number of freelance dive instructors in PDC. The established dive shops do compete with them on a different level, since the freelance dive instructors can offer much lower prices than the dive shops. Interviewees say that this competition is unfair because the freelancers often do not have the legal papers to work, cannot afford to have a physical shop, that they don't have the costs for buying and maintaining equipment and that they don't pay taxes. Some of the dive shop owners would like the government to do something about this. When asked what the biggest threat to their company was, most dive shops said that weather conditions, freelancers and their low prices. Some of them have mentioned the degradation to the reefs and change in biodiversity.

5.1.2 Briefings and correction of depreciative behaviour

At all the dive shops the dive briefings are given by the instructor who leads the dive. All briefings include safety procedures, reef topography, aquatic species that might be seen during the dive and most of the dive shops say they include telling their customers during the briefing that touching anything underwater is not allowed. With DSDs and novice divers all dive shops say that they emphasise not touching, watching buoyancy and fin kicks. All dive shops say that they take the DSDs and novice divers to the shallow reefs where there is a sandy area next to the reef. If the buoancy of the diver is good enough, the instructor will take them on top of the reef. All interviewees say that when they see depreciative behaviour that they correct this behaviour. Some of the dive shops have very strict policies and will cancel the dive if a customer show really bad depreciative behaviour, such as touching or taking things from the ocean bottom or harassing aquatic life, in which case the customer will not get refunded. Many dive instructors will lead by example and will reinforce good diving behaviour after a dive if the customer has shown depreciative behaviour. They will, again, say that touching is not allowed or that the customer needs to watch their fins and buoyancy. In the case of a diver whom has a camera, shows depreciative behaviour, and the customer needs to stabalise themselves holding on to something underwater, the camera will not be allowed to go with the customer during the next dive.

5.1.3 Changes in the reefs and amount of aquatic life

Many dive shop owners and instructors have seen changes in the reefs and in aquatic life. The changes in the reefs that have been observed by them is the health of the reef and a lot of breakage. Breakage does not only occur due to the divers diving the reefs, but also by anchoring and the fishermen that fish in the area. Most dive instructors carry a knife with them while diving as to be able to cut a fishing line which is stuck on the reef and at times they will cut the rope of an anchor if they find the anchor on the reef. The latter does not happen very often since most boat men know that they need to drop the anchor on the sand and not on the reef. The two reefs that have been used as examples during this research are Tortugas (profundo) and Jardines. The reason for choosing these reefs as examples is because they are the most frequented dive sites and because the changes in these reefs have been observed most. - Tortugas is a bottom reef which slopes from 4 meters until approximately 45 meters. Tortugas means turtle in Spanish. The reason the reef has this name is because there always used to be many turtles on this reef, feeding on the sea grass and the sponges. Jardines is a shallow reef which has a small wall and next to that a sandy area. The top of the reef lies in approximately 6 meters of water and the deepest part of the reef can be found at approximately 12 meters. (for reef maps please see appendix 3)- On the Tortugas Reef there has been a lot of damage to barrel sponges and soft corals like sea fans. On the shallow reef, Jardines, there has been a lot of damage of hard corals such as brain corals and staghorn corals. With respect to the aquatic life there have been noticable changes on both reefs as well. When looking at Tortugas, the interviewees have observed less turtles. Ten years ago when some of the dive shops took their customers to Tortugas, they would have the policy that if the customer didn't see more than 15 turtles during one dive, they would be refunded. Nowadays, we are lucky to see 3 to 5 turtles during one dive. There also used to be big schools of barracuda, but now we may see one or two barracudas together. On the Jardines reef there are still schools of grunts but the fish population has decreased according to some of the interviewees. Some dive shops say that there is a lot of overfishing on the reefs, other dive shops say that the animals are free to go as they please, and thus choose to be on the deeper reefs where there are less or hardly any divers.

5.1.4 Possible conservation and preservation solutions

When asked what would be the best way to perserve and conserve the reefs in front of Playa, many interviewees had the same idea. Dive shop owners and managers feel that the amount of boat traffic and the amount of divers in the water needs to be regulated more, especially during bull shark season. Many of them say that education is key. It is important to educate your dive instructors and the customers you have to create awareness on the impact of diving on the reefs. Seven out of the ten dive shops that were interviewed think that the reefs in front of PDC should be made a Marine Protected Area (MPA) or a natural reserve. However, one interviewee, who had also helped setting up the MPA for Cozumel in 1991, said that making an area an MPA is a lot of work. The seas and the beaches fall under federal jurisdiction, which means that if they do want to make the reefs in Playa a MPA, the whole process has to go through el D.F. Not only will this take a lot of

time, they will also need lawyers and it will cost a lot of money. However, there was only one dive shop owner who was against maken the reefs in Playa an MPA. He has lived in Playa for over 25 years and is also a fisherman in this area. He said that if the area would become an MPA, he would no longer be able to fish in these waters. His point of view seemed to differ from all the other dive shop owners. Most dive shop owners are for banning the fishermen in this area because they say it is being overfished. Dive shop owners also seem to be concerned about the way that the runoff water from the hotels ends up in the sea and the way that Playa is being developed , in their eyes, in an unsustainable way. (Eventhough Coastal tourism is interconnected with the impact on the ecosystems and MBT, it has not been researched well enough during this research and will therefore only be touched upon in the end of this document and in the section of further future research.) Other ideas for preserving the natural reefs in Playa are to build artificial reefs and sink more wrecks as to aleviate the reefs that are there now.

5.1.5 Responsibility for maintaining the reef

When asked who is responsible to maintain the reefs, all interrviewees noted that everyone is responsible. By everyone they mean the community of Playa del Carmen, the dive shop owners, the instructors and all the divers and people engaging in activties in and on the water. There are a couple of dive shops that are member of the Association of Dive and Water Sports Operators of the Riviera Maya, named Asociacion de Prestadores de Servicios Acuaticos de la Riviera Maya (APSA), a local NGO. APSA mostly organises the legal paperwork, such as permits, for their members. However, of the interviewees that are a member of APSA, none of them seem to be happy with the services that this association provide. They say that there is a lack of funds to actually really start a good initiative and that it would not be fair for the members to pay the fees and all the other dive shops reaping the benefits of, for example, the bouyes or moorings that would be installed. Some dive shops would like to see more follow up from the federal government on the implementation of the policies and regulations.

There is an other NGO in the area, called Saving Our Sharks (SOS), of which almost half of all the dive shops in Playa are a member of. This organisation was launched in 2010 and their main goal is to study and conserve the sharks, especially the bull sharks, in the area and to protect the environment for future generations to enjoy. This organisation seems to have more weight behind it than APSA and seems more successful at what they are trying to achieve. They are applying a triple helix model, combining research, working with the governement and working together with the dive industry. With the bull shark season coming up (November to February), many dive shops are preparing for this and say that they pay extra attention to the safety aspects during their briefings for the bull shark dives. SOS has created a “guidebook for best practices” especially for this season.

5.1.6 Unsustainable growth and development

The last question asked during the interviews was where do the interviewees think PDC will be in the next 5 to 10 years. Most interviewees said that there will be a lot more development, they fear unsustainable

development. They fear that the cenotes (underground cave and cavern systems which are directly and indirectly connected to the ocean) will be polluted more due to the increasing numbers of tourists swimming, snorkeling and diving in the cenotes which will indirectly pollute the oceans. One of the interviewees gave two very good examples. He compared PDC with Acapulco and Puerto Vallarta in terms of sustainable development. Both destinations in Mexico developed in an organic way. Acapulco was home to the stars of Los Angeles in the '50 and is now a relatively run down destination. The interviewee said this was due to the uncontrolled and unsustainable development in the area, which brought about a change in the type of tourist, which he called a "cheaper type of tourist".. Puerto Vallarta was also a very popular destination, both for beach tourism and diving. Nowadays, in comparisson to PDC it is not as desirable to visit and has, according to the interviewee, "bled out". Cancun is an other example which he gave. Cancun was developed in the '70 as a tourist enclave. The initial tourist area is now almost void of tourists due to all the new All Inclusive Resorts which are lined up along the "hotel zone" along the coast. There is a fear that the unsustainable growth and the uncontrolled development may lead to social issues and other environmental issues that may harm the destination.

5.2 Findings Observations

Initially the observation schedule had been set up for there to be 9 deep dives, 9 mid-deep and 9 shallow dives to be observed. The dive observations were supposed to be done at 3 different sized dive centres. Unfortunately due to low season and weather not permitting the marina to open, this target was not reached. The reason for setting up the schedule in that way was to document the experience level of the divers during the dive and thus seeing whether or not experience had anything to do with the amount of depreciative behaviour being shown by the divers. The divers / customers were not informed of the research being done, as to not change their behaviour. The instructors were informed of the research, for safety reasons.

Definitions for the dives:
Deep dive: >18 Meters
Mid-deep dive: 12 – 18 Meters
Shallow dive: 12 >

In total there were 21 dives obserrved of which 7 deep dives, 5 mid-deep dives and 9 shallow dives. A total of 87 divers were observed of which 34 during the deep dives, 19 during the mid-deep dives and 34 during the shallow dives. Participants of the deep dives are all at least Advanced Open Water (AOW) certified divers. Participants of the mid-deep dives are a mixture of very experienced to Open Water (OW) certified divers and the participants of the shallow dives were mainly OW certified divers and DSD divers. The latter are customers with little to no experience and for most of the DSDs it was the first time ever diving. During the deep dives there were 24 male divers and 10 female divers. During the mid-deep dives there were 16 male and 3 female divers and during the shallow dives there were 20 male and 14 female divers. Prior to all of the dives, a dive

briefing was given to the customers where safety procedures, dive signals, reef topography, aquatic life, types of corals and emergency procedures were covered. All of the dives were boat dives, where divers do a backroll to enter the water. The following behaviour was observed:

- The number of divers with cameras
- The number of divers with cameras touching corals while stabalising to take a picture
- The number of divers intentionally touching corals
- The number of divers unintentional touching corals
- The number of divers stirring up sediment
- The number of divers touching aquatic life
- The number of divers littering
- The number of divers wearing suntan lotion

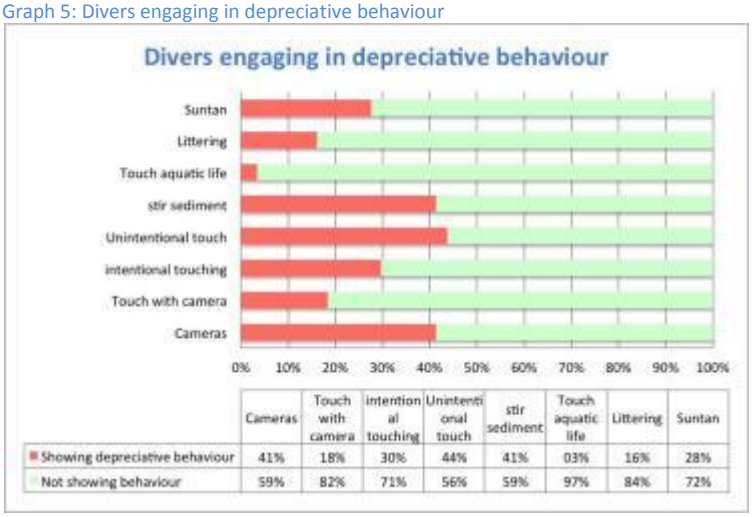
Table 3 will show the results of the percentage of divers engaging in depreciative behaviour in an overview:

Table 3: Percentage of divers engaging in depreciative behaviour

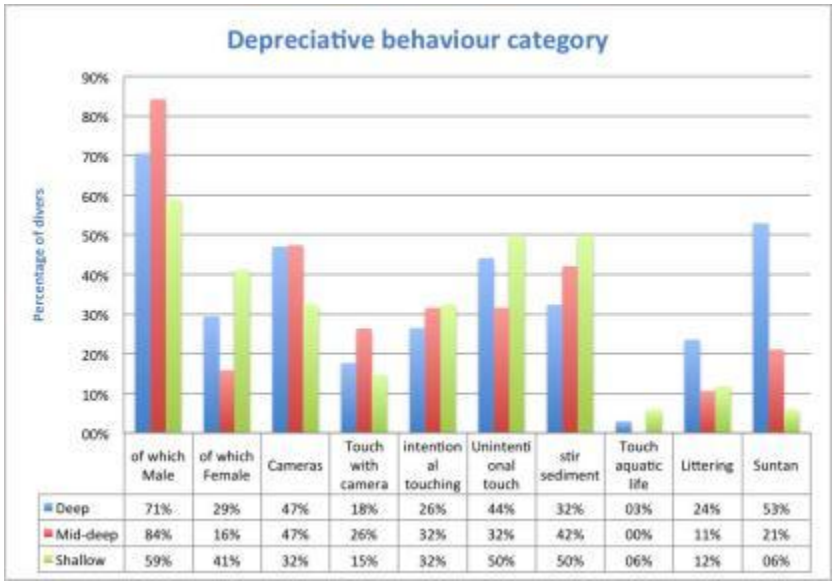
	Deep dives in absolute numbers	% of divers	Mid-deep dive(r)s in absolute numbers	% of divers	Shallow dive(r)s in absolute numbers	% of divers
Total dives	7		5		9	
Total amount of divers	34	100,00%	19	100,00%	34	100,00%
of which Male	24	70,6%	16	84,2%	20	58,8%
of which Femal	10	29,4%	3	15,8%	14	41,2%
Cameras	16	47,1%	9	47,4%	11	32,4%
Touch with camera	6	17,6%	5	26,3%	5	14,7%
intentional touching	9	26,5%	6	31,6%	11	32,4%
Unintentional touch	15	44,1%	6	31,6%	17	50,0%
stir sediment	11	32,4%	8	42,1%	17	50,0%
Touch aquatic life	1	2,9%	0	0,0%	2	5,9%
Littering	8	23,5%	2	10,5%	4	11,8%
Suntan	18	52,9%	4	21,1%	2	5,9%

The graphs below describe the results of the observations, the type of depreciative behaviour and the percentage of customers enganging in that type of behaviour during the dives. The first graph shows the total amount of percentage of the divers engaging in depreciative behaviour. The second graph shows the percentage per dive category.

Graph 5: Divers engaging in depreciative behaviour



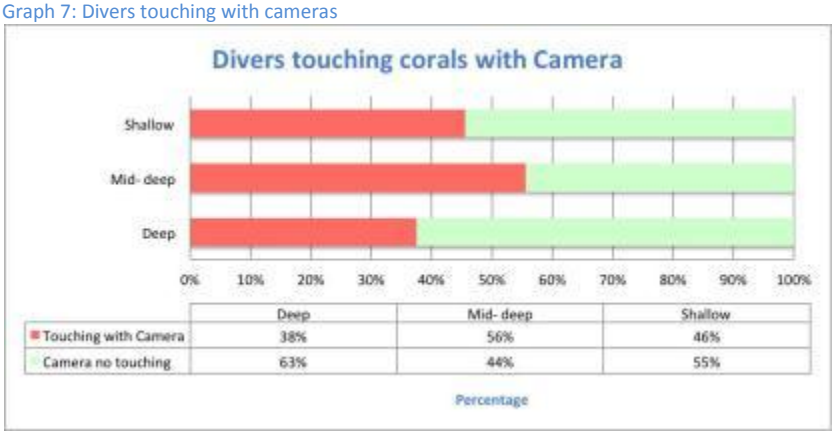
Graph 6: Results per category



	of which Male	of which Female	Cameras	Touch with camera	intentional touching	Unintentional touch	stir sediment	Touch aquatic life	Littering	Suntan
Deep	71%	29%	47%	18%	26%	44%	32%	03%	24%	53%
Mid-deep	84%	16%	47%	26%	32%	32%	42%	00%	11%	21%
Shallow	59%	41%	32%	15%	32%	50%	50%	06%	12%	06%

This graph shows the percentage of divers with a camera touching corals to stabalise themselves while taking pictures:

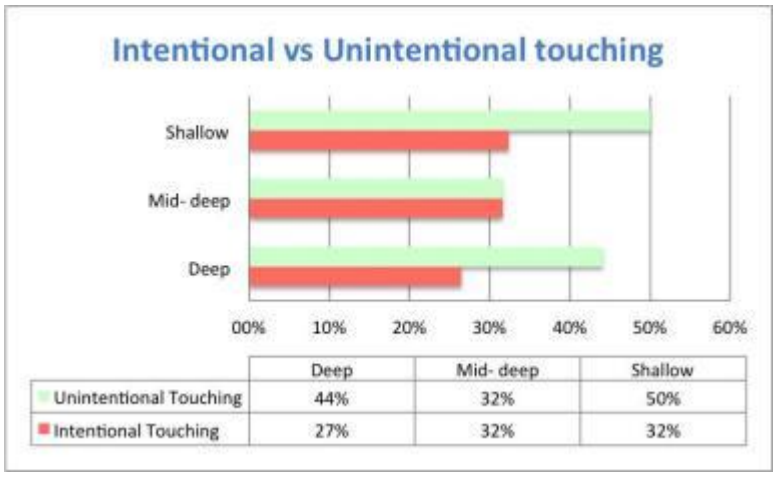
Graph 7: Divers touching with cameras



	Deep	Mid- deep	Shallow
Touching with Camera	38%	56%	46%
Camera no touching	63%	44%	55%

This graph shows the amount of intentional touching vs unintentional touching of corals during the dives. Intentional touching of corals is done when a diver hold coral to stabalise him /herself to either take a closer look at aquatic life or when trying to stay in one place when there is a current. Unintenional touching can be a diver accidentally kicking or touching coral because he is not aware enough of his/ her surroundings or when the current is strong and he/ she gets puched into the reef.

Graph 8: Intentional vs. unintentional touching



	Deep	Mid- deep	Shallow
Unintentional Touching	44%	32%	50%
Intentional Touching	27%	32%	32%

5.3 Content Analysis of photographs

To find good visual material for the content analysis several forums and website communities were consulted. The members of the community were asked to send pictures of Playa del Carmen. Various pictures have been used to analyse the changes that Playa has gone through in the past. Pictures range from 1974 to pictures that were taken recently. The pictures can be found in the appendix.

In the first set of photographs the physical changes over the years is clearly visible. The ferry dock area has undergone vast changes where it keeps being developed and updated. The fauna has been cleared from the beach and make place for buildings. In 2006 the ferry dock was still rather a small landmark. In the last picture, which is a recent picture taken earlier this year, 2015 there is a two-story building being constructed. There is definitely anticipation for growth in tourism and ferry traffic.

The second set of pictures shows the great changes that Playa has undergone from 1974 until 2010 and the development on land. The third set of pictures demonstrates the broadness of the beach. The first picture is an aerial view of Playa del Carmen in 2005, the second picture is an aerial view of the Playacar (a specific area in PDC, which is both hotel zone and a gated community for residents) beach area. In 2010 the government had commissioned a company to make the beaches broader.

The third and last picture is of the same area in Playacar, from a different angle than the one of 2010, however the same stretch of beach. In all three pictures the reefs are visible and in all pictures the proximity of the reefs to the beach is visible. As said before, Playa del Carmen is the fastest growing town/city of Central and South America at the moment and has been for the past 10 years.

The fourth set of pictures shows the rapid development within the town. Calle Corazon used to be a small street with restaurants and small shops on it. It has now made way for a big mall with all the international brands. The first picture of the set was taken early 2014, the second picture was taken earlier this summer, 2015. This goes to show how quickly buildings are constructed and how rapid the development of the town is.

5.4 Other relevant information obtained during the research

During the field research some additional unstructured interviews were conducted to obtain more background information and to get a better understanding of the context in which the research was conducted. During these interviews it became more clear what the current issues are in Playa del Carmen. As observed in PDC, there is an issue with unregulated hotel and property development in the town. With this uncontrolled development come issues such as waste management, water management, sociopolitical and socioeconomical and other environmental issues. Some of the specific issues are pointed out below.

- Policy and regulations are not adhered to and there is no real follow up on theses policies and regulations. A good example of this is the building regulations in PDC. Regulation states that developers are not allowed to build higher than 3 levels. However, rather than adhering to these regulations and trying to a sustainable sollution, developers are willing to pay a fine for breaking regulation. There is also no uniformity in the way that dwellings are built on the "other side of the highway".

- The sewage system does not have the carrying capacity for the rapid development of this town. There are buildings which house companies and apartments that are not connected to the sewage system, as well as households that are not connected. The drainage system of the town is also connected to the sewage system, which means that during heavy rainfall the rainwater ends up in the same system, which causes it to overflow and break, allowing raw sewage to seap into the ground, groundwater and come up through the drains in the streets.

- In a relative poor state people flock to PDC in search of work. This has brought about a new phenomenon in Playa del Carmen, namely, unemployment. Initially people will find work in construction but once the construction project is over the people don't have a job anymore but they will stay in Playa. This means there is also more criminal activity due to the fact that people have no other means of supporting themselves. Since no one is really from Playa, there is no feeling of belonging to the community and little social control.

Other issues that not only affect Playa but the whole of Mexico are:

- Policies, regulations and laws are not adhered to. There is no authority to make sure the three are being upheld. There often are power struggles between the different stakeholders in an area.
- There is a lot of short term thinking instead of long term thinking and seeing the bigger picture
- The money earned from MPAs through the selling of bracelets is not going towards the maintanance of the MPA conservation or research.

All of the above is related to coastal management and both directly and indirectly impact the ecosystems and the environment.

Chapter 6: Conclusions and recommendations

In this chapter the first section 6.1 will discuss the links between the field study findings from the interviews and those from the observations. The second section 6.2 will discuss the overall conclusions for Playa del Carmen. The third and final section 6.3 will discuss the recommendations based on the overall findings (literature review and field research results) of the study.

6.1 Connection between interviews and observations

Interviews were conducted so as to find out how the dive shops operate and whether or not they are aware of the impact on the reef ecosystems in Playa. It became clear that all the interviewees are aware of the importance of the ecosystems and the impact that diving has on the reefs. All interviewed dive shops say that they educate their divers during the briefings and that they state the importance of not touching or harming anything and that they will intervene if they see any depreciative behaviour. However, during the dive briefings given to the safety procedures, reef topography and aquatic life were discussed but not the importance of not disturbing marine life or touching corals. All divers are told either during the briefing when doing their DSD course or Open Water course that touching corals and aquatic life is not allowed. Therefor most dive instructors see this as a given and do not see the need to repeat this during the dive briefing when customers are certified. During the observations there were only 3 instructors that intervened and corrected the behaviour during the dive and only 1 who reinforced good diving behaviour. During one of the mid-deep dives one of the instructors engaged in depreciative behaviour.

The interviewees said during the interviews that when they find divers with poor buoyancy, inefficient fin kicks and stirring up sediment, the instructors will not take them on top of the reef but on the sandy part next to the reef. However, in practice and during the dives a different truth was observed. The conclusion that can be drawn from the observations done during the dives, is that the bigger the group of divers, the less overview the guide has and that the guide / instructor will not have time to correct depreciative behaviour of the divers in the group. Also, it was observed that the number of customers per dive guide or instructor was greater with the bigger dive companies than with the smaller dive companies. From an environmental point of view, it is better to have a smaller number of divers in a group than a bigger amount. This way the guide/ instructor can give each customer more attention and it will be easier to intervene and correct depreciative behaviour.

As with most things in life, it is safe to say that practice makes perfect. Although that it can also be said that with diving, it is not about the number of dives that one has logged, but that the frequency of diving makes the difference. For instance, a diver with over 300 dives can be either good or bad. If the diver dives frequently he will know how to control his/ her buoyancy and conduct good behaviour underwater. However, someone that dives only once or twice a year will have more difficulty because he/she did not anticipate the different conditions from his last dive. In general, we can see that the customers who have little to no experience will

kick up more sediment and that there is more unintentional touching of corals than the divers that are more experienced.

6.2 Overall conclusions for Playa del Carmen

6.2.1 Awareness of the impact of MBT on the ecosystems

Literature has shown us that carrying capacity is important and perceptual carrying capacity is equally, if not more important, to inhabitants of the destination and the tourists that visit. When looking at the ecological carrying capacity of the sea, the reefs and biodiversity on and around the reefs in Playa, we can conclude that the ecological carrying capacity is reaching a saturated state. From a visitor's perspective, perceptual carrying capacity is important when planning and writing policy. If policy and regulations are only written to prohibit and limit recreation then the destination will grow in a different way, which might not be as appealing to tourists. The feedback that is given to the tourism operators can be used as input from the industry to policymakers. We can derive from the answers of the interviewees that the changes in the reefs and biodiversity on the reef, fish population, amount of species and also coral colonies are decreasing. As one of the interviewees mentioned, aquatic life is free to go where it wants. The conclusion that we can draw from that is that aquatic life and fish are changing behaviour because of the amount of visitors the area has. This research indicates that MBT activities do have an impact on the ecosystem and the biodiversity of the aquatic life. As said by the interviewees, there have been notable changes on at least two reefs in PDC. These changes are not only caused by the increase of snorkeler and divers in the water, but also caused by the increase of boat traffic, noise pollution and water pollution. There have been changes in the amount of both hard and soft corals and the increase of anthropogenic density and activity in the area has also caused a change in the number of aquatic species that live in these waters as well as the amount of fish. The findings from the interviews show us that dive shops say that they intervene and correct depreciative behaviour. However, observations only showed that there were only three instructors who actually intervened and corrected depreciative behaviour underwater and after the dive. This either means that instructors do not follow company policy on intervening and correcting behaviour with fun divers because the group is too big and therefore have less overview, or because they are fearful for bad reviews and complaints from customers. Either way, both instructors and tourists need to be more aware of the impact that they have on the ecosystems and aquatic life. Most studies show the relation between coral disease and reef-based activities.

6.2.2 Pessimistic view on moving forwards

When looking at the situation on land, it is obvious that most interviewees do not see a very bright future for this destination. The amount of hotel and real estate development that is happening in the destination shows that investors and developers still see growth possibilities. However, inhabitants notice the rapid changes and fear that the uncontrolled and unsustainable development may harm their lifestyle and the natural environment, which drew them to the destination in the first place. All four picture sets show that the

development over the past years has increased. As demonstrated in this paper (chapter 1) there has been an annual average growth in numbers of tourists in Quintana Roo of 6,88% the annual average growth for room occupancy is 4,33%. The numbers have been quoted to the interviewees of this research, as to give them an idea of how fast the destination is growing. Most of the dive shops have seen an increase in numbers of customers as well. For some dive shops this is reason to grow their business and to establish new selling points. Others say that they would not like to expand because the level of service that they provide and customer care is more important to them than the numbers.

6.2.3 Continuance of growth

With Playa being the fastest growing town in all of Central and South America it is well portrayed in the pictures where mangrove forests, authentic streets and jungle has to make way to new big shopping malls for the tourists. This uncontrolled and unsustainable development has an impact on the natural environment and on the ecosystems. Set 2 and 3 give us a perfect example of the changes and the development that has been going on in PDC. Set 2 shows how the shoreline and the beach have changed over the years. Beach encroachment (building near or on the beach) is one of the causes of beach erosion. The extension of the ferry pier and the rebuilding of it have changed the currents near the shore, which also amplifies the beach erosion. In 2010 the Mexican government commissioned a company to make the beaches broader. The result can be seen in the third set of pictures. However, the picture from 2015 shows that much of the beach has since been eroded away due to the change in currents.

6.2.4 action and reaction of federal government

The way that the governance of this destination is organised is hard to understand since there are several layers of government and different institutions that seem to have difficulty in communicating with each other and finding a mutual goal to work towards. The federal government of Mexico has decided to make the sea around the Yucatan Peninsula an MPA. The project is called “Caribe Mexicano” and the government is working to implement the new policy and regulations. The International Union for Conservation of Nature (IUCN) divides protected areas (PAs) into six main categories. All of the categories can be found in the appendix. Mexican law says that if an area is made into an MPA, all activities that were undertaken before it became an MPA, must also be able to be exercised after the area becomes an MPA. This means for the research area, that fishing and recreational activity will still be allowed. The best categories for the MPA in Playa will be either Category II, which is a National Park, managed for ecosystem protection and recreation, or Category V, which is a Protected landscape/ seascape, managed for conservation and recreation. Through zoning within the MPAs it will be possible to still allow fishing. In looking at the different types of MPAs and establishing an MPA in the area, it will be possible to conserve and also to meet some of the needs of the stakeholders of the area. As indicated in the results chapter, there is a demand for maintaining the reefs and the biodiversity in this area.

6.2.5 Education and awareness

Last but not least a connection between education and awareness and the impact of marine based tourism can be made. The information gathered from the interviews and the data from the observations show two different truths. The first being that dive operators say they educate their divers and intervene and correct depreciative behaviour. And the second being that during the observations divers are not aware of their impact on their surroundings and depreciative behaviour is not intervened, corrected or noticed by the instructor. The gap between what is said is done and what is actually being done needs to be bridged, which can be done through education and raising awareness.

6.3 Recommendations

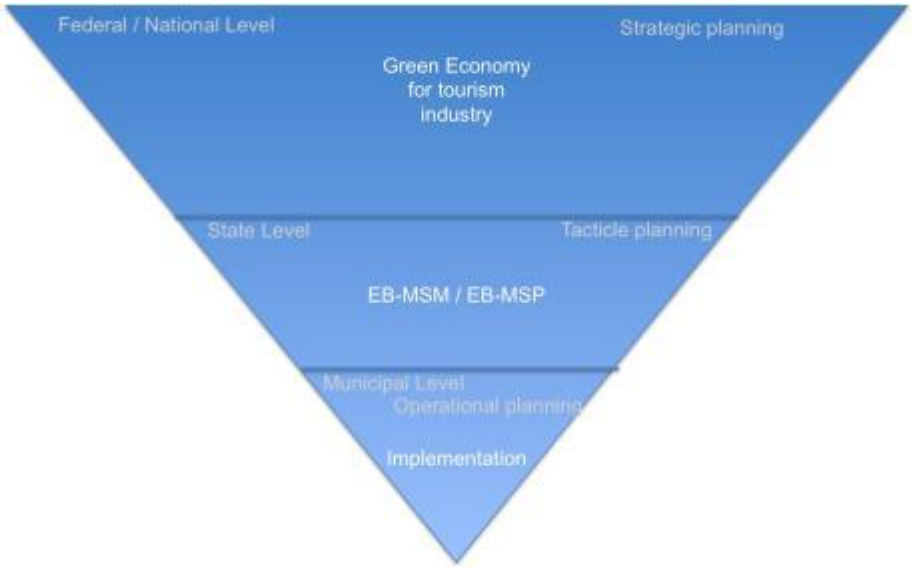
6.3.1 Need for control and sanctions due to ineffective governance

As mentioned in the previous section, the way that the destination is governed can sometimes be hard to understand due to the complexity of the Mexican governmental system. This research shows that policy and regulations are not being adhered to. Relating this to the first point, the research also indicates that because of communication problems, there is no governmental institution, regulatory body or association that follows up on the policy and regulations that are written. Results from the interview show us that from the industry's point of view as well as from the NGOs' point of view, there is a need for the follow up on policy and regulation. There also is a demand for an organisation or an association that will act in their interest. Currently no such organisation exists in Playa del Carmen. Mexico and the Riviera Maya have a tourism board. However, the main activities of the tourism board is to promote the destination and they are not involved in the strategic planning and development of the Riviera Maya or PDC for that matter. When looking at Playa del Carmen it can be concluded that it is not developing in a sustainable way and that there is association that makes sure environmental standard are followed.

6.3.2 Recommendation 1: From the Green economy towards implementation

The first recommendation based on the findings and conclusions would be to look at the governance of the area. It would be possible to take the green economy approach to improve human well-being and social equity as well as reducing the impact tourism and other industries have on the environment. On a smaller scale, an Ecosystem Based Marine Spatial Management approach can be used by tourism planners to alleviate the stress on the ecosystems as well as the impact of the uncontrolled and unsustainable way that a destination is developing. On a municipal level it is important to make sure that the laws, regulations and policies set forth by the different governments are being implemented and upheld.

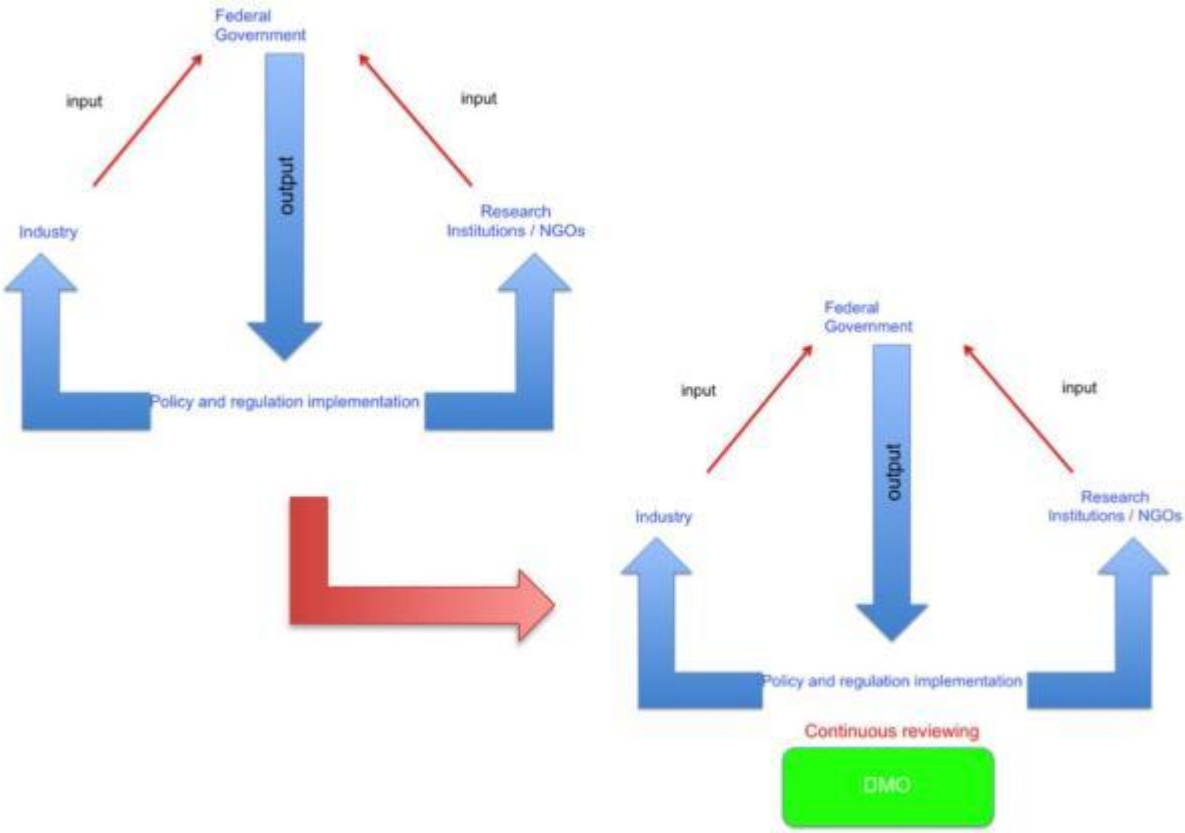
Figure 11: From the Green economy strategy towards implementation



6.3.3 Recommendation 2: Destination level

Zooming in on the destination and the different stakeholders in the area, the simplified model for MBT regarding the governance of the beaches and seas in Mexico is shown in figure 12. As it is, the federal government writes policy and regulations. However, it is not clear how much overlap there is with state and municipal laws and whether or not these laws, policies and regulations compliment each other or not. This research shows that there is no government department, organisation or association that makes sure that the regulations are implemented.

Figure 12: Current situation to desired situation



To mitigate the impact of tourism and especially the impact of MBT on the ecosystems a DMO could be established. It would be recommended that the DMO is either a regional DMO (RTO), responsible for the governance / management whole of the Riviera Maya in terms of tourism development and infrastructure. Or, the second recommendation could be a local DMO, responsible for the management and governance of the development of only Playa del Carmen. In both cases it must be understood that the DMO can offer to be a strategic leader in developing the destination in a sustainable way The DMO's function would also be to bring partners / stakeholders together and the DMO can offer support in writing strategic plans, policy and regulations and implementing those plans. It would be recommended that the DMO would be a public – private initiative in which both public and private sectors have an equal share in votes.

The ideal situation would be the following:

Figure 13: Ideal situation

6.4 Recommendations for further research

Based on the international literature and the findings of this research there are several topics that are interesting for further research. As concluded earlier in this paper, there is not a very clear organisation in the governance of the area and, as with may other destinations, stakeholders seem to communicate with each

other poorly, often not knowing that they might be working towards the same or similar goal. Therefore, a stakeholder analysis for destination Playa del Carmen would be suggested. The second suggestion for further research, which pertains to this study, is a feasibility study for a DMO, whether it is in PDC alone or for the whole of the Riviera Maya. The third suggestion for further research in this area would be to do a longitudinal study on the impact of CT on the ecosystems of the MBR. The last suggestion for further research in the area would be to do a longitudinal study on Green Economy indicators, such as GHG and energy emissions, water consumption and waste management, and seeing if a there can be a transitional change within this destination towards a Green Economy model.

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Appendices

Appendix 1: Interview questions for semi-structured interviews

1: In the period from 2010 during 2014 there has been an annual average growth in room occupancy of 4,3% and the annual average growth in tourists in the state has been 6,8%. Has this dive shop experienced an increase in numbers of divers in that same period?

2: How many dive shops do you think there were in 2010 and how many are there now?

3: Would you say that the competition for your position in the dive industry market has changed in the past couple of years?

4: What are the biggest threats for your company?

5: who gives the dive briefings before a dive?

6: Which points in the dive briefings do you emphasise regarding the reefs and aquatic life?

7: When you or one of your instructors sees depreciative behaviour, does he/she act upon this?

8: How do you reinforce your clients when they touch or harass aquatic life or corals?

9: In the years that you have been operating in PDC, have you seen a change in the reefs and the numbers in fish? If so, what changes have you observed?

10: What do you think would be the best way to preserve the reefs in front of PDC?

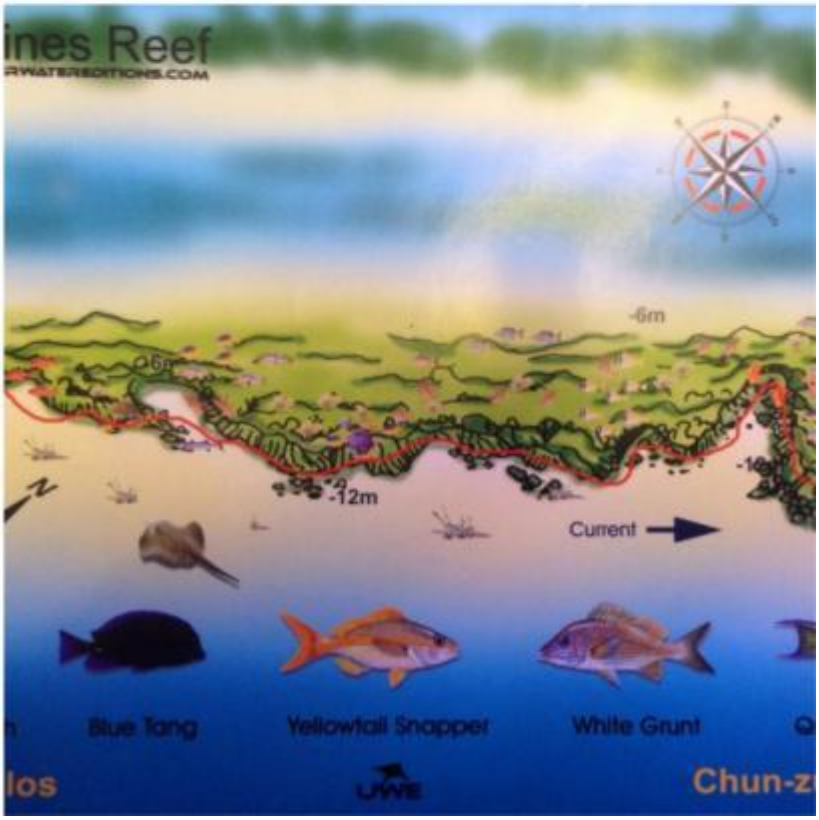
11: Who do you think is responsible for making sure that the reefs in front of PDC will not be degraded anymore?

12: Where do you think Playa del Carmen will be in 5 years in terms of development and sustainability?

Appendix 2: Observation checklist

Dive Company Date (Time)	
# Divers	
Guides + observer	Instructor: ; DMT
# Divers Touching corals	
Divers with camera	
Intentional touching while stabilising to take a picture	
Unintentional touching of corals	
Stirring up sediment	
Littering	
Touching/feeding aquatic life	
Wearing sun tan lotion	
Dive site	
Max Depth	
Water temp	
CERTS	
# Male and # Female	
Notes:	

Appendix 3: Reef Maps Tortugas reef and Jardines reef

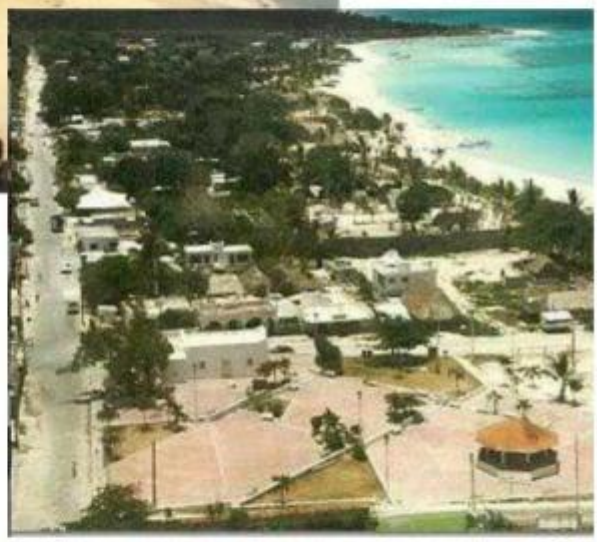


Appendix 4: Relation between Research Questions and Interview Questions

	RESEARCH QUESTIONS	INTERVIEW QUESTIONS
RQ 0	What can be done to manage the anthropogenic impact of marine-based tourism on the environment of Playa del Carmen to achieve a more environmental sustainable destination?	8: How do you reinforce your clients when they touch or harass aquatic life or corals? 10: What do you think would be the best way to preserve the reefs in front of PDC? 12: Who do you think is responsible for making sure that the reefs in front of PDC will not be degraded anymore?
RQ 1	What are the environmental impacts of tourism and specifically Marine Based tourism?	1: In the period from 2010 during 2014 there has been an annual average growth in room occupancy of 4,33% and the annual average growth in tourists in the state has been 6,8%. Has this dive shop experienced an increase in numbers of divers in that same period? 2: How many dive shops do you think there were in 2010 and how many are there now? 4: What are the biggest threats for your company?
RQ 2	Which marine-based tourism activities are being undertaken in Playa del Carmen and how do they impact the natural environment?	LITERATURE / OBSERVATIONS in combination with 9: In the years that you have been operating in PDC, have you seen a change in the reefs and the numbers in fish? If so, what changes have you observed?
RQ 3	How do marine-based tourism activities influence the biodiversity and aquatic life?	4: What are the biggest threats for your company?9: In the years that you have been operating in PDC, have you seen a change in the reefs and the numbers in fish? If so, what changes have you observed? 6: Which points in the dive briefings do you emphasise regarding the reefs and aquatic life? 7: When you or one of your instructors sees depreciative behaviour, does he/she act upon this? 5: who gives the dive briefings before a dive?
RQ 4	Which strategic approaches could mitigate the impact of the mbt activities?	12: Where do you think Playa del Carmen will be in 5 years in terms of development and sustainability? 10: What do you think would be the best way to preserve the reefs in front of PDC? 11: Who do you think is responsible for making sure that the reefs in front PDC will not be degraded anymore?
RQ 5	What models would be applicable to the research area to minimise the impact of marine-based tourism	Literature

Appendix 5: Pictures

Set 1: Playa del Carmen Ferry Dock Area (n.d.)

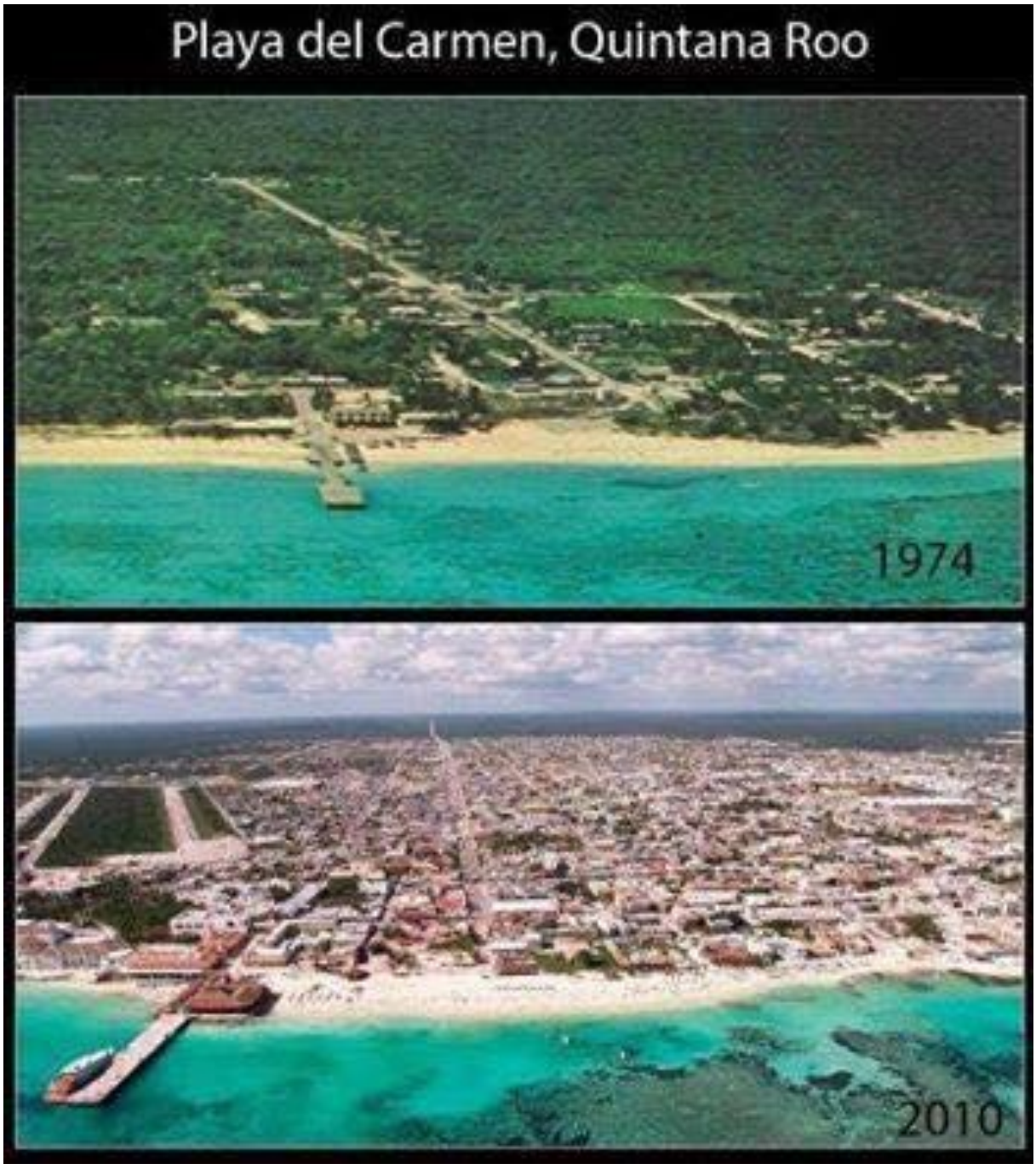


2006

2006 (view from the sea)

2015

Set 2: On land development:



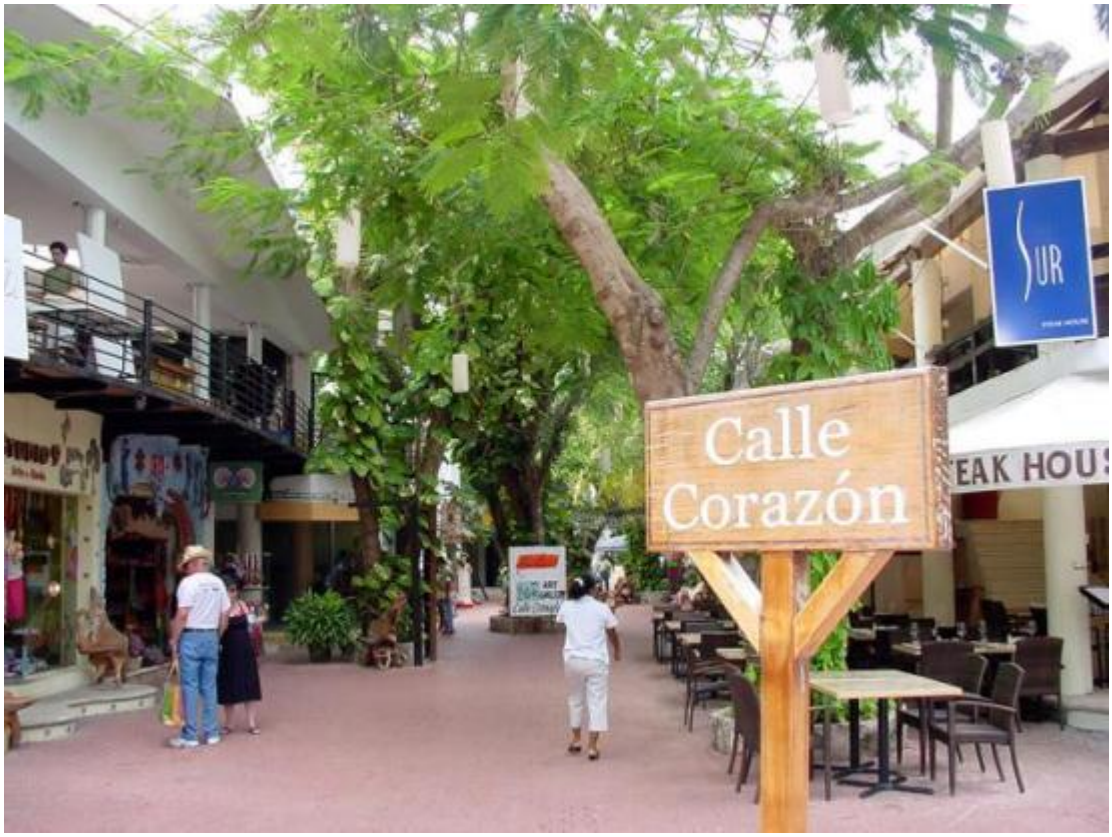
Set 3: Proximity of reefs to beach

2005

2010

2015

Set 4: Calle Corazon 2014



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Appendix 6: Types of MPAs as categorised by the IUCN

Types of MPA's

The IUCN divides protected areas (PAs) into six main categories, which represent a continuum from stricter protection to regimes designed for sustainable resource use:

- Category Ia – Strict nature reserve (managed mainly for science);
- Category Ib – Wilderness area (managed for wilderness protection);
- Category II – National park (managed for ecosystem protection and recreation);
- Category III – Natural monument (managed for conservation of specific natural or cultural features);
- Category IV – Habitat/species management area (managed for conservation through management intervention);
- Category V – Protected landscape/seascape (managed for landscape/seascape conservation and recreation); and
- Category VI – Managed resource protected area (managed for sustainable use of ecosystems).

Please note that a given MPA may contain several IUCN categories covering several management objectives in a zoned protection scheme. An area classified solely as Category VI is an incomplete MPA; to become a true MPA, it must contain areas of higher protection such as natural reserves or other IUCN Category I core areas to protect essential critical habitat for species found in the MPA. Unfortunately, some governments have misinterpreted the IUCN categories and have taken to declaring MPAs using Category VI alone, without including areas with a higher level of protection or change in the management regime of the area (i.e., essentially with all users and uses continuing on as they were before 'protection').

The IUCN protected area management categories have been used for MPAs as well as for the land-based protected areas (PAs) for which they were originally established. Please note that by itself the categorization of an MPA does not necessarily indicate size, design, degree of protection or even the full extent of management objectives, nor does it allow one to establish the degree of biological representation or effective management. Still, combined with other information, the categories do provide indications of the kind of protection intended. Also, note that outside the I–VI category system, there are several marine management areas that confer some measure of protection including fishing closures, restricted pollution areas, as well as the national and international high seas sanctuaries.

In practice, sanctuaries cannot ensure true comprehensive protection for cetaceans, or for anything else, when the area to be covered is large, such as the national waters of a country or an entire ocean basin – most or all of which is on the high seas outside national waters. But the UN Convention on the Law of the Sea (UNCLOS), the Convention on Biological Diversity (CBD), the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and various other

fisheries agreements and conventions hold great promise in terms of creating effective large-scale MPAs for cetaceans. **The Pelagos Sanctuary for Mediterranean Marine Mammals** with its comprehensive list of conservation measures – and to a lesser extent the Indian Ocean Sanctuary and the more recent Southern Ocean Sanctuary – may provide the building blocks. (http://www.cetaceanhabitat.org/diff_mpa_sanctuary.php, 27-10-2015)