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Is coastal tourism ready for the next generation?

Is the tourism industry in the Wadden-area aware of and adapting to the possible effects of climate change?

Case study: Lauwersmeer area and a comparison with Greetsiel

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Abstract

This research project is about the impact climate change will have on the tourism industry of the Wadden-area, and if and how the tourism industry adapt to it. It will specialize on Lauwersmeer area, in the Netherlands and make a comparison with Greetsiel, in Germany. Both places are situated at the coast and are quite similar areas. Climate change has effect on the (tourism industry of the) Wadden-area, but the tourism industry affects as well climate change by producing CO2 emission. If coastal tourism is ready for the next generation, depends mainly on the sustainability of the tourism industry. Adaptation measures to climate change, will contribute to a sustainable development of the tourism industry.

First there will be given an overview about what climate change is and what the effects of climate change are on the Wadden-area. Furthermore future climate scenarios will be given. With knowledge from the foregoing, six interviews were held in Lauwersmeer area with stakeholders from the tourism industry. The main results of the interviews in Lauwersmeer area, is that the interviewees are: skeptical about climate change; negative about more extreme weather events; neutral or positive about the temperature rise in the summer; positive and negative about the temperature rise in the winter; negative about the scenarios who predict more rainfall in the summer; and of the opinion that to threat sea level rise, dikes have to be made higher and broader or maybe give more space back to nature. Furthermore the interviewees said: we are not thinking about climate change yet. Measures to reduce the effects of climate change, for instance decrease CO2 emissions, are in the tourism industry made with the thought of reducing cost and for marketing reasons.

In Greetsiel four equivalent interviews were held with stakeholders from the tourism industry there. The obtained qualitative data from interviews in both places is compared. The outcome is that there are mainly similarities in the thoughts of the stakeholders between the tourism industry in Lauwersmeer area and Greetsiel. The main results are that the interviewees in both places are: skeptical about climate change; not thinking about climate change so much; and the organizations are not yet adapting to the possible effects of climate change. With the foregoing obtained knowledge, it is possible to answer the main research question: is the tourism industry in the Wadden-area aware and adapting to the possible effects of climate change? It can be concluded that the tourism industry is not enough aware and adapting to the effects of climate change. There is a gap between what the experts state about climate change and how the tourism industry deals with it.

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1. Introduction

1.1 Motives

This research is part of a bigger research from seven students in total. Three students from the university of Groningen in the Netherlands have taken Lauwersmeer area as research area. Two students from both the university of Oldenburg and Bremen have taken Greetsiel in Germany as research area. Research is done in both places and there is made an comparison. Both places are situated at the coast of the Wadden Sea and are tourist places. For an overview see figure 1. This research specializes on Lauwersmeer area, see figure 2. Lauwersmeer area and Greetsiel are quite similar areas, but Greetsiel has big hotels and an open connection to the Wadden Sea. Before 1969 Lauwersmeer, part of Lauwersmeer area, had as well an open connection to the Wadden Sea (Sijtsma, et al., 2012). The Wadden Sea is both nationally and internationally formalized in legislation and different management institutions. An example of this is the European Natura 2000 legislation (Kabat, et al., 2012). Another example of an international formalized institution is the Trilateral Cooperation about the Wadden Sea of Denmark, Germany and the Netherlands, which started in 1978. In 2010 the three nations updated the priorities to focus on climate change, invasive species, and the decline of bird populations and fisheries (Johnson, et al., 2012). Moreover since 2009, the Dutch and German Wadden Sea are on the World Heritage list of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Danish part is envisioned for 2013 (Kabat, et al., 2012).

The covering theme of the trilateral thesis project is: is coastal tourism ready for the next generation? Coastal tourism is one of the fastest growing sectors of the tourism industry (Kellens, et al., 2011). Because coastal tourism is growing fast, it will be important to aspire sustainable development of the coastal tourism industry. Therefore sustainable tourism is the keyword in every thesis. The definition of sustainability is: "A development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Williams, 2009, p.110). Social, economical and ecological aspects are the three aspects that effects sustainability.

Research will be done on these three aspects in both places. This research will specialize in the ecological part and it will analyze the effects of climate change on the tourism sector. The effects of climate change will affect tourism businesses and destinations (choices) (Scott, et al., 2011). Tourism is highly climate-sensitive. At the same time, the greenhouse gas emissions from tourism, including transports, accommodation and activities, but excluding for example the energy used for constructions and facilities, accounted in 2005 for about 5% of global CO2 emissions (Simpson, et al., 2008). In 2007 the Davos Declaration on climate Change and Tourism agreed that, if tourism wants to grow in a sustainable way, the tourism sector has to respond rapidly to climate change within the evolving UN framework and progressively reduce its greenhouse gas emissions. By reducing greenhouse gas emissions, the tourism industry can be part of the solution to climate change (Simpson, et al., 2008).

While both places are situated at the coast, sea level rise, as result of climate change, can have

direct impact on the areas. The goal of the Deltcacommssion is to protect the safety of the Netherlands on the long-term against sea level rise (Kabat, et al., 2009). The two scenarios of sea level rise from the Delta commission as well as the four climate scenarios of the KNMI'06 - which verify changes of sea level, temperature, precipitation and wind for a period of 30 years- will be discussed in this research paper (KNMI, 2008). It will be interesting to see if and how the tourism industry adapts to the climate change.

Figure 1: Overview Greetsiel and Lauwersmeer area

Figure 2: Overview Lauwersmeer area

1.2 Problem definition

The goal of this research project is to explore what impact climate change will have on the tourism sector of the Wadden-area and whether the tourism sector adapts to that or not. Therefore the main research question is: is the tourism industry in the Wadden-area aware of and adapting to the possible effects of climate change? The following sub-questions will help answering the main question:

- What is climate change?
- What is the impact of climate change on the tourism industry of the Wadden Sea area?
- What are the different future climate scenarios for the Wadden Sea area?
- What are the thoughts of the tourism industry in Lauwersmeer area about climate change?
- What are the similarities and differences between Lauwersmeer area and Greetsiel on this subject?
- What are the differences between the opinions from the experts and the tourism industry?
- What is the reaction of the tourism industry on the possible effects of climate change and future climate scenarios?

1.3 Structure of the thesis

The motives and relevations of this research project are discussed first and are followed by the theoretical framework. In the theoretical framework answers will be given to several sub-questions. Different future climate scenarios are given as it is important in order to know what can be expected in future. Furthermore a conceptual model will show the relation between different components that effect each other on the topic: Is the tourism industry in the Wadden-area aware of and adapting to the possible effects of climate change? In the third chapter methodology will be discussed. Qualitative research in the form of interviews with stakeholders from the tourism industry is done ; in chapter four there will be given an overview of the important points and results. In the conclusion an answer on the main-question will be given as well as some suggestions for further research.

2. Theoretical framework

2.1 Glossary

Key words in this research project, which might not be clear enough, are defined as follows:

Absolute sea level rise and relative sea level rise: Absolute sea level rise occurs when the amount of sea water rises and/or when the temperature of the sea water rises . Absolute sea level rise is about the same as Nieuw Amsterdams Peil (NAP) (KNMI, 2009). Relative sea level rise is absolute sea level rise corrected with the vertical movement of the soil. For instance, settlement of the soil, will cause a higher relative sea level rise than absolute sea level rise (KNMI, 2009).

Beach days: The number of days all beaches are open, can be called beach days. This is based on the length of the local beach season and multiplied by the number of beaches (NOAA, 2013).

Climate adaptation and mitigation capacity: This capacity dependents on environmental and socio-economic circumstances and the availability of technology and information (IPCC, 2007).

Climate change: Climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer (EPA, 2012). The UN Framework Convention on Climate Change (UNFCCC) makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability attributable to natural causes (IPCC Third Assessment Report, 2001).

Climate change adaptation: "Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation" (IPCC TAR, 2001a, in Levina and Tirpark, 2006, p.6).

Climate change mitigation : "Climate change mitigation relates to technological, economic and social changes and substitutions that lead to emission reductions" (IPCC, 2007c, in Simpson, et al., 2008, p.33).

Sustainable tourism: United Nations World Tourism Organisation (UNWTO): Sustainable tourism assesses today's needs of tourist and travel regions while protecting/preserving and raising chances of the future (BfN, n.d.). There should be a management of all resources which conforms to economics, social and aesthetic needs and conserves cultural integrity, basic ecological processes, biological diversity and the livelihood at once (BfN, n.d.).

2.2 Theory

2.2.1. What is climate change?

Climate can be described as the averages and extremes of temperature, wind and the amount of precipitation. It is common to calculate these climate averages over 30 years (Vellinga, 2011). The climate on earth has changed several times since the originate of the earth, through natural causes. Climate is dominated by two major factors: the sun and the atmosphere. Sunlight provides the energy which heats the earth. Without the atmosphere, the heat would be reflected by the earth into space. In this case the earthtemperature would be - on average- about 30 °C cooler (Met Office, 2011). However the atmosphere allows sunlight to pass through, but stops the heat from escaping back out into space. This is called the greenhouse effect, see figure 3 (Met Office, 2011).

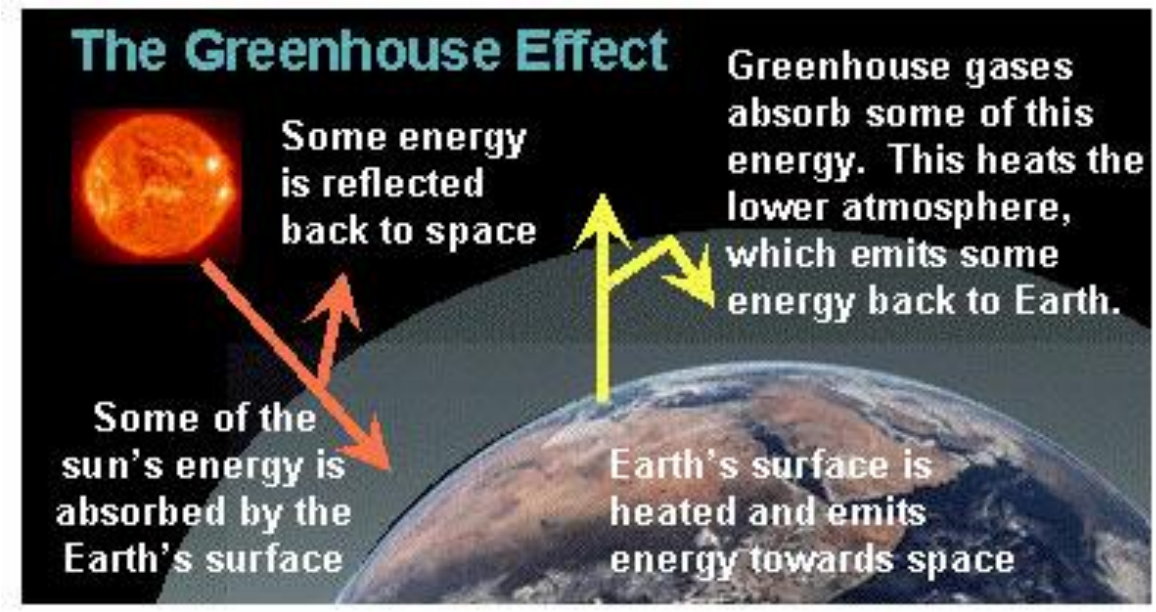

Figure 3: Greenhouse effect (NOAA, 2008).

Most of the greenhouse gasses occur naturally, but they also can be caused by human activities. From the industrial revolution on in the 18th century, human beings are producing greenhouse gasses (European Commission, 2005). Burning of fossil fuels such as coal, oil, and natural gas from the industrial revolution on causes carbon dioxide (CO2), a greenhouse gas. Land use changes by human beings such as deforestation, have contributed as well to CO2 to the atmosphere, and therefore contributed as well to our climate change (Government of Canada, 2012).

Nowadays human beings on earth are living in an interglacial climate, with an averaging global temperature about 14 °C (Met Office, 2011). Atmospheric concentrations of CO2 are now higher than at any time in the last 420.000 years, see figure 4 (Sharp, et al., 2007). These higher concentrations cause a warming effect on earth and is mainly the outcome of human activities (State Government of Victoria, 2013).

In the 1980s climate change became well known (European Commission, 2005). Every country contributes to it and is also effected by climate change, although in varying degrees. Developing countries are more vulnerable: they often depend on climate-sensitive activities such as agriculture and do not have much money to adapt to the consequences of climate change (European Commission, 2005). Also low-lying countries, for instance the Netherlands, are more vulnerable to the impacts of climate change, particularly to sea level rise (IPCC, 2007).

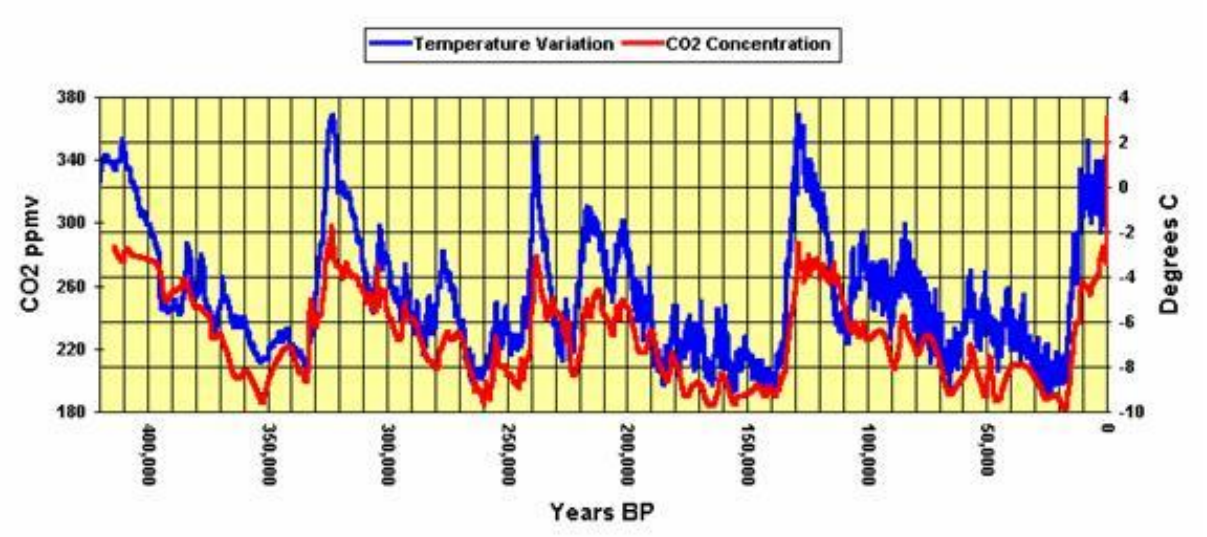

Figure 4: Historic atmospheric CO_2 levels over the past 420,000 years (*Sharp, et al., 2007*).

2.2.2 What is the impact of climate change on the tourism industry of the Wadden Sea?

Climate change has impacts on the tourism industry in several ways. Attention will be drawn to the most important points. First of all coastal tourism is one of the fastest growing sectors of the tourism industry (Kellens, et al., 2011). And because coastal areas will be more populated, the vulnerability of the coast for flooding through sea level rise increases (Kellens, et al., 2011).

Second of all climate change may influence tourists to choose another destination, indirectly as a result of temperature rise, sea level rise and coastal erosion. The major reason for tourists travelling from Northern Europe to the Mediterranean is a sunny and warm coastal destination. Tourist travel from Northern Europe to the Mediterranean takes 16 % of world's tourists in account (Parry, et al., 2007). Higher temperatures are to be expected to change summer destination preferences. In particular in Europe: hot summers in the Mediterranean may lead to a shift in tourism to spring and autumn and around the Baltic and North Sea, summer tourism may grow (Parry, et al., 2007).

Thirdly, the combined effects of climate change - global warming, increase of extreme rainfall, sea level rise and the fact that sea water will be more diluted with fresh water owing to the increased draining of river water- ecology will be influenced (Kabat, et al., 2009). For example a clear difference in the amount of hibernating birds between warm and cold winters was stated . Another example is that changes in water temperature have huge influences on the composition of the ecology

of the North Sea and Wadden Sea, with probable consequences for the fishery (Kabat, et al., 2009).

Fourthly tourists are dominating the demand of fresh water on the Wadden Sea islands (Kabat, et al., 2009). Furthermore securing fresh drink water happens to be more complex through increasing dynamics of soil water and surface water. More extremes in rainfall and temperature rise will influence the quantity of fresh drink water (Kabat, et al., 2009). Rainfall extremes will be a pressure on the water systems in the Netherlands, while extreme dry periods may lead to a lack of fresh drink water (Kabat, et al., 2009). Sea level rise can increase the amount of salt in fresh water. Due to sea level rise, increasing pressure difference between the higher sea level and the lower water level of the area behind the dike, will cause salt marsh. This implies that sea water could migrate towards the other side of the dike (ENW, 2013). This would influence the water quality in a negative way (Kabat, et al., 2009).

Moreover, for the recreation sector climate change is also positive. Higher temperatures will result in more available beach days (Kabat, et al., 2009). On the other hand ice recreation , Elfstedentocht, is less likely to occur. Furthermore climate change has also effect on the healthiness of people and animals. In a direct way heat , cold and ultraviolet (UV) radiation are effecting health. For the Wadden-area, the effects of UV radiation will be important in particular. An increasing exposure to UV radiation, due to more beach days, and the larger amount of UV radiation, due to higher CO2 level and changes in the ozone layer will have effects (Kabat, et al., 2009). Besides this the rise of sun hours and temperature will cause a strong increase of algae (Kabat, et al., 2009). This can be a threat for recreational water use. Also, the effects of climate change on the Wadden Sea area will have some negative effects on the landscape quality and will probably influence the possibilities for use of space as well (Kabat, et al., 2009).

2.2.3 Future climate scenarios for the Wadden Sea

Introduction

Describing climate scenarios with additional detailed information about changes of temperature, sea level, rainfall and wind gives a good opportunity to compare statements of experts with the thoughts from the tourism industry about it, see paragraph 4.1 and 4.3.

There are many uncertainties while predicting climate change, therefore different models and scenarios are made. Predictions about climate change until 2050 are less uncertain then predictions further ahead, for reasons that the outcome for 2050 is largely effected by the greenhouse gasses we are producing at the moment (Lowe et al, 2009, in Kabat, et al., 2009). Worldwide there are different

institutions which predict scenarios about the effects of climate change on places on earth. The Intergovernmental Panel on Climate Change (IPCC) is a global institution that every several years makes an assessment report. In 2006 the Royal Netherlands Meteorological Institute (KNMI) reported climate scenarios of the Netherlands, named KNMI'06, based on the facts of the fourth assessment report of IPCC (Kabat, et al., 2009). In 2008, the Delta commission, presented the Delta Commission Report named: "working together with water", with more extreme predictions about sea level rise than KNMI predicted for the Netherlands. This Delta commission report is also based on the facts of the fourth assessment report of IPCC. This research project will now take a close look at the four scenarios from KNMI'06 and the two scenarios of sea level rise from the Delta commission.

Scenarios KNMI'06

The scenarios predictions of the KNMI'06 serve the national standard in adaptation strategies (KNMI, 2008). The climate scenarios verify changes in temperature, precipitation, wind and sea level over a period of 30 years (KNMI, 2008). Besides these factors, changes in air circulation patterns and changes in wind direction plays a part in climate change as well (Kabat, et al., 2009). The KNMI'06 came up with four scenarios: G+, G, W+ and W, see figure 5. Scenario G+ and G presume a moderate temperature rise of 1 °C in 2050, while W+ and W presume a moderate temperature rise of 2 °C. Furthermore scenario G and W do not include changes in air circulation patterns, while G+ and W+ do (KNMI, 2008). It is not possible to indicate which scenario is most probable.

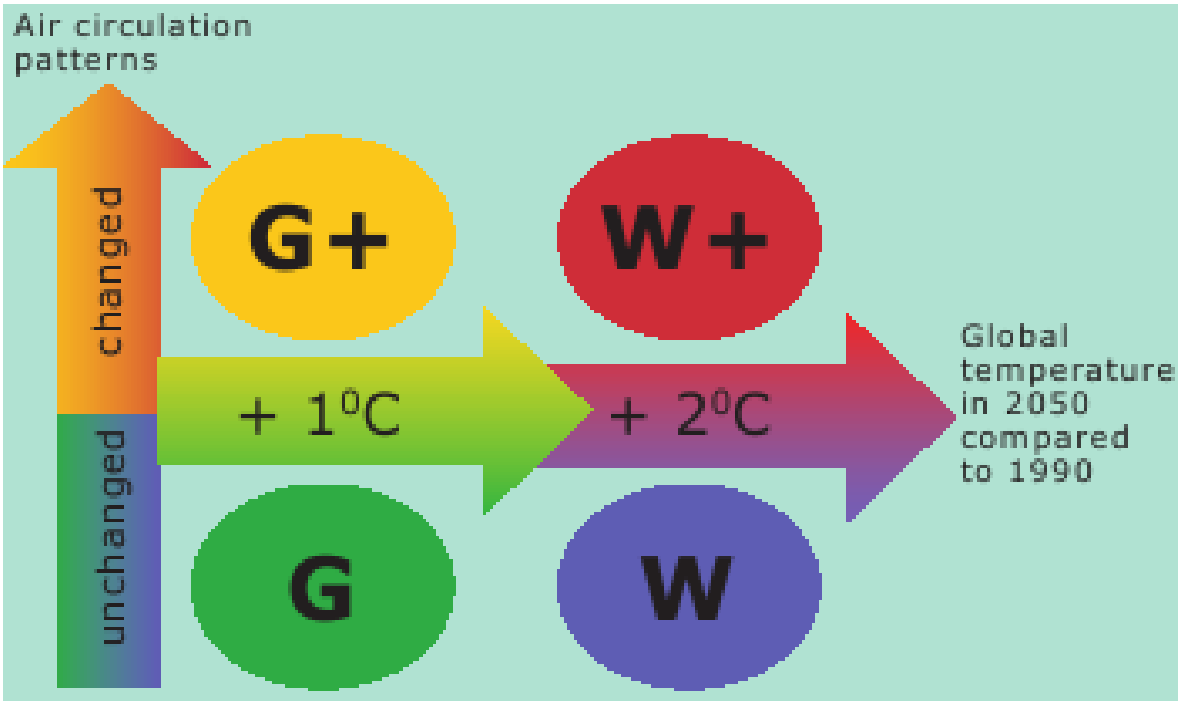

Figure 5: KNMI'06 scenarios (KNMI, 2008).

The rising temperature level for the Netherlands is mentioned in all the four scenarios. In summers (June, July and August) around 2050 there will be an increase in average temperature in the Netherlands of 0.9 - 2.8 °C. And in summers around 2100 the temperature will rise somewhere between 1.7 - 5.6 °C. Additional, extreme maximum temperatures will increase more than the average temperature. Around 2100 there will be extreme maximum temperatures , 40 °C or more is possible (Sterl et al., 2008a, in Kabat, et al., 2009). In winter (December, January and February) temperature will rise in all the four scenarios; around 2050 between 0.9 - 2.3 °C and around 2100 between 1.8 - 4.6 °C. The temperature on the coldest days increases a bit more than the average temperature in winter. The amount of days with ice and frost will decrease (Kabat, et al., 2009).

For all four scenarios applies that: there will be more rainfall in the winter period; there will be more rainy days and there will be more extreme rainfall. In summer the scenarios G and W predict a slightly increase of rainfall. While on the other hand G+ and W+, show that the total rainfall in summer will reduce as well as the number of days with rainfall (Kabat, et al., 2009).

The climate scenarios of KNMI'06 predict that the average wind strength barely increase until 2100. This applies as well for the highest average wind strength a day per year (Kabat, et al., 2009). Changes in wind direction are important. In the Netherlands wind from the north causes a relative high water level and high waves. This higher sea water level will increase the possible chance of flooding. But fortunately scenarios do not predict more north wind. Nevertheless the Wadden Sea coast is sensitive for more water caused by wind (Kabat, et al., 2009).

The KNMI'06 scenarios do predict an absolute sea level rise between 15-35 centimeter for 2050. And for 2100 an absolute sea level rise between 35-85 centimeter is predicted (KNMI, 2008).

Remarked: not all effects of climate change is known about enough, for example how the ecosystem will change; and not all influences on effects to climate change are included in models. Besides that the outcome of the scenarios are average numbers and do not count with extreme incidents. Also take in mind that the Netherlands has experienced soil settlements. On some local areas soil settlement is an increasing problem owing to gas extraction (Kabat, et al., 2009).

Detailed information according to the four KNMI'06 of climate change scenarios in the Netherlands around 2050 and 2100 are showed in table 1 in the attachments.

The Delta comission scenarios

The Delta commission has came up with two sea level rise scenarios in 2008: one for 2100 and one for 2200. The goal is to protect the safety of the Netherlands on long-term (Deltacommissie, 2008); these scenarios might not be most probable to happen, but if they happen and no measures are taken to cope with possible higher sea level rise, huge consequences will happen. The difference with the scenarios of KNMI'06, is that the scenarios of the Delta commission are based on the predictions of the less probable high average temperature rise of 6 °C for 2100. Further new understandings about icecap dynamics are processed (Katsman et al., 2008, in Kabat, et al., 2009). For an overview of the

differences, see table 2 in the attachments. Besides changes in temperature, changes in precipitation and wind circulations will have huge impacts on sea level rise as well.

The two scenarios of the Delta commission must be seen in addition to KNMI'06 scenarios. The Delta commission state that sea level rise in 2050 will be the same as the predictions from KNMI'06. In 2100 the Delta commission expects an absoulute maximum sea level rise of 120 cm,while the absolute maximum sea level rise of the KNMI'06 scenarios is 85 centimeter (KNMI, 2008). The difference in sea level rise between the to models for 2100 is 35 centimeter, see figure 6. This difference can be explained by several factors. First of all the Delta commission works with an average temperature rise of 6 °C, while the KNMI'06 scenarios are working with an average temperature rise of 2 °C or 4 °C. Calculating with an average temperature rise of 6 °C instead of 4 °C, results in an extra sea level rise of about 15 centimeter by extra seawater expansion. Second of all, more extreme changes and melting of the ice caps from Greenland and Antarctica cause an extra sea level rise about 20 centimeter. In 2200 the Delta commission expects a sea level rise of 2 - 4 meter (KNMI, 2008).

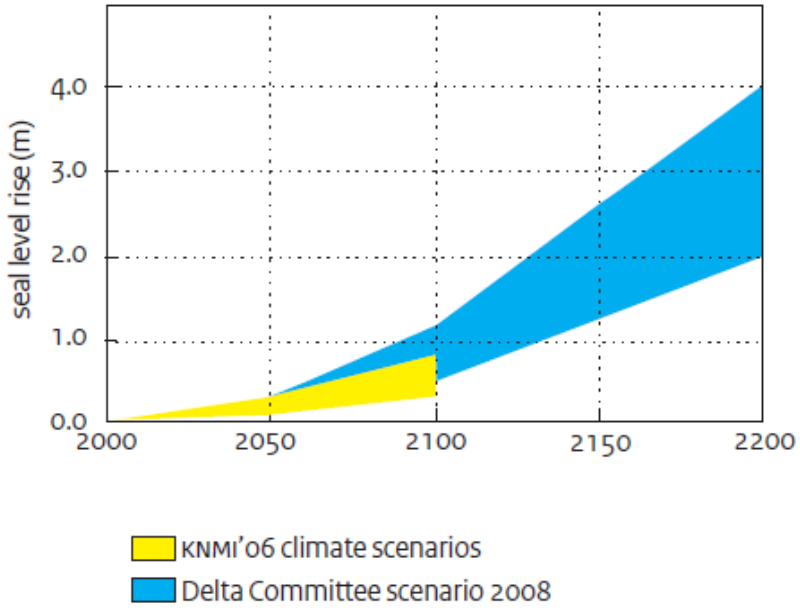

Figure 6 : Difference between predictions sea level rise (Klein Tank & Lenderink, 2009).

In the Netherlands even current standards of flood protection are not being met everywhere (Deltacommissie, 2008). The Delta commission rapport state that: freshwater security remains a crucial role, as well protection against flooding. The sea level is probably rising faster than has been assumed, and variations in river flow, from the Rhine and Meuse, are expected to increase (Deltacommissie, 2008). Furthermore, the Delta commission states that beach nourishments or supplements along the North Sea coast may contribute to adaptation of the Wadden Sea area to sea level rise (Travis, 2011).

2.3 Conceptual model

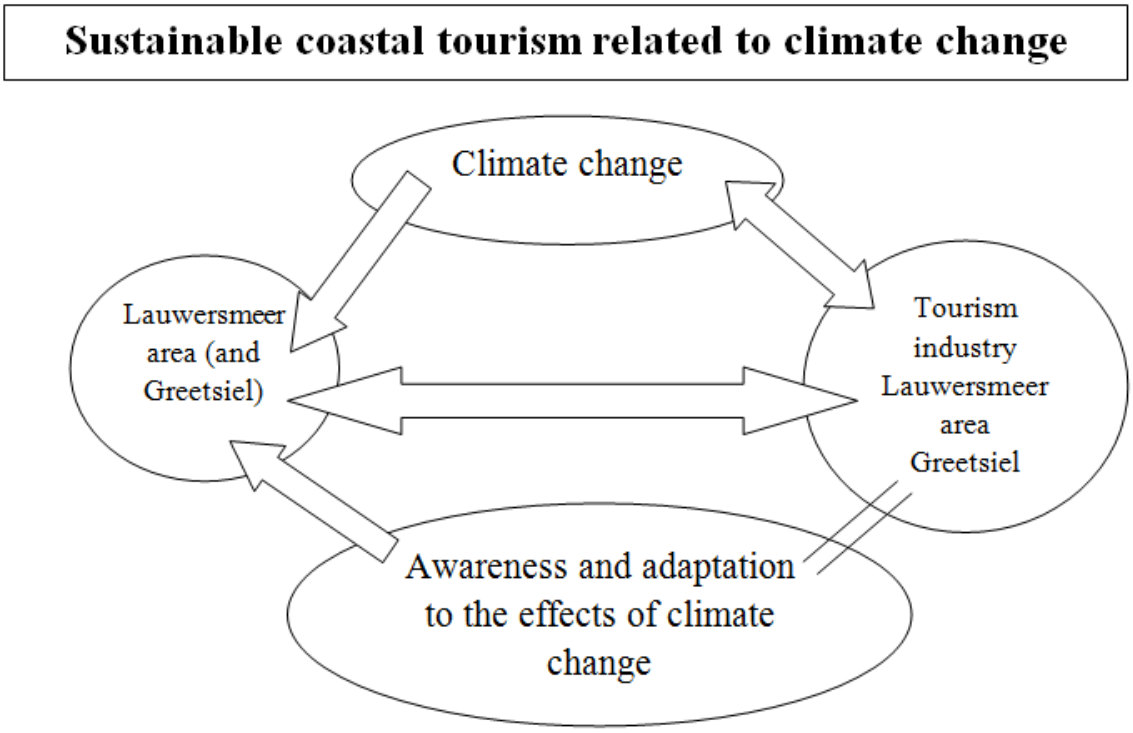

Figure 7: Conceptual model.

From the foregoing obtained information in this research project, a conceptual model, see figure 7, can be made. The link how the tourism industry can affect climate change, is made in the introduction. Namely by reducing CO2 emission, the tourism industry can contribute to reduce the effects of climate change. However climate change has as well influence on Lauwersmeer area and Greetsiel and on the tourists in both places (and therefore on tourism industry), as discussed in paragraph 2.2.2. For instance future climate scenarios of KNMI'06 predicting temperature rises, which causes increasing exposure to UV radiation for tourists.

Furthermore the appearance of Lauwersmeer area and Greetsiel, will affect the tourism industry. This is mentioned in paragraph 2.2.2. and is discussed as well by some interviewees, see paragraph 4.1. The interviewees mentioned that changing ecology, for instance disappearing of seals, can have huge influence on the Wadden-area. On the other hand the tourism industry can as well affect the appearance of Lauwersmeer area and Greetsiel, for instance by planning new or destructing old things.

Moreover, Lauwersmeer area and Greetsiel, can as well be influenced trough adaptation measures. This will contribute to sustainable coastal tourism. If the tourism industry is adapting enough, is among other things depending on the fact whether the tourism industry is or is not enough aware of the effects of climate change. The awareness and adaptation of the tourism industry will be discussed in paragraph 4.4.

3. Methodology

To be able to answer the main question "is tourism industry in the Wadden-area aware of and adapting to the possible effects of climate change?", primary as well as secondary data are used. The Geographical Information System (GIS) is used to create a map presenting an overview of the location of the two research places and also to give a detailed map of Lauwersmeer area. For primary data interviews with stakeholders from tourism industry are conducted. This qualitative data makes it more difficult to compare results from interviews between Lauwersmeer area and Greetsiel than if was chosen for quantitative data. However there is also a benefit from this qualitative data: the interviewees may give more detailed information about a topic on open questions and might as well come up with additional information.

The interviews are conducted with different stakeholders and organizations from the tourism industry. Unfortunately an important organization, a nature conservation organization, is missing here. A stakeholder from such an organization could be probably more attached with ecology and therefore probably as well be more attached with climate change than other stakeholders. And hence might give different answers on the interview questions than other stakeholders of tourism industry.

In total six interviews are conducted in Lauwersmeer area. Two are conducted with a municipal official in the field of tourism and recreation: one with Pytsje de Graaf from municipality of Dongeradeel and the other with Ellen Kiewiet from municipality de Marne. It is interesting to find out if climate change is an item on the agenda of the municipalities. Furthermore an interview with the manager J.Bos, from camping Lauwersoog and an interview with the front manager office of Landal Esonstad, Maaike van der Molen, is conducted. Interviewing the manager of camping Lauwersoog is interesting because this camping already faced problems with a to high water level. To interview Landal Esonstad is interesting because the water in the park is connected with Lauwersmeer. Moreover an interview with the manager, Hinke Kemper, of the tourist information office from Lauwersland as well as an interview with Ursula Appolt and Lammert de Hoop from Lauwersland Promotietour is conducted.

In Greetsiel Svenja Böttcher, student from the university of Oldenburg conducted four interviews. The interviews are conducted with stakeholders from: the Tourist Association, Nordsee Touristik GmbH, the Nationalpark House and the Nationalpark management.

As secondary data information from experts on climate change is used. Information obtained from experts are concerning the following topics: what is climate change, which changes in climate can be expected for the Netherlands and what are the effects of climate change on the Wadden-area. The main points I would like to find out by interviewing tourism industry are: do stakeholders know what climate change is, is climate change something stakeholders are thinking about and is tourism industry adapting to climate change.

Ethical issues can arise when interviews are conducted. For example: will the interviewees

respond honestly or will their answers be political correct? Furthermore the interview questions are made in English and translated into Dutch and German, which might influence the interpretation of the questions. This makes it more difficult to compare the results of the interviews conducted in Lauwersmeer area and Greetsiel. Also different outcome in interviews may arise by different circumstances in which the interviews are conducted. This is caused by the effect of different power relations. All the interviews were conducted in the office of the interviewees, except for the interview with Lauwersland Promotietour, which was conducted in the house of one of the interviewees. Moreover, the interviewees was told that the information they gave in the interviews, would be only read by people from the university of Groningen. At the moment, this project will probably be published online. Therefore an email is send to all interviewees to ask if it is allright that their name, function and organization is mentioned in this changed situation. Furthermore, transcripts of the interviews are not attached. A request can be send to receive these transcripts.

4. Results

4.1 Main outcomes interviews Lauwersmeer area

The interviews consisted of eight questions to obtain the most important information to be able to answer three sub-questions. Namely: similarities and differences between Lauwersmeer area and Greetsiel; differences between the opinions of experts and the tourism industry; and what is the reaction of the tourism industry on the possible effects of climate change and future climate scenarios? But first will be given an overview of the main results of the interviews.

On the question: "What is climate change?", most of the interviewees mentioned the sea level and temperature rise and some did mention the melting of ice-caps. Some interviewees did also mention that the Netherlands experiences soil settlement. This in combination with a sea level rise, will strengthen the chance of flooding. Overall interviewees said: I am not really thinking about climate change so much, because it is something on such a long term and we do not know what is going the happen. It is not sure which scenario will occur and probably the nature will adapt to it for a part itself. The manager of camping Lauwersoog, J. Bos, is most sceptical about climate change of all the interviewees. He said: "Already for 10.000 years there are fluctuations in temperature on earth and there are a lot of new perspectives about climate change by the media, but what are concrete consequences of climate change?" Something what most of the interviewees said was: the weather events are becoming more extreme. The common thought of the interviewees was, that this inconstancy will be negative for their business. Lammert de Hoop, from Lauwersland Promotietour said: "I recognize that it is raining more heavily and that it takes place in shorter periods." Furthermore most of the interviewees mentioned that climate change will have influence on the current nature of the Wadden Sea and the fishes. Ellen Kiewiet, from municipality de Marne, highlighted that climate change can have consequences for the ecosystem.

Strengthen dikes and making them higher and/or broader is something almost all interviewees mentioned to need to happen in the future. Most of them are of the opinion that we cannot continue building dikes higher and higher. A better alternative is to broaden dikes, but this is complicated. Dikes cannot be made broader on the side of the Wadden Sea, while it is protected by UNESCO. And inland of the dikes are very old houses and villages, as well as the well know "fisker's huskes", mentioned by Pytsje de Graaf, from municipality Dongeradeel. Some interviewees mentioned to give nature more space. For example Hinke Kemper from VVV Lauwersland, said: "We have to choose to adapt to it in a natural way, maybe we have to think about flooding homes." Lammert de Hoop said: "It will be more sustainable for the future if we adapt in a natural way to climate change."

Stakeholders of the tourism industry are of the opinion that the changing booking behaviour of the tourists, namely more last minute bookings, is mainly because of: the economic crisis; the trend of using internet more and more often; the trend that people go more often on vacations and stay shorter. But climate change has a role in it as well. Maaike van der Molen, manager front desk office Landal

Esonstad, said: “We have more last minute bookings if the weather forecast is good for the coming week, especially for camping places.” The main outcome on the question: “Are there projects or measures in your organization to reduce the emission of CO2 and therefore reduce the effects of climate change?”, is that most organizations have projects, but they do it mostly with the thought of improving their image for marketing reasons and for reducing costs.

On the question which measures are made to adapt to climate change, most of the interviewees said this is not something they are working on. But some do create more indoor activities for bad weather situations. And on long term it might be good for their business as well, because of the predicted increasing rainfall as effect of climate change. On the other hand, most of the organizations of the stakeholders want to and do attract tourists who come for enjoying the nature, adventure and calm. Moreover some of the interviewees said that on long term they might have to make more bungalows and luxury houses, to adapt to the weather/climate circumstances.

The interviewees got some statements from experts about temperature rise, sea level rise, and changes in rainfall patterns. First of all the interviewees were all neutral or positive about the average temperature rise in the summer. J. Bos is neutral about it, he said: “The fact that it is getting a little bit warmer does not have really big influences, because for the tourism industry the amount of sun hours is more important.” Those who were positive said: if the temperature rises, maybe more inhabitants of the Netherlands will stay in our own country for vacation, instead of going to Southern Europe. Lammert de Hoop said: “The rise of temperature will be all right unless the temperature does not increase above 40 °C.” And Hinke Kemper said: “If the sun is always shining it is not that healthy for people to be always outside.” Higher temperatures in the winter can be positive as well as negative. Higher temperatures in the winter will be negative, because there will be no Elfstedentocht. Ellen Kiewiet mentioned a positive effect of higher temperatures, she said: “It can be positive because people will probably go outside more often, while if it is snowing or icy people are staying in and they do not like to drive with their car somewhere.” Furthermore Ellen Kiewiet and Hinke Kemper, are of the opinion that winters are becoming colder and last longer.

Two out of the four scenarios of KNMI’06 state that the rainfall in the Netherlands will increase in summer. Most of the stakeholders of the tourism industry are of the opinion that this will be a negative development for the tourism industry. Although some stakeholders are of the opinion that if it will increase a little bit, it will not make such a big difference with nowadays.

Concerning sea level rise, there are different thoughts. For instance, Pytsje de Graaf said: “If the sea level rise, we will lose our nature of the Wadden-area. Because the Wad will not dry anymore, so Wad walking will not be possible anymore and it will be a negative point for the seals. It will have a negative influence on tourism in this region.” Ellen Kiewiet, said as well that the sea level rise can have negative influence on seals and that it might be more difficult to Wad walking and therefore will have a negative impact on tourism in the region. Hinke Kemper said: “On long term we cannot do

Wad walking anymore and the landscape will change; the Wadden region will decrease in attractiveness." Furthermore, Pytsje de Graaf said: "Sea level rise will have a negative influence on the islands of the Netherlands, maybe they will disappear and they are a force of attraction for Lauwersmeerg area". Landal Esonstad and camping Lauwersoog both faces already some problems with the water level of Lauwersmeer. Maaike van der Molen said: "The expected sea level increase of 20-35 centimetre for 2050 will already have big influences for our park." The park has an open connection to Lauwersmeer and if the water level of Lauwersoog increases through the increase of the seawater, the water in the park will reach some of the front doors of the houses on the park. Additionally Maaike van der Molen said: "If the sea level will increase around 80 centimetre or more in 2100, we might have to think about shutting down the open connection between our park and Lauwersmeer." Though the camping of Lauwersoog also already face some problems with the water level, the manager does not think sea level rise will be the main issue for the water level problems he faces. J. Bos said: "The influence of ebb and flood, wind direction from the north and more heavy rainfall, have more impact on the water level of Lauwersmeer than the increase of the sea level." Furthermore Ursula Appolt, from Lauwersland Promotietour said: "If the sea level rises 85 centimetres, by 2100, the area of Lauwersmeer might not exist anymore if we do not higher and/or broaden our dikes. By changing dikes we have to deal with legislation as Natura 2000 for example."

One of the goals of Lauwersland Promotietour, is to promote the whole Wadden Sea region as one. Everyone will benefit from this at the end. Lauwersland Promotietour is working together with Greetsiel. Last year three vintage boats sailed from Lauwersmeer to Greetsiel, to promote there the region of Lauwersmeer. A point who came up in the interview with Lauwersland Promotietour is that: a lot of farmers just behind the dikes suffer of the fact that fresh water is mixed together with sea water. The salty sea water comes through under the dikes and is not good for their agriculture business. If the sea level will rise, there will be even a higher pressure on the dikes and even more salt water will probably go through under the dikes, so the problem will continue to grow.

4.2 Similarities and differences between Lauwersmeer area and Greetsiel

As discussed in the introduction, Lauwersmeer area and Greetsiel are quite similar areas. Therefore it was interesting to held the same interview and see what the differences and similarities are between the answers of stakeholders from the tourism industry in both places.

There have been found much more similarities in the thoughts of stakeholders than differences. First of all, stakeholders of both places have a similar way of thinking about climate change. They are sceptical about it, because climate change is something what happens on such a long term. Second of all, most of the interviewees mentioned that we have to higher or broaden our dikes. This is because of the sea level rise and more extreme weather events, especially storms, that cause

extra pressure on the dikes. Thirdly, all stakeholders are neutral or positive about average temperature rise in summer. Although extreme temperatures above 40 °C will maybe have a negative influence, as for instance Lammert de Hoop from Lauwersland Promotietour said. Fourthly, measures against reducing CO2 emission, which will reduce the effect of climate change are often made for marketing reasons and/or reducing cost. Concerning increasing rainfall, there are several thoughts. Most stakeholders said: if rainfall will increase slightly, it will not have a huge effect on the tourism industry. But it will have a negative influence as rainfall will increase a lot more and a lot more extreme rainfalls will appearance. Furthermore, there are no active adaptations to climate change in the tourism industry of Greetsiel and Lauwersmeer area. This is related to the first point, that the tourism industry is sceptical about climate change and is not really thinking about it yet.

There cannot be found really important differences between the opinions of the stakeholders of the tourism industry in Greetsiel and Lauwersmeer area. But there can be found some interesting points who were not mentioned through stakeholders in both places. An interesting point who came up in an interview in Lauwersmeer area is: the problem of salty fresh inland water for agriculture. And an interesting point who came up in the interviews of Greetsiel is: that stakeholders in Greetsiel said we have to work on sustainable tourism.

4.3 Differences between opinions experts and tourism industry.

All stakeholders of the tourism industry together were able to mention a lot of aspects in the field of climate change, but each stakeholder separately knew less. Furthermore there were points who were not, or almost not mentioned by stakeholders of the tourism industry. For instance, on the question: what is climate change, not any stakeholder mentioned that climate change can be caused by nature and by activities of human beings. Overall, for the interviewees it was difficult to mention most important effects on the Wadden Sea area through climate change. For instance, only two interviewees said something about the probable danger of the higher average temperature level. Besides that, the effects of climate change on the ecosystem are exposed by stakeholders. Also, only one interviewee said something about the negative effect rising sea level could have on fresh inland water for agriculture. And no interviewee mentioned possible problems for water quality and quantity for the whole Netherlands.

There are as well differences between statements from experts about climate change, in particular about climate change scenarios, and thoughts of the tourism industry about it. For instance: two of the interviewees think that climate change will cause colder and longer winters. But all the scenarios state that the average temperature will become warmer in winter (Kabat, et al., 2009).

4.4 What is the reaction of the tourism industry on the possible effects of climate change and future climate scenarios?

Stakeholders of tourism industry said: we are not yet adapting to the effects of climate change, see paragraph 4.1 and 4.2. The stakeholders are skeptical about climate change because it is not known which scenario will come true and it is something what happens on such a long term. Weaver (2011), confirms that adaptation is not yet an issue that is understood in most tourism sectors. Because of this outcome, it is interesting to explain what causes the gap between the knowledge of the experts and how the tourism industry deals with climate change.

Most important in order to explain the gap is the fact that climate change is time scaled on long term, while on the other hand tourism is time scaled on short term. Weaver (2011), confirms this difference in timeframes, which causes inherent complexity of climate and tourism systems, for instance the future climate scenarios. Therefore Weaver (2011), is doubting about the value of climate change scenarios and climate change-linked tourism scenarios. Furthermore Lew (2010, in Scott, 2012), point out that tourism cannot ignore the long term nature of sustainability, although it is more challenging and problematic for decision-makers in the tourism industry with much shorter planning timeframes.

Another point who contribute to the gap between the knowledge of the experts and how the tourism industry deals with it, is the lack of awareness of the tourism industry about climate change, see paragraph 4.1 and 4.3. Most interviewees said that climate change is not something they are yet thinking about. Furthermore each stakeholder separately is not able to mention the most important effects of climate change. OECD and UNEP (2011) confirms that the awareness of the tourism industry and among consumers on the topic of climate change about climate change is not enough, although it is raising. But on the other hand Weaver (2011), states that the majority of the government and private sector of developed countries have become aware of climate change. However the majority seemed not want to change their travel and other behaviour in ways it could help to reduce the effects of climate change, for example by decreasing CO2 emission (Weaver, 2011). Thus statements of experts about awareness of the tourism sector is different. Finally, the raising awareness of the tourism industry about climate change is needed to facilitate adaptation and mitigate its future impacts (OECD and UNEP, 2011).

Because the tourism industry is not adapting and mitigating enough to the possible effects of climate change, it is important to underline: how both adaptive and mitigating capacities can enhance sustainable development and thereby reduce vulnerability to climate change (IPCC, 2007). Nowadays, not many plans who promote sustainability have explicitly included adaption (IPCC, 2007). But in the future cheap mitigation options, like reducing emissions, will probably be exhausted, whereas the need to adapt to climate change will become more urgent (Weaver, 2011).

5. Conclusion

Coastal tourism is one of the fastest growing sectors of the tourism industry (Kellens, et al., 2011). The Wadden Sea is both nationally and internationally formalized in legislation and institutions (Kabat, et al., 2012). For these reasons it will be important to focus on sustainable development of the tourism industry. Sustainability is affected by social, economical and ecological aspects. Climate change, in particular related to ecological aspects, has influence on sustainability of the tourism sector of the Wadden-area. Information obtained from experts and from interviews held in Lauwersmeer area and Greetsiel, contribute to the answer on the main question: is the tourism industry in the Wadden-area aware of and adapting to the possible effects of climate change?

Climate change will affect tourism businesses and destinations (choices) (Scott, et al., 2011). Possible effects of climate change on the Wadden-area are: changing ecology; changing landscape quality and land use; insecurity about quantity and quality of fresh water; more available beach days (Kabat, et al., 2009); and rising vulnerability through flooding (Kellens, et al., 2011). Besides that tourism is highly climate-sensitive, the tourism industry can influence the effects of climate change as well. Climate change makes a distinction between climate change attributable to human activities and climate variability attributable to natural causes (IPCC Third Assessment Report, 2001). The tourism industry can by reducing CO2 emissions, be part of the solution to climate change (Simpson, et al., 2008).

Main predictions of KNMI'06 scenarios for 2050 and 2100 are: temperature will rise in summer as well as in winter; sea level will rise; if more or less rainfall in summer will happen is different per scenario, but in every scenario more extreme rainfalls will occur; and wind strength would barely change (Kabat, et al., 2009; KNMI, 2008). Higher sea level predictions of the Delta commission compared to KNMI'06, are made with the goal to protect the safety of the Netherlands on long-term (Deltacommissie, 2008).

The interviewees did not always had the same thoughts as experts about the topic how climate in the Netherlands will change and what the effects of climate change are on the Wadden-area. For example, two stakeholders thought that winters are becoming colder and last longer, what is the opposite of what experts state in the climate scenarios.

The main results of the interviews are that interviewees: were skeptical about climate change, were not able to mention the main effects of climate change on the Wadden-area; were not thinking about climate change yet, and were not adapting to climate change yet. This suggest that the tourism industry is not aware enough to the effects of climate change. OECD and UNEP (2011) confirms this. But on the other hand Weaver (2011), states that the majority of the government and private sector of developed countries have become aware of climate change. This is an interesting result, remarked: OECD and UNEP mention tourism industry, while Weaver mention the government and private sector in relation to awareness. This difference in "definitions" of the actor can make a difference on the

answer whether tourism industry is aware or not to the effects of climate change. Furthermore the different statements of the experts about this topic suggest that it is not clear if the tourism industry is aware of the effects of climate change. However from the results of the interviews can be concluded that the tourism industry is not enough aware to the effects of climate change.

From interviews with the tourism industry in the Wadden-area can be concluded that there is no active adaptation to climate change. And Weaver (2011), state that the majority of tourists not wants to change their travel and other behaviour in ways it could help to reduce the effects of climate change by mitigation measures, in the form of decreasing CO2 emission. Finally, the tourism industry should become aware of how both adaptive and mitigate capacities can enhance sustainable development and thereby reduce vulnerability to climate change (IPCC, 2007). This growing sustainable development can contribute to make coastal tourism ready for the next generation.

From the foregoing can be concluded that the tourism industry in the Wadden-area is not enough aware of and adapting to the possible effects of climate change. The gap between knowledge of experts about climate change and how the tourism industry deals with it can be mainly explained by: the time-scaled differences, climate change on long term and tourism industry on short term; and by the effect that the tourism sector is not aware enough to the effects of climate change.

For further research, it would be interesting to find out how the gap between what the experts know about climate change and the way the tourism industry adapts to it can be minimized. Furthermore, it would be interesting to find out in which ways the tourism sector and tourists can and do want to reduce their use of CO2, by changing their travel and other behaviour.

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Attachments

1. The KNMI'06 table: Table of the KNMI'06 predictions for 2050 and 2100 about climate change, compared to baseline year 1990 (KNMI, 2008). Summer stand for June, July and August, and winter stand for December, January and February (KNMI, 2008).

2050		**G**	**G+**	**W**	**W+**
Global temperature rise		+1°C	+1°C	+2°C	+2°C
Change in air circulation patterns		no	yes	no	yes
Winter	average temperature	+0,9°C	+1,1°C	+1,8°C	+2,3°C
	coldest winter day per year	+1,0°C	+1,5°C	+2,1°C	+2,9°C
	average precipitation amount	+4%	+7%	+7%	+14%
	number of wet days (≥0,1 mm)	0%	+1%	0%	+2%
	10-day precipitation sum exceeded once in 10 years	+4%	+6%	+8%	+12%
	maximum average daily wind speed per year	0%	+2%	-1%	+4%
Summer	average temperature	+0,9°C	+1,4°C	+1,7°C	+2,8°C
	warmest summer day per year	+1,0°C	+1,9°C	+2,1°C	+3,8°C
	average precipitation amount	+3%	-10%	+6%	-19%
	number of wet days (≥0,1 mm)	-2%	-10%	-3%	-19%
	daily precipitation sum exceeded once in 10 years	+13%	+5%	+27%	+10%
	potential evaporation	+3%	+8%	+7%	+15%
Sea level	absolute increase	15-25 cm	15-25 cm	20-35 cm	20-35 cm

2100		G	G+	W	W+
Global temperature rise		+2°C	+2°C	+4°C	+4°C
Change in air circulation patterns		no	yes	no	yes
Winter	average temperature	+1,8°C	+2,3°C	+3,6°C	+4,6°C
	coldest winter day per year	+2,1°C	+2,9°C	+4,2°C	+5,8°C
	average precipitation amount	+7%	+14%	+14%	+28%
	number of wet days (≥0,1 mm)	0%	+2%	0%	+4%
	10-day precipitation sum exceeded once in 10 years	+8%	+12%	+16%	+24%
	maximum average daily wind speed per year	-1%	+4%	-2%	+8%
Summer	average temperature	+1,7°C	+2,8°C	+3,4°C	+5,6°C
	warmest summer day per year	+2,1°C	+3,8°C	+4,2°C	+7,6°C
	average precipitation amount	+6%	-19%	+12%	-38%
	number of wet days (≥0,1 mm)	-3%	-19%	-6%	-38%
	daily precipitation sum exceeded once in 10 years	+27%	+10%	+54%	+20%
	potential evaporation	+7%	+15%	+14%	+30%
Sea level	absolute increase	35-60 cm	35-60 cm	40-85 cm	40-85 cm

Table 2: Differences KNMI'06 scenarios and Delta commission scenario(KNMI, 2008).

Het **Deltacommissie scenario** voor de zeespiegelstijging schetst een 'plausibele bovengrens' van de mogelijkheden en komt daarmee als extreem scenario naast de bestaande **KNMI'06 scenario's** te staan die de bandbreedte van meest waarschijnlijke uitkomsten beschrijven. Voor sommige vraagstukken van lange termijn veiligheid tegen overstromingen is het zinvol om uit te gaan van zo'n aanvullend scenario.

Deltacommissie scenario	**KNMI'06 scenario's**
'Plausibele bovengrens' van de mogelijkheden	Bandbreedte van meest waarschijnlijke uitkomsten
Specifiek voor het doel van deze commissie: lange termijn veiligheid tegen overstromingen	Algemeen voor iedereen: brede range van toepassingen
Gericht op 2100 en daarna	Gericht op 2050 en 2100
Uitgegaan van IPCC 'likely' bovengrens voor wereldtemperatuurstijging (+6°C in 2100 t.o.v. 1990)	Uitgegaan van IPCC 'best estimates' voor wereldtemperatuurstijging (+2°C of +4° in 2100 t.o.v. 1990)
Extreme extrapolatie onzekerheden ijskapdynamica	Minder extreme extrapolatie onzekerheden ijskapdynamica
⇓	⇓
Maximale zeespiegelstijging in 2100 van 120 cm (excl. 10 cm bodemdaling)	Hoogste scenario voor zeespiegelstijging in 2100 is 85 cm (excl. bodemdaling)