Master's thesis

Measuring Sustainability and Climate Change Adaptation in Coastal Communities
an Application of the QualityCoast Indicators for Markgrafenheide/Hütelmoor

Johanna Schumacher

Advisor: PD Dr. habil. Gerald Schernewski

University of Akureyri
Faculty of Business and Science
University Centre of the Westfjords
Master of Resource Management: Coastal and Marine Management
Ísafjörður, May 2014

Supervisory Committee

Advisor:
Gerald Schernewski, PD Dr. habil.

Reader:
Michael Honeth, MMM

Program Director:
Dagný Arnarsdóttir, MSc.

Johanna Schumacher
Measuring Sustainability and Climate Change Adaptation in Coastal Communities an Application of the QualityCoast Indicators for Markgrafenheide/Hütelmoor

45 ECTS thesis submitted in partial fulfilment of a Master of Resource Management degree in Coastal and Marine Management at the University Centre of the Westfjords, Suðurgata 12, 400 Ísafjörður, Iceland

Degree accredited by the University of Akureyri, Faculty of Business and Science, Borgir, 600 Akureyri, Iceland

Printing: Háskólaprent, Reykjavík, May 2014

Declaration

I hereby confirm that I am the sole author of this thesis and it is a product of my own academic research.

_____

Johanna Schumacher

Abstract

Within the context of Integrated Coastal Zone Management (ICZM) and Sustainable Development, the use of indicators to measure sustainability in coastal communities has garnered increasing interest. However, on a local level indicator use is often restricted to one-time applications or project duration, and they are rarely used by coastal municipalities due to their lack of direct and clearly visible benefits. A combination with a certification scheme such as the QualityCoast Award is hoped to add value and increase incentives for coastal communities. Hence, within the scope of this thesis the QualityCoast indicators' potential to measure sustainability and climate change adaptation was assessed. A self-assessment tool based on the SUSTAIN methodology and QualityCoast indicators was developed and applied to three distinct points in time (1980, 2000 and 2013) for the seaside resort Markgrafenheide in Germany. A coastal protection and realignment scheme implemented in the study area built the basis for the analysis of the ways in which major changes are reflected in the results and to what extent coastal communities can improve their sustainability scores through appropriate measures. It was found that the scheme was reflected only limitedly in the indicator scores and that many indicators were outside the sphere of influence of the community. Identified reasons for this include the lack of suitable indicators in the QualityCoast indicator set to reflect climate change adaptation and nature restoration, as well as lacking benchmarks and weights. Furthermore, the large number of policy indicators and qualitative nature of indicators was found to be problematic. Finally, additional indicators and methodological changes for the aggregation and weighting of indicators are suggested, and trade-offs between local specificity and large-scale comparison discussed.

Keywords: Coastal Sustainability, Indicators, Self-assessment Methodology, Climate Change Adaptation, ICZM, QualityCoast

Table of Contents

List of Figures

List of Tables

Acronyms

BasiQ	Pre-assessment procedure for the QualityCoast Award that consists of a reduced set of indicators
CoPraNet	Coastal Practice Network
EC	European Commission
ECNC	European Centre for Nature Conservation
EIA	Environmental Impact Assessment
ETIS	European Tourism Indicator System
EU	European Union
EUCC	Coastal & Marine Union
GDR	German Democratic Republic
GSTC	Global Sustainable Tourism Council
ICZM	Integrated Coastal Zone Management
IOW	Leibniz-Institute for Baltic Sea Research
LUNG	State Agency for Environment, Nature Protection and Geology (Landesamt für Umwelt, Naturschutz und Geologie)
MLUV	Ministry for Agriculture, Environment and Consumer Protection of Mecklenburg-Western Pomerania (Ministerium für Landwirtschaft, Umwelt, und Verbraucherschutz Mecklenburg-Vorpommern)
StALU MM	State Authority for Agriculture and Environment of Central Mecklenburg (Staatliches Amt für Landwirtschaft und Umwelt Mittleres Mecklenburg)
StAUN	State Authoritz for Environment and Nature Rostock (Staatliches Amt für Umwelt und Natur Rostock)
WG-ID	Working Group on Indicators and Data
UNCED	United Nations Conference on Environment and Development

Acknowledgements

I would like to express my deepest gratitude to all those who provided assistance throughout the course of my studies and this thesis.

First and foremost I would like to thank my supervisor, Gerald Schernewski, for his expert advice and overall guidance throughout this research project and Silke Schönwald for her continuous support, enthusiasm and motivation. Besides, I would like to thank my colleagues from the Coastal & Marine Management Group for their contributions and advice during my time at the Baltic Sea Research Institute. I would also like my external reader, Michael Honeth, for his interest, comments and constructive feedback.

My thanks also go to the staff of the University Centre of the Westfjords, my lecturers and fellow students for making the Coastal and Marine Management programme a great experience. Especially, I would like to thank our Academic Director Dagný Arnarsdóttir for her suggestions, help and patience from the first to final stages of my thesis and Albertína Friðbjörg Elíasdóttir for her revision and suggestions.

I would like to show my gratitude to those who shared their knowledge and time and provided helpful information and contacts during my research. Special thanks to Jürgen Dudek and Dr. Joachim Schmidt for all their time and efforts.

Lastly, and most importantly, I would like to extend my thanks to my friends and families in Iceland and abroad: Thanks to my parents and sister for their support all the way throughout my studies; thanks to my Icelandic family for making Iceland my second home; thanks to Lina, Birte, Konny, and Silke for making my time in Rostock a great pleasure; thanks to Jen, Râna, Astrid, Georg, Anna, and Flor for language and GIS emergency help, good times in Ísafjörður and moral support during thesis composition; thanks to Megan and Katja for their time, comments and interest; and thanks Nora, Katja, Tina, Laura and Julia for their encouragements, friendship and endless support throughout the past years.

1 Introduction

Coastal zones are of particular importance due to their natural and structural diversity resulting from dynamic land and sea interactions. They constitute highly specialized habitats and ecosystems that are vulnerable and sensitive to changes. Furthermore, they provide a variety of resources and ecosystem services, some of which are exclusive to coastal zones. As a result, coastal zones often provide good opportunities for economic and social development and are hence of great socio-economic importance. Consequently, the pressure on coastal zones resulting from human utilizations such as tourism, fisheries, renewable energies or sand dredging is increasing and conflicts between different users arise, which often lead to the degradation of natural coastal environments and an unsustainable development of coastal communities. Furthermore, coastal zones and the communities living within are especially prone to the risks and effects of climate change. Rising sea levels and an increase in storm frequency and intensity pose a direct threat to coastal ecosystems, communities, and infrastructure. But also rising air and water temperatures and changes in precipitation patterns will affect coastal habitats and communities (cf. Daschkeit & Sterr, 2003; Cicin-Sain & Knecht, 1998; Hildebrand & Norrena, 1992).

Integrated Coastal Zone Management (ICZM) is a process that is intended to reduce the impacts on coastal areas and communities and reduce their vulnerability. It aims at the protection of resources and environments within the coastal zone and the promotion of sustainable development in coastal communities through the harmonization of decision making processes. This is achieved through the integration of different sectors, governmental and administrative levels, as well as the land and the sea (Cicin-Sain & Knecht, 1998). ICZM is considered to be an iterative process comprised of information collection, planning, decision making, management, and monitoring of implementation (European Parliament and Council, 2002). The concept of Integrated Coastal Zone Management is increasingly implemented and used in coastal states around the world. Since the 1990s ICZM initiatives and practices on an international, national, regional or

local level have been launched throughout Europe to improve the state and development of coastal zones and societies.

A vital part of the cyclic ICZM process is to establish systems to monitor the coastal zone and provide information to the public (European Parliament and Council, 2002; UNCED, 1992). Therefore, many ICZM guidelines emphasize the importance of developing and using indicators to monitor and evaluate the state and direction of development of coastal zones. Indicators are intended to measure progress, raise awareness and support decision making while being clear, easily communicable and understandable (Diedrich, Tintoré, & Navinés, 2010; Hoffmann, 2009). Hence, efforts have been made within the scientific community for the development of suitable indicators to assess the state and progress of coastal zones on different spatial scales. However, despite the great availability of indicator sets, the acceptance and application of indicators to measure sustainable development of coastal communities is mostly limited to scientific applications and hardly used by practitioners. This is often due to lacking expertise, complexity as well as financial and time constraints (Schernewski, Schönwald, & Katarzyte, submitted). Within the European INTERREG-IVC-Project SUSTAIN an indicator-based self-assessment tool was developed by a mixed group of representatives from local authorities as well as scientists. It is intended to allow coastal municipalities throughout Europe to assess sustainability on a local and regional level for the purposes of examining and ensuring coastal sustainability (SUSTAIN Partnership, 2012a). However, also with the SUSTAIN methodology immediate and clearly visible benefits for coastal communities are lacking. Therefore, it is likely that the evaluation and awareness-rising process itself might provide too little incentive for coastal authorities and communities to make use of it (Schernewski et al., submitted). Consequently, Schernewski et al. (submitted) suggest to combine the SUSTAIN methodology with the QualityCoast Award, a label that certifies sustainable coastal tourism destinations worldwide, thereby creating added value for coastal communities.

1.1 Research Purpose

Building on the recommendations of Schernewski et al. (submitted) the purpose of this research is to increase the attractiveness of indicator sets for measuring coastal sustainability for the improvement of sustainable coastal management. Therefore, the

QualityCoast indicators will be merged with the SUSTAIN self-assessment methodology to improve incentives for local practitioners to make use of the indicator-based assessment method to monitor sustainability performance. The prospect of receiving the QualityCoast Award for sustainable tourist destinations could provide additional promotional benefits for coastal communities to measure their sustainability. Further benefits to coastal destinations from the QualityCoast Award include improved awareness of sustainability issues, monitoring of strength and weaknesses, guidance for improvement, and dissemination of information for visitors and the local community (EUCC & ECNC, 2014). Hence, within the scope of this research, a self-assessment tool, based on the QualityCoast indicators shall be developed. Its suitability to advance coastal management on a local level while yet being applicable to coastal communities throughout Europe or even globally shall be evaluated. In order to allow coastal authorities to assess whether their efforts contribute to a sustainable development of the coastal zone, changes need to be reflected in the indicator results and sustainability scores that are used for monitoring purposes.

1.2 Research Aims and Objectives

Consequently, the research aim is to evaluate the QualityCoast indicator set for measuring climate change adaptation and sustainability in coastal communities as well as its utility for sustainable coastal management. Thus, an indicator tool that combines the SUSTAIN self-assessment methodology with the QualityCoast indicator set, is developed that allows coastal communities to assess their state and progress towards sustainability. A concrete example of a coastal protection and realignment scheme that was implemented in the seaside resort Markgrafenheide and included the restoration of the adjacent nature reserve Heiligensee & Hütelmoor provides the basis for this study.

The implications of the scheme cover environmental, social and economic components of (coastal) sustainability. The coastal protection scheme represents an adaptation measure that decreases risks from flooding thus ensuring safety for the local community and protecting important infrastructure from damage. Furthermore, the long-term maintenance costs for coastal protection efforts will be reduced. The coastal realignment schemes for the swampy moor and nature reserve Heiligensee & Hütelmoor includes the restoration of the area that had been drained and cut off from coastal dynamics through protection

measures. Thereby, a unique habitat with its flora and fauna will be restored (Weisner & Schernewski, 2013). Furthermore, protection of moors gained importance in the context of climate change mitigation. Under drained and degraded conditions moors can emit large amounts of greenhouse gases. In contrast, natural moors serve as carbon sinks. Thus, rewetting the swampy moor could in the long-term lead to greenhouse gas emissions reductions (Koebsch, Glatzel, Hofmann, Forbrich, & Jurasinski, 2013; Joosten, 2009).

Based on the concrete example of Markgrafenheide and the nature reserve Heiligensee & Hütelmoor it will be analysed to what extent climate change adaptation measures and progress towards sustainability are reflected in the results of the QualityCoast indicator application and how the results can be further used for coastal planning and management on a local level.

The specific objectives of the research are:

1. To develop an indicator tool in which the QualityCoast indicators and the SUSTAIN scoring methodology are merged (hereafter referred to as the *Coastal Sustainability Tool*).

2. To apply the indicator set to three distinct points in time (1980, 2000 and 2013) to the seaside resort Markgrafenheide to reflect the state before and after the coastal protection and realignment scheme.

3. To analyse whether climate change adaptation measures are reflected in the scores of the overall sustainability, criteria, categories, and indicators.

4. To give recommendations for additional indicators and necessary changes that should be included in the *Coastal Sustainability Tool.*

5. To evaluate its utility for sustainable planning and management on a local level, while yet being applicable to coastal communities throughout Europe.

1.3 Specific Research Questions

The thesis seeks to address the following research questions:

1. Using the area of Markgrafenheide/Hütelmoor with its coastal protection and realignment schemes as an example, how suitable are the QualityCoast indicators

and the methodology used in the *Coastal Sustainability Tool* to reflect efforts of coastal communities towards sustainability and climate change adaptation through repeated applications?

2. To what extent are coastal communities able to improve their sustainability score through appropriate measures?

3. If repeated applications of the QualityCoast indicators for different years show an improvement in coastal sustainability, are these improvements also visible for visitors and the local community?

1.4 Scope and Delimitation of the Research

For the purposes of the thesis, the research area is restricted to a single case study conducted for the village of Markgrafenheide and the adjacent nature reserve Heiligensee & Hütelmoor. The set of indicators that was merged into the *Coastal Sustainability Tool* and used during the project is limited to the indicators taken from the QualityCoast Award, and the application restricted to two past states (1980 and 2000) and the current state (2013). Furthermore, the study is limited to the evaluation of the QualityCoast indicators' suitability to measure change, as well as their utility for coastal management. This thesis does not assess whether a combination of the SUSTAIN self-assessment methodology with the QualityCoast indicators will actually contribute to the attractiveness of indicator-based assessments for coastal municipalities.

1.5 Data and Methods

All data that was used for this project was collected by the author of the thesis herself using mixed methods including internet and telephone research, review of documents, personal observations, expert interviews, and a short survey for tourism businesses. The scoring methods used in the *Coastal Sustainability Tool* combine both aspects from the QualityCoast indicator set and the SUSTAIN self-assessment methodology. The same method was used throughout the three applications.

1.6 Structure and Context of the Thesis

Subsequent to the introduction, this thesis is organized as follows. The next chapter provides the current state of knowledge about indicators as monitoring tools in the context of coastal sustainability in Europe. The first part of the chapter describes the use of sustainability indicators in general. The second part introduces the concept and development of ICZM in Europe and describes the use of indicators in this context. Furthermore, the use of indicators in the context of tourism certifications is shortly described. In the third chapter the study area is introduced and its development since 1980 described and the methodology of the research explained. The results of the three indicator applications in the study area are presented in the fourth chapter. In the fifth chapter, the research methodology and results will be discussed along the three research questions. Finally, the conclusion in the sixth chapter summarizes the main lessons extracted from the indicator applications and gives further recommendations.

2 State of Knowledge (Literature Review)

The literature review conducted for this thesis and outlined below is divided into three main sections. In the first part the use of sustainability indicators is described in general and important criteria are discussed. The second part focuses on the use of indicators in the context of Integrated Coastal Zone Management. For this, it first introduces the concept of ICZM and then describes the latest state of the art of indicator applications to assess sustainability in coastal communities. In the last section the use of indicators in the context of sustainability certifications for tourism destinations is shortly described and the QualityCoast Award and indicator set introduced.

2.1 Sustainability Indicators

2.1.1 Sustainability

Since the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 and publication of Agenda 21, the global action plan for achieving sustainable development, the concept of sustainability has been integrated into many governmental policies and has become a guiding principle for environmental resource management (Bond & Morrison-Saunders, 2011; Gallagher, 2010). No generally agreed upon definition exists for the concept of sustainability or sustainable development, but the most commonly cited definition is the one used in the Brundtland Report in which sustainable development is defined as *'...development that meets the needs of the present without compromising the ability of future generations to meet their own needs'* (World Commission on Environment and Development, 1987). In the past decades various definitions for sustainability have been suggested, which refer to the integration of economic, environmental and social dimensions and emphasize the importance of intra- and intergenerational equity. Increasingly a fourth dimension that constitutes institutional aspects is added (Mori & Christodoulou, 2012; Gasparatos, El-Haram, & Horner, 2008; Valentin & Spangenberg, 2000).

2.1.2 Sustainability Assessment

A variety of assessment methods to measure progress towards sustainability have been developed, including environmental impact assessments, integrated assessments, product-related assessments, monetary assessments, and indicators or indices (Mori & Christodoulou, 2012; Ness, Urbel-Piirsalu, Anderberg, & Olsson, 2007). The importance of adopting indicators to measure sustainability is recognized in Agenda 21 and has triggered the development of numerous academic studies and initiatives of governmental and non-governmental agencies in the field of sustainability indicators since 1992 (Moreno Pires, Fidélis, & Ramos, 2014; Rinne, Lyytimäki, & Kautto, 2013; Dahl, 2012).

2.1.3 Development of Sustainability Indicators and Indices

Indicators can be defined as parameters or variables that convey messages or provide information about particular states, processes or phenomena that occur around us. Thereby the underlying state or condition that the indicator describes is of interest (Hoffmann, 2009; McCool & Stankey, 2004). Single indicators can be aggregated into indices or composite indicators and are considered to be able to communicate complex systems, phenomena, and information in a simplified, comprehensible, and easily understandable way (Mori & Christodoulou, 2012; Diedrich et al., 2010; Hoffmann, 2009). They are regarded as a valuable tool for awareness-raising and facilitating decision-making processes and bridging the gap between science and practice (Dahl, 2012; Diedrich et al., 2010; Hanson, 2003), and can be used to shed light on the question how management interactions can shape future states and provide early warning functions, when used to evaluate different scenarios (Sébastien & Bauler, 2013; Hanson, 2003). Furthermore, repeated applications can be used to track long-term sustainability trends retrospectively (Ness et al., 2007).

2.1.3.1 Criteria for Indicator Evaluation

A strong focus on the development of sustainability indicators and indices can be observed in the literature, whereby different frameworks, evaluation criteria, and methods for the development of successful indicators and indices are discussed. Repeatedly mentioned characteristics that indicators need to fulfil include being valid, simple, quantifiable, comparable, readily communicable, sensitive to change, and objective (Sébastien &

Bauler, 2013; Ness et al., 2007; Fraser, Dougill, Mabee, Reed, & McAlpine, 2006; McCool & Stankey, 2004; Hanson, 2003). In general, the most frequently mentioned criteria refer to the applicability of indicators or ease of use and the need for objectivity, and are summarized by Reed, Fraser, & Dougill (2006) as shown in Table 2.1.

Table 2.1 Criteria to evaluate sustainability indicators (Reed et al., 2006)

Criteria to Evaluate Sustainability Indicators	
Objectivity Criteria	Ease of Use Criteria
Indicators should	
Be accurate and bias free	Be easily measured
Be reliable and consistent over time space and time	Make use of available data
Assess trends over time	Have social appeal and resonance
Provide early warning of detrimental change	Be cost-effective to measure
Be representative of system variability	Be rapid to measure
Provide timely information	Be clear and unambiguous, easy to understand and interpreted
Be scientifically robust and credible	Simplify complex phenomena and facilitate communication and information
Be verifiable and replicable	Be limited in number
Be relevant to the local system/environment	Use existing data
Sensitive to local stresses or the change it is meant to indicate	Measure what is important to stakeholders
Have a target level, baseline, or threshold against which to measure them	Be easily accessible to decision-makers
	Be diverse to meet the requirements of different users
	Be linked to practical action
	Be developed by end-users

Indicator sets have been developed for different spatial scales and in various contexts. Some focus on sustainability or sustainable development as a whole and others on specific sectors or industries such as the energy sector and sustainable tourism (cf. O'Mahony, Ferreira, Fernández-Palacios, Cummins, & Haroun, 2009; Tsaur, Lin, & Lin, 2006; Ko, 2005), or particular impacts for instance biodiversity or climate change vulnerability and adaptation (cf. Palmer, et al., 2011; Torresan, Critto, Dalla Valle, Harvey, & Marcomini,

2008; Löser, 2007). While the above-mentioned criteria are generally considered crucial for the effectiveness of indicators and indices, it has been acknowledged that sustainability issues are not always quantifiable and their assessment can require the use of qualitative data, especially for socio-economic aspects of sustainability (McLaughlin, McKenna, & Cooper, 2002). Yet, qualitative indicators are discussed controversially. On the one hand, they are regarded as problematic, because of difficulties to be measure and rank qualitative data (McLaughlin et al., 2002) and are sometimes considered to be subjective (Tsaur et al., 2006). On the other hand, they are seen as complements to quantitative indicators that can improve understanding of the sustainability concept (Ko, 2005; Bell & Morse, 2003). Furthermore, as some sustainability indicators are difficult to assess in quantitative terms or due to difficulties in obtaining quantitative data for them, it is recognized that 'objectivity may come at the expenses of usability' (Reed et al., 2006). Others argue, that despite being difficult to rank qualitative indicators are effective in providing necessary information (Bell & Morse, 2003; Miller, 2001).

2.1.3.2 Aggregation and Weighting of Indicators

For the purposes of simplification and communication, indicators are often aggregated. This can refer to a thematic integration of indicators from a set, for instance into the dimensions of sustainability. In an extreme case, indicator results can also be aggregated into a single composite indicator or index (Reed et al., 2006). In this context, mention should be made to the identification of weights for indicators of dissimilar importance. Depending on the methods used, aggregation and weighting can highly affect indicator results, and their use has been critically discussed and alternatives have been suggested such as dividing indicators sets into core and supplementary or optional indicators (Reed et al., 2006). The choice of aggregation and weighting scheme can be pre-defined for an indicator set or determined through participative procedures.

2.1.3.3 Controversies over Sustainable Indicators

Sustainability indicators have been discussed controversially, with the main points of criticism being reductionism or over-simplification and subjectivity (Singh, Murty, Gupta, & Dikshit, 2012; Bond & Morrison-Saunders, 2011), while others cast doubt on the ability to effectively assess sustainability and progress towards it using indicators in general, due

to the complexity as well as ambiguity of the concept itself (cf. Dahl, 2012; Mori & Christodoulou, 2012).

As mentioned previously, one of the requirements and strength of indicators is their ability to simplify and communicate complex phenomena. By the same token, it is recognized that this can also become a major weakness if only a few indicators or even a single index value are used to represent complex systems or concepts, such as sustainability. Thus, it is controversially discussed to what extent the concept of sustainability can be broken down into smaller components or if it is too complex to be assessed on the basis of a limited number of indicators (Fraser et al., 2006; Reed et al., 2006). While a numerical representation of indicators can be easily communicated it loses details about the information that are intended to be conveyed. In contrast disaggregated indicators that are simply listed are often considered too complex in practice (Sébastien & Bauler, 2013).

Subjectivity can be an issue at different steps throughout the use of indicators. Elements of subjectivity can be present in the choice or definition of indicators, in the selection of baselines and targets against which indicators should be assessed, and also in the choice of aggregation schemes and selection of weights for single indicators or groups of indicators within a set (Miller, Twining-Ward, & Simpson, 2013; Mori & Christodoulou, 2012).

2.2 Measuring Coastal Sustainability

2.2.1 Development of Integrated Coastal Zone Management in a European Context

Increasing utilization of coastal areas and impacts of climate change have led to the degradation of coastal zones worldwide and the need for a harmonization of conflicting uses and sustainable utilization of coastal and marine resources is increasingly recognized (Shipman & Stojanovic, 2007). Integrated coastal zone management is a tool and process that is defined in terms of sustainable development and intended to reduce the pressures on coastal zones and harmonize conflicts by integrating different sectors and interests and different administrational levels. It also includes spatial and temporal integration (Gallagher, 2010; Shipman & Stojanovic, 2007; Cicin-Sain & Knecht, 1998). The importance of a sustainable development of coastal zones worldwide is also incorporated in Agenda 21, whereby Chapter 17 is of particular importance (Karim & Hoque, 2009;

Cicin-Sain & Knecht, 1998). It highlights the need for the 'protection of the oceans […], seas and coastal areas and the protection, rational use and development of their living resources' and identifies integrated management and sustainable development of coastal and marine areas as its first programme area to reach this objective (UNCED, 1992). Following this, thirty-five regional and local demonstration programmes were conducted by the European Commission (EC) between 1996 and 1998. The results of the demonstration programmes were used to identify examples for good practice of ICZM in Europe and also served as the basis for the development of a European strategy on ICZM. Furthermore, a set of general principles on which successful ICZM initiatives are based, were identified throughout the demonstration programmes (European Commission, 1999). Within this context, ICZM is considered to be '*a dynamic, continuous and iterative process designed to promote sustainable management of coastal zones*' which includes '*the full cycle of information collection, planning, decision making, management and monitoring of implementation*' (European Commission, 1999). 'Integrated' refers to several dimensions and includes the horizontal integration of different sectors, the vertical integration of different administrative levels, as well as the integration of time and space including the integration of terrestrial and marine components, and the integration of a variety of instruments to meet the objectives (European Commission, 1999; Cicin-Sain & Knecht, 1998). Thus, ICZM can be regarded as a multi-level governance system (Schuchardt, et al., 2004) that functions differently depending on the spatial scale that it is applied to. On the one hand it functions as a framework and process for the integration of conflicting interests and on the other hand as a tool for a sustainable development of the coastal zone as well as conflict resolution.

The European Parliament and Council adopted the *Recommendation on the Implementation of Integrated Coastal Zone Management in Europe* on May 30th, 2002 (European Parliament and Council, 2002). Within the recommendation member states are requested to conduct an overall stocktaking of their coastal zones. Hereby, relevant sectors and stakeholders, administrative levels, cooperation structures and legislative measures should be identified. Following the overall stocktaking, member states are supposed to formulate national strategies on ICZM that consider the following eight principles: they should have (a) a broad holistic and (b) long-term perspective, (c) make use of adaptive management and (d) consider local specificities, (e) work with natural processes,

(f) involve all parties concerned, (g) support and involve relevant administrative bodies at different levels and (h) make use of a combination of instruments (European Parliament and Council, 2002). The principles shall provide the common understanding of ICZM development in Europe. Furthermore, since ICZM is considered to be an iterative process, the need for monitoring and evaluation methods and tools and the use of indicators in this context is emphasized within the EU recommendations (European Parliament and Council, 2002). Member states are required to establish monitoring systems for the collection and dissemination of information about their coastal zone (European Parliament and Council, 2002).

2.2.2 Use of Indicators to Measure and Monitor Sustainability in the Context of ICZM

Indicators play an important role in the context of ICZM as a tool for evaluating the state and direction of development of coastal zones. Hence, within the EU ICZM Expert Group the Working Group on Indicators and Data (WG-ID) was formed (Gallagher, 2010). Its purpose was to develop assessment methods for member states to evaluate whether their coasts become more or less sustainable. In this context two types of indicators are differentiated. *Sustainability indicators* are used to measure sustainable development or the state of the coast, whereas *progress indicators* are intended to measure the progress of ICZM implementation (Pickaver, Gilbert, & Breton, 2004). Several projects and studies have been conducted to measure sustainability and ICZM implementation on different spatial scales. Within the scope of the COREPOINT project an indicator set of the WG-ID was used to measure ICZM progress in different countries throughout Europe on the national, regional and local level (Ballinger, Pickaver, Lymbery, & Ferreira, 2010; Pickaver A. H., 2009). The DEDUCE project concentrated on the application of the *sustainability indicators* that were developed by the WG-ID. The indicators were applied to different spatial levels, ranging from the European to the local level (DEDUCE Consortium, 2007).

In recent years a shift towards a more localized use of indicators to measure coastal sustainability is recognizable throughout the academic literature. While indicator-based sustainability assessments on the national level are considered to be advantageous for international comparisons, it has been acknowledged that they do not reflect heterogeneity

between and within countries and lack local specificity (Fontalvo-Herazo, Glaser, & Lobato-Ribeiro, 2007). Thus, the focus has shifted to the regional and local level, on which ICZM or sustainability initiatives are generally implemented. It is acknowledged that ICZM implementation differs from one place to another and that participatory approaches for indicator development and use are needed (Diedrich et al., 2010; McKenna, Cooper, & O'Hagan, 2008). Different frameworks for stakeholder involvement have been proposed, which included the identification of place specific indicators, setting targets or baselines to measure them, and determining weights for indicators of varying importance (Diedrich et al., 2010; Fontalvo-Herazo et al., 2007; Fraser et al., 2006; Reed et al., 2006). Yet, the process of developing indicator sets that are tailored to local conditions is often time and resource intensive and lacks comparability between regions (Reed et al., 2006). Thus, efforts have been made to construct indicator sets that are comparative internationally and at the same time relevant for the local level (Diedrich et al., 2010). Valentin & Spangenberg (2000) suggest using an approach that provides a common structure, but allows communities to develop their own indicators, thus enabling a certain degree of flexibility as well as comparability. A range of standardized indicator-based methods for sustainability assessment in various contexts have been developed (Moreno Pires, Fidélis, & Ramos, 2014). Standardized methods are typically developed by non-governmental actors, including non-governmental organisations, think tanks and scientists that serve as middle-actors between decision makers and local communities (Moreno Pires et al., 2014; Sébastien & Bauler, 2013).

2.2.2.1 SUSTAIN – a Self-assessment Tool for Coastal Communities

A similar approach, specifically tailored for coastal communities, was also taken in the three-year European INTERREG-IVC-Project SUSTAIN. The project aimed at evaluating sustainability and improving management of coastal zones on a local or regional level. Its objective was the development of a fully implementable policy tool that is targeted to coastal authorities and communities throughout Europe (Schernewski, Schönwald, & Katarzyte, submitted; SUSTAIN Partnership, 2012a). For this purpose, an indicator-based assessment method for coastal communities and authorities was created. The indicator set that was developed covers the four dimensions or pillars of sustainability, that are subdivided into a number of criteria (see Figure 2.2) each consisting of a set of indicators (SUSTAIN Partnership, 2012b). The consequent SUSTAIN policy tool, called *DeCyDe for*

Sustainability (Isotech Ltd., Cyprus), consists of three distinct steps as shown in Figure 2.1, and will be described in more detail in Section 3.2.1. of the methodology chapter.

1. Stakeholder consultation for the selection of optional indicators that are most suitable for the region/municipality

2. Data collection for core and optional indicators and scoring of indicators in the DeCyDe-for-Sustainability spreadsheet

3. Moderated weighting exercise in which weights for the covered pillars and issues are selected by local stakeholders
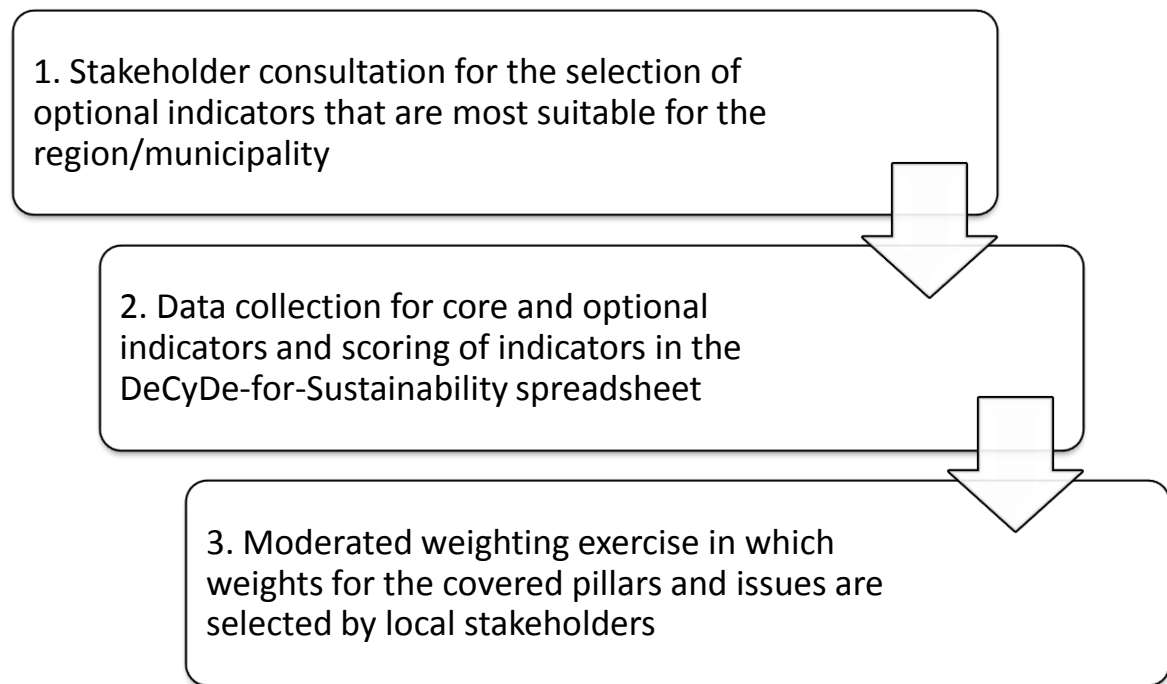
Figure 2.1 Description of the SUSTAIN DeCyDe-for-Sustainability method

2.2.3 Deficits in the Practical Application and Use of Indicators in Coastal Communities

Despite being considered a valuable tool to overcome the science-policy gap, indicators in the context of ICZM are still used only limitedly and mostly for scientific purposes or in the context of governmental or non-governmental research projects. Due to short project durations, they are often restricted to one time applications and have not proved themselves in practice (Breton, 2006). Reasons for the limited acceptance by local authorities and practitioners to use indicators for the purpose of measuring the state and progress of coastal zones are considered to include financial constraints, lack of time and expertise, complexity, and uncertain benefits (Schernewski et al., submitted). Other reasons identified for sustainability assessments in general include the lack of political interest and support (Moreno Pires et al., 2014). Thus, Schernewski et al. (submitted) suggest that a standardized yet flexible methodology such as SUSTAIN could be combined with a tourism certification scheme to add value through the potential certification as a sustainable destination.

2.3 Use of Indicators in Tourism Certification Schemes

Indicator-based methods have also been applied to assess sustainability in the tourism sector and for the purpose of awarding tourism businesses and operators, accommodations, or entire destinations with an eco-label or sustainability certification scheme (O'Mahony et al., 2009; Ko, 2005; Miller, 2001). Tourism eco-labels range from being valid only on a localized level to international recognition and from being used for single businesses (e.g. Green Key) or beaches (e.g. Blue Flag) to entire destinations (Buckley, 2002). Two examples of internationally recognized schemes that certify entire destinations are the EarthCheck and QualityCoast programme. Both are awarded based on a set of criteria and indicators that have to be fulfilled in the applying destination. For the purposes of this thesis, the QualityCoast programme is used as it is tailored particularly to coastal communities throughout Europe, but currently also extended to the global level.

2.3.1.1 QualityCoast Label and Indicators

QualityCoast is a certification programme for sustainable coastal tourism destinations that resulted from the INTERREG project Coastal Practice Network (CoPraNet) and is managed by the Coastal & Marine Union (EUCC). It certifies entire destinations, such as towns, municipalities, small regions or islands and is based on the fulfilment of a set of criteria that 'have been developed to measure the success of Integrated Coastal Zone Management at local level, in connection to the EU Recommendation for ICZM' (EUCC, 2012). An indicator-based approach, consisting of a set of quantitative and qualitative indicators, is thereby used to assess tourism sustainability in the destination (O'Mahony et al., 2009). The indicator set is subject to annual revision and includes several of the sustainability indicators developed by the WG-ID. In the past years the criteria of the Global Sustainable Tourism Council (GSTC) and all indicators from the European Tourism Indicators System for Sustainable Management at Destination level (ETIS) have been incorporated into the QualityCoast indicator set. Similar to the SUSTAIN indicator set the QualityCoast indicators cover all of the conventional dimensions of sustainability. They are divided into categories (equivalent to the SUSTAIN Pillars) and further subdivided into criteria (equivalent to SUSTAIN Issues) as shown in Figure 2.2.

SUSTAIN

ENVIRONMENTAL QUALITY

Air Pollution

Biodiversity & natural resource management

Change at the coast

Energy and climate change

Land use

Public health and safety

Waste management

Water resources and pollution

ECONOMICS

Economic opportunity

Land use

Tourism

Transport

SOCIAL WELL-BEING

Demography

Equity

Education and training

Local and cultural identity

Public health and safety

GOVERNANCE

Policies/Strategies for sustainability

Monitoring tools for sustainability

Human resources capacity building

Implementation of good management practices

Stakeholder involvement/public participation

QualityCoast

NATURE

Nature & conservation

Access, information & application

Green policies

Open landscapes

ENVIRONMENT

Environmental management

Blue flags & beaches

Water management

Sustainable transportation

Waste & recycling

Energy & climate mitigation

Climate change adaptation

TOURISM & BUSINESS

Destination management

Business involvement

Hospitality & satisfaction

HOST COMMUNITY & SAFETY

Freedom & justice

Community participation

Heatlth & safety

IDENTITY & CULTURE

Cultural heritage

Territory & tradition

Local identity

Figure 2.2 Comparison of SUSTAIN pillars and QualityCoast categories as shown in bold block capitals and QualityCoast criteria and SUSTAIN issues listed below (Schernewski et al., submitted

3 Study Area and Research Methodology

In this chapter background information on the study area will be given and the used methodology explained. The description of the development of the study area between 1980 and today (2013) will be guided along the four pillars of sustainability that are covered through the indicator set was included in the *Coastal Sustainability Tool*. The second part of the chapter describes the methodology including the development of the *Coastal Sustainability Tool*, the data collection and scoring of the indicators.

3.1 Study Area – Markgrafenheide/Hütelmoor

The chosen study area comprises the seaside resort Markgrafenheide and the adjacent nature reserve Heiligensee & Hütelmoor (hereafter referred to as Hütelmoor). Markgrafenheide is part of the Hanseatic City of Rostock, in the federal state of Mecklenburg-Western Pomerania in the Southern Baltic Sea Region Figure 3.1 (a). The district is situated on the Eastern side of river Warnow around 20 km from the city centre (Figure 3.1(b)). Altogether, Markgrafenheide and the nature reserve Hütelmoor have a total area of around 1,000 ha and a coastal strip of around 6 km (Hansestadt Rostock, 2014).
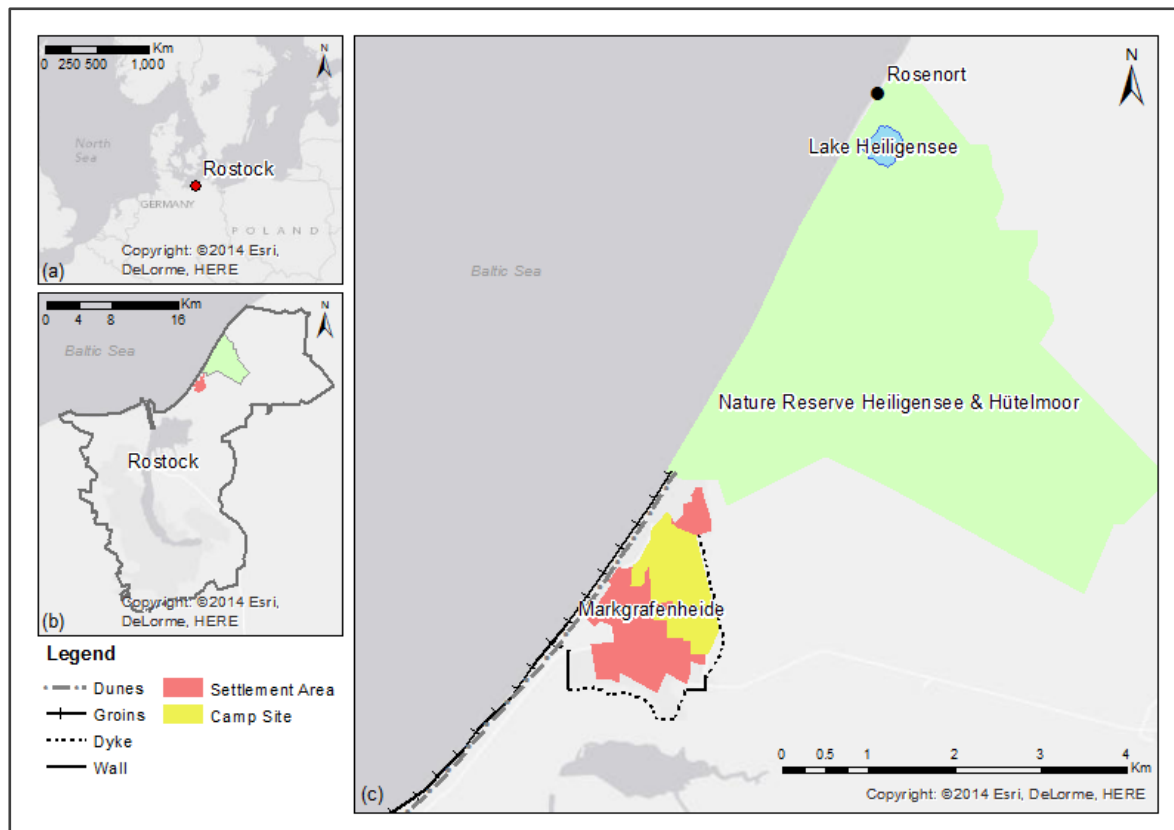
Figure 3.1 The study area's location (a) in the Southern Baltic Sea region, (b) in the city of Rostock, and (c) showing the coastal protection and realignment scheme of the settlement area of Markgrafenheide and the nature reserve Heiligensee & Hütelmoor

3.1.1 Environment

3.1.1.1 Coastal Protection

The coastal strip along Markgrafenheide and the Rostock Heath (*Rostocker Heide*) is subject to erosion. Whereby the most north-eastern part of the study area, close to Rosenort (see Figure 3.1(c)), is most affected. Here the coastline retreated up to 210 m in a hundred years (MLUV , 2009). Different coastal protection measures have been applied over the years to counteract this process. In the 1960s a revetment wall was constructed to protect the settlement from flooding. Since the beginning of the 1970s, beach nourishment measures have been applied repeatedly in the study area as compensation for the negative sediment balance and for the creation of coastal dunes as flood protection. Furthermore, a system of groins was built along the coast in the mid-1970s (Weisner & Schernewski, 2013; Zorn, 2013). However, since Markgrafenheide is also at risk of inland flooding, the protection of the outer coastline was not sufficient for the settlement area. Therefore,

comprehensive coastal protection measures were conducted (see Figure 3.2). They included beach nourishment for the enhancement of the coastal dune and widening of the beach. Furthermore, thirty-eight wooden groins were established and extended in front of the settlement area. Between 2004 and 2006 a ring-dyke was establish around the settlement area (see Figure 3.1(c)). In order to minimise the impacts on neighbouring biotopes, the dyke was substituted by a metal sheet pile wall in the western part (MLUV , 2009). In Mecklenburg-Western Pomerania the obligation for coastal protection is restricted to settlement areas. Thus, in consequence of the ring-dyke protection, the coastal protection in front of the Hütelmoor was abandoned. Instead, a coastal realignment strategy that allows for the restoration of natural coastal dynamics has been adopted for the area (Weisner & Schernewski, 2013).

Figure 3.2 Images of the coastal protection schemes for the Markgrafenheide settlement, (top left) aerial image of the settlement area showing part of the western part of the ring-dyke with the metal sheet pile wall left of the arrow and the dyke right of the arrow © Dr. Lars Tiepolt, StALU MM, (bottom left) transition between metal sheet pile wall and dyke, photo taken by the author on October 5, 2013 (bottom right) aerial image of the protected settlement with wooden groins along the beach © Dr. Lars Tiepolt, StALU MM, (top right) maintained groin field in front of Markgrafenheide, photo taken by the author on August 10, 2013.

3.1.1.2 Nature Protection

Markgrafenheide is in the rural part of Rostock and partly located in a wood and heath land region called Rostock Heath (*Rostocker Heide)*. The swampy moor that is characterized by aperiodic saltwater influxes, stretches northeast of Markgrafenheide. It has been under protection since 1957 with a total size of 490 ha (Umweltministerium Mecklenburg-Vorpommern, 2003). The area had been drained and used as pasture land since the 16th century, and temporarily as mowing areas. In 1976 a complex ditch system and a pumping station was established which allowed the drainage of the area and intensification of agricultural use. This led to a severe degradation of the ecological state of the area. After German reunification, attempts to bring the area back into a more natural state were made and the groundwater table was gradually raised. However, extensive agricultural use and maintenance measures for the protection and recovery of threatened flora and fauna were continued (Leipe & Leipe, 2013; Umweltministerium Mecklenburg-Vorpommern, 2003).

Figure 3.3 Images of the coastline adjacent to the Hütelmoor nature reserve (top left) coastline in 2000 while the area was still protected against erosional forces © Dr. Birger Gurwell, StALU MM (bottom left) coastline in 2010, two years after protection scheme had been abandoned, with clearly visible coastal retreat © Dr. Lars Tiepolt, StALU MM, (top right) abandoned groins in front of the Hütelmoor, photo taken be the author on August 23, 2013 (bottom right) retreating coastline at the point of the expected dune breach, photo taken by the author on November 9, 2013

In the context of the ring-dyke protection scheme for Markgrafenheide (as described above) the realignment scheme and restoration of the nature reserve Hütelmoor is realised as a compensation measure, which started in 2008. Besides the abandonment of the original protection scheme, the pumping station was removed and a ground-sill installed, in order to raise the groundwater level and allow for a rewetting of the moor. Furthermore, the restoration of dynamic coastal processes will cause a narrowing of the beach and eventually lead to a dune breach towards the moor and the development of a shallow bay at lake Heiligensee (see Figure 3.1) (Weisner & Schernewski, 2013). Thereby, salt water influxes during storm events will be enabled.

3.1.2 Society

Markgrafenheide belongs to the district Rostocker-Heide, which is among the least densely populated districts of Rostock. Since German reunification the population size has been in decline. While Markgrafenheide had a population size of around 890 in 1980 it decreased to 770 until 2000 and currently has a size of approximately 560 (Rostock Markgrafenheide - Urlaub an der Ostsee, 2014; Hansestadt Rostock, 2002). The average age of the population in the district Rostocker-Heide has increased from 35.8 to 50.6 years between 1992 and 2012 (Hansestadt Rostock, 2013). It is 5.9 years above the average for Rostock. Hence, the area belongs to one of the oldest and fastest aging districts in the city.

3.1.3 Economy

Owing to its location on the Baltic Sea coast and close to the Rostock Heath, Markgrafenheide is an important recreation area for locals, but has also attracted tourists from other parts of the GDR and later Federal Republic of Germany. Therefore, the local economy has been dominated by the tourism industry. The main tourism development took place in the 1950s and 1960s, with the opening of the young pioneers camp *Alexej Maressjew* and other summer vacation camps, the development of a camping site in the coastal forest and the establishment of several company holiday homes (Rostock Markgrafenheide - Urlaub an der Ostsee, 2014; Hansestadt Rostock, 1996). The majority of tourists are comprised of one-day guests and visitors in transit. Especially the completion of the motorway A19 between Rostock and Berlin in 1978, led to an increase in the number of short-term visitors (Dossmann, 2003).

After German reunification the number of tourists in Markgrafenheide declined. Between 1992 and 2008 the grounds of the former pioneers' camp were leased and continued operations as the Baltic Sea Holiday Resort (*Ostseeferienzentrum*). The camping site was reopened in 1993. Several of the company holiday homes were reopened as guesthouses or hotels in the 1990s (Rostock Markgrafenheide - Urlaub an der Ostsee, 2014; Hansestadt Rostock, 1996). In 1996 Markgrafenheide gained the status of a seaside resort as part of the seaside resort Warnemünde.
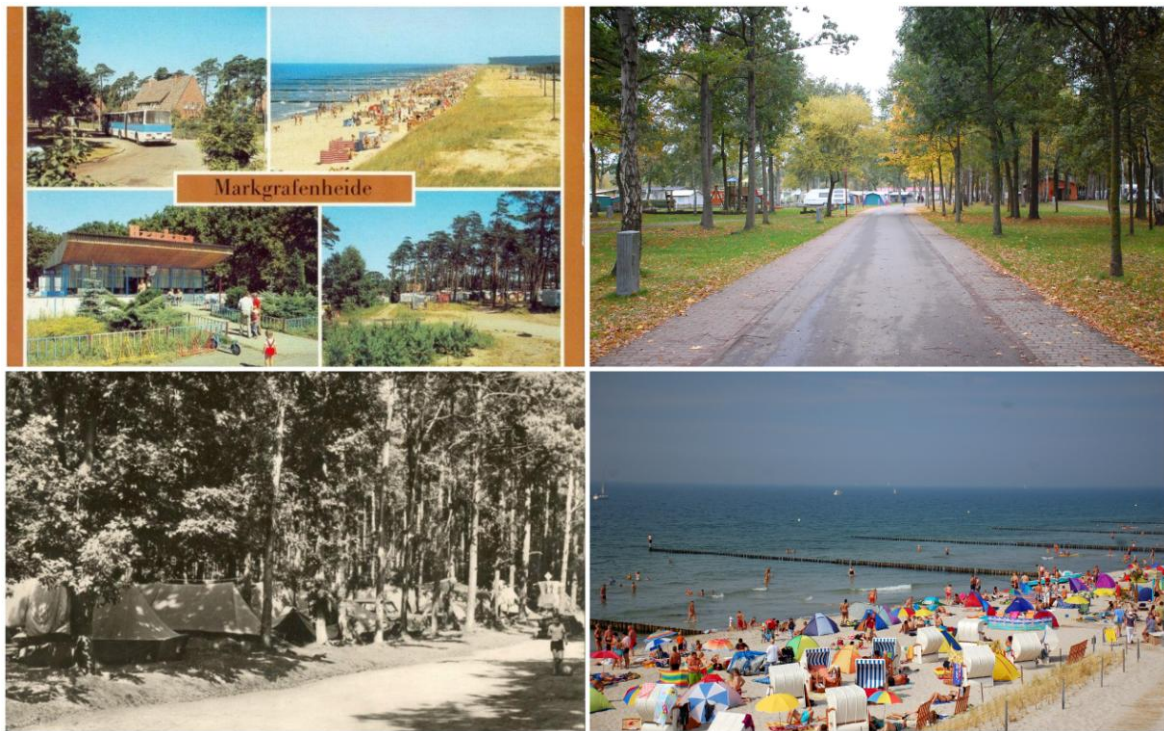
Figure 3.4 Images of the seaside resort Markgrafenheide (top left) postcard of Markgrafenheide from the 1980s © Rostock-Markgrafenheide.de, (bottom left) camping site of Markgrafenheide before the German reunification © Rostock-Markgrafenheide.de, (top right) camping site Markgrafenheide, photo taken by the author on October 13, 2013, (bottom right) beach in front of Markgrafenheide on a warm summer day, photo taken by the author on July 27, 2013

3.1.4 Governance

Markgrafenheide is located in the territory of the former GDR. As part of the city of Rostock it was part of the regional district of Rostock, one of the fourteen regional districts of the GDR (each named after its capital). The district of Rostock covered almost the entire Baltic Sea coast of the GDR and was subdivided into four urban districts and ten rural districts (Staatliche Zentralverwaltung für Statistik, 1981).

Today Markgrafenheide, as part of the city of Rostock, is located in Mecklenburg-Western Pomerania, one of the sixteen German federal states. Markgrafenheide is part of the district Rostocker-Heide, which also includes the villages Hohe Düne, Hinrichshagen, Wiethagen and Torfbrücke (Hansestadt Rostock, 2013).

3.2 Methodology

The description of the methodology follows the chronological order of the research. First, the development of the *Coastal Sustainability Tool* is described. Afterwards, the data collection for the indicators that were included in the tool is described.

3.2.1 Development and Description of the *Coastal Sustainability Tool*

In order to measure the sustainability of coastal municipalities a self-assessment tool referred to as the *Coastal Sustainability Tool* was developed within this project. The tool is based on the design of the *DeCyDe-for-Sustainability* tool, a spreadsheet-based scoring and preference methodology that was developed by *Isotech Ltd., Research and Consultancy, Cyprus* and used within the SUSTAIN project. For the purpose of an application of the QualityCoast indicators, the tool was modified and the QualityCoast indicators integrated. Before the introduction of the newly developed *Coastal Sustainability Tool* that was used for the purposes of this project, the SUSTAIN methodology and the QualityCoast indicators will be described in the following sections.

3.2.1.1 The SUSTAIN Methodology

The self-assessment methodology that originated from the SUSTAIN project is comprised of three steps, namely selection of suitable indicators, data collection and scoring of the indicators and a weighting exercise. The SUSTAIN indicators are divided into a set of 58 core indicators and additional 33 optional indicators. The core indicators are meant to be used by all participating communities or authorities. Whereas, the optional indicators can be chosen freely and adjusted to local conditions in order to take local specificities into account (Schernewski et al., submitted). The indicators are grouped 22 distinct issues, which are further grouped into the four pillars of sustainability, i.e. economics, environmental quality, social well-being and governance (SUSTAIN Partnership, 2012b). The governance pillar adds the institutional component and the indicators therein have

many similarities with the *progress indicators* of the WG-ID, whereby the focus is more on sustainability rather than specifically aimed at ICZM.

In the second step each indicator is scored on a range between 1 and 10 (with 10 indicating excellence of an indicator). Generally, six predefined answer options including their assigned score are given. For the pillar Governance a checklist approach is used, whereby the score 10 is given if a community fulfils the respective indicator and a score of 1 is given, if it does not fulfil it. The indicator score for each issue is simply calculated as the average of all indicators within the issue. In case no data is available for an indicator, the score 0 is given and will be considered in the average as such. A score for each pillar is calculated as the sum of all issue scores within a pillar. The final Score for Sustainability is calculated as the sum of the indicator scores for all issues, and can be used as a comparative value in consecutive indicator application in a community (Schernewski, submitted; SUSTAIN Partnership, 2012a).

The third step is a participative process in which the pillars and issues are weighted in moderated workshops. This part of the SUSTAIN methodology is intended to raise awareness of sustainability concerns and facilitate exchange among stakeholders and decision makers (Schönwald & Schernewski, submitted). For this, pillars (or issues respectively) are organized in a matrix and compared in pairs. The number of pillars or issues that are compared in this step will be determined in the previous steps in which the indicator set is selected. A score is then given to each pillar in accordance with its relative importance compared to the other (see Figure 3.5). The *Total* is calculated by adding up all scores in one column. Afterwards, each single score is divided by the total score of its column and shown in the mint green cells next to them. The sum of all single weights (mint green cell) in a row result in the weight coefficient (weight coef) for each pillar (or issue respectively), as shown in the rightmost column in Figure 3.5. Just as the total indicator score, the weights determined in a first application can be used as reference values for consecutive applications in a community (Schönwald & Schernewski, submitted).

26

GENERAL TABLE

Y \ X	Economics score		Environmental Quality score		Social Well Being score		Governance score		weight coef
Economics	1.00	0.13	1	0.30	1/5	0.04	1	0.10	0.14
Environmental Quality	1	0.13	1.00	0.30	3	0.58	3	0.30	0.33
Social Well Being	5	0.63	1	0.30	1.00	0.19	5	0.50	0.40
Governance	1	0.13	1/3	0.10	1	0.19	1.00	0.10	0.13
Total	8.00		3.33		5.20		10.00		1.00
Total check	1.00		1.00		1.00		1.00		

After the weighting score for each pillar has been decided (indicated in red print), the weight coefficient is calculated automatically

Legend for the Weighting System of the SUSTAIN Pillars

Pillar Y		COMPARED TO		Pillar X		IS
less important ←				→ more important		
much	more	slightly	equal	slightly	more	much
1/7	1/5	1/3	1	3	5	7

Figure 3.5 Sample input mask and legend for the SUSTAIN weighting methodology adapted from Isotech, Ltd. (SUSTAIN Partnership, 2012c)

In a final results table, the indicator scores that were calculated in the second step can be combined with the weight coefficients that resulted from the third step to obtain a *Final Indicator Score*. In order to calculate the *Final Indicator Score*, the weight coefficient for an issue is multiplied with the indicator score of the same issue and the weight coefficient of the pillar in which it is grouped.

3.2.1.2 The QualityCoast Indicator Set and Award

The QualityCoast indicator set covers the five categories Nature, Environment, Identity & Culture, Tourism & Business and Host Community & Safety. Each category is subdivided into three to seven criteria and supported by a wide range of indicators, which are intended to measure both policy performance and visible sustainability status in a destination. Indicators are further divided into a set of core and a set of optional indicators called Your Choice Indicators. The core indicators mostly consist of sustainability indicators such as identified by the WG-ID and the indicators of the Global Sustainable Tourism Council (GTSC). All core indicators are supposed to be taken into consideration when applying for the QualityCoast Award, except for up to 25 % of the GSTC indicators, if they are considered to be less relevant for a destination. Furthermore, a minimum of one optional

indicator for each criterion should be answered. The optional indicators are mostly adopted from the European Tourism Indicator System (ETIS) that was launched in 2013 by the European Commission and is currently in its testing phase (EUCC & ECNC, 2014; EUCC, 2012). Since QualityCoast criteria and indicators are subject to annual revision, the number of each varies from year to year. The latest version of the indicator set consists of 88 core and 128 optional indicators (EUCC & ECNC, 2014). In previous years a set of *Voluntary Indicators* was further included, but has been fully incorporated into the *Your Choice Indicators* recently.

In order to apply for the QualityCoast Award an applicant is supposed to provide information on each indicator, and make a self-assessment by scoring each indicator between 1 and 5. The score 1 indicates absence of any quality or relevant policy in case of policy indicators (or no information provided for the indicator). The score 5 indicates excellence of an indicator, or full policy implementation in case of policy indicators (EUCC & ECNC, 2014). Subsequently, the application is reviewed by the QualityCoast secretariat and a jury, which will determine a final score based on the indicators scores and weight factors, which differ between core and optional indicators (EUCC & ECNC, 2014; EUCC, 2012). The final score is doubled in order to obtain a value on a scale up to 10 (with 2 being the lowest). A minimum average score of 5.7 is necessary for a first-time applicant to be awarded as a QualityCoast destination, and is increased by 0.1 with every reapplication (EUCC & ECNC, 2014).

3.2.1.3 Description of the *Coastal Sustainability Tool*

The *Coastal Sustainability Tool* that was developed and used throughout this project incorporates the core indicators of the QualityCoast indicator set (a draft version for the 2013/2014 indicator set was used) into the *DeCyDe-for-Sustainability* spread-sheet. Furthermore, in order to add the institutional aspect of sustainability all indicators from the governance pillar of the SUSTAIN indicators were added. Thus, the tool has a total of 117 core indicators that are grouped into twenty-five criteria in a total of six categories. All core indicators are listed in Appendix I.

CRITERION 10. ENERGY & CLIMATE MITIGATION	Brief Description	Scoring Ranges						Indicator Score
10.3. Do you have a system to reduce reliance on fossil fuels? (GSTC/D5)	Please list measures that are taken and indicate on a scale from 1 to 5	No 1	Yes, a little 2 **[2]**	Yes, somewhat 3	Yes, mostly 4	Yes, fully 5		No Data — **1**
10.4. Do you encourage tourism-related enterprises to conserve energy and use renewable energy technologies? (GSTC/D5)	Please choose the suitable answer, indicate the corresponding score and clarify with examples	No 1 **[1]**		Yes, to conserve energy or use renewable energy technologies 3		Yes, to conserve energy and use renewable energy technologies 5		No Data — **1**
10.5. % Renewable energy consumption: National (BasiQ E12)	Please indicate the approximate %	0-4% 1	5-9% 2	10-14% 3 **[3]**	15-19% 4	>19% 5		No Data — **1**
10.6. Do you have a system to encourage tourism-related enterprises and services to measure, monitor, report, and mitigate their greenhouse gas emissions? (GSTC/D4)	Please choose the suitable answers (more than one option possible) clarify with examples	No 1	Yes, a system to measure 1 **[1]**	Yes, a system to monitor 1	Yes, a system to report 1	Yes, a system to mitigate 1	if you indicated a 'yes' option add +1 point 1 **[1]**	No Data — **1**
10.7. % of MWh of green energy production from solar, wind, wave or tidal energy, by generating facilities in the destination (BasiQ E13)	Please indicate the approximate %	0% of local energy production from green energy 1	1-25% of local energy production from green energy 2 **[2]**	26-50% of local energy production from green energy 3	51-75% of local energy production from green energy 4	76-100% of local energie production from green energy 5		No Data — **1**

Indicator Score: 2.25

Number of indicators considered in the score calculation: **4 out of 5**

Figure 3.6 Excerpt from the Coastal Sustainability Tool showing various types of answering options and their application

In order to keep the QualityCoast scores on a scale between 1 and 5, the scoring range from the SUSTAIN methodology, which ranged from 1 to 10, was adjusted down. Furthermore, predefined answering options were decided. Thereby, mainly five types of answering options were used as exemplified in the excerpt of the *Coastal Sustainability Tool* shown in Figure 3.6. A large number of indicators in the tool are scored based on a Likert-scale (see Indicator 10.3 in Figure 3.6). For some indicators, qualitative descriptions that are each linked to a score between 1 and 5 are given. In some cases the number of possible answers is reduced to three (see Indicator 10.4 in Figure 3.6). Where the QualityCoast scoring ranges were known the ranges were directly taken over. This was mostly the case for quantitative indicators, taken from the BasiQ pre-assessment and indicated as such in the *Coastal Sustainability Tool,* which ask for numbers or percentages (e.g. Indicator 10.5 in Figure 3.6). For some indicators, several suitable answers can be selected and the assigned scores for each answer are summed up (see Indicator 10.6 in Figure 3.6). Finally, three out of the 117 core indicators only ask for a brief description and are not considered in the calculation of the indicator scores.

When the indicator set is applied to a specific destination the suitable answer is selected and the respective score, which is shown in the grey cell beneath, is entered into the white cell. In cases where no data is available or an indicator is not applicable to a destination, this has to be indicated by entering a 1 into the white cell below the No Data cell. The respective indicator will then not be considered in the score calculations. The indicator score that is calculated for each criterion is the average score of all indicators answered within a criterion. If applicable, a short description and source of information has been added for each indicator by the author of this thesis.

FINAL SUSTAINABILITY INDICATOR (SELF-)ASSESSMENT				
CATEGORY	CRITERION	SCORE (max. 5)	POINTS (max. 10)	NUMBER OF INDICATORS CONSIDERED IN SCORE CALCULATION
NATURE	Nature & Conservation	0.00	0.00	5 out of 5
	Access, Information & Education	0.00	0.00	5 out of 5
	Green Policies	0.00	0.00	7 out of 7
	Open Landscapes	0.00	0.00	3 out of 3
	TOTAL	0.00	0.00	20 out of 20
ENVIRONMENT	Environmental Management	0.00	0.00	3 out of 4
	Blue Flags & Beaches	0.00	0.00	2 out of 2
	Water Management	0.00	0.00	8 out of 8
	Sustainable Mobility	0.00	0.00	2 out of 3
	Waste & Recycling	0.00	0.00	3 out of 3
	Energy & Climate Mitigation	0.00	0.00	7 out of 7
	Climate Change Adaptation	0.00	0.00	2 out of 2
	TOTAL	0.00	0.00	27 out of 29
IDENTITY & CULTURE	Cultural Heritage	0.00	0.00	8 out of 8
	Territory & Tradition	0.00	0.00	3 out of 3
	Local Identity	0.00	0.00	2 out of 2
	TOTAL	0.00	0.00	13 out of 13
TOURISM & BUSINESS	Destination Management	0.00	0.00	10 out of 10
	Business Involvement	0.00	0.00	7 out of 8
	Hospitality & Satisfaction	0.00	0.00	5 out of 5
	TOTAL	0.00	0.00	22 out of 23
HOST COMMUNITY & SAFETY	Freedom & Justice	0.00	0.00	4 out of 4
	Community & Participation	0.00	0.00	2 out of 2
	Health & Safety	0.00	0.00	2 out of 2
	TOTAL	0.00	0.00	8 out of 8
GOVERNANCE	Policies/Strategies for Sustainability	0.00	0.00	7 out of 7
	Monitoring Tools for Sustainability	0.00	0.00	6 out of 6
	Human Resources Capacity Building	0.00	0.00	4 out of 4
	Implementation of Good Management Practices	0.00	0.00	4 out of 4
	Stakeholder Involvement & Public Participation	0.00	0.00	3 out of 3
	TOTAL	0.00	0.00	24 out of 24
TOTAL		0.00	0.00	114 out of 117
Destination's Sustainability in %	0.00			

Figure 3.7 Overview of the Final Sustainability Indicator Assessment sheet

In the final assessment sheet (see Figure 3.7) all criteria scores are listed. Additionally, the criteria scores within a category are averaged to an overall category score. The average of all category scores results in a total sustainability score for a destination. In accordance

with the QualityCoast assessment methods and for ease of comparison, scores are multiplied by two to obtain points. Scores are assessed on a scale between 1 and 5, whereas points are shown on a scale between 2 and 10. Lastly, a destination's sustainability is calculated as its score's percentage of the maximum possible score. Furthermore, the final assessment sheet shows the number of indicators that were considered in the score calculations for each criterion, category and total score respectively. A summary of all changes and aspects adopted from the SUSTAIN and QualityCoast methodologies for the *Coastal Sustainability Tool* is shown in Table 3.1.

Table 3.1 Summary of the aspect taken from the SUSTAIN and QualityCoast methodology for the Coastal Sustainability Tool

SUSTAIN	QualityCoast	Additional Changes
The design of the *DeCyDe-for-Sustainability* spreadsheet was used	All categories, criteria and core indicators where used	Indicators are not weighted, but the SUSTAIN weighting method was adjusted to the QualityCoast criteria and categories
Governance indicators were added	The scoring range from 1 to 5 was adopted	Answers for each indicator including assigned scores where defined
Final assessment table was adopted from the *DeCyDe-for-Sustainability* tool	Rather than summing up criteria scores to a final category and total score, averages are used	In case no data is available for an indicator, the indicator will not be considered in the calculations

The newly developed *Coastal Sustainability Tool* was presented to and discussed with members of the Coastal and Marine Management group of the Leibniz-Institute for Baltic Sea Research (IOW) in August 2013 and criticism and suggestions were considered in the subsequent modifications of the tool. Furthermore, six groups each consisting of two or three students from Klaipėda University in Lithuania used the *Coastal Sustainability Tool* and applied it to two coastal communities. Their experiences led to additional modifications of the tool.

3.2.2 Data Research and Scoring

Within the scope of this study, the indicator set was applied to the coastal village Markgrafenheide. Three applications were conducted for the years 1980, 2000 and 2013 in order to analyse whether the changes that resulted from the coastal protection and realignment scheme are reflected in the indicator results. The year 2000 reflects the situation before and 2013 after the implementation of the coastal protection and realignment scheme. The year 1980 was chosen additionally, to reflect the state in which Markgrafenheide was a popular tourist destination in the GDR and to add another reference state for further comparison. For the applications all core indicators and at least one optional indicator per criterion were used, with the exception of the Governance criteria. No optional indicators were designated for the Governance issues (criteria) within the SUSTAIN indicator set. Therefore, within this study optional indicators were only applied for the twenty criteria that were taken from QualityCoast. Due to the study's focus on a climate change adaptation measure, optional indicators that reflected climate change adaptation were used preferably and as many optional indicators as possible were answered for the criterion Climate Change Adaptation. For the criteria in which climate change adaptation is not reflected the optional indicators were chosen according to their suitability for the destination and data availability. Furthermore, following the QualityCoast manual, more than one optional indicator was answered for the criterion Blue Flags & Beaches (criterion 6), as it is required for coastal destinations. Selected optional indicators were added to the indicator tool and the same methodology that was described above for the scoring of the core indicators was used for the optional indicators.

Following the indicator selection, data research was conducted mostly in the first half of September 2013 and between October and mid-November 2013. The methods for data collection were adapted from previous application of the QualityCoast indicators (c.f. O'Mahony et al., 2009) and the SUSTAIN indicators (Schernewski, submitted) and included internet and telephone research, interviews with local experts, on-site observation and analysis of public data and documents received from local authorities and the municipal archive of Rostock.

It was attempted to answer the indicators primarily through internet research. Hereby, official statistics, online documents and geo-web services such as GeoPortal.MV

(Landesamt für innere Verwaltung Mecklenburg-Vorpommern, 2014) or Geoport HRO (Hansestadt Rostock, 2014) were used to obtain the needed information. Analysed documents included general frameworks for Markgrafenheide, environmental reports for the city of Rostock, guidelines for city development and development plans, the tourism concept for the city of Rostock and the seaside resort Warnemünde, statistical yearbooks and minutes of meetings of the local advisory council of the district Rostocker-Heide. Furthermore, short telephone or email inquiries were used to answer the indicators in case the information was not readily accessible through internet research and to contact representatives of local offices and departments, to access data that was not readily available through the internet, but accessible in-house. Some indicators were also answered through on-site observations that were made during repeated visits to the study area.

As it proved to be difficult to obtain information for the year 1980 through internet and telephone research, documents from the municipal archive and literature from the special library for GDR history in Rostock were reviewed. Collections analysed in the municipal archive covered the time frame from the 1970s and 1980s and included reports on summer seasons, documents from the local campsite and pioneer camp, general frameworks for Markgrafenheide and documents concerning environmental problems in the area.

Furthermore, short semi-structured interviews with local experts and representatives of local authorities were conducted. They were selected based on their responsibilities or suggested by previously contacted persons or interviewees. All interviewees and their responsibilities are listed in Table 3.2. The intention of conducting interviews was to gain a general picture of the situation in the study area in the past and to find answers to the indicators that could not be answered using the previously mentioned methods. Hereby, interviewees were not asked to score the indicators themselves and the indicator questions were not directly asked. Instead, the author scored the indicators based on the information gained from the interviews. This was done to ensure better comparability of the selected scores between the three applications, despite using different sources of information.

Additionally, a short survey, based on the 'ETIS Sample Enterprise Survey for Sustainable Destinations' (Miller et al., 2013) was used to collect data from local tourism businesses (accommodations and restaurants) for the optional indicators. The survey was composed of

34

twenty open-ended questions (Appendix II), and was either filled out by business owners and sent by email or conducted as phone surveys.

Table 3.2 Overview of local experts interviewed during data collection

Interviewee	Position/Responsibilitiy
Jürgen Dudek	Local resident and chairman of the local advisory council of Markgrafenheide
Frank Niehusen	Local resident and operator of the webpage www.rostock-markgrafenheide.de
Birgit Pöhlmann	State Authority for Agriculture and Environment of Central Mecklenburg (StALU MM), Department Coast – Specialist contact person for coastal protection measures
Dr. Sonja Leipe	StALU MM, Specialist contact person for technical supervision of the Hütelmoor realignment scheme
Dr. Joachim Schmidt	Voluntary caretaker of the nature reserve Hütelmoor
Dr. Hinrich Lembcke	Office for City Development, City Planning and Economy of the Hanseatic City of Rostock – Specialist contact person for sustainability issues and local Agenda 21

After data collection, each indicator was scored based on the pre-defined answering options. If possible, a short description was given to clarify the chosen score or to list the source of information that was used to answer the indicator. If no information was available to give an answer to an indicator the No Data option was chosen.

3.3 Limitations

Due to its scope, the research is limited spatially and in time. The study is only conducted within a single destination and the application is limited to the years 1980, 2000 and 2013. Data research was only conducted in fall 2013. Therefore, only the application for 2013 describes a present state, whereas the applications for the years 1980 and 2000 are conducted in retrospect. Furthermore, the methodology is limited to the application and scoring of the indicators and analysis of their results. Even though the SUSTAIN weighting matrix was integrated into the *Coastal Sustainability Tool* using the QualityCoast categories and issues, a weighting exercise was not intended to be conducted in the study area for the purposes of this project.

4 Results

In this chapter the results of the three indicator applications are presented. For all comparisons, points instead of scores are used to allow for a comparison on a scale up to 10 points, with 2 points being the lowest possible score. For the purposes of comparison and in regard to the research questions changes in points between the three years are looked at, and are considered to be significant if they increase or decrease by at least 1.0 points. This was chosen to reflect a change from one level to the next based on the QualityCoast assessment. The presentation of the results is structured as follows. In the first section the results of the achieved points within the six categories, on the criteria level that is, are shown. In the second section, the achieved points between the six categories are compared, using core and optional indicators, as well as only selected indicators to focus on climate change adaptation. For further analysis, the indicator set is divided into policy and status indicators, similar to the differentiation between progress and sustainability indicators made by the WG-ID. Finally, the overall sustainability results for the destination for each of the three applications are looked at.

In light of the coastal protection and realignment scheme that builds the basis for this study, a particular focus is placed on the categories Nature and Environment. Following the QualityCoast manual, all core indicators were taken into consideration and scored. However, in case data were not available or an indicator not applicable, the No Data option was chosen. Furthermore, for each criterion at least one optional indicator was supposed to be chosen. However, this was not possible for each criterion, due to the small selection of optional indicators that were suitable. Therefore, in three of the twenty criteria that were adopted from the QualityCoast label (Energy & Climate Mitigation, Hospitality & Satisfaction, and Freedom & Justice), no optional indicators were included. Following the QualityCoast manual more than one optional indicator were selected for the criterion Blue Flags & Beaches. Several optional indicators were also chosen for the criterion Climate Change Adaptation to put an emphasis on the coastal protection and realignment scheme. An overview of all scores and points that resulted from the three applications including the number of indicators that were considered in the score calculations is shown in Figure 4.1.

Detailed calculations for the criteria including single scores for each indicator, and a short description and sources of information for the indicators are shown in the spreadsheets of the *Coastal Sustainability Tool* in Appendices V to VII.

CATEGORY	CRITERION	1980				2000				2013			
		Score	Points	Number of Indicators		Score	Points	Number of Indicators		Score	Points	Number of Indicators	
NATURE	Nature & Conservation	2.60	5.2	4/5	+1	2.92	5.8	5/5	+1	2.92	5.8	5/5	+1
	Access, Information & Education	2.60	5.2	4/5	+1	2.83	5.7	5/5	+1	2.83	5.7	5/5	+1
	Green Policies	2.43	4.9	6/7	+1	3.25	6.5	7/7	+1	3.31	6.6	7/7	+1
	Open Landscapes	3.75	7.5	3/3	+1	4.00	8.0	3/3	+1	3.75	7.5	3/3	+1
	TOTAL	**2.84**	**5.7**	**17/20**	**+4**	**3.25**	**6.5**	**20/20**	**+4**	**3.16**	**6.3**	**20/20**	**+4**
ENVIRONMENT	Environmental Management	3.38	6.8	3/4	+1	3.63	7.3	3/4	+1	3.88	7.8	3/4	+1
	Blue Flags & Beaches	3.25	6.5	2/2	+2	3.80	7.6	2/2	+3	3.80	7.6	2/2	+3
	Water Management	2.36	4.7	6/8	+1	3.50	7.0	7/8	+1	3.81	7.6	7/8	+1
	Sustainable Mobility	2.33	4.7	2/3	+1	2.33	4.7	2/3	+1	2.33	4.7	2/3	+1
	Waste & Recycling	4.50	9.0	1/3	+1	3.50	7.0	3/3	+1	4.00	8.0	3/3	+1
	Energy & Climate Mitigation	1.00	2.0	7/7	+0	1.86	3.7	7/7	+0	2.29	4.6	7/7	+0
	Climate Change Adaptation	2.40	4.8	2/2	+3	2.60	5.2	2/2	+3	3.17	6.3	2/2	+4
	TOTAL	**2.75**	**5.5**	**23/29**	**+9**	**3.03**	**6.1**	**26/29**	**+10**	**3.32**	**6.6**	**26/29**	**+11**
IDENTITY & CULTURE	Cultural Heritage	1.71	3.4	6/8	+1	1.88	3.8	7/8	+1	2.00	4.0	7/8	+1
	Territory & Tradition	2.50	5.0	1/3	+1	3.00	6.0	3/3	+1	3.00	6.0	3/3	+1
	Local Identity	3.00	6.0	2/2	+1	3.33	6.7	2/2	+1	3.33	6.7	2/2	+1
	TOTAL	**2.40**	**4.8**	**9/13**	**+3**	**2.74**	**5.5**	**12/13**	**+3**	**2.78**	**5.6**	**12/13**	**+3**
TOURISM & BUSINESS	Destination Management	1.00	2.0	7/10	+1	1.11	2.2	8/10	+1	1.64	3.3	10/10	+1
	Business Involvement	1.57	3.1	6/8	+1	1.86	3.7	6/8	+1	1.86	3.7	6/8	+1
	Hospitality & Satisfaction	1.50	3.0	4/5	+0	2.25	4.5	4/5	+0	2.20	4.4	5/5	+0
	TOTAL	**1.36**	**2.7**	**17/23**	**+2**	**1.74**	**3.5**	**18/23**	**+2**	**1.90**	**3.8**	**21/23**	**+2**
HOST COMMUNITY & SAFETY	Freedom & Justice	2.50	5.0	2/4	+0	2.75	5.5	4/4	+0	2.75	5.5	4/4	+0
	Community & Participation	1.33	2.7	2/2	+1	3.67	7.3	2/2	+1	3.67	7.3	2/2	+1
	Health & Safety	4.33	8.7	2/2	+1	3.78	7.6	2/2	+1	2.44	4.9	2/2	+1
	TOTAL	**2.72**	**5.4**	**6/8**	**+2**	**3.40**	**6.8**	**8/8**	**+2**	**2.95**	**5.9**	**8/8**	**+2**
GOVERNANCE	Policies/Strategies for Sustainability	1.33	2.7	6/7	+0	2.14	4.3	7/7	+0	3.29	6.6	7/7	+0
	Monitoring Tools for Sustainability	1.00	2.0	4/6	+0	1.20	2.4	5/6	+0	1.67	3.3	6/6	+0
	Human Resources Capacity Building	1.00	2.0	4/4	+0	2.25	4.5	4/4	+0	3.00	6.0	4/4	+0
	Implementation of Good Management Practices	1.00	2.0	4/4	+0	2.50	5.0	4/4	+0	3.50	7.0	4/4	+0
	Stakeholder Involvement & Public Participation	1.00	2.0	3/3	+0	2.67	5.3	3/3	+0	3.00	6.0	3/3	+0
	TOTAL	**1.07**	**2.1**	**21/24**	**+0**	**2.15**	**4.3**	**23/24**	**+0**	**2.89**	**5.8**	**24/24**	**+0**
	TOTAL	**2.19**	**4.4**	**93/117**	**+20**	**2.72**	**5.4**	**107/117**	**+21**	**2.83**	**5.7**	**111/117**	**+22**
	Overall Sustainability in %	**44%**				**54%**				**57%**			

Figure 4.1 Overview of results for all criteria, categories and overall sustainability including number of core and optional indicators considered in the score calculations

38

4.1 Comparison of Results of all Applications within each Category

For the presentation of achieved points for the destination simple bar diagrams were chosen. Graphical illustrations of indicator scores are considered important for the provision of easily communicable results, and are often visualised in polygon or web diagrams (Reed, Fraser, & Dougill, 2006). However, bar diagrams were chosen in accordance with the visualisation used for the QualityCoast Award and for ease of representation of change between the three applications. In the diagrams the score for each criterion is shown inside the bar of the respective application year. The three applications are shown in chronological order from left to right. After each category number and name, the number of core indicators that are included in the criterion are indicated in parentheses.

4.1.1 Nature

In the criteria Nature & Conservation and Access, Information & Education the points increased by 0.6 and 0.5 between the application years 1980 and 2000, while no changes are shown when comparing 2000 and 2013 (see Figure 4.2). For the third category (Green Policies) a significant increase from 4.9 to 6.6 between 1980 and 2000 is shown, though no changes are indicated between 2000 and 2013. All core indicators were answered for the years 2000 and 2013, whereas one of the core indicators could not be answered for the year 1980 for each of the three criteria (see Figure 4.1). In the fourth criterion (Open Landscapes) an improvement from 7.5 to 8.0 points between the years 1980 and 2000 and a decrease from 8.0 to 7.5 between 2000 and 2013 can be seen. In this criterion all three core indicators were answered for each year. Additionally, one optional indicator was answered in each of the four criteria for each year as shown in Figure 4.1.
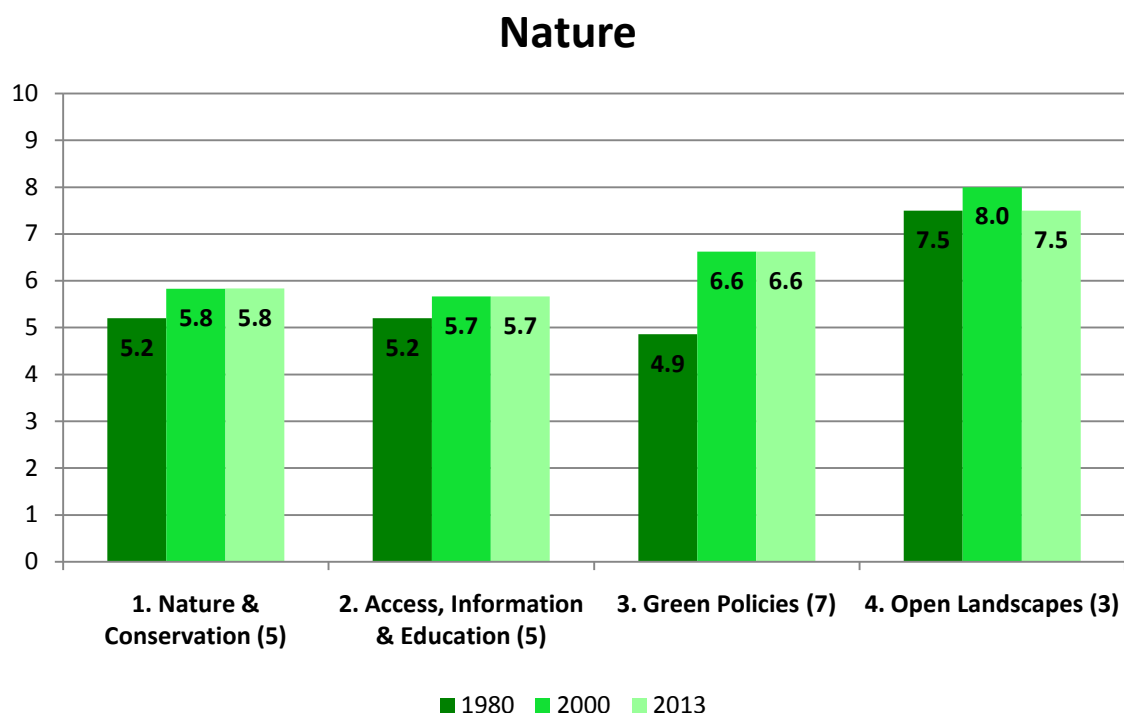
Nature

Figure 4.2 Comparison of achieved points of the criteria within the category Nature and number of core indicators in each criterion shown in parentheses

When only applying the core indicators for the nature criteria, the points are equal for the years 2000 and 2013 in all four criteria. The optional indicator that was included in the criterion Open Landscapes asked whether 'Human-made structures in the marine domain that are visible from the shore exist.' While no structures existed in 1980 and 2000, the research platform of the artificial reef Rosenort is now visible from the shore. Therefore, while the years 1980 and 2000 were scored with a 5 (no structures), the 2013 application received the score 4 (very few structures).

4.1.2 Environment

For the first criterion (Environmental Management) the same number of core and optional indicators were used for each application and a continuous improvement of 0.5 points can be seen between each application. Following the QualityCoast manual as explained in the methodology three optional indicators were included in the sixth criterion (Blue Flags & Beaches). As shown in Figure 4.3, the reached points in the criterion increased from 6.5 to 7.6 between 1980 and 2000, but remained constant in 2013.
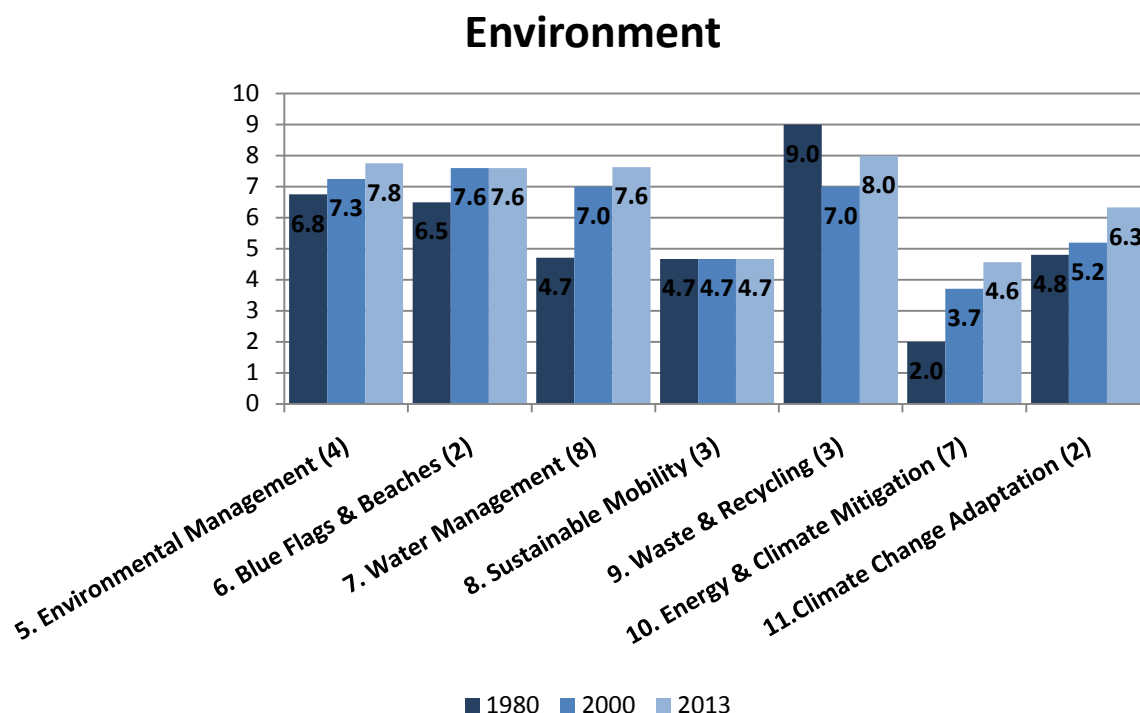
Environment

Figure 4.3 Comparison of achieved points of the criteria within the category Environment and number of core indicators in each criterion shown in parentheses

A continuous improvement in points can be observed for the criterion Water Management. The points increased significantly from 4.7 to 7.0 between 1980 and 2000, and from 7.0 to 7.6 between 2000 and 2013. One indicator less was considered for the year 1980 than for the other two years. For the eighth criterion (Sustainable Mobility) two out of three core indicators and one optional indicator were considered in the score calculations for each year and the reached points remain constant for all applications at a low level of 4.7 points. The criterion Waste & Recycling reached the highest number of points (9.0 points) in 1980 and then decreased to 7.0 points in 2000. In 2013 8.0 points were scored. While all three core indicators and one optional indicator were answered for the 2000 and 2013 application, only one of the core indicators and one optional indicator was included in the 1980s application. A continuous improvement in points can also be observed for the last two criteria. The same amount of indicators were used for each year for the tenth criterion Energy & Climate Mitigation and the points increased significantly between 1980 and 2000 from 2.0 to 3.7. In 2013 the 4.6 points were reached. However, in general the points in this criterion can be considered as low.

In light of the project's focus on climate change adaptation based on the coastal protection scheme that was conducted in the study area between 2004 and 2006, as many of the optional indicators as possible were chosen for the criterion Climate Change Adaptation. The two core indicators of the criterion were answered for all years. Additionally three optional indicators were included for the years 1980 and 2000, and four optional indicators for the year 2013. In the applications for 1980 and 2000 4.8 points and 5.2 points respectively were reached. Between 2000 and 2013 the points increased significantly by 1.1 points to 6.3 points.

4.1.3 Identity & Culture

As shown in Figure 4.4, slight improvements in points can be observed between 1980, 2000 and 2013 in the Cultural Heritage criterion. However, with 3.4, 3.8 and 4.0 respectively, the points reached in this criterion are rather low. For this criterion, six out of eight core indicators and one optional indicator was answered for 1980 and seven out of eight core and one optional indicator for 2000 and 2013 (see Figure 4.1). In the thirteenth criterion (Territory & Tradition) 5.0 points were scored for the year 1980 and 6.0 points for the years 2000 and 2013. Only one of the three core indicators in this criterion could be answered for the 1980 application, whereby all core indicators were considered for the other applications. Also for the criterion Local Identity the score improved from 6.0 points in 1980 to 6.7 points and stayed constant in 2013.
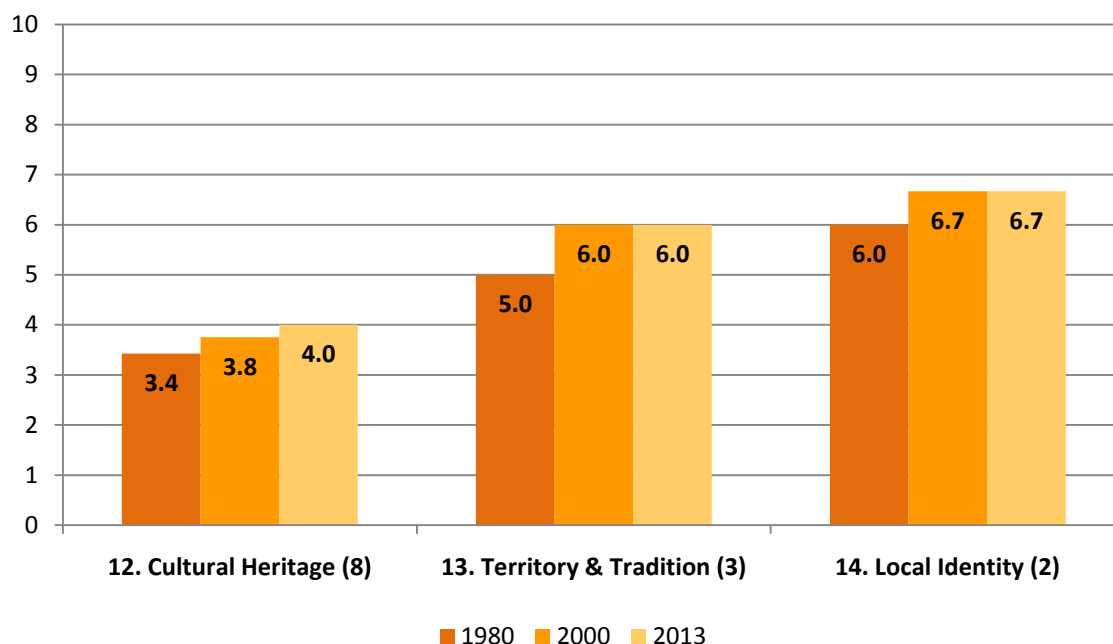
Identity & Culture

Figure 4.4 Comparison of achieved points of the criteria within the category Identity & Culture and number of core indicators in each criterion shown in parentheses

4.1.4 Tourism & Business

The scores achieved for the three criteria in the category Tourism & Business are all below five (see Figure 4.5) and are therefore considered as low. For the criterion Destination Management seven and eight out of ten core indicators and one optional indicator were considered in the calculations for 1980 and 2000 respectively. All core indicators and one optional indicator were used for 2013. The points increased slightly between 1980 and 2000 from 2.0 points to 2.2 points and significantly between 2000 and 2013 to 3.3 points. In the sixteenth criterion (Business Involvement) the points increased from 3.1 to 3.7 points between 1980 and 2000, but remained constant for 2013. The same number of indicators was used for the three years. For the criterion Hospitality & Satisfaction four out of five core indicators were answered for 1980 and 2000 and all core indicators for 2013. No optional indicator was included in this criterion. Between 1980 and 2000 the points increased significantly from 3.0 to 4.5 points. However, in 2013 reached points decreased by 0.1 points to a total of 4.4 points.
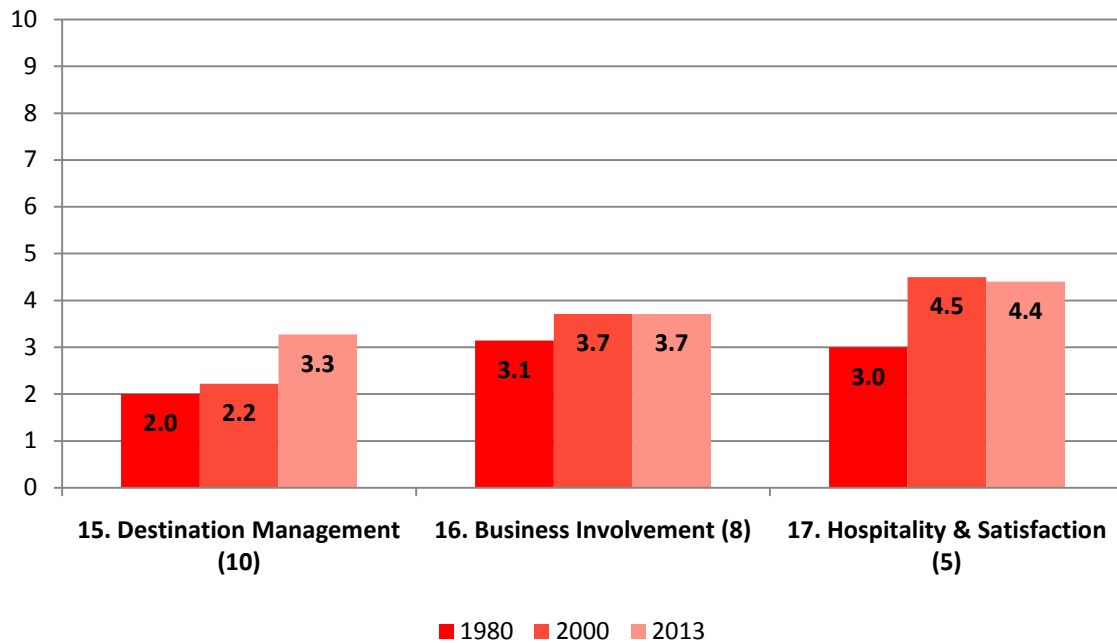
Tourism & Business

Figure 4.5 Comparison of achieved points of criteria within the category Tourism & Business and number of core indicators in each criterion shown in parentheses

4.1.5 Host Community & Safety

As presented in Figure 4.6, the first two criteria of the category Host Community & Safety show an increase in points between 1980 and 2000 whereas the points remained constants between 2000 and 2013. In the criterion Freedom & Justice only two of the four core indicators could be answered for 1980. Furthermore, no optional indicator was included in any of the three years. The points achieved between 1980 and 2000 increased from 5.0 to 5.5 points. For Community & Participation the same number of indicators (two core indicators and one optional indicator) was answered for all applications. The points between 1980 and 2000 increased significantly from 2.7 to 7.3 points. A declining trend in points can be seen in the criterion Health & Safety, despite using the same number of core and optional indicators for the three applications. For 1980, 8.7 points were reached, which decreased significantly to 7.6 points in 2000 and 2013.
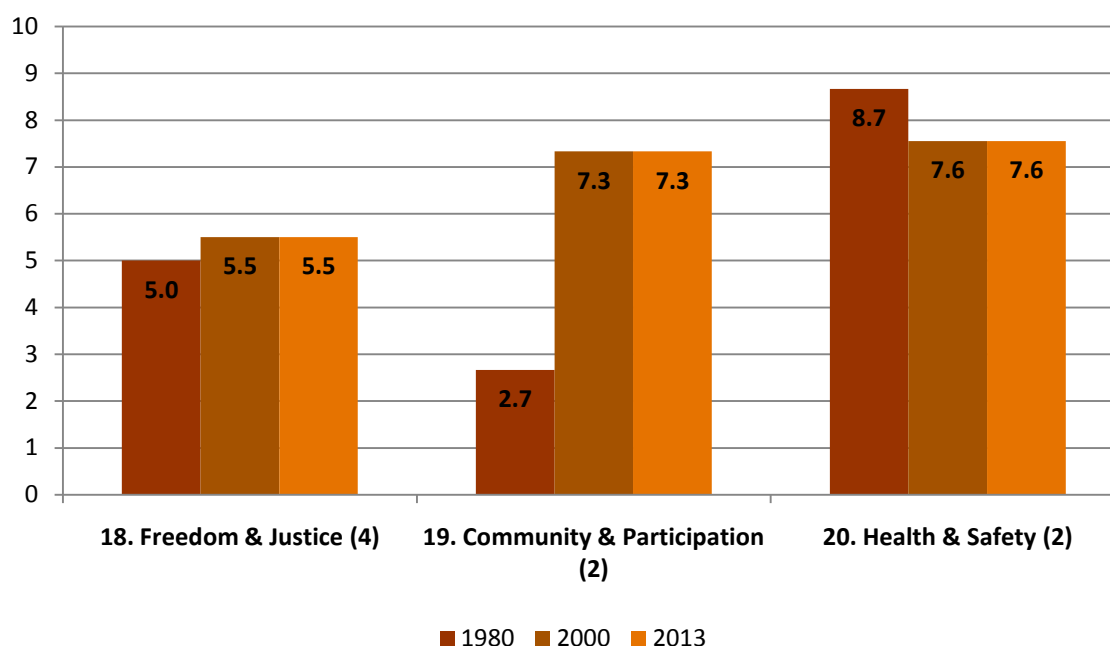
Host Community & Safety

Figure 4.6 Comparison of achieved points of the criteria in the category Host Community & Safety and number of core indicators in each criterion shown in parentheses

4.1.6 Governance

All criteria in the category Governance show a continuously increasing trend in points between 1980 and 2013 (see Figure 4.7). With the exception of Criterion 21 (Policies/Strategies for Sustainability) all other criteria scored 2.0 points for the year 1980, indicating the absence of all indicators in a criterion. The criterion Policies/Strategies for Sustainability reached 2.7 points in 1980 and increased to 4.3 points in 2000 and 6.6 in 2013. Only six out of seven indicators were considered for the year 1980. The reached points for criterion 22 (Monitoring Tools for Sustainability) are low for all years, but increased significantly between 2000 and 2013 from 2.4 to 3.3 points. Only four out of six core indicators were used for the year 1980 and five out of six for 2000. A significant increase between all years can also be observed for the criteria Human Resource Capacity Building and Implementation of Good Management Practices. The reached points for the twenty-fifth criterion (Stakeholder Involvement & Public Participation) increased significantly between 1980 and 2000 (from 2.0 points to 5.3 points). A further increase from 5.3 to 6.0 points is shown between 2000 and 2013.
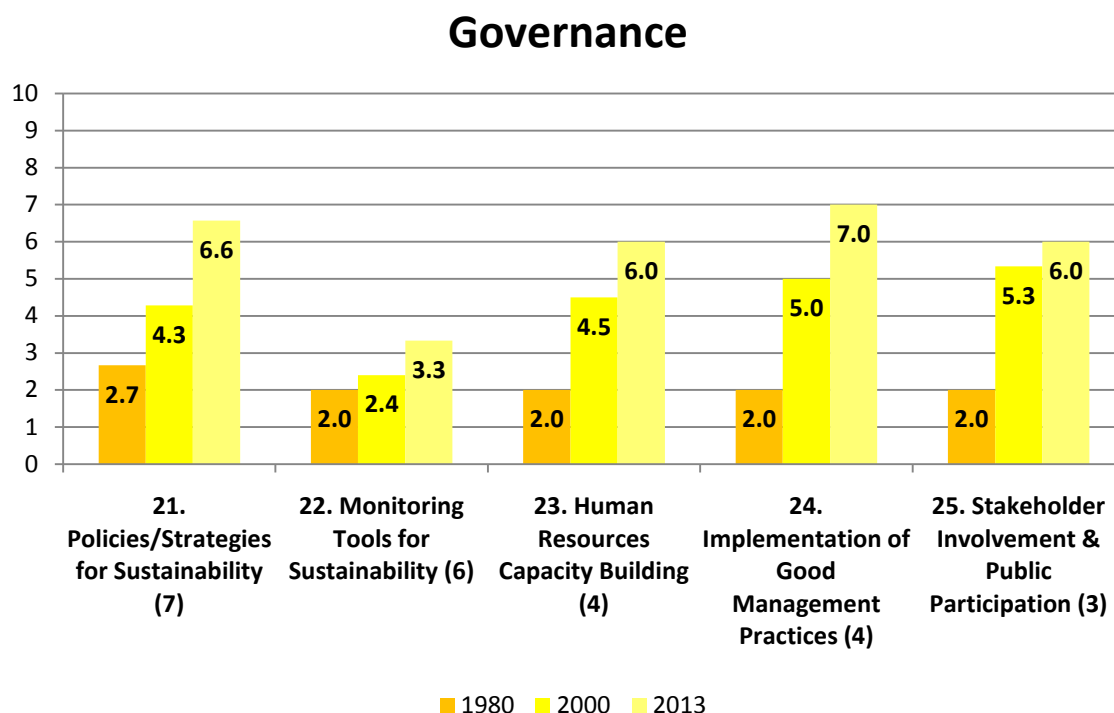
Governance

Figure 4.7 Comparison of achieved points of the criteria in the category Governance and number of core indicators in each criterion shown in parentheses

4.2 Comparison of Results of all Applications between Categories

In this section the total points reached within each of the six categories for the three applications are compared. Just as in the previous section, bar diagrams are used and for each category the results are shown in chronological order with the points for the 1980 application shown leftmost, and the 2013 application rightmost.

In all categories points increased between the applications for the years 1980 and 2000, (see Figure 4.8). As already shown in the previous section, the number of core indicators that were included in the calculations was generally lower for the year 1980. In the category Nature the points decreased from 6.5 to 6.4 between 2000 and 2013, despite using the same amount of indicators for both years. For the categories Environment, Identity and Culture, Tourism & Business slightly increasing trends by 0.5, 0.1 and 0.3 points respectively between 2000 and 2013 are shown. The points remained equal in the category

Host Community & Safety. In the last category (Governance) the points increased significantly from 4.3 to 5.8 points.

Generally, it can be seen, that the points in the categories are mostly within the range between 5 and 7. The categories Tourism & Business and Governance constitute exceptions. With points between 2.7 and 3.8 the scores in the category Tourism & Business are significantly lower compared to the other categories. Governance has a very low score for the 1980, but increased significantly for 2000 and 2013.

Comparison of Category Results
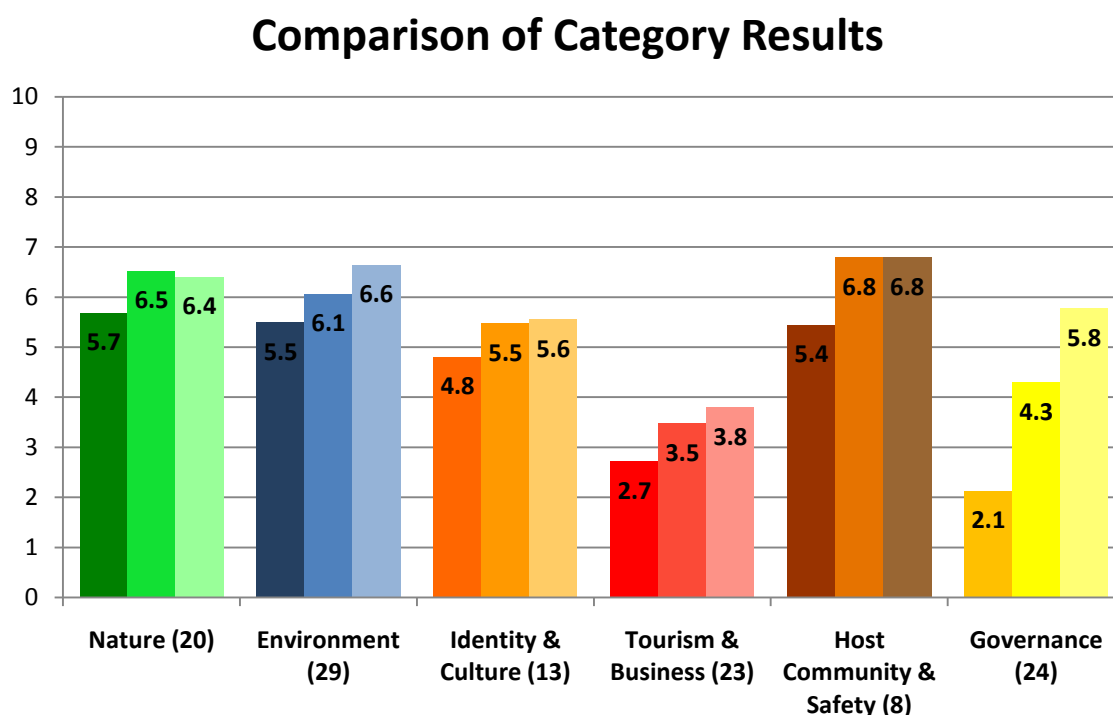
Figure 4.8 Comparison of reached points in each category for the three applications (shown in chronological order from left to right) and number of core indicators included in each category shown in parentheses

4.2.1 Focus on Climate Change Adaptation

Further analysis sought to determine whether progress towards climate change adaptation is better reflected in the results if only those indicators relevant to the coastal protection and realignment scheme are chosen from the set of optional indicators. The category results for this application are shown in Figure 4.9. It can be seen that by only applying the core indicator set, the differences between the applications for 2000 and 2013 equal out and the scores for the categories Nature, Identity & Culture and Host Community & Safety

are the same for 2000 and 2013 with 6.3, 5.7 and 6.6 scores respectively. The trend in the category Host Community & Safety remains the same, whereby each year reaches 0.1 points more than in the application in which optional indicators are included. When only including optional indicators in the Climate Change Adaptation criterion, the reached points for the category Environment are slightly lower in each of the three years. However, the change in scores remains mostly the same, with an increase of 0.7 for both years, instead of 0.6 between 1980 and 2000 and 0.5 between 2000 and 2013. Since no optional indicators are included in the last category (Governance), no changes occur.

Comparison of Category Results without Optional Indicators
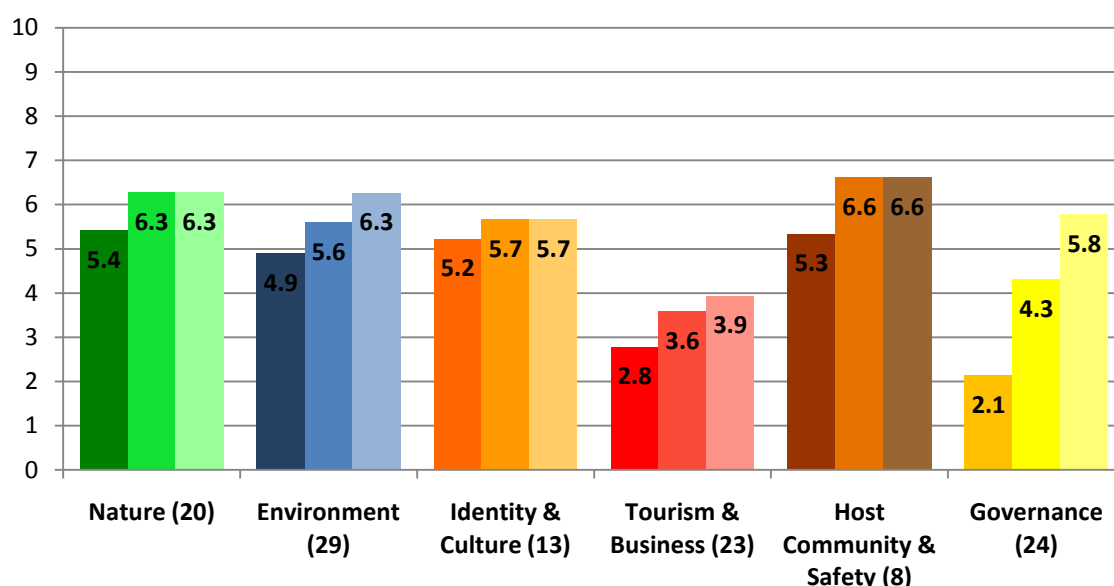
Figure 4.9 Category results for the three applications based on the core indicators and selected optional indicators from the criterion 12 (Climate Change Adaptation)

4.2.2 Comparison of Category Results for Policy and Sustainability Indicators

During the development and application of the *Coastal Sustainability Tool,* a large number of indicators that ask for the presence of relevant guidelines or policies were identified in all of the five criteria taken from the QualityCoast indicator set. Similar to the categorisation into *Progress Indicators* and *Sustainability Indicators* used within the WG-ID (Pickaver et al., 2004), the core indicators and selected optional indicators were

separated into policy and status indicators for further analysis and in hopes of being able to shed light on the third research question. Indicators that referred to policies, guidelines, or system are categorised as policy indicators. Those indicators that can be directly observed or measured are categorized as status indicators. Thereby, seventy-five policy indicators and thirty-nine status indicators were identified in the set of core indicators (see Appendix I). Figure 4.10 shows the results of the points reached in each category for the policy and status indicators.
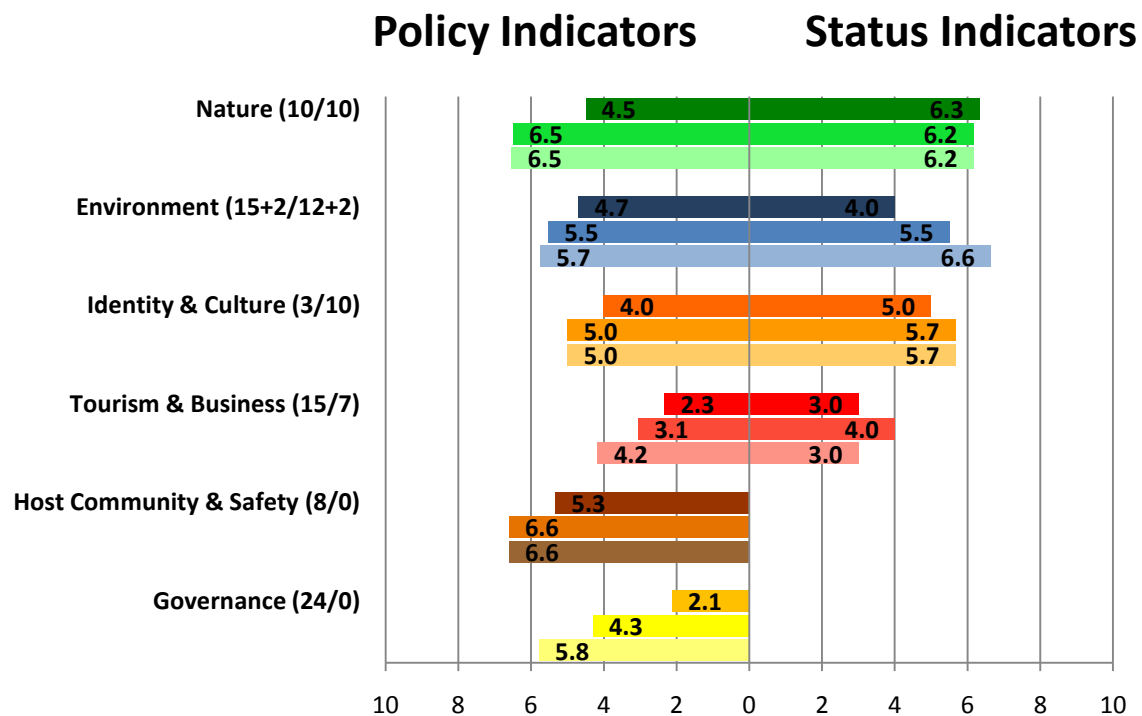
Figure 4.10 Comparison of category results for policy and status indicators including ratio of policy to status indicators in parentheses

The comparison between policy and status indicators shows different trends throughout the categories. In the Nature category, the same amount of policy indicators and status indicators are included. The points for the policy indicators significantly increase from 4.5 point to 6.5 between 1980 and 2000 but remain equal for 2013. The points for the status indicators are 0.1 points higher in 1980 than for the other two applications. However, only eight of ten indicators were answered for 1980, while all ten indicators were answered for 2000 and 2013. In the category Environment fifteen policy indicators and twelve status indicators were identified. Additionally, four optional indicators were included, of which two are policy and two are status indicators. The results for the category

Environment show an increase of 0.8 points between 1980 and 2000 and a small increase of 0.2 points between 2000 and 2013 for the policy indicators. However, while the changes for the overall results for the category Environment do not change significantly (see Figure 4.9), an increase from 4.0 points to 5.5 points between 1980 and 2000 and from 5.5 points to 6.6 points can be seen when only status indicators are considered. The ratio of policy to status indicator is three to ten indicators in the category Identity & Culture. The score for the policy indicators is lower than for the status indicators, but the trend is the same showing an increase in points only between 1980 and 2000. The results for the status indicators in this category are comparable to the overall results discussed in the previous section. In the category Tourism & Business a stronger increase in points between 2000 and 1980 is shown for the policy indicators in comparison with the overall results of the category. The highest number of points for the sustainability indicators is reached in 2000. However, the number of indicators considered in score calculations, differ between the three applications with five, six, and seven indicators used for 1980, 2000 and 2013 respectively.

4.3 Comparison of Overall Sustainability Results
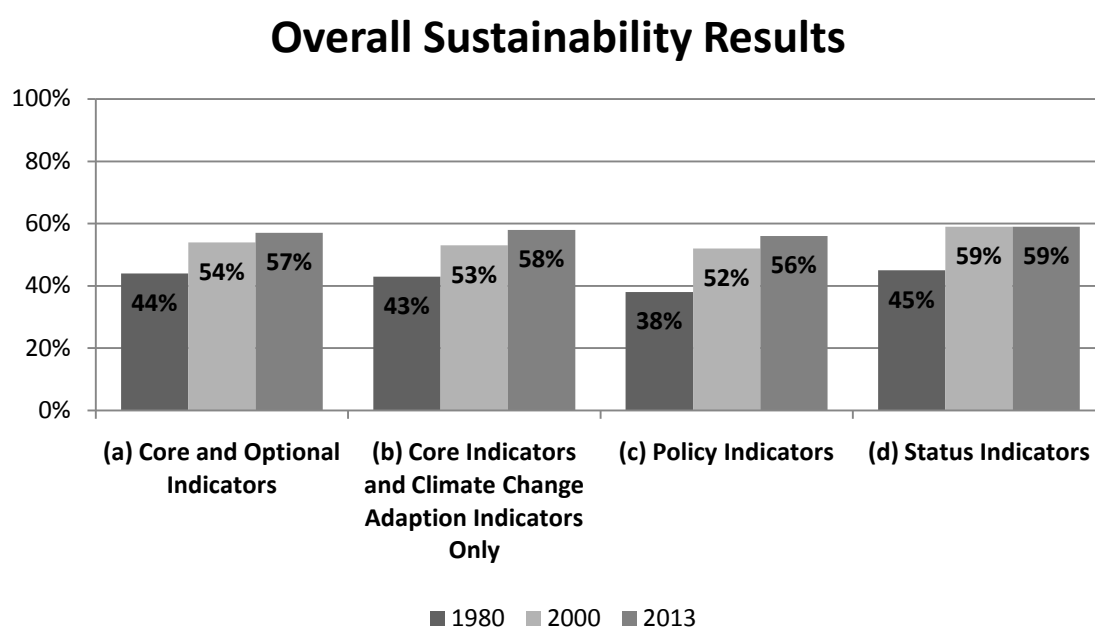
Overall Sustainability Results

Figure 4.11 Overall sustainability results for (a) all core and optional indicators, (b) core indicators and selected indicators from the criterion Climate Change Adaptation, (c) policy indicators only and (d) status indicators only

For each of the three application years, the overall sustainability in percent is shown in Figure 4.11. The results for the application in which optional indicators are selected for all criteria and in which they are only chosen for the Climate Change Adaptation criterion are shown, as well as the overall sustainability results for policy and status indicators only. Out of the 117 core indicators 93 were included in the calculations for the year 1980, 107 for the year 2000 and 111 for the year 2013. Furthermore, for the first set of results shown in Figure 4.11a, 20 optional indicators were used for 1980, 21 for 2000 and 22 for 2013. In general, the three applications for Markgrafenheide indicate a sustainability below 50 % in 1980 and a between 50 and 60 % in 2000 and 2013.

The overall sustainability results for the application using optional indicators for all criteria (see Figure 4.11a) and an application using selected indicators only (see Figure 4.11b) show only little variations. Both results, for 1980 and 2000, decrease by 1 % from 44 % to 43 % and 54 % to 53 % when only core and climate change adaptation indicators are answered. For the year 2013 the comparison shows an increase from 57 % to 58 %. Thus, the difference between the years 2000 and 2013 increases from 3 % to 5 %.

In contrast to the policy indicators, the status indicator results are higher in all of the three years. Results for 1980 are 38 % for policy and 45 % for status indicators and in 2000 52 % for policy and 59 % percent for status indicators. Thus, there is a 7 % difference between policy and status indicators for both years. With 3 % this difference is smaller for the year 2013 in which the overall sustainability is 56 % for policy and 59 % for status indicators. Surprisingly, the overall sustainability results for the status indicators are equal for 2000 and 2013.

4.4 Summary of Results

In the previous sections it is shown that changes in indicator results occur more often between the years 1980 and 2000 and changes for the overall sustainability can be considered significant. Whereas equal points or only slight variations are often observed between 2000 and 2013, in between which the coastal protection and realignment scheme was implemented. Regarding the three research questions the previous sections showed mixed results:

Between the years 2000 and 2013, the reached points for all Nature criteria are the same if no optional indicators are included. Consequently, the scored points for the category Nature are also the same for 2000 and 2013. Also the separation into policy and status indicators shows no variation in points for the two years. Thus, this indicates that the restoration of the Hütelmoor is not reflected in the category Nature.

In contrast, a significant improvement in reached points can be seen for the Climate Change Adaptation criterion of the category Environment and it can be assumed that the coastal protection and realignment scheme positively affects the results. Moving from the criteria level to category level, the changes in points become less relevant. However, the separation into policy and status indicators shows a significant improvement between 2000 and 2013 for the status indicators of the Environment category.

Despite a general increase in overall sustainability from 1980 to 2013, only small changes can be seen on the overall sustainability level between the years 2000 and 2013. For the status indicators the results equalize, indicating no change in 'visible sustainability'. In general, the achieved results for all applications were rather low considering a minimum score of 5.7 (corresponding to 57 % Overall Sustainability) necessary to gain QualityCoast certification.

5 Discussion

In this section the limitations of the research methodology will be addressed and results along the three research questions discussed. Furthermore, suggestions for improvements of the indicator set and methodology are provided and concluding evaluations of the research project made.

5.1 Limitations of the Methodology

Limitations of this research mainly emerged due to differences in data availability and data quality and were also caused by the chosen methods for score calculations and will be discussed below.

5.1.1 Data Availability and Quality

Data quality plays an important role, when indicators are used for the purpose of monitoring changes or progress towards a specific goal. In order to assure comparability of data, the same sources should be used for all applications (O'Mahony et al., 2009). However, this proved difficult during the data collection for this project. While information was often readily accessible or directly observable for the present state (2013 application), this was more difficult for the past states. Especially for the 1980 application, information was often lacking, or documents were not available because electronic versions of older documents do not exist and responsibilities changed after the German reunification. Statistical information from the same authority was usually only available for the time period after the German reunification. Furthermore, if statistical information was accessible for 1980, it often covered a different spatial scale. While information for 2000 and 2013 was available for the district Rostocker Heide, which is part of the city of Rostock, as described in Section 3.1.4, it was only accessible for the District of Rostock, which covered almost the entire Baltic Sea coast of the GDR, for the year 1980. Likewise, national percentages referred to the GDR in 1980, but to the Federal Republic of Germany

in 2000 and 2013. Moreover, many of the indicators required information that was not necessarily documented, but easy to assess for the present state using personal observation or short telephone inquiries. Personal observations were not possible for the past states, and are thus often based on personal communication that could not always be verified. Thus, some indicator scores for the year 1980 are based on personal communication and the general situation in the GDR and do not necessarily reflect local conditions. In addition, some indicators, especially those included in the optional indicators, were too specific to be answered in retrospect for the years 1980 and 2000 (e.g. Indicator 5.5. *List of noisy events in the previous year*) and had to be estimated based on general information or could not be considered for the specific year. Some of the indicators or predefined answering options were not applicable at all for 1980. In this case, the No Data option was chosen and led to a considerably lower number of indicators that were considered in the calculations for the year 1980.

Furthermore, needed information was often not available for the three particular years and spatial scale that was defined within the scope of this study. The latest available statistical information was mostly from the year 2011, or even older. Furthermore, some assessments are not made or published annually, and therefore the data does not always reflect the specific year, but rather a timeframe. Concerning spatial differences, the smallest unit for which statistical data was assessed was usually on the level of the district Rostocker Heide, or for the entire city of Rostock. Tourism related information was only available for the seaside resort Warnemünde, to which Markgrafenheide belongs. However, Markgrafenheide only constitutes a relatively small part, concerning number of tourists or accommodations of the seaside resort Warnemünde as a whole. Many of the accommodations in Markgrafenheide are privately owned houses in which rooms are rented out during the summer season and are thus not considered in the general assessments for the tourism sector. For the year 1980, the scale for which data was assessed was even larger. The spatial scale is of particular importance when assessing policy indicators. As shown in Section 4.2.2 almost two thirds of the core indicators in the *Coastal Sustainability Tool* are policy indicators. However, most policies, guidelines or systems are made on a higher level, such as the municipal or city, regional, or even national level. Despite that, they are applicable on the local level, but might not have been implemented into practice.

Other difficulties during data collection included lack of responses and long response times.

5.1.2 Lack of Benchmarks

Benchmarks, reference values, target levels or baselines have to be defined against which an indicator can be measured and scored in order to successfully measure trends (Reed et al., 2006). Within the *Coastal Sustainability Tool* concrete values were defined or adapted from the QualityCoast Award for some indicators. However, for a large number of indicators, Likert-scale type answering options were chosen. While the definition of benchmarks might be easy in some cases, it seems to be impossible in other cases, for instance for various qualitative indicators (cf. McLaughlin et al., 2002). Indicator 13.3 from the category Identity & Culture (*How has the cultural heritage of the destination developed since 1992?*) is used as an example to further elaborate on this. On the one hand, the perception of this indicator is likely to differ from person to person. While one person might only think of physical heritage such as artefacts or monuments, another will include intangible heritage such as traditions, language or folklore. Likewise, the perception of its development will be different. Therefore, most of the policy indicators that refer to the existence of guidelines, systems or policies have to be answered on a Likert-scale. However, the extent to which a policy is implemented or its quality will be perceived and scored differently. Therefore, the chosen score is often subjective or questionable and will not be the same if the application is repeated by another person. However, the repeated application by the same person, as it was done for the purposes of this thesis, allows for some comparability.

5.1.3 Limitations in Score Calculations

As described in the methodology (Section 3.2.1) the indicators for which the No Data option was chosen, are not considered in the calculation. The total indicator score for the respective criterion is calculated as the average of all remaining indicators of the criterion. The number of indicators in a category varies from two to ten indicators, and therefore, the effect of missing data on the score differs from one criterion to another. While selecting No Data for an indicator that is grouped in a criterion with a large number of indicators has little effect on the total score of the criterion, missing data in a criterion that consist of a small number of indicators, can highly affect the total score, both positively and

negatively. The same applies to those indicators that consist of sub-indicators, which are averaged. For example, criterion 21 Health & Safety consists of only two indicators and one of them is further divided into three sub-indicators. For the year 1980, only one of them could be answered and received the maximum score. Since No Data was selected for the other two sub-indicators, the total score remained 5 for the indicator as a whole. As opposed to this, for the years 2000 and 2013 all sub-indicators were answered. Despite all other scores being equal, the total points for the criterion was significantly higher for the 1980 application than for 2000 and 2013 as shown in Figure 4.6.

Finally, it should be mentioned that the indicators used in this project were not weighted, but all scored equally. This does not necessarily have to be a limitation, but it should be kept in mind that each indicator has therefore only a very small effect on the total sustainability score.

5.2 Analysis of Differences between Years and Categories

In general, indicators can be used for monitoring purposes when they are measured repeatedly over a certain time period (Diedrich et al., 2010). In order to see whether a community is moving towards or away from a specific goal, efforts that are made to reach this goal must be positively reflected in indicator results. Using the coastal protection and realignment schemes as an example for community efforts to improve sustainability and climate change adaptation, it is analysed whether these efforts led to improved indicator scores in the criteria, categories and overall sustainability of the destination. However, the visualisation of results shows that changes occurred mostly between 1980 and 2000, rather than between 2000 and 2013, when the coastal protection and realignment scheme was implemented. Significant changes for the overall sustainability and on the category and criterion level can be seen when comparing the 1980 and 2000 results. However, while some significant differences occurred in single criterion, they seem to equalize on the higher levels (category and overall sustainability) for the years 2000 and 2013. The reasons for this are likely to result from a number of aspects that shall be further analysed and discussed at this point.

56

5.2.1 Analysis of Differences in Results between 1980 and 2000/2013

First of all, as previously shown, there are several limitations concerning the application for the year 1980. Variations in data quality between 1980 and the other two applications as well as the smaller number of core indicators (93 as opposed to 107 and 111 respectively) considered in score calculations can be possible explanations for these differences. However, with the German reunification, major political, economic and social changes occurred that are reflected in the indicator scores. Since the German reunification the study area falls under German legislations and many new laws came into force in the 1990s. This is for instance shown in the significantly different policy scores in the category Nature between 1980 and 2000. All of the criteria included in this category, indicate significant changes (an increase of two points in each category) for the policy indicators, compared to no or very small changes for the status indicators (for details see Appendix IV). Major changes are also shown for all criteria of the Governance category that are largely owing to the increased awareness of sustainability issues and improvements made in local sustainability initiatives in the 1990s subsequent to the UNCED. It is further assumed that policy changes on a much higher level, such as the introduction of various EU Directives (e.g. EIA Directive, Water Framework Directive, Wastewater Directive, Habitats Directive) are reflected in the different results for 1980 compared to 2000 and 2013. Furthermore, the tourism industry and Markgrafenheide as a destination have changed since the 1990s. The district of Rostock (Baltic Sea Coast of the GDR) was the most popular holiday region of the GDR and attracted the largest number of tourists of all GDR districts (Göhrlich, 2012; Staatliche Zentralverwaltung für Statistik, 1981). Several company holiday homes were located in Markgrafenheide and access was restricted to employees. Also the allocation of holiday and camping certificates was mostly centrally regulated by the state and the demand significantly exceeded the possible supply (Göhrlich, 2012). Thus, promotion as a tourist destination and competition between different accommodations played an insignificant role in 1980, and indicators referring to tourist satisfaction, use of labels and promotion could be considered to be of minor importance during that time, and scored low. Likewise, the changes in the local tourism industry are also observable in the significant changes in points for Community & Participation (criterion 19).

5.2.2 Analysis of Differences in Results between 2000 and 2013

The aim of this project was to evaluate whether progress towards sustainability and climate change adaptation are reflected in the results of the *Coastal Sustainability Tool* using the concrete example of the coastal protection and realignment scheme that was carried out between 2004 and 2006 in the study area, with restoration of the nature reserve Hütelmoor starting in 2008 (Weisner & Schernewski, 2013). However, based on the results shown in the previous chapter, it can be concluded that the scheme is only reflected in the results to a limited extent.

Despite the comprehensive restoration of the nature area no changes occurred in any of the four Nature criteria (see Figure 4.2) and consequently also not in the scored points for the category Nature. The selection of *Your Choice Indicators* from the Nature category did not contain any indicators that were relevant for the reflection of the restoration efforts, which could have led to a stronger emphasis compared to other issues reflected in the category (e.g. tourism impacts on nature, tourism access to nature and provision of information). In contrast, significant changes are visible in the results for the criterion Climate Change Adaptation (see Figure 4.3), for which additional indicators were selected from the *Your Choice Indicators*. Thus, the indicators in this criterion included two core and four optional indicators. Differences in given scores were only made in one of the core and one of the optional indicators, which will be looked at in further detail:

The relevant core indicator (Indicator 11.2) asked for the *length of coastal protection structures as a percentage of the total length of the coastline* and differentiates between seawalls or hard coastal revetments and groins or other coastal defence structures. The highest score is given if no structures are in place and the least if the entire coastline is protected by seawalls or hard coastal revetments. Hence, the abandonment of the coastal protection schemes in front of the Hütelmoor led to an increased score for 2013. The coastal protection and realignment scheme for Markgrafenheide is considered to be successful in terms of both coastal and environmental protection (Weisner & Schernewski, 2013). However, generally, an unprotected coast is not necessarily the most sustainable option for a destination as it can negatively affect social or economic aspects of sustainability. Thus, it can be seen that indicators and defined benchmarks are to some degree value-laden or subjective (cf. Rinne et al., 2013). While the example of the chosen

case of Markgrafenheide was positively reflected in this indicator, a different choice of coastal protection measure would have caused a decrease in the score for the indicator, even though it might have been the most sustainable option, including environmental, social and economic aspects. The optional indicator that had different results for both years referred to *percentage of tourism accommodations and attraction infrastructure located in "vulnerable zones"* (Indicator 11.5) and decreased with the implementation of the ring-dyke around the settlement area.

This shows that differences in only a few indicators can significantly change the points received within a criterion. However, when scores are further aggregated to the level of categories or overall sustainability, the differences in their scores dwindle in importance, but also the information that is intended to be communicated loses detail. Therefore, the decision if, as well as the way in which, indicators are grouped and aggregated also determines whether a certain change is reflected in the results or not. This is particularly important, as sustainability or ICZM issues and indicators are often interrelated (cf. Diedrich et al., 2010; Valentin & Spangenberg, 2000), and could thematically be grouped into more than one category. For example, Indicator 11.5 described above, is currently grouped into the criterion Climate Change Adaptation, but could as well fall into the criterion Health & Safety. Likewise, many of the policy indicators that are found in the first five categories could as well be considered Governance indicators. Indicators are typically grouped and aggregated in order to simplify the information that is intended to be communicated (Reed et al., 2006). While the choice of grouping indicators does not affect the overall score, it does make a difference on the lower levels. However, when indicators are aggregated into an overall score only, a lot of detailed information is lost, and the score has little meaning without further explanation. Furthermore, when scores are aggregated highly scored indicators are able to compensate for indicators with low scores. This is supported by the example of the comparison of status indicators. On the category level shown in Figure 4.10 a significant increase in points for the category Environment and significant decrease in points for the category Tourism & Business are shown between the years 2000 and 2013. These differences equalize as can be seen in Figure 4.11d, in which both years have the same overall sustainability scores. Thus, improvements in promotion efforts and community involvement in tourism could potentially compensate for nature degradation in the overall sustainability scores. Consequently, it is debatable whether

scores should be aggregated at all or if disaggregated information and indicator lists should be used (Sébastien & Bauler, 2013; Reed et al., 2006). In contrast, no aggregation is likely to cause information to be incomprehensible and difficult to grasp as one gets lost in the details. Therefore, when using indicators for the purposes of communicating information, grouping and aggregating them is useful. However, it has to be kept in mind, that this has an effect on the outcome of an application.

Another aspect which might be responsible for the similarities in points for the years 2000 and 2013 is the large number of policy indicators. With the exceptions of the categories Tourism & Business and Governance the points for the policy scores are equal or very similar in the remaining categories. Since guidelines, plans or policies are usually implemented over a longer time period and do not change frequently, it can be assumed that the timeframe of 13 years is too short to reflect changes within the policy indicators. As noted in Section 5.1.1, data is often not readily available for a specific year, and therefore time periods rather than points in time are reflected in the indicators. This reduces the differences between both years even more. Variations in the two mentioned categories are due to the implementation of a tourism conception for the city of Rostock (cf. Hansestadt Rostock - Tourismuszentrale Rostock und Warnemünde, 2012) and the progress made within the Agenda 21 council of the city of Rostock. Both affected indicator scores in the two groups positively. However, the tourism conception and also the Agenda 21 council are implemented or act for the whole city and not specifically the local level of Markgrafenheide. Therefore, they have an effect on the points in the category despite not being implemented locally.

5.3 Community Influence on Indicator Results

According to Hanson (2003) indicators can for instance be used to evaluate how a management intervention will affect the future state of a region, such as its progress in sustainable development. Hence, specific efforts conducted to improve the sustainability have to be positively reflected in the scores. For this purpose, indicators have to be sensitive enough to show such changes. Using the coastal protection and realignment schemes as an example of a coastal community's effort to improve its sustainability and progress towards climate change adaptation, it was shown in the previous section that the scheme was not well reflected in the overall sustainability, and was only shown on the

lower levels. Especially when looking at the status indicators, in which the scheme should be reflected, no changes in points occurred. Despite being considered to positively affect the environmental, social and economic components of sustainability the coastal protection and realignment scheme is not reflected in the results of the higher levels. The applications showed that the scheme has a positive effect on only a small number of indicators in the *Coastal Sustainability Tool*. Only two of the 117 core indicators and additionally four optional indicators could be related to the coastal protection scheme and no indicator could be directly related to the restoration of the nature reserve. Therefore, this small fraction of the total number of indicators was not sufficient to indicate progress towards a more sustainable state.

During the application of the QualityCoast indicator set it became obvious that many of the indicators can be considered policy indicators. Also, a larger number of indicators that inquire the provision and access of information in a destination were found in all categories. Furthermore, when analysing the indicators further, a focus on climate change mitigation rather than adaptation could be observed for the majority of the indicators in the category Environment. Finally, it has to be noted that the QualityCoast indicators are very diverse as shown by the numerous criteria and diversity of indicators within the criteria. It also has to be kept in mind that they are tailored for tourism destinations and consequently have a strong focus on tourism throughout all categories. Since all indicators were weighted equally within the scope of this project, it is likely that no single effort towards sustainability or climate change adaptation will be able to improve the overall score. In contrast, making general efforts in a destination towards more transparency and provision of information, or improvements in monitoring schemes or provisions of guidelines and policies are more likely to influence the overall sustainability. However, despite recognizing that dissemination of information concerning coastal sustainability issues is important, it does not necessarily lead to improvements in the actual state. Furthermore, the application for Markgrafenheide showed that a large number of the indicators were outside the sphere of influence of the local community (e.g. many of the policy indicators) or not relevant for the study area (e.g. indicators for cultural heritage or local identity).

5.4 Practical Relevance of Indicator Results

It is not only important that communities are able to increase their scores through appropriate efforts. On the contrary, changes that are shown in the sustainability score must as well be visible or observable. In respect of the third research question, this section will focus on the changes that are shown between the three applications, and evaluate how they are reflected in the actual local conditions. For this, changes in status indicator results are looked at. As described above, changes between 2000 and 2013 are not reflected in the overall sustainability score of the status indicators due to the aggregation of scores reflecting negative and positive trends. Hence, the status indicators are looked at on the category level (see Figure 4.10), whereby major changes between 2000 and 2013 are shown for the category Environment. A more detailed analysis shows that significant changes occurred within the status indicators for the criteria Water Management, Waste & Recycling, Energy & Climate Mitigation, and Climate Change Adaptation (see Appendix IV). However, in the first three of these criteria, indicators referring to national averages for instance for waste water treatment (Indicator 7.2.), waste separation (Indicator 9.1.) and renewable energy consumption (Indicator 10.5) are included. As categories are broken into smaller units (criteria, status indicators in a criterion or even single indicators) the importance of each indicator increases and so does their influence on the score. This also seems to be the case in the Environment criteria named above. Thus, the changes shown in the results do not only reflect local conditions, but are further influenced by changes on the national level. While taking national averages into consideration might be useful for international comparison, such as the QualityCoast Award, it should not be included in an indicator set tailored for local communities. This is because the inclusion of indicators at the national level can weaken the significance of the results for communities, as changes that are reflected in the results are not necessarily visible by local residents or visitors. For instance, the score for the status indicators in the criterion Waste & Recycling is based on two indicators only, both referring to the percentage of separately collected waste. The first one asks for the national average, and the second for the local level. The trend on the local level did not lead to a change in the indicator score, while the score for the national level increased from 3 to 5, thereby increasing the points for the criterion significantly between 2000 and 2013, even though no changes or very little occurred locally.

Nevertheless, some changes that are shown in the results can also be observed locally. For example the certification of the beach adjacent to the settlement area of Markgrafenheide with the Blue Flag is reflected in the different points received between 1980 and 2000 for the status indicators in the criterion Blue Flags & Beaches. Furthermore, the changes in coastal protection scheme that are reflected in the Climate Change Adaptation criterion are clearly visible.

Thus, it can be concluded, that not all changes that are reflected in the results for the status indicators are also necessarily perceptible locally by residents or visitors. This also leads back to the problem of spatial relevance and coverage of indicators. As described in the previous section, some indicators cannot be influenced by local communities, as they address changes that occur on higher levels. Likewise, some changes that are shown in the results are not perceptible locally, as they mostly occur on a higher level. Therefore, the spatial coverage of an indicator influences whether a change is observable by the local community and its visitors and needs to be considered during the development of indicators for the local level.

5.5 Improvements of Indicator Set and Methodology

Throughout the previous sections a range of problems concerning the indicator set as well as the used methodology have been identified. These shall be targeted for the modification of the *Coastal Sustainability Tool*. Changes necessary to improve the reflection of climate change adaptation efforts in the indicator set shall be suggested at this point, and include additional indicators as well as methodological changes.

5.5.1 Suggestions for Additional Indicators

One of the reasons why the coastal protection and realignment measure was reflected in the indicator applications only to a very limited extent was the small number of indicators in the QualityCoast indicator set that addressed issues such as flooding, erosion, coastal protection and nature restoration. In general, it could be seen that the indicators in the set address mitigation rather than adaptation efforts. But, coastal communities are especially prone to the effects of climate change such as sea level rise and an increase in extreme weather frequency and intensity (Daschkeit & Sterr, 2003). In order to better reflect climate change adaptation efforts, additional indicators would have to be added to the

existing indicator set. However, the need for climate change adaptation and the specific measures that need to be taken result from the community's climate change vulnerability and are therefore location-dependent. Furthermore, the predicted effects of climate change contain many uncertainties. Hence, it is difficult to define general indicators for successful climate change adaptation on a local level that are applicable internationally (Torresan et al., 2008; Löser, 2007). However, various studies have been conducted to define indicators to assess the state of the coast and to measure coastal vulnerability. Parameters or indicators considered in vulnerability assessments typically include physical and morphological parameters such as beach and dune width, distribution of wetlands and vegetation, as well as density of coastal population and number of coastal inhabitants (Palmer, et al., 2011; Torresan et al., 2008). Other socio-economic aspects that can be considered in vulnerability assessments are cultural heritage and infrastructure at risk or land use types (McLaughlin, McKenna, & Cooper, 2002). An inclusion of such indicators would not directly help to measure climate change adaptation, but rather to identify areas of vulnerability. Repeated applications could identify trends showing whether a coastal community becomes more or less vulnerable to the impacts of climate change, and thereby advance adaptation efforts.

Potential indicators that could be included to better reflect the specific coastal protection and realignment scheme used in this project could encompass the following aspects:

- Annual and long-term costs for coastal protection measures
- Rate of coastal retreat
- Percentage or extent of dynamic coastline
- Extent of potential flooding areas
- Extent of natural areas restored
- Abundance of flora and fauna typical for the restored habitat

Even though climate change adaptation is most often associated with impacts due to sea level rise and increasing storm frequencies and intensity, it should not be limited to the risks of flooding and coastal erosion only. Additionally, increasing water and air temperatures and changes in precipitation regimes are likely to have an effect on coastal residents and the tourism industry (Schmidt-Thomé, Klein, Nockert, Donges, & Haller, 2013; Daschkeit & Sterr, 2003). It is therefore important to not only limit adaptation to

flooding risks, but also consider other effects that will concern coastal communities and the tourism industry. The present indicator set should therefore be extended to encompass adaptation to aspects such as longer tourism seasons, heat stresses, changes in water quality, and water shortages during summer and increased rainfall during winter.

5.5.2 Suggestions for Methodological Changes

Only adding more indicators to the existing *Coastal Sustainability Tool* will not help to improve its effectiveness for coastal management on a local level. In contrast, each indicator will have diminishing relevance. Thus, in addition, methodological changes are necessary to overcome the challenges that have been identified throughout this project. These changes include the selection of indicators of higher importance or definition of suitable weights as well as the identification of benchmarks or reference values.

5.5.2.1 Weighting of Indicators

As Reed et al. (2006) suggest, the indicators in a set are rarely of equal importance. Hence they can be differentiated either by dividing them into core and optional indicators or through the selection of weights. Even though the indicators taken from the QualityCoast indicator set included both core and optional indicators, both were equally weighted in the *Coastal Sustainability Tool*. A large number of indicators in the indicator set could be considered irrelevant for a small coastal community such as Markgrafenheide. Most of the indicators in criterion 12 Cultural Heritage received the minimum score, due to the absence of museums, heritage sites, monumental buildings or artists. For instance, an indicator such as 12.7 (Cultural heritage with UNESCO World Heritage status) will be irrelevant for the majority of destinations and should thus be included in the set of optional indicators. Furthermore, indicators referring to local identity and impacts on the local culture can be considered of minor importance in a destination like Markgrafenheide, in which domestic tourists make up the vast majority of visitors. In regard to the diversity of coastal destinations and variations in the tourism types developing therein, a much smaller set of core indicators and should be accompanied by a large selection of optional indicators. This could allow for more flexibility and improve applicability of the indicator set for a greater variety of destinations focusing on either beach tourism, nature tourism, cultural tourism or a combination thereof.

		Nature		Environment		Identity & Culture		Tourism & Business		Host Community & Safety		Governance		Weight Coef
		Score		Score		Score		Score		Score		Score		
Nature		1	0.35	1	0.27	5	0.33	3	0.52	5	0.38	7	0.23	0.35
Environment		1	0.35	1	0.27	5	0.33	1	0.17	3	0.23	7	0.23	0.26
Identity & Culture		1/5	0.07	1/5	0.05	1	0.07	1/3	0.06	1	0.08	5	0.17	0.08
Tourism & Business		1/3	0.12	1	0.27	3	0.20	1	0.17	3	0.23	7	0.23	0.20
Host Community & Safety		1/5	0.07	1/3	0.09	1	0.07	1/3	0.06	1	0.08	3	0.10	0.08
Governance		1/7	0.05	1/7	0.04	1/5	0.01	1/7	0.02	1/3	0.03	1	0.03	0.03
Total		2.88		3.68		15.20		5.81		13.33		30.00		1.00
Total check		1.00		1.00		1.00		1.00		1.00		1.00		

Legend for the Weighting System of the Categories

	Category Y		COMPARED TO		Category X		IS
	less important	←			→	more important	
much	more	slightly	equal	slightly	more	much	
1/7	1/5	1/3	1	3	5	7	

Figure 5.1 Weighting matrix and legend for the QualityCoast categories using the SUSTAIN methodology with random example of weight calculation (cf. Figure 3.5)

Alternatively or supplementary, weights can be used to differentiate between indicators of dissimilar importance, and could be given to single indicators or on the criterion or category level. They could be either predefined or selected locally with stakeholder participation. While predefined weights are useful for wide comparison, they lack local specificity. A participatory approach such as provided in the SUSTAIN methodology and described in Section 3.2.1 would allow for greater flexibility for local communities to emphasize indicators that are of local relevance by addressing local problems. To exemplify, Figure 5.1 shows the weighting matrix for the QualityCoast categories, including potentially selected weights for a tourism destination that wants to emphasize efforts towards natural and environmental improvements. The results from the first application of such a weighting method, serves only as a reference value for later applications (Schönwald & Schernewski, submitted), and could be used to evaluate how resource allocations and management decisions would affect sustainability scores. Furthermore, participatory approaches for the selection of indicators of different importance and definition of weights are considered to facilitate communication between stakeholders (Fontalvo-Herazo et al., 2007).

Another potential problem identified during this project was the aggregation of indicators into criteria and categories. Due to the inter-linkage of sustainability or ICZM issues,

indicators cannot always be grouped unambiguously into a single category or criterion (Diedrich et al., 2010; Valentin & Spangenberg, 2000). Rather than already grouping indicators, another option could be to only provide the overall categories, as well as the set of indicators and let communities identify their own problems and areas of improvement and let them group chosen indicators accordingly. Thus, a community could for instance choose to improve information dissemination or the implementation guidelines or policies and group the relevant indicators accordingly, to ensure that appropriate efforts will be reflected and will not get lost as a result of being scattered within different categories.

Yet, a greater selection of optional indicators and participatory approaches for defining groups and choosing suitable weights, allow for more flexibility and better reflection of local conditions, they have the disadvantage of reducing comparability with other coastal communities (cf. Moreno Pires et al., 2014; Fraser et al., 2006; Reed et al., 2006). Furthermore, they are more time and resource consuming, than using predefined sets and weights (Fraser et al., 2006), thus diminishing the original intention of developing a standardized and user-friendly self-assessment method for coastal communities.

5.5.2.2 Benchmarks/Reference Values for Scoring Indicators

A major constraint identified during the application of the QualityCoast indicators was the lack of clearly defined benchmarks or reference values against which the indicators could be measured. For some indicators, benchmarks were already available from the QualityCoast set, and for others they could be adapted easily. However, many indicators in the QualityCoast set are of qualitative nature, for which it is difficult to identify intervals or numerical values (McLaughlin et al., 2002), and even more so if they are intended to be applicable for a variety of destinations. Nevertheless, specific answering options were defined for some indicators as explained in the methodology chapter and exemplified in the Figure 3.6. During the application process it was realized that indicators with predefined answers were clearer while those indicators that were scored on a Likert-scale left room for interpretation, which reduces comparability between destinations, but is also likely to result in different scores for the same destination if the application is conducted by different people due to variations in personal perceptions. On the other hand, the predefined answers sometimes resulted in a low score, because no suitable answer for the destination was given. While Likert-scale type answers allow for more flexibility this is not

the case with predefined and fixed answers. However, without clearly defined answering options it will be difficult to use the QualityCoast indicators to measure progress. Setting benchmarks could be done within the tool itself and pre-defined standardized benchmarks will be provided for all destinations. Another way would be to choose benchmarks locally through the identification of individual benchmarks that are for instance connected to community's development visions and goals. Repeated applications within a community could then be used to assess whether it is moving towards these goals, by measuring change between two or more applications. Again, the choice of how to define benchmarks leads to a trade-off between comparability, flexibility, subjectivity and resource-intensity.

Another problem related to setting benchmarks is the use of the Global Sustainable Tourism Council's criteria for the QualityCoast Award. The GSTC criteria are used as indicators in the QualityCoast indicator set. However, they are rather vague and general. Thus, their interpretation and the definition of related benchmarks proved to be difficult. Rather than using the 'criteria' as QualityCoast indicators, the potential indicators that are suggested by the GSTC to support each GSTC criterion, should be used, as they are often easier to measure or could at least serve as checklists to identify to what extent each GSTC criterion is fulfilled in a coastal community.

5.6 Concluding Evaluation

The application of the QualityCoast indicators using the *Coastal Sustainability Tool* to measures sustainability and climate change adaptation on the basis of the concrete example of Markgrafenheide proved to be difficult for various reasons, including availability and quality of data, lack of suitable indicators to reflect climate change adaptation efforts, and different methodological problems. In the specific example of the seaside resort Markgrafenheide, no significant changes were reflected in the overall sustainability or QualityCoast criteria between 2000 and 2013 and possible explanations for this are described above, and improvements suggested.

The identification of indicators and corresponding benchmarks that are applicable throughout Europe, but yet relevant locally, will remain a major challenge. During this project the trade-offs between wide comparability, local relevance, data availability and subjectivity that have also been identified in previous indicator studies, were reconfirmed.

Yet, it is important to keep in mind in which context an indicator set was developed and what group or audience it is supposed to address. Even though the QualityCoast certification is based on the fulfilment of a set of criteria related to the ICZM principles of the EU recommendations (cf. EUCC, 2012), it has a strong focus on a destination's ambitions to provide sustainability policies for the tourism industry and transparent information for residents and visitors. Furthermore, it is used for international comparison and promotional purposes. For the QualityCoast certification, the indicators are scored by a jury based on the information provided by a community. This allows the inclusion of qualitative indicators, flexibility in scoring and consideration of local specificities. However, when indicators are used to measure progress with the aim of enhancing coastal management locally, they need to include clearly defined benchmarks to be effective. These benchmarks need to be relevant for the specific situation that is supposed to be evaluated. This was difficult using the QualityCoast indicators, which are often based on qualitative information. The set also lacked suitable indicators to reflect coastal protection and nature restoration.

Despite the weaknesses in measuring progress towards sustainability and climate change in the specific case of Markgrafenheide, the application of the QualityCoast indicators proved to be beneficial for the identification of weaknesses and areas of improvement in the study area. According to Dahl (2012) the 'most significant effect of an indicator [...] can simply be to make a problem visible,' which seems to be applicable for the QualityCoast indicators as well. The large and diverse QualityCoast indicator set provides a good basis for coastal communities to identify strength and weaknesses. For instance, during the data collection and scoring of indicators for Markgrafenheide areas of improvements were identified for the co-operation between the tourism industry and the environmental department. Further improvements could be made concerning the provision of information about the natural environment for instance in regard to the coastal protection and realignment scheme. Hence, repeated applications of the QualityCoast indicators with the aim of increasing a destination's sustainability could lead to improving the exchange between different stakeholders, as well as improving the dissemination of information. Both are recommended aspects for national ICZM strategies that are included in the EU recommendations on ICZM (European Parliament and Council, 2002). Moreover, the application identified areas for which data is neither available nor assessed, but is of

interest to the local community, such as the contribution of tourism to the local economy or the impact of tourism on the natural environment like the nature reserve. Benchmarks or target values could be defined for identified weaknesses and included in the *Coastal Sustainability Tool* by a community itself and assessed repeatedly to measure progress to overcome the identified gaps. Thus, allowing for adaptive action which is required in coastal management. Finally, indicators could be added to the set of optional indicators during its annual revision. Additional indicators could be based on improvements made in single destinations and serve as examples for other coastal communities, thus improving the exchange of coastal destinations' best practices. Repeated applications of the QualityCoast indicators with the aim of increasing a destination's sustainability could then lead to improvements in local sustainability and enhance coastal management, through the consideration of local specificities and adaptive capacities as well as involvement of stakeholders and cooperation between different sectors and administrative departments,

6 Conclusion and Outlook

The use of the QualityCoast indicators for the purposes of measuring sustainability and climate change adaptation based on the specific case of a coastal protection and realignment scheme in the coastal village and seaside resort Markgrafenheide did not prove to be successful. The scheme was only reflected limitedly. Improvements were solely visible when single indicators were looked at or grouped to the level of criteria. The main reasons for this included weaknesses concerning the indicator set, data availability and methodological problems, such as lacking benchmarks and weights. Indicators that reflected coastal protection and nature restoration were not sufficiently represented in the QualityCoast indicators.

Furthermore, it was shown that in the case of Markgrafenheide, the community had only limited influence on the sustainability scores. Many of the QualityCoast indicators were found to be out of the community's sphere of influence. Thus, it is suggested, that future studies should not be conducted on a level below the municipal level. The application showed also that changes that are reflected in the scores are not necessarily visible for the residents or visitors locally. This is assumed to be due to the high number of policy indicators. The inclusion of the SUSTAIN Governance indicators further increased the number of policy indicators. A revision of the indicators that were included in the *Coastal Sustainability Tool* is recommended to reduce the number of policy indicators and eliminate overlapping indicators as well as indicators that are out of the sphere of influence of communities.

Despite major weakness concerning the *Coastal Sustainability Tool's* effectiveness to measure progress towards sustainability and climate adaptation, the QualityCoast indicators seemed beneficial for the identification of weaknesses and areas for improvement in the case of Markgrafenheide. By allowing more flexibility and including stakeholders in the definition of indicators and benchmarks, the tool could be used to facilitate exchange between stakeholders and provision of information concerning the

coastal zone for the public. It could further lead to a better reflection of local specificities and enhance adaptive action in coastal management.

Since the indicator set was only applied to a single destination within the scope of this research, it is advisable to compare the results of this thesis with two other applications of the *Coastal Sustainability Tool* conducted during the winter 2013/2014 within the scope of two master theses. This could help to support the conclusions drawn from this study and lead to further improvements of the *Coastal Sustainability Tool* for future applications.

Within the scope of this thesis, it was not assessed whether a combination of a self-assessment method with the QualityCoast indicators would actually contribute to the attractiveness of indicator-based assessments for coastal municipalities. Besides the revision and improvement of the *Coastal Sustainability Tool,* this needs to be assessed in order to advance its further utilization. It should be analysed if and how certified destinations make use of the QualityCoast certification to advance coastal management or whether the interest is mostly limited to the label's promotional benefits. Furthermore, an application of the revised *Coastal Sustainability Tool* to a certified destination could give a better indication of the potentials of the QualityCoast indicators and the tool's effectiveness for coastal management on the local level.

Bibliography

Ballinger, R., Pickaver, A., Lymbery, G., & Ferreira, M. (2010). An evaluation of the implementation of the European ICZM principles. *Ocean & Coastal Management* , 738-749.

Bell, S., & Morse, S. (2003). *Measuring Sustainability: Learning from doing.* London - Sterling: Earthscan Publications.

Bond, A. J., & Morrison-Saunders, A. (2011). Re-evaluating sustainability assessment: Aligning the vision and the practice. *Environmental Impact Assessment Review* , 1-7.

Breton, F. (2006). *Report on the use of the IZCM indicators from the WG-ID. A contribution to the ICZM evaluation.Version 1.*

Buckley, R. (2002). Tourism Ecolabels. *Annals of Tourism Research* , 183-208.

Cicin-Sain, B., & Knecht, R. W. (1998). *Intergrated Coastal and Ocean Management. Concepts and Practices. .* Washington D.C., Covelo, CA: Island Press.

Dahl, A. L. (2012). Achievements and gaps in indicators for sustainability. *Ecological Indicators* , 14-19.

Daschkeit, A., & Sterr, H. (2003). Klimawandel in Küstenzonen. *Umweltwissenschaften und Schadstoff-Forschung* , 199-207.

DEDUCE Consortium. (2007). *Indicators Guidelines. To adopt an indicator-based approach to evaluate coastal sustainable development. .*

Diedrich, A., Tintoré, J., & Navinés, F. (2010). Balancing science and society through establishing indicators for integrated coastal zone management in the Balearic Islands. *Marine Policy* , 772-781.

Dossmann, A. (2003). *Begrenzte Mobilität: eine Kulturgeschichte der Autobahnen in der DDR.* Essen: Klartextverlag.

EUCC & ECNC. (2014). *QualityDestination. QualityCoast. Participation Manual 2014.* Retrieved from http://www.qualitycoast.info/wp-content/uploads/2013/12/QD-QC-2014-Participation-Manual.pdf

EUCC. (2012). *Quality Coast Award 2013 Application Manual.* Retrieved from http://www.qualitycoast.info/?publication=application-manual-12_13&wppa_open=1

European Commission. (1999). *Towards a European Integreated Coastal Zone Management (ICZM) Strategy: General Principles and Policy Options.* Luxembourg: Office for Official Publications of the European Communities.

European Parliament and Council. (2002). Recommendation of the European Parliament and of the Council of 30 May 2002 concerning the implementation of Integrated Coastal Zone Management in Europe (2002/413/EC). *Official Journal of the European Communities* , 24-27.

Fontalvo-Herazo, M. L., Glaser, M., & Lobato-Ribeiro, A. (2007). A method for the participatory design of an indicator system as a tool for local coastal management. *Ocean and Coastal Management* , 779-795.

Fraser, E. D., Dougill, A. J., Mabee, W. E., Reed, M., & McAlpine, P. (2006). Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. *Journal of Environmental Management* , 114-127.

Gallagher, A. (2010). The coastal sustainability standard: A management systems approach to ICZM. *Ocean and Coastal Management* , 336-349.

Gasparatos, A., El-Haram, M., & Horner, M. (2008). A critical review for reductionist approaches for assessing the progress towards sustainability. *Environmental Impact Assessment Review* , 286-311.

Göhrlich, C. (2012). *Urlaub vom Staat. Tourismus in der DDR.* Köln Weimar Wien: Böhlau Verlag.

Hansestadt Rostock - Tourismuszentrale Rostock und Warnemünde. (2012). *Die Hansestadt Rostock mit dem Seebad Warnemünde. Tourismuskonzeption 2022.* Hansestadt Rostock.

Hansestadt Rostock. (2014). *Geoport.HRO.* Retrieved March 30, 2014, from Geoport.HRO: http://www.geoport-hro.de/frames/index.php?PHPSESSID=fsm6qm9c6unaeuds13gl97t314&gui_id=Geoport.HRO&mb_user_myGui=Geoport.HRO&mb_myPOI2SCALE=312900,5997300,8000

Hansestadt Rostock. (2002). *Rahmenplan Markgrafenheide, Fortschreibung 2002.* Rostock.

Hansestadt Rostock. (1996). *Rostock - Markgrafenheide. Rahmenplan 01.RP.102.1.*

Hansestadt Rostock. (2013). *Statistisches Jahrbuch 2013.*

Hanson, A. J. (2003). Measuring progress towards sustainable development. *Ocean & Coastal Management* , 381-390.

Hildebrand, L. P., & Norrena, E. J. (1992). Approaches and Progress Toward Effective Integrated Coastal Zone Management. *Marine Pollution Bulletin* , 94-97.

Hoffmann, J. (2009). Indicators for an ICZM. Experience with a problem-oriented approach. . *Journal of Coastal Conservation* , 141-150.

Joosten, H. (2009). *The Global Peatland CO2 Picture: peatland status and drainage related emissions in all countries of the world.* Ede: Wetlands International.

Karim, M. S., & Hoque, R. (2009). Integrated Coastal Zone Management and Sustainable Development of Coastal Area: A Short Overview of International Legal Framework. In E. Moksness, E. Dahl, & J. Støttrup, *Integrated Coastal Zone Management* (pp. 170-177). Chichester: Blackwell Publishing Ltd.

Ko, T. G. (2005). Development of a tourism sustainability assessment procedure: a conceptual approach. *Tourism Management 26* , 431-445.

Koebsch, F., Glatzel, S., Hofmann, J., Forbrich, I., & Jurasinski, G. (2013). CO2 Exchange of a temperate fen during the conversation from moderately rewetting to flooding. *Journal of Geophysical Research: Biogeosciences, Vol. 118* , 940-950.

Landesamt für innere Verwaltung Mecklenburg-Vorpommern. (2014). *Gaia-MV*. Retrieved March 30, 2014, from GeoPortal.MV: http://www.gaia-mv.de/gaia/gaia.php

Leipe, T., & Leipe, S. (2013). Das NSG "Heiligensee und Hütelmoor" - Veränderungen der Vogelwelt in den letzten 16 Jahren im Zusammenhang mit "Renaturierungsmaßnahmen". *Naturschutzarbeit in Mecklenburg-Vorpommern: Schriftenreihe für alle Gebiete der Naturschutzarbeit und der naturkundlichen Heimatforschung in Mecklenburg-Vorpommern* , 14-24.

Löser, N. (2007). Indikatoren als Hilfsmittel zur Messung der Anpassungsfähigkeit an den Klimawandel. In G. Schernewski, B. Glaeser, R. Scheibe, A. Sekścińska, & R. Thamm, *Coastal Development: The Oder estuary and beyond, Coastline Reports 8* (pp. 203-211).

McCool, S. F., & Stankey, G. H. (2004). Indicators of Sustainability: Challenges and Opportunities at the Interface of Science and Policy. *Environmental Management* , 294-305.

McKenna, J., Cooper, A., & O'Hagan, A. M. (2008). Managing by principles: A critical analysis of the European principles of Integrated Coastal Zone Management . *Marine Policy* , 941-955.

McLaughlin, S., McKenna, J., & Cooper, J. A. (2002). Socio-economic data in coastal vulnerability indices: constraints and opportunities. *Journal of Coastal Research* , 487-497.

Miller, G. (2001). The development of indicators for sustainable tourism: results of a Delphi survey of tourism researchers. *Tourism Management 22* , 351-362.

Miller, G., Twining-Ward, L., & Simpson, M. (2013, February). *European Tourism Indicator System. Sample Enterprise Survey for Sustainable Destinations.* . Retrieved from

http://www.surrey.ac.uk/shtm/Files/ETIS%20Toolkit%20Sample%20Enterprise%20
Survey.pdf

MLUV . (2009). *Regelwerk Küstenschutz Mecklenburg-Vorpommern - Übersichtsheft - Grundlagen, Grundsätze, Standortbestimmung und Ausblick.* Schwerin.

Moreno Pires, S., Fidélis, T., & Ramos, T. B. (2014). Measuring and comparing local sustainable development through common indicators: Constraints and achievments in practice. *Cities* , 1-9.

Mori, K., & Christodoulou, A. (2012). Review of sustainability indices and indicators: Towards a new City Sustainability Indec (CSI). *Environmental Impact Assessment Review* , 94-106.

Ness, B., Urbel-Piirsalu, E., Anderberg, S., & Olsson, L. (2007). Categorising tools for sustainability assessment. *Ecological Economics* , 498-508.

O'Mahony, C., Ferreira, M., Fernández-Palacios, Y., Cummins, V., & Haroun, R. (2009). Data availability and accessibility for sustainable tourism: An assessment involving different European coastal tourism destinations. *Journal of Coastal Research* , 1135-1139.

Palmer, B. J., Van der Elst, R., Mackay, F., Mather, A. A., Smith, A. M., Bundy, S. C., et al. (2011). Preliminary coastal vulnerability assessment for KwaZulu-Natal, South Africa . *Journal of Coastal Research* .

Pickaver, A. H. (2009). Further Testing of the Approved EU Indicator to Measure the Progress in the Implementation of Integrated Coastal Zone Management in Europe. In E. Moksness, E. Dahl, & J. Støttrup, *Integrated Coastal Zone Management* (pp. 69-77). Chichester: Blackwell Publishing Ltd.

Pickaver, A. H., Gilbert, C., & Breton, F. (2004). An indicator set to measure the progress in the implementation of integrated coastal zone management in Europe. *Ocean & Coastal Management 47* , 449-462.

Reed, M. S., Fraser, E. D., & Dougill, A. J. (2006). An adaptive learning process for developing and applying sustainability indicators with local communities. *Ecological Economics* , 406-418.

Rinne, J., Lyytimäki, J., & Kautto, P. (2013). From sustainability to well-being: Lessons learned from the use of sustainable development indicators at national and EU level. *Ecological Indicators* , 35-42.

Rostock Markgrafenheide - Urlaub an der Ostsee. (2014). *Geschichte. Markgrafenheide von den Anfängen bis heute.* Retrieved January 28, 2014, from Markgrafenheide. Sonne, Strand & Meer...: http://www.rostock-markgrafenheide.de/uber-markgrafenheide/geschichte/

Schernewski, G., Schönwald, S., & Katarzyte, M. (submitted). Application and evaluation of an indicator set to measure and promote sustainable development in coastal areas. *Ocean & Coastal Management* .

Schmidt-Thomé, P., Klein, J., Nockert, A., Donges, L., & Haller, I. (2013). Communicating Climate Change Adaptation: From Strategy Development to Implementation. In P. Schmidt-Thomé, & J. Klein, *Climate Change Adaptation in Practice: From Strategy Development to Implementation* (pp. 1-9). Chichester: John Wiley & Sons, Ltd .

Schönwald, S., & Schernewski, G. (submitted). Nachhaltige Entwicklung an der Küste messen und bewerten. *Geographische Rundschau* .

Schuchardt, B., Bildstein, T., Lange, H., Lange, J., Silvia, P., Osthorst, W., et al. (2004). Wie wir gute IKZM-Praxis definieren: erste Ergebnisse des Forschungsvorhabens RETRO - Our definition of good ICZM practice: first results of the research project RETRO. In G. Schernewski, & T. Dolch, *Geographie der Meere und Küsten. Coastline Reports 1* (pp. 153-162).

Sébastien, L., & Bauler, T. (2013). Use and influence of composite indicators for sustainable development at the EU-level. *Ecological Indicators* , 3-12.

Shipman, B., & Stojanovic, T. (2007). Facts, Fictions, and Failures of Integrated Coastal Zone Management in Europe. *Coastal Management 35* , 375-398.

Singh, R. K., Murty, H. R., Gupta, S. K., & Dikshit, A. K. (2012). An Overview of sustainability assessment methodologies. *Ecological Indicators* , 281-299.

Staatliche Zentralverwaltung für Statistik. (1981). *Statistisches Jahrbuch der Deutschen Demokratischen Republik - Band 1980.* Staatsverlag der Deutschen Demokratischen Republik.

SUSTAIN Partnership. (2012a). *Measuring coastal sustainability. A guide for the self-assessment of sustainability using indicators and a means of scoring them.* Retrieved from http://sustain-eu.net/what_are_we_doing/measuring_coastal_sustainability.pdf

SUSTAIN Partnership. (2012c). *Scoring coastal sustainability. A report on the sustainability criteria scoring and their assessment.* Retrieved from http://sustain-eu.net/what_are_we_doing/scoring_coastal_sustainability.pdf

SUSTAIN Partnership. (2012b). *The SUSTAIN indicator set. A set of easily measurable sustainability indicators.* Retrieved from http://sustain-eu.net/what_are_we_doing/sustain_indicator_set.pdf

Torresan, S., Critto, A., Dalla Valle, M., Harvey, N., & Marcomini, A. (2008). Assessing coastal vulnerability to climate change: comparing segmentation at global and regional scales. *Sustainability Science* , 45-65.

Tsaur, S.-H., Lin, Y.-C., & Lin, J.-H. (2006). Evaluating ecotourism sustainability from the integrated perspective of resource, community and tourism. *Tourism Management 26* , 640-653.

Umweltministerium Mecklenburg-Vorpommern. (2003). Heiligensee und Hütelmoor 32. In *Die Naturschutzgebiete in Mecklenburg-Vorpommern* (pp. 185-186). Schwerin: Demmler-Verlag.

UNCED. (1992). *Agenda 21, Programme of Action for Sustainable Development, adopted at the United Nations Conference on Environment and Development, Rio de Janeiro, Brazil.*

Valentin, A., & Spangenberg, J. H. (2000). A guide to community sustainability indicators. *Environmental Impact Assessment Review* , 381-392.

Weisner, E., & Schernewski, G. (2013). Adaptation to climate change: A combined coastal protection and re-alignment measure in a southern Baltic tourism region. *Journal of Coastal Research* , 1963-1968.

World Commission on Environment and Development. (1987). *Our Common Future.* Oxford: Oxford University Press.

Zorn, P. (2013). *Küstenschutz Rostocker Heide.* Rostock: StALU MM.

Appendices

Appendix I - Core indicators and selected Climate Change Adaptation indicators (optional) Grouped into Policy and Status Indicators

Appendix II - Final Indicator Assessment Results for Core and Climate Change Adaptation Indicators (Optional)

Appendix III - Final Indicator Assessment Results for Policy and Status Indicators (Based on Core and Climate Change Adaptation Indicators)

Appendix IV - Final Indicator Assessment Results for Policy and Status Indicators (Based on Core and Climate Change Adaptation Indicators)

Appendix V – Applications of the Coastal Sustainability Tool (enclosed CD-ROM)

Appendix I: Core indicators and selected Climate Change Adaptation indicators (optional) Grouped into Policy and Status Indicators

POLICY INDICATORS	STATUS INDICATORS

NATURE

CRITERION 1: NATURE & CONSERVATION

POLICY INDICATORS	STATUS INDICATORS
1.4. How has the impact of tourism on the ecological environment of the destination developed before 1992? (The year 1992 has been chosen because of the UNCED conference in Rio de Janeiro)	1.1 Nature area as a % of the total land surface of the destination (BasiQ N1)
	1.2. Legally protected nature area (including geological features) as a % of the total land surface of the destination (Please add contours on the map) (BasiQ N2)
	1.3. Marine protected area (incl. under Natura 2000) as a % of the marine waters (12 nautical miles zone) (BasiQ N3)
	1.5. How has the impact of tourism on the ecological environment of the destination developed since 1992? (The year 1992 has been chosen because of the UNCED conference in Rio de Janeiro) (BasiQ N8)

CRITERION 2: ACCESS, INFORMATION & EDUCATION

POLICY INDICATORS	STATUS INDICATORS
2.3. Does the destination have publicly available guidelines for visitor behaviour that are designed to minimize adverse impacts? (GSTC/C3)	2.1 Is interpretive information provided at key natural sites? (GSTC/C5)
	2.2. Is the information provided at key natural sites communicated in relevant languages?(GSTC/C5)
	2.4. Opportunities for hiking in the destination
	2.5. Opportunities for snorkelling to observe marine wildlife (BasiQ N5)

CRITERION 3: GREEN POLICIES

3.1. To what extent have natural values been of major importance in recent policy decisions, e.g. in spatial planning and project development?

3.2. Which natural areas or beaches are sometimes used by off-road motorised vehicles?

3.3. a) Does the destination have planning guidelines, regulations, and policies that integrate sustainable land use, design, construction, and demolition? (GSTC/A6)

3.3. b) Are the regulations that protect natural and cultural heritage publicly communicated and enforced? (GSTC/A6)

3.4. Does the destination have a policy and system to conserve key natural sites (including scenic, cultural, and wild landscapes) (GSTC/C1)

3.5. Does the destination have a system that encourages visitors to volunteer or contribute to community development, cultural heritage, and biodiversity conservation? (GSTC/C7)

3.6. Is there a system to monitor the impact of tourism on sensitive environments and protect habitats and species? (GSTC/D2)

3.7. Does the destination have a system to ensure compliance with local, national and international standards for the harvest or capture, display, and sale of wildlife? (including both plants and animals) (GSTC/D3)

CRITERION 4: OPEN LANDSCAPES

4.3. Is a policy in place to protect and restore open landscapes and to avoid landscape degradation?

4.1 % of non built–up areas (C+D in the land use table,1st sheet of this form) of the land area (BasiQ N4)

4.2. % of the coastal strip, up to 500 m from high water mark free from buildings, incl. on the beach (BasiQ N6)

ENVIRONMENT

CRITERION 5: ENVIRONMENTAL MANAGEMENT

5.1. List the key environmental risks (that are within the municipality's sphere of influence) in the destination? (GSTC/D1)

5.2. To what extend does the destination have a system in place to address these key environmental risks? (GSTC/D1)

5.3. a) Does the destination have guidelines and regulations to minimize noise (including noise from nearest airports)? (GSTC/D11)

5.3. b) Do you require tourism- related enterprises to follow these guidelines and regulations? (GSTC/D11)

5.4. a) Does the destination have guidelines and regulations to minimize visual pollution and light? (GSTC/D11)

5.4. b) Do you encourage tourism-related enterprises to follow these guidelines and regulations? (GSTC/D11)

CRITERION 6: BLUE FLAGS & BEACHES

6.1. Presence of marinas (BasiQ E21) and number of marinas awarded with a Blue Flag

6.2. Presence of touristic bathing beaches (BasiQ E20) and number of beaches awarded with a Blue Flag

CRITERION 7: WATER MANAGEMENT

7.1. % of permanent surface water compared to the land area (BasiQ E7)

7.4. Does the destination have clear and enforced guidelines in place for the siting, maintenance and testing of discharge from septic tanks and wastewater treatment systems? (GSTC/D9)

7.2. % of waste water treated before discharged into sea: National average (BasiQ E8a)

7.5. a) Does the destination have a system to conserve and manage water usage? (GSTC/D6)

7.3. Approximate % of waste water treated before discharged into sea - local figure for the destination (BasiQ E8b)

7.5. b) Do you encourage tourism-related enterprises to manage and conserve water? (GSTC/D6)

7.6. Does the destination have a system to monitor its water resources to ensure that use by tourism is compatible with the water requirements of the destination? (GSTC/D7)

7.7. a) Does the destination have a system to monitor drinking and recreational water quality? (GSTC/D8)

7.7. b) Are the monitoring results publicly available? (GSTC/D8)

7.8. How are the gulf courses in the destination irrigated?

CRITERION 8: SUSTAINABLE MOBILITY

8.1. Is there a system to increase the use of low-impact transport in the destination? (including public transport) (GSTC/D12)

8.2. Main measures during the last two years to realise the above policy

8.3. Are there any car free zones in the urban areas? What is its total size as a % of the total area?

CRITERION 9: WASTE & RECYCLING

9.3. a) Is there a system to ensure solid waste is reduced, reused and recycled? (GSTC/D10)

9.3. b) Do you encourage tourism-related enterprises to adopt waste reduction strategies? (GSTC/D10)

9.1. Estimated % of solid waste collected separately - National average (BasiQ E9a)

9.2. Approximate % of solid waste collected separately - local figure for the destination (BasiQ E9b)

CRITERION 10: ENERGY & CLIMATE MITIGATION

10.1. Do you have a system to promote energy conservation? (GSTC/D5)

10.2. Do you have a system to measure energy consumption? (GSTC/D5)

10.3. Do you have a system to reduce reliance on fossil fuels? (GSTC/D5)

10.4. Do you encourage tourism-related enterprises to conserve energy and use renewable energy technologies? (GSTC/D5)

10.6. Do you have a system to encourage tourism-related enterprises and services to measure, monitor, report, and mitigate their greenhouse gas emissions? (GSTC/D4)

10.5. % Renewable energy consumption: National (BasiQ E12)

10.7. % of MWh of green energy production from solar, wind, wave or tidal energy, by generating facilities in the destination (BasiQ E13)

CRITERION 11: CLIMATE CHANGE ADAPTATION

11.1.a) Does the destination have a system to identify challenges and opportunities associated with climate change?

11.1b) Is this system encourages climate change adaptation strategies for development, siting, design, and management of tourism facilities that contributes to the sustainability and resilience of the destination? (GSTC/A4)

(optional) 11.3. Do programs, policies or plans exist for coastal resilience, protection against climate change and risk of coastal erosion, flooding and saline infiltration of coastal aquifers (BasiQ E19)

(optional) 11.4. % of the destination included in climate change adaptation strategy or planning (ETIS/D.2.1.1)

11.2 Climate adaptation: protection and resilience of the coast (11.3 &11.5)

(optional) 11.5. % of tourism accommodation and attraction infrastructure located in "vulnerable zones" (ETIS/D.2.1.2)

(optional) 11.6. Tourism infrastructure and establishments located in zones vulnerable to flooding, e.g. restaurants on beaches

IDENTITY & CULTURE

CRITERION 12: CULTURAL HERITAGE

12.3. Does the destination have publicly available guidelines for visitor behaviour that are designed to minimize adverse impacts? (GSTC/C3)

12.4. Does the destination ensure that historical and archaeological artefacts are not illegally sold, traded or displayed? (GSTC/C4)

12.1. Number of important monumental buildings, historical and archaeological sites (relative to the size of the destination) (BasiQ C2)

12.2.a) Number of museums (incl. modern museums) (relative to the size of the destination) (BasiQ C3)

12.2.b) Number of artists (incl. craftspeople and street musicians) (relative to the size of the destination)

12.5. Is interpretive information provided at historical, archaeological, religious, spiritual, and cultural sites? (GSTC/C5)

12.6. Is the information communicated in relevant languages? In which languages? (GSTC/C5)

12.7. Cultural heritage with UNESCO World Heritage status (BasiQ C1)

12.8. % of small scale cultural landscapes of the same or similar kind as those from before 1940s relative to the total land area (BasiQ C4).

CRITERION 13: TERRITORY & TRADITION

13.1. Does the destination have a policy and system to conserve key historical, archaeological, religious, spiritual, and cultural sites? (including scenic, cultural and wild landscapes) (GSTC/C1)

13.2. How has the cultural heritage of the destination developed since 1992?

13.3. How has the impact of tourism on the cultural heritage developed since 1992?

CRITERION 14: LOCAL IDENTITY

14.1. Villages and / or town centres built in local or traditional style; estimated approximate percentage of residential areas (villages, town centres and residential neighbourhoods) that were built or rebuilt in a local or traditional style, i.e. from before 1940 (including subsequent buildings with similar construction) expressed as a percentage of the total built-up area of towns and villages (BasiQ C5)

14.2. List of local products that are typical for the destination or for the region

TOURISM & BUSINESS

CRITERION 15: DESTINATION MANAGEMENT

15.1. Is the destination implementing a multi-year tourism strategy that is publicly available? Is the strategy suited to its scale that considers environmental, economic, social, cultural heritage, quality, health, and safety issues, and was developed with public participation? (GSTC/A1)

15.2. Does the destination have an effective organization, department, group, or committee responsible for a coordinated approach to sustainable tourism? Has this group defined responsibilities for the management of environmental, economic, social, and cultural heritage issues? (GSTC/A2)

15.4. Does the destination have an up-to-date, publicly available inventory of its key tourism assets and attractions? (including natural, historical, archaeological, religious, spiritual, and cultural sites) (GSTC/A5)

15.5 Are all tourist sites and facilities, including those of natural, cultural and historic importance, accessible to all? (including persons with disabilities and others who have specific access requirements) (GSTC/A7)

15.3. Does the destination have a system to monitor, publicly report, and respond to environmental, economic, social, and cultural heritage issues? (GSTC/A3)

15.6. Is promotion accurate with regard to the destination and its products, services, and sustainability claims? (GSTC/A13)

15.7. Are promotional messages authentic and respectful? (GSTC/A13)

15.8. Is the direct and indirect economic contribution of tourism to the destination's economy regularly monitored and publicly reported? (GSTC/B1)

15.9. Does the destination have a visitor management system for attraction sites that includes measures to preserve and protect key natural and cultural assets? (GSTC/C2)

15.10. Do you promote your destination as a green, clean or sustainable destination, referring to awards or certifications in this field?(including hotels, apartments and camping sites)

CRITERION 16: BUSINESS INVOLVEMENT

16.1. Does the destination have a system to promote sustainability standards consistent with the GSTC criteria for tourism enterprises? (GSTC/A10)

16.2. Does the destination have a system that supports local entrepreneurs and promotes fair trade principles?(GSTC/B9)

16.3. Does the destination provide equal employment and training opportunities for local residents? Are the opportunities open to women, youth, minorities, and other vulnerable populations? (GSTC/B2)

16.4. Number of hotels in the destination. Count up all accommodations (including hotels, apartments, etc.) in www.booking.com (BasiQ B2 (24a)

16.5. % of accommodations awarded with a Green Key, Travelife label and/or other similar labels (specify the name) in relation to the total number of accommodation in the destination. Specify names of accommodations. (BasiQ B4)

16.6.% of hotels with a Green Key of Travelife label relative to the total number of hotels in the destination (BasiQ B5)

16.7. Seasonal pressure by tourism: number of months in which approx. 80% of tourists arrive (in average years) (BasiQ B3)

16.8. Impact of the destination on the marine ecosystem, also outside the destination(international): Effects of the business sector on the destination (fishing and food industry) on population of fish, dolphins and whales, coral reefs, etc. (BasiQ B1)

CRITERION 17: HOSPITALITY & SATISFACTION

17.2. Does the destination have a system to monitor, to publicly report and to take action to improve tourist satisfaction? (GSTC/A9)

17.1.1. Zoover rate

17.3. Are communities' aspirations, concerns, and satisfaction with tourism regularly monitored, recorded and publicly reported? (GSTC/B4)

17.1.2. number of reviews

17.4. Is care taken to ensure that key stakeholders are included and that responsive action is taken where needed? (GSTC/B4)

17.5. Does the destination provide regular programs to residents to enhance their understanding of tourism opportunities, tourism challenges, and the importance of sustainability? (GSTC/B6)

HOST COMMUNITY & SAFETY

CRITERION 18: FREEDOM & JUSTICE

18.1. Does the destination have a system to ensure respect for the tangible and intangible intellectual property of individuals and communities? (GSTC/C6)

18.2. Do you ensure that laws and regulations regarding property acquisitions exist and consider communal and indigenous rights, and do not authorize resettlement without informed consent and/or full compensation? (GSTC/A8)

18.3. Do you protect, monitor, and safeguard local resident access to natural, historical, archaeological, religious, spiritual, and cultural sites? (GSTC/B5)

18.4. Do you have a defined system and established practices to prevent commercial, sexual or any other form of exploitation and harassment, particularly of children, adolescents, women and minorities? (GSTC/B7)

CRITERION 19: COMMUNITY PARTICIPATION

19.1. Does the destination have a system that enables stakeholders to participate in tourism-related planning and decision making on an ongoing basis? (GSTC/B3)

19.2. Does the destination have a system to enable tourism-related enterprises to support community and development initiatives? (GSTC/B8)

CRITERION 20: HEALTH & SAFETY

20.1. Does the destination have a system to prevent and respond to tourism-related crime, safety and health hazards? (GSTC/A11)

20.2. a) Does the destination have a crisis and emergency response plan that is appropriate to the destination? (GSTC/A12)

20.2. b) Are key elements communicated to residents, tourists, and tourism-related enterprises? (GSTC/A12)

20.2. c) Does the plan establish procedures and provide resources and training? (GSTC/A12)

GOVERNANCE

CRITERION 21: POLICIES/STRATEGIES FOR SUSTAINABILITY

21.1. A sustainable development strategy which includes specific references to the coast and adjacent marine is in place.

21.2. There is effective political support for the sustainability process.

21.3. There are integrated sustainability development plans.

21.4. Sustainability issues are covered by relevant policies at the local/regional level.

21.5. Sustainability issues are covered by relevant legal instruments at the local/regional level.

21.6. Guidelines have been produced by national, regional or local governments which advise planning authorities on appropriate sustainable uses of the coastal zone.

21.7. Strategic Environmental Assessments (SEA) are used to regularly examine policies, strategies and plans for integration of sustainable activities.

CRITERION 22: MONITORING TOOLS FOR SUSTAINABILITY

22.1. Sustainability targets have been set?

22.2. The sustainability targets are regularly reviewed.

22.3. There is regular monitoring of the coastal area with respect to sustainability issues?

22.4. A report on the State of the Coast has been written with the intention of repeating the exercise every five or ten years.

22.5. Reviewing and evaluating progress in implementing sustainability criteria is regularly conducted.

22.6. Assessment of sustainability issues shows a demonstrable trend towards a more sustainable use of coastal and marine resources.

CRITERION 23: HUMAN RESOURCES CAPACITY BUILDING

23.1. Local/regional administrations have adequate capacity of staff to deal with sustainability matters.

23.2. Local/regional administrations have adequate expertise available to deal with sustainability matters.

23.3. Staff are trained on coastal sustainability matters.

23.4. All the relevant administrative levels and departments are collectively working on sustainability matters.

CRITERION 24: IMPLEMENTATION OF GOOD MANAGEMENT PRACTICES

24.1. There is an identifiable point of contact for coastal sustainability matters.

24.2 Existing instruments are being adapted to deal with sustainability management matters.

24.3. A long-term financial commitment is in place for undertaking initiatives which aim towards sustainability.

24.4. Integrated programs on the coast are being carried out that improve the sustainability of the area.

CRITERION 25: STAKEHOLDER INVOLVEMENT & PUBLIC PARTICIPATION

25.1. All stakeholders involved in sustainability performance have been identified and are both informed and involved.

25.2. Partnerships have been established between local authorities and communities for sustainability matters.

25.3. There is a public participation process involving all necessary stakeholders, including business.

Appendix II: Tourism Business Survey

General

1. Type of tourism business (hotel, guesthouse, holiday apartment, restaurant, etc.):
2. When was the business established?
3. How is guest satisfaction monitored?
4. Percentage of repeat/return visitors (within 5 years)
5. Has the business received any voluntary verified certification/labelling for environmental/quality/sustainability/CSR measures? If yes, when?
6. Bed capacity of the business:
7. Does the business provide opportunities for apprenticeships or internships?
8. Percentage of jobs in the business that are seasonal?

Environment

9. Since when is the business connected to the central sewage system?
10. Does the business have low-flow showerheads and taps and/or dual flush toilets or waterless urinals? If yes, since when?
11. Is waste collected separately and recycled? If yes, indicate the type of wastes and since when?

Mobility

12. What is the average travel (km) by tourists to and from home?
13. Estimated percentage of guests that do not use a car to arrive at the destination:
14. What are the main means of transportation used by visitors to get around the destination?

Local and sustainable products

15. Does the business promote local/regional dishes? If yes, indicate since when?
16. Are local, sustainable and/or Fair Trade products and services sourced in the business?
17. Is seafood that is served in the business sourced from certified, sustainably caught fisheries? Were any dishes taken from the menu because of the degree of vulnerability?
18. Estimate the percentage of the offered meals and drinks that are sourced from local or regional producers.

Accessibility

19. Is the business accessible for people with disabilities? Since when, and how?
20. Are rooms accessible for people with disabilities? Since when, and how?

Appendix III: Final Indicator Assessment Results for Core and Climate Change Adaptation Indicators (Optional)

CATEGORY	CRITERION	1980				2000				2013			
		Score	Points	Number of Indicators		Score	Points	Number of Indicators		Score	Points	Number of Indicators	
NATURE	Nature & Conservation	3.00	6.0	4/5	+0	3.20	6.4	5/5	+0	3.20	6.4	5/5	+0
	Access, Information & Education	2.50	5.0	4/5	+0	2.60	5.2	5/5	+0	2.60	5.2	5/5	+0
	Green Policies	2.00	4.0	6/7	+0	3.07	6.1	7/7	+0	3.07	6.1	7/7	+0
	Open Landscapes	3.33	6.7	3/3	+0	3.67	7.3	3/3	+0	3.67	7.3	3/3	+0
	TOTAL	**2.71**	**5.4**	**17/20**	**+0**	**3.13**	**6.3**	**20/20**	**+0**	**3.13**	**6.3**	**20/20**	**+0**
ENVIRONMENT	Environmental Management	3.17	6.3	3/4	+0	3.50	7.0	3/4	+0	3.83	7.7	3/4	+0
	Blue Flags & Beaches	1.50	3.0	2/2	+0	2.50	5.0	2/2	+0	2.50	5.0	2/2	+0
	Water Management	2.08	4.2	6/8	+0	3.29	6.6	7/8	+0	3.64	7.3	7/8	+0
	Sustainable Mobility	2.00	4.0	2/3	+0	2.50	5.0	2/3	+0	2.50	5.0	2/3	+0
	Waste & Recycling	5.00	10.0	1/3	+0	3.33	6.7	3/3	+0	4.00	8.0	3/3	+0
	Energy & Climate Mitigation	1.00	2.0	7/7	+0	1.86	3.7	7/7	+0	2.29	4.6	7/7	+0
	Climate Change Adaptation	2.40	4.8	2/2	+3	2.60	5.2	2/2	+3	3.17	6.3	2/2	+4
	TOTAL	**2.45**	**4.9**	**23/29**	**+3**	**2.80**	**5.6**	**26/29**	**+3**	**3.13**	**6.3**	**26/29**	**+4**
IDENTITY & CULTURE	Cultural Heritage	1.83	3.7	6/8	+0	2.00	4.0	7/8	+0	2.00	4.0	7/8	+0
	Territory & Tradition	3.00	6.0	1/3	+0	3.00	6.0	3/3	+0	3.00	6.0	3/3	+0
	Local Identity	3.00	6.0	2/2	+0	3.50	7.0	2/2	+0	3.50	7.0	2/2	+0
	TOTAL	**2.61**	**5.2**	**9/13**	**+0**	**2.83**	**5.7**	**12/13**	**+0**	**2.83**	**5.7**	**12/13**	**+0**
TOURISM & BUSINESS	Destination Management	1.00	2.0	7/10	+0	1.13	2.3	8/10	+0	1.70	3.4	10/10	+0
	Business Involvement	1.67	3.3	6/8	+0	2.00	4.0	6/8	+0	2.00	4.0	6/8	+0
	Hospitality & Satisfaction	1.50	3.0	4/5	+0	2.25	4.5	4/5	+0	2.20	4.4	5/5	+0
	TOTAL	**1.39**	**2.8**	**17/23**	**+0**	**1.79**	**3.6**	**18/23**	**+0**	**1.97**	**3.9**	**21/23**	**+0**
HOST COMMUNITY & SAFETY	Freedom & Justice	2.50	5.0	2/4	+0	2.75	5.5	4/4	+0	2.75	5.5	4/4	+0
	Community & Participation	1.50	3.0	2/2	+0	4.00	8.0	2/2	+0	4.00	8.0	2/2	+0
	Health & Safety	4.00	8.0	2/2	+0	3.17	6.3	2/2	+0	3.17	6.3	2/2	+0
	TOTAL	**2.67**	**5.3**	**6/8**	**+0**	**3.31**	**6.6**	**8/8**	**+0**	**3.31**	**6.6**	**8/8**	**+0**
GOVERNANCE	Policies/Strategies for Sustainability	1.33	2.7	6/7	+0	2.14	4.3	7/7	+0	3.29	6.6	7/7	+0
	Monitoring Tools for Sustainability	1.00	2.0	4/6	+0	1.20	2.4	5/6	+0	1.67	3.3	6/6	+0
	Human Resources Capacity Building	1.00	2.0	4/4	+0	2.25	4.5	4/4	+0	3.00	6.0	4/4	+0
	Implementation of Good Management Practices	1.00	2.0	4/4	+0	2.50	5.0	4/4	+0	3.50	7.0	4/4	+0
	Stakeholder Involvement & Public Participation	1.00	2.0	3/3	+0	2.67	5.3	3/3	+0	3.00	6.0	3/3	+0
	TOTAL	**1.07**	**2.1**	**21/24**	**+0**	**2.15**	**4.3**	**23/24**	**+0**	**2.89**	**5.8**	**24/24**	**+0**
TOTAL		**2.15**	**4.3**	**93/117**	**+3**	**2.67**	**5.3**	**107/117**	**+3**	**2.88**	**5.8**	**111/117**	**+4**
Overall Sustainability in %		**43%**				**53%**				**58%**			

Table title: FINAL SUSTAINABILITY INDICATOR (SELF-)ASSESSMENT

Appendix IV: Final Indicator Assessment Results for Policy and Status Indicators (Based on Core and Climate Change Adaptation Indicators)

		POLICY						STATUS					
		1980		2000		2013		1980		2000		2013	
CATEGORY	CRITERION	Score	Points	Score	Points	Score	Points	Score	Points	Score	Points	Score	Points
NATURE	Nature & Conservation	1.00	2.00	2.00	4.00	2.00	4.00	3.67	7.33	3.50	7.00	3.50	7.00
NATURE	Access, Information & Education	3.00	6.00	4.00	8.00	4.00	8.00	2.33	4.67	2.25	4.50	2.25	4.50
NATURE	Green Policies	2.00	4.00	3.00	6.00	3.07	6.14	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
NATURE	Open Landscapes	3.00	6.00	4.00	8.00	4.00	8.00	3.50	7.00	3.50	7.00	3.50	7.00
NATURE	**TOTAL**	**2.25**	**4.50**	**3.25**	**6.50**	**3.27**	**6.54**	**3.17**	**6.33**	**3.08**	**6.17**	**3.08**	**6.17**
ENVIRONMENT	Environmental Management	3.17	6.33	3.50	7.00	3.83	7.67	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
ENVIRONMENT	Blue Flags & Beaches	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	1.50	3.00	2.50	5.00	2.50	5.00
ENVIRONMENT	Water Management	1.17	2.33	2.75	5.50	2.88	5.75	3.00	6.00	4.00	8.00	4.67	9.33
ENVIRONMENT	Sustainable Mobility	2.00	4.00	3.00	6.00	3.00	6.00	2.00	4.00	2.00	4.00	2.00	4.00
ENVIRONMENT	Waste & Recycling	5.00	10.00	3.00	6.00	3.00	6.00	NO DATA	NO DATA	3.50	7.00	4.50	9.00
ENVIRONMENT	Energy & Climate Mitigation	1.00	2.00	2.00	4.00	2.20	4.40	1.00	2.00	1.50	3.00	2.50	5.00
ENVIRONMENT	Climate Change Adaptation	1.75	3.50	2.33	4.67	2.33	4.67	2.50	5.00	3.00	6.00	3.75	7.50
ENVIRONMENT	**TOTAL**	**2.35**	**4.69**	**2.76**	**5.53**	**2.87**	**5.75**	**2.00**	**4.00**	**2.75**	**5.50**	**3.32**	**6.64**
IDENTITY & CULTURE	Cultural Heritage	1.00	2.00	2.00	4.00	2.00	4.00	2.00	4.00	2.00	4.00	2.00	4.00
IDENTITY & CULTURE	Territory & Tradition	3.00	6.00	3.00	6.00	3.00	6.00	NO DATA	NO DATA	3.00	6.00	3.00	6.00
IDENTITY & CULTURE	Local Identity	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	3.00	6.00	3.50	7.00	3.50	7.00
IDENTITY & CULTURE	**TOTAL**	**2.00**	**4.00**	**2.50**	**5.00**	**2.50**	**5.00**	**2.50**	**5.00**	**2.83**	**5.67**	**2.83**	**5.67**
TOURISM & BUSINESS	Destination Management	1.00	2.00	1.00	2.00	1.75	3.50	1.00	2.00	2.00	4.00	1.50	3.00
TOURISM & BUSINESS	Business Involvement	1.00	2.00	1.33	2.67	2.00	4.00	2.00	4.00	2.00	4.00	2.00	4.00
TOURISM & BUSINESS	Hospitality & Satisfaction	1.50	3.00	2.25	4.50	2.50	5.00	NO DATA	NO DATA	NO DATA	NO DATA	1.00	2.00
TOURISM & BUSINESS	**TOTAL**	**1.17**	**2.33**	**1.53**	**3.06**	**2.08**	**4.17**	**1.50**	**3.00**	**2.00**	**4.00**	**1.50**	**3.00**
HOST COMMUNITY & SAFETY	Freedom & Justice	2.50	5.00	2.75	5.50	2.75	5.50	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
HOST COMMUNITY & SAFETY	Community & Participation	1.50	3.00	4.00	8.00	4.00	8.00	2.00	4.00	4.00	8.00	4.00	8.00
HOST COMMUNITY & SAFETY	Health & Safety	4.00	8.00	3.17	6.33	3.17	6.33	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
HOST COMMUNITY & SAFETY	**TOTAL**	**2.67**	**5.33**	**3.31**	**6.61**	**3.31**	**6.61**	**2.00**	**4.00**	**4.00**	**8.00**	**4.00**	**8.00**
GOVERNANCE	Policies/Strategies for Sustainability	1.33	2.67	2.14	4.29	3.29	6.57	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
GOVERNANCE	Monitoring Tools for Sustainability	1.00	2.00	1.20	2.40	1.67	3.33	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
GOVERNANCE	Human Resources Capacity Building	1.00	2.00	2.25	4.50	3.00	6.00	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
GOVERNANCE	Implementation of Good Management Practices	1.00	2.00	2.50	5.00	3.50	7.00	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
GOVERNANCE	Stakeholder Involvement & Public Participation	1.00	2.00	2.67	5.33	3.00	6.00	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
GOVERNANCE	**TOTAL**	**1.07**	**2.13**	**2.15**	**4.30**	**2.89**	**5.78**	**NO DATA**	**NO DATA**	**NO DATA**	**NO DATA**	**NO DATA**	**NO DATA**
	TOTAL	1.92	3.83	2.58	5.17	2.82	5.64	2.23	4.47	2.93	5.87	2.95	5.89
	Overall Sustainability in %	38		52		56		45		59		59	

(Table header: FINAL SUSTAINABILITY INDICATOR (SELF-)ASSESSMENT)

Appendix V: Applications of the Coastal Sustainability Tool (enclosed CD-ROM)

Contents of enclosed CD-ROM:

- **Application of the Coastal Sustainability Tool for the Year 1980**
- **Application of the Coastal Sustainability Tool for the Year 2000**
- **Application of the Coastal Sustainability Tool for the Year 2013**