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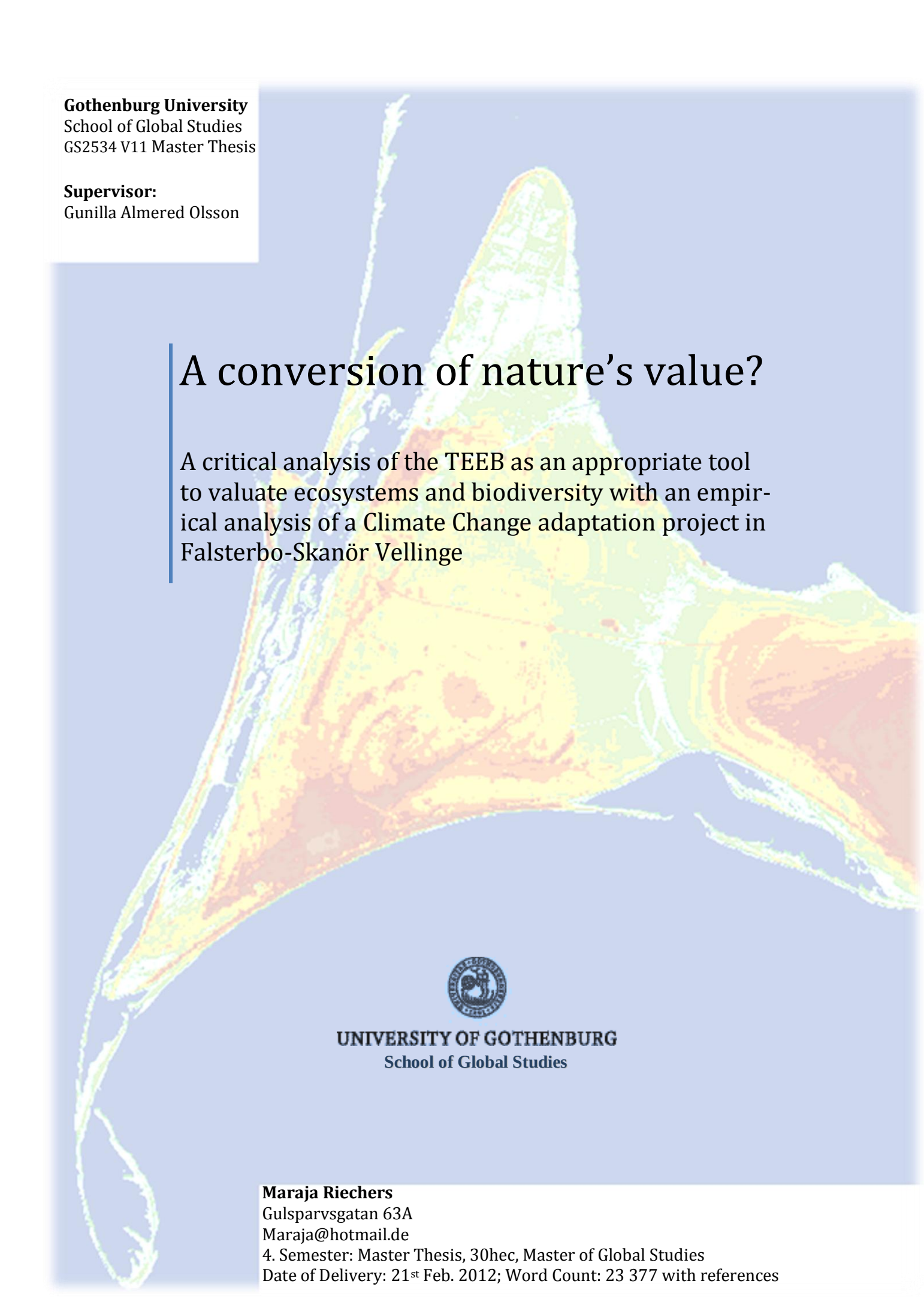
A conversion of nature's value?

A critical analysis of the TEEB as an appropriate tool to valuate ecosystems and biodiversity with an empirical analysis of a Climate Change adaptation project in Falsterbo-Skanör Vellinge



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Abstract

This thesis critically analyzes the appropriateness of The Economics of Ecosystems and Biodiversity (TEEB) in terms of theoretical and practical implications and limitations. Separated into two parts, this thesis firstly examines the theoretical background and flaws of the framework in terms of it stated goal to enhance sustainability. In their regard, nature's value is defined as benefits to society and is assessed through forms of economic valuation. TEEB uses the intuitive and convincing language of the world's dominant economic-political system of capitalism to guide decision-makers and aims to mainstream economic valuation. Among the theoretical problems within the approach, commensurability and silencing of other values are the most striking. The theoretical background of TEEB is assessed critically, and I show that economic valuation could only in some terms be helpful and should be seen as a small part of a broader multi-criteria analysis.

To test TEEB's practicability, the unique attempt to merge an economic valuation with the topic of local climate change adaptation in Falsterbo-Skanör Vellinge. For this, I dissected the TEEB down to the level of actual valuation and analyzed its practical problems. Statements from regional and local decision-makers on their view upon the impact of economic valuation round the empirical part off.

Keywords: TEEB, Sustainable Development, De-Growth, Economic/ Environmental Valuation, Climate Change

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Table of Contents

List of Tables

List of Figures

Abbreviations

BD	Biodiversity
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
CBA	Cost-Benefit Analysis
CVM	Contingent Valuation Method
ESS	Ecosystem Services
EUE	Ecological Unequal Exchange
GEC	Global Environmental Changes
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
IMF	International Monetary Fund
IPCC	International Panel of Climate Change
IUCN	International Union for Conservation of Nature
MA	Millennium Ecosystem Assessment
SECOA	Solutions for Environmental Contrasts in Coastal Areas
SWOT	Strength – Weakness – Opportunity – Threats
TEEB	The Economics of Ecosystems and Biodiversity
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention for Climate Change
WCED	World Commission on Environment and Development
WHO	World Health Organization
WTO	World Trade Organization
WWF	World Wide Fund of Nature

1. Introduction

1.1. Background

Calls for worldwide changes towards sustainability can be heard through all ranges of society (e.g. WCED, 1987; Daly, 1973; Nentwig, 2005; Gore, 2007). The 20th century was exceptional in terms of exponential growth rates (Moran, 2007:17f; McNeill quoted in: Krausmann et al, 2009:2696), and the 21st does not seem to be much different (MA, 2005; IPCC, 2007). Population, consumption, pollution and many more factors created an overshoot above the earth limited capacities starting already decades ago (e.g. Meadows et al, 1972). We are exploiting the worlds resources far beyond from what is sustainable and the negative impacts of our behavior are still unclear (Ibid; IPCC, 2007; UNFCCC, 2007; Breshears et al, 2010; Martens et al, 2010). Global Environmental Changes (GEC[1]) are globally visible and since decades scientists, politicians and citizens have been calling for a change to sustainability and tried to offer approaches to improve the urgent situation (e.g. Chasek, 2008; Jackson, 2011; Martínez-Alier, 2011a,b).

Yet, the question is: how can the goal of a global sustainability society be achieved, and how far should these changes go? The answer is far from easy to find. And the reasons for this are inherent within the problems character.

Choices for explanations and solutions towards sustainability are driven by fear, believe and differing values. They also have to be incorporated in certain ways of government, policies, science and development. Pielke (in Jasanoff, 2007:242f) analyzes the problem of handling such value-laden conflicts in the differentiation between their treatment as "tornado politics" (which are based on scientific knowledge and where knowledge gaps can be filled through further research) and "abortion politics". 'Abortion politics' are value-laden, wicked problems and research will never lead to a consensus on how to act (Ibid.).

All this characteristics make the goal of sustainability a "wicked problem" and hard to achieve (Rittel, 1973). Wicked problems are problems with high complexity and involve multiple stakeholders. They are unique, with no definitive formulation and no rational, immediate and optimal solutions can be found (Ibid:161ff). The different aspects and layers of unsustainability are mostly human induced and therefore "symptom[s] of another problem" (Ibid:165). Their impacts are transboundary and interlinked with myriad of different areas of life and human well-being. Because of these intricate interdependencies, possible answers of the problem might engender or exacerbate new and unforeseen side-effects (Ibid.). I especially

[1] Climate change, Land use and land cover changes, Pollution, Biodiversity changes

want to stress one characteristic of wicked problems, that is, the choice of explanations for the problem determines the nature of its solution attempts (Ibid:166; see section 2.).
In light of this, the goal of sustainability is a difficult process. Approaches to tackle this task ranges from theoretical discussions (section 2. and 3.) to practical tools (4. and 5.). More importantly, they range from criticism of the current system (2.3) to mainstreaming sustainability within existing paradigms (2.2).
This thesis will depart from the discussion of ways towards global sustainability and critically discuss one new and emerging practical tool of high political relevance: The Economics of Ecosystems and Biodiversity (TEEB)[2]. For testing the concept, I will take the steps towards a contingent valuation of Falsterbo-Skanörs ecosystem to analyze if local climate change adaptation projects can appropriately be measured by TEEB.

This introduction will outline the purpose, aim and justification of my thesis (1.2. Objectives), which then departs into my research questions and hypothesis' (1.3. Research Questions). I then outline the most important limitations of my research (1.4. Delimitations), and shortly describe my study site of Falsterbo-Skanör Vellinge (1.5. The Example of Falsterbo-Skanör). The Introduction will end with an outline of my thesis (1.6. Thesis Structure).

1.2. Objectives

Ecosystem and biodiversity degradation affects us all. Thus, systematic changes are necessary (e.g. MA, 2005; IPCC, 2007). But what can trigger a change in behavior? As discussed above, solutions for wicked problems do not include trial-and-error learning. Instead, their characteristics lead only to one-shot operations. One of these 'one-shot' solutions is the approach of "The Economics of Ecosystem and Biodiversity" (TEEB).
This approach tries to tackle the wicked and value laden problem of sustainability by calling on the power of political and economic connections. TEEB states that although the value of nature is indescribable and priceless, in market terms priceless means zero-price (2010:xxiii). In this regard, by integrating the external benefits of ecosystem services into the market, its value is supposed to be adjusted and taken into account. TEEB's goal is to provide political leaders with more information of the "actual economic value" of ecosystem services and to enable them to compare the costs and benefits of their decisions (Ibid.).
Yet, the TEEB approach tries to avoid the containing emotions and different worldviews, inherent in sustainability, through the claim of a "neutral", pragmatic, neo-liberal and post-

[2] hosted by UNEP with financial support from the European Commission and selected countries

positivistic framework. Pricing nature is a difficult ethical action and one has to be careful on how this approach is used and with what intentions it might be applied. Broadly speaking, by stating that economics are the strongest world language, and then as well using this language, the TEEB strengthens power relations of mainstream economics. Using the language of economy silences other voices: indigenous, nature's intrinsic value etc. By using a cost-benefit approach, multi-criteria and pluralist approaches are neglected and disempowered. Regardless that exactly these perspectives are the most comprehensive, TEEB claims that they cannot be translated into economic values.

In contrast, environmental valuation is economic and politically appealing and attracts politicians and researcher from different disciplines. TEEBs practicability and its monetary outcome have indeed a convincing impact. To test TEEB in its practicability and impact, I dismantle the framework towards a local application stage. I use one of the most favored techniques (contingent valuation) to assess TEEB applicability on a local climate change project in a Swedish community. For assessing the impact, I surveyed local and regional decision-makers on their usage of economic valuation.

Environmental valuation is rarely used for spatial explicit climate change projects and likewise adaptability assessments rarely include a monetary valuation. Hence, the thesis will contribute to the existing research on environmental valuation and adaptation, respectively. It distinguishes itself through a unique approach towards environmental valuation on a spatial explicit climate change project under the banner of sustainability.

The point of this paper is not to provide the reader with a full economic valuation, as this would burst the frame of this paper. However I took all steps, inclusive a small pilot study, to test the framework. To round off, I survey local and regional decision-makers about their opinion on economic valuation and its impact.

Comparing the theoretical problems with its convincing practicability, the discussions focus around questions of: Is the TEEB approach ethically justifiable? Will it make the situation worse and is pricing nature a step in the wrong direction? Will pricing the priceless and indescribable lower nature's value? Or is it a step in the right direction, as it is at least a motion: a silver buckshot and try to solve the problem of over- and misuse of nature?

1.3. Research Questions

To contribute to the above described discussion, the overarching research question of my thesis is:

In how far is the TEEB approach an appropriate tool to valuate ecosystems and biodiversity?

For this I will put the theoretical and practical applicability of the TEEB framework to a test. In exploring theoretical and practical problems and limitations, this paper seeks to discuss the TEEB comprehensively. The framework ought to provide the tools for local assessments. In light of this, its applicability and generalizability are important. Thus, I apply the TEEB framework on a specific climate change adaptation project and its impacted ecosystems in Falsterbo-Skanör in Vellinge up to the stage of a pilot study. I use the contingent valuation method to assess the applicability of the TEEB on a climate change adaptation project. Hence, my specific research questions are:

- *To which extend, in a theoretical and practical sense, could the economic value of the ecosystems and biodiversity be assessed with the TEEB approach?*
- *How useful and manageable is the TEEB approach? What are its limitations and flaws? Is the outcome justifiable in terms of nature conservation and protection?*
- *What are the appealing traits the TEEB inherits?*

One of my hypotheses is that the TEEB approach is too biased within economics to give an appropriate picture of the value of an ecosystem. Adding to that I hypothesize, that the reliance on available data on ecosystem services and economic traits of a region is a major flaw. This is due to the fact that data availability might constrain the TEEB to certain places with good data quality. Further, I suspect the outcome of the TEEB to be highly uncertain due to the adding up of uncertainties within the data collection and calculation process.
Yet, due to its high political relevance and popularity I conjecture a high political relevance of applications of TEEB. I suppose the TEEB bears the potential of awareness creating towards ecosystem services and might, if all criticisms are pointed out, give its part towards information for decision-makers.

1.4. Limitations and Delimitations

There are major limitations for my study. Firstly, the research and analysis on which this thesis is based is a product of one person, who is inherently subjective and limited by personal experience. As said above, the choice of explanations and perspectives on wicked problems determines their resolution.

Secondly, this master thesis addresses a transdisciplinary topic (sustainability) and an interdisciplinary approach (TEEB). By analogy, this thesis includes sociological, ecological and economical sections. My previous education has been interdisciplinary and I consider myself as being very eclectic. However, this can be a weakness and strength. I am neither an economist nor an ecologist hence I faced problems within these fields during my research. Nevertheless, since I am not involved in economic or ecologic paradigms, I have a critical outsider perspective, which was very helpful to address my research questions.

One important limitation is data availability and methodological constrains. As described, the TEEB approach is heavily dependent on economic and ecological data of the site. As the basics of a monetary valuation are its ecosystem service data – data availability and survey methods are crucial aspects which have to be borne in mind. However, these parts of limitations are a major section of my analysis itself. The TEEB approach is made to be globally applicable by different researchers. It stays and falls with the data availability and applicability of its methods. In this respect, I consider problems due to data quality and availability as a method-inherent flaw.

Lastly, my thesis cannot offer a complete valuation and application of the contingent valuation. Due to time and financial constrains, a 'valid' or sound valuation could not possibly be done. Having considered all options, a small pilot study seemed the best possible option.

I will discuss these aspects in more length within section 4. concerning the applicability of TEEB on Falsterbo-Skanör Vellinge.

1.5. The Example of Falsterbo-Skanör

Falsterbo-Skanör lies on the tip of a peninsula within the municipality of Vellinge in southwest Sweden. As the quality of existing data is crucial, I chose Falsterbo-Skanör Vellinge as my study site, considering this ecosystem has been the object of many studies. Additionally, Falsterbo-Skanör Vellinge is an unprecedented example of climate change adaptation projects in present communal planning. Generally, Falsterbo-Skanör Vellinge is an area with natural character. Its coast-line is mainly made of sandy beaches and dunes (SECOA, 2011a). Due to these traits, Falsterbo-Skanör is an attractive summer site and thousands of visitors come especially for the seaside. The low-lying peninsula is prone for flooding and in risk of severe climate change effects. Consequently, planning for adapting to climate change on the municipality level has already begun. Plans for building dams are discussed and evaluated on different levels. Yet, "[t]here is a need to find a way to prioritize among national interests. […] because there are no scientific criteria or well-established procedures to establish priorities" (Ib-

id:23). A population based environmental valuation on a monetary basis could be a new initial point in an attempt to guide decision-makers.

With its precious nature, cultural heritance and flourishing tourism, Falsterbo-Skanör Vellinge is a perfect site to put the TEEB to a test. The ecosystem and biodiversity is a highly valued good, thus pricing nature could be an interesting endeavor.

1.6. Thesis Structure

To achieve the ambitious tasks named, the thesis at hand is structured in two overarching parts. I will first critically analyze the TEEB within a broader theoretical framework and discuss its presumptions. The second layer of analysis is practical. Here, I criticize the TEEB in its actual applicability to the method used.

After the thesis' introduction and outline (1. Introduction), I will present the theoretical background and framework of the TEEB (2. Theory: Theoretical Background of Sustainability). For this, I firstly describe the history of the sustainability debate (2.1. The History of the Sustainability Debate). I than show that this discussion can be artificially categorized within two overarching theoretical streams: one that mainstreams goals for sustainability within existing paradigms (2.2. Sustainable Development), and one that criticizes the existing system (2.3. De-growth). Departing from this discussion, I show that according to different theoretical approaches, the valuation norms and methods differ (2.4. Environmental Valuation Methods).

The TEEB approach is one of the environmental valuation frameworks discussed (3. Theoretical Analysis: The TEEB Approach). In section 3. I will therefore present TEEB's theory (3.1.) and its modus operandi (3.2.). Concluding, I scrutinize The Economics of Ecosystems and Biodiversity and its underlying presumptions. The point of this section is to stress its theoretical limitations and flaws (3.3. Summary: TEEB's Theoretical Problems).

The second part of my thesis consists of a practical application of the TEEB framework on a local climate change adaptation project (4. Empirical Analysis: An Application of TEEB on Falsterbo-Skanör's Climate Change Adaptation). As I dissect the framework down to local application, the used contingent valuation method is explained in 4.1.1. (Contingent Valuation Method). The overall methodological discussion is found in section 4.1 (Methodological Discussion: Choosing a Method).

Section 4 also consists of the empirical analysis and application of TEEB on Falsterbo-Skanör. I describe Falsterbo-Skanörs ecosystem and its climate change vulnerability in more detail (4.2. Falsterbo-Skanör Vellinge). Thereupon, I analyze the uniqueness and exemplariness of present action to adapt to climate change (4.3. Climate Change in Falsterbo-Skanör).

Within this section I also illustrate and discuss the local applicability of TEEB and economic valuation and TEEB's practical appeal (4.4. Empirical Data Collection; 4.5. Findings). This discussion leads to the critical conclusion of the adaptability and usability of economic valuation methods on Falsterbo-Skanör's ecosystem and biodiversity (4.6. Summary: TEEB's Practical Problems).

The thesis at hands ends with a summery consisting of conclusion, discussion and findings and concludes with a Strength - Weakness - Opportunity - Threat analysis

(SWOT) to illustrate the appropriateness of the TEEB approach as a tool to value ecosystems and biodiversity (5.).

2. Theory: Theoretical Background of Sustainability

> *"The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution." Rittel, 1973*

TEEB's core content is to value nature's benefits to society through the application of economic valuation (TEEB, 2010:5,6). It aims to frame and synthesize existing knowledge to present a framework to "mainstream the economics of nature" which shows the full range of values (Ring et al, 2010:15,20).

This section aims to illustrate the theoretical background from which the TEEB emerged. With this in mind, I firstly describe the history of the sustainability debate (2.1.).

The description will show a crystallization of two different theoretical stances: Sustainable Development (2.2.) and De-growth (2.3.). From there on, I debate that, according to theoretical groundings, methods for environmental valuation differ (2.4.).

This discussion will give a comprehensive background to understand and analyze the emergence of the TEEB, which will be discussed in the coming section.

2.1. The History of the Sustainability Debate

Debates on sustainability and its implementations have been ongoing since decades. Already in 1972 the Club of Rome published their influential work "Limits of Growth", a year later Herman Daly showed how such a world within the limits of the earth's capacity could work. Daly (likewise John Stuart Mill 124 years before him) proposed a steady-state economy instead of one with infinite growth (Meadows et al, 1972; Daly, 1973). Both, members of the Club of Rome and Daly are today, roughly 40 years later, still writing with the same urgency (Daly, 2008; Club of Rome, 2011).

Fifteen years after the "Limits of Growth", in 1987, "Our Common Future" (WCED, 1987) was published by the World Commission on Environmental Development. It was the first time that companies, politicians and scientists from different branches worked together to describe the status quo of the world's sustainability. They aimed to enhance the scientific debate and political actions to act against global environmental changes (WCED, 1987; Dresner, 2007:1-2/31ff). The Brundtland report, how it is mostly called, brought the term "Sustainable Development" to prominence and aimed to mainstream the concept. 'Mainstreaming' excludes a priori structural world changes, thus sustainability has been compromised to sustainable development by neglecting system critique (Ibid.).

Indeed, mainstreaming of sustainable development has proven to be successful. It led to a row

of political events, as the Earth Summit in 1992 or the implementation of the International Panel of Climate Change (Dresner, 2007; IPCC, 2011; UN, 2011). Environmental degradation was not longer seen as a necessary side-effect of industrialization with only marginal impact. Instead, sustainable development acknowledged the fact that environmental degradation is a matter of survival for developing countries and a matter of sustaining wealth and livelihood standards in developed ones (cf. CBD, 2011; UN, 2011; UNFCCC, 2011a).

Many practical approaches to achieve the goal of sustainable development have been made since then (e.g. local, regional, national and global environmental movements[3]; political agreements, regulations, laws[4]; technical improvements[5]).
In recent years, two scientific approaches had a considerable impact on current debates and developments of sustainability assessments. Both call for a more practical approach to global environmental changes: the Millennium Ecosystem Assessment (MA, 2005) and the Economics of Climate Change: the Stern Review (2006). The former, the Millennium Ecosystem Assessment, shows the accelerating urgency of the need for change and draws attention to the connection of human well-being and ecosystems. The term of Ecosystem Services (ESS) is coined and comprehensively explained within this report (MA, 2005). The latter, the Stern Review, consists of an economic pricing of climate change. Even though it was not the first report dealing with economic value and nature (Costanza et al, 1987; Heywood, 1995; Daily, 1997), its political and economic impact was considerable (e.g. TEEB 2010:5; Ring et al, 2010). By showing the complexity of trade-offs between cost of action and inaction against the current development, the Stern Review changed the economical understanding of climate change and made a powerful case for action (Ibid.).

The paragraphs above unravel a crystallization of two different streams of thoughts. One mainstreamed a rather liberalist approach to sustainability but is a paradigm changing concept with great impacts on global and national politics and our society: Sustainable Development (2.2.).
The other was mentioned within the 1970s and fairly marginalized due to its economical extremes. Yet, section 2.3. shows that the debate about steady-state economies never abated and presently gains more importance under the banner of De-Growth (2.3.).

[3] E.g. FSC, 2011; Greenpeace, 2011; WWF, 2011
[4] E.g. BMU, 2011; UNFCCC, 2011b
[5] E.g. CAT, 2011

2.2. Sustainable Development

> *"We do not pretend that the process is easy or straightforward. Painful choices have to be made. Thus […] sustainable development must rest on political will" WCED, 1987*

The term "Sustainable Development" firstly emerged in the 1980s from the International Union for Conservation of Nature and Natural Resources. In 1987 it became politically acceptable and applicable. The credits for that belong to Gro Harlem Brundtland of the World Commission on Environment and Development and her report: Our Common Future.

Within this document the Brundtland commission called for a new path of development which does not exclusively restrict itself to economic growth (WCED, 1987:4). The concept of sustainable development is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Ibid:8). It hence, enabled the connection between the contrasting groups of 'developers' and 'environmentalists' (Dresner, 2007:64).

The crucial components of sustainable development are defined as meeting basic needs (for present and future generations), recognizing environmental limits (and adapting lifestyles accordingly) and, especially explicit, the principles of inter- and intragenerational equity. The Brundtland report was the first document which included this notion of all-encompassing equity within their concepts. It is stressed within the report that the concept of needs refers to intragenerational and the notion of limits to intergenerational equity (WCED, 1987:43). Such highlighted distinction is one strength of sustainable development.

The commission also was pioneer in clearly developing a common understanding about the long-term effects for human life on earth. What is more, they advocated clearly for a (global) leadership built on trust and mutuality, as well as for the invention of government instruments that launches global action (Hauff, 2007:2). Further the Brundtland report includes sections upon conflict prevention, poverty mitigation and food security, as well as a discussion on global warming, threats for biodiversity and ecosystems and the problems of urbanization. In this light, the concept of sustainable development is broad and encompassing. Their considerations critically framed a new and promising approach towards sustainability.

Yet, written in 1987, much has changed in the world since then (e.g. end of cold war, Fukushima, Globalization/Glocalization and shifting global power relations). Especially the new and all-encompassing debates on Anthropogenic Climate Change have influenced the debate on sustainable development in contradicting ways. As the IPCC phrased it: "Sustainable de-

velopment can reduce vulnerability to climate change, and climate change could impede nations' abilities to achieve sustainable development pathways" (2007:20).

The guidelines outlined in "Our Common Future" are now, over 20 years later, still accurate and relevant (Hauff, 2007). However, the urgency for actions increased.

The figure below shows the three main goals which are incorporated within sustainable development and their inclusion within global and national governance.

Figure 2.2.1 Sustainable Development, Theory

Source: Olsson, 2010b, Own illustration

The IUCN, UNEP and WWF define sustainable development as "improving the quality of human life while living within the carrying capacity of supporting ecosystems" (quoted in Chasek 2008:244). Improving the quality of human life, mostly termed as economic growth, was up till then seen as contradictious with sustainability. Yet, in contrast to prior theories, the Brundtland report postulates that economic development and sustainability can go together. Put simply, it aimed for the continuation of economic growth while achieving sustainability. As this aspect is possibly the reason for the great impact and applications of sustainable development, I will elaborate on this further.

The concept of sustainable development avoids the language of absolute limits. In contrast, correct and immediate management of technology and social organizations could lead to a "new era of economic growth" (WCED, 1987:8). What is more, in the view of this analytical stance, growth is necessary to achieve global equity (Dresner, 2007:35). Equity is widely discussed within the report. Unfair resource extraction and exploitation ought to be tackled through sustainable development goals. The new area of economic growth will bring prosperity within the developing world and likewise assure obtainment of equal resources. By analogy, this seeks to insure that resources continue to be available for developing countries to maintain growth (WCED, 1987:9).

Nevertheless, sustainable development imposes limitations upon the development path. It implies certain limits of resources and requires "life-styles within the planet's ecological means […]" (Ibid:9). These limits consist of technological, biophysical and organizational factors (Ibid.). Yet, there is "no set of limits in terms of population or resource use" but different limitations hold for uses of materials, water, land and energy (Ibid:45). Overall, sustainable development requires from developed countries to change their lifestyles to one that is coherent with the earth's carrying capacity (Ibid:9).

These claims are backed by economic theories concerning development and environmental degradation. Some theories postulate a positive correlation between economic growth and environmental protection exists (in Gleditsch, 1998:395). These theories are based on the 1991 developed Environmental Kuznets Curve (EKC). The EKC theory states that greater wealth leads to greater pollution, however, at a certain point the curve reaches a tipping point and further development will turn into environmental friendliness (Pallab et al, 2006). These considerations frame a polarized view on limits to growth and some try to show that sustainable development and economic growth can go together. According to this theory, high developed countries can afford technologies reducing environmental degradation through their industries (especially pollution). Further, a clean environment becomes a desirable state, which might lead to a restoration of prior environmental degradations (in Gleditsch, 1998; Yandle et al, 2002).

Yet, this theory is highly contested, as it neglects the issue of ecological unequal exchange (see section 2.3.). The correlation of greater wealth and increased environmental friendliness has to be analyzed critically. An increase of development standards increases the level of consumption per capita (Gleditsch, 1998:383). By analogy, this increases the ecological footprint further beyond the national capacity and import of resources and raw material becomes necessary. This shifts environmental stresses and ecological burdens outside national boundaries. Statistical data may show that environmental degradation decreases with an increase of wealth, yet it is in fact only relocation.

Sustainable development tackled the status quo of previous governing. Yet, due to intricate interdependencies, the approach might engender or ex-acerbate new and unforeseen side effects (Hulme, 2009:334).

Implementations of sustainable development are driven by fears, beliefs and values. This is due to the fact that impacts of global environmental changes are global, transboundary and

interlinked with a myriad of different areas of life and human well-being. Furthermore, to be successful, it requires incorporation in governance, policies, science and development.
The Brundtland report acknowledged these difficulties and embraced concept such as trans-disciplinarity, participation, cooperation and learning, to avoid and mitigate conflicts (WCED, 1987:290ff; Hirsch-Hadorn et al, 2006; Owen and Cowell, 2011).
Sustainable development aims to tackle "wicked problems" (Rittel, 1973; Hulme, 2009:334). A wicked problem is unique, with no definitive formulation, and for which rational and optimal solutions cannot be found (Ibid.). They are basically too value-laden to be solved effectively. One attempted to attack wicked or post-normal problems (Bjurström, 2011) is the concept of 'clumsy solutions' or rather the silver buckshot (Prins and Rayner, 2007:973f; Hulme, 2009:337ff). "Clumsiness", so Hulme, "allows for several or all […] contradictory goals and policies to be simultaneously pursued" (2009:338). I personally would categorize sustainable development within these 'clumsy' solutions. Successful sustainable development cannot be measured in a short time span. The complexity of the problem creates risks of maladaptations and short-sightedness (Ibid.).

I have now explored the concept of sustainable development. Already in this rather compressed illustration, fundamental critics and problems are visible. The discussion above illustrates clearly that sustainable development is a 'contestable concept'[6]. Within contestable concepts, like justice or liberty, there is no agreement on the actual meaning or definition. Yet, that does not make these concepts incorrect or meaningless.
With this kept in mind, it is important to note the great influence the Brundtland report had on governmental agencies. The initial point for sustainable development was to integrate environmental considerations into economic decision making (Dresner, 2007:63) and its political impacts were more considerably. Through all levels of respected and influential institutions (e.g. UNEP, IUCN, WWF, the new established IPCC etc.) calls for substantial changes could be heard and the guidelines for sustainable development were incorporated. The Earth Summit in 1992 was one immediate outcome and since then successive meetings to achieve the goals of sustainable development are made (most currently the COP 17 meeting in Durban 2011).
The great impact of sustainable development can be traced back to two connected factors. First and foremost sustainable development does not compete with economic growth. It does not threaten the basic of the dominant economic model, and that found many adherents. Keep-

[6] Termed by Jacobs in 1991

ing growth rates stable while aiming for sustainability attracted a wide range of high political actors.

Secondly, and in connection to the previous argument, sustainable development got popular for its broadness in definition and careful formulations. The Brundtland commission was a conglomerate of different stakeholders concerned with an undefined wide spectrum of interwoven problems and the aim of mainstreaming its solutions. These aspects are a clear strength when it comes to raising awareness or knowledge and mainstreaming sustainable development goals. They are, however, also a weakness.

I started this section with a quote from the introduction of "Our common future", which I deemed as quite insightful. Sustainable development is as a concept so broad and, in itself, a compromise between the participants (Dresner, 2007:36), hence it lacks conformity (Ibid:33) and a strong language (Hauff, 2007:5). Development is not clearly defined and the question of "what exactly are needs?" is left open. Sustainable development was framed too vague in its output to be able to reflect the significance of the problems we are facing. Yet, despite all criticism, sustainable development created a fruitful discussion among politicians and citizens and led to a line of movements for change.

2.3. De-Growth

> *"the quantitative expansion of the economic subsystem increases environmental and social costs faster than production benefits, making us poorer not richer" Daly, 2008*

I opened this paper by illustrating the history of the sustainability debate. In the following section I concentrate on the rather marginalized discussion on steady-state economies. As seen previously, the discussion on the limits of growth (Meadows et al, 1972) and steady-state economies within these limits (Daly, 1973) is not new. Currently, there seems to be a 'renaissance' of this movement under the banner of de-growth. The idea of de-growth has been formulated within the 1970s (Georgescu-Roegen, 1979). Presently, about 30 to 40 years after the initial discussion, the de-growth movements gains new momentum (e.g. Jackson, 2011; Martínez-Alier, 2011a,b). Authors from the 1970's are taken as departure point and claims are made that, instead of sustainable development, a revised direction has to be taken. This new direction is de-growth.

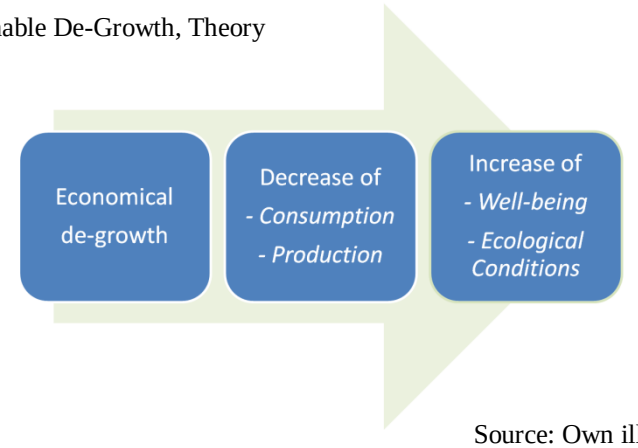
Sustainable de-growth can be seen as a counter position to the orthodox paradigm of sustainable development. De-growth is equally a concept, as well as a social movement. But I will come back to the movement aspect later.

Proponents for de-growth advocate for radical changes of the existing system structures: they call for a smaller economy with less production and less consumption (Martínez-Alier, 2009; 2011a). Or more specific and positively defined, sustainable de-growth is the "equitable downscaling of production and consumption that increases human well-being and enhances ecological conditions at the local and global level, in the short and long term" (Schneider et al, 2010). It seeks for favoring quality and cooperation in economics instead of quantity and competition (Latouche, 2003:18; Daly, 2008). "Hence, it can be said that the de-growth movement adheres to the idea of establishing other social ideals rather than calling for development as such" (Martínez-Alier et al, 2010:1743). Sustainable de-growth is articulated as the "prosperous way down" (Odum and Odum, 2006) – and a promising alternative to global collapse (Meadows et al, 1972).

In spite of such overarching goals, I would like to stress that de-growth aims neither for a 100 percent decrease nor does it hold for every single sector of economy. While the overarching ratio of economy decreases, other sectors (possible within the service sector and through new technologies of e.g. renewable resources) could still increase (cf. Martínez-Alier et al, 2010). De-growth is not an obstacle to progress and is not comparable to depression (Schneider et al, 2010).

The figure below shows the theory of de-growth where economic decrease lead to less production and consumption but to an increase of ecological conditions and hence to a higher well-being.

Figure 2.3.1 Sustainable De-Growth, Theory



Source: Own illustration

While studying the de-growth movement, one gets a sense of urgency and uncompromisingness. In a broad sense, the current dissatisfaction of the economic system, triggered by the economic crisis in late 2008 and in present (e.g. the Euro debt crisis in 2011), and even its socio-economical movement "Occupy Wall Street" are indicators of the rising urgency of action.

The 'renaissance' of de-growth within current years is a widespread phenomenon (e.g. the De-growth Conference Barcelona 2010 or Paris 2008 and the own internet website www.degrowth.eu). Support for sustainable de-growth is found in many fields of academics – from economic to ecology. The revised justification for de-growth is, that present economies have already overshot the earth' carrying capacity and are unsustainable (Daly, 1991), because warnings 40 years earlier were overheard. Thus, a certain amount of de-growth is now unavoidable to adapt into global capacity limits. If a certain amount of economic de-growth is achieved, a steady-state could be the goal (Jackson, 2011:123).

Yet, there are highly contradictory standpoints within the steady-state and de-growth debate over possible theoretical overlaps (Martínez-Alier et al, 2010). I will not go into detail here to discuss different perspectives. Rather, I engage to integrate both, as they have comparable goals. If analyzed within a long time span, de-growth can be seen as the medium through which a stable equilibrium of sustainable resource use can be achieved (Ibid.).

Before turning to de-growth as movement, I will pause and go more in-depth into the main justification of this concept: the limits of economic growth. This is a critical and not widely accepted concept. It stands in harsh contrast to present paradigms of the worlds' economies.

The premise of limits to growth is explained by biophysical limitations measured through the entropy law (Georgescu-Roegen, 1971). To illustrate this argument further, I will shortly take the reader within the study of social metabolism. There are different methods used to describe metabolic flows. Energy and material extraction fuel the economy and therefore economic growth (and its ecological and social rucksack), which then leads to the outcome of waste and pollution. This is a self-accelerating spiral: the higher the economic growth, the higher the energy and material use and eventually the higher waste and pollution.

Hence, overall, infinite growth is not likely to be manageable.

Proponents for de-growth state that: "[t]he dominant economic paradigm rewards *more* instead of *better* consumption and *private* versus *public* investment in *man-made* rather than *natural* capital" (Martínez-Alier et al, 2010:1741; original highlighting). The UN concept of sustainable development is contested by these groups because it works within the dominant economic paradigm. Sustainable development leads to the belief that the current exponential economic growth can proceed and that no radical changes and compromises are necessary to achieve sustainability (Daly, 1991). Yet, in the theoretical stance of de-growth, this is fundamentally wrong.

The concept of sustainable development refers to the internalization of externalizations to

combat market failures and undervaluations. Despite this claim, no effective measurements were implemented by governments. What is more, the actual effects even contradicted sustainability (Jackson, 2011:4,5). Instead of internalizing externalities, richer markets were able to shift their costs into poorer countries (Martínez-Alier, 2011a). This hypothesis is a strong counter-argument to the actual functionality of sustainable development and leads us to the social movement of sustainable de-growth.

As stated above, sustainable de-growth is also a movement. It stands in close connection with the "environmentalism of the poor" and discusses the global implications of our current economic system (Martínez-Alier, 2002).
The present dominant economic structure increases social asymmetries. Measurements such as eco-space and ecological footprint (e.g. Rees, 1992; Dakhia and Berezowska-Azzas, 2010) show that richer countries are living way beyond their geographical capacity and can only maintain their wealth through imports of energy and commodities and through exporting their waste and hard labor (Rees, 1999). Only through shifting the "metabolic trajectory" (Martínez-Alier, 2011b), current economic growth was able to be sustained. A phenomenon described by Harvey (2003) as the 'accumulation by dispossession', which means that environmental degradation has been outsourced.
This phenomenon is described in many different terms: 'unequal environmental exchange' or 'ecological debt' are examples and term great accelerations for environmental conflicts (Rice, 2007).

The theory of ecological unequal exchange was developed by J. Rice (2007) in the branch of Political Ecology. It refers to the asymmetric flow of resources from extractive economies to production economies. While high developed countries accumulate wealth and use a high percentage of the resources, environmental costs are outsourced to developing countries (Ibid; Bruckmeier, 2010). The wealth of higher developed countries is based on historic resource extraction. Today, the resources in these countries are low and have to be imported from the global periphery (Hornborg et al., 2007:259ff).
As inequality rises, this processes led to the emergence of the grassroots movement of the environmentalism of the poor. This movement is rather an environmental justice movement than environmentalist movement as such. Instead of fighting for environmental conservation, these groups fight for preserving their livelihoods and cultural values (Martínez-Alier, 2002). Hence, it combines livelihood concerns with socio-economic aspects and environmental

issues.

The most significant beneficiaries of biodiversity and ecosystem services are the poor. The predominant impact of loss or degradation has an immediate input on their well-being (Martínez-Alier, 2011a). Communities dependent on ecosystem services suffer the most acute from unsustainable exploitation, production or waste disposal, as it affects their existence first (WHO, 2003; IPCC, 2007:590,589). Poor populations are highly vulnerable and exposed to environmental changes, and they lack the capacity for adaptation to such transitions. Vulnerability relates to "the exposure and sensitivity of that system to hazardous conditions and the […] resilience[7] of the system to cope, adapt or recover from the effects of those conditions" (Smith and Wandel, 2006:284). As Smith and Wandel (Ibid.) states, occupancy characteristics with all social, economic, cultural, political and environmental conditions are highly important for the notion of sensitivity as it impacts also the adaptability and resilience (also Holling, 1973 cited in Young et al., 2006:305).

As said, the UN concept of sustainable development encompasses the current dominant economical paradigm. This paradigm is built upon privatization of public goods and ecosystem services. Additionally, it reinforces the power of economy through globalization processes in the finance sector (through instances such as the IMF, WTO and World Bank). Poorer communities, who are highly dependent on public accessible ecosystem services, are hence deprived from their rights and capabilities for a sustainable livelihood (Jackson, 2011:32).
The connection to the environmentalism of the poor will be necessary in later section for assessing implications of the TEEB.

The previous discussion shows that sustainable development has been under great criticism. Yet, de-growth has been historically marginalized and presently waved aside (Martínez-Alier, 2011a). I conjecture the problems of sustainable development lie in a theoretical area. There are different notions of sustainability and there are different notions of development. What these concepts actually mean differ often from person to person. Hence, "agreeing on the meaning of sustainable development is not fundamentally about agreeing upon a precise definition but agreeing upon the *values* that would underlie any such definition" (Dresner, 2007:64, original highlighting). The following section will illustrate how these different values are assessed depending on the theoretical departure point.

[7] Resilience is defined as the capacity to persist in the face of change. Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist (Folke, 2006)

2.4. Environmental Valuation Methods

Under theories on development and sustainability lie perceptions, measures and methods for valuation. As Rittel described 1973, "the choice of explanation determines the nature of the problem's resolution". The focus on this section lies upon the illustration of the difficulty of environmental valuation by pointing out different notions of values and methods. This broad overview on environmental valuation will open up to one very specific framework: TEEB.

Studies on environmental valuation have rapidly increased within the last 20 years. Especially after the appearance of the Millennium Ecosystem Approach, environmental valuation studies have skyrocket (Naturvårdsverket, 2006:9). It is said that the emergence reflects the public opinion that ecosystem services should be integrated within economic analysis, especially when concerned with policy information (Ibid.).

Environmental valuation is defined as: "procedures for valuing changes in environmental goods and services, whether or not they are traded in markets […]" (GESAMP, 2009 quoted in Mazourenko, 2009). Yet, this definition is broad and contested. As a case of view, one can see the exchangeability of the terms environmental valuation and economic valuation. Even though the former does not exclusively deals with economics, many scholars use the terms synonymously.

Basis for economic valuations are postulations within welfare economic theory, where it is believed that changes in human well-being can be measured as economic values. These values are revealed through trade-offs between scarce resources (Söderqvist et al, 2005). Thus, environmental valuation ought to show the dynamics of socio-ecological systems and human well-being (Ring, 2010).

I will give further elaborations by describing the modus operandi of environmental valuation.

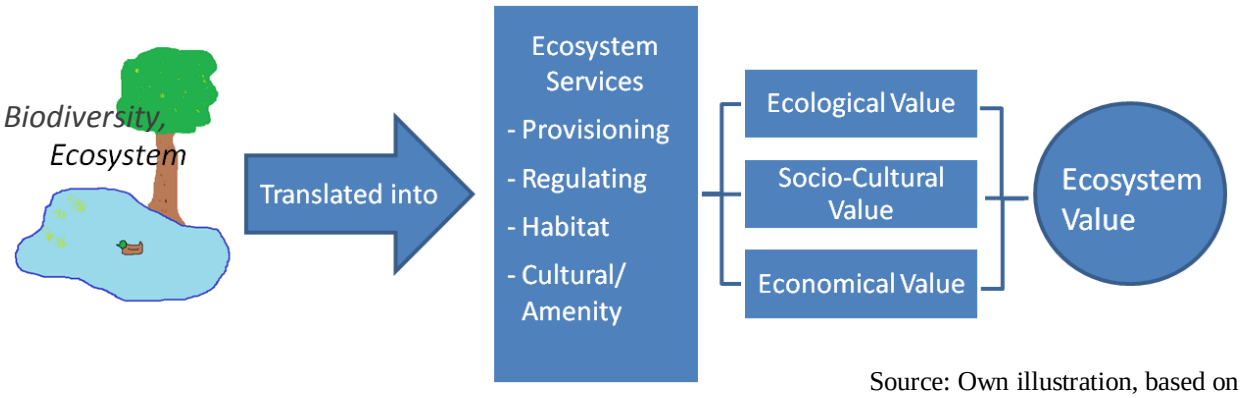
An ecosystem is a complex composition of a biological environment, consisting of existing species and non-living components (MA, 2005:V). Humans are interwoven into ecosystems (Socio-Ecological Systems) and benefit from them. These benefits are called ecosystem services (ESS) (Ibid.). In market terms they can be seen as external benefits as some of them have no market value. Due to this market failure, in the gross of literature 'economic valuation' means the transition of non-market values of ecosystem services into a monetary price (Naturvårdverket, 2006:82).

To valuate ecosystems, firstly an assessment of their structures/processes, functions and services are made. Ecosystem services have been classified into four categories, to distinguish

human benefits (following description based on MA, 2005; TEEB, 2010:35f): Provisioning, Regulating, Habitat and Cultural Services. The *provisioning services* include the material resources which are provided by ecosystems to humans such as food, forestry products and water. The second category is *regulating services*. As the name indicates, they have regulating effects. These include e.g. air and water quality, carbon sinks, control of food quality and availability, as well as the control of diseases. The third category, *habitat services*, stresses the importance of ecosystems to provide habitat for migratory species and maintain genetic diversity (TEEB, 2010:25; here the TEEB differs from the MA). Lastly ecosystem services have been distinguished into *cultural services*. These services are of non-material nature and concern recreational, aesthetical and spiritual values of ecosystems. A holistic calculation of ecosystem services in connection with human well-being can offer new opportunities for land-use, whereby human well-being, economy and nature win likewise (Posthumus et al, 2010:1519). These different services are then assessed by their ecological, socio-cultural and economic values and the overall outcome is aggregated into one overarching value.

The figure below shows the translation of biodiversity and ecosystems into different categories of ecosystem services and the calculation of a total ecosystem value.

Figure 2.4.1. Environmental Valuation



Source: Own illustration, based on De-Groot, 2002

Despite its holistic nature, most environmental valuations focus on specific parts of valuation. In TEEB, economic valuation mostly excludes ecological values as being too indirect to measure (TEEB, 2010:28). Further, socio-cultural values are within economic valuation only marginally assessed. In contrast, if the valuation focuses on socio-cultural values, economic (monetary) values are mainly left aside.

I have been previously referring back to Rittel's assumption and here, within the discussion of the choice of methods his statement becomes clearer. The differences shown within the focal point of valuations are traced back to the actual interpretation and theoretical assumptions of

the problem by different stakeholders (Kosoy and Cobera, 2010). If you see unsustainability as a problem of ecology – of ecosystem resilience, thresholds and carrying capacities – you have different values for the environment and hence different methods. When unsustainability is interpreted as social or cultural problem, then human behavior, their impacts or institutional organization is higher valued and assessed. And the outcome differs again if you aim to focus on victims and their vulnerability or on companies and how they could work more efficient, or on political actors. Finally, if you see unsustainability as a threat or an obstacle to economic growth, or as a hindrance in economic development, then again, you value differently and the methods change.

The values perceived as the most important are measured by fitting methods. These theoretical implications make studies hard to compare and show a pluralism of value which is dependent on the context in which the assessment takes place.

To illustrate this, I made an extensive literature review on environmental valuation. The tables below do not show a comprehensive overview - rather they aim to show the diversity of values and methods used in the literature.

The following table shows a compilation of values categorized (in no particular order) within the three overarching themes of ecologic, socio-cultural and economic values:

Table 2.4.2 Values

Ecologic Value	Socio-Cultural Value	Economic Value
Insurance Value	Physical/ Mental Health Value	Output Value
Resilience Values (population recovery time, disturbance absorption capacity)	Historic Value National Value Identity Value	Present Value (today's future value discounted to the present)
Integrity Value	Aesthetic Values	Actual Value
Biodiversity Value Habitat Value	Ethical/ Social Justice Values (Bequest/Altruistic)	Use Value Non-use Value
Complexity Value	Cultural diversity Value	Direct use Value
Rarity Value	Amenity Value	Indirect use Value
Ecosystem Health Value	Educational Value	Option Value (future as an asset)
Organization Value (function, productivity, throughput)	Religious Value Spiritual Value Deontological Value	Quasi-Option Value (unsure future use value)
Structure Value	Freedom Value	
Scope for growth Value	Intrinsic Value (no market but use value)	
Non-use Intrinsic Value	Existence Value	

Source: own compilation mainly based on Chee, 2004, De-Groot 2002/2010, Costanza, 1999, TEEB, 2010

If you compare the columns, there are clear and strong differences. This table includes values which are related to (economic) benefits and non-market values, like spirituality and inter- and intragenerational values. They also include values of ecosystems, such as biodiversity or

nature's intrinsic values. Not all values can be measured by the same method. Intrinsic values, spirituality or religion, as a case of point, cannot be measured in economic terms. By analogy, a low degree of emotional attachment or a low ecologic value does neither indicate a low economic value nor a lack of dependency of communities on this ecosystem.

As discussed above, depending on which different values are perceived as important the choice of methods is delimited. Additionally, the choice of methods is dependent on the stated goal. If, for example, you chose to give a monetary value for an ecosystem, not all measurements are functional. If you try to measure individual sustainable livelihoods or ecosystem functions, your measures differ.

The following table shows a compilation of valuation methods categorized (in no particular order) within the three overarching themes:

Table 2.4.3 Valuation Methods

Ecologic Valuation Methods	Socio-Cultural Valuation Methods	Economic Valuation Methods
GPP, NPP, GEP	Participation Action Research (Citizens Jury)	Direct Market price (Trade, goods, services)
Network Analysis (Diversity Index, Average mutual information, Predictability)	Deliberative/ Participatory approach (Focus groups, in-depth groups)	Indirect Market price (WTP, WTA, Factor income)
Material [and Energy] Flow Analysis/Accounting (M[E]FA)	Livelihood Approach	Market Cost approaches (Avoided/Replacement cost)
Material Input per Unit Service (MIPS)	Social Value Survey	Revealed preference (Travel cost, Hedonic Pricing)
Carrying Capacity (I=P.A.T.) Ecological Footprint	Consultative Methods (Questionnaire, in-depth interviews)	Stated Preference Approaches (Choice Modeling, Contingent Valuation)
Energy Return of Input (EROI)	Vulnerability Assessment	Benefit Transfer
Human Appropriation of Net Primary Production (HANPP)	Capability Assessment	Participatory approaches (Group/Deliberative valuation, Mediated modeling)
Simulation Modeling	Health-based value assessment	Conjoint Analysis
Scenario Planning	Rapid- rural Appraisal	
Life Cycle Assessment (LCA, LCC)	Participatory rural Appraisal	
	Q- Method	
	Multiple Criteria Decision Analysis	
	Scenario Planning	

Source: own compilation mainly based on Chee, 2004, De-Groot 2002/2010, Costanza, 1999, TEEB, 2010

These tables have been included to exemplify the wide range of values and methods that can, and are used within environmental valuation. There exist no coherent definition and standard of usage of environmental valuation.

The decision to use one particular method or even the compilation of different methods within one branch is clearly a subjective choice. Hence, the following section describes what the

TEEB defines as problem and what as solution. It finally analyzes the TEEB as a framework and method with the aim to guide decision-makers while using the current dominant system, and which theoretical flaws stand behind such a choice.

3. Theoretical Analysis: The TEEB Approach

"No matter how challenging, if we truly want to manage our ecological security, we must measure ecosystems and biodiversity – scientifically as well as economically." TEEB, 2008

This section explains and discusses the TEEB approach. For this matter, I concentrate on the theory used by TEEB (3.1.) and its modus operandi (3.2.). This bears the potential to compare the TEEB with the previous debated theoretical perspectives and valuation methods. The final section (3.3. Summary: TEEB's Theoretical Problems) stands as conclusion of the first and theoretical part of this master thesis. I will show that the TEEB is only one of many possible valuation techniques with various theoretical flaws. Thus, I conclude by pointing out the theoretical problems this approach inherits. The point of this section is breaking down the TEEB from a theoretical analysis to an empirical discussion.

The TEEB emerged in the direct aftermath of the Millennium Ecosystem Assessment report and the Stern review. As described in section 2.1. both reports call for a practical approach to global environmental changes. One shows the accelerating urgency of the need for change and draws attention to the connection of human well-being and ecosystems by coining the term of Ecosystem Services (MA, 2005). The other consists of an economic pricing of climate change with considerably political and economic impacts (Stern, 2006; Ring et al, 2010; TEEB 2010:5). The Stern review showed the complexity of trade-offs between cost of action and inaction against the current development and henceforth changed the economical understanding of global environmental changes. Together with prior research concerned with economic value and nature (Costanza et al, 1987; Heywood, 1995; Daily, 1997) the Stern review laid the fundaments for the TEEB.

Within the scientific debate in the aftermath of the Stern review, the G8+5 meeting of environmental ministers in Potsdam, 2007, called for a study on "the economic significance of the global loss of biodiversity" (G8, 2007, Annex p6) which stands in direct connection to the Earth Summit's Convention of Biodiversity (UN, 2011). Consequently, the Economics of Ecosystem and Biodiversity (TEEB) was commissioned in the same year (BMU, 2008).

TEEB's core content is to value nature's benefits to society through the assessment and presentation of valid forms of economic valuation within appropriate frameworks and methodologies (TEEB, 2010:5,6).

This human-centered perspective on ecosystems offers possibilities for new standpoints and alternative ways of valuating land-use changes and exploitation. In the view of this theoretical stance, policies fail to account for the full economic values of ecosystems and biodiversity

(MA, 2005). Consequently, short-term economic benefits cause overexploitation and land-use changes and create unsustainability. Thus, the TEEB claims that an economic valuation is, in today's society and market structure, the only alternative (Ibid:xxiii). TEEB uses the intuitive and convincing language of the world's dominant economic-political system of capitalism to communicate nature's value (Ibid:xix). It aims to "help decision-makers to make better informed choices" (Ibid:xxiii) hence it has a clear political and theoretical dimension.
This will be under scrutiny in the following paragraphs.

3.1. Theory

The TEEB emerged in the aftermath of the Stern report on call from the international community. It sees itself as part of a change towards a more sustainable future. TEEB aims to frame and synthesize existing knowledge to present a framework to "mainstream the economics of nature" and show the full range of values (Ring et al, 2010:15,20). Consequently, it does not aim to create new methods or techniques for valuations.
The approach is based on four principles: First, it calls for *pragmatic* instead of perfectionist changes. With the perception that time is a precious good, they aim for *solutions with immediate outcomes*. Their purpose is to guide *discrete planned changes* instead of 'creative destruction'[8] and to include a *common sense and equity*. The TEEB approach tries to connect policy making and environmentalist issues through the dominant paradigm of economy. Thus, it aims to adapt the value of ecosystems within the "power of economic reasoning" (Ibid.) and explicitly aims for the policy use of environmental valuations. Yet, despite of working within the current dominant economic paradigm, they do not stand for free market fundamentalism (TEEB, 2010:xix).

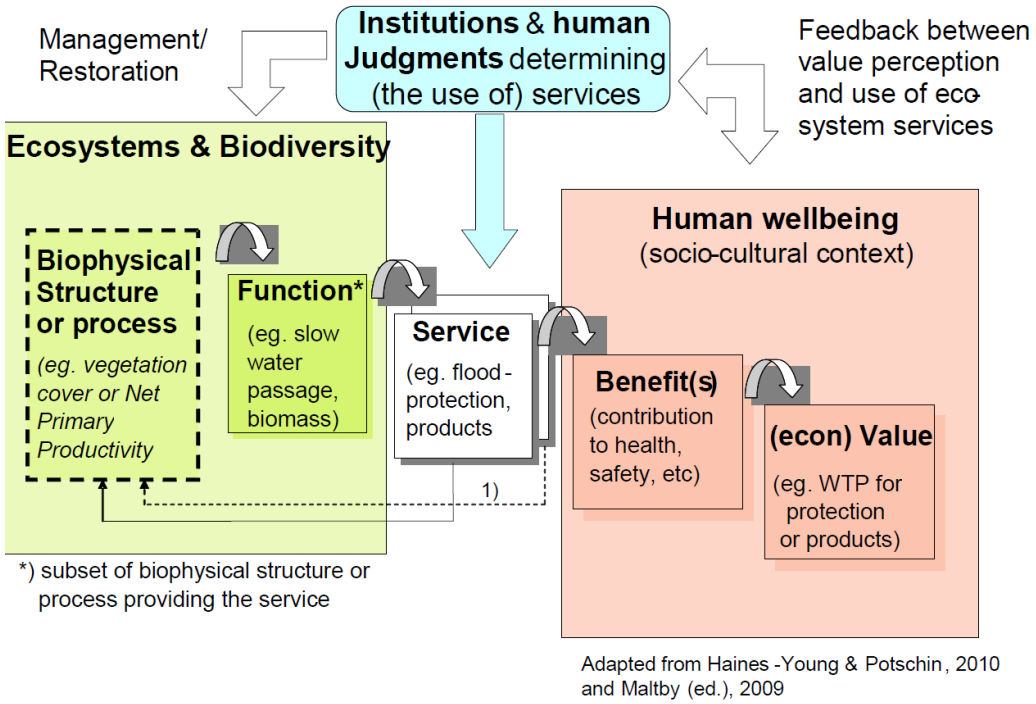
The benefits of ecosystems and biodiversity are termed as natural capital. They are measured by including the cost of its loss and protection failures versus the costs of conservation (Σ cost of loss; cost of protection – Σ cost of conversion; TEEB, 2010:iii;xxiii). The measurements of ecosystem services include firstly a cost-benefit assessment of conserving an ecosystem. It thereby *recognizes* all ecosystems and non-market values involved. These values are then used as a tool to guide the *translation of knowledge* into incentives and to *demonstrate* this knowledge through monetary terms. This is done by assessing the consequences of a land-cover or land-use change and by giving a realistic calculation of the trade-offs of exploitation and conservation (Ibid.). This calculation includes a broad time span, to incorporate future

[8] Termed by Schumpeter in 1937

generations (intergenerational equity; WCED, 1987). Furthermore, it includes local, as well as global scale assessments (intragenerational equity; Breshears et al., 2010; TEEB, 2010:xxiii). The TEEB sees it as important to acknowledge current uncertainties within the measurement of ecosystem services, as well as within valuation and aggregation of values (TEEB, 2010:22;xxiv). The last step is to *capture* the value through incentives and price adjustments on a legally binding sphere (Ibid.). The purpose of the approach is to provide more and better data to understand the economic significance of losses and inaction for ecosystems, biodiversity and human well-being.

The figure below shows the original illustration of TEEBs conceptual framework and its proceedings from ecosystem function and processes to an economic value.

Figure 3.1.1 Pathway from ecosystem structure and processes to human well-being



Source: TEEB, 2010:17

If one compares figure 3.1.1 with 2.4.1 above, one important difference can be seen. Instead of using all three different value categorizations (ecologic, socio-cultural and economic values), TEEB uses the economic value of the environment as a representation of the whole socio-cultural context. Ecological and socio-cultural values are integrated under economical values and do not stand for themselves. These constrain the value assessment.

Uncertainty is a strong issue within the TEEB framework and there are different levels which have to be acknowledged. The TEEB stresses that uncertainty within ecosystem service valuations have to be addressed and handled with transparency. Ecosystem resilience or thresholds,

as well as invisibilities of interconnections between functions of the system are by nature highly uncertain (Breshears et al, 2010). This hinders a realistic valuation. In consequence, while presenting the results, it is necessary to remind decision-makers that specific uncertainties are included within the study and that the outcome can only be an estimate.
Spatial explicitness is one precondition to tackle uncertainty and to enable a sound analysis. Further, the TEEB works within the precautionary principle to recognize future risks and its values. Moreover, the valuation is based on marginal values to include issues of resilience and the possible crossing of ecosystem thresholds.

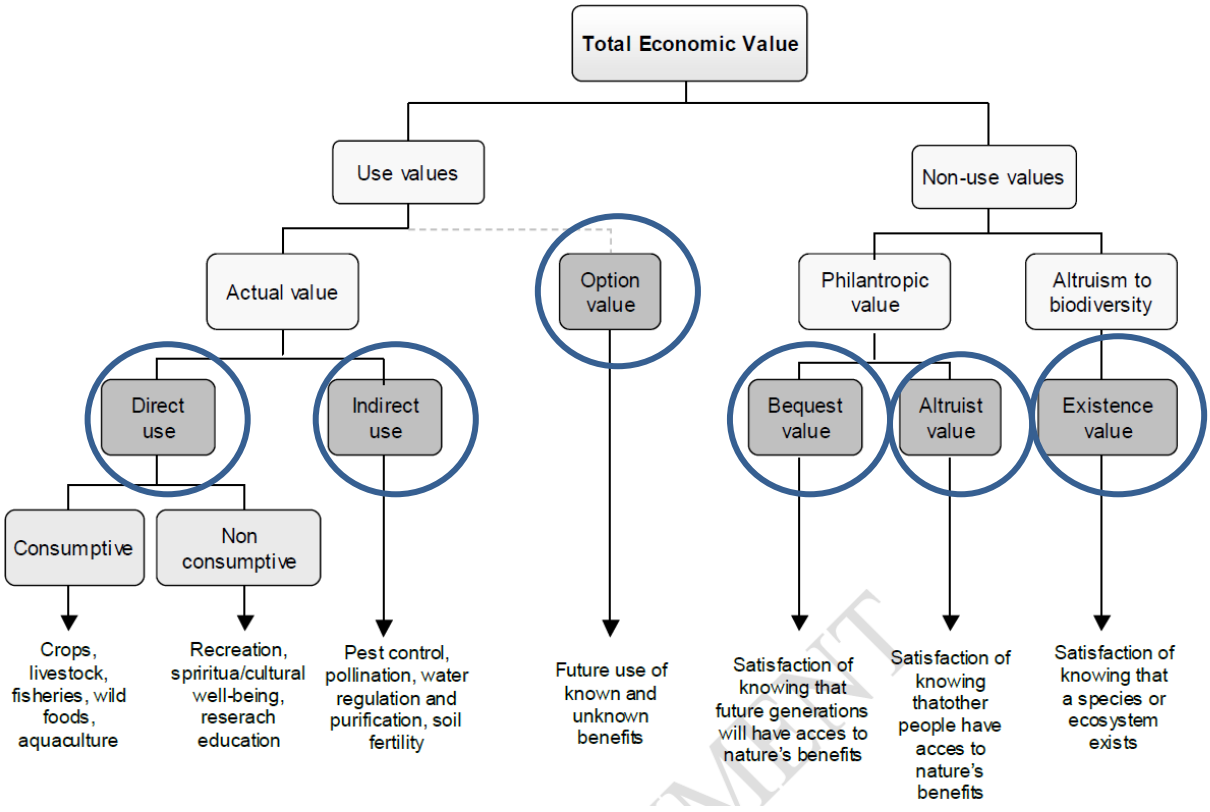
Generally, the authors of the TEEB approach are highly reflective on its own use of theoretical concepts and implications, as well as methods used. This is shown in the fact that the authors acknowledge an existing risk for misuse. They thereupon postulate that the purpose of the study must guide the valuation. A wrong purpose could have reverse effects on achieving sustainability (TEEB, 2010:xxiv). Consequently, the TEEB shall only be used for informing and alerting the public and decision-makers on the destructive behavior and to minimize trade-offs. Here it is worthwhile quoting TEEB at length. They clearly state that *"any valuation of biodiversity and ecosystem services needs to take account of the range of ecological and socio-cultural values that are not covered by economic valuation, but need different approaches and methodologies to be reflected into decision making"* (EPA- SAB, 2009 quoted in TEEB, 2010:16). The TEEB knows about its theoretical and methodological flaws, nevertheless it is stated that this approach is the only alternative. There is no other option equally accurate than TEEB. It is the best possible approach, at least in present times (Ibid.)
This postulate will be explored through a close examination of their methodology and way of working.

3.2. Modus Operandi

With the theoretical implications above in mind, the TEEB aims to include a broad range of indirect and direct economic values. It claims ability to be used in the decision-making of land-use alternatives and exploitations. TEEB's main focus lies upon economic values and an assessment of cost and benefits in welfare economics. Ecological values, such as seen in table 2.4.2, are excluded from economic valuation as they are too indirect and complex to measure, despite their importance for human survival. The only values included in the TEEB for ecology are intrinsic values (see below). Socio-cultural values such as non-material well-being cannot fully be captured by economic valuation.

As a result of these value restrictions, economic values are the main concentration and contribute to different elements of a total economic value. The graph below is the original presentation of these values within the TEEB framework.

Figure 3.2.1 Value types within the TEV approach



Source: TEEB, 2010:195, own highlights

The most important values are direct use and indirect use values, option value and the three non-use values of bequest, altruistic and existence value which are often counted together.

The TEEB is very specific in how to be used. Additional to the theoretical discussion on uncertainty and purpose, it gives a step by step discussion on its usage. I have given this guidance in section 2.4 and will now specify TEEBs differences.

TEEB acknowledges 22 ecosystem services within four different categories (provisioning, regulating, habitat and cultural services). These differ from previous studies and are shown in table 3.2.2 below. The table below is also compilation of the specific economic methods and techniques used according to these values and ecosystem services.

Thus, the table shows clearly the practical framework discussed beforehand.

Table 3.2.2 Detailed Ecosystem Services and Values combined with possible applicable Methods from TEEB

Services	Use Values		Non-use Values			
Groups and Services	**Direct Use Values**	**Indirect use values**	**Option value**	**Bequest value**	**Altruistic Value**	**Existence Value**
Provisioning Services						
1. Food	Contingent rating, Contingent Valuation Method , Factor income	NA	Contingent Valuation Method	NA	NA	NA
2. Water	Public investment, Replacement/ Restoration cost	NA	Restoration Cost	NA	NA	NA
3. Raw Materials	Contingent Valuation Method, Contingent ranking, Factor income	NA	Restoration Cost	NA	NA	NA
4. Genetic resources	Participatory valuation	NA	?	NA	NA	NA
5. Medicinal resources	Participatory valuation	NA	Restoration Cost	NA	NA	NA
6. Ornamental resource species	Participatory valuation Conversion Cost	NA	?	NA	NA	NA
Regulating Services						
7. Air quality regulation	NA	Market price/ Avoided cost, Replacement cost	?	NA	NA?	NA?
8. Climate regulation	NA	Participatory Valuation, Avoided Cost	?	NA	NA?	NA?
9. Moderation of extreme events	NA	Contingent Valuation Method , Participatory Valuations	?	NA	NA?	NA?
10.Regulation of Water flows	NA	Choice Modeling, Avoided/Restoration Cost	Payment for Ecosystem Services	NA?	NA?	NA?
11. Waste Treatment	NA	Avoided/Restoration/Replacement Cost	?	NA	NA?	NA?
12. Erosion prevention	NA	Contingent Valuation Method	?	NA	NA?	NA?
13.Maintenance of soil fertility and nutrient cycling	NA	CVM, choice modeling	?	NA	NA?	NA?
14. Pollination	NA	Factor income, Replacement Cost	?	NA	NA?	NA?
15. Biological Control	NA	Damage/Replacement Cost	Option Value	NA?	NA?	NA?
Habitat Service						
16.Maintenance of life cycle migratory species	Choice Modeling	?	Replacement Cost	Choice Modeling	Choice Modeling	Choice Modeling
17.Maintenance of Genetic Diversity	Public Investment	Choice Modeling, Replacement Cost	Replacement Cost	Contingent Valuation Method	Contingent Valuation Method	Contingent Valuation Method
Cultural Services						
18. Aesthetic Information	Circe Modeling, Hedonic pricing	NA	?	?	?	?
19. Opportunities for recreation and Tourism	Choice Modeling, Contingent Valuation Method, Travel Cost Method	NA	Option Value, Expenditure on Wilderness	Choice Modeling	Contingent Valuation Method	?
20. Inspiration for culture, art and design	Travel Cost Method	NA?	?	?	?	?
21. Spiritual experience	Contingent Valuation Method, Travel Cost Method	?	?	Contingent Rating	Contingent Valuation Method, Choice Modeling	Deliberative monetary valuation
22. Information for cognitive development	Total Economic Value, Benefit Transfer	Total Economic Value, Benefit Transfer	Total Economic Value, Benefit Transfer	Total Economic Value Benefit Transfer	Total Economic Value, Benefit Transfer	Total Economic Value, Benefit Transfer

NA: Not Applicable NA?: Not applicable for all? ?: No Sources; not tried yet Source: own compilation, TEEB, 2010:325-357

The table above serves this section twofold. First, the specifications of ecosystem services used by the TEEB are shown. In section 2.4 the overarching categories of ecosystem services are explained. Second, this table provides information on which methods have been and are possible to use and for which value. Further, it shows that some values lack assessment and methods are not applicable for all (marked as NA). As this table clearly illustrates, environmental valuation has not yet been applied for every value (marked as ?) and further research needs to be done to give comprehensive information.

3.3. Summary: TEEB's Theoretical Problems

As a concluding remark of the first and theoretical part of my master thesis, I now give a short repetition of the theoretical flaws and limitation of the TEEB approach.

TEEB is a framework ordered by international politics with the aim of mainstreaming valuation of ecosystem and biodiversity. This aspect has always to be born in mind to understand whom the TEEB addresses. Consequently, it tries to act as a "neutral" scientific approach within a neo-liberal and post-positivistic framework. Yet, as I analyzed before, the problems which the TEEB tries to tackle are value laden and wicked. The TEEB tries to avoid this containing emotions and different worldviews, which are inherent in sustainability, by claiming scientific neutrality. In my point of view, the TEEB wants to solve wicked problems with tornado politics.

As discussed previously, sustainability has different definitions according to various schools of thoughts. On the one hand, there is sustainability which focuses on the environment and where growth is contested. On the other hand, sustainability is more connected to development and implies a redirection of growth. In exploring the different theoretical stances on sustainability, the previous section gives the tools at hand to examine TEEBs inherited understanding.

Often connected to these different viewpoints are notions about weak and strong sustainability. Strong sustainability stands for the separation of natural and human-made capital and implies an incommensurability of values. Thereupon, sustainability is reached if natural capital does not decline. To put simply it means zero depletion of nature. Weak sustainability, in contrast, calculates natural and human-made capital together. In consequence this means that depleted natural capital can be compensated with technology. Weak sustainability is achieved when the total capital is not declining. Within this approach, values are commensurable.

With this in mind, TEEB gives the implication that by measuring monetary values of certain

ecosystem their value can be easily compared. Whereas the TEEB states explicitly that it does not stand for general tradability of assets, I assume from their writings that they have a rather weak notion of sustainability. What is more, if the monetary value is lower than short-term economic benefits, ecosystems can be compensated with man-made services.
Pricing nature is ethically difficult. Even though this difficulty is acknowledged by TEEB, it nonetheless advises to use it. The value of nature and how far it should be transitioned into monetary terms is a highly contested matter.
To give a better picture and to explain TEEBs perspective I will concentrate in the following on the debate for and against monetary valuation.

3.3.1. Values of Nature

In the following paragraphs I debate valuing nature in monetary terms. For this, I first give arguments counter valuation and sequencing state advantages and possible compromises.

Strong counter-arguments for an economic valuation of nature are concerned with equity. A cost-benefit analysis (CBA) of nature would place a value on the interest of people in proportion to their wealth. The more the people are able and willing to spend for ecosystems, the more value it has. Hence, environmental valuation methods (such as contingent valuation, section 4.1.1) inherit that environments have greater value for the rich than for the poor (Dresner, 2007:110-113). Yet, as I have clearly shown in section 2.3., it is especially the poorer population which is more dependent on ecosystem services. Hence, the value of nature should be higher.
This problem is accelerated through the fact that the economical methods used are problematic. TEEB itself discusses flaws and failures of the most used methods within its framework. Daily (2000) describes that a cost-benefit analysis cannot reflect the full social cost of production as most goods are not traded. Revealed preference methods, for example, are not relevant in setting values on existing assets. Further, methods for avoided cost calculations are only partially useful and have a lower bound indication of values. Also, contingent valuations are notoriously unreliable, so Daily, especially in issues where the public is unfamiliar with and individual preferences are highly dependent on the institutional context and knowledge instead of the value as such. Pricing nature can therefore not guarantee equity (Dresner, 2007:113).
Apart from the above mentioned criticism, Daly (1990 quoted in Dresner, 2007:109f) states that "such a calculation involves so many guesstimates, uncertainties, and arbitrary assump-

tion that it is […] too nonmarginal, too systemic and pervasive for prices to mean anything". Cost-benefit "analysis are methodological incongruous" (Martínez-Alier, 2002:27) and weak comparability is preferred rather than multi-criteria decision aids.

As a consequence, the methods are not able to deal with the concept of sustainability (Dresner, 2007:112), and include an ethical decision of values. Dresner (Ibid.) distinguishes levels of environment within cost-benefits analysis which range between equity (or fairness) on one end of the scale and utility (or happiness defined as a maximum increase today) on the other. According to the level of environment within cost-benefit analysis, the outcome will differ. Future generations or nature without a use value might stand in opposition to the greatest number of goods for the greatest number of people. The TEEB framework tried to involve these aspects, but as they state: the purpose guides the valuation and misuse of the approach is easy. There is no guarantee that the approach might not misguide decision-makers.

Another argument against valuation is made by Martínez-Alier (2002:9). He states that the environmentalist movement is "run over" by economist. Subsequently, intrinsic or non-market values are left aside (Dresner, 2007:111f). A monetary presentation of ecosystems and biodiversity does not guarantee an adequate representation (Martínez-Alier, 2011a). Hence, it must be asked, who has the power to simplify the complexity of nature and to impose a particular standard and procedure of valuation on others (Kosoy and Corbera, 2010). The power of imposing a decision and a certain commensuration of value has to be seen critically. Martínez-Alier claims that usually the visibility of money implies the invisibility of other issues (2011b). Despite TEEBs respect for important values outside monetary valuations, it is stated that economics are the most convincing world language. Yet, by using the dominant system, power relations of mainstream economics are strengthened. Using the language of economy silences other voices: such as ecosystem dependent communities, indigenous or nature itself. By using a cost-benefit approach, multi-criteria and pluralist approaches are neglected and disempowered. Even though TEEB states that exactly these perspectives are the most comprehensive, they claim that they cannot be translated into economic value. Hence, Martínez-Alier advocates an "orchestration of science", "methodological pluralism" and transdisciplinarity (Ibid.).

These considerations critically frame conflicts over valuations (techniques). Yet, the task might be difficult yet not impossible. Many authors state clearly their skepticism over environmental valuation but they also see the usefulness within the approach.

It is claimed that the internalization of externalities is useful to stimulate a debate of environ-

mental aspects in economics and to take nature into account. TEEB aims to mainstream the inclusion of ecosystems and biodiversity into the central area of policy – which in modern terms is economy (Dresner, 2007:63). That economics are a dominant and pervasive language in present times seems to be the underlying perception of many scholars (e.g. Ibid; Daily 2000; Jackson 2011). And in fact, short-term benefits engender more action than long-term consideration. Especially northern countries seem to act only if they expect economic loss (Dresner, 2007:63; Jackson, 2011). Ecosystem services are mainly seen as free gifts and over-use is one severe consequence (Dresner, 2007:114-115). This state of resource management is unbearable for many concerned parties and hence pragmatic, immediate changes are one option for fast action.

Maybe economic valuation is not perfect, yet could be the best possible methods in present times. Waiting for moral changes will simply take too long. Scientists have been calling for action for decades (IPCC, WCED) but only the Stern review made a huge political impact (Jackson, 2011) and could indicate that money does talk louder than moral. This would lead to the conclusion that the language of economy should also be spoken by environmentalists and used for their matters.

Considering all stated critique, I argue that environmental valuation can only be one way of organizing information to guide and help decision-makers. It is definitively no solution or end in itself (Daily, 2000). TEEB is one tool in a much larger field of decision-making. Yet, it could be used together with financial instruments and institutional arrangement to allow individuals to capture value assets (Ibid.). Especially between people living at the same time and with similar income environmental valuation could be good indicator for strength of preferences (Dresner, 2007:63f) and help to prioritize in decision-making.

If these conditions are held, valuation can lead to profoundly favorable effects (Daily, 2000). It can lead to greater self-reflection to rethink the relationship between humans and nature and to a raise of awareness of man-made influence and its consequences (Dresner, 2007:63f). In the view of this stance, the benefits for an economic valuation outweigh their costs.

As a compromise, I consider it as advisable to use environmental valuation as one criterion within a multi-criteria analysis (MCA). Within this method, environmental valuation with its flaws and problems can act as one benchmark within a broader framework of a qualitative and quantitative compilation. Advantage hereby is that, according to the accuracy of valuation results, certain weighting can be given to the value (Department for Communities and Local Government, 2009:17). Therewith, when the results of environmental valuation are not consi-

dered as robust, it can have a lower weighting within a broader coverage of information. These might give decision-makers an "honest-broker" approach (Jasanoff, 2007) towards the pluralism of value.

The following second part of the thesis will apply the discussed TEEB framework in a specific way onto a climate change adaptation project in Falsterbo-Skanör Vellinge

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4. Empirical Analysis: Application of the TEEB on Falsterbo-Skanörs' Climate Change Adaptation

> *"There is a need to find a way to prioritise among national interests. […] because there are no scientific criteria or well-established procedures to establish priorities" SECOA, 2011a:28*

TEEB is a framework for environmental valuation. It ought to guide policy options and help to make decisions. I opened this paper by critically discussing the theoretical background of TEEB and proceed now by testing the TEEB on a practical level. For this, I chose Falsterbo-Skanör Vellinge as a study site, as it is a unique example for adaptation planning for climate change in present times. To assess the applicability of the TEEB on a specific and spatial explicit climate change project, the environmental valuation technique of contingent valuation has been selected. Economic valuation is seldom discussed as decision-making tool for local climate change and vice versa researchers concerned with climate change adaptation do rarely exert an economic valuation. The thesis at hand connects these two fields of study and uses an economic method within a locally specific climate change adaptation project on an unparalleled study site.

This second, empirical, part of my thesis is structured as followed: Firstly the choice of method is explained (4.1. Methodological Discussion: Choice of Method). After this discussion I turn to the study site. For this Falsterbo-Skanör in Vellinge will be analyzed (4.2. Falsterbo Skanör Vellinge). I will then proceed by describing Falsterbo-Skanörs climate change adaptation project (4.3. Climate Change in Falsterbo Skanör). I then proceed by describing the data collection of my two questionnaires (4.4. Empirical Data Collection) and discussing their findings (4.5. Findings). This second part of the thesis at hand concludes with a summarized section of the TEEBs Practical Problems (4.6.).

4.1. Methodological Discussion: Choice of Method

The TEEB approach is not bounded to one specific method. It includes a wide range of methods and techniques within revealed and stated preference methods. To give a broader picture I will illustrate a selection of methods used by TEEB.

To put simply, economic valuation can be distinguished into revealed and stated preference methods. Revealed preferences examine consumer behavior through their purchasing habit. This includes analyzing change in house pricing, travel costs or hedonic pricing. In contrast, stated preference methods are based on the direct valuation of a willingness to pay (WTP) or willingness to accept (WTA) certain costs (table 4.1.1).

Another method stated by the TEEB is called 'benefit transfer'. It is used to estimate economic values for ecosystem services by transferring available information from already completed studies in another location. This technique is often used when it is too expensive and too time consuming to conduct an original valuation study (Pearce, 2006; ecosystemvaluation.org, 2011). In my point of view this method has major flaws, as it is difficult to find comparable study sites.

The table below gives a short overview of some methods used within the TEEB and how they are used.

Table 4.1.1 Revealed and Stated Preference Methods

Method	Revealed Preferences	Stated Preferences
Direct (actual observable choices)	**Market Price:** prevailing prices for goods and services traded in markets: prices paid for fish, wood products etc	**Contingent Valuation:** surveys are used to ask people how much they would be willing to spend for environmental amenities
	Productivity Methods: estimate changes in net income if natural resources are used in production process: improved reservoir water quality may decrease treatment costs and/or increase productivity for a firm using water supplies)	**Conjoint Analysis/ Choice Experiments:** surveys to ask people to state a preference between one group of environmental amenities (with a given cost) and another set of environmental amenities (with a different cost)
	Travel Costs: estimates value of recreation benefits based upon consumer's expenditures to visit a site: recreation surveys to determine distance traveled and related expenses	
Indirect (actual behavior)	**Hedonic Property Values/ Hedonic Pricing:** estimates the value of environmental amenities that affect the prices of other goods: homes located next to parks or open spaces can have higher property values	**Contingent Rating:** respondent is presented with a choice set consisting of three or more alter-natives, which the respondent is asked to rank from the most preferred to the least preferred alternative
	Avoided damage cost, Replacement cost: estimate values based on either the costs of avoiding damages due to lost services, the cost of replacing ecosystem services, or the cost of providing substitute services	

Source: http://www.ecosystemvaluation.org; TEEB, 2010; Pearce, 2006

With this overview in mind, the following section will explain my choice of method and explore the positive and negative traits of a contingent valuation.

4.1.1. Contingent Valuation Method

Contingent valuation (CVM) is a method within the quantitative research strategy. Its main purpose is to collect numerical data with a deductive theoretical approach (cf. Bryman, 2008:140). Before explaining this technique in detail, I will describe its theoretical background: Quantitative research has their roots within a positivist paradigm (Bernard, 1994:258)

and originated from natural science. Thus, it shifted and adapted natural science research into the field of social science. It therefore has an objectivist conception of social reality which separates the researcher from his research (Bryman, 2008:13; Smith and Owens, 2008:178; Creswell, 2009:6ff). Results from quantitative studies have to have high reliability (Creswell, 2009:214). The empirical material gathered should have an inner consistence and should be replicable and repeatable (Bryman, 2008:153f). Yet, to fulfill the premises of high quality the results have also to be valid. Validity refers to the accuracy and integrity of the conclusions drawn from the data (ibid:151ff). This premise is seen as of higher quality as reliability because a result can be reliable but not valid. Yet, a valid result is always reliable.
Depending on the sample size, its representative and its selection, generalizability can be achieved. Statistical calculations (confidence interval, significance) measure in how far the results can be generalized (de Vaus, 2001:237; Diekmann, 2008:704ff).

Contingent valuation (CVM) is a stated preference method of environmental valuation.
Within environmental valuation stated preference methods are clearly used the most often (Sundberg and Söderqvist, 2004a, 2004b:13; NEV Database, 2007) and widely accepted. Contingent valuation is here the preferred valuation technique. In a meta-study of 170 environmental valuations 82% of all stated preference studies used contingent valuation. The astonishing majority of this technique is explained through its convenient handling and the broad available literature.
CVM is a monetary valuation technique and is hence working within the cost- benefit analysis (CBA). Cost- benefit analysis examines the economic efficiency of certain actions or personal preferences. Efficiency is reached when marginal costs and marginal benefits equal. Put simply, it means that the total benefits have to surpass the total costs by the largest amount possible (Ahmed, 2006:3). Within a CBA, one first specifies the policy project which ought to be evaluated. Following, the effects which might lead to costs or benefits of the project are quantified and, in a further step, a present value of these costs and benefits is estimated. In a last step, costs and benefits of the project are compared and a net social benefit is calculated (Net social benefit = benefits – costs). This idea stands behind the contingent valuation (Perman, 2003; Pearce, 2006).
The contingent valuation is used to estimate economic environmental values through a survey. Within a CVM people are directly asked for their willingness to pay (WTP) to restore or preserve an environmental service. The survey is usually based on a hypothetical scenario

(Ahmed, 2006:9). Less often willingness to accept (WTA) is used to measure the costs, mostly of restoration.

CVM can be used to assess all sorts of use and non-use values and is rather convenient to create (through e-mail or mail survey, personal interviews). Further, it is usable for ex-post and ex-ante evaluations (Freeman, 2003; Adger et al, 2005). Justification of CVM studies equal the ones I discussed above for TEEB. Within economic reasoning it is said that priceless means zero price. It is stated that CVM is the 'best guess' individuals can have for their own willingness to pay for natures services. "Some number is better than no number" (in Diamond, 1994) seems to be a convincing argument. TEEB backs this by arguing that monetary valuation can give estimates to policy makers, who might have decided differently without this information. Table 3.2.2 above shows that CVM is an often used technique for TEEB.

Yet, the critique for this popular method is high. As said, quantitative studies have to have a high reliability and validity. The CVM is said to lack both too much to give an appropriate value (e.g. Adger et al, 2005). For example, the survey cannot possibly include all necessary information to give the interviewee a good understanding of the ecosystems assessed. Thus, CVM relies heavily on existing knowledge, which affects the validity of the study. Also, it is criticized that the survey does not measure the preferences it attempts to (NOAA, 1993; Pearce, 2006), because interviewees are often overwhelmed by giving a prize to environmental services. The CVM asks for their specific and personal amount of money they would be willing to pay (mostly yearly) for preserving a certain environmental good or service. Yet, analyses have shown that, instead of valuing the personal worth of the service, persons tend to think about organizational factors such as the cost of a preservation project or equal shares among all households (Diamond, 1994).

Further, CVM answers often dependent on the order of the survey. Values given may vary by order, as coming values are related to the starting one (Ibid; Freemann, 2003).

Other impacts on the reliability of the survey are the interconnected "embedding effect" and the effect of "warm glow". The embedding effect states that the amount of money attached to ecosystem services do not vary with their quantity. As an example, the preservation of an area with 100 birds might be valued as being worth 50€ each year. Yet, the preservation of an area which saves 10 000 birds is valued equally. This phenomenon is said to be due to the "warm glow" effect. "Warm glow" describes the positive feeling of giving, or rather of doing something which is considered to be good. Donating money to an organization could be compared with this effect. Consequently, it shows that the monetary valued named is not always con-

nected to the environmental service in question, but to the general feeling of *something should be done* (NOAA, 1993; Diamond, 1994).

Additionally, CVM is dependent on the personal budget. The money spendable (especially yearly) is always a small amount of the available income. Low, non-existing or unstable income will affect the monetary value attached to ecosystems within CVM surveys. I have, however, explained above (section 2.3.) that especially the poorer population is dependent on ecosystem services. Yet, the monetary value in these cases would decrease with rising non-monetary value (Diamond, 1994; Adger et al, 2005). Overall, cost- benefit analysis implies a commensurability of values and makes compensations for degradations possible. Furthermore, the monetary values are aggregated as if they would have the same value. Yet, a certain amount for one person could be of higher value than the same amount for another (Adger et al, 2005).

The discussion above shows the many different problems which cover the CVM. Nevertheless and despite of all the flaws, the CVM is one of the most popular environmental valuation technique. To increase the reliability and validity of the CVM either, a small amount of expert interviews is preferred (e.g. Diamond, 1994) or the sample size is heightened. The latter increases time and cost factors (Adger et al, 2005), whereas the former lacks generalizability.

The empirical analysis of this thesis discusses the background data for an economical valuation. Through detailed examination of Falsterbo-Skanör's ecosystems and services, I show that including all necessary values, ecosystem services and information into a CVM questionnaire is a difficult task.

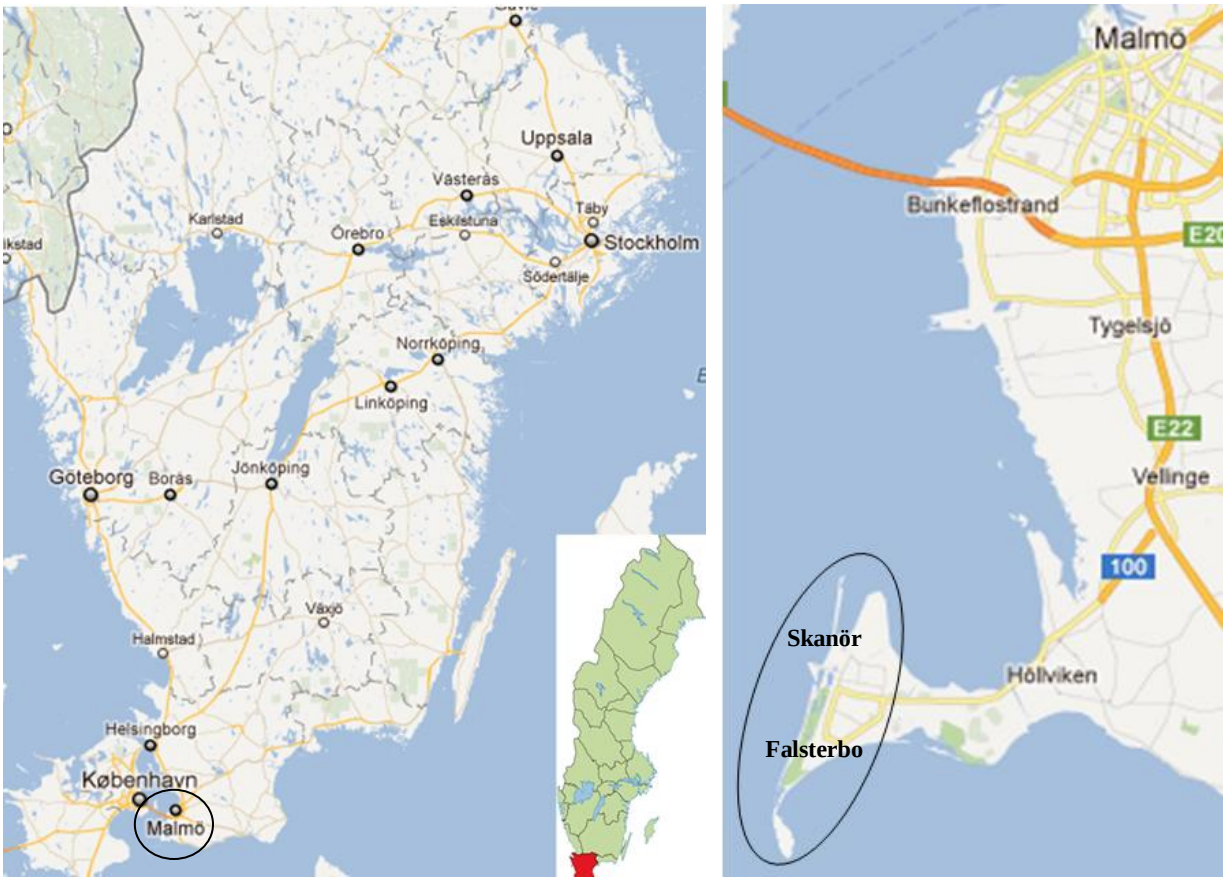
4.2. Study Site: Falsterbo-Skanör Vellinge

The study site chosen for my thesis is Falsterbo-Skanör in the municipality of Vellinge. Falsterbo-Skanörs ecosystems have been the object of many studies (e.g. Bentz, 2009; Naturskyddsföreningen, 2010; SECOA, 2011a;) and these give the background to disassemble the TEEB framework to its smallest part: an economic valuation study.

Falsterbo-Skanör are twin towns and located at the tip of the Falsterbo peninsula in south-west Sweden (map 4.2.1). It has a land area of 542 hectare (2010) with a population of 6 937 (2010). The number of inhabitants per square kilometer is 1 280 (SCB, 2011). With an average yearly income of 312 600kr (in 2009 - ca. 35 000€; SCB, 2011), Vellinge is one of the richest municipalities in Scania and is ranked under the 16 richest regions in Sweden. This is due mainly to the high mean income (Ibid; SECOA, 2011a).

The figure below shows the location of Scania and Vellinge, as well as Falsterbo-Skanör at the tip of the Falsterbo peninsula.

Figure 4.2.1 Southern Sweden (Scania region marked); Falsterbo Peninsula (Falsterbo-Skanör marked)



Source: Google Maps, 2011; Wikipedia, 2011

Most of the coastal area in Falsterbo-Skanör consists of shallow water and the territory bears plenty of grazing and heather land. The coast-line is mainly made of sandy beaches and dunes. The low-lying peninsula is prone for flooding and in risk of being severely affected by climate change (SECOA, 2011a).

Therefore, Falsterbo-Skanör recently is researched by the international and interdisciplinary EU project SECOA (Solutions for Environmental Contrast in Coastal Areas). The project studies coastal zone management in various countries and seeks to contribute to the creation of knowledge in terms of institutional development and conflict mitigation, as well as the improvement of resource management. The Gothenburg University (Department of Global Studies, Section Human Ecology) is the Swedish partner of the SECOA project. In an analysis of Falsterbo-Skanör's natural resource-use within a DPSIR (Driving forces- Pressure- States- Impacts- Response) analysis, SECOA came to the conclusion that the region is an interesting example of climate change adaptation related conflicts in present communal planning and hence can be used as a future preview and learning site (SECOA, 2011a).

Falsterbo-Skanörs ecosystems are diverse and well preserved. One major ecosystem services in Falsterbo-Skanör is recreation, such as beaches, though not all of them are public and touristic sites. Additionally, the sublitoral sandbanks provide a habitat for marine species and often include eel-grass meadows which bear a high biodiversity and nurturing value. Grasslands, drift lines and small forested sections characterize the area and are sometimes used as grazing areas. Also, cutting of meadows maintains the cultural landscape and biodiversity. The biodiversity in the lagoon, humid slacks, salt marches and all kinds of dunes is comparable high (Bentz, 2009; SECOA, 2011a).

The ecosystems analyzed here are ecologically well mapped. Thus, I will use the existing categorization to be able to utilize them for my purpose (figure 4.3.2, Bentz, 2009; SECOA, 2011a). The categorizations are based on EU Natura 2000 classifications for habitat types.

Figure 4.2.2 shows the areas under analysis, marked through different colors. The satellite picture also enables the reader to get a visual impression of the landscape in discussion.

Figure 4.2.2 Ecosystems on the outer Falsterbo peninsula

Source: adapted from SECOA, 2011a, Google maps, 2011

4.2.1. Ecosystem Services in the Falsterbo-Skanör Area

In the following part, I concentrate on the description of the ecosystem services included within these areas. This illustration is neither comprehensive nor covers all ecosystems in their great detail. The specific ecologic conceptions of potential relationships and an analysis

of their components in precise detail would go beyond the frame of this paper. Yet, it is of uttermost importance to understand the composition of ecosystems. As some description reach beyond common ecological knowledge the information box below explains selected natural habitats and is included (table 4.2.1.1).

Information Box for Natural Habitats

Table 4.2.1.1 Information to natural habitat areas (EU natural habitat types)

Habitat Types	Description	Ecosystem Service
Sublitoral sandbanks	Slightly and constantly covered by sea water, Few hard bottom (reef) areas in connection with singular smaller or larger rocks or constructions	Biodiversity (nurturing service etc)
Mudflats/ Sandflats	Not covered by seawater at low tide, shallow, sandy, muddy often free from macro vegetation but with cyanobacteria and diatoms	Recreation
Drift lines	Annual vegetation of drift lines, Sodium rich drift areas, annual vegetation	Water treatment
Salicornia	Colonizing mud- and sandbanks, contain salt deposits	Recreation
Salt marshes	Marshy meadows, salinity over 1.5%, partially grazed	Cultural landscape through grazing, water treatment
Embryonic shifting dunes	Early stage of dunes: deposited by waves and transported by wind	Recreationally used beach area
Grey dunes	Fixed coastal dunes, herbaceous vegetation, stable	Recreation, coastal protection (mitigation of extreme events)
Dunes with Empetrum	Stable coastal dunes, acidified due to loss of minerals, covered with low or creeping hard vegetation	Recreation, coastal protection (mitigation of extreme events)
Humid dunes slacks	Humid slacks within the dune system caused by erosion	Biodiversity
Dry Grassland	Dry, acidic substrate	Biodiversity (regular grazing necessary)

Source: own analysis, SECOA, 2011a

In terms of value, the TEEB is clear about which ecosystem services exists and can be valued. I therefore use its classifications. Falsterbo-Skanörs ecosystem services and values can be categorized into eighteen classes with different significance covering provisioning, regulating, habitat and cultural services (table 4.2.1.2).

The table below shows the ecosystem service classification of TEEB, the land areas which bear these services and how they are provided.

Table 4.2.1.2 Ecosystem Services by land area of the outer Falsterbo peninsula

Ecosystem Services	Land Area (Based on figure 4.2.2)	Provided through
Provisioning Services		
1. Food	All	Small scale fishing Insignificant
3. Raw Materials	A, D	Hay, Wood, fiber; Insignificant
4. Genetic resources	All	High Biodiversity
6. Ornamental resource species	A, B, C, D	Shells, Lichen, Moss, Driftwood
Regulating Services		
7. Air quality regulation	A, B, C, D	Good Air Quality
9. Moderation of extreme events	A, B, C, D	Sublitoral sandbanks, dunes, mud-flats, grasslands and forested parts
11. Waste Treatment	A, B, C, D	Vegetation
12. Erosion prevention	A, B, C, D	Sublitoral sandbanks, dunes, mud-flats, grasslands and forested parts
13.Maintenance of soil fertility and nutrient cycling	A, B, C, D	Vegetation
14. Pollination	D	Heath meadows
15. Biological Control	A, B, C, D	All Flora and Fauna
Habitat Service		
16.Maintenance of life cycle migratory species	A, B, C, D	High Biodiversity, shelter for migratory birds
17.Maintenance of Genetic Diversity	A, B, C, D	High Biodiversity
Cultural Services		
18. Aesthetic Information	All	Various beaches, historical sites, landscape, biodiversity etc
19. Opportunities for recreation and Tourism	A, B, C, D, E	See above
20. Inspiration for culture, art and design	All	See above
21. Spiritual experience	All	See above
22. Information for cognitive development (education and science)	All	See above

Source: own compilation: TEEB, 2010; SECOA, 2011a; Bentz, 2009

Within the *provisioning services* only two categories deem possibly significant. Genetic resources are mainly option or non-use values as they offer future benefits (4)[9]. Also ornamental resource species (6), such as shells, lichens, moss or driftwood are some examples which are used in artisan work and as decorations (MA, 2005)

Regulating services contain with eight services the highest amount of ecosystem services provided in Falsterbo-Skanör. Firstly to name is the provisioning of good air. Ecosystems extract and release chemicals which influence and regulate the air quality (7). As the air quality in Falsterbo-Skanör is considerably good, regulation of air quality can be seen as a positive service provided by its ecosystems (Ibid; SECOA, 2011a).

[9] The numbers behind the service indicates the TEEB classification number as seen in table 3.2.2

The onshore ecosystems of Falsterbo-Skanör consist to a great extent of sublitoral sandbanks, dunes in all stages and mudflats. Together with grasslands and forested parts, these traits provide a moderation of extreme events, such as flooding and storm protection (9). Through its water storage capacity, the ecosystems provide a buffer zone against a rising sea-level and harsh winds coming from the seaside and show a significant impact in terms of the timing and runoff of flooding. Further, the same sites provide the regulating service of erosion prevention (12). Erosion is a problematic issue in Falsterbo-Skanör, due to natural and man-made induced processes. Grasslands and other planted areas, as well as dunes help for soil retention and the prevention of landslides (SWECO, 2011).

The maintenance of soil fertility and nutrient cycling also play an important role within the ecosystem services in Falsterbo-Skanör (13). Another service worth noting is waste treatment in terms of water purification, pollution control and detoxification (11). The above named plants and ecosystems help to filter out and decompose organic wastes, which are introduced to the system.

Other regulating services of the ecosystems are pollination and biological control (14,15). The composition of ecosystem affects the distribution, abundance and effectiveness of pollinators. Moreover, ecosystems regulate the prevalence of pests and diseases from livestock and crop. Also, disease vectors such as ticks and mosquitoes are regulated by the ecosystems (Ibid; MA, 2005).

By and large, the factors described contribute to the overall resilience[10] of a particular ecosystem. Rapid changes have uncertain effects on the stability of ecosystems. Falsterbo-Skanörs ecosystems can be classified as relatively healthy. Nevertheless, changes within its composition through climate change might alter this ecological health.

Habitat services are provided by the ecosystems of Falsterbo-Skanör through two parts. As described above, the biodiversity in this region is high. Natural ecosystems help to maintain genetic diversity, but also man-made habitats increase the amount of species (17). Grazing and cutting meadows are of great importance to maintain its high biodiversity. The maintenance of life cycles for migratory species can also be judged as considerable (16) because the peninsula is known for its wide range of birds and shelters many different migratory species (Bentz, 2009; SECOA, 2011a).

[10] Resilience is defined as the capacity to persist in the face of change. Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist (Folke, 2006)

Cultural services in Falsterbo-Skanör can be found for all five of the services named by TEEB. Already named is the cultural service of opportunities for recreation and tourism (19). The small peninsula is known for its scenic beauty and beaches. Falsterbo has its own horse-show and shooting range which both attracts tourists. Further, the high biodiversity, especially concerning migratory and local birds, are a cause for visiting (e.g. Falsterbo Bird Observatory; Vellinge.com, 2011).

Falsterbo-Skanör is inhabited since the middle ages and has great historical and cultural sites. It has been an important harbor in the time of the Hanseatic League. Owned to this long history and flourished culture, Falsterbo-Skanör has a vast amount of historical sites from many ages (e.g. Falsterbohus) and a high cultural heritage value (e.g. Falsterbo Museum). These cultural services provide educational values, which are expressed through inspiration for culture, art and design (20). The area has been a source for inspiration for many artists (especially in paintings, e.g. Charlotte Wahlström) and has therefore a high value (Ibid.).

Connected to the inspiration are spiritual experiences and aesthetic information values (21,18). Both classifications of cultural services can be found in Falsterbo-Skanör manifested through religious sites (e.g. historical churches, graveyards, ruins). Lastly, the cultural service of information for cognitive development can be named as an aspect of Falsterbo-Skanörs ecosystem services (22). Within the TEEB framework, this ecosystem service is bounded to traditional and formal educational values and intellectual stimulation. It draws a reference to the influence of ecosystems on the types of knowledge system developed within a region (through e.g. landscape, biodiversity, weather and climate; Bentz, 2009; SECOA, 2011a).

Falsterbo-Skanörs value of nature is considerable high and sufficiently observed and gives the perfect study site for an economic valuation. With this in mind, I will now introduce the issue of climate change and its natural and political planning impacts.

4.3. Climate Change in Falsterbo-Skanör

4.3.1. The Issue of Climate Change

Before turning to the specific local climate change impacts and adaptation in Falsterbo-Skanör, I will pause to introduce the issue of climate change.

Climate change occurred over millions of years and describes the changes of global or regional weather patterns. In modern times "Anthropogenic Climate Change" (ACC) is used to describe the increasing changes in climate, and weather patterns, as well as the increase of extreme events (IPCC, 2007; Olsson, 2010a). Anthropogenic Climate Change often refers to Anthropogenic Global Warming, which has its effect in the rising greenhouse gas composi-

tion of the atmosphere (IPCC, 2007; I will from here on use climate change synonymous with ACC).

Climate change has a direct impact on human well-being. On the one hand, it decreases the non-use and option values of ecosystems by increasing the risks and uncertainties of climate conditions (MA, 2005). On the other hand, climate change heightens the risk of extreme weather events. These effects can become a vicious cycle as climate change negatively affects the resilience of local ecosystems and at the same time increases pressure at them. Climate change exacerbates already existing problems of sustainability and adds a new dimension of risks and uncertainties

As I described in section 2.2. above, encompassing debates on climate change have influenced the debate on sustainable development and sustainability in contradicting ways. "Sustainable development can reduce vulnerability to climate change, and climate change could impede nations' abilities to achieve sustainable development pathways" (Ibid:20). These obstacles to a sustainable life within the earth's carrying capacity emerge from negative effects of climate change on ecosystem services.

Climate change adaptation is one possible path on the way of achieving a sustainable living (next to mitigation, retreat, attack etc). Adaptation to climate change is defined as the ''adjustments in individual groups and institutional behavior in order to reduce society's vulnerability to climate" (Pielke, 1998 in Smith and Wandel, 2006:282). As climate change leads to a decrease in some ecosystem services, successful adaptation has to include a valuation of communal dependences upon these services. "A major challenge is to develop governance systems that make it possible to relate to environmental assets in a fashion that secures their capacity to support societal development" (Folke, 2006:253).

There are numerous uncertainties in relation to the physical aspects of climate change and its local and global impacts and implications on socio-ecological systems (Hulme, 2009). The governance with risk and uncertainty is problematic due to contradictory values involved. Climate change is an anticipated catastrophe – a possible future threat (Beck, 2009). Though there are present hazards, it is the interpretation and affiliation of the "staged risk" of climate change, which influences today's adaption policies. Further, climate change adaptation is, like sustainability, a wicked problem. It is driven by fear, believes and values and incorporated in a certain way of government, science and development, as well as risk management. Therefore Pielke (in Jasanoff, 2007) sees one problem of handling climate change in the treatment

as neutral, scientific solvable 'tornado politics' instead of emotion-attached 'abortion politics' (see discussion in 2.).

For successful adaptation to climate change, the valued driven political aspects have to be evaluated and incorporated in the strategy plan. Only a comprehensive, wide reaching assessment can lead towards success. Yet, successful adaptation to climate change cannot be measured in a short time span. The complexity of the problem creates risks of maladaptations and short-sightedness (Hulme, 2009:338). Impacts of climate changes are global, transboundary and interlinked with a myriad of different areas of life and human well-being. Sustainability and climate change stand in close relationship and have their roots in the same problems.

Yet, "[a]daptation has the potential to reduce the apparent cost of climate change, or even to yield benefits, although some adaptation will themselves incur costs" (Ibid:119). Planned and reactive adaptation strategies have a great potential in decreasing economic costs of climate changes (Ibid.). In the theoretical stance of TEEB (2010), successful adaptation is closely related to economic assessments and aspects. To put simply, present economic investments have to be balanced against potential damages in the future. In the case of the present study, the economic costs of building dams should be balanced with the economic value attached to the preservation of existing ecosystems in Falsterbo-Skanör. As the TEEB pledges that ecosystem conservation and restoration is an investable tool to support successful adaptation (Ibid:13,28).

Despite this, the TEEB framework, or to be broader, economic valuation, is seldom used related to local climate change adaptations (EEA, 2011). This is even more surprising, as the genesis of the TEEB lies within the topic of climate change. TEEB draws its inspiration from the Stern review and committed oneself to the climate change issue (TEEB, 2009). Moreover, it is explicitly stated within the TEEB framework, that a study with good quality and substantial significance has to be spatially explicit. Yet, the framework has rarely been used to evaluate local climate change adaptation projects. This correlates to the fact that overall local climate change adaptation and environmental economic valuation are not often merged. Most studies do not cover the topic of climate change. When climate change is addressed within economic valuations, studies tend to be global, not regional, assessments of policy options (Sundberg and Söderqvist, 2004a; NEV Database, 2007).

Vice versa, if one looks on projects about adaptation to climate change, environmental economic valuation mostly are left aside. Only some studies cover the issue of climate change and sea level rise with environmental valuation (Nicholls and Harvey, 2008; Hinkel and

Klein, 2009; Mcleod et al, 2010) or include it within the debate of sustainability (Shahbazbegian and Bagheri, 2010; Turner, 2010).

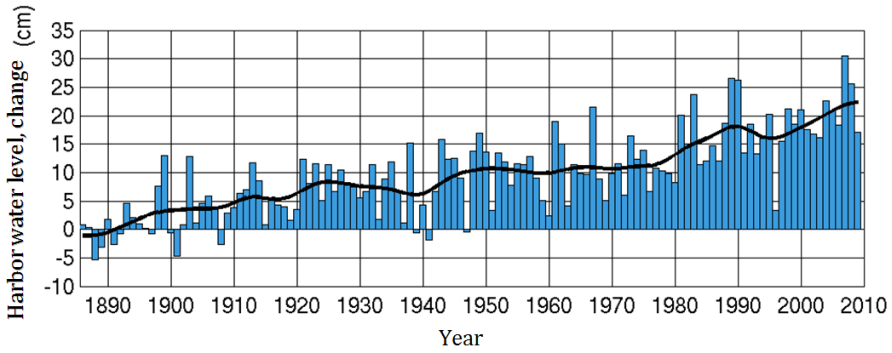
The critical empirical study at hand is an attempt to merge economic valuation and local climate change adaptation under the banner of sustainability. Studies using methods of economic valuation often lack a critical stance. Thus, the study at hand tries to fill these gaps and aims for an eclectic attempt to engage and inform decision-makers and fellow researchers.

4.3.2. Climate Change Adaptation in Falsterbo-Skanör

There has been an extensive examination of climate change effects on Falsterbo-Skanör's ecosystems (Bentz, 2009; SECOA, 2011a). My empirical study will departure from their description of climate change impacts on ecosystems (Bentz, 2009) and its possible political planning repercussions (SECOA, 2011a). I will take the case of climate change effects in Falsterbo-Skanör as the basis to assess the applicability of the TEEB on a dam building project. For this I dissect the TEEB onto the level of constructing a contingent valuation survey which could be used to survey the economic value Falsterbo-Skanör inhabitants attach to the ecosystems services lost and preserved by building the dams.

The municipality of Vellinge is expecting climate change effects within the next two decades (Bentz, 2009). Flooding has already become more frequent and severe. Parts of the peninsula are occasionally covered with water for a short time period. Table 4.3.2.1 illustrates the phenomenon of rising harbor water-level over more than a hundred years.[11]

Table 4.3.2.1 Water level change in Swedish harbors from 1890 to 2010



SMHI, 2010 in SECOA, 2011a

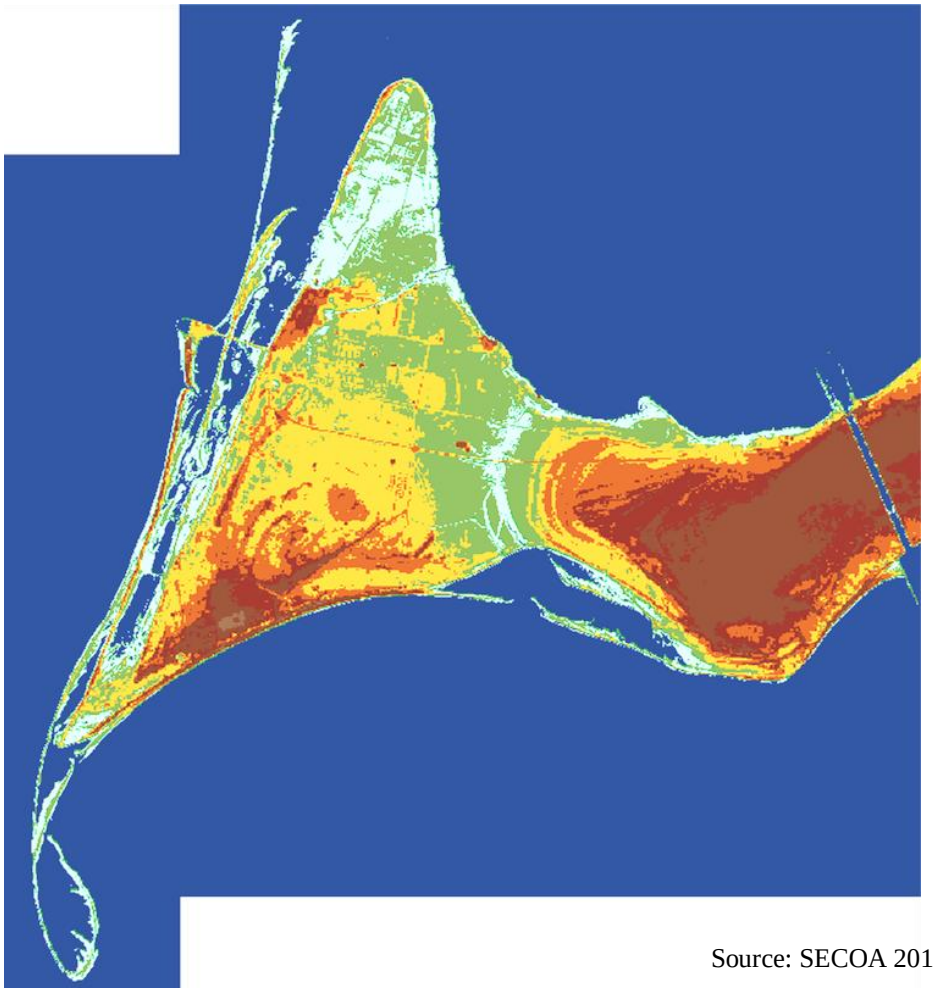
As said, climate change is a partly unpredictable process with uncertain impacts. Yet, statistical facts show the rising urgency for adapting to future events. Threats from climate change include a rise in sea level, which increases the risk of flooding. The sea-level rise also affects the ground water level which is believed to rise. These two aspects fortify the risk of erosion

[11] The rising water-level is less drastic as it appears here, due to an equally rising land-level

(SECOA, 2011a). The International Panel on Climate Change (2007) states that a rise of up to about 0.6 meters is likely to occur within the 21st century. In Falsterbo- Skanör a sea-level rise of this amount would already have severe consequences. Climate change effects would strengthen the flooding problem through more frequent and higher peaks (SECOA, 2011a). With a sea-level by 0.5 meters within this century, the ecosystems and their services would change rapidly.

In the following paragraphs I concentrate on the impacts of climate change indicated through a sea-level rise of 0.5 meters on Falsterbo-Skanörs ecosystems.
The figure 4.3.2.2 below shows the Falsterbo peninsula with a sea-level rise of 0.5 meters (light blue colored areas). The color differences indicate the geographical area in terms of height. The darker the areas, the higher the land.

Figure 4.3.2.2 Inundation of the Falsterbo peninsula by 0.5 meters



Source: SECOA 2011b

With a rise of sea-level of 0.5 meters, inhabited areas are spared from inundation. However, cultural and ecological values will change substantially. Overall an area of about 1.5km^2 is

going to be lost, of which most of it is open land and partly marsh land. These changes are specified in the following (SECOA, 2011c).

The total area of most semi-dry areas and onshore biotopes will decrease substantially and shallow water habitats take over instead. The lagoon of Måkläppen (A)[12] and its humid slacks will vanish. Former dry, species rich, grasslands will decrease in size and shift land inwards. In some regions (Northern Flommen and Southern Älasjön [B], Skanör sand ripples and Bakdjupet [C]) salt marshes will disappear. Drift lines and embrional dunes will diminish by about half the sizes. The salt marshes and drift lines of Knösen and Knåvängen (D) will be reduced by about 70% and its permanent sand dunes are prone to be reduced by 40%. The sand bad will be completely inundated and the nearby golf course will also suffer from party flooding.

It is important to bear the uncertainties concerning climate change impact on ecosystems in mind. Shallow water habitats will, in this scenario, decrease immensely in size. Yet, this has not to be negative, as these areas could become covered by eel-grass meadows and turn into flourishing nurture areas (with possible positive effects on fish stocks). Nevertheless, these implications are assumptions and with current status of knowledge, one can only determine what is likely to be lost (Bentz, 2009; SECOA, 2011a).

Anyhow, certain decreases of ecosystem services and its attached values are conjecturable.

One can expect that the moderation of extreme events might suffer (9)[13]. As said above, this is a vicious cycle. Climate change increases the occurrences of extreme weather events and, at the same time, reduces ecosystem resilience. Another negative impact of regulating services is expected from the prevention of erosion (12). Erosion prevention is prone to diminish when inundated landmasses increase and soil softens. This problematic will be of great importance within the region, since it already suffers of erosion (Ibid; MA, 2005).

Other regulating services such as pollination (14) and biological control (15) are likely to be negatively influenced by inundation. Pollination could be reduced because the amount of plants will simply lessen. Effects of biological control are more uncertain. Flooded areas are often disease prone and the increasing soil humidity might raise the chance of crop and livestock illnesses (such as fungus). Yet these impacts are rather uncertain and should be assessed with care (Ibid.).

Climate change has an even more contradicting influence on habitat services. The maintenance of life cycle and migratory species could increase, as birds like shallow water areas (16). However, the maintenance of genetic diversity might suffer substantially, as the habitats of

[12] The letters refer to figure 4.3.2

[13] The numbers behind the service indicates the TEEB classification number as seen in table 3.2.2

rare species are under change. It is nonetheless important to consider the uncertainties in habitat development and its possible positive repercussions (Ibid.).

A decrease in cultural services will probably have the most immediately effects on human well-being. Recreational services (19) are likely to decrease, as existing and popular sites such as the public beach and other bathing areas vanish. The same goes for inspiration for culture, art and design or spiritual services. I suspect that changes in historic valuable landscapes flooding effects might have a negative influence.

The table 4.3.2.3 below gives an overview of the land areas under scrutiny, their actual sizes, ecosystems and ecosystem services and expected changes through a 0.5 meter sea-level rise. The table is mainly taken from SECOA (2010a) and slightly adapted.

Table 4.3.2.3 Falsterbo-Skanörs ecosystems and climate change impacts

	Land Area	Area (ha)	Ecosystem	Ecosystem Service	Sea level rise (0.5m)
A	South Flommen and Måkläppen	227.9	Sublitoral sandbanks, mudflats, lagoon, drift lines, sand dunes in all stages without forest, humid slacks, species rich dry grassland, old oak forest	Recreational (beach), Biodiversity	Lagoon and humid slacks vanish, Total area of onshore biotopes will decrease and become shallow water habitats
B	North Flommen, Southern Älasjön	146.3	Sublitoral sandbanks, mudflats, drift lines, salt marshes, sand dunes in all stages without forest, humid slacks	Recreational (sand beach), Biodiversity	Salt marshes and humid slacks will vanish. Drift lines and embrional dunes decrease by 50-60%, dry and semidry habitats will decrease and become shallow water habitats
C	Skanör sand ripples and Bakdjupet	73.7	Sublitoral sandbanks, mudflats	Biodiversity CO_2 sequestration Recreational (sand beach),	Salt marches and humid slack will vanish. Drift lines and embrional dunes decrease by 50-60%, dry and semidry habitats will decrease and become shallow water habitats
D	Knösen and Knåvängen	275.4	Sublitoral sandbanks, drift lines, salt marches, grey and sand dunes, forested areas	Biodiversity Recreational use, Erosion prevention, Cultural heritage objects	Drift lines will vanish, salt marshes decrease by 70%, permanent sand dunes decrease by 40%, dry and semidry habitats will decrease and become shallow water habitats
E	Coastline Strandbad	n.a.	Sublitoral sand banks, beach	Recreational (public beach, shooting range)	Beach inundated

Source: SECOA, 2011a; Bentz, 2009, adapted

In Falsterbo-Skanör the discussion about precautionary adaptation to climate change reached a high political level. The increasing risk of flooding, led politicians and planners starting to consider severer inundation within their municipality planning process. This fact is as such

remarkable, considering the above description on the problematic governance of climate change related issues.

To tackle the increasing risk of future inundation, plans of building two dams were created. Fleeing the land to higher levels is seen as problematic, as the higher hinterland is already densely populated and additionally bears most of the arable land. Thus, building dams was a reasonable option.

The first and inner dam would be built around important building areas, the second and outer one around cultural heritages and natural areas (SWECO, 2011).

The following inundation maps show the proposed dams on the Falsterbo peninsula. The first picture shows the inner dam with 2.1 meter flood, the second shows the outer dam with 2.4 meter rise. Within a 2.1 meter high flooding about 22km^2 of land would be lost through inundation without the dams. In contrast, about 10km^2 of land would be preserved by the dam building, and only about 8km^2 of land will be lost lying outside the dams (SECOA, 2011c). The pictures show clearly the path and impact of the proposed dams.

Figure 4.3.2.4 Proposed inner and outer dam with different water levels

Source: Folkesson, 2010 in SECOA, 2011a

The dams would be partly build upon existing landscape features and include the strengthening of existing dunes (SWECO, 2011.). As discussed above, climate change induced sea-level rise will decrease dry areas and onshore biotopes. The dams are planned in such a way that natural areas such as dry grassland and heath meadows are protected (see figure 4.3.2.4). Despite the obvious protection of natural and cultural areas, habitats the proposed dams are controversial, because of their impacts on different interests. Though great parts of the areas

would be protected by the dam, some parts might be negatively affected by the construction. Here contrasts emerge around the question of where to build the dam exactly and how (Ibid.). Other frictions engender through e.g. the expected impact on aesthetical value of landscapes. High valued views towards the sea-side might be negatively affected, as existing dams are heightened and new sections build (Ibid; SECOA, 2011a.).

There is also a conflict between environmental or cultural protection. The dam building might have negative influence on cultural heritage objects. Falsterbo-Skanör has, as said, a long history and some of the historic sea-weed dams might be over covered by the new project. This causes frictions and conflicts within the planning process because the alternative line for the new build dam would affect the coastal biotopes negatively (Ibid.). Hence, the exact lines of the new dams are under negation. Compromises either have to be made concerning old sea-weed dams, or concerning dry and wet habitats which will be affected by the line of dams.

Additionally, the national interests of Sweden might be contradicting with local ones. As tourism in the region should be promoted, the overall planning goal is to keep the coast clear and not to affect recreational sites (Ibid.).

Overall, the dam line is a focus point for conflict between cultural and natural preservation mainly connected to the actual placement, its construction and design. It is thus necessary to prioritize within the municipality planning (SWECO, 2011). However, as said, there are "no scientific criteria or well-established procedures to establish priorities" (SECOA, 2011a:23).

Economic Valuation might give a point of departure to solve these planning processes. With a survey of economical attachments towards ecosystem services from local inhabitants, a hint could be given of how to prioritize between natural protection cultural preservation and the promotion of tourism. Yet, I have outlined the strength and weaknesses of economic valuation. Hence, I will discuss the applicability of TEEB within the following section and the summary of the second part of my thesis.

4.4. Empirical Data Collection

To assess TEEBs applicability on a local level, I took the steps from examine its theoretical background until its practical functionality. The last and final step of scrutinizing the applicability and unraveling possible problems is the realization of an economic valuation.

The following table gives an overview on my empirical studies, methods and aims which will be explained and discussed in the following sections.

Table 4.4.1 Overview of Empirical Study

Method	Details	Aim
CVM Study	Standardized personal interviews	Monetary Value for different contradicting ecosystem services
Evaluation of CVM Study	Standardized personal interviews	Understanding of responses, certainty of answers
Online Survey	Standardized e-mail survey with open questions	Evaluation of usage, impact and opinion of economic valuation on local and regional decision-makers

Source: Own compilation

A contingent questionnaire was created to assess how monetary values of ecosystem services can be assessed. The questionnaire stands as an example to critically analyze the appropriateness of TEEB on local level. Further, the questionnaire has been used to survey the reactions of respondents towards the survey. The valuation was made through a convenient sample of 13 respondents.

The contingent valuation questionnaire was constructed according to existing literature. Questions and structures where synthesized by given examples and adapted to the current research. Contingent valuation questionnaires are mainly divided into three themes. The contingent scenario frames the first part of a questionnaire. Warm-up questions in form of attitudinal questions initiate the actual questionnaire. Sequencing, the questionnaire includes questions regarding the monetary value of the project or ecosystem services. To create a metadata analysis, questions on the questionnaire itself were included in the survey. Questions on demographics complete the survey.

The questionnaire can be found in annex I, together with a short description of its results.

Within my thesis the appeal of the TEEB framework and economic valuation reoccurred constantly. Considering all the problems inherited in the TEEB and its positive international repercussions, the question of the appeal of the framework comes to mind.

Thus, the following and final section within the second part of the paper illustrates the appeal of TEEB and economic valuations. To get a better picture on the actual opinion upon economic valuation, I surveyed the opinion on economic valuation among local and regional decision-makers upon.

I created an online survey to assess the attitude and usage of economic valuation of local and regional decision-makers. My population was all regional and local decision-makers concerned with environmental or climate change planning issues. I choose the regions of Scania and Västra Götaland, as they include coastal areas and have offices on climate change. I also included the municipalities of Vellinge, Lomma and Gothenburg for the assessment. The questionnaire was standardized with an open question. The response rate amounted to about 40% with nine respondents. It included questions upon knowledge of economic valuation, the frequency of using economic valuation and opinion of its impact. The questionnaire can be found in the annex II.

4.5. Findings

Building upon the two questionnaires and the theoretical discussion, the findings of my questionnaire are discussed in the following.

To discuss the findings of my first questionnaire, I would like to take the reader back to the discussion in the first part of this thesis upon the values used in TEEB. TEEB claims to integrate a comprehensive amount of value. Yet, through a detailed analysis I showed, that the values used are biased and constrained. This is fortified by a CVM survey.

As an example: To calculate the Total Economic Value of a study site with three ecosystems, in which every ecosystem provides ten services, roughly 90 different values would have to be assessed (if assumed that each ecosystem has ten services in average, and each service has three values categories in average). Admittedly, this is a very large amount. Values often overlap (e.g. option and bequest value etc.) and such a large number would neglect overlaps. Yet, I hope to make clear, that the amount of questions for a monetary value of each service and for each value possible would be very high. Consequently, compromises have to be done.

These compromises can include a justified merge of values which are already overlapping. I consider this as justified, as different values from one ecosystem service might not be separable for the interviewees. The possibility a respondent can give distinct monetary values for all six categories for one good, is doubtful.

Yet, narrowing down surveyed values might fortify the bias of valuation. As discussed in 2.4 and 3.3.1, stakeholders have different priorities of values. Together with the delimitation of values within a CVM survey, existing dominant patterns of valuation could be strengthened. Values for spirituality, religion or nature's intrinsic values might be neglected.

There are many unsolved questions regarding the practicability or implementation of an encompassing (non-biased) valuation. A comparison with the questionnaire used (Annex I)

shows these problems in greater detail. The different value of an ecosystem, with all its intricate details, is compromised in the end into questions, which ask for a certain amount of money a person would be willing to pay. There is no room for broadening or an inclusion of different sorts of questions concerning the specific values for different traits. This would simply burst the frame of such a questionnaire.
In my point of view, it is questionable if such a questionnaire is able to help within issues of wicked problems concerning climate change or sustainability. They can, however, might give a broader picture on projects, such as policy or planning changes. Yet, for more detailed information, this technique might not be applicable.

TEEB's practical appeal can be summarized to the fact that the dominance of the economic system over natural values creates great influences within the planning process. TEEB uses these influences to raise awareness for nature's values. By analogy, TEEB delivers some number defining the value of ecosystem services and the priceless can be given a price.
While researching about TEEB and economic valuation, I found the explanations mostly very vague and hard to grasp. Economic valuation is a tool for decision-makers and has a high appeal. The findings of my second questionnaire can be summarized as follows.
Firstly, most of my respondents were familiar with the concept of economic valuation, which gives the findings more credibility and shows the popularity of the concept. The overall opinion towards economic valuation is overall positive. With a mean of seven out of ten, it is clearly seen as a positive valuation process.
Answers concerning the actual impact of economic valuation have not been homogenous. Answer-categories reached from one to nine (out of ten) and reach a 4.3 within a calculated mean. This can be correlated with the actual usage of economic valuation. Economic valuation is rarely being used. Neither respondents nor colleagues of participants use this technique often to prioritize within their decision making. Yet, there is a small indication, that local decision-makers use economic valuations more often, than regional ones.

The overall impression towards economic valuation of the respondents is hence positive. The doubts within its impact can be explained through its rare usage and rather new emergence. Here it seems worthwhile to quote one respondents at length:
"My overall impression is that this kind of valuation has not yet been used very often. For me that work in a county board it's not as relevant as for the municipalities, and I don't know in what extent they use economic valuations. I have not heard about any particular good exam-

ples but I think if it had been used it would be a great tool for decision making politicians. […] these kind of analyses haven't been used much but could probably have a great potential if they did."

This quote shows the differences between local and municipality levels and shows the great faith these planners project into economic valuations. This is fortified by following quote. The participant stated that: "It is an interesting and important method to give nature comparable value to other interests of society, but it is not used in the current planning process at county or municipal level."

One participant had some doubt towards this technique. The respondent's opinion on economic valuation and the impact it might have were rather low. He stated, that for him economic valuation "can be a detour compared to a more direct compensation", as he feared the commensurability of ecological values. Interestingly, the respondent emphasized his background as biologist and stressed that he is judging through this lens.

Concluding, the findings of my study illustrate a certain trend towards hope or the sense of usefulness of economic valuation, even though it has not been used very often. Comments of the participants, however, give the indication that in the future, more projects will include cost-benefit analyses. Hence, further studies might be there to come.

4.6. Summary: TEEB's Practical Problems

As a concluding remark of the second and empirical part of my master thesis, I now give a summary of the practical flaws and limitation within the TEEB approach.

To give a condensed critique on the TEEB I would like to take the reader back to the beginning of section 3 where I explained the TEEB approach in detail. TEEB tries to achieve pragmatic and immediate solutions and calls for discrete planned changes (instead of a creative destruction) with a common sense of equity. TEEB's way of working starts with the recognition of all economic and non-market values. These will then translate knowledge into incentives and demonstrates a monetary value. The latest step is to capture this value through price adjustments and incentives.

Whereas most of the description can be accepted, the way of working should be seen critically. Already while closely examining this condensed outline, contradictions arise. As discussed, they recognize myriad values, yet, they do not translate all of these values into incen-

tives. Therefore, the demonstrated monetary value might be inaccurate and price adjustments will be false estimates of the value of the environment.
Also, the outcome of a TEEB framed study is an aggregation of all flaws and limitations of the process. These facts might lead to the perspective that the aggregated uncertainties on the way of procedure deem the outcome non-valid. To refer back to Daly, the uncertainties might be too great and to systemic for the prices to have a meaning (Daly, 1990 quoted in Dresner, 2007:109f).

There are specific problems with the TEEB approach which I would like to take up again. One is discussed within the section "TEEB's Theoretical Problems" and concerns the issue of multiple values. I have discussed this aspect from a theoretical stance, and would like to give now a practical perspective towards this problem.
TEEB seeks to mainstream economic valuation into the decision-making process of environmental contrasts. As I discussed above, it claims to include myriad values (figure 3.2.1.). Yet, the inclusion of all values within an actual valuation survey is a highly difficult task. Usually, it can be expected that the area of scrutiny includes more than one ecosystem. Each ecosystem then contributes to the provision of up to 22 services. Again, each service has about one to six different inherent values. I have explained this simple 'overload' of values for a questionnaire above. A compromise on certain values is therefore necessary to fulfill the goal of an economic valuation.
TEEB's practical problems are partly inherent in the methods and techniques it is built upon. It does not create new methods but seeks to overarch and frame existing economic valuations. Thus, failures within methods lead to flaws within the TEEB. I have given a debate upon the contingent valuation method and I stressed above (2.4.) that every technique has criticisms. This is not the place to discuss every problem for each method. I would, however, like to emphasize that each and every quantitative valuation technique is far from perfect, and depending on which method (or combination of methods) has been used, the outcome has to be judged differently.
As this debate shows, there are practical questions open, which have, until now, not been sufficiently discussed in the literature (also shown in table 3.2.2). The TEEB framework is a relatively new approach and hence this gap might be filled in the future. Yet, is has to be kept in mind that the practicability of the TEEB is diminished by this.
To include non-use values, different techniques are used. Most of them work with questionnaires. Yet, these cannot provide sufficient information for the interviewee which might be

needed. Often, environmental valuations cover topics or interconnections which are not commonly known. However, most stated preference methods are based on prior knowledge. Consequently, they lack reliability and validity. Furthermore, the effect of 'warm glow' makes the connection between the ecosystem service asked for and the actual state value from participant vague and unreliable. It cannot be determined if interviewees give a monetary value to this specific ecosystem, to certain projects or the 'good cause' as such.

Another problem is the global applicability of the framework. To be able to get a rather accurate value, the data for ecosystem services have to be sufficient, the area has to consist of inhabitants with equal income and with an understanding of nature and monetary terms. The question then occurs, on which places the TEEB is measurable. Mazourenko (2009) contests the applicability of environmental valuation for policy implementations in Africa, and I would suggest that there are many places on which the TEEB is not appropriate. With all the flaws mentioned it is already a difficult tasked to do. Thus, I doubt the global applicability of the method. This is a major flaw. Mainstreaming economic valuation into policy making in only developed regions will not have the positive impact which was anticipated by implementing TEEB.
This correlates to the aspect of power relations and I would like to come back to the "environmentalism of the poor" (2.3). TEEB seeks to include a sense of intragenerational equity within their framework. I have discussed in length that poorer communities depend more on ecosystem services and are yet, disempowered by standard economic valuation techniques. The question of who has the power to value and to simplify values has to be kept in mind. Especially if the constrains are biased and only applicable for few.

To conclude, this study offers numerous implication of the usage of economic valuation.
First, the findings of this study reinforce the importance of actively incorporating multi-decision analysis within policy-making instead of favoring economic valuations. Used as important part of the decision-making process, TEEB can be a helpful tool. Yet, without an inclusion of non-use values an accurate and sufficient conversion of nature's value cannot be guaranteed.
The way, in theoretical and practical sense, in which the value of the ecosystem and biodiversity of Falsterbo-Skanör Vellinge can be assessed with the TEEB approach, can be seen as insufficient to tackle the wicked problem of sustainability. Further, TEEBs usefulness and manageability is diminished by its inherited limitations and flaws concerning theoretical justi-

fications and practical problems. I leave it however to the reader to judge the justifiability of the TEEB in terms of nature conservation and protection.

To return to my hypotheses, I stated, that the TEEB might be too biased in economics to give an appropriate value. This hypothesis can be seen as confirmed. Secondly, I expected major problems of data availability. As I chose my case of study according to the existing data, this aspect had an effect within my research. Yet, as there was sufficient data to build upon, the hypothesis can partly be rejected. On a wider and global scale, this problem has greater implications and might delimit the application to only highly researched areas.

My third hypothesis concerned the high amount of uncertainty the TEEB aggregates and the sequencing loss in credibility. I consider this hypothesis as confirmed. Lastly, I supposed a high political relevance of economic valuation and a high appeal of the framework. Building upon the personal findings of my study I see this hypothesis confirmed.

As I have now been able to illustrate the TEEB, I will now proceed to the final conclusion and summary of my theoretical and practical findings.

5. Summary

"You cannot solve a problem from the same consciousness that created it. You must learn to see the world anew."
Albert Einstein

Following section will give the final statements of this master thesis differentiated in (5.1.) discussion, (5.2.) SWOT-analysis and a rounding off conclusion (5.3.).

5.1. Discussion

Calls for world-wide changes to achieve sustainability started an encompassing discussion. The current way of living is unsustainable and cannot continue much longer. Yet, theoretical and practical debates focus on the question of the form of changes acceptable and in what pace.

I started this thesis by exploring the history of the sustainability debate and by showing two different theoretical stances which emerged. TEEB's theoretical line can be drawn back to the stance of sustainable development. Through its close bondage with political actors and its neo-liberal approach, economics and economic growth are acknowledged to be the crucial part of our decision-making process. TEEB reinforces the current dominant economical system and acts thus within a capitalist framework. Changes towards sustainability are definitively a goal of the TEEB approach, however, one must ask: what kind of changes do they create?

To answer my research questions explicitly, I would like to draw back here to the discussion on de-growth and sustainable development. De-growth seeks to implement structural changes to alter an urgent situation. It tackles the current dominant system and calls for basic, all-encompassing modifications of systems. In contrast, sustainable development aimed to mainstream sustainability within the current system to raise awareness. TEEB is also an attempt to mainstream. It tries to mainstream economic valuation within the current system to shift the focus towards the environment and to raise awareness about its value. Yet, 'mainstreaming' comes with compromises and one can argue that the compromises within the TEEB are great.
When TEEB is seen as the answer, one has to ask, what is seen as problem. As Rittel said, the choice of the problems explanation determines its solution. TEEB sees the problem to be an economic market failure. Thus, as economics are seen as the problem, economics are used as answer.
Yet, as Einstein said, we cannot solve problems with their cause. The narrow and constrained field of economics might have potential, however, it has to be a conscious decision if one

wants to use the tools of a current, struggling system, or if one "sees the world anew".
The choice to use economics has to be seen as such: a choice. The claim of 'neutrality' of neither their methods, nor their outcome can be taken for granted. While using economics, other branches of science or formal and informal knowledge are silenced. I discussed in length that values are not equally included into an economic valuation.
Within de-growth thoughts, there is mostly no need for economic valuations. Including the environment within the market system seems fundamentally wrong. Economic growth is counterproductive. Within the stance of the de-growth movement, the failures of the market cannot be corrected through an integration of natural capital. Hence, this way of working seems rather odd, as it does tackle a symptom but not the cause (Martínez-Alier, 2011a,b).
TEEB states that short-term economic benefits are the cause for environmental degradation and that a monetary value would change cost-benefit analyses to favor nature protection. Yet, if short-term benefits are the problem, then it might be necessary to tackle why this economic system favors short-term benefits instead of sustainability. This discussion shows the extend, in a theoretical and practical sense, in which the economic value of the ecosystems and biodiversity could be assessed with the TEEB approach (Research Question I).

I neither aim to dismiss economic valuation, nor do I seek to talk it down. Yet, I wanted to stress its negative traits. The usefulness and manageability of the TEEB approach, limited by its flaws, and especially the justifiability of its outcome in terms of nature conservation and protection are highly dependent on the weighting within decision-making processes (Research Question II). TEEB should be included within a multi-decision framework. Concepts such as transdisciplinarity, participation and cooperation have to be included for accurate valuations. What is more, all valuations have to be completely transparent.
"*Any valuation of biodiversity and ecosystem services needs to take account of the range of ecological and socio-cultural values that are not covered by economic valuation, but need different approaches and methodologies to be reflected into decision making*" (EPA- SAB, 2009 quoted in TEEB, 2010:16). Martínez-Alier (2011) calls in this respect for an 'orchestration of science' and 'methodological pluralism'. Outcomes of studies within the TEEB framework can be indices for preferences or capture value assets. Yet, they are no end in itself and have to be integrated within a broader picture to be able to give an 'honest broker' attempt for decision-makers.

Problems concerning sustainability, or climate change, are wicked problems. They reach into myriad fields and areas of life. One could be doubtful, if the TEEB is an appropriate solution for such a difficult task.
Yet, as I termed it in the beginning of my thesis, maybe TEEB is at least a movement and a step in the right direction. It could be seen as one of this 'one-shot' or 'clumsy' solutions and 'silver buckshot'. TEEB emerged from the recognition that the current degradation of nature cannot continue much longer. They take the urgency from the de-growth movement and analyze the problem differently. TEEB observes human failures and former mistakes and asks: what has not been done before? Pointing out the myriad values of nature, its spiritual impact and likewise, has always been stressed and pointed out. Yet, it has always been marginalized and neglected. TEEB states to be a practical approach, which aims for immediate and pragmatic outcomes. These are the factors the framework should be judged with. Maybe, on a long term basis, the TEEB engenders change and develops into a medium to achieve sustainability. The hopes and positive associations with economic valuation are undeniable. The reasons the G8, and later the BMU, implemented the TEEB and the positive opinions from policy makers in my findings can probably be traced back to the same underling hope: That we can change towards sustainability within the current system. These facts can be seen as the appealing traits the TEEB inherits (Research Question III).

Overall, TEEB's goal is to understand and raise the awareness on the costs of economic loss and inaction. This goal has to be highly treasured. If captured correctly and in areas of good monetary understanding, the aggregated value of ecosystems will probably be rather high. I draw this conclusion on the monetary value stated by Stern (2006) and other economic valuations. A monetary value of inaction and loss of ecosystem services draws a clear picture for action. Yet, should we not learn to acknowledge nature in all its values? To refer back to the title of my master thesis, in my point of view, TEEB does not offer an accurate conversion of nature's value.

My study can be integrated into the existing critical research on economic valuation and TEEB in particular (Diamond, 1994; Chee, 2004 or Daily, 2000). It can also be seen as a work within the discussion of sustainability and its contradicting practical effects (Daly, 1997; Martínez-Alier, 2011; Schneider et al, 2010).
A useful extension of this study would be to further refine the understanding and gaps of the usage of economic valuation for local climate change projects. Further a proper main study of

the monetary value attached to building the dams by the inhabitants of Falsterbo-Skanör could be used within a multi-decision analysis and help to prioritize between interests. A quota sample could be used to reach different users and providers of ecosystem services and could give comprehensive results within a multi criteria framework.

As I have now discussed my findings and answered my research questions and hypotheses, I will present the findings in a SWOT analysis of the TEEB.
This gives a short and condensed overview and shows the outcome of my studies in one view.

5.2. SWOT Analysis of the TEEB approach

A SWOT analysis is a commonly used tool to facilitate decision-making, mainly used in strategic planning. The matrix is a compilation of the helpful and harmful aspects for the TEEB to achieve their objectives. It gives a fast overview upon the aspects discussed within this paper and aims to provide a comprehensive finish.

Figure 5.2.1 SWOT Analysis

Helpful for achieving the objectives	Harmful for achieving the objectives
Strength	***Weakness***
Pragmatic, immediate outcomes Politically influential Works within the current system Economically accepted methods Monetary valuation/ outcome Raises awareness Estimates price Indicates preferences Capture value assets	Works within the current system Aggregated uncertainties Weak sustainability Commensurability of value Not applicable globally Possible negative impacts on equity Methodological flaws Data availability Theoretically partially unjustifiable
Opportunity	***Threat***
'New' approach Possibility for change 'Silver buckshot' Raises awareness Positive attitude of decision-makers Gives new information to prioritize Gives "some number" instead of no number	Market fundamentalism Ethically problematic Theoretically not always justifiable Disempowering for other values/ valuation methods Excluding of values Economic bias Possible misuse, misguidance

Source: Own compilation

5.3. Conclusion

I opened this paper with a discussion on sustainability and ended it within a small field of empirical practicability. The paper extends existing research on the applicability of economic valuation, and the TEEB approach in particular, by analyzing its theoretical and practical background. Concluding, this study is an attempt to employ the framework of TEEB on a local climate change project under the banner of sustainability. In this regard, the essential purpose of this paper was the testing of the TEEB approach on its applicability and possible limitations.

For this I first reviewed the history of the sustainability debate on its emergence and thus clarified two streams within sustainability. I argued that approaches towards sustainability are usually broken down into a series of theoretical and methodological approaches, which differ depending on the theory used. As a result, I illustrated two main theoretical stances towards sustainability and introduced sustainable development as a theory and tool for decision-making and pointed out its embeddedness within the dominant economic system. Contrasting to sustainable development, I illustrated the theory and movement of de-growth and its goal of a system change within world structures.

From there on I inferred that the theory explaining a problem constrains the choice of methods for assessing sustainability. Through an extensive literature review I condensed my findings within ecologic, socio-cultural and economic values and concluded that, depending on the standpoint, values differ and different methods are acknowledged.

Consequently, I argued that the framework for 'The Economics of Ecosystems and Biodiversity' is one approach towards sustainability inherited with a certain theoretical bias. I inferred that this bias is expressed within its methodological choice and the acknowledged values.

Bearing theoretical flaws of the concept in mind, I approached the practical site of TEEB by dissecting the framework into is smallest pieces. This entailed the application TEEB on a specific spatial explicit climate change project in Falsterbo-Skanör Vellinge. Therefore, I outlined the specific method of contingent valuation used within my study in detail. Also, I described the ecosystems of the region and consequently analyzed the expected changes from a climate change induced sea-level rise of 0.5m. I presented the analysis of the empirical data collection for the contingent study and concerning a study upon the opinion of economic valuations from decision-makers. These findings are explained and hence shed light upon the practical appeal the TEEB approach draws from. Lastly, I stress the practical flaws of the concept.

Taken together the findings offer a preliminary evidence that the TEEB as a overarching framework to mainstream economic valuation in policy making is related to great theoretical and practical limitations and has therefore only to be seen as a small part of information delivered to decision-makers.

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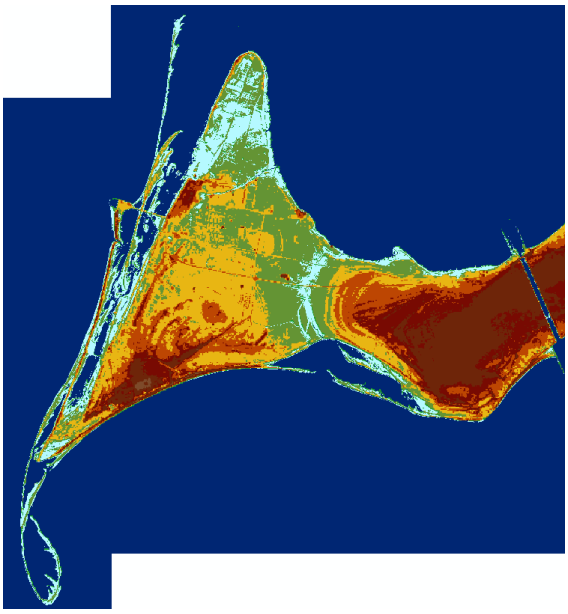
Annex I
Questionnaire I

Climate Change Adaptation in Falsterbo-Skanör

Scenario explanation:
In Falsterbo-Skanör, climate change effects are expected to take place within the next coming decades. A rise in sea-level of about 0.5meters could take place within this century. This inundation would for example decrease the total area of onshore biotopes and turn them into shallow water areas. Additionally, the lagoon in Måkläppen would vanish, as well as most of the salt marshes. Most of the beaches would be inundated.



Within the municipality planning process the building of dams is taken into consideration to mitigate coming higher peaks and higher frequency of flooding. The scenario includes an outer and an inner dam.
However building the dams would affect the landscape view. Additionally, some parts of the old seaweed dams would be destroyed by the building.

Towards this scenario of building dams, I would like to ask you some questions.

A. Questions Regarding Association with Area:

1. On a scale from 1 to 10 where 1 means very bad and 10 equals outstanding how much do you feel you know about Falsterbo-Skanör's natural environment?									
1	2	3	4	5	6	7	8	9	10

□ Do not know
□ Do not want to answer

2. On a scale from 1 to 10 where 1 means very bad and 10 equals outstanding how much do you feel you know about climate change?									
1	2	3	4	5	6	7	8	9	10

□ Do not know
□ Do not want to answer

3. How would you describe your attachment towards Falsterbo-Skanör's natural environment?	Very high	High	Mediate	Low	Very low

□ Do not know
□ Do not want to answer

B. Environmental Valuation Questions:

4.	Considering the dam building would take place, how much money would you be willing to spend each year to enable the building of the dams?
	500kr
Inner Dam	Yes
Outer Dam	No

□ Do not know
□ Do not want to answer

If no:

5. Would you pay	250kr?

□ Do not know
□ Do not want to answer

If Yes:

6. Would you pay	750kr?

□ Do not know
□ Do not want to answer

7.	Considering the dam building would take place, how much money would you be willing to spend each year to protect the old sea-weed dams and the landscape view?
	500kr
Inner Dam	Yes
Outer Dam	No

□ Do not know
□ Do not want to answer

If no:

8. Would you pay	250kr?

□ Do not know
□ Do not want to answer

If Yes:

9. Would you pay	750kr?

□ Do not know
□ Do not want to answer

C. Questions Regarding the Respondent:

10. How would you describe your over-all attitude towards the dam build-ing?	Very positive	Positive	Mediate	Negative	Very negative

□ Do not know
□ Do not want to answer
□ Do not care

11. How sure have you been concerning the amount of money to name within this questionnaire?	Sure	Not sure

□ Do not know
□ Do not want to answer

12. Year of Birth	

13. Gender	Male	Female

Annex II
Results of Questionnaire I

With the above discussed problems borne in mind, I will describe my findings in the following. As they are based on a small sample size, the findings lack reliability and validity.

The monetary value for enabling the building of the dams 576,92kr per year (N=13; Question 4). The planned distinction between outer and inner dam could not be kept, as the respondents did not consider the differences despite description. Hence, the monetary value has to be seen as an overall value for both dams. Usually the amount of money per year is extrapolated onto the whole population and aggregated for a total yearly value. As I do not consider my findings as generalizable, this calculation will be left aside[14].

The monetary value for protecting the old sea-weed dams and landscape value has not been taken into close consideration by the participants. Nearly half of the participants (N=5) chose not to give a value. The average monetary value given was 281,25kr per year and hence, significantly less.[15]

Overall the respondents stated to have a good knowledge upon the ecosystems of Falsterbo-Skanör ($\bar{x}$=7; N=13; Question 1) and a likewise stable knowledge on climate change ($\bar{x}$= 7,5; N=13; Question 2). Further, the attachment to the environment of Falsterbo-Skanör lies between high and mediate, with a tendency towards high (N=13; Question 3).

The respondents were mainly male within their 60s and 70s, which can be expected to be due to the constant commuting of the working population. This fact makes it harder to reach the employed population.

The outcome of my study has to be judged with care. Yet, and what is more, my study showed the reluctance of interviewees for giving monetary values. Especially in the sequencing question for the preservation of sea-weed dams, respondents did not considered answers relevant. Additionally, about half of the participants (N=6) were uncertain concerning the amount of money stated.

The overall opinion concerning the dam building project is not significantly correlated to any answers stated and was additionally rarely answered (N=5).

[14] The value to enable the dam buildings would be 4 002 094kr per year
[15] The value to protect old sea-weed dams and landscape values would be 1 951 031kr per year

Annex III
Questionnaire II

Economic Valuation of Nature

Economic valuation means the process of assessing a monetary value on nature. Nature can be defined as ecosystem or its services, as biodiversity or anything equally.
It uses differs economical techniques – from surveying the Willingness to Pay for services, to the amount of money spend on travelling to a certain place.

Concerning Economic Valuation I would like you kindly to answer following questions:

1. Are you familiar with the concept of Economic Valuation?	Yes	No

2. On a scale from 1 to 10, were 1 means very negative and 10 equals very positive, what is your opinion on Economic Valuation?
If you have no prior knowledge about Economic Valuation, please give your first impression

1	2	3	4	5	6	7	8	9	10

3. On a scale from 1 to 10, were 1 means very low and 10 equals very high, how do you judge the impact of an Economic Valuation on the decision-making process?

1	2	3	4	5	6	7	8	9	10

4. How often have you been using information from Economic Valuation within your decision-making?

Never	
Rarely	
Sometimes	
Often	
Very often	

5. How often do colleagues or people within your area of work been using information from Economic Valuation within your decision-making?

Never	
Rarely	
Sometimes	
Often	
Very often	

6. Lastly, may I ask you for your overall opinion upon Economic Valuation?
Please feel free to state whatever is on your mind.