

PRIVATE SECTOR AND NATURAL CAPITAL

Recognizing value – Exploring opportunities



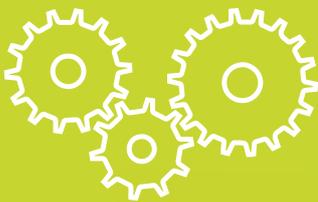
NATURAL CAPITAL ASSESSMENT FOR TOURISM ON JUIST



Nationalpark
Wattenmeer



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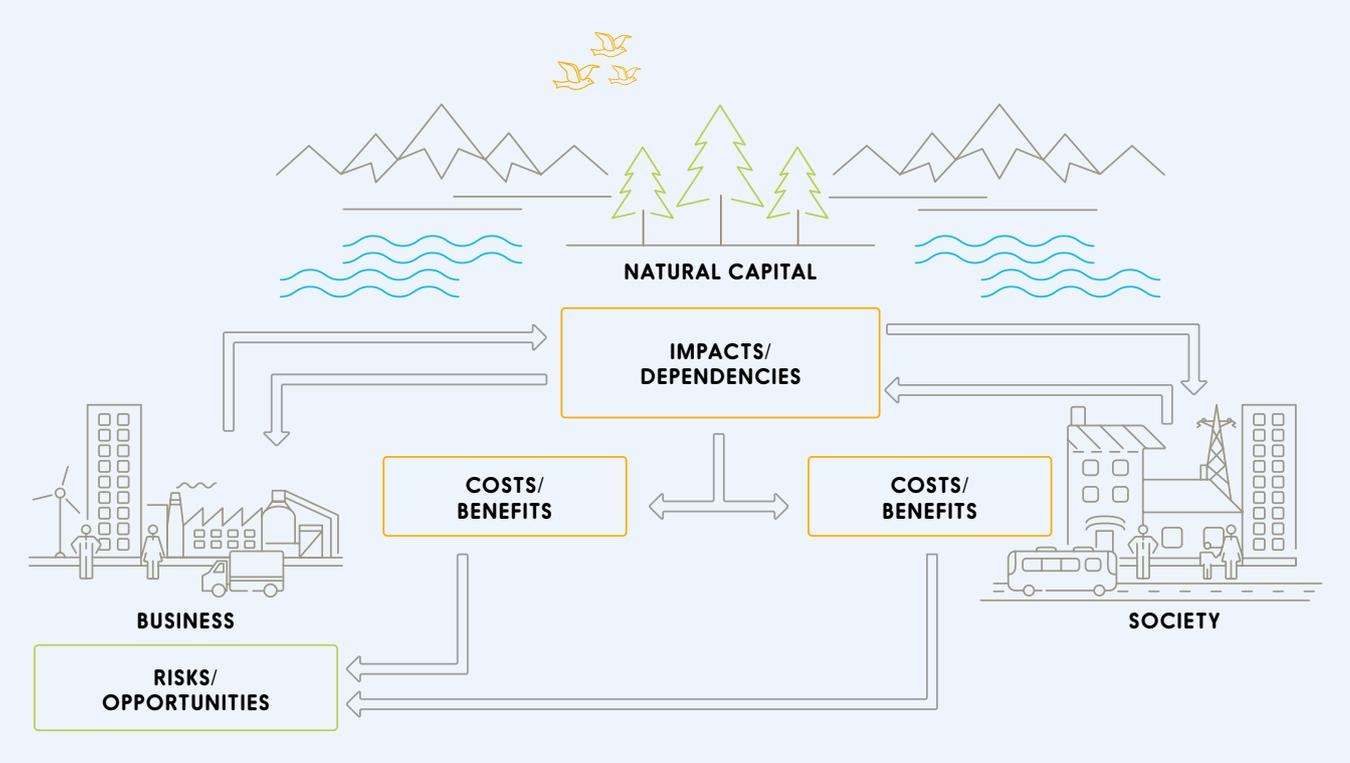
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1. Goal of the pilot study

Natural capital assessments enable companies to assess and evaluate the environmental impacts of a product, project, corporation or one of its sites (Infobox 1). The Global Nature Fund (GNF) and its project partners have carried out two natural capital assessments. Both studies are based on the Natural Capital Protocol. This is an international framework that explains how to carry out a natural capital assessment based on four phases (why, what, how, what next). The second pilot study (Natural Capital Assessment for Tourism on Juist) is described over the following pages. In the first study, GNF and its project partners assessed the natural capital costs for trenchless pipe laying and compared them with an open construction method. The pilot study is available online at: <http://www.business-biodiversity.eu/en/pilot-studies-natural-capital>

**INFOBOX 1:
NATURAL CAPITAL**

Natural capital can be defined as the world's stocks of natural assets – both renewable and non-renewable – which include soil, air, water, minerals and all living things, beneficial and crucial to the survival of mankind.



Natural capital impacts and dependencies: conceptual model (NCC 2016)

GOAL OF THE PILOT STUDY

INFOBOX 2: THE FOLLOWING ORGANISATIONS WERE INVOLVED IN THE PILOT STUDY



The **Global Nature Fund (GNF)** was responsible for the methodical implementation of the natural capital assessment. The non-profit organisation regularly publishes studies and guidelines on sustainable management. The pilot studies by GNF help to encourage the distribution and reproduction of innovative approaches.



The **local authority and health resort administration on Juist** is responsible for organising tourism offers on Juist. They work together with residents and local businesses to develop objectives and measures with a sustainable orientation for the island. The administration publishes an annual sustainability report, calculates the carbon footprint and is the point of contact for tourists.



The **National Park Administration Lower Saxon Wadden Sea** coordinates measures for protection, management and development in the national park and carries out intensive public relations work. The Plastic free Juist project and the "Taste the landscape - protect the landscape - regional products" campaign are two examples of such collaboration on Juist.

Goal of the analysis

GNF has conducted this pilot study in collaboration with the local authority and health resort administration on Juist, representing the island-based tourism companies and the Lower Saxon Wadden Sea National Park (Infobox 2). With the natural capital assessment of tourism on Juist, all the parties involved are pursuing two objectives. Firstly, the findings should support a well-founded exchange between the various stakeholders (tourists, residents, companies, suppliers, etc.) on a sustainable approach for the island. Secondly, the natural capital assessment should highlight further possibilities for the island's environmentally friendly orientation.

The health resort administration on Juist has already implemented a wide range of environmental protection measures. For example, a brochure provides visitors with practical tips on saving energy and a seawater adventure pool is operated with renewable energy. Measures have previously focused on avoiding greenhouse gas emissions since Juist, as an island, is directly exposed to the effects of climate change, such as rising sea levels and the risk of storm floods. In addition to greenhouse gas emissions, this study also assesses other impact drivers¹, such as land conversion, air pollutants or water consumption. The findings obtained should supplement future measures and strategies of the island.



¹ Causes of changes in natural capital or reasons for environmental costs are referred to as impact drivers.

2. TOURISM ON JUIST

The island of Juist is approximately 16 km² in size and is located in the Wadden Sea National Park in the North Sea in the federal state of Lower Saxony. The island only has 1,700 inhabitants. Almost 130,000 people visit the island every year. The majority of the island's inhabitants are employed in tourism, which accounts for an annual turnover of 88 million euros and is by far the key source of income and most important sector of the island's economy. The tourism sector comprises around 200 hotels, guest houses, holiday apartments and houses, as well as a large number

of restaurants and offers of leisure time activities (such as beach sport or carriage rides). Most facilities are operated by the island's inhabitants themselves.

Juist strives to offer environmentally friendly tourism with the additional aim of preserving the environment for future generations. Juist is car free and 80 % of the island consists of nature conservation areas. Many guests appreciate the species-rich flora and fauna.



3. Scope of the pilot study

The pilot study identifies changes to natural capital that are attributable to tourism activities on the island of Juist. The first step is to identify the impact drivers caused by tourism that occur directly on the island. In addition, tourism activities have an impact on natural capital even if they do not occur directly on Juist. A large number of tourists travel long distances to visit the island. Although the arrival and departure to and from Juist does not give rise to emissions on the island itself, these are however,

directly attributable to tourism. These impact drivers are therefore also included within the scope of this study. The same applies to agricultural production. There is no agriculture on Juist. Food is therefore imported. Cultivation and importing food requires areas for production that are not on the island itself and these lead to emissions, which have also been included in this study. The natural capital assessment is based on data from tourism on Juist in 2015.

4. Identification of the relevant impact drivers (materiality assessment)

The materiality assessment assists companies in selecting relevant activities and impact drivers for a natural capital assessment. In the initial stage, a list is drawn up of almost all tourism activities that potentially trigger changes to natural capital. In addition to what is known by those involved in conducting the study (GNF, the local authority of Juist, the National Park Administration of Lower Saxony Wadden Sea), information from other stakeholders has been included (e.g. the shipping company responsible for the ferry, the local waste disposal companies, experts in different areas).

Since it is impossible to assess all activities relating to changes in natural capital, it is necessary to evaluate the relevance of each activity. The decision depends on the aim of the analysis and whether data, methods and time are available for the assessment. Various issues are discussed and decisions made with all parties involved. The following table shows a selection of tourism activities discussed and their relevance for the change in natural capital.

Table 1: Materiality assessment

Activities		Potential impact drivers	Relevance
Locally			
Soil sealing	Proportionally, there are fewer sealed areas on Juist than on the German mainland. In particular, the ban on private cars, which means less traffic areas are required, is the reason for this. Accommodation, restaurants and leisure activity facilities for tourists, however, require sealed areas.	The sealed areas for tourism infrastructure are no longer available as a habitat for animals and plants.	Juist is characterized by high biodiversity with numerous specialised species. Sealing areas destroys habitats and is therefore regarded as being relevant.
Water use	Visitors and tourism businesses use water for washing, cooking, hygiene and other purposes.	People, animals and plants all require water. Intensive water use can lead to the loss of living beings and other environmental damage. On Juist, water is provided by a freshwater lens that is fed by rainwater.	The water supply is currently ensured by the freshwater lens. Since the drinking water supply plays an important role for Juist and also needs to be maintained in the future, this aspect has also been taken into account in the natural capital assessment.
Waste water	A sewage treatment plant purifies the waste water on Juist before discharging into the surrounding mud flats.	Discharging wastewater into the environment can have various impacts on flora and fauna.	The sewage treatment plant on Juist must meet environmental protection requirements and limits. Thanks to good water purification, the impact on the mud flats can be classified as low. Waste water has therefore not been considered in the assessment.
Energy consumption	EWE AG is the energy supplier on Juist. Firms involved in tourism use energy sources such as natural gas and electricity.	Energy generation and use cause damage to natural capital that not only affects the island of Juist. Energy consumption involves emissions of greenhouse gases and air pollutants. Greenhouse gases contribute to global climate change. Air pollutants are detrimental to human health.	CO ₂ emissions associated with the use of energy sources on Juist were already recorded in previous studies (energy and CO ₂ balance 2015) and reduction measures derived from these. Natural gas and electricity are major drivers of natural capital changes and are thus also included in this assessment.

Activities		Potential impact drivers	Relevance
Outside Juist			
Food supply	There is no agricultural production on Juist. Restaurants and supermarkets import food for visitors and residents from the mainland.	Growing food on the mainland brings about changes to natural capital. Cultivating crops requires areas of land that are no longer available as a habitat for animals and plants and thus reduce biodiversity. It removes water from the water cycle and causes greenhouse gases and air pollutants that are detrimental to health. This not only occurs in Germany but also in other countries.	Depending on the type of farming and local conditions, agriculture has a strong impact on local ecosystems and biodiversity. Environmental impacts from food production are therefore included in the analysis.
Arrival and departure of guests	Most tourists travel by car or train to the ferry ports on the mainland and continue their journey by ferry from there to Juist. There is an airport on Juist, but very few visitors travel to the island by plane.	Every means of transport is powered by fuel or electrical energy. Both power sources result in greenhouse gases and other air pollutants. Road construction also causes changes to the environment and the landscape.	Juist is practically a car-free island. Nevertheless, travelling to and from the island causes considerable changes to natural capital. Journeys have therefore been included in the natural capital assessment.
Waste disposal	Tourism leads to waste. Waste is collected by horse and carriage on Juist. The waste is transported to a mechanical biological waste treatment plant on the mainland to be treated.	The waste treatment plant separates toxic materials and recyclable materials. In comparison to the total amount of waste, the final waste to be deposited in landfills is considerably reduced in terms of volume and weight. However, the waste disposal site in the district of Ammerland requires areas that are no longer available as a habitat for animals and plants. In addition, waste treatment plants produce emissions and pollutants.	The use of landfill areas and emissions of pollutants involved in the disposal of waste cause relevant changes to natural capital. For this reason, they have been considered as part of the analysis.
Raw materials (e.g. for buildings)	Building hotels, guest houses, restaurants and other buildings for tourism infrastructure require raw materials.	The removal and provision of building materials causes changes to the landscape and the destruction of habitats for animals and plants.	Tourism-related buildings on the island of Juist are used over decades. Their impact on natural capital is minor compared to other tourism activities. We therefore classify them as being less relevant.



5. Data collection and evaluation

The materiality assessment is followed by data collection and the evaluation of changes to natural capital. These steps are conducted by interviewing experts, researching literature and using LCA models². Consumption and emissions are then available in quantifiable indicators and units, which can be assigned to four categories of impact drivers (climate change, air pollutants, water consumption, land use/biodiversity). The quantitative values in turn serve as a basis for a monetary estimate of the change to natural capital. The cost rates used were taken from scientific literature

and publicly accessible databases. The following table provides an overview of some of the data and information sources considered. Further values used and the complete calculation are available in the Background document Juist Natural Capital Assessment (only available in German) under http://bit.ly/juist_NC. That means our assumptions, together with the formulas and data used, are publicly available and that our approach is comprehensible and transparent.

Table 2: Extract from the cost rates and sources for the natural capital assessment

Category	Value	Unit	Assessment and cost category procedure	Year	Data origin
Climate change					
Greenhouse gases	102	€ / t CO ₂ -eq	Climate costs for limiting global warming to a maximum of 2 °C temperature increase (450 ppm).	2015	Interpolated and inflation-adjusted value, German Federal Environment Agency (http://bit.ly/2iJwcd5)
Air pollutants					
Nitrogen oxide (NO _x)	13,482	€ / t NO _x	Determining the environmental costs based on damages to health (DALY ³).	2015	Interpolated and inflation-adjusted value, German Federal Environment Agency (http://bit.ly/2Fp6fub)
Particulate matter (PM _{2,5})	59,278	€ / t PM _{2,5}			
Ammonia emissions (NH ₃)	19,392	€ / t NH ₃			
Water consumption					
Drinking water Aurich	0.85	€ / m ³	Costs for supplying drinking water by determining market prices for the district of Aurich. Juist belongs to the district of Aurich.	2017	OOWV (http://bit.ly/2olcioe)
Drinking water Germany	1.95	€ / m ³	Average costs for supplying drinking water in Germany.	2015	Interpolated and inflation-adjusted value, German Federal Statistical Office (http://bit.ly/1PD5wyL)
Land use / biodiversity					
Biodiversity loss due to land usage	1,185,620	€ / (species x year)	Average annual (modelled) costs to prevent the extinction of a species (derived from costs that are necessary to downgrade a species by one threatened category within the Red List).	2015	Life cycle assessment data for the number of affected species: ReCipe (http://bit.ly/2iTWzNH); McCarthy (http://bit.ly/2k7bdy6) for an estimate of costs incurred, BfN species protection report (Artenschutzreport) for the proportions of risk categories among living organisms in Germany (http://bit.ly/1PW3tGX).

² LCA stands for Life Cycle Assessment. LCA models translate complex scientific contexts into easily comprehensible indicators. Since not all information can be made available, one speaks of models (highly simplified representations of reality).

³ Using DALY (Disability-adjusted Life Years) and VSL (Value of a Statistical Life), health injuries can be modelled as monetary losses.

6. Results

The activities considered in this study amount to natural capital costs of EUR 3,293,661 for 2015. These natural capital costs are composed of the costs from the various categories (climate change, air pollutants, water consumption and land use / biodiversity),

distributed across the individual activities associated with tourism (activities on the island, food supply, arrival and departure, waste disposal) (Table 3).

Table 3: Results of the natural capital assessment in EUR for 2015

	 Locally	 Food supply	 Arrival and departure	 Waste disposal	TOTAL
 Climate change	 846,006 €	 635,705 €	 634,928 €	 77 €	2,116,716 €
 Air pollution	 148,479 €	 345,480 €	 234,736 €	 1,530 €	730,225 €
 Water	 149,398 €	 170,266 €	x €	x €	319,664 €
 Land use / Biodiversity	 18,545 €	 66,016 €	 42,493 €	 2 €	127,056 €
TOTAL	1,162,428 €	1,217,467 €	912,157 €	1,609 €	3,293,661 €

RESULTS / CONCLUSION AND NEXT STEPS

Only 35.3 % of the changes to natural capital result from local activities, such as the use of electricity and the provision of water. The small proportion of local natural capital costs as part of the total cost of natural capital is due to the fact that Juist already implements numerous measures to make local tourism as environmentally friendly as possible. One example being that Juist is car free. The climate costs of an average visitor to Juist are EUR 2.15 per day. An average German causes costs of EUR 2.55 per day and thus about 15 % more. A tourist on Rügen creates costs to the amount of EUR 4.64⁴. That more than clearly demonstrates the benefit of environmental measures on Juist.

Other environmental costs arise on the German mainland and, in the case of food production and provision, on a global scale. The latter has by far the least favourable effect on nature. A total of EUR 1,217,467 in damage costs (approx. 37 %) is generated by food production and processing, with emissions of greenhouse gases and air pollutants accounting for the largest proportion. Due to over-fertilised soils and meat production, greenhouse gases, such as nitrous oxide and methane, as well as air pollutants such as ammonia, arise in Germany and lead to changes in natural capital. We used German averages to determine the environmental costs of providing food.

27.7 % of natural capital costs are associated with tourists travelling to and from the island. The number of visitors travelling by

car is almost 61 %. Only 30 % of visitors travel by train, but they cause only 20 % of natural capital costs. The 2.2 % of visitors who travel by plane, however, cause almost exactly the same amount of natural capital costs as those travelling by train. The other visitors use the bus or a combination of transport means (car/train).

The impact of tourism on biodiversity is relatively small with EUR 127,056 in damage costs. One reason for this is that we only assessed land usage. The area, which is used as tourist infrastructure, is only partially available as a habitat for flora and fauna, which affects them in their natural habitat. Other aspects, such as the disruption of local biodiversity by tourists in the national park due to discarded waste, noise, etc., could not be included in this study due to the complexity of the assessment and the large amount of time required.

Some environmental impacts were not classified as relevant in this analysis or they were not covered for other reasons (time, data availability, complexity). Therefore, the natural capital assessment carried out within this pilot study shows only a small portion of the actual impact caused by tourism activities. It does, however, cover the major impacts for Juist and offers further starting points for the island's sustainable orientation.

7. Conclusion and next steps

Initially, the natural capital costs amounting to over three million euros caused by tourism on Juist in 2015 appear high. It must, however, be taken into account that every form of tourism, just as people's everyday lives, has an impact on nature. The environmental costs for other destinations are likely to be higher since Juist, as a car-free island, already has an exemplary character with numerous environmental protection measures.

Tourism on Juist brings benefits that are not recorded in the assessment. Tourism creates jobs for residents. Natural capital costs were offset by net tourism revenues of EUR 79 million in 2015. The island's natural capital creates other benefits for residents and guests. Large parts of the island are nature conservation areas and Juist is an island with a proportionally high number of specialised

species. Tourism not only requires, but also enables, the preservation of these protected areas. The peacefulness and protected nature are important reasons for many guests to visit the island. Such a comparison between environmental costs resulting from tourism and benefits for residents, visitors and the environment could be examined in a follow-up study.

The work on the pilot study has shown that assessing the impacts on natural capital is an important initial step, offering many starting points for further analysis and action for sustainable tourism. The following table gives an overview of the measures derived from the analysis that contribute to a reduction in environmental damage in all four impact driver categories (Table 4).

⁴ See „Background document Juist natural capital assessment“ (only available in German) under http://bit.ly/juist_NC.

Table 4: Measures to reduce the environmental impact from tourism

Tourist activities	Findings	Recommendations for businesses involved in tourism and the health resort administration
 <p>Locally</p>	<p>A third of all natural capital costs are incurred on Juist. They are mainly caused by greenhouse gas emissions that occur from heating with natural gas.</p>	<p>Accommodations: Hotels and apartments could charge for water, electricity and heating costs based on consumption and give visitors' detailed information about the associated environmental costs. Guests would be motivated to consume as little water, electricity and natural gas as possible.</p> <p>Another way to save power is to use key cards that have to be inserted into a corresponding device for the power supply. When leaving the room with the key card, no devices remain in stand-by mode and thus reduce power consumption.</p> <p>Tourism businesses: A water park on Juist is already being operated with renewable energy. Other tourist facilities on the island could follow this example in order to reduce greenhouse gas emissions.</p>
 <p>Food supply</p>	<p>The area of food production accounts for one-third of the costs in the natural capital assessment. The reasons for this are greenhouse gas emissions and high land use.</p>	<p>Restaurants: One way for restaurants to reduce their negative impact on natural capital is to offer vegan and vegetarian dishes. Half as many greenhouse gases are caused by a vegan diet as the diet of an average German.</p> <p>The supply of organic and seasonal products also helps to reduce the environmental impact of growing and transporting food. Here, the health resort administration refers to an online market hall for restaurants and retail outlets, which will be built up in the next few years, to simplify the purchase of organic products.</p> <p>In addition, measures could be developed to reduce food waste in businesses involved in tourism. Restaurants can offer dishes in different portion sizes. Information labels about food waste at buffet restaurants help to make visitors aware of the issue.</p>
 <p>Arrival and departure</p>	<p>27.7 % of the total natural capital costs occur with visitors travelling to and from the island. Also because 61 % of visitors travel by car, which has a greater impact on natural capital than travelling by train.</p>	<p>Tourist information: As a measure to reduce this impact, the Juist health resort administration refers to environmentally friendly train travel in their booking offers. In addition, the health resort administration could seek to cooperate with Deutsche Bahn (German railway company) to offer discounted tickets to holidaymakers.</p> <p>The health resort administration and tourism businesses could also provide guests with information about the actual costs of arrival and departure: Lower overall costs⁵ (environmental costs + normal price to Norddeich Mole) are incurred when travelling to and from Juist by train compared to travelling by car (environmental costs, fuel, wear and tear, parking fees). The health resort administration could provide tourists with such a calculation about the environmental impact of the different options for travelling to the island.</p>
 <p>Waste disposal</p>	<p>The environmental costs for waste disposal are low. Air pollutants caused during landfill account for the largest proportion.</p>	<p>Compared to the other natural capital costs, the costs of disposal are very low. In addition, the ability to influence individual businesses in the waste disposal process is limited. We recommend focussing on measures for other tourism activities.</p> <p>Restaurants/accommodation businesses: Consistently avoiding waste, however, enables natural capital costs for disposal to be kept low. When shopping attention could be paid to as little packaging material as possible. In addition, the reduction of food waste is an important starting point.</p>

⁵ See „Background document Juist natural capital assessment“ (only available in German) under http://bit.ly/juist_NC.

