



The Economics of Ecosystems
and Biodiversity in the
Caribbean Netherlands

The value of nature in the Caribbean Netherlands



TEEB

CARIBBEAN
NETHERLANDS

Total Economic Value in the Caribbean Netherlands

The value of nature in the Caribbean Netherlands

The Challenge

Healthy ecosystems such as the forests on the hillsides of the Quill on St Eustatius and Saba's Mt Scenery or the corals reefs of Bonaire are critical to the society of the Caribbean Netherlands. In the last decades, various local and global developments have resulted in serious threats to these fragile ecosystems, thereby jeopardizing the foundations of the islands' economies. To make well-founded decisions that protect the natural environment on these beautiful tropical islands against the looming threats, it is crucial to understand how nature contributes to the economy and wellbeing in the Caribbean Netherlands. This study aims to determine the economic value and the societal importance of the main ecosystem services provided by the natural capital of Bonaire, St Eustatius and Saba. The challenge of this project is to deliver insights that support decision-makers in the long-term management of the islands' economies and natural environment.

Overview Caribbean Netherlands

The Caribbean Netherlands consist of three islands, Bonaire, St Eustatius and Saba all located in the Caribbean Sea. Since 2010 each island is part of the Netherlands as a public entity. Bonaire is the largest island with 16,000 permanent residents, while only 4,000 people live in St Eustatius and approximately 2,000 in Saba. The total population of the Caribbean Netherlands is 22,000. All three islands are surrounded by living coral reefs and therefore attract many divers and snorkelers. Compared to other Dutch Caribbean islands such as Aruba and Curacao the Caribbean Netherlands are home to a great wealth of natural environment. Nature-based tourism on the Caribbean Netherlands is not limited to marine activities such as snorkelling and diving but also includes land-based activities that concern the natural landscape of the three islands. Unique features of the islands are the 'Saba Bank', one of the largest atolls in the world just a few miles of the Saba coast, the elfin forest on top of Mt Scenery or the coral reefs around Bonaire, which are considered among the most pristine coral reef of the whole Caribbean. On all three islands the coastal waters, containing the popular reefs, are officially marine protected areas and parts of the terrestrial natural environment are protected as national parks. All the parks are actively managed by local nature conservation organizations. Five wetland areas on Bonaire are furthermore protected under the Ramsar convention.

The Approach

By assigning economic values to the main ecosystem services of the Caribbean Netherlands, this research draws attention to the economic benefits of biodiversity and highlights the growing costs of biodiversity loss and ecosystem degradation. From the onset of the study, stakeholders on each island actively participated in the research by providing information and valuable insights. This process of stakeholder engagement also created public support for the concept of ecosystem services among the target audiences. The studies address the most relevant ecosystems and ecosystem services for each of the three islands and apply a range of economic valuation and evaluation tools. By surveying more than thousand people on the three islands including tourists, local residents as well as interviewing around 1,700 Dutch residents in the continental Netherlands, this study estimates the willingness of individuals to pay for the protection of nature of the Caribbean Netherlands. Furthermore, scenario analyses are conducted to inform decision-makers about the most effective strategies to manage the ecosystems of the islands thereby supporting the economy and wellbeing of its residents.

The Results

The total economic value (TEV) of the ecosystem services provided by marine and terrestrial ecosystems represents an important part of the economy. The TEV of the natural environment of the Caribbean Netherlands amounts to \$122 million per year. The TEV and its underlying components can be used to design a strategy for effective conservation measures and sustainable development. After extensively analysing different development scenarios for the value of future ecosystem services on Bonaire, St Eustatius and Saba, we can draw a number of clear and outstanding conclusions. For example, there are indeed ample opportunities to further develop the tourism industry, however, increasing the tourism sector beyond its capacity will cause pressures the local ecosystems cannot endure. Consequently, degradation of the natural environment will deter future tourists from coming to the Caribbean Netherlands. Furthermore, we clearly show that with the current pressure on ecosystem services of Saba, St Eustatius and Bonaire, the TEV of its natural environment will significantly decrease. Therefore, increased support for nature conservation proves to be a profitable investment in the economy as well as the environment of the three islands. These and other lessons learned in this elaborate study are well documented in a series of extensive online reports and a number of easily accessible policy briefs communicating the outcomes of the study for each individual island.

The Challenge

In the current era of financial insecurity and environmental degradation conventional investments often increase pressures on the natural environment. In response, a growing community of practitioners and researchers is trying to show that the economy and environment are strongly interlinked, and that in fact a healthy environment is critical to financial as well as human wellbeing. To make well-founded decisions when managing the economy and the environment of a country, it is crucial to recognize all benefits that are derived from ecosystems and their importance to society. This challenge requires tailor-made methods to accurately measure and value these

ecosystem services in the local context. This task is complex because most ecosystems are either public or quasi-public goods: there are no specific property rights assigned nor can people be excluded from using them. Such situations are referred to as 'a tragedy of the commons', often leading to overexploitation and degradation. By assigning a monetary value to these systems, environmental economists create an insight into the benefits for different stakeholders. This enables local governments to regulate the supply of ecosystem services efficiently and equitably. By designing appropriate mechanisms and policy strategies (e.g. taxes, property rights) the optimal supply of ecosystem services can be maintained or restored.



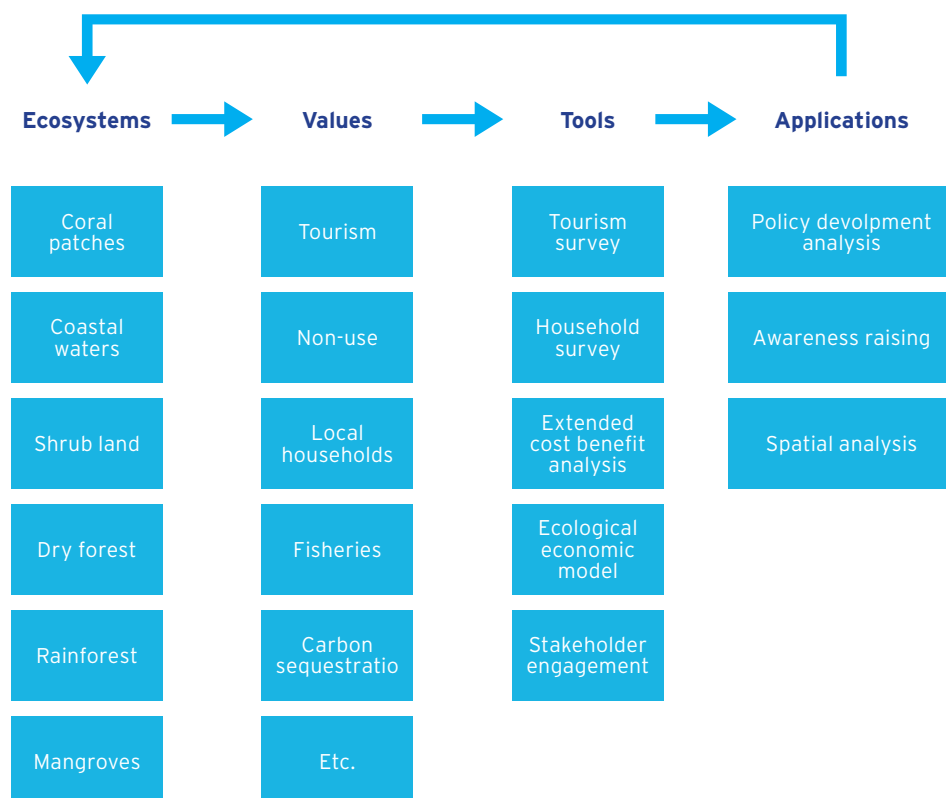
The Approach

The Caribbean Netherlands are a unique part of the Kingdom of the Netherlands, with coastal waters containing relatively pristine coral reefs, rain forests on top of the hills in Saba and St Eustatius and the inherent biodiversity. Where until the second half of the twentieth century the natural environment remained relatively untouched, the economy of the region nowadays relies heavily on international tourism, which on the one hand provides economic benefits, yet on the other hand also puts severe pressures on the local ecosystems. Paradoxically the tourism industry is highly dependent on a well-maintained natural environment to attract tourists. Therefore, it is crucial to understand how the natural environment contributes to the economy and wellbeing of the inhabitants of the islands.

This study estimates the economic benefits of ecosystems and biodiversity on the Caribbean Netherlands and highlights the costs of biodiversity loss and ecosystem degradation. A better understanding of the value of ecosystems and biodiversity can support decision makers to make wise and inclusive decisions for long-term sustainable economic development on these islands. To inform decision makers about the most effective strategies to preserve nature as an important economic source, a full-scale valuation of all ecosystem services on the islands of Saba, St Eustatius and Bonaire has been jointly undertaken by Wolfs Company and the VU University Amsterdam. The study addresses all relevant ecosystems and ecosystem services and applies a range of tools to determine the economic value of nature on the three islands. Figure 1 shows the overall project framework providing an overview of assessed ecosystem services and developed tools and application.

Figure 1
Analytical framework

Figure 1



Results

This extensive study has resulted in complete socio-economic valuation of the natural resources of the Caribbean Netherlands. One of the main outcomes of the study is the total economic value (TEV) of the natural environment on the islands. This TEV and its underlying components are used to build a strategy for effective conservation measures and sustainable development. The TEV is the sum of the ecosystem services provided by the marine and terrestrial ecosystems of Saba, St Eustatius and Bonaire. In total, more than ten different services have been valued in monetary terms. The most relevant services that were assessed are summarized below.

Local cultural and recreational values

The importance of the natural environment to the residents of the three islands has been assessed through a public survey. Between 300 and 400 households on each island participated in this household survey,

addressing a wide range of issues such as ecosystem threats, benefits, and preferred environmental management options. Due to the different natural environments of the three islands, residents on each island specified different concerns regarding the natural environment. However, some common environmental issues that local residents across the three islands worry about most can be identified: solid waste treatment and free roaming livestock. Active livestock management and better solid waste facilities are supported by a majority of the local residents. In total, the WTP of households on the three islands for conservation of the natural environment is estimated at \$2.3 million. A crucial next step in increasing the local cultural and recreational value is raising awareness among the residents of the Caribbean Netherlands about the vital role of nature on the islands. Results indicate that this will result in stronger support for additional environmental measures and higher appreciation of the islands' natural resources.

Percentage of tourists that participated in various activities

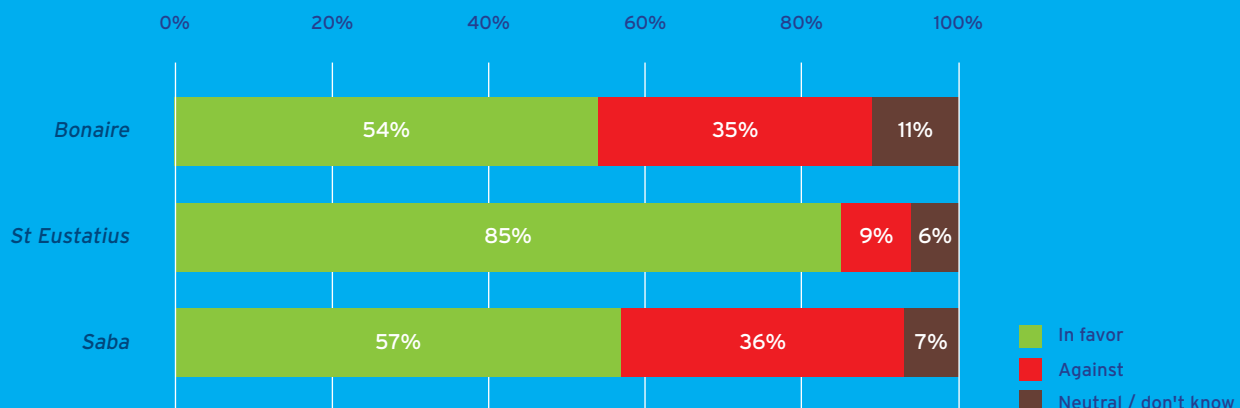
Tourism in the Caribbean Netherlands relies heavily on the local natural environment. The three islands have different characteristic features that appeal to tourists. Tourism on Bonaire focuses on diving, while Saba benefits more from the visiting hikers. St Eustatius has relatively low participation rates, indicating that there is room to develop the supply of touristic activities.





Managing roaming livestock

Roaming livestock is seen as a problem on all of the three islands in the Caribbean Netherlands. Uncontrolled livestock can destroy vegetation, thereby increasing erosion and threatening the coral reefs that surround the islands. A strong majority of the population prefers active management of the roaming animals.





Tourism

The tourism industry is the most important economic pillar for the Caribbean Netherlands, with an estimate of a 100,000 stay-over visitors per year and Bonaire as a growing cruise destination. Most touristic activities on the Caribbean Netherlands depend strongly on the quality of the natural environment. Tourists often visit islands for diving and hiking in the pristine natural environment of the Caribbean Netherlands. Although the tourism sector is the most important economic sector of the Caribbean Netherlands, the economic value of the contribution of the natural environment to its tourism industry has never been quantified. To determine the tourism value of local ecosystems a survey of tourists visiting Saba, St Eustatius and Bonaire was conducted, recording visitors' expenditures as well as their Willingness-To-Pay (WTP) for nature conservation and additional management. The 650 respondents were also asked about their perception and activities related to the natural environment. The share of the annual expenditures of all tourists is estimated at \$30 million. The WTP for nature conservation is estimated at an annual \$18.4 million adding up to a total economic tourism value of \$48.5 million per annum. The high WTP of visitors for additional nature conservation measures suggests that current user fees for the national parks can be increased without having an effect on the number of tourists visiting the islands.

Value of nature in the Caribbean Netherlands for citizens in the Netherlands

How do citizens of the Dutch mainland value the ecosystems in the Caribbean Netherlands, even if many will never visit these beautiful islands? This and other questions are addressed in an extensive case study. Over 1,200 face-to-face interviews were conducted with people in the Netherlands, and an additional 500 respondents filled out an online questionnaire. The most notable result is that Dutch mainland citizens have a positive WTP for protecting nature on both sides of the ocean (i.e. the mainland Netherlands and the Caribbean Netherlands).

Yet, the WTP has diminished since 2012 and was estimated for 2013 at €3.10 (\$4.30) per month per household. However, the management of nature in other Dutch Caribbean islands is also included in this WTP (Sint Maarten, Aruba and Curacao). The aggregated annual WTP for nature protection in the three islands of the Caribbean Netherlands by all Dutch households is estimated at \$63 million. Compared to the other values in the research, the non-use value of Dutch citizens is rather large. Although this value is a genuine economic value, this ecosystem service is predominantly a non-financial value. The actual payment that is derived from Dutch mainland taxpayers is significantly lower than is the case for most other ecosystem services. Although our study indicates there is ample support for greater financing from the Dutch households for nature management in the Caribbean Netherlands, the actual amounts are hypothetical and should be interpreted with care.

Other Values

Besides local cultural and recreational amenities, tourism benefits and the non-use value for households in the Netherlands, the ecosystems of the Caribbean Netherlands provide several other services. We have estimated the annual economic values for fisheries, carbon sequestration, medicinal and pharmaceutical values, research and education art and coastal protection. In summary, these other values represent an additional annual \$8 million for the three islands. The most important of these other values are the fisheries and the research value. Especially on Saba, fisheries is an important economic pillar since the Saba Bank, which is one of the largest atolls in the world, provide a habitat of many popular commercial species such as the spiny lobster and various red fish. The research value is distributed among the three islands, as the tropical forests, the mangroves and the coral reefs are subject to many scientific studies. The funding for this research is a good indicator of the economic value of the ecosystems for the academic global community.

Conclusions & Recommendations

The analyses of the wide range of ecosystem services provided by the natural environment of the Caribbean Netherlands generate many opportunities for decision makers to improve economic and environmental policies on the islands. To deliver information to decision makers the first step is to calculate the Total Economic Value (TEV) and to grasp the role of nature in the economy. Next, an analysis of alternative future scenarios provides an objective means of understanding which interventions in the economy and environment generate the highest yield. Such an integral approach is intended to ensure the betterment of the environment of each of the three islands to warrant sustainable economic development.

Total Economic Value versus the Total Use Value

By summing up the worth of the range of valued ecosystem services, the annual TEV of the natural environment of the Caribbean Netherlands is estimated to be \$122 million. The TEV of nature in the Caribbean Netherlands differs from the sum of separate TEVs of the three islands. This difference is caused by a change in the non-use value of Bonaire since the study results were presented in 2012. This is close to \$5.800 per capita of island residents and clearly shows that the economy of the Caribbean Netherlands has a high dependence on its natural assets. Although the TEV of nature on the three islands is very large, it should be highlighted that the non-use value of Dutch mainland citizens is also included in this TEV. As demonstrated in Figure 2, more than half



of the TEV consists of this non-use value, which at present is not translated into actual financial benefits of the ecosystems to the islands financial system. As depicted in figure 3 the main share of the remaining values is provided by the tourism industry. The benefits that the natural environment of the Caribbean Netherlands provides to beneficiaries on the islands amount to \$59 million annually.

This study made use of a dynamic model to simulate the current situation on the islands and to give insight in the effect of possible future scenarios or management options. Scenarios were developed in close cooperation with local stakeholders to analyse how the value of ecosystem would respond in the long term to different threats and interventions. Out of the extensive analysis of the ecosystem services and the different scenarios it becomes apparent that management of threats in order to maintain or even increase the value of ecosystems is a very worthwhile economic investment. In the scenario analysis this is shown through cost benefit analyses of managing roaming livestock and the invasive lionfish.

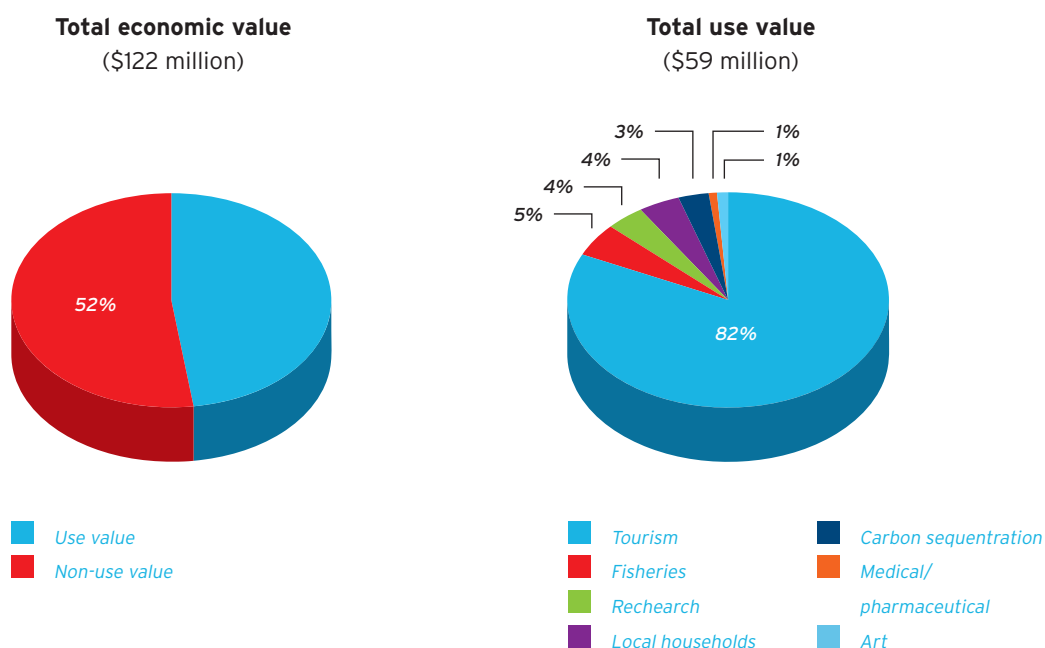
The analysis also shows that excessive tourism expansion increases the value of tourism to the island in the short run. However, tourists visit the islands for the tranquillity and unspoilt natural landscape and marine environment. Without these assets the Caribbean Netherlands will cease to be the attractive destination that it currently represents. These tourists are unlikely to return if nature loses its appeal as a result of underinvestment in the maintenance of the unique ecosystems of the islands. Given these potential economic losses, careful development combined with increased investments in natural capital will pay off in the long run.

Further Information

For further information about valuing Ecosystem Services in the Caribbean Netherlands, contact Esther Wolfs at esther@wkics.com or Pieter van Beukering at IVM pieter.van.beukering@vu.nl and the webpage www.wolfscompany.com

*Figure 2
Total economic value
vs. total use value*

Figure 2



Tourism industry is the most important economic pillar for the Caribbean Netherlands

The Economics of Ecosystems
and Biodiversity in the
Caribbean Netherlands



Ministry of Economic Affairs

TEEB

CARIBBEAN
NETHERLANDS

Photo credits

Stijn Schep and Pieter van Beukering (cover and page 10), Paul Hoetjes (page 4), iStock (page 7 and 8), Peter Nijenhuis (page 8) and Pieter van Baren (page 8).