

Natural Capital Accounting for the UK Overseas Territories: a Guide

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Executive summary

NATURAL CAPITAL provides ECOSYSTEM SERVICES which BENEFIT PEOPLE, these benefits can be VALUED. Services, beneficiaries and values can be consistently presented in NATURAL CAPITAL ACCOUNTS, which can feed into POLICY and PLANNING

- Natural capital accounting is a technique to demonstrate the immense value that the natural environment contributes to society.
- A national natural capital account answers three key questions: What natural assets do we have? What benefits do they generate for us? What is the economic value of those benefits?
- In answering these questions, the accounts consistently present interconnected data on physical extent and condition of assets, measure and value the benefits they provide as well as maintenance costs. This forms a rich evidence base with which to make better decisions.
- Natural capital accounting is most useful when it is seen as an ongoing and iterative process that is improved with new evidence that reflects the changes in nature and society.
- This guidance focusses on applying natural capital accounting in the UK Overseas Territories and does not seek to replicate international guidance and research.

Natural capital accounting is part of the growing use of the national accounting approach to measure and value the role of the natural environment in supporting human wellbeing. In December 2012, the UK Office for National Statistics set out a strategy to incorporate natural capital into UK Environmental Accounts by 2020. In 2016, a programme of work was initiated in Caribbean and South Atlantic Overseas Territories to extend the natural capital concept to the UK's Overseas Territories (OTs).

Implemented by the Joint Nature Conservation Committee (JNCC) on behalf of the UK's Department for Environment and Rural Affairs (Defra) and funded by the Foreign and Commonwealth Office's (FCO) Conflict, Stability and Security Fund (CSSF), this work programme is designed to introduce and develop the natural capital concept in partnership with OT governments. The programme demonstrates the processes involved in natural capital accounting, the data required, and the multiple benefits that the natural environment provides to all sectors of society. The work programme is designed to provide a solid foundation on which to build future work programmes within individual Territories¹, or on a cross-territory basis, to share data and applications. Natural capital evaluations and accounting are not a static, one time, process but involve regular updating and review to monitor trends over time, through use of appropriate indicators, and to allow accounts to be extended and updated. Natural capital accounting should be routine, not exceptional, and does not have to be resource intensive providing an effective mechanism to make use of socio-economic and scientific data routinely collected for other purposes.

The UK's Overseas Territories provide a home to 220,000 people in a wide variety of small islands, at high and low latitudes, and in very different biogeographic settings. The economic and physical security of all of these

¹ Initially working with Anguilla, Ascension, British Virgin Islands, Falkland Islands, Montserrat, St Helena, Tristan da Cunha, Turks & Caicos.
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islands is highly dependent on the natural environment, but each has different aspirations and capacity for economic growth. Natural capital accounting aims to present better information on the benefits the natural environment provides to society to allow these aspirations to be met whilst ensuring the ability of the environment to deliver these benefits is not compromised.

In the OTs, such benefits include the more obvious values attributable to fisheries and tourism, but also resilience provided by the natural environment to natural disasters. The extreme 2017 hurricane events in the Caribbean provided clear evidence of the functional, humanitarian and economic value of natural capital assets in mitigating inland flooding and coastal zone storm surge. Natural capital reporting is therefore not purely passive, reporting on existing states or trends, but can be part of an active process. It can inform policy making and planning to identify opportunities for economic development, and enhanced resilience to disaster, based on better management of existing natural assets or active interventions to maintain these values.

Effective management of natural environmental resources requires protecting environmental assets, and in the context of increasing pressure from human activity, actively investing in their upkeep and restoration. Knowing the economic value of the benefits of doing so will help make the case for protection and investment and create real and sustainable prosperity and a flourishing natural environment for the OTs.

This guidance, developed jointly by eftec and JNCC, defines what is meant by natural capital and ecosystem services and why the concepts and practice are important. It also presents the individual components of national natural capital accounting, which are most useful as parts of an interconnected and consistent process to better measure and value benefits from the natural environment. Examples are used to demonstrate how JNCC and its partners are actively applying this process in the OTs. The final sections look at the immediate and longer term future for natural capital accounting in the Overseas Territories.

This guidance outlines an ongoing approach to natural capital accounting in the Overseas Territories led by JNCC. The guidance is not a detailed report on these activities. Detailed reporting on the work programme will follow during 2019 in respect of individual Overseas Territories. This reporting will include identification and valuation of natural capital assets of critical importance to the small island Territories in the Caribbean and South Atlantic and describe the techniques used to undertake this work programme.

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Introduction

As small islands, the United Kingdom's Overseas Territories provide a home to 220,000 people who are reliant on their natural environment, and the benefits that it provides, for their economic welfare and their security. These benefits are broad and varied. They include habitats supporting local fisheries, coastal zone protection provided by reefs and mangroves, the tourist appeal of some of the world's most beautiful beaches, and the biodiversity that enriches the cultural and economic life of local inhabitants.

The OTs face many challenges as they simultaneously develop policies and plans for economic development and enhanced environmental management. While economic growth can increase the wellbeing of the island populations, it can also put immense pressure on the local environment, especially through infrastructure development. The natural environment is a foundation for social and economic activity but is also susceptible to damage from human activity, such as increased demand for clean water, land use change and increasing pressures on fisheries. Better understanding of the linkages between human activity and the environment, and the ways that the environment benefits the societies of the OTs, can help maintain these benefits.

Natural capital accounting provides a way of understanding this dynamic interplay between human activity and the natural environment. This form of accounting considers the natural environment as 'natural capital', which interprets nature as providing assets that provide humans with benefits, also known as 'ecosystem goods and services'. This guidance document relates to applications of natural capital accounting in the UK OTs. It reflects learning from ongoing work to understand the value of natural capital in the OTs by the Joint Nature Conservation Committee (JNCC), in partnership with OT Governments, UK academics and the private sector. The document does not seek to replicate existing guidance on natural capital accounting, nor does it report in detail on these activities, but describes an ongoing approach to natural capital accounting in the Overseas Territories led by JNCC.

Natural capital assessments use economic analysis tools and data for measuring what is conventionally not measured, particularly the non-financial benefits from the natural environment, and the dependencies of economic activity on the environment. These tools aim to provide comprehensive, high quality and clear evidence to support decision making.

JNCC embarked on the '*Natural Capital in the Caribbean and South Atlantic Overseas Territories*² project in 2016. The project provides an assessment of natural capital in the majority of the UK's Caribbean and South Atlantic OTs and builds capacity to monitor environmental change and to integrate environmental evidence into economic policy making and infrastructure planning.

The project is funded by the Foreign and Commonwealth Office's Conflict, Stability and Security Fund (CSSF), and as part of a programme of work managed by the UK Government's Department for Environment, Food and Rural Affairs (Defra) to support environmental management and economic resilience in the Territories. The programme of work involves mapping and valuing the participating OTs natural capital assets through integrating ecological data, satellite data, Geographic Information Systems (GIS) and economic assessments.

² 'Natural capital in the Caribbean and South Atlantic Overseas Territories: valuation, vulnerability and monitoring change' - <http://jncc.defra.gov.uk/page-7443>

The strategic objectives for this natural capital work programme are to:

- Identify the priority natural capital assets associated with the terrestrial and marine natural environment, priorities for each participating Territory established through detailed, on-island, consultations;
- Establish the estimated economic value for priority environmental assets;
- Establish measurable attributes (natural capital metrics) to monitor changes in value through time;
- Support integration of natural capital valuations into national mapping (GIS) to define the spatial distribution of these natural assets to promote the integration of the valuations into planning processes;
- Tailor work to individual Territory priorities and policy objectives, recognising biogeographical differences and the availability of data to support analysis.

This guidance:

- Outlines an ongoing approach to promoting natural capital accounting in the Overseas Territories, supported by the UK Government and implemented by JNCC in partnership with OT Government agencies;
- Provides an Overseas Territories context for the activities underway as part of the JNCC led OT natural capital work programme;
- Provides context for the application of UK and international guidance specific to natural capital accounting but not a detailed report on these activities;
- Defines what is meant by natural capital and ecosystem services;
- Describes what the process of natural capital accounting involves;
- Shows how the components that constitute natural capital accounts have been developed in the OTs, illustrated with a number of examples;
- Looks at the immediate and longer-term future for the natural capital accounting process in the OTs.

Natural Capital and Ecosystem Services

Over recent years, several ways have emerged of describing and implementing the concepts of natural capital and ecosystem services. In the publication 'Towards a Framework for Defining and Measuring Changes in Natural Capital', the Natural Capital Committee proposes that natural capital should be defined as: *"the elements of nature that directly and indirectly produce value or benefits to people, including ecosystems, species, freshwater, land, minerals, the air and oceans, as well as natural processes and functions"*.

If natural capital is the 'elements of nature', or natural assets, then the value or benefits they produce are derived from the goods and services that they provide, also known as 'ecosystem services'. As well as ecosystem services, natural capital includes non-living resources, such as minerals, oil, gas and aggregates. Most of these resources are measured and valued through market economic data. Therefore, a focus of natural capital accounting is to measure and value the benefits from ecosystem goods and services that are not traded.

In the Common International Classification of Ecosystem Services (CICES)³, ecosystem services are defined as *'the contributions that ecosystems make to human well-being'*. They are seen as arising from the interaction of biotic and abiotic processes, and refer specifically to the 'final' outputs or products from ecological systems, specifically the things directly consumed or used by people. Ecosystem services are therefore the flows of benefits which people gain from natural ecosystems, and natural capital is the stock (or wealth) of natural ecosystems from which these benefits flow. Ecosystem services can be subdivided into provisioning, regulating, cultural and supporting services (Box 1).

Viewing the environment through the lens of natural capital is an effective means to consider its value in the language of economics. Using the concept of capital, as something that keeps on providing so long as it is maintained, and expressing the value of ecosystem services in monetary terms presents a useful way to understand and apply the same concepts as other economic factors when making decisions that impact the environment and the value that it provides.

In many cases, the JNCC OT natural capital programme begins with habitat mapping, normally based on use of satellite data where this is applicable. In broad terms, the natural capital of the OTs draws on the habits, terrestrial and marine, of the islands which provide ecosystem goods and services. Natural capital accounting aims to present better information on these benefits, and the impacts that human activity may have on their value to society. In a small island context, ecosystems provide benefits to all sectors of society and a participatory approach is fundamental to the JNCC led OT natural capital assessments. Stakeholder consultation is essential to establish a wide range of views from all sectors of society, including views on priorities for evaluation, identification of beneficiaries and identifying scope to integrate natural capital accounting into government policy⁴. Effective management of OT resources requires protecting environmental assets, and in the context of increasing pressure from human activity, actively investing in their upkeep and restoration. Knowing the economic value of the benefits of doing so will help make the case for protection and investment;

"If the only tool you have is a hammer, you tend to see every problem as a nail."
- Abraham Maslow (1908-1970)

³ <https://cices.eu/content/uploads/sites/8/2012/07/CICES-v-4-Consultation-Briefing-Note.pdf>

⁴ British Virgin Islands consultation example: http://jncc.defra.gov.uk/pdf/OT_NCA_BVI_Scope_of_NCA.pdf

Box 1: Natural capital accounting – Types of ecosystem services

The most widely used definition of ecosystem services is from the Millennium Ecosystem Assessment: “*the benefits people obtain from ecosystems*”. It further categorised ecosystem services into four types:

- **Provisioning services:** material outputs from nature (e.g., seafood, water, fibre, genetic material).
- **Regulating services:** indirect benefits from nature generated through regulation of ecosystem processes (e.g., mitigation of climate change through carbon sequestration, water filtration by wetlands, erosion control and protection from storm surges by vegetation, crop pollination by insects).
- **Cultural services:** non-material benefits from nature (e.g. spiritual, aesthetic, recreational, and others)
- Provisioning, regulating and cultural services are referred to as final ecosystem services and are underpinned by **Supporting services**. These are the fundamental ecological processes that support the delivery of other ecosystem services (e.g. nutrient cycling, primary production, soil formation).
- Analysis of benefits from natural capital also includes **abiotic services**, the benefits arising from fundamental geological processes (e.g. the supply of minerals, metals, oil and gas, geothermal heat, wind, tides, and the annual seasons).

Source: Based on Natural Capital Coalition (2016) Natural Capital Protocol, and Millennium Ecosystem Assessment (2005): Ecosystems and human wellbeing. Biodiversity Synthesis. Washington DC: Island Press.



Rockhopper penguins
Falkland Islands

Fur seal
South Georgia



Giant Petrel
South Georgia



The biodiversity of the South Atlantic is of global significance, has huge intrinsic value and attracts wildlife tourism. All photographs by Megan Tierney, JNCC

Overview of Natural Capital Accounting

Natural capital accounting is the process of compiling data on the quantity and quality of natural capital assets and physical and monetary value data on the benefits they provide. Figure 1 shows the natural capital accounting process applied in the OTs. The data are presented in a structured way to measure and monitor the benefits consistently over time, and act alongside other national accounts, such as GDP, to inform policy and planning decisions. In the same way that the structured recording of other national statistics in conventional national accounts informs and improves a country's decisions, natural capital accounts enable better decisions to be made about the natural environment.

Natural capital accounts are a set of interrelated component accounts that aim to answer the following key questions:

- **What natural capital assets do we have?** → **A Natural capital asset register** is an inventory that holds details of the stocks of natural capital assets within the geographical boundary of the country. This is usually based on the extent of the main habitats, but can also include their condition or quality, and other relevant factors such as extent of different land uses or protected areas. For example, a coral reef may contain a variety of species and the quality of this diversity may be measured by the number of species recorded on the site for a few selected taxa (e.g. fish, coral). The asset register helps track trends in the extent and quality of habitats but does not give any information about their use or value.
- **What benefits do these assets provide?** → **A Physical flow account** reports the expected flow of goods and services which are provided by the assets in the register. This can include benefits related to sub-soil natural capital resources (e.g. aggregate extraction) and final ecosystem services. This account provides information on the benefits provided by natural capital, with the flows measured in different physical units (e.g. number of recreational visits or visitors, weight of produce) so are not comparable in a common unit of value.
- **What is the value of these benefits?** → **A Monetary account** which calculates two values. Firstly, the annual values of the flows of goods and services that are captured in the physical flow account. Secondly, asset values which are the sum of the expected flows of discounted⁵ values over time. This account values benefits in a common metric, money, for ease of interpretation and comparison.

The HM Treasury Green Book discusses discounting in detail, stating that *“discounting is used to compare costs and benefits occurring over different periods of time – it converts costs and benefits into present values. It is based on the concept of time preference, that generally people prefer to receive goods and services now rather than later. If Projects A and B have identical costs and benefits but Project A delivers benefits a year earlier, time preference means Project A is valued more highly.”*

In a practical sense, the goal of natural capital accounting is to bring together data from different sources into one framework for reporting in a consistent format, regularly updated, to give insight into values of goods and services, and fed directly into policy and planning decision making (Figure 1). The interconnected nature of the accounting structure allows an understanding of what drives differences or changes in value, whether through changes in extent or condition, changes in the flow of services, or changes in their value. This helps understanding and discussion of the importance of natural capital to a wider range of stakeholders, and comparison across other sectors and activities to help assess trade-offs and justify resource allocations. It can

⁵ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

also help identify key sectors which are reliant on natural capital and point out various risks and opportunities associated with it.

As with other data analysis and decision-support tools, the quality of natural capital accounting is as robust as the quality of the inputs that feed in to it. The accounts are designed to complement, not replace, existing environmental management approaches, and present monetary values alongside physical data as mentioned above. The evidence base should be formed on sound scientific understanding of ecosystems, robust methods of data collection, and transparent reporting of gaps and uncertainty. The accounts are a tool, and only as valuable as the proficiency with which they are utilised. Misinterpretation of results can be counter-productive and even harmful to the environment and the benefits it provides. Education and awareness should form an integral part of the process (Figure 1) building an understanding of how the principles of how accounts are constructed.

Even when data is limited, natural capital accounting can be a useful process to identify the links between natural capital assets, the benefits they provide and the values these have to people. This can help identify the most significant data gaps that need to be filled to better understand these connections. In recognition of this, JNCC has, when necessary, adopted an iterative process in its approach to the Overseas Territories natural capital programme. Initial phases working with available data, demonstrating the value of the approaches adopted for policy and planning making, even with limited data, and then using additional phases of work to acquire further data and supplement the initial results.

Box 2: Natural capital accounting builds on a number of principles

- **Repeatability** - the approach must be repeatable, so that measurement can happen at regular intervals without investing disproportionate time and resources into developing new methods. This enables monitoring of trends over time.
- **Consistency** – the approach must be consistent so that results can be compared and/or collated between habitats, benefits, data types, and across time periods, sectors and regions. This allows results to be expressed in equivalent formats and comparable.
- **Benefits focused** – the approach should focus on the value provided to people, so it must not just focus on the presence and function of ecosystems, but also how they benefit people, by understanding how people are able to access and use the ecosystem services provided.
- **Links** – the approach should seek to establish linkages between the existing natural environment, the quality or health of that environment, its ability to provide ecosystem goods and services, people’s ability to access and use those services, the value placed on the benefits provided, and the overall asset value of the natural capital.
- **Stakeholder participation** – the approach should involve stakeholders, particularly the participants in a programme or those affected by the likely policy and planning consequences arising from natural capital accounting exercises. A wide range of different types of participation and stakeholders can be involved at any stage of the evaluation process, including identifying priority goods and services to value, geographical areas of highest importance, data collection, analysis, reporting, and identification of policy and planning applications of natural accounting. (See footnote 4, page 7, for an example of an OT stakeholder consultation.)

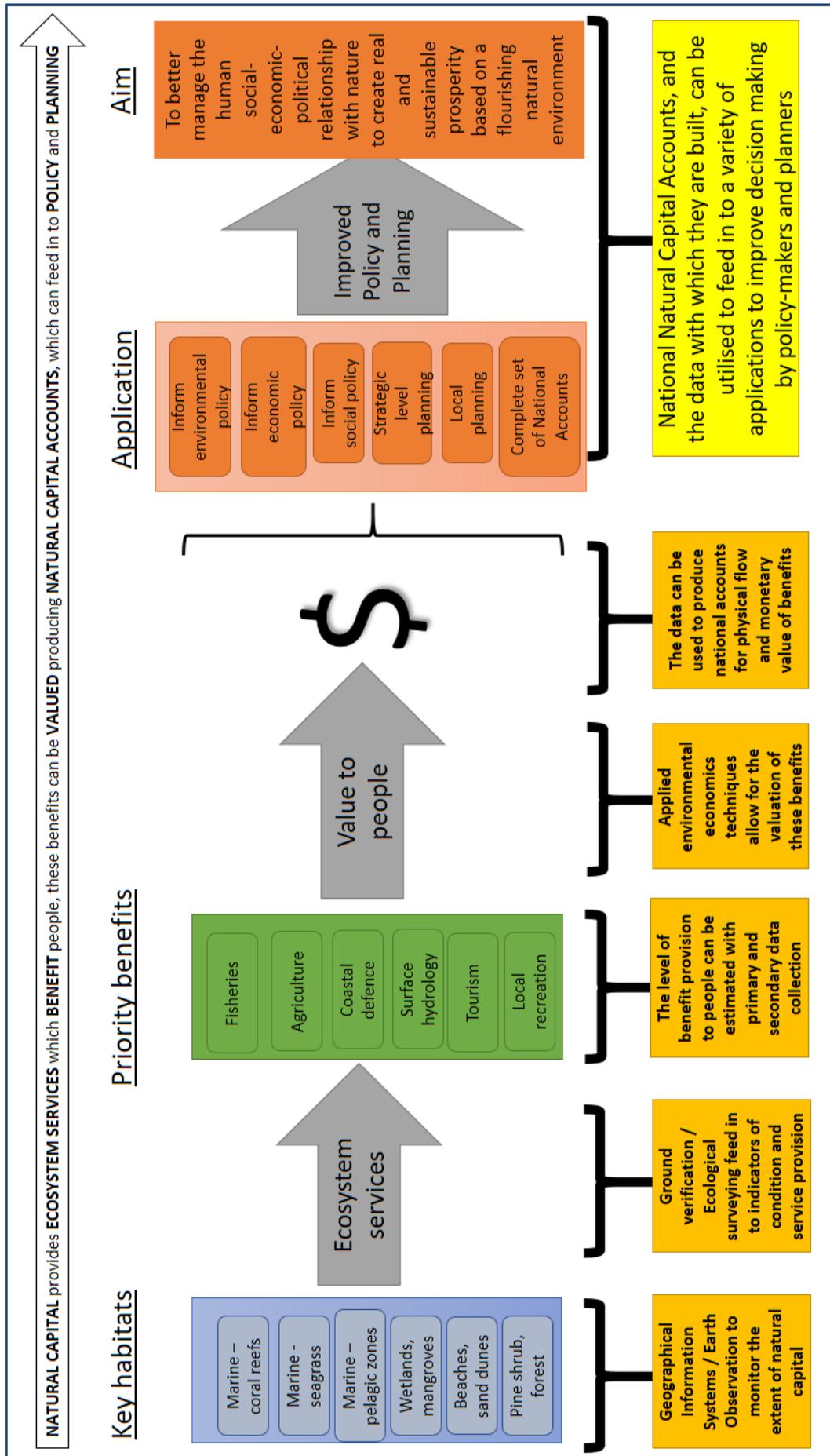


Figure 1: The natural capital accounting process as applied by JNCC and partners in a Caribbean OT context

Asset Register

The asset register is a record of the extent and condition of all of the natural capital assets in a given area. The natural capital asset register therefore acts as an inventory that holds details of the stocks of environmental assets that are relevant to the accounts, along with information on their quality, functionality, and other relevant factors.

The foundation for an asset register may be based on distribution and condition of *'Key habitats'* from which goods and services are derived (Figure 1). Habitat extent can be determined and mapped by traditional field techniques, with additional spatial data obtained through remote sensing techniques such as Earth Observation (EO) and integrated into Geographic Information Systems (GIS). The combination of remote sensing and on-the-ground techniques provides a strong evidence base from which to build the spatial basis for an asset register. The starting point for some analyses are not habitat based and are initiated using socio-economic statistics, such as fish catch returns and tourist statistics, which are integrated into the natural capital accounting process as *'Priority benefits'* (Figure 1).

Some considerations in constructing an asset register:

Use of existing data – it is not always necessary to acquire new data for natural capital assessments. Economic and ecological data collection already occurring for other purposes (for example tourism and fisheries) can feed into the accounting process, reducing the need for additional data gathering;

Spatial mapping - mapping spatial distribution of assets using GIS and EO is important for asset management and spatial planning. These technologies can provide the basis for cost effective updating of the asset register. This can be done remotely, off-territory, but is ideally undertaken on-island using local expertise;

Condition indicators – condition of habitats is critical to delivery of goods and services. When monitoring condition, picking suitable indicators is integral and this requires familiarity with the ecosystems in question and specialist knowledge in ecology, hydrology or related natural sciences. The development of indicators should be guided by the whole natural capital accounting process, so that systems are built which use the indicators that best capture the value of the provision of benefits.

Capacity building – training in the OTs to support natural capital assessments should be undertaken as an ongoing process updated at regular intervals to ensure natural capital review processes are managed by OT based organisations. A key part of the JNCC led programme is providing training in use of natural capital techniques and developing cost effective monitoring programmes in partnership with the OTs. This training includes use of GIS and EO techniques for valuation and monitoring, and also developing software solutions to ensure that data can be stored and processed on island.

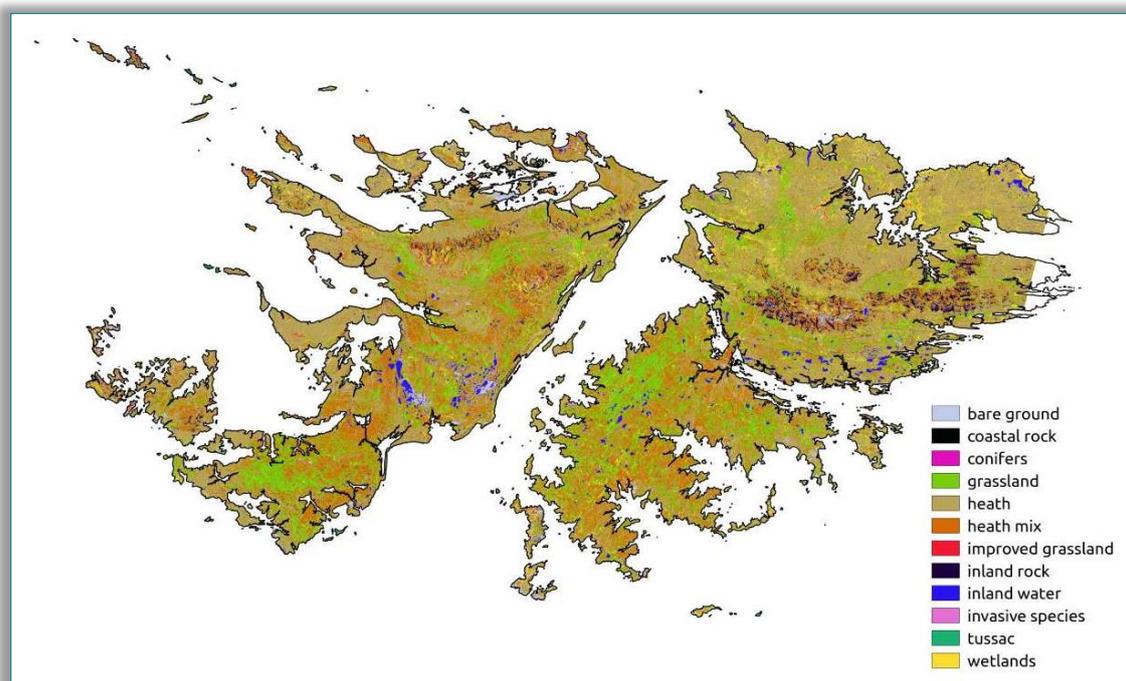
Box 3: Natural capital accounting on the Falkland Islands – Asset Register

The South Atlantic Natural Capital Assessment included producing a broad scale habitat map for Falkland Islands generated from Earth Observation techniques. A habitat classification was generated by an expert terrestrial ecologist. Due to the size and inaccessibility of much of the Falkland Islands, ground-truthing was only possible on an ad-hoc basis. Habitats therefore remain at a broad scale; some of the original habitat classifications were merged into broader classes (e.g. grassland), whilst others were refined where the data allowed.

Satellite imagery was taken by the European Space Agency’s Sentinel 2 at a resolution of 10 metres. It was classified using a pixel-based approach with more than 6,000 points matched with a specific habitat class. A habitat classification model was run in QGIS to compare the 6,000 points with the satellite imagery to produce a seamless habitat map.

This is the first complete habitat map that has been produced for the Falklands and will be an important foundation for future decision making and terrestrial research. Data are now available via the IMS-GIS data centre.

Other data available – such as the population census in the Falkland Islands - have not previously been expressed spatially. There are also data gaps, such as water sources, waste water outlets, rubbish dumps etc. A series of baseline maps has therefore been developed which set out the social, environmental and economic aspects of the Falkland Islands. These will form a basis for any future spatial planning.



Falkland Island habitat map – a foundation for land use planning and natural capital mapping and accounting

Physical Flow Accounts

The physical flow account records the expected flow of goods and services from the natural capital assets in the asset register. They provide a physical measure of the quantity of benefits on an annual basis and includes important information on the variety of ways that the environment provides value to people.

Key ecosystem benefits for the Overseas Territories vary from Territory to Territory, and the priorities for assessment, established through consultation, also vary. These benefits include the commonly recognised and relatively easy to value fishery and tourism values, the protective functions provided by the natural environment in mitigating hurricane impacts in the Caribbean and the less tangible, but important in a small island context, cultural services. Table 1 lists the principle natural capital themes being evaluated through the JNCC led programme of work.

Caribbean themes	South Atlantic themes
Artisanal fisheries	Commercial fisheries
'Mass' tourism	'Niche' tourism
Water resources and security	Water resources and security
Natural capital role in disaster mitigation	Erosion and landslip vulnerabilities
Forestry and agricultural values	Forestry and agricultural values
Cultural services	Cultural services
	Waste management – implications for natural capital values
	Deep sea ecosystem services

Table 1: Principle natural capital themes evaluated for the Overseas Territories

Habitats		Marine			Terrestrial		
Benefits		Coral reefs	Seagrass	Pelagic zones	Wetlands, mangrove	Beaches, sand dunes	Pine shrub, forest
Provisioning	Fisheries	*	*	*	*		
	Agriculture						*
Regulating	Coastal protection	*	*		*	*	
	Surface hydrology						*
Cultural	Tourism	*				*	
	Local cultural services	*			*	*	*

Table 2: Asset - Service Matrix for the Turks and Caicos Islands initial natural capital accounts

Note: This example uses a selection of ecosystem types (i.e. habitats) and ecosystem services (i.e. benefits). The orange (starred) shading indicates which ecosystem types provide the priority benefits identified. Work should start with a matrix using a full typology of both ecosystems, ecosystem services and abiotic services.

For habitat derived goods and services, not all physical flows from natural capital will be significant or worth evaluating. An 'asset-service matrix' can be useful in identifying the most relevant flows of benefits for inclusion in an account (Table 2). Completing this matrix can be a useful process to undertake during a multidisciplinary

meeting, providing a process that helps different experts to combine their knowledge and learn from each other. This co-working has benefits beyond accounting, including better identification of problems, priorities and solutions. Once the prioritised benefits that are possible to quantify are identified, the annual flows should be measured. The approach to measuring the benefits provided within the OTs will vary between territories by type of ecosystem service and benefit. Some relevant data will already exist such as economic data for natural resources, the tourism sector and other user group data, and utilities and infrastructure data. Additional data can be collected through social research including surveying, economic and econometric analysis, and monitoring of environmental outputs and levels of usage. Geo-referenced socio-economic data along with infrastructure maps can be compared with habitat maps to help identify and measure location-specific use. Figure 1 outlines how these elements fit in to the overall natural capital accounting process in the OTs.

In practice, secondary data in a readily useable format may be limited, especially with regards to regulating services. Resource and time constraints can further limit primary data collection. This may require an innovative approach using what is available, clearly caveated with assumptions and further inferences to fill remaining gaps and making use of modelling where possible. In such cases, it is important to prioritise the most material benefits in the given context and to focus on where the most value is being provided: the natural capital accounting process identifies these elements. Any limitations with the adopted approaches should be clearly noted and provide a guideline for improving future iterations of the accounts.

Data with which to measure these benefits is already collected for different uses, and can be mutually beneficial, for example:

- **Fisheries data** may be collected as economic data for national economic accounts, for natural capital accounting to demonstrate the value of marine habitats and by environmental departments to monitor marine ecosystem health. Note that this data may be incomplete where fishers are not registered and/or practice informal fishing, and other approaches may be employed to supplement it.
- **Data collected by tourism boards** to assist hotels in planning for and managing the economically important hospitality sector can also be used to track the benefit that natural capital contributes to the tourism sector and help justify investment in its maintenance to sustainably provide this benefit.
- **Infrastructure maps** used for spatial planning can be used with GIS and EO to help model the flood hazard protection benefit natural capital provides against sea surge, identifying specific infrastructure and community facilities protected by the natural environment.



Fish landings and data collection, Montserrat. Photograph Tony Weighell, JNCC

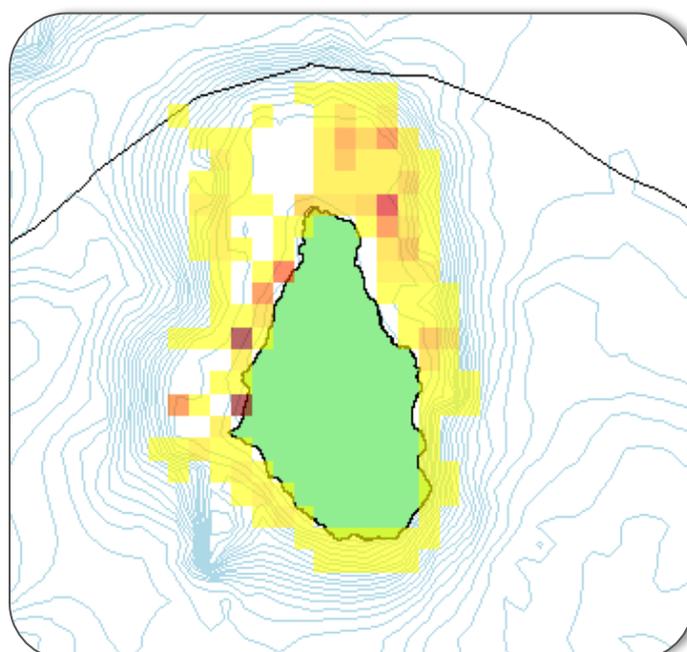


Box 4: Natural capital accounting on Montserrat – Physical flow account

An initial NCA was developed by Montserrat, supported by JNCC and eftec, built on preceding work to map habitats on the island using open source satellite data (Sentinel-1 and Sentinel-2), combined with ground-truthing. Based on this habit mapping and other evidence, including an enhanced fishery monitoring programme, data on physical flows and monetary values of ecosystem services were collated. The data were combined into an account summary and presented to stakeholders on the island.

Data to produce the physical accounts were collected by the following methods:

- **Water** - Water consumption and production data are recorded by Montserrat Utilities Limited (MUL). Production levels
- **Food from land** – volume of food production from the cultivated land on Montserrat is unknown, a proxy for profits from cultivation is the rent paid on the land.
- **Hunting** – estimated quantity of meat per year obtained from hunting feral animals
- **Minerals** – quantity of sand and gravel extracted is not known, but the majority is exported, and the Montserrat Port Authority collects monthly data on the net weight of sand and aggregate exports.
- **Tourism** - The Montserrat Tourism Division records data on total number of leisure visitors used along with the stay-over visitor exit survey report data on the purpose of respondents' visits, average length of stay, type of accommodation and a rating of tourism activities and services.
- **Fisheries** – Weekly landings calculated based on a JNCC field survey of fishermen and extrapolated to estimate annual values.



Fishing effort for nearshore zone of Montserrat

Monetary Accounts

The monetary account measures the value of the flows of benefits that are captured in the physical flow account in monetary terms. They aim to measure both the market and non-market values and estimate the total economic value through different techniques of economic valuation⁶. This applies to both the annual value of the benefits flow and the natural capital asset value over a defined assessment period. Figure 1 outlines how this element fits in to the overall natural capital accounting process in the OTs.

As the monetary account measures value in a common metric, money, it allows for comparison between different benefits within the accounts, and between different accounts. Importantly, it also allows for comparison across many other factors which may act as inputs to decision making, such as: national economic accounts; the financial cost of an intervention; replacement costs for critical infrastructure; the price paid for public provision of alternative services; and income revenue streams from traditional capital assets. Monetary values help assess trade-offs across these factors, and to justify allocation of scarce resources to environmental management and protection.

Monetary valuation of the different flows of benefits captured in a natural capital account will usually use a variety of valuation techniques and data sources. Values from 'market' goods can be estimated using current data or appropriate forecasts of output prices and input costs. Valuation of benefits that do not have a market value is more challenging but can be estimated through a range of non-market valuation methods, such as revealed preference, stated preference, and value transfer. Data for the monetary value of non-market benefits (e.g. informal recreational use) can be collected through primary research using environmental economics valuation methods or by adapting evidence available from existing studies (i.e. Willingness to Pay transfer values).

Caution must be used with any adopted approaches, and with the results expressed with appropriate caveats, to ensure that the monetary units applied reflect the value as accurately as possible. Table 3 illustrates use of a 'traffic light' system to indicate uncertainties in methods used for monetary valuation in a natural capital account in the OTs.

Physical flows and monetary values should be recorded separately, and then reported together, as together they create added value. Where monetary valuations are uncertain, but suggest certain benefits are important, physical flow indicators might be the best measure. In the context of the OTs, it may be likely in some cases that producing physical flow accounts is more feasible than monetary valuations, but even so the aim should be to build monetary accounts to guide the collection of the most important data for the physical account. As with physical data, sources already exist for the monetary valuation of some priority benefits. For example:

- Fisheries and agricultural produce are sold in markets and so market data will exist;
- Tourism receipts and expenditure data can be used to estimate value in monetary terms for tourism; and,
- The monetary value of avoided property damage can be estimated with listed property value and damage cost estimates from construction costs or insurance claims.

⁶ For a discussion of Total Economic Value and economic valuation applied to the environment see the 2016 Valuing Nature Programme paper "Demystifying Economic Valuation". Available from: <http://valuing-nature.net/demystifying-economic-valuation-paper>

Benefit	Note on approach
Fisheries	Based on a combination of reported fish for export and domestic consumption patterns and prices paid to fishers, likely overestimates value of domestic consumption. (M)
Agriculture	Based on farmer reported weights and a spot check of market prices, likely a good approximation of overall value. (L)
Coastal defence	Current gaps in data for GIS input layers for physical benefit and damage cost estimates for valuation, likely a considerable benefit. (H)
Surface hydrology	Current gaps in data for GIS input layers for physical benefit and damage cost estimates for valuation, likely a moderate benefit. (H)
Tourism	Based on tourism surveys for number of nights, activities, and expenditure, and assumptions for degree of ecosystem dependence, likely a reasonable approximation of overall value. (L)
Local cultural services	Based on total population and a transfer value for Willingness to Pay for cultural services, generalised approach likely underestimates the total value. (M)
Uncertainty level and description	
High uncertainty (H)	Low uncertainty reflects confidence in the evidence to support decisions. High uncertainty reflects results that may be inaccurate by more than an order of magnitude. Some data may be marked as 'moderate' where the data used are themselves accurate, but do not provide a full measure of the services' value
Moderate uncertainty (M)	
Low uncertainty (L)	

Table 3: Presenting uncertainty in monetary value of natural capital benefits

Several approaches to valuing benefits within the context of the OTs have been applied (Box 5), some of which require innovation in approach. Once the annual flow of monetary value has been established, the asset value can be constructed based on the expected profile of the flow of benefits and their monetary value over time, expressed in present value terms. For example, the changes in the flow of benefits and their monetary value can be impacted by the extent and condition of the habitats providing them, factors related to access and recipient populations, and the unit value of the benefit.

As the monetary account records trends in value over time it can be used to monitor the impact of interventions and establish the return on investment. This can help justify the protection of environmental assets and their enhancement to increase future revenue streams of ecosystem services.

Box 5: Natural capital accounting on Turks and Caicos Islands - Monetary flow account

The TCI Department of Environment and Coastal Resources (DECR) was supported by the JNCC and etfec to conduct an initial natural capital account.

The assessment focused on specific benefits which drive environmental value in TCI, with economic valuation to apply monetary values as follows:

- **Fisheries** – The value is calculated as the weight of landed fish times the market price paid to fishermen at landing. An average of the three most recent years for which data was available on prices paid to fishermen at landing was used.
- **Agriculture** – The quantities reported for each item of produce were valued with the market price as quoted in a local grocery store and adjusted to account for other factors included in the price.
- **Coastal defence** - A monetary value is applied for the avoided cost associated with flooding. As specific real estate value data is not available, costs are calculated as the proportion of relative damage applied to an estimate of reconstruction cost per square meter in the OTs.
- **Water regulation** – A monetary value is applied for the damage cost avoided due to the benefit of water flow regulation provided by vegetation. As specific real estate value data is not available, costs are calculated as the proportion of relative damage applied to an estimate of reconstruction cost per square meter in the OTs.
- **Tourism** – A ‘factor of ecosystem dependence’ score was applied to the value added by the tourism sector for each tourism expenditure category. This value was applied to the total expenditure for each category of visitor, and applied to the total number of visitors in each category. For cruise ship tourist and crew expenditure, and supplementary cruise line expenditure, the value added by the tourism sector and a factor of ecosystem dependence was applied to the total average spend per visit. To account for the value to tourists over the price they pay, a transfer value was applied based on the willingness to pay for nature conservation from visitor exit surveys on other Caribbean islands. This value was applied to the total number of overnight visitors.
- **Local cultural services** - Willingness to pay for cultural and non-use values were adopted from research literature and adjusted to reflect the relative Purchasing Power Parity of the TCI. There were applied to the total resident population of the islands to estimate the welfare value provided.



Arawak beach, Anguilla, displaying multiple benefits from the natural environment

Photograph by Jake Kuyer, etfec

The immediate future for OT Natural Capital accounting

The JNCC led, CSSF supported, natural capital programme in the Overseas Territories has demonstrated the value of natural capital accounting in the participating Territories. The programme builds on previous work supported by the UK Government to encourage mainstreaming of environmental issues into decision making in the Overseas Territories of Anguilla, British Virgin Islands, Turk and Caicos Islands and the Falkland Islands⁷. The mainstreaming work supported small scale projects to demonstrate the application of environmental economic techniques in environmental management.

Extending this earlier work, the natural capital CSSF programme has demonstrated the scale of monetary and cultural benefits to the Territories, the value of natural capital approaches to planning and policy making, and how existing socio-economic and scientific data can be fed into these approaches. A key objective of the JNCC led programme has been to begin the process of embedding these natural capital principles and practice into planning and policy making in the participating Territories. The programme has also been designed to provide the OTs with data, including high resolution satellite data, for future use by the OTs and to train OT professionals in the use of natural capital techniques.

There is now widespread recognition, within the UK and in global institutions, of the value of the natural capital approach in environmental management and economic planning. Funding for national and regional environmental programmes increasingly offers opportunities for research into or application of natural capital techniques and the 2018, Round 7, UK Government Darwin Plus programme identified natural capital as a key theme for funding.

Territories that have participated in the JNCC-led programme are now well placed to continue to use data and new skills acquired through the CSSF programme to use their own resources, or seek additional support from other sources, for future work. Immediate, short term (2/3 years), priority activities should address the following:

- 1. Extend the natural capital approach to Territories not participating in the JNCC led programme.**
 - Participants in the JNCC, CSSF supported, programme represent a significant subset of the 14 UK Overseas Territories. Regional workshops during the final phases of the programme, and report dissemination, will communicate the opportunities and benefits of the natural capital approach to other Territories.
- 2. Define lead organisations and their roles.**
 - A collective understanding is necessary across different government departments on the environmental impact of economic growth on the ability of ecosystems to deliver goods and services which benefit people. Natural capital accounting processes may be initiated by environmental departments, but a key, if not lead, role should lie with statistics department to ensure natural capital accounting is mainstreamed as part of national accounting. Readily accessible sources of relevant data,

⁷ <http://jncc.defra.gov.uk/page-6436>

systematically feeding into planning and policy decisions at all levels, can become an integral component of review cycles.

3. Update and extend natural capital assessments

For the Territories that have been involved in the programme the immediate future should include updating and extending the assessments and applications undertaken through the current programme.

- Natural capital evaluation and accounting processes should be iterative, at all stages, from basic habitat mapping, identification of priority benefits and then application of techniques. The processes should be embedded in decision making through repetition of the accounts, ideally annual, building more reliable data systems and methodologies with each iteration.
- Any progress or improvement, even if incomplete, will add value to the overall process, and its ability to effectively feed into decision making. As the accounts become increasingly comprehensive records of the value natural capital provides to a Territory, they should become further embedded in the OTs policy and planning systems and form a vital component of government statistics and public record.
- The frequency of updates also needs to consider how sensitive different variables are to change. Tourist revenues or fish catch can vary from year to year, habitat extent and condition will change (for better or worse) over longer periods. Updating of accounts and the use of indicators to monitor change should reflect these rates of change. A significant benefit of natural capital accounting techniques - scientific, economic and social - is their ability to monitor a wide variety of national trends and provide up to date information to decision makers. Regular updating is therefore essential.
- Once the initial natural capital accounting processes are in place, replication should not be overly burdensome, and can evolve over time rather than requiring significant investment in any one-time period.

4. Develop information management systems

- Data collection and management systems are critical to ensure the quality of outputs is of an appropriate level to inform policy and planning. This will involve the use of standardised protocols and knowledge about data handling and processing to collate information from varied sources and present the data in a policy relevant format.
- Once the systems are set up, evaluations should be based wherever possible on data collected for other socioeconomic or scientific purposes. Updates can be streamlined so that as new data is generated, it is fed into the natural capital accounting system as a matter of routine. Natural capital accounting should be routine, not exceptional, but does not have to be resource intensive. While the accounts should be produced on an annual basis, it is not necessary to update every element every year provided it is clear on the provenance and vintage of data being used.

The longer-term role for Natural Capital accounting in the Overseas Territories

The UK's Overseas Territories provide a home to 220,000 people in a wide variety of small islands, at high and low latitudes, and in very different biogeographic settings. The economic and physical security of these islands is highly dependent on the natural environment, each with different aspirations and capacity for economic growth. Natural capital accounting is a way to understand the value that the natural environment contributes to society in these islands. In doing so, it can provide an evidence base with which to make better decisions that help to optimise the benefits that the natural environment provides.

These decisions can be made at country or community level, providing aggregated data for national policy makers and planners but also demonstrating the relevance and value of local natural capital assets for individual communities. In the context of disaster risk assessments, and the role of nearshore and coastal habitats in mitigating storm surge impacts, detailed mapping and natural capital assessments can even focus on assessing this role in protecting individual properties, residential, business or public utilities.

The set of reports on the 2016 – 2019 JNCC led natural capital programme in the OTs will highlight both the value of the natural environment to the Overseas Territories and the policy and planning applications of a natural capital approach. The programme has also identified two areas of overarching strategic significance to inform a long-term role for natural capital accounting in the Overseas Territories in the context of their own economic and environmental planning.

First, natural capital accounting provides a philosophy, a framework and processes to make a wide range of socio-economic and scientific data policy relevant.

- Large amounts of economic, social and scientific data are routinely collected by Territory based government and non-government organisations. UK, regional and international funds support a wide range of environmental research projects in the Territories. The UK Government's Darwin Plus programme alone has funded 100 projects through seven rounds. The CSSF programme is supporting Blue Belt and invasive alien species control programmes. European, North American and OT based NGOs and international academic institutes are engaged in a wide range of Territory based scientific research with much of this now focussed on the marine environments of the South Atlantic and Caribbean.
- Data from these past, current and potential future activities are of immense value for national economic and environmental planning and policy making in the OTs. A major barrier to the optimal use of such data – irrespective of its source and intended use – is the lack of tools and processes to make such data policy relevant. As a result, available data is frequently not presented in a form for practical use by policy makers and planners, and its policy relevance may not even be recognised.
- A natural capital approach can provide a unifying framework and set of tools to make socio-economic and science data policy relevant. Irrespective of the original purpose of the data collection exercises (social, economic, scientific) natural capital accounting can demonstrate the relevance of data for policy makers and make these data accessible to individuals and organisations in policy relevant formats, as

statistics or in map form.

- A natural capital approach – as outlined in this document – provides a structured process that can meet the requirements of environmental legislation, development of environmental management strategies, developing plans for sustainable tourism and contribute to monitoring the environmental changes facing the Territories.
- The 2017 hurricane disasters in the Caribbean have highlighted the importance of maintaining and enhancing those elements of the natural environment critical for protecting human life, livelihoods and property. These events have made it imperative that disaster planning makes use of all available data.

Second, to enable the wide variety of available data to be made policy relevant, information management systems are needed that can store, collate and analyse the large amounts of data currently available and deliver them to the relevant organisations and individuals in a usable format.

- The socio-economic and scientific data that underpins all aspect of natural capital accounting is accumulating at an increasing pace, particularly data derived from remote sensing technologies such as satellites, drones and marine surveys. The capacity to store and process this data, and undertake the necessary analysis to make it relevant and accessible to policy makers and planners, is a limiting factor in many Territories. The JNCC led work programme highlighted this data management limitation early in the programme and where possible has worked with some OTs to remedy this, building physical and human capacity to manage data on-island alongside remote support through ‘cloud’ based applications.
- Natural capital accounting can provide a powerful mechanism for maximising the use of widely varying forms of data in national planning and policy making. This is only feasible and practical if Territory governments have the information management systems needed to collate data from the many sources involved and present it in the appropriate policy relevant forms – statistical data sets, maps or economic outputs – to decision makers. Significant effort needs to be made to ensure the Territories have these systems in place in terms of hardware, software and trained personnel.



2017 Hurricane damage, Anguilla. The natural environment plays a significant role in protecting property and human life from wind and storm surge. Photograph Amanda Gregory, JNCC



+44 (0) 20 7580 5383

eftec@eftec.co.uk

eftec.co.uk

[@eftecUK](https://twitter.com/eftecUK)

Established in 1992, eftec is the first consultancy in the UK to apply environmental economics to public policy and business challenges.



Joint Nature Conservation Committee

+44(0) 1733 562626

Email: comment@jncc.gov.uk

<http://jncc.defra.gov.uk/>

JNCC is the public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation.