



---

# CONNECTING FINANCE AND NATURAL CAPITAL

---

A SUPPLEMENT TO THE  
NATURAL CAPITAL PROTOCOL

---



NATURAL  
CAPITAL  
COALITION



Natural Capital  
Finance Alliance  
Finance sector leadership on natural capital

SECRETARIAT:



# Table of Contents

|   |           |
|---|-----------|
| <b>Foreword</b>   | <b>1</b>  |
| <b>Orientation</b>  | <b>2</b>  |
| Document structure  | 2         |
| Finance activities covered  | 4         |
| Audience  | 4         |
| <hr/>   |           |
|  <b>1 FRAME STAGE Why?</b>               | <b>5</b>  |
| 1.1 What is natural capital?  | 6         |
| 1.2 The relationship between the finance sector and natural capital   | 7         |
| 1.3 Natural capital-related risks and opportunities   | 9         |
| 1.4 What do natural capital assessments offer?  | 12        |
| 1.5 Actions   | 14        |
| 1.6 Outputs   | 14        |
| 1.7 Case Studies  | 15        |
| <hr/>   |           |
|  <b>2 SCOPE STAGE What?</b>              | <b>16</b> |
| 2.1 Decide the objective  | 17        |
| 2.2 Identify the target audience  | 18        |
| 2.3 Define the scope  | 19        |
| 2.4 Actions   | 31        |
| 2.5 Outputs   | 31        |
| 2.6 Case studies  | 32        |
| <hr/>   |           |
|  <b>3 MEASURE AND VALUE STAGE How?</b> | <b>34</b> |
| 3.1 Measure impact drivers and/or dependencies  | 37        |
| 3.2 Measure changes and trends in natural capital   | 41        |
| 3.3 Conduct valuation   | 46        |
| 3.4 Actions   | 51        |
| 3.5 Outputs   | 51        |
| 3.6 Case studies  | 52        |
| <hr/>   |           |
|  <b>4 APPLY STAGE What next?</b>       | <b>54</b> |
| 4.1 Collate results   | 55        |
| 4.2 Validate and/or verify findings   | 57        |
| 4.3 Disseminate results and take action   | 59        |
| 4.4 Actions   | 63        |
| 4.5 Outputs   | 63        |
| 4.6 Case studies  | 64        |
| <hr/>   |           |
| <b>5 Annex 1: Examples of valuation techniques</b>  | <b>66</b> |
| Glossary  | 70        |
| References  | 71        |
| List of figures   | 74        |
| List of tables  | 74        |
| List of boxes   | 75        |
| Acknowledgments   | 76        |

# Foreword by Mark Gough, Natural Capital Coalition; Marie Morice NCFA; and Angelique Laskewitz, VBDO

**If we told you that we could supply you with information that was essential to your portfolio, that would provide competitive advantage, and generate benefits to society and the environment, we are sure that you would all be interested in getting it.**

You would also probably be confused as to why this essential information was not already available to you.

Our relationship to the natural world (or natural capital) is, for the majority of the time, invisible in our decision making, and yet the companies that that we lend to, invest in and provide risk cover for, both depend and impact on it. The realization of these impacts and dependencies is growing, and leading companies in the corporate sector are now carrying out natural capital assessments to understand their risks, identify opportunities, and make better informed decisions.

Financial institutions are beginning to also recognize the gap in their information sources and the indirect impacts and dependences they have through their banking, investment and insurance activities.

There are some examples of excellence and a growing number of initiatives in this space, including the Principles for Responsible Investment, Environmental, Social, Governance (ESG) indicators and indexes, and the Sustainable Development Goals.

Natural capital approaches can enhance these by providing a clear framework to ensure that non-financial information is meaningful, robust, and pertinent for financial decision makers. It builds on existing processes, and encourages wider discussion around moving from impact to dependency, from measurement to valuation, from stocks to flows and from separate issues to a systems approach. It can help us to balance short term goals with long term resilience.

The Natural Capital Protocol has created a globally recognized and standardized framework for business. This supplement to the Protocol, aims to connect finance and natural capital in the same way, and to create a common language across business, government, civil society and finance on this important topic.

We have been extremely lucky to have so much input, not only from within the finance community, but also the influencers and enablers of the financial system. The Supplement has been developed collaboratively, through consultation and engagement with many different stakeholders to develop a widely accepted, scientifically robust, and useful guidance.

Hopefully this Supplement will inspire debate and conversation, start disagreements and lead to innovation. It is just a piece of paper at the moment, albeit with the input of many experts in the space, but it now needs to be turned into reality. Please read, apply, test and improve what is written here, and then share your experiences with others so we can continue to learn together.

Mark Gough  
Executive Director, Natural  
Capital Coalition

Marie Morice  
Director, Natural Capital  
Finance Alliance

Angelique Laskewitz  
General Director,  
Association of Investors for  
Sustainable Development  
(VBDO).

The Natural Capital Coalition is a unique global multi-stakeholder collaboration that brings together leading initiatives and organizations to harmonize approaches to natural capital.”

The Natural Capital Finance Alliance (NCFA) is a collaboration between the UN Environment Programme Finance Initiative (UNEP-FI), Global Canopy and the finance sector which works towards the integration of natural capital considerations into financial decision-making.

The Dutch Association of Investors for Sustainable Development (VBDO) represents private and institutional members who consider it important that the companies in which they invest are socially responsible.

# Orientation

Financial institutions are largely aware that sustainability or “environmental, social, and governance” (ESG) issues can create risks for their banking, investment, and insurance outcomes. These institutions are also increasingly recognizing opportunities from active consideration of ESG factors. Even so, taking action can be complex and challenging.

The consideration and assessment of nature as a form of capital provides a systematic way to improve financial institutions’ identification and management of natural capital-related risks and opportunities. The approach builds on existing ESG practices and translates commitment into action by helping to generate trusted, credible, and actionable information that can be used to inform decisions.

## Document structure

This Supplement is based on the framework of the Natural Capital Protocol, a standard decision-making process written for business, made up of four stages covering ‘why’, ‘what’, ‘how’, and ‘what next’. This document builds on the Protocol, providing sector-specific guidance to make the Protocol more applicable and practical for financial institutions.

In the Supplement, each Stage asks specific questions and provides guidance on how to answer them. At the end of each Stage is a list of typical outputs (see figure 0.1).

### Box 0.1 The Natural Capital Protocol

The Protocol is a standardized framework for business to identify, measure, and value their direct and indirect impacts (positive and negative) and dependencies on natural capital.

It is designed to help generate trusted, credible, and actionable information that business managers need to inform decisions.

[www.naturalcapitalcoalition.org/protocol](http://www.naturalcapitalcoalition.org/protocol)

You may find it helpful to refer to the Natural Capital Protocol and supporting information available on the Natural Capital Hub for additional background, methodological detail, and greater depth around natural capital thinking.



**Figure 0.1**  
Key questions and outputs for each Stage of the Supplement

## Finance activities covered

This Supplement covers banking, investment, and insurance activities within the finance sector, with a specific focus on the following activities:

- **Banking:** Project finance, corporate lending, and underwriting
- **Investment:** Investment across the range of asset classes (e.g., equities, corporate bonds, sovereign bonds, property, private equity, infrastructure), active ownership (engagement), and impact investing
- **Insurance:** Corporate underwriting and reinsurance, with investment management activities covered under investment

The Supplement provides a framework for financial institutions to assess the natural capital impacts and dependencies of the entities and portfolios that they support. These impacts and dependencies represent an indirect relationship to natural capital on the part of the financial institution. If you are looking to identify, measure, and value your institution's direct impacts and/or dependencies (e.g., office materials, travel, and energy use), you should apply the Natural Capital Protocol rather than this Supplement.

## Audience

This Supplement is aimed primarily at ESG analysts, environmental managers, responsible investment managers, due diligence specialists, risk managers, analysts, and portfolio managers working in financial institutions.

Natural capital thinking can play an important role in informing strategic decisions, and it is therefore important to engage across the financial institution.

# FRAME STAGE

## Why?



The Frame Stage helps you establish why you would conduct a natural capital assessment.

The Frame Stage introduces concepts such as natural capital, ecosystem services, and natural capital impacts and dependencies. The stage explains how these concepts can pose risks and opportunities to the finance sector, and why a natural capital approach can help identify and manage them.

| Stage                 | Sections  |
|-----------------------|---|
| <b>01</b> Frame stage | 1.1 What is natural capital?  |
|                       | 1.2 The relationship between the finance sector and natural capital |
|                       | 1.3 Natural capital-related risks and opportunities                 |
|                       | 1.4 What do natural capital assessments offer?                      |
|                       | 1.5 Actions   |
|                       | 1.6 Outputs   |
|                       | 1.7 Case Studies  |



# 01 Frame stage

## 1.1 What is natural capital?

**Natural capital** is the **stock** of renewable and non-renewable natural resources (e.g., plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people. These benefits are commonly known as ecosystem services or abiotic services (see glossary left).

Natural capital underpins our societies, economies, and institutions and regulates the environmental conditions that enable human life.

We use the term capital as a metaphor. Natural capital is not a fungible asset like financial capital. It is instead a way of describing our relationship with nature and measuring and valuing nature's role so that we can include it in decision-making.

### Glossary

**Natural capital:**  
 the stock of renewable and non-renewable natural resources (e.g., plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people (Natural Capital Coalition 2016a).

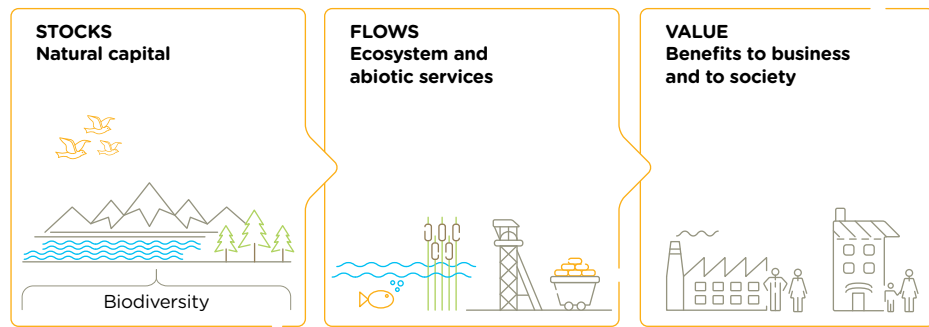
**Ecosystem:**  
 A dynamic complex of plants, animals, and microorganisms, and their non-living environment, interacting as a functional unit. Examples include deserts, coral reefs, wetlands, and rainforests (MA 2005). Ecosystems are part of natural capital.

**Ecosystem services:**  
 The most widely used definition of ecosystem services is from the Millennium Ecosystem Assessment (MA 2005): "the benefits people obtain from ecosystems". The MA further categorized ecosystem services into four categories:

- **Provisioning:** Material outputs from nature (e.g., seafood, water, fiber, genetic material).
- **Regulating:** 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:** Non-material benefits from nature (e.g., spiritual, aesthetic, recreational, and others).
- **Supporting:** Fundamental ecological processes that support the delivery of other ecosystem services (e.g., nutrient cycling, primary production, soil formation).

**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).

**Biodiversity:**  
 The variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems (UN 1992).



**Figure 1.1**  
 Natural capital stocks, flows, and value (Natural Capital Coalition 2016a)

Financial institutions often look at the environment through specific issues, such as water, waste, biodiversity, forestry, and climate change. There is a common misconception that natural capital concerns only biodiversity, but in fact natural capital includes all of these environmental issues and binds them together, including climate change.

**Biodiversity** is nevertheless critical to the health and stability of natural capital as it provides resilience to shocks, like floods and droughts, and supports fundamental processes such as the carbon, nitrogen, and water cycles as well as soil formation. Therefore, biodiversity is both a part of natural capital and also underpins the services that natural capital provides.

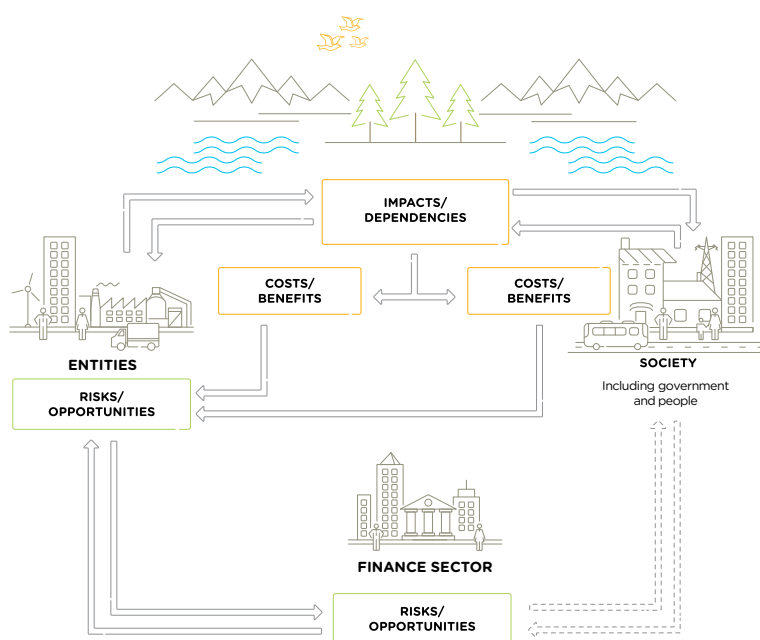
Natural capital thinking provides financial institutions with more in-depth understanding of the interconnections and trade-offs between all environmental issues. The concept of natural capital broadens the conversation to include dependencies, as well as impacts, and considers value, in addition to measurement alone. Understanding the value of both natural capital impacts and dependencies helps financial decision makers to understand the significance of these issues to their institution, and therefore make more informed decisions. This leads to greater insight on the reliability and resilience of financial returns, and the associated natural capital risks and opportunities for the institution.





## 1.2 The relationship between the finance sector and natural capital

Financial institutions support entities (including public and private organizations, projects, activities, assets, financial instruments, etc.) through their banking, investment, asset management, and insurance activities. These entities interact either directly or indirectly with natural capital. This can be through production inputs (raw materials, water, energy), or a dependency on the services that nature provides (regulating services such as pollination, supporting services such as nutrient cycling, or cultural services such as recreation). The conceptual model (figure 1.2) illustrates these interactions.



**Figure 1.2**  
Conceptual model for natural capital and the finance sector

Entities serviced by the finance sector impact and depend on natural capital. These impacts and dependencies deliver both costs and benefits to the entities (e.g., via operational production inputs, regulated emissions, license to operate) and to society (e.g., via recreational utility of landscapes, positive or negative health impacts, loss or preservation of species). In turn, these costs and benefits create risks and potential opportunities, which are transferred to the financial sector through banking, insurance products, and investments such as corporate bonds, stocks, and financial derivatives.

For example, a bank may lend money to an agricultural business. The agri-business may take actions to reduce soil erosion on its land (positive impact), leading to increased yield (benefit), thus enhancing the ability of the business to service its debt. This, in turn, improves the credit quality of the bank's portfolio (lower risk). A further example relating to soft commodities and natural capital risk can be found in box 1.3.

As the conceptual model shows, the finance sector also interacts with and depends on society, which includes government and people. Society provides the foundational enabling conditions necessary for the finance sector to exist, the social license to operate, to which finance responds by providing support and services (such as retail banking) to society. Government plays an important role in framing the enabling conditions for a stable economy by setting regulations and directing finance through the creation of market incentives which can stimulate the integration of natural and social capital into market decisions. Government also has the potential to influence market distortions which can affect financial decision making, see Box 1.1. These societal and policy-making factors are very important, but they are outside of the scope of this Supplement, which focuses on financial services provided to entities.



## Box 1.1 Market failures and distortions: focus on externalities and subsidies

Significant market failures are often directly connected to “externalities”; an externality is the cost or benefit that affects a party who did not choose to incur that cost or benefit.

Market failures include:

- Imperfect competition (e.g., when there is concentrated market power from monopolies).
- Missing markets (e.g., public goods, such as defense, education, and health, or situations where there are no property rights).
- Market distortions (i.e., where the government intervenes in the market, including in situations where it acts to address other market failures and/or to improve the equity of resource distribution). Market distortions include the following policies:
  - Taxes: These can be applied to change behavior and raise revenues (e.g., a tax on pollutants can help overcome the problem of negative externalities).
  - Subsidies: These are typically used to increase the production of a certain type of good (e.g., to support agricultural production of certain crops or help reduce the cost to consumers (e.g., fuel).
  - Price controls: These can be placed on monopolies such as utilities (e.g., water providers).
  - Nationalization: This relates to converting profit-seeking monopolies into nationalized organizations to improve social welfare outcomes.

While taxes and subsidies are often well intended, they can often have unintended consequences that result in environmentally damaging activities (e.g., monoculture, clearing of natural habitat, or overfishing). In these situations, they are referred to as “perverse” subsidies, causing more damage than good on natural capital.

When looking to value impacts on society in the Measure and Value Stage, the price of the tax or subsidy should be excluded, as they are “transfer payments” rather than actual resource-use costs.



### 1.3 Natural capital-related risks and opportunities

There are many natural capital-related risks and opportunities that are relevant to financial institutions. They can be grouped together under five categories, as shown in table 1.1.

**Table 1.1:**  
Examples of natural capital-related risks and opportunities for finance

| Category   | Examples of natural capital-related risks  | Examples of natural capital-related opportunities  |
|--|--|--|
| <b>Operational</b><br><i>Relating to entities' activities, expenditure and processes, etc.</i>   | <ul style="list-style-type: none"> <li>– Increased insurance claims resulting from changes in rainfall and flood patterns.</li> <li>– Increased risk of default as a result of entities facing higher business costs due to poor crop yields leading to higher agricultural commodity prices.</li> <li>– Reduced valuations due to increased costs for ecosystem services (e.g., higher cost for deeper groundwater extraction).</li> </ul>  | <ul style="list-style-type: none"> <li>– New mutual funds that invest in companies offering innovative solutions to natural capital problems (e.g., waste bio-refineries, biodiversity conservation banks).</li> <li>– Increased issuance of bonds for green infrastructure projects (e.g., natural flood management solutions).</li> </ul>  |
| <b>Legal and regulatory</b><br><i>Relating to laws, policies, and regulations that affect the activities of both financial institutions and entities</i> | <ul style="list-style-type: none"> <li>– Increased risk of defaults due to higher business costs as a result of changes in water treatment and disposal requirements.</li> <li>– Premature write-offs of assets as a consequence of delays due to difficulties in obtaining project permits and licenses.</li> <li>– Downward revaluation of assets due to high risk of litigation relating to activities that damage the natural environment or compromise livelihoods.</li> <li>– Risk of asset stranding as a consequence of land-use change limitations, constraints on pesticide use, waste generation, etc.</li> </ul> | <ul style="list-style-type: none"> <li>– Increased sales of liability and other insurance to cover natural capital-related legal risks.</li> <li>– Reduced risk of asset stranding by ensuring that the regulatory risks associated with natural capital are explicitly considered in investment decision making.</li> <li>– More timely preparation for investors in adhering to current and potentially stricter future regulation in relation to fiduciary duty.</li> </ul>   |
| <b>Markets</b><br><i>Relating to the flow and provision of financial services</i>  | <ul style="list-style-type: none"> <li>– Inability to attract co-financiers and/or investors due to uncertain risks related to natural capital.</li> <li>– Loss of investment value due to customer boycotts of entities producing products that are seen to have negative environmental impacts.</li> <li>– Loss of clients due to a fund's poor environmental performance outcomes (e.g., if a fund has suffered natural capital-related write-downs).</li> </ul>  | <ul style="list-style-type: none"> <li>– Increased demand for funds that invest in companies that have positive environmental credentials.</li> <li>– Enhanced financial performance of investee companies as a result of being able to access new markets and develop new products to meet green consumer demand.</li> <li>– The development of new revenue streams from new/emerging environmental markets and products (e.g., carbon offsets, sale of surplus water rights, habitat credits, renewable energy or electric vehicles).</li> </ul> |
| <b>Reputational</b><br><i>Relating to trust and relationships between stakeholders</i>   | <ul style="list-style-type: none"> <li>– Damaged reputation as a consequence of negative press coverage related to support of projects or activities with negative impacts on natural capital (e.g., deforestation of rainforest, overfishing).</li> <li>– Loss of clients as a result of their perception that the financial institution does not adequately account for natural capital in its decision making.</li> </ul>   | <ul style="list-style-type: none"> <li>– Improved reputation as a result of supporting activities that enhance natural capital (e.g., ecosystem remediation or rehabilitation).</li> <li>– Positive media coverage for supporting innovative activities (e.g., energy efficiency, circular economy activities).</li> <li>– Improved ratings by sustainability/ESG analysts.</li> </ul>   |
| <b>Societal</b><br><i>Relating to the relationship between, and consequence for, wider society beyond the institution and entities</i>                   | <ul style="list-style-type: none"> <li>– Damage to a local market as consequence of local community protests about the impacts of a project on their ability to access natural capital or related ecosystem services (e.g., pollution of aquifers as a consequence of the operation of a chemical plant).</li> </ul>   | <ul style="list-style-type: none"> <li>– Upward revaluation of assets through ensuring that local communities benefit from activities being supported by the finance sector (e.g., improved recreational access to a managed wetland, improved water quality from a managed water catchment).</li> </ul>   |

For further examples, see ACCA, *Fauna & Flora International*, and *KPMG 2012; CISL 2015; UNEP FI 2008; VBDO and CREM 2016*.



The classification of climate-related risk and opportunities by the Task Force on Climate-Related Financial Disclosures (FSB-TCFD 2017) has strong similarities with the classification presented in table 1.1. The TCFD considers two types of risk: (i) physical risks, similar to operational risk in table 1.1; and (ii) transition risks that encompass the remaining risk categories in the table. TCFD specifically identifies technological risk, which is not identified here as it is considered as a transversal risk across the rest of categories. This Supplement, and the natural capital approach generally, considers the value of natural capital both to the financial institution and to society more generally, it therefore includes a specific category of societal risk, which is not separated out by the TCFD.

The TCFD identifies resilience as a source of opportunity, which is aligned with operational opportunities in table 1.1. The other forms of opportunity (resource efficiency, energy source, and products and services) are included within the operational, legal and regulatory, market or reputational typology of opportunities above.

Boxes 1.2 and 1.3 discuss additional considerations around natural capital-related risks and opportunities including the relevance to sovereign credit risk (box 1.2) and a sector-specific perspective (box 1.3).

### Box 1.2 The relevance of natural capital for sovereign credit risk and bond markets

With more than US\$ 45 trillion in outstanding government debt (Bank for International Settlements 2016) (figure accurate at time of writing), this asset class is one of the largest in the global economy. Governments are also responsible for the management and stewardship of vast national stocks of natural capital. As countries rely on the resilience and productivity of their natural capital to sustain their economies, their approach to natural capital management may influence financial markets' perception of country risk and price of government debt.

A growing number of banks and investors are recognizing the need for a broader understanding of emerging risks in bond markets. Natural resources, both renewable and non-renewable, are critical to each nation's economy. Yet, to date, risks stemming from natural resources in particular are not adequately considered in determining the effectiveness of public finance.

The Environment Risk in Sovereign Credit (ERISC) initiative (UNEP FI 2016) has developed metrics and methods for quantifying natural resource and environmental risks so that these risks (such as how climate change might impact food production and economic indicators) can be incorporated into sovereign credit risk assessments.

One ERISC study found that if environmental risks were quantified and considered, 8 out of 78 countries assessed would experience a downgrade of at least one notch in their sovereign risk rating. Of these, 16 countries would be downgraded by three notches or more. These scenarios provide some early indication that natural capital can affect credit ratings and subsequently affect costs to governments of borrowing money through international capital markets.

This has been further supported by reports from the major credit ratings agencies. For example, Moody's has produced an infographic, "Climate Change and Sovereign Credit Risk" (Moody's 2016), highlighting links between physical climate-related factors and sovereign debt ratings and, through this lens, identifying higher- and lower-risk countries.

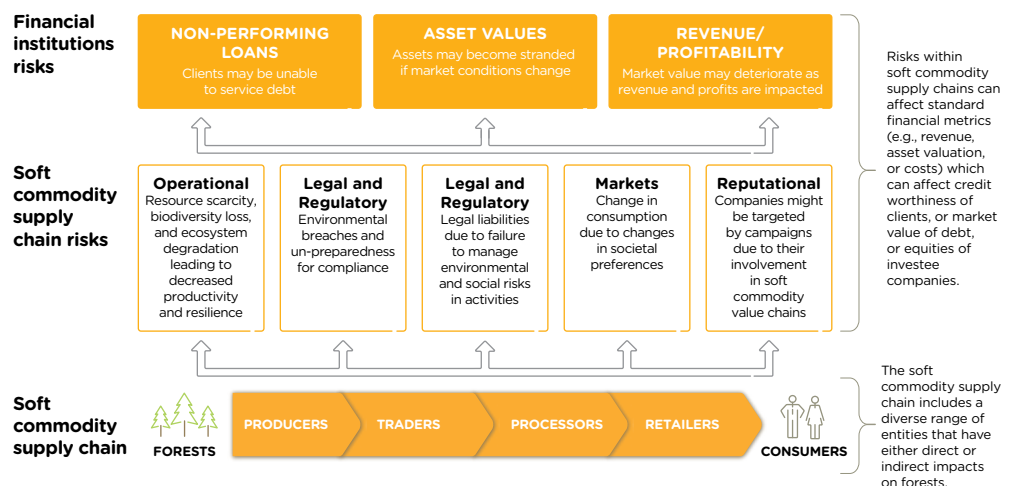


### Box 1.3 Soft commodities and natural capital risks: one example from a forest ecosystem

Palm oil, soy, and beef are examples of valuable soft commodities that generate significant impacts through degradation of forest ecosystems (e.g., through illegal logging) (note that many soft commodities impact ecosystems, such as seafood taken from marine ecosystems, this box provides only one example). Financial institutions that support soft commodity production value chains (by providing debt, equity, and other forms of capital or trading) can, the consequent degradation of natural capital, therefore suffer exposure to associated risks, such as decreased yields or conflict with local communities.

Financial institutions, especially those whose portfolios are significantly exposed to sectors with large direct or indirect impacts or dependencies on forest ecosystems, need to be aware of how this risk may affect financial operations and transactions. For example, from the lending perspective, the loss of forest ecosystems could impact cities and the agricultural sector by reducing provision of clean water, natural plague control, or pollination; it could therefore impede an agricultural client's ability to service its debt and therefore impair the credit quality of the portfolio. On the investment side it may affect valuations, and on the insurance side it may affect risk exposure. Banks, traders, and investment managers have a considerable indirect natural capital footprint by lending to, or investing in, companies involved in unsustainable production, trade, or sale of soft commodities. On the insurance side, association with illegal activities may result in loss of cover, or changes in ecosystem services may change the conditions of crop insurance.

It is still difficult to calculate a portfolio's exposure to entities with significant forest footprints, and/or the value at risk from issues such as water scarcity or deforestation impacts. However, the development of soft commodity policies offers a way for banks and investors to better manage this exposure, by managing their lending or investment in assets that potentially have high deforestation impacts. Figure 1.3 shows an example of how soft commodities (in this case forest products) are connected to risks for financial institutions.



**Figure 1.3** Soft commodities and natural capital risks (adapted from NCF and UNEP 2015)



## 1.4 What do natural capital assessments offer?

A number of finance sector initiatives address environmental issues. These include:

- The Equator Principles
- UN-supported Principles for Responsible Investment
- IFC Performance Standards (IFC 2012)
- Banking Environment Initiative
- UNEP Finance Initiative
- UNEP-FI’s Principles for Sustainable Insurance
- UN Environment Inquiry into the Design of a Sustainable Financial System
- The Dutch Association of Investors for Sustainable Development (VBDO)
- The Natural Capital Finance Alliance

Many financial institutions are already developing and using sustainability/ESG tools and methodologies, which can help bankers, insurers, and investors evaluate which environmental risks might affect a company’s revenue and costs and how the company is managing those risks. Some financial institutions might look at how companies manage natural capital-related issues such as energy use, waste, pollution, climate change impacts, biodiversity, and natural resource use.

The application of a natural capital approach builds on the ESG and risk initiatives already in use, but provides additional benefits, such as those described in table 1.2.

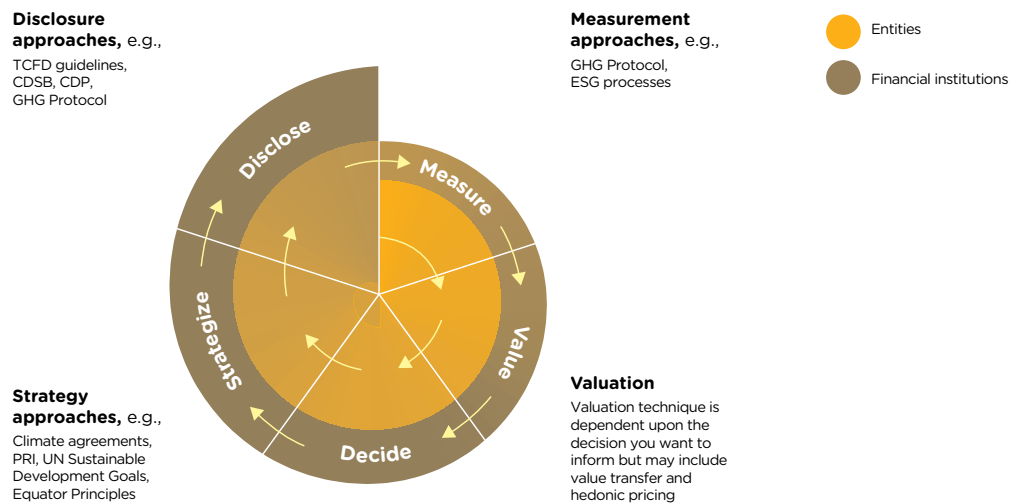
**Table 1.2:**  
The additional value of a natural capital approach

| Area                            | Existing approach   | Additional value of a natural capital approach   |
|---------------------------------|---|--|
| <i>Impacts and dependencies</i> | <p><b>Focus on impact</b></p> <p>A focus on the impacts on natural capital, rather than dependencies. Water discharge, waste and carbon are some more advanced issues in relation to impact, with concerted efforts to develop tools and instruments.</p>   | <p><b>Impact and dependencies</b></p> <p>A natural capital approach importantly includes a consideration of dependencies (e.g., fiber, minerals, seafood, pollination, climate regulation, water regulation, wind), to provide a holistic view of risks and opportunities.</p>   |
| <i>Valuation</i>                | <p><b>Focus on measurement</b></p> <p>Many financial institutions are already effectively measuring environmental aspects of their banking, investing, and insurance practices. This tends to be focused on measuring quantities of natural resources used as inputs to production (water, minerals, etc.) or the non-product outputs of business activities (emissions, discharges, etc.).</p> | <p><b>Focus on valuation</b></p> <p>A natural capital approach provides an understanding of what these inputs and outputs mean in terms of value to society and value to businesses and financial institutions in relation to associated impacts and dependencies. This progression from measurement to valuation is critical in understanding the extent of risk, exposure, and opportunity to better inform decision-making.</p> |
| <i>Scope</i>                    | <p><b>Limited issues</b></p> <p>Environmental assessments tend to focus on a relatively limited set of natural capital issues (e.g., relatively little attention is paid to regulating services and cultural values).</p>   | <p><b>Broader range of issues</b></p> <p>Able to consider a much wider range of natural capital impact drivers and dependencies, including those which might vary depending on context. Provides increased coverage of regulating services and cultural values. From this broader range, users are then equipped with better information to identify which are the most material.</p>  |
| <i>Connectivity</i>             | <p><b>Stand-alone</b></p> <p>Environmental issues tend to be seen as a series of stand-alone issues (e.g., climate change is often analyzed and treated as a distinct issue to water, biodiversity, or public health). The consequence is that relationships between these issues are often missed (e.g., issues of scarcity, multiple uses and trade-offs).</p>                                | <p><b>Interrelated system</b></p> <p>Able to treat natural capital as a set of interrelated issues, considering trade-offs and net positions.</p>  |



This Supplement builds on work already done by the Natural Capital Protocol. The Protocol is written for businesses and other entities to understand their own impacts and dependencies. The Supplement enables financial institutions to build on the Protocol framework and to make it applicable for their own decision-making.

Figure 1.4 illustrates how the natural capital assessment process acts like a continuum, with entities (e.g., businesses) and financial institutions tracking the same path. Entities measure, value, decide, and strategize against their own natural capital impacts and dependencies. These could be shared with supporting financial institutions through public sustainability reporting, or in response to surveys or ratings, or through direct requests. This then allows the financial institutions to build their own understanding on their entities and portfolios, allowing them in turn to measure, value, decide, strategize and disclose if they chose to.



**Figure 1.4**  
The process of integrating natural capital information



## Flexibility across types of analysis

A natural capital analysis is likely to resemble one of five types (see table 1.3). You may choose combinations of analysis. For example, if you wish to demonstrate active engagement with your investees, you may begin by analyzing total value across your portfolio, then use the results to engage with stakeholders (e.g., investee companies) and finally communicate findings to the public.

**Table 1.3:**  
Types of natural capital analysis

|   |   |
|---|---|
| <i>Assessment of risk and opportunities</i>   | Providers of financial services are exposed (both positively and negatively) through the direct natural capital risks and opportunities of the entities (companies, activities, assets, etc.) they engage with. Improved understanding, measurement, and valuation of natural capital impacts and dependencies can help to better inform decisions, and thus provide better returns, in the finance sector. |
| <i>Comparison of options</i>                  | Natural capital assessments provide information to compare options, and can help to assess and balance expected profitability against risk exposure. Natural capital assessments provide actionable and reliable information to allow comparison of natural capital-based risk and opportunity and to understand trade-offs.  |
| <i>Engage stakeholders</i>                    | The finance sector has a crucial role as a driver of change. Financial institutions can use natural capital assessments to engage with stakeholders (such as investees, suppliers, clients, and the public) to encourage greater attention to, and awareness of, natural capital.   |
| <i>Estimate total value and/or net impact</i> | Natural capital assessments can provide actionable information about the total value/net impact of individual entities and of portfolios. Total contribution to society can be used to consider the social value of financial activities over time. It might also be used to assess the value at risk due to portfolio composition.   |
| <i>Communicate internally or externally</i>   | Natural capital assessments generate and organize information using a systematic, comprehensive, globally acceptable framework. This can be used to enhance transparency both internally and externally.  |

## 1.5 Actions

1. Identify which natural-capital related risks and opportunities might be relevant, now or in the future. The examples in table 1.1 may be helpful.
2. Using the examples of additionality in table 1.2, consider how the natural capital approach might help you address some potential risks and opportunities.
3. Of the types of natural capital analysis in table 1.3, consider which might be of most interest within your financial institution.

## 1.6 Outputs

After completing the Frame Stage, you will have the following outputs:

- An understanding of the business case for considering natural capital information in decisions.
- Knowledge of how a natural capital assessment can benefit you.
- Potential types of analysis and uses of their results.





## 1.7 Case Studies

Case study examples are used to illustrate how you can use the information created from this Stage to inform your decision making.

**Table 1.4:**  
Case studies for the Frame Stage

|  | Bank for @ll  | Asset manager Triple Capital   | Capital Insurance  |
|--|---|--|--|
| <i>Context</i>   | <p>Bank for @ll is a signatory to the Equator Principles. The bank's project finance team is reviewing a funding request from one of its clients for a major natural gas project comprising:</p> <ul style="list-style-type: none"> <li>- A gas extraction field</li> <li>- A gas pipeline (400 km)</li> <li>- An onshore gas liquefaction plant</li> </ul> <p>The onshore gas plant will be located close to a UNESCO World Heritage marine site. The bank is concerned about the effects of the project on biodiversity, and hence its acceptance by the UNESCO committee. As a signatory to the Equator Principles, the Bank cannot afford the reputational risk of investing in a UNESCO-disapproved project.</p> | <p>Triple Capital is a signatory to the Principles of Responsible Investment (PRI), with long-standing commitments to account for environmental, social, and governance (ESG) issues in its investments and to engagement with the companies and other assets it invests in.</p> <p>Triple Capital is exploring whether natural capital assessment(s) can help it to better understand and manage natural capital-related risks and opportunities, and also help it to respond to those clients with a particular interest in natural capital.</p> | <p>Capital Insurance provides business interruption insurance to many of its clients. This insurance frequently covers losses as a result of flooding or other extreme weather events, many as a result of climate change.</p> <p>Capital Insurance routinely assesses weather- and flood-related risk as a standard part of its due diligence processes. It now wants to explore whether it is fully accounting for its exposure to climate change-related risks at the portfolio level and how it might improve processes for assessing these risks.</p> <p>Related to the increase in extreme weather events, Capital Insurance also wants to explore the extent to which its portfolio is dependent on natural flood defenses, and the value of this dependency.</p> |
| <i>Understanding the business case for natural capital</i> | <p>The bank will conduct an assessment to determine the net impact of the project and will consider data from this assessment in its decision on whether or not to fund the project, and what mitigation measures could be adopted for it to comply with UNESCO expectations, and therefore allow the bank to proceed with investment.</p>  | <p>The fund manager will conduct an assessment to identify risks and opportunities, by focusing on its emerging market listed equity portfolios.</p>   | <p>The insurer will conduct an assessment of how climate change is expected to affect flood risk profiles and of potential future payouts to the companies it insures. It will also look specifically at the business value of natural flood defenses across its portfolio.</p>  |
| <i>How a natural capital assessment benefits you?</i>      | <p>The main benefit for the bank is to have actionable information about the viability of the project and associated risks to the neighboring marine UNESCO site. They hope this information will help to design mitigation measures, and therefore make the project an attractive, compliant investment.</p>   | <p>Improvement of risk management (by enhancement of inclusion/exclusion and overweighting/underweighting criteria). Also, enhancement of engagement and voting practices.</p>   | <p>The insurer will be able to identify regional and sectoral risk exposure and improve pricing of insurance. Depending on the value of dependency to natural flood defenses, the company may also inspire preventative action to limit its future risk.</p>   |
| <i>How might the results be used?</i>                      | <p>Bank for @ll wants to understand the risks and impacts of the project on the biodiversity and mitigation options, as well as to assess whether project impacts would be acceptable to the UNESCO committee, and to the bank itself as a signatory to the Equator Principles.</p>   | <p>If the exploratory assessment is useful, Triple Capital will use future assessments to inform investment decision-making and portfolio risk management processes. Assessments will also guide identification of engagement opportunities.</p>   | <p>Capital Insurance wants to understand how significant climate change is as a portfolio-wide risk, to inform its thinking on whether it needs to pay more attention to this sort of systemic risk in its due diligence and decision-making processes, particularly regarding the management of flood defenses.</p>   |

# SCOPE STAGE

## What?



The Scope Stage helps you define what should be included in your assessment.

In this Stage, you will define your objective and identify the audience for the results of your natural capital assessment. The Scope Stage also guides you through a series of interrelated decisions to scope your assessment including identifying assessment focus and boundaries. Scoping is an iterative process where decisions are refined over time, both during the scoping process and during the later Stages of the assessment.

| Stage                 | Sections                         |
|-----------------------|----------------------------------|
| <b>02</b> Scope stage | 2.1 Decide the objective         |
|                       | 2.2 Identify the target audience |
|                       | 2.3 Define the scope             |
|                       | 2.4 Actions                      |
|                       | 2.5 Outputs                      |
|                       | 2.6 Case studies                 |



# 02 Scope stage

## 2.1 Decide the objective

Once you have decided to conduct a natural capital assessment, and you have defined the analysis type, you then need to define a specific objective. Table 2.1 includes some examples of objectives and groups these by type of analysis.

If this is your first natural capital assessment, consider starting with a narrower or more manageable objective, to help yourself get familiar with the process. For example, use an issue for which you already have some data or have internal experience.

**Table 2.1:**  
Examples of objectives for different types of analysis

| Type of analysis                              | Sample objectives  |
|---|--|
| <i>Assess risk and opportunities</i>          | <ul style="list-style-type: none"> <li>- To estimate the natural capital-related risk by economic sector, across a number of different regions, to inform future portfolio risk.</li> <li>- To assess the market potential for new natural capital-related <b>products</b> (e.g., investment products linked to sustainable tourism, or products related to sustainable coastline protection).</li> </ul>  |
| <i>Compare options</i>                        | <ul style="list-style-type: none"> <li>- To analyze how <b>portfolios</b> perform under different scenarios (e.g., different low-carbon transition pathways).</li> <li>- To compare different investment opportunities, (e.g., two different agricultural developments with respect to their dependency on ecosystem services such as pollination of crops or water security).</li> </ul>  |
| <i>Stakeholder engagement</i>                 | <ul style="list-style-type: none"> <li>- To assess the dependency on water of a <b>portfolio</b> of manufacturing facilities in a drought-prone area, with the aim of engaging with the most exposed companies to help them reduce dependencies.</li> <li>- To work with a bank's <b>portfolio</b> of farmers to help them improve their resilience to natural capital changes and to reflect this in their risk ratings.</li> </ul>   |
| <i>Estimate total value and/or net impact</i> | <ul style="list-style-type: none"> <li>- To quantify the financial significance of the biodiversity and deforestation-related impacts of a new mining <b>project</b>, as part of a wider project risk assessment or due diligence process for a client.</li> <li>- To assess the impact of drought scenarios across a <b>portfolio</b>.</li> <li>- To create an investment fund with a net positive impact on natural capital, covering water, carbon, and biodiversity.</li> <li>- To ensure that the entire financial institution has a net positive impact on natural capital.</li> </ul> |
| <i>Communicate internally or externally</i>   | <ul style="list-style-type: none"> <li>- To build internal knowledge and understanding of natural capital, so that key decision-makers within the organization understand the degree to which future revenues, costs, and success rely on natural capital.</li> <li>- To gather information on the natural capital impacts and dependencies in an investment <b>portfolio</b> to enable reporting to investors and stakeholders.</li> </ul>  |



## 2.2 Identify the target audience

It is important to identify and agree for whom you are carrying out the assessment (the target audience) as this helps to focus the assessment on the type of information, or appropriate degree of confidence, needed. The target audience may simply be the person who commissioned the work but is usually a wider group or groups.

**Table 2.2:**  
 Examples of target audiences

| Internal target audiences may include:   | External target audiences may include:   |
|--|--|
| <ul style="list-style-type: none"> <li>- Board directors</li> <li>- Senior management (e.g., CEO, CIO, CRO)</li> <li>- Credit committee</li> <li>- Portfolio managers</li> <li>- Account managers</li> <li>- Risk management teams</li> <li>- Investment, credit, or insurance analysts</li> <li>- ESG teams</li> <li>- Communications teams</li> <li>- Employees</li> </ul> | <ul style="list-style-type: none"> <li>- Shareholders or investors</li> <li>- Deposit holders</li> <li>- Civil society organizations (e.g., NGOs, labor unions)</li> <li>- Entities or projects in which the organization has a financial interest</li> <li>- ESG research and ratings agencies</li> <li>- Governments or financial regulators</li> <li>- Clients, customers, or members of pension funds</li> <li>- Local communities and other parties affected by the impacts or dependencies of the entity or portfolio in question</li> </ul> |

Identifying a target audience is different from selecting groups for stakeholder engagement. Stakeholder engagement is used to inform a process (as an input) rather than being the intended audience for the output. There can of course be overlap between these two groups.

When identifying your target audience, you should consider:

- **Time requirements.** For example, if using a natural capital assessment to inform a board-level decision, planning should incorporate the time needed to achieve the necessary level of confidence/accuracy.
- **The level of verification and validation needed.** For example, when deciding to use the information to inform regulators, a verification process may be necessary.
- **The depth of detail and format of the output.** For example, when informing local communities and NGOs, transparency in data sources and assumptions will help to create trust.



## 2.3 Define the scope

There are several aspects that you should consider when defining the scope. These are all interrelated and the decision you make regarding one aspect will inform other aspects. Defining the scope is thus iterative and you may need to review decisions several times as you proceed:

- Is the focus of the assessment on individual companies, entities, or activities, or on portfolios?
- Is the focus on impacts and/or dependencies?
- What is the value perspective (business and/or societal values)?
- What are the boundaries (e.g., spatial/geographic, temporal, baselines, and scenarios)?
- What is material (significant)?

### 2.3.1 Decide the focus of the assessment

The focus of the assessment refers to the activities that will be included in your natural capital assessment. Being explicit about the focus will help you to better define the assessment process and resources required.

Assessments can be conducted at one of two levels, either individual entity or portfolio.

- **Individual entity** refers to a single organization (public or private), project, or activity, or an individual asset, which is supported through banking, investment, and insurance activities. Examples might include:
  - A listed company
  - A government bond
  - A mine, factory, or farm
- **Portfolio** refers to a collection of multiple entities held, or supported, by your financial institution. This includes your full portfolio, and/or a subset such as an asset class or region. A portfolio-level assessment could therefore refer to, but is not restricted to:
  - A collection of companies in an investment fund
  - A loan book in a particular geographic region
  - A portfolio of insured assets in a particular sector
  - The full portfolio of entities managed by a financial institution

It is important to recognize that risks can combine to become significant at portfolio level even if they appear to be of lesser importance at an individual entity level. For example, financial institutions might find that they have significant exposure to water- or biodiversity-related risks because of their aggregated exposure to specific geographies, sectors, or markets, even if these were not identified as significant risks at the individual entity level. Equally, water or biodiversity may not aggregate into significant impacts/dependencies at portfolio level but could be high-risk considerations within a sector or geographically specific asset group.

Your choice of assessment focus has implications in terms of the resources you will need to conduct the assessment, especially knowledge, data, time, and skills. Some general considerations to take into account include:

- Individual entity focus requires in-depth knowledge of a specific entity and the context of its activity. Data can often be provided by the manager of the project or entity under assessment.
- Portfolio focus requires comprehensive understanding of natural capital and implications of sectoral and geographical diversity. Detailed knowledge of the portfolio's sectoral and geographical breakdown is also required. The development and management of large databases could require additional time.



## 2.3.2 Decide whether to focus on impacts and/or dependencies

When assessing an individual entity or portfolio, decide whether to include impacts, dependencies, or both, and a preliminary list of impacts and dependencies to include (later you will decide which are material for the analysis). This decision will be informed by assessment objectives.

- **Impacts:** You may wish to identify, measure, and value the natural capital impacts of the entity/portfolio(s) because they can create direct and indirect risks and/or opportunities for you. The impacts can have consequences both on the entity/portfolio(s) and on society. Examples of impact with consequences for the entity/portfolio might include changes in your investee companies' costs, income, or asset values due to changes in regulations, with implications for company valuations, insurance premiums, dividends, or financing costs. Examples of impacts with consequences for society might include people displaced due to hydro dam construction or the positive recreational value for local communities following a mine site rehabilitation program.
- **Dependencies:** You may wish to identify, measure, and value the natural capital dependencies of the entity/portfolio(s) to evaluate how dependencies can affect financial viability. For example, you might assess portfolio exposure to water scarcity in a particular region, or reliance on food supply chains which could be affected by large loss of pollinator populations. Costs (or benefits) associated with changes in regulation and/or fiscal measures (e.g., taxes, subsidies), such as higher input prices resulting from subsidy removal, are also factors to consider in a natural capital assessment.

To decide whether you will be focusing on impacts or dependencies or both, it is helpful to understand the underlying concepts of **impact drivers**, **impact pathways**, and **dependency pathways**. These concepts, new to many institutions, are integral to understanding the additional benefits of a natural capital approach.

An **impact driver** is a measurable quantity of a natural resource that is **used as an input, or generated as an output**, by an entity that you are financially supporting. Impact drivers are generally expressed in quantitative units (e.g., kilograms, m<sup>3</sup>, hectares) and are the standard metrics for most ESG analysis. An impact driver is not the same as an impact. An impact is a change in the quantity or quality of natural capital that occurs as a consequence of an impact driver. A single impact driver may therefore be associated with multiple impacts. These concepts are illustrated in box 2.1.

Impact pathways describe how impact drivers result in changes in natural capital and ultimately affect different stakeholders. This approach is an extension of standard ESG analysis. The impact pathway is a concept adopted by several initiatives and organizations when identifying science-based natural capital boundaries or targets and is also used to define sustainable scenarios (such as low-carbon transition scenarios). Dependency pathways serve the same purpose for dependencies; again, the dependency pathway concept is an extension of standard ESG analysis and allows the user to understand and track the consequences of their natural capital dependencies.

### Glossary

#### **Impact driver:**

An impact driver is a measurable quantity of a natural resource that is used as an input to production (e.g., volume of sand and gravel used in construction) or a measurable non-product output of business activity (e.g., a kilogram of NO<sub>x</sub> emissions released into the atmosphere by a manufacturing facility).

#### **Impact pathway:**

An impact pathway describes how, as a result of a specific activity, a particular impact driver results in changes in natural capital and how these changes affect different stakeholders.

#### **Dependency pathway:**

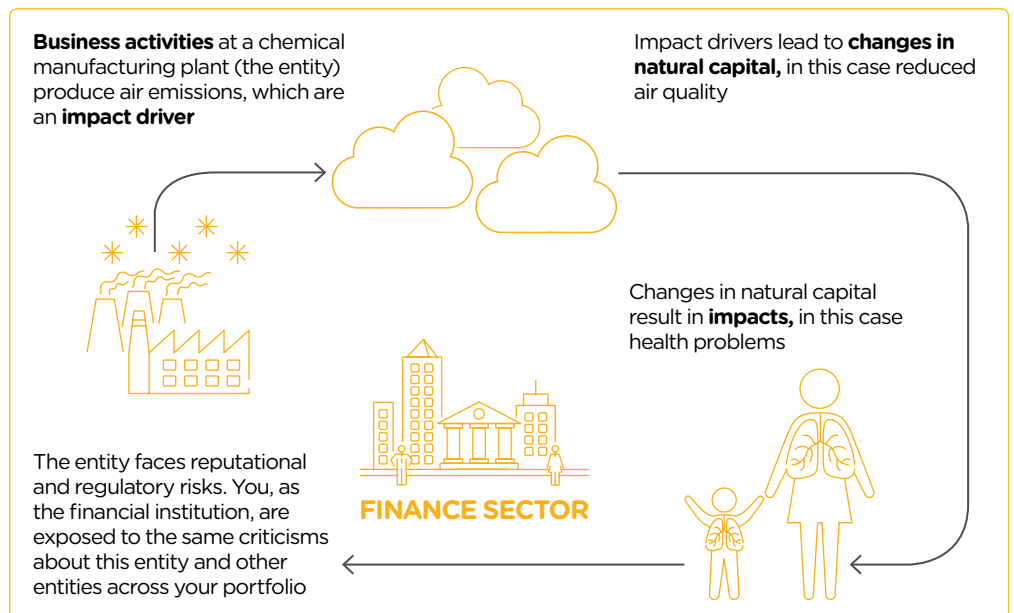
A dependency pathway shows how a particular business activity depends upon specific features of natural capital. It identifies how observed or potential changes in natural capital affect the costs and/or benefits of doing business.



## Box 2.1 Impact and dependency pathways

### Impact pathways

Figure 2.1 illustrates how financed entities can have natural capital-related impacts. Shown here is the impact pathway for air pollution, a classic non-product output of industry, typically found in portfolios that include manufacturing businesses. In this example, the supported entity is a business that manufactures industrial chemicals, a process resulting in the emission of certain pollutants (the impact driver). These pollutants lead to a reduction in air quality (the change in natural capital), which may have significant consequences for various groups of people, one example might be health implications for local communities (the impact). These impacts, as well as changes to natural capital, in turn carry reputational and regulatory risks for the financial institution supporting the chemical manufacturer, potentially leading to questions about an institution's investment choices and due diligence.



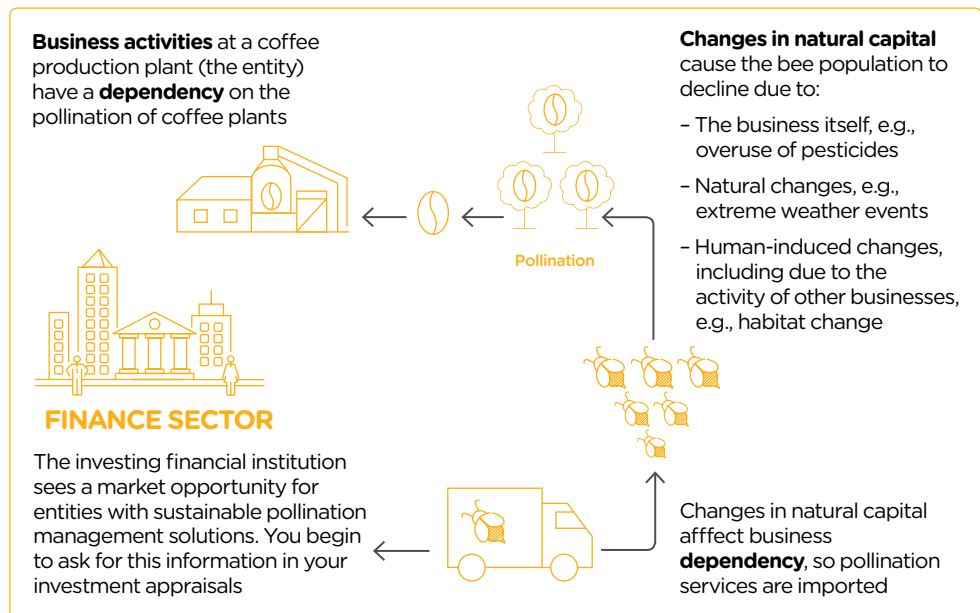
**Figure 2.1.** Generic steps in an impact pathway (Source: Natural Capital Coalition 2016a)



## Dependency pathways

You might also need to understand how your financed entities/portfolio(s) depend on natural capital, and the consequent risks and opportunities.

Figure 2.2 illustrates the dependency pathway for a coffee-producing entity, using the pollination of coffee plants as an example of a natural capital dependency. In this situation, a local decline in the populations of wild pollinators (due to deforestation) results in lower yields and/or additional costs to the coffee-producing entity, which is forced to rely on commercial pollinating services as a consequence. This, in turn, results in impacts such as lost yield and revenue for the entity, and increased risk for both the company and supporting financial institution. Following this experience, the supporting financial institution might place greater emphasis on how its agricultural investments can demonstrate positive management of pollinators, viewing entities that actively manage natural capital as a more resilient, and therefore preferable, investment opportunity.



**Figure 2.2**

Generic steps in a dependency pathway (Source: Natural Capital Coalition 2016a)

As part of scoping, you will need to identify impact drivers and dependencies across your supported entities/portfolio(s). A good starting point is analyzing the principal sectors or activities you support.

For example, if you know that your entities/portfolio(s) include food and beverage producers, you should be aware of the impact drivers associated with this sector. These include the use of agrochemicals, terrestrial ecosystem land use, and emissions to air. You should also be aware of the associated dependencies such as water consumption, pollination, and biodiversity. If your entities/portfolio(s) include fashion brands, you should consider impact drivers such as the use of chemicals and water in the wet processing of apparel and solid waste that arises from garment production, and be aware of dependencies such as raw materials (plant fibers, animal skins, valuable stones) used in manufacture, and the energy needed in the retail phase (Natural Capital Coalition 2016b and c).

If analyzing by sector, you can leverage the sector guides to the Natural Capital Protocol and studies that have mapped main impact drivers and dependencies against different sector activities (ACCA, Fauna & Flora International, and KPMG 2012, Trucost 2013, UNEP FI 2008). These references can help you when identifying potential impact drivers and dependencies of the entity or portfolio(s) that you are assessing.





**Table 2.3:**  
Examples of impact drivers to consider

| Business input or output | Impact driver category    | Examples of specific, measurable impact drivers<br>(Note: these are not exhaustive)  |
|--------------------------|---------------------------|--|
| <i>Inputs</i>            | Water use                 | Volume of groundwater consumed, volume of surface water consumed.  |
|                          | Terrestrial ecosystem use | Area of natural habitat converted, e.g., to monoculture or forest plantation.  |
|                          | Freshwater ecosystem use  | Area of wetland, ponds, lakes, streams, rivers necessary to provide ecosystem services such as water purification, fish spawning; area of peatlands restored.  |
|                          | Marine ecosystem use      | Area of aquaculture by type, area of seabed mining by type. Area of coral damaged by coastal engineering or building.  |
|                          | Other resource use        | Volume of mineral extracted, volume of wild-caught fish by species, number of wild-caught mammals by species.  |
| <i>Outputs</i>           | GHG emissions             | Volume of carbon dioxide (CO <sub>2</sub> ), methane (CH <sub>4</sub> ), nitrous oxide (N <sub>2</sub> O), sulphur hexafluoride (SF <sub>6</sub> ), hydrofluorocarbons, (HFCs), and perfluorocarbons (PFCs).   |
|                          | Non-GHG air pollutants    | Volume of fine particulate matter (PM <sub>2.5</sub> ) and coarse particulate matter (PM <sub>10</sub> ), volatile organic compounds (VOCs), mono-nitrogen oxides (NO and NO <sub>2</sub> , commonly referred to as NO <sub>x</sub> ), sulphur dioxide (SO <sub>2</sub> ), carbon monoxide (CO). |
|                          | Water pollutants          | Volume of nutrients (e.g., nitrates and phosphates) or other substances (e.g., heavy metals and chemicals) discharged to receiving water body.   |
|                          | Soil pollutants           | Volume of waste matter discharged and retained in soil over a given period.  |
|                          | Solid waste               | Volume of waste by classification (i.e., non-hazardous, hazardous, and radioactive), by specific material constituents (e.g., lead, plastic), or by disposal method (e.g., landfill, incineration, recycling, specialist processing).  |
|                          | Disturbances              | Decibels and duration of noise, lumens and duration of light, at site of impact.   |

Note: Climate change is a change in natural capital for which GHG emissions are the impact driver. The impacts of climate change are the consequences felt by people (whether from the perspective of society, entities, or financial institutions).

**Table 2.4:**  
Examples of dependencies to consider

| Business inputs    | Dependency category | Specific dependencies                                 |
|--------------------|---------------------|---|
| <i>Consumptive</i> | Energy              | Solar, wind, hydro, geothermal, biofuel, fossil fuel. |
|                    | Water               | Fresh water (ground, surface, or rain) or sea water.  |
|                    | Nutrition           | Human or animal food.                                 |



**Table 2.4: continued**  
 Examples of dependencies to consider

| Business inputs        | Dependency category                  | Specific dependencies  |
|------------------------|--------------------------------------|--|
| <i>Non-consumptive</i> | Materials                            | Wood fiber, soft commodities, genetic resources, metals, minerals, other plant and animal materials. |
|                        | Regulation of physical environment   | Flood attenuation, water quality regulation  |
|                        | Regulation of biological environment | Crop pest control, pollination   |
|                        | Regulation of waste and emissions    | Waste assimilation, noise and dust regulation  |
|                        | Experience                           | Nature-based recreation, tourism   |
|                        | Knowledge                            | Information from nature (e.g., for biomimicry)   |
|                        | Spiritual/ethical values             | Health benefits from access to green space, wellbeing benefits from sacred sites and landscapes      |

If you are conducting a portfolio-level assessment, start by identifying all major impact drivers and dependencies that are occurring across all entities within your portfolio(s). In section 2.3.5 you will refine this list into those that are most material and therefore need assessing.

### 2.3.3 Specify value perspective

A key action in your assessment is deciding whose value perspectives to consider. Remember that the concept of value relies on the recipient of the natural capital cost or benefit, so the perspective that you choose will likely yield a different value estimate; for example, a local community is likely to place a higher value on recreation than would a business. In broad terms, you may focus your assessment on the value to business, whether a particular entity or a group of businesses within a portfolio (which we refer to as “business value”), on the value to society (which we refer to as “societal value”), or a combination of both.

- A **business value perspective** is used to assess the financial implications of impacts and/or dependencies for the entity or portfolio you are evaluating. Financial implications include tangible costs (such as the purchase cost of resources or raw materials, or the costs of pollution prevention measures) and less tangible costs (such as losses due to supply disruption or delays in permitting, or losses arising from negative reputational impacts).
- A **societal value perspective** is used to assess the costs and benefits to society arising from changes in natural capital that result from the impact drivers of the entity or portfolio you are evaluating. These costs and benefits are generally not captured through current market systems and are known as externalities (i.e., they affect other stakeholders, whether individuals or other businesses, but have no direct consequence for the business causing the impact). The societal value perspective can be particularly interesting for considering relationships between the UN Sustainable Development Goals (SDGs); for example, chemical pollution from a factory might induce negative health impacts for local communities; understanding the societal value of those health impacts (through using a societal value perspective) could demonstrate how SDG 12 (Responsible consumption and production) can influence SDG 3 (Good health and well-being).
- Both perspectives (business and societal) can be used when you wish to have a comprehensive overview of all the implications of impacts and dependencies for the entity or portfolio you are evaluating. There is potential for many societal impacts caused by businesses to become internalized over time, with implications for bottom lines.



## Box 2.2 Other terms for value perspectives

A variety of other commonly encountered terms relate to the value perspective for natural capital costs and benefits. These include:

- **Financial/non-financial value:** These terms are often used to differentiate between those business costs (or benefits) that can be assessed and described in financial (or monetary) terms and those that are difficult to evaluate in financial terms. For example, the costs of waste disposal can be evaluated in financial terms, whereas biodiversity loss is often described as non-financial because it is difficult to quantify in financial (monetary) terms. It is important to emphasize that “non-financial” is not a commentary on scale or significance.
- **Externality:** An externality is a cost or benefit that affects a party who did not choose to incur that cost or benefit. An externality arises when a consequence of an action affects someone other than the agent undertaking that action and the acting agent (in this case an entity or group of businesses in a portfolio) is neither compensated nor penalized. An externality may be positive (e.g., the aesthetic benefits of restoring a river) or negative (e.g., the public health impacts of industrial air pollution).
- **Economic (societal)/welfare value:** *Economic value* is a measure of the benefit or satisfaction provided by a good or service to an individual or entity. From a consumer perspective, this is a subjective feeling that can be measured in monetary units through “willingness to pay”. Some environmental goods and services are not exchanged in the market so the *welfare value* for these is directly equivalent to what people would be willing to pay for them. *Consumer surplus* represents the difference between what someone would be willing to pay for each unit of good or service consumed and what they actually pay for it. *Producer surplus* represents the difference between what a provider receives for a unit of goods or services and the minimum the provider would be willing to receive for it. *Economic welfare* is the total benefit to society from economic transactions, comprising both consumer and producer surplus, whilst consumer surplus also represents the additional societal value generated.
- **Private/public value:** Private value refers to the financial implications of impacts and/or dependencies for the entity or portfolio in question; these include tangible costs (such as the purchase cost of resources or prevention measures costs) and less tangible costs (such as the cost due to supply disruption or delay in permitting). Public value refers to the costs and benefits to society arising from changes in natural capital that result from the impact drivers of the entity or portfolio in question; these costs and benefits may not be fully captured through current market systems and the parts not captured are known as externalities.

Even where costs and benefits are not felt by the financial institution that is causing them, and are seen as being non-financial, intangible, or public, there is a growing awareness that over time these costs will become internal. Understanding these costs and benefits allows financial institutions a fuller picture of their actions, resulting in more robust decision-making.

There are planning implications to consider when selecting your value perspective:

- **Data requirements:** financial data (i.e., data on business costs and benefits) are often more easily accessible than data needed to conduct societal valuation.
- **Time requirement:** the potential complexity of societal valuations will affect the time required to conduct the assessment.
- **Skills:** you may find you have available information regarding value to the business but may need to use external valuation services when considering value to society.



## 2.3.4 Define boundaries and/or scenarios

### a) Spatial boundaries

Establishing the spatial boundary means deciding what geographic area the assessment will consider. This depends on various factors, including the organizational focus and chosen value perspective.

For an assessment at an entity level, the spatial boundary may include the “potential area of influence” for each type of impact or dependency (i.e., the total area over which each impact may occur and affect people). This may involve the following considerations:

- Impacts to biodiversity and ecosystem services, for example, may extend well beyond the immediate vicinity of a project, due to ecological linkages, wildlife migration, location of people and communities, and other landscape-level factors. In this case, to get the best information you should aim to assess the most meaningful boundary you can with the resources you have available.
- Water pollution and related hydrological issues, for example, should be assessed at catchment level, taking into account relevant upriver, downriver, and water scarcity issues as appropriate.
- If assessing air-quality issues, the specific area and features likely to be affected as a result of wind and dispersion may be considered.

For portfolio-level assessments, multiple boundaries (spatial, temporal, political, etc.) may need to be considered. For example, consideration may be given to:

- Proximate impacts and dependencies (e.g., the amount of land used or affected by the portfolio)
- Catchment or regional impacts (e.g., water consumption, water discharges)
- National impacts (e.g., contribution to total waste generation)
- Global impacts (e.g., greenhouse gas emissions)

The value perspective also affects the spatial boundary. When conducting the assessment from a business value perspective, the spatial boundary is generally more restricted than the boundary used for a societal value perspective. For example, when assessing the societal impacts of a business extracting large amounts of groundwater, the geographic scope should include the whole river basin to fully reflect costs and benefits to the population potentially affected. In contrast, an assessment from the business value perspective may be limited to a plant-level spatial boundary.

The value chain to be assessed has significant implications for setting the spatial boundary. For example, an assessment may include the activities of a company within its own factories, or it may also include upstream (supply chain) and/or downstream (use of products) activities. The inclusion of the upstream dimension implies expanding the boundary to include the regions of suppliers and their impacts and/or dependencies. Similarly, the inclusion of the downstream dimension implies including areas impacted by use of the products or services. This consideration is particularly important for financial institutions, as you may be supporting both upstream polluters and downstream dependents of a water supply.



## b) Temporal boundary/time horizons

Identifying a temporal boundary means determining an appropriate time frame for the assessment (i.e., over how many days, months, or years should impacts and/or dependencies be assessed and compared?). Setting an appropriate time boundary allows you to incorporate changes in value of impacts and dependencies over time, as, for example, regulatory frameworks can become stricter over time and may involve a higher financial penalty, which therefore increases the materiality or significance of issues. Some examples of relevant questions in selecting the temporal boundary include:

- Should the assessment cover past, present, and/or future impacts and dependencies?
- What and when is the most appropriate temporal baseline? Should you consider changes in natural capital relative to some original “pristine” state, or to conditions when the investee company took effective control?
- What period should the assessment cover? For example, an assessment may be limited to a “snapshot” of the situation at a particular point in time. Alternatively, it may cover a particular financial year, or the entire expected project lifespan.

While these questions should be answered in light of the natural capital assessment objectives, the following may be useful pointers:

- The temporal boundary should reflect responsibilities and contextual factors (e.g., fiscal or regulatory frameworks). For example, in the case of a project, if the operator is likely to be held responsible for historic performance or impacts or for end-of-life remediation, the assessment should cover these time periods. Similarly, if a project is influenced by contextual factors, such as regulation or subsidies, the assessment should take into account the duration of any such dependencies and any possible changes that may occur.
- The temporal boundary should align with the financing time frame. For example, if you provide debt to a project in the form of a bond, you may wish to assess impacts and dependencies over the lifetime of the bond. Similarly, if you are providing flooding insurance for a defined period of time (e.g., one year), this may be an appropriate time period to choose. It should however be noted that reputational and liability risks can extend beyond the financing time frame.
- The temporal boundary may be chosen to relate to a specific political agreement that uses scientific basis to define future scenarios, such as emissions reductions in line with a two-degree scenario.
- The temporal boundary may align with reporting cycles, both in terms of the period covered by the assessment and the frequency of assessment (e.g., if the project, portfolio, or organization has annual reporting requirements, the natural capital assessment process could align with these reporting cycles).

Again, this is particularly important for financial institutions with long-term (or even intergenerational) beneficiaries.



### **c) Baseline**

A baseline is the starting point or benchmark against which changes in natural capital can be compared. The type of baseline selected will depend on the nature of the assessment. Examples include:

- Past trends over a specified period of time, based on historical data. For example, trends in the amount of water used by entities in the portfolio, or the exposure of the portfolio to risks such as flooding. This may be restricted by the availability of data.
- The state of natural capital at a point in time, such as before the start of a project which is being financed by the institution. For example, when assessing mining or infrastructure projects, it might be necessary to consider natural capital change against a pre-development baseline, and to consider how natural capital might have changed over the same period if the project had not been developed.
- A sector-wide or economy-wide average level of a given natural capital impact or dependency (i.e., an industry benchmark).

When selecting baselines, it is useful to consider the following:

- Can the baseline be aligned with financial reporting and/or strategic time frames? This will facilitate incorporation of the data and information into decision making.
- Can the baseline results be compared or benchmarked against similar entities or portfolios (internally or externally)? This will provide insights into relative performance.
- What baselines have been used for other similar assessments? This will help identify data sources and methodologies that might be used.

### **d) Alternative scenarios**

Finance sector actors often need to answer “what if?” questions as part of their decision-making. For example, they may consider questions such as:

- “What if regulation were introduced?”
- “What if there were a significant change in the cost of water?”
- “How would my portfolio be affected by a major drought in a particular region?”
- “What if there were a dramatic shift in public opinion?”
- “How can we help to shape a more sustainable future? What would be the positive natural capital impact, if we introduce higher sustainability standards across our portfolio?”

These questions are as relevant to individual entity focus as they are to portfolio focus. Adequately considering alternative scenarios relating to natural capital is crucial to identify risk and try to reduce it. Consideration of such scenarios also actively engages finance sector actors in shifting economy-wide practices and guiding banking, investment, and insurance decision making towards activities with positive effects on natural capital.

Finance sector research and decision-making processes are generally designed to ask these types of questions and test different scenarios. Questions can be examined in different ways:

- Through development of different scenario narratives or assumptions (e.g., the storylines underpinning alternative futures/scenarios).
- Through amending line items in financial models (e.g., assuming the cost of a specific natural resource doubles).
- Through altering probabilities (e.g., making certain scenarios more likely).
- Through altering discount rates (e.g., giving greater weight to future impacts). See also box 4.2 on societal discount rates.



## 2.3.5 Conduct materiality assessment

### a) Define criteria

The term “material” is often used to refer to the financial significance of an issue. In the case of this Supplement, “material” is broader and refers to impacts or dependencies on natural capital that have the potential to alter the decisions being taken. This therefore includes natural capital impacts and dependencies that may not have direct financial implications. For clarity, the Supplement uses the term “financial materiality” or “financially material” when talking specifically about the financial significance of a natural capital impact or dependency.

There are many different approaches to prioritization of material issues, for examples see the Natural Capital Protocol Toolkit ([www.naturalcapitaltoolkit.org](http://www.naturalcapitaltoolkit.org)). This Supplement does not specify one particular method for assessing materiality, but instead emphasizes the importance of carrying out a systematic and transparent assessment. Most organizations have experience with at least one approach through their risk, governance, finance, or strategy functions. As far as possible, use your organization’s established approaches, adapting them if necessary to include natural capital. Remember that the process of identifying and assessing material issues is an iterative process and may change following the findings of your natural capital assessment.

The criteria you use to identify material impacts and dependencies will be defined and framed by the objectives of your natural capital assessment. For example:

- If the objective is to identify and assess the financial consequences of biodiversity and water-related impacts of a new mining project, the criteria may be framed in terms of project economics as a whole (i.e., how significant are the associated costs and benefits, including any mitigation actions, relative to the overall project costs and returns).
- If the objective is to assess portfolio impacts or dependency on specific natural resources, the criteria may be expressed in terms of the absolute scale of the impacts or dependencies (e.g., the volume of water consumed, the volume of water discharged) or the relative scale of the impacts (e.g., the proportion of the annual flows of a river that are extracted) or change relative to a chosen baseline.
- If the objective is to assess the reputational implications of natural capital impacts or dependencies, the criteria may be expressed in terms of the scale of the impact, positive or negative, that different natural capital impacts and dependencies have on corporate reputation.
- If the objective is to assess the potential for new natural capital-related products (e.g., investment products linked to sustainable forestry practices, the provision of bonds for green infrastructure), the criteria may be expressed in terms of the potential volume of product sales.

### Glossary

#### **Materiality:**

In the Natural Capital Protocol and Supplement, an impact or dependency on natural capital is material if consideration of its value, as part of the set of information used for decision making, has the potential to alter that decision (adapted from OECD 2015 and IIRC 2013).



### **b) Assess materiality**

The impact drivers and/or dependencies that you have identified can now be assessed against the materiality criteria you have selected.

In determining materiality, you should assess whether and how the impacts and dependencies you have identified affect the individual entity or portfolio that you are evaluating. In this process you may need to take account of the risks and opportunities identified at the beginning of the assessment mentioned in table 1.1.

For an entity evaluation these may manifest themselves in ways such as:

- Increased costs of doing business, such as higher insurance premiums or higher costs of production due to changing regulation, and therefore lower margins.
- New business opportunities such as developing eco-friendly products to reduce natural capital impacts.
- Changes to capital investment requirements to minimize environmental impact or to protect assets against future risks.
- New sources of capital such as from impact investors or through the issuance of green bonds.
- Lower asset valuations due to “stranding” such as a mine which no longer has access to water.
- Impacts to the organization’s ability to deliver its goods and services to its customers or clients, through transport disruption or difficulties accessing raw materials, leading to lower sales.
- Positive or negative impacts to brand and reputation, including license to operate.

These risks and opportunities at the entity level may affect the viability of banking, insurance, investment, or other services; they may affect the cost of accessing these services, or they may affect the terms on which these services are provided.

At the portfolio level, the aggregate effects of natural capital-related impacts and dependencies may include:

- Changes in the risk profile of the portfolio due to dependencies on natural capital, such as increased risk from agriculture companies due to dependency on pollination.
- Changes in the expected returns from the portfolio due to natural capital-related events such as droughts (physical risks) or changes in regulation (policy and legal risks).
- Changes in asset valuations of sectors (e.g., the asset value of hydro power plants may vary depending on local changes in precipitation; the asset value of coal sector entities may vary depending on regulatory changes concerning pollution and GHG emissions).
- New investment opportunities, such as renewable energy, electric vehicles, energy efficiency, new technologies.

When assessing materiality, it is important to remember that:

- Financial and non-financial implications may need to be assessed. For example, stakeholders such as local communities may be more concerned about impacts to natural capital, whereas facility managers may be more concerned about direct costs.
- Attention should be paid to how changes in time frames can change values of impacts and dependencies; for example, regulatory frameworks may become stricter or change over time.
- Natural capital impacts and dependencies can affect finance sector organizations at the individual entity level and at the portfolio level. It is important to recognize that risks and opportunities which are material at the entity level may not be material at the portfolio level, and vice versa.





## 2.4 Actions

1. Decide your objective; what specific question are you going to try and answer with your natural capital assessment. See table 2.1 for some examples.
2. Decide your target audience; who do you intend to receive the results of your assessment. Section 2.2 gives more detail on this decision.
3. Decide the focus of the assessment, whether an individual entity, or a portfolio (whether full portfolio or a subset). Section 2.3.1 gives more detail on making this decision.
4. Decide whether you will focus on impacts and/or dependencies; Section 2.3.2 gives more detail on making this decision. Tables 2.3 and 2.4 offer a more detailed breakdown of impact and dependency categories.
5. Decide your value perspective; whether value to business and/or value to society. Section 2.3.3 gives more detail on making this decision.
6. Define boundaries and/or scenarios. Section 2.3.4 gives more detail on the various elements to consider.
7. Define the criteria for, and conduct, your materiality assessment. You may be able to use several aspects of your existing approaches to materiality, although section 2.3.5 gives more detail on how materiality may be applied to natural capital.

## 2.5 Outputs

After completing the Scope Stage you should have the following outputs:

- A clear objective for your assessment
- An agreed target audience
- A defined scope including:
  - Overall focus of the assessment (entity/portfolio(s))
  - Focus on impacts and/or dependencies
  - Value perspective (business and/or societal values)
  - Boundaries (spatial, temporal, baseline) and/or scenarios
  - What is material (significant)



## 2.6 Case studies

**Table 2.5:**  
Case studies for the Scope Stage

|   | Bank for @ll  | Asset manager Triple Capital  | Capital Insurance  |
|---|---|---|--|
| <i>Context</i>  | <p>Bank for @ll is a signatory to the Equator Principles. The bank's project finance team is reviewing a funding request from one of its clients for a major natural gas project comprising:</p> <ul style="list-style-type: none"> <li>- A gas extraction field</li> <li>- A gas pipeline (400 km)</li> <li>- An onshore gas liquefaction plant</li> </ul> <p>The onshore gas plant will be located close to a UNESCO World Heritage marine site. The bank is concerned about the effects of the project on biodiversity, and hence its acceptance by the UNESCO committee. As a signatory to the Equator Principles, the Bank cannot afford the reputational risk of investing in a UNESCO-disapproved project.</p> | <p>Triple Capital is a signatory to the Principles of Responsible Investment (PRI), with long-standing commitments to account for environmental, social, and governance (ESG) issues across assets and to engage with the companies and other entities it invests in.</p> <p>Triple Capital is exploring whether natural capital assessment(s) can help it to better understand and manage natural capital-related risks and opportunities, and also help it to respond to those clients with a particular interest in natural capital.</p> | <p>Capital Insurance provides business interruption insurance to many of its clients. This insurance frequently covers losses as a result of flooding or other extreme weather events, many as a result of climate change.</p> <p>Capital Insurance routinely assesses weather- and flood-related risk as a standard part of its due diligence processes. It now wants to explore whether it is fully accounting for its exposure to climate change-related risks at the portfolio level and how it might improve processes for assessing these risks.</p> <p>Related to the increase in extreme weather events, Capital Insurance also wants to explore the extent to which its portfolio is dependent on natural flood defenses, and the value of this dependency.</p> |
| <i>What is the objective of your assessment?</i>                | To ensure that the bank understands the value of its biodiversity-related impacts (i.e., cost to society, and also the cost of mitigation and compensation in monetary terms) and that this value is integrated into decision making on whether or not to fund the project.   | To assess whether natural capital impacts and dependencies are affecting the risk-return profiles of the investment portfolio, to identify strategies to manage risks and opportunities, and have better engagement with entities they invest in.   | To decide whether Capital Insurance needs to adapt its due diligence processes to account for systemic risks such as climate change, and whether more attention can be given across its portfolio to managing natural flood defenses.  |
| <i>What is the organizational focus?</i>                        | Entity level: the natural gas project.  | Portfolio level: the emerging market listed equity portfolio managed by Triple Capital for a large pension fund.  | Portfolio level: the manufacturing sites operated by its clients in a specific country which are highly exposed to climate change.   |
| <i>Who is the target audience?</i>                              | Board directors and senior management   | CIO<br>Equity portfolio managers and analysts<br>Pension fund   | Head of Due Diligence and Underwriting   |
| <i>Will the assessment cover impacts and/or dependencies?</i>   | Impacts   | Impacts and dependencies  | Dependencies   |
| <i>Which value perspective?</i>                                 | Business and societal   | Business and societal   | Business only  |
| <i>What is the baseline for the natural capital assessment?</i> | The situation without the project.  | Current and historic (last 3 years) impacts and dependencies of a specific pension fund portfolio.  | The current portfolio exposure to climate-related events under the most plausible scenario.  |



**Table 2.5: continued**  
Case studies for the Scope Stage

|   | Bank for @ll   | Asset manager Triple Capital  | Capital Insurance  |
|---|--|---|--|
| <i>What scenarios will be considered in the assessment?</i> | The situation with the project built. The project promoter explained that there are no viable alternative locations. The full range of mitigation options will be considered.                      | (a) Low, (b) Current, (c) High prices for emissions/ discharges and for consumptive dependencies.   | Three alternative flood risk scenarios will be considered.   |
| <i>What are the spatial or geographic boundaries?</i>       | Extraction area, pipeline corridors, and radius of 40 km around the liquefaction plant to include the parts of the UNESCO World Heritage site that may be affected.                                | To the extent possible, the study will consider approximate impacts and dependencies, as well as catchment, regional, national, and global impacts.   | The extent of the specific country analyzed.   |
| <i>What are the temporal boundaries?</i>                    | The project lifetime (25 years).   | The last 3 years for which historic data are available.   | Two time frames: 1-2 years (standard lifetime of the insurance policies)/30-50 years (to inform strategic thinking). |
| <i>What is material?</i>                                    | <p><b>Impacts:</b></p> <ul style="list-style-type: none"> <li>- Potential damage to protected areas</li> <li>- Habitat fragmentation</li> <li>- Potential impacts to threatened species</li> </ul> | <p><b>Impacts:</b></p> <ul style="list-style-type: none"> <li>- Greenhouse gas emissions</li> <li>- Water use</li> <li>- Water discharges</li> <li>- Waste</li> </ul> <p><b>Dependencies:</b></p> <ul style="list-style-type: none"> <li>- Energy</li> <li>- Water</li> </ul> | <p><b>Dependencies:</b></p> <ul style="list-style-type: none"> <li>- Natural flood defense</li> </ul>                |

# MEASURE AND VALUE STAGE

## How?



The Measure and Value Stage guides you through how to measure and value natural capital.

This Stage provides guidance on indicators, changes, and trends in natural capital. The Stage offers a logical process for valuing the consequences of these changes, so that you can understand their relative importance, worth, or usefulness.

The extent and depth of your valuation exercise will partially depend on the type of decision you hope to inform.

| Stage                             | Sections  |
|-----------------------------------|---|
| <b>03</b> Measure and value stage | 3.1 Measure impact drivers and/or dependencies    |
|                                   | 3.2 Measure changes and trends in natural capital |
|                                   | 3.3 Conduct valuation                             |
|                                   | 3.4 Actions                                       |
|                                   | 3.5 Outputs                                       |
|                                   | 3.6 Case studies                                  |



## Understanding valuation

Many financial institutions are already measuring environmental aspects of their banking, investing, and insurance activities. Such measurements tend to focus on quantities of natural resources used as inputs to production (water, minerals, etc.) or the non-product outputs of business activities (emissions, discharges, etc.). These data are critical inputs to sound decision making.

What is missing though, and what a natural capital approach provides, is understanding what these inputs and outputs mean in terms of value to society and value to businesses and financial institutions in relation to associated impacts and dependencies. Natural capital valuation provides us the context in which we can understand these measurements.

This progression from measurement to valuation is critical in understanding the extent of risk, exposure, and opportunity to better inform decision making.

To value something means to understand its relative importance, worth, or usefulness. Value can be expressed in monetary terms, but also in quantitative and qualitative terms. An example of qualitative valuation is simply describing how important something is, such as through expressing that something has a high or medium value. Valuation is an important part of a natural capital assessment and helps to understand the significance of business and societal relationships with nature.

Importantly “value” differs from “price”. “Price” is what people pay for goods or services in market transactions, whereas value can be more subjective.

Some natural capital resources and services have a market price, such as timber, fish, and water use, whilst others such as clean air and natural flood protection tend to have no price. In many situations even timber, fish, and water use may have no price, or a lower price than their values. In cases where natural capital has no price, or a low price, it can still provide a high value to individuals and organizations.

The aim of this section is to provide finance institutions with a standardized approach to obtain accurate and actionable information about the value of natural capital and associated impacts and dependencies for society, businesses, and financial institutions.

How you move through the Measure and Value Stage depends on the objectives of your natural capital assessment. For example, if your objective is to compare two potential projects to finance, then this will likely require a collation and comparison of site-specific data points for each project, whereas an assessment of risks and opportunities for a global investment portfolio will be more likely to include generic estimations, as the available data might be much less granular. The measurement and valuation process will also vary depending on whether you are assessing an individual project or asset, a company, or a portfolio (whether a subset or full portfolio). This Stage will discuss some of the key considerations you should keep in mind.

In the Scope Stage, you will have identified the impacts and/or dependencies which are likely to be material. You can now measure and value these, via a three-step process:

1. Measure impact drivers and/or dependencies.
2. Measure changes and trends in natural capital.
3. Conduct valuation of impacts and/or dependencies.

### Glossary

**Value (noun):**  
The importance, worth, or usefulness of something.

**Economic value:**  
The importance, worth, or usefulness of something to people—including all relevant market and non-market values. In more technical terms, the sum of individual preferences for a given level of provision of that good or service. Economic values are usually expressed in terms of marginal/incremental changes in the supply of a good or service, using money as the metric (e.g., \$/unit).

**Market value:**  
The amount for which something can be bought or sold in a given market.

**Price:**  
The amount of money expected, required, or given in payment for something (normally requiring the presence of a market).



## Before you get started with the Measure and Value Stage

In preparing for this Stage it is especially important to consider any planning requirements, in terms of availability of existing data, tools, and specific published literature, as well as considerations of internal capacity.

- Note on **tools**: The **Natural Capital Protocol Toolkit** ([naturalcapitaltoolkit.org](https://naturalcapitaltoolkit.org)) is a platform where you can find relevant guidelines, modeling tools, datasets, and other useful resources for conducting natural capital assessments based on this framework. Keeping these online means that they can be continuously updated and will be more relevant to users. The Toolkit has a filter function enabling identification of relevant tools for different sectors of the economy, including finance.
- Note on **internal capacity**: You may decide to conduct the measurement and valuation process yourself, or to commission a third party (e.g., data service provider or consultancy) to do the work. Factors to consider in making the decision include your internal capacity to conduct different valuation approaches and techniques (e.g., qualitative, quantitative, or monetary – for impacts on business or on society), the availability of relevant data, and any data requirements. For example, a bank or insurance company may have sufficient access to the production data for the companies they finance and might feel comfortable aggregating these data themselves for an assessment. They may however choose to engage an external provider to help with monetary valuation if they do not have in-house environmental economic expertise.

The following sections provide guidance for undertaking measurement and valuation yourself or can be used to engage with a third-party provider to ensure that their work is aligned with your requirements. Further details and examples relating to measurement and valuation are provided in the Natural Capital Protocol.



# 03 Measure and value stage

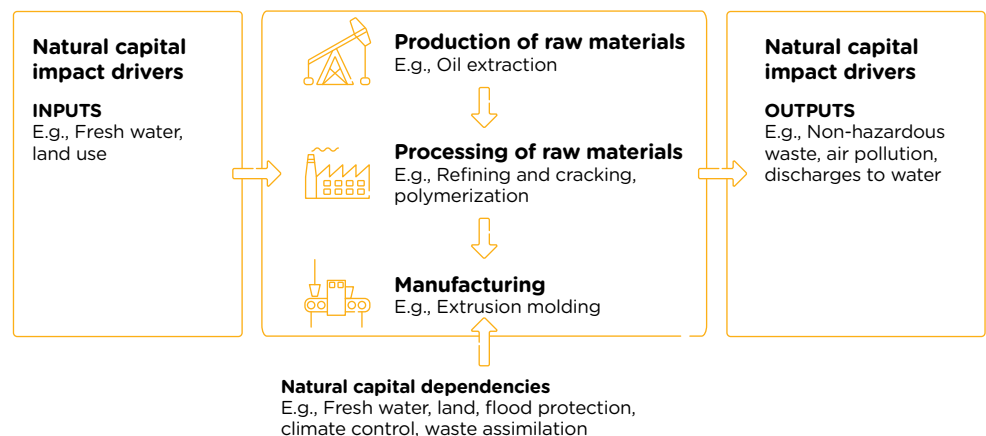
## 3.1 Measure impact drivers and/or dependencies

This section will look at how to measure the material impact drivers and/or dependencies for both entity- and portfolio-level assessments.

### 3.1.1 Map activities against impact drivers and/or dependencies

The first task is to consider the key activities undertaken that are relevant to your entity- or portfolio-level assessment. The level of detail to go into for this exercise, and the remainder of the assessment, will depend on your scope and objective.

For an entity-level assessment, figure 3.1 maps the impact drivers and dependencies for the production of a plastic product. The figure shows three high-level activities along the supply chain (i.e., production, processing, and manufacturing), indicating some associated types of inputs, outputs, and dependencies.



**Figure 3.1** Process diagram showing impact drivers and dependencies associated with producing a plastic cup (Natural Capital Coalition 2016a)

A portfolio-level assessment could involve looking at multiple entities across different sectors; you may therefore decide to make the task more in-depth by focusing on only the highest risk/greatest impact entities within the portfolio. Alternatively, an Environmentally Extended Input-Output (EEIO) approach could be used to effectively identify all likely main activities, impact drivers and dependencies associated with entities (EEIOs combine data on the environmental impacts of different sectors in an economy with traditional Input-Output tables, which show aggregate exchanges between sectors in volume or value terms).



### 3.1.2 Select indicators for impact drivers and/or dependencies to be measured

For each material impact driver and/or dependency within your scope, you need to determine what you will be measuring (the indicator) and the type of data needed. Measurement of indicators can be either qualitative or quantitative. For qualitative measurements, consider using scales such as large to small, high to low, severe to minor, or essential or superfluous (and defining the criteria for these).

For quantitative measurements, some examples of potential indicators are given in tables 3.1 and 3.2.

**Table 3.1:**  
 Examples of quantitative indicators for different impact drivers

| Business input or output | Impact driver category    | Examples of quantitative indicators                                  |
|--------------------------|---------------------------|--|
| <i>Inputs</i>            | Water use                 | Cubic meters of groundwater consumed                                 |
|                          | Terrestrial ecosystem use | Hectares of natural forest converted into agriculture land           |
|                          | Freshwater ecosystem use  | Hectares of wetland used or relied upon for services                 |
|                          | Marine ecosystem use      | Area of aquaculture by type  |
|                          | Other resource use        | Tons of mineral extracted, number of wild-caught mammals by species  |
| <i>Outputs</i>           | GHG emissions             | Tons of carbon dioxide (CO <sub>2e</sub> )                           |
|                          | Non-GHG air pollutants    | Tons of fine particulate matter (PM <sub>2.5</sub> ) released to air |
|                          | Water pollutants          | Kilograms of nitrates and phosphates released to surface water       |
|                          | Soil pollutants           | Kilograms of chlorinated pesticides discharged to soil               |
|                          | Solid waste               | Tons of hazardous waste generated (or avoided)                       |
|                          | Disturbances              | Decibels of noise above normal level                                 |

Source: Natural Capital Coalition 2016a





**Table 3.2:**  
Examples of quantitative indicators for different dependencies

| Business inputs        | Dependency category                     | Examples of quantitative indicators   |
|------------------------|---|---|
| <i>Consumptive</i>     | Energy                                  | Kilowatt hours of energy  |
|                        | Water                                   | Cubic meters of water (ground, surface, or sea water) used  |
|                        | Nutrition                               | Joules of energy consumed   |
|                        | Materials                               | Tons or cubic meters of wood  |
| <i>Non-consumptive</i> | Regulation of physical environment      | Hectares of habitat providing water filtration; cubic meters/day of water filtered by vegetation  |
|                        | Regulation of biological environment    | Risk level of incident (e.g., flood frequency); resilience against diseases (e.g., in trees or crops)                                     |
|                        | Regulation of waste and emissions       | Grams of pollutant assimilated per kilometer of river   |
|                        | Knowledge                               | Importance of particular species for the resilience of ecosystems based on scientific knowledge (e.g., threshold at which services cease) |
|                        | Well-being and spiritual/ethical values | Number of people benefiting from green space or using a spiritually important site  |

Source: Natural Capital Coalition 2016a

Selecting the right indicators for each of your material impact drivers and/or dependencies requires careful consideration, as they may be used again to track the environmental performance of an investment over time, or for comparison across portfolios or other investments. To encourage standardization and enable comparison of entities over time, the analysis should consider a review of peers and standard-setters before selecting indicators. The Natural Capital Hub can provide a starting point for reviewing emerging industry standards.

### 3.1.3 Identify how you will measure impact drivers and/or dependencies

You now need to determine which data sources you will use to qualitatively or quantitatively measure your impact drivers and/or dependencies. There are two different potential sources of available data which include:

- **Primary data:** Data collected specifically for the assessment being undertaken.
- **Secondary data:** Data that were originally collected and published for another purpose or a different assessment.

Table 3.3 shows some examples of potential primary and secondary data sources, both for individual entity and portfolio assessments.

Although primary data will deliver more precise results, data collection may involve significant effort and specialist skills. Primary data are also only reliably correct at the time and place of capture. Therefore, it is likely that most financial institutions will use a combination of primary and secondary data, as a result of time and practical considerations. Depending on the objective of the assessment, various combinations of primary and secondary data may be needed to inform decisions. Additional details for this action, in particular around use of secondary data and use of intermediate indicators, are provided in the Natural Capital Protocol.



**Table 3.3:**  
 Examples of primary and secondary data sources

|                       | Individual entity assessments   |   | Portfolio(s)   |
|-----------------------|---|---|--|
|                       | Projects  | Assets  |  |
| <i>Primary data</i>   | Site survey data collected for a specific use. For example, this may be obtained as part of an environmental or social impact assessment, the results of which could be provided by project managers. | Information provided publicly by the asset (e.g., corporate annual reports, sustainability reports, regulatory filings, or CDP disclosure).<br><br>Information provided privately to the financial institution in response to specific queries. | Information collated internally by analysts (e.g., financial risk data, aggregated ESG data).  |
| <i>Secondary data</i> | Existing information obtained from third parties such as research agencies, NGOs, consultants, credit ratings agencies.   | Existing information obtained from third-party research and data providers such as ESG service providers and credit ratings agencies. This may include estimated data.  | Existing information obtained from third-party providers such as Bloomberg, credit ratings agencies.<br><br>If you know the sectors within the portfolio, you may choose to estimate averages with Environmentally Extended Input-Output (EEIO) tables, which summarize the exchanges between major sectors of an economy, and integrate information on the environmental impacts. |

You should then identify any key data gaps and determine whether identified gaps need to be filled, as well as how and by whom. You may decide that it is impractical on the grounds of time or cost to address these gaps, but acknowledging and recording gaps is necessary for validation or verification of results in the Apply Stage. Appropriate use of professional judgement, clearly stating any assumptions made, may be adequate depending on the context.

### 3.1.4 Collect data

If conducting an entity-level assessment, you will need to collect data for all material impacts and/or dependencies, across all activities undertaken by the entity.

If conducting a portfolio-level assessment, be realistic about the quantity of data you can effectively gather and interpret. The focus is to identify the data needed to complete your natural capital assessment and inform a decision, not to collect data for its own sake.

**Note:** For both entity- and portfolio-level assessments, it is important **not to aggregate** the measurements of your impact drivers or dependencies at this stage, as this will prevent your understanding of contextual variables in the next section.

For example, if conducting an entity-level assessment of an international agricultural producer, you should be aware that if you aggregate the measurements of soil pollutants across all agricultural sites, you will lose any context that influences the value of those impacts. For example, the proximity of water sources to each site could significantly affect the magnitude of values associated with impacts. Try to keep measurements separate until you collate in section 4.1.

Other guidance on data collection can be found in section 5.2.4 of the Natural Capital Protocol.



## 3.2 Measure changes and trends in natural capital

Now that you have measured the impact drivers and/or dependencies against your list of indicators, you will need to understand the context for these measurements and consider how they affect, and are affected by, changes in natural capital. For example, how does a project's water consumption relate to local trends in water availability; how does a fishing company's dependence on the marine environment relate to trends in the changing demands for, and availability of, fish.

You may also need to consider how external factors and trends in natural capital and related ecosystem services may alter the costs and benefits of the impact drivers and dependencies over time (e.g., changes in ecosystem health due to acidification caused by local industry may result in deterioration of forest products supply in the future). These trends may lead to new legislation, increased prices, or restrictions on business activities which could affect the value of your investments or the probability of insurance payouts or credit downgrades.

Trends in natural capital can affect your organization's financial returns whether those trends are caused by entities in which you have an interest or whether due to impacts from other sources (e.g., through legislation, or upstream water use by other companies in which you have no investment). It is therefore necessary to consider all potentially relevant and material causes of change to natural capital.

### 3.2.1 Identify changes in natural capital associated with impact drivers and/or dependencies

This action considers the changes in natural capital that are likely to result from the impact and dependency drivers that you have already measured. The action is relevant to situations where an entity or portfolio you are assessing directly affects natural capital, such as when an entity's water use affects the quality or availability of water, or indirectly affects natural capital, such as through the GHG emissions of its suppliers.

This action can be passed over if:

- The impacts (or consequences) on the entity/portfolio(s) are independent of the magnitude of the natural capital-related impacts on society (e.g., many regulations and taxes are not set based on the public value of your impacts); or
- other studies or analytical tools are used to estimate the link between the impact driver and natural capital changes (e.g., many published LCA data have the change in natural capital implicitly included); or
- the impacts on society do not affect the natural capital that these activities depend on (e.g., human health impacts arising from wastewater discharges do not necessarily affect the availability of fresh water).



**Table 3.4:**  
 Examples of changes in natural capital for different impact drivers

| Impact driver category           | Example indicator                              | Example of change in natural capital resulting from the impact driver   |
|----------------------------------|--|---|
| <i>Water use</i>                 | Cubic meters of water consumed                 | Change in water availability for other users  |
| <i>Terrestrial ecosystem use</i> | Hectares of forest converted to pasture        | Change in wildlife populations, stocks of timber and non-timber forest products, erosion control              |
| <i>Marine ecosystem use</i>      | Hectares of mangrove ecosystem cleared         | Change in fish stocks and ecosystem services such as protection from storm surges                             |
| <i>Fresh water ecosystem use</i> | Hectares of valley flooded for a dam           | Change in various capital stocks and ecosystem services (e.g., wildlife, carbon sequestration, flood control) |
| <i>Non-GHG air pollutants</i>    | Tons of PM <sub>2.5</sub> released to air      | Change in PM <sub>2.5</sub> concentration and change in frequency/severity of smog                            |
| <i>Water pollutants</i>          | Kilograms of arsenic released to surface water | Change in arsenic concentration and change in fish abundance  |
| <i>Solid waste</i>               | Tons of non-hazardous waste incinerated        | See GHG and non-GHG air pollutants  |

Source: Natural Capital Coalition 2016a

### 3.2.2 Identify changes in natural capital associated with external factors

In addition to identifying changes in natural capital associated with impacts and dependencies caused by the business activities of relevance to your assessment, it is important to consider how the same natural capital may be affected by other impacts. A range of external factors could have considerable implications that potentially change the outcome of your assessment.

**a) Consider your exposure to the change**

External factors that could substantially alter the state of natural capital should be identified. These factors may directly or indirectly affect the degree of the impacts associated with the entity or portfolio assessed, including impacts on society and/or natural capital dependencies.

- **Impacts (private or public):** Identify external forces already affecting, or that could result in changes to, your impacts on natural capital. For example, the development of irrigated farming in a region could mean that the entity’s or portfolio’s water use becomes much more significant in a local context, due to changing supply and demand conditions.
- **Dependencies:** Identify external factors already affecting, or that could result in changes to, your dependencies on natural capital. For example, if a nearby forest is degraded, this could reduce the protection from fire and flooding that your entities or portfolios benefit from. Likewise, the establishment of additional protection for the same forestry resource may lead to an increase in ecosystem services.

**b) Consider the source of change**

External factors potentially leading to changes in natural capital include both natural forces and human activities. Understanding the source of change can be helpful for you to assess any consequent fluctuation based on the influence of these sources (e.g., in the case of climate change, a scenario analysis can include estimations for a two degree scenario and/or energy transition scenarios provided by international agencies). This is important when considering both business dependencies and impacts. The factors can be described as follows:

- **Natural changes:** All environments, habitats, and species are in a dynamic state. For example, rivers change their routes due to fluvial erosion and deposition processes, while populations of certain species can vary dramatically based on predator-prey cycles or on mortality due to harsh weather conditions.



- **Human-induced changes:** Many ecosystems are changing as a result of human pressures (e.g., land-use change, increased water use, pollution, climate change). Impact drivers resulting from the activities of other businesses, government agencies, and individual behaviors can all affect natural capital, with potentially significant consequences for your financing activities or portfolios. Climate change in particular is a human-induced change (via GHG emissions) that has the potential to influence, accelerate, or destabilize other changes in natural capital, often increasing their unpredictability and magnitude. Some changes might move the state of natural capital beyond a tipping point, or into an unsafe operating space (e.g., extinction rates, biochemical flows, phosphorus and nitrogen cycles). The world is currently attempting to address these human-induced changes through the introduction of international conventions (such as the Sustainable Development Goals (SDGs), Aichi Targets of the Convention on Biological Diversity (CBD), UNFCCC Paris Agreement, etc.).

Identifying the external factors that may influence the state of natural capital, and determining the trends associated with these factors, will help you to build a picture of your emerging risks and opportunities. Understanding trends in external factors is especially important where changes in natural capital are non-linear, cumulative, or approaching critical thresholds or planetary boundaries.

#### c) Consider the likelihood of change occurring

Another important consideration in assessing change in natural capital is to account for the likelihood of the change occurring. For example, if you are assessing the changes in water demand in a specific catchment, you need to consider whether demand will change (e.g., because of new industrial development), how likely it is that demand will change (e.g., how likely is it that the industrial development will proceed), and how likely it is that the change in demand will be as predicted (e.g., what are the development options, what are the likely water-demand scenarios associated with each of these options). Another example relates to climate change: while the broad consequences of climate change (e.g., in terms of temperature change, changes in rainfall patterns, changes in sea levels) are well understood, there are many uncertainties about, for example, the precise scale of the impacts that will occur, how these impacts will manifest themselves in specific locations, and the timing of these impacts.

Additional considerations are listed in the Natural Capital Protocol.

### 3.2.3 Measuring changes and trends in natural capital

When measuring changes, it is important to consider both how to measure the change in natural capital and the likelihood of that change. There are several different methods you could use for each of these.

#### a) Measuring changes in natural capital

To help select the appropriate method to estimate changes in natural capital, refer to table 3.5 and consider the following elements:

- Level of detail required.
- Requirement of site-specific data or possibility of using validation of key assumptions when using estimates transferred from another context.
- Geographical scope.
- Local/contextual data availability.
- Technical background required for applying different methods.
- Availability of time, budget, and other resources.



**Table 3.5:**  
 Examples of measurement and estimation methods for assessing changes in natural capital

| Changes in natural capital                                     | Direct measurement methods   | Modeling methods   | Modeling methods – more detailed methods  |
|--|--|--|---|
| <i>Climate change</i>  | N/A – current emissions can be measured, which can be used to model future changes.                                  | The IPCC publishes several scenarios which can be applied in corporate assessments to identify current and predicted global or regional changes.<br><br>Bespoke modeling is also possible depending on the time and costs involved.  |   |
| <i>Land cover</i>  | Transects to assess the density, age, and/or species distribution of vegetation and other species.                   | The probability of land-cover change may be predicted from soil and rainfall data, human settlements and infrastructure, etc.  | Data from remote sensing can be used to measure and model a range of variables related to land cover (e.g., carbon storage, primary productivity, water cycles).  |
| <i>Change in concentration of pollutants in air/water/soil</i> | Direct measurement of water, air, or soil quality.   | LCIA literature provides “characterization factors” which describe the change in natural capital as a result of emissions or resource use (“elementary flows” and “waste flows”). These factors provide a generic view of potential changes and rarely take into account local environmental or socio-economic conditions such as eutrophication or acidification potential. | A range of fate models are available which consider the persistence and movement of specific pollutants in different mediums, based on the chemical properties of the chemical in question and biophysical conditions. For air and water, most methods make use of dispersion modeling through time and space. For emissions to soil, it is first necessary to estimate the pathways through which pollutants will move between soil, air, and water. |
| <i>Change in physical water scarcity</i>                       | Direct measurement of renewable fresh water reserves.  | Water stress or scarcity indices are available at different geographical scales and can be used to estimate changes following increased or decreased consumption.  | Hydrological models can provide a simplified view of the processes in the water cycle to estimate how changing the balance of these processes will impact the availability of water in different parts of the system.   |
| <i>Change in flooding</i>                                      | Direct measurement of change in flooding frequency and actual flooding damages.                                      | Risk assessment based on historical events.  | Hydrological models can be used to calculate risk factors based on physical features of the landscape and climate projections.  |
| <i>Change in erosion</i>                                       | Direct measurement of loss of topsoil and sedimentation of local waterways.  | Estimate based on published factors for given type of soil, climate, and land management techniques.   | Process models taking into account local physical features of the landscape and hydrological and climate systems that lead to erosion, as well as anthropomorphic drivers and feedback.   |
| <i>Change in fish stocks</i>                                   | Direct measurement based on catch volumes or ecological survey methods (variable depending on species and location). | Basic population dynamics model with generic data inputs.  | More detailed models of population dynamics building on primary data of stocks, existing pressures, and population recovery statistics.   |

**b) Assessing likelihood of changes**

It is also useful to quantify the risk or likelihood of changes occurring. Ideally estimates would be probability-weighted, which requires multiplying the likelihood (probability) by the extent of change.

Techniques to help do this include probability-based analysis (e.g., using multivariate regressions to evaluate contributory factors, and Monte-Carlo analysis), multi-criteria analysis, and expert opinion (see Natural Capital Protocol for further details).



### 3.2.4 Specific considerations for a portfolio assessment

There are a number of specific considerations for a portfolio assessment. Before aggregating measurements, you should consider if impacts or dependencies are context-specific (i.e., the consequences of a liter of water extracted from a relatively rainfall-rich area are not the same as those a liter of water extracted from a drought-prone or arid area). You should incorporate the influence of local contextual factors into your analysis before aggregating (e.g., by using water scarcity factors), and perhaps introduce a context-based ranking or weighting into your analysis.

Portfolio managers should also be careful when using aggregated figures. Generally, such numbers are compared to benchmarks to gain preliminary insights in performance (i.e., concerned institutions attempt to reduce their exposure relative to the benchmark). However, it is important to remember that aggregated values may obscure details about the likelihood and nature of risks and opportunities. If an entity achieves a small but positive impact in a region or sector where the benchmark is comparatively negative, then this is a significantly greater achievement than it may appear in an aggregated benchmark comparison. This is why a disaggregated consideration of context is essential.

When assessing at the portfolio level, it is often unrealistic to collect direct measurements at the same level of detail as you might for an individual entity. Particularly for large, international portfolios, understanding all elements of local changes and trends would be highly resource intensive and in many cases the data needed are not yet available in a transparent and systematic manner. If this is the case, it is likely that a portfolio-level assessment will tend to be top-down, rather than bottom-up. Looking at the geographical distribution or concentration of a portfolio will help to identify potential “hot spots” or areas of greater concern for natural capital impacts or dependencies, such as water or deforestation. You could also assess by jurisdiction, for example when considering the risk of changing emissions legislation on a portfolio. You might also assess your portfolio by sector, to highlight the most exposed sectors and sub-sectors for further investigation.

#### Geographical considerations

If you understand where impact drivers/dependencies are occurring across your portfolio, you can cross reference these locations against geographical natural capital changes and trends such as:

- Trends in sea-level rise: Does your portfolio contain a high number of manufacturing sites that are at potential risk from sea-level rise? How fundamental are the activities at risk, for example are they moveable (such as an office) or immovable (such as a farm at a certain latitude or a nuclear power station)?
- Trends in water scarcity: Do water-related impact drivers and/or dependencies feature heavily across your portfolio (e.g., if you finance manufacturing activities)? In this case you could cross reference the location of these activities against water scarcity mapping tools (see the Natural Capital Protocol Toolkit) to see if these activities might be at risk now or in the future.
- Changes to local climate: Are any primary production activities within your portfolio exposed to seasonal temperature fluctuations, or to El Niño conditions?
- Changes to local ecosystems: Are any activities in your portfolio located in protected areas? How might the biodiversity and ecosystem functioning of these areas be affected by the introduction of invasive species, and do your financial activities depend on that biodiversity or ecosystem functioning?

#### Sectoral considerations

Some changes might occur at the sectoral level, for example;

- Regulation: Does your portfolio contain activities which might be subject to increasing regulation (such as pesticides control in the agriculture sector)? Consider sectoral trends across your portfolio.
- Resource scarcity: Is your portfolio dependent on certain resources which might be susceptible to changes in the quantity and/or quality of natural capital stocks and their distribution?



### 3.3 Conduct valuation

Based on the impact drivers and dependencies and associated changes in natural capital measured in this process, the next actions help you identify and value the different types of financial and societal costs and benefits that may arise from your financing activities.

#### 3.3.1 Define the consequence of impacts and/or dependencies

For each impact and dependency taken forward in the assessment, you need to identify what the consequences are in terms of potential cost and benefits. Depending on your scope and objectives, this will include costs and benefits arising from one or more of the following:

**Consequences of impacts on businesses.** These include costs and benefits occurring both directly and indirectly as a result of changes associated with natural capital. Direct costs can include new or increased prices and taxes for resource use or damages. Indirect costs can include reputational impacts, or losing a licence to operate. These indirect business costs are often closely linked to the societal impacts caused by a business (see 'Consequences of impacts on society' below). Impacts may also lead to benefits if the company actively provides or maintains a resource (e.g., engages its agricultural suppliers on more sustainable water management practices, therefore improving downstream water quality) or restores a habitat (e.g., if there are credits associated with provision of that habitat).

**Consequences of impacts on society.** The natural capital impacts associated with your entity or portfolio may also affect society. This includes generating costs and/or benefits to individuals, communities, and organizations that are not fully captured through existing markets (i.e., causing externalities). An example is air emissions such as particulate matter (e.g., PM10) that affects local people causing health problems and even premature deaths. Costs can include hospital expenses, reduced quality of life, and loss of worker productivity. Alternately, an entity or businesses within a portfolio may generate benefits and cost savings (e.g., if they produce a product that generates additional societal benefits of value in excess of the price paid for the product).

**Consequences of business dependencies.** Perhaps of most direct relevance to the finance sector is the consequence of changes with regard to business dependencies. This includes costs and benefits associated with direct use of resources (i.e., goods) such as water and timber, and with changes in provision of services such as water filtration and natural flood and erosion control. Costs can include increased prices, reduced productivity due to a lack of resources, asset stranding, and the cost of finding an alternative supply or constructing a replacement service (e.g., man-made flood defense).

#### 3.3.2 Determine the relative significance of the costs and benefits

For those costs and/or benefits identified above, it can be useful to assess their relative significance to determine which should go forward for monetary valuation. This is in effect an initial qualitative valuation step. For example, if an entity or business portfolio uses a large volume of water, the assessment of consequences may have identified costs associated with other withdrawal uses of water, angling, recreational use, human health, impacts on adjacent property prices, and impacts on wildlife. It may be that the consequences of some of these water-related impacts are minor or negligible and not worth the effort of valuing further.





### 3.3.3 Select appropriate valuation technique

For each significant cost and/or benefit identified, you will need to select an appropriate valuation technique, based on whether you intend to assess values in qualitative, quantitative, or monetary terms. There are many natural capital valuation techniques available. Here you can find a general description of them, with examples of valuation techniques used at an entity and portfolio level highlighted in table 3.6.

**Note:** A table with case studies by valuation technique can be found in **Annex 1**. This table shows different applications of valuation techniques to illustrate the process, requirements, outputs, advantages and limitations of each technique.

- **Qualitative valuation** is used to identify the potential scale of costs and/or benefits expressed in descriptive, non-numerical terms. This may have been done to an extent in your materiality assessment (Section 2.3.5), but can be built upon further. Techniques can involve eliciting stakeholder opinions and/or expert judgement, and include:
  - *Opinion surveys*, in particular using open-ended questions.
  - *Facilitated group discussions*.
  - *Relative valuation*, where all impacts (costs and benefits) are evaluated relative to each other, and expressed, for example, as high, medium, or low values.

Information collected through qualitative valuation techniques may be used to identify hotspots within a portfolio for further investigation or to make preliminary assessments of natural capital opportunities by sector or geography.

Many financial sector practitioners may already be familiar with qualitative approaches, as they are frequently used within risk rating processes.

- **Quantitative valuation** is used to identify numerical data as indicators, to better understand the magnitude or relative importance of impacts and dependencies. These techniques use numerical ratings and estimations that may include some form of weighting and facilitate comparability. The information can be gathered and collected through different approaches, including:
  - *Structured surveys* based on a set of closed-ended questions that allow statistical analysis.
  - *Indicators* of any parameter desired (e.g., number of houses under risk of flood in your insurance portfolio, number of threatened species affected by lending activities).
  - *Multi-criteria analysis* that, by using scoring and weighting approaches, allows measuring under the same scale a set of parameters that are often measured in different units.

The information provided by these techniques could be used to conduct a preliminary risk and opportunity assessment or for making an investment option appraisal based on materiality.

Many ESG approaches already offer some quantitative valuation, although the guidance within this Supplement hopes to extend its use with regards to understanding value to society, as well as value to the financial institution.

- **Monetary valuation** techniques translate costs and/or benefits into a single common currency, money. This allows them to be more easily aggregated and compared. The techniques can be categorised into five major types of approach: market-based, cost-based, revealed preference, stated preference and value transfer.
  - (i) **Market-based approaches** are used for valuing natural capital goods and services exchanged in markets (e.g., timber, water, carbon permits or pollution permits). This category encompasses:
    - a. *Market and financial prices* taken from real observations of prices in the market. Mitigation cost (those incurred to avoid, reduce, or restore the extent or intensity of impacts and dependencies) are also included in this category (e.g., water treatment costs).
    - b. *Production function* estimates how changes in natural capital can have consequences on the output of marketed goods and services, sometimes using empirical modeling (e.g., the consequences of reduced water availability on crop yields, or cutting down mangroves on fish populations and catches).



- (ii) **Cost-based approaches** are used to estimate the value of natural capital goods and services not directly exchanged in markets. The value of goods and services can be estimated by assessing the costs of substituting these goods and services with alternatives or by assessing associated costs incurred. This category encompasses:
- a. *Replacement costs* estimate the cost of replacing natural capital goods and services with an artificial substitute (product, infrastructure, or technology); for example, replacing natural flood defense with a man-made flood defense) or replacing natural pest control with a chemical alternative.
  - b. *Damage costs* estimate the value of losses (of health, property, infrastructure, etc.) due to natural capital degradation and natural disasters such as flood events. This can also be used in reverse when there is an improvement in natural capital (e.g., the benefits from providing natural flood defense from habitat restoration equate to the potential damage costs averted).
- (iii) **Revealed preferences** are based on observation of consumer choices of other goods and services exchanged in existing markets. Through their behavior, individuals reveal their preferences for natural capital services. This category encompasses:
- a. *Hedonic pricing*, which assesses how environmental factors influence market prices of certain goods (e.g., noise or green spaces can influence property prices).
  - b. *Travel costs*, which elicit the value of a natural space by measuring the travel costs incurred and time used when visiting a natural asset for recreation.
- (iv) **Stated preferences** are based on the information expressed (through questionnaires) by individuals when directly asked. This category encompasses:
- a. *Contingent valuation* that infers ecosystem values by asking individuals their maximum willingness to pay (or willingness to accept compensation) for a specified change in the relevant non-market good or service from natural capital.
  - b. *Choice experiments* by which individuals are presented with alternative goods/options with different characteristics (i.e., various attributes or levels, such as distance, number of species present, or some other aspect of natural capital), as well as different prices. They are asked to choose their preferred option, from which the value for the relevant non-market good or service from natural capital may be inferred.
- (v) **Value transfer** (also called “benefit transfer”) involves applying a monetary value calculated using one of the above techniques in one context to another similar context elsewhere. It is likely to be a common approach used by the finance sector.

Value transfer can be less time and resource demanding than other techniques and is a practical alternative to primary valuation. Value transfer does have limitations, particularly in the accuracy that it can provide:

- Technical errors made in the original assessment will be transferred to and inherited by your current assessment.
- Context-specific values will be transferred both spatially (from a specific location) and over time (from the moment of assessment).

Value transfer is considered useful for a first screening and could be potentially useful for the finance sector, in particular where the aim of the exercise is to generate a high-level assessment of exposure or risk (e.g., at portfolio level) rather than a precise monetary valuation of the implications of the impacts or dependencies in question. For large-scale projects, primary valuations are more likely to be the preferred approach.

Significant expertise and applied experience is required to conduct value transfer with confidence, and to understand when it is and is not appropriate.

Value transfer can be undertaken in various ways:

- Transferring *unitary values* (the mean or median) of an existing project (e.g., the EU estimated the external costs of air pollution on health and the environment, and these could be used as a guide for estimating the impacts of a European factory).
- Transferring an *adjusted unitary value*, to account for some contextual factors. For example, a North American estimate for the external costs of air pollution could be used in a different region of the world after adjusting for economic factors such as a difference in average incomes or purchasing power parity.



- Using a *value function* which involves using results from multiple valuations to develop a function or model to estimate the value of similar impact drivers or dependencies for the project to be assessed. For example, when estimating the value of losing an area of wetland, drawing upon many other wetland valuations undertaken elsewhere to ascertain the relationship between value and key variables such as type of wetland, size of the wetland, area of wetland lost, and key socio-economic characteristics of the stakeholders affected.

To use value transfer with confidence you will need (efttec 2010):

- Reliable estimates of the economic value of the impact and/or dependencies on natural capital, based on a thorough review of previous studies.
- A thorough description of the changes in impact drivers and/or dependencies on natural capital under consideration (at the assessment site).
- Knowledge of how economic value changes due to the variation in impact drivers and/or dependencies on natural capital at the study site(s) (e.g., the relationship between the level of impacts and/or dependencies on natural capital and willingness to pay for marginal changes).
- Knowledge of which contextual factors determine economic value and to what extent (e.g., the number of individuals affected by the change in natural capital, their uses of natural capital, their socio-economic characteristics such as income, age, gender, and education, and the availability and price of substitute goods or services).

There are many places you can find databases of value transfer studies, including the European Commission's Benefits Table (BeTa), Environmental Valuation Reference Inventory (EVRI), and The Economics of Ecosystems and Biodiversity (TEEB) Valuation Database Manual. The significant progress and accessibility of ecosystem services modeling tools is also considered as a very useful alternative to value transfer. For more details on databases and tools, see the Natural Capital Toolkit and the Natural Capital Hub.

**Table 3.6:**  
Example outcomes of valuation techniques applied across different focuses

|                     | Entity (examples)  | Portfolio (examples)   |
|---------------------|--|--|
| <i>Qualitative</i>  | <ul style="list-style-type: none"> <li>– <b>Significant increase</b> in return on investment in natural infrastructure projects, as a result of public-policy changes.</li> <li>– <b>High reduction</b> in waste management costs of one of your investee companies through adoption of a circular economy strategy.</li> </ul>            | <ul style="list-style-type: none"> <li>– <b>High risk</b> of default of your agri-business portfolio in water stressed regions due to increasing water scarcity.</li> <li>– A <b>medium exposure</b> of your oil and gas portfolio to potential compensation and remediation costs from accidental marine spills.</li> </ul> |
| <i>Quantitative</i> | <ul style="list-style-type: none"> <li>– Contribution, in <b>percentage</b>, of one of your investee companies to the deforestation of a specific region.</li> <li>– <b>Number</b> of threatened species supported by financing a large-scale mining habitat restoration project.</li> </ul>   | <ul style="list-style-type: none"> <li>– <b>Area in hectares</b> of native forest lost per year from deforestation across your portfolio.</li> <li>– Environmental <b>risk scores</b> for each sector within your portfolio based on a multi-criteria analysis covering water, GHGs, biodiversity impacts, etc.</li> </ul>   |
| <i>Monetary</i>     | <ul style="list-style-type: none"> <li>– <b>Monetary value</b> of impact on biodiversity of a large urban-planning project requesting funds from your bank.</li> <li>– Reduction in potential <b>liability costs</b> of a multinational oil transport investee company resulting from a shift of vessel fleets to double hulls.</li> </ul> | <ul style="list-style-type: none"> <li>– <b>Monetary value</b> of the positive impact on air quality resulting from the renewable energy green bonds program of your bank.</li> <li>– Increase in <b>operational costs</b> of your agri-business portfolio due to pollination services imported.</li> </ul>                  |



When selecting your valuation technique(s) you should also consider:

- How you intend to use your results (e.g., do you need qualitative estimates for initial screening of your portfolio at sectoral level, or do you need monetary valuation to inform investment and/or credit risk).
- Resources, time, and skills available (e.g., surveys are more intensive than value transfer).
- If impacts and dependencies are material to your business (e.g., material risks or opportunities might justify primary valuation methods).
- Limitations and strengths of the valuation technique (e.g., value transfers may not be particularly accurate, and willingness-to-pay surveys can be the most effective at ascertaining accurate non-market benefits such as recreation and landscape values).
- Local/contextual considerations (e.g., it may be inappropriate to use monetary valuation when looking at the value of threatened or spiritually important species).

Note: Expert input is highly recommended when conducting valuation, due to the range of different techniques available and the many factors that can influence the feasibility, appropriateness and reliability of outcomes of each.

### **3.3.4 Undertake or commission valuation**

#### **a) General considerations**

Based on your objective, combined with the information you have compiled and the valuation techniques selected, you may now either undertake or commission the relevant valuation for your chosen assessment.

Note: Because significant training and applied experience is generally required to apply natural capital valuation techniques with confidence, this framework does not give details on application and execution of these techniques. However, further guidance on each of the techniques is provided in Table 7.1 and Annex B of the Natural Capital Protocol.

#### **b) Considerations at portfolio level**

Care should be taken when aggregating values at the portfolio level. As when measuring changes in natural capital, you will need to consider all relevant geographical, sectoral, and social contexts and not assume transferable homogeneity across your portfolio. This will be particularly relevant when:

- Using value transfer, and not wanting to transfer values from unsuitable or inappropriate contexts.
- Attempting to aggregate values from different sources/studies.

For portfolio-level assessments, it will be helpful to refer back to section 3.3 of the Supplement, “Measure changes and trends”, and to have a list of the contexts in which your material impacts and/or dependencies occur, to ensure you are using appropriate valuation techniques/valuation transfer estimates that can represent each of these contexts. Final aggregation will then be more indicative of your portfolio’s characteristics. Other considerations might include:

- **Baseline:** Check that the primary/transferred values for aggregation use similar time horizons, baselines, and assumptions to your own study.
- **Demographic considerations:** Ensure you have checked the socio-demographic sample of previous studies before you transfer them into your own portfolio study. For example, the societal value of pollution damages may be lower in areas with less population exposed, so it might not be appropriate to use air pollution values from Europe in a portfolio study looking at rural Africa without making appropriate adjustments.
- **Socio-economic considerations:** You may need to adjust values before transferring them into your assessment. For example, is local purchasing power consistent between the original assessment and your own?



## 3.4 Actions

- Map your activities against impact drivers or dependencies. Section 3.1.1 gives a helpful typology to start from.
- Select the indicators you will use to measure impact drivers and/or dependencies that you are assessing, and the data sources you will use. Sections 3.1.2 and 3.1.3 give guidance on indicators and data sources.
- Gather your data using the points of guidance in section 3.1.4.
- Measure the changes and trends in natural capital, including those associated with your impact drivers and/or dependencies (section 3.2.1) and those associated with external drivers (section 3.2.2). See section 3.2.3 for how to conduct the measurement.
- Prepare for valuation by identifying the most significant consequences of your impact drivers and/or dependencies (sections 3.3.1 and 3.3.2) and the most appropriate valuation technique to meet your objective. Section 3.3.3 offers some considerations when choosing valuation techniques.
- Undertake or commission valuation using the guidance points in section 3.3.4.

## 3.5 Outputs

After completing the Measure and Value Stage, you should have the following outputs:

- A list of indicators.
- Data for each indicator or, where data are not available, a plan for addressing the data gap.
- A good understanding of the changes and trends in natural capital.
- A comprehensive valuation of relevant natural capital-related costs and benefits, whether in qualitative, quantitative, and/or monetary terms.
- A full record of key assumptions, sources of data, and methods used.



### 3.6 Case studies

**Table 3.7:**  
 Case studies for the Measure and Value Stage

|   | Bank for @ll  | Asset manager Triple Capital   | Capital Insurance  |
|---|---|--|--|
| <i>Context</i>  | <p>Bank for @ll is a signatory to the Equator Principles. The bank's project finance team is reviewing a funding request from one of its clients for a major natural gas project comprising:</p> <ul style="list-style-type: none"> <li>– A gas extraction field</li> <li>– A gas pipeline (400 km)</li> <li>– An onshore gas liquefaction plant</li> </ul> <p>The onshore gas plant will be located close to a UNESCO World Heritage marine site. The bank is concerned about the effects of the project on biodiversity, and hence its acceptance by the UNESCO committee. As a signatory to the Equator Principles, the Bank cannot afford the reputational risk of investing in a UNESCO-disapproved project.</p> | <p>Triple Capital is a signatory to the Principles of Responsible Investment (PRI), with long-standing commitments account for environmental, social, and governance (ESG) issues across assets and to engagement with the companies and other entities it invests in.</p> <p>Triple Capital is exploring whether natural capital assessment(s) can help it to better understand and manage natural capital-related risks and opportunities, and also help it respond to those clients with a particular interest in natural capital.</p>  | <p>Capital Insurance provides business interruption insurance to many of its clients. This insurance frequently covers losses as a result of flooding or other extreme weather events, many as a result of climate change.</p> <p>Capital Insurance routinely assesses weather- and flood-related risk as a standard part of its due diligence processes. It now wants to explore whether it is fully accounting for its exposure to climate change-related risks at the portfolio level and how it might improve processes for assessing these risks.</p> <p>Related to the increase in extreme weather events, Capital Insurance also wants to explore the extent to which its portfolio is dependent on natural flood defenses, and the value of this dependency.</p> |
| <i>Which indicators will you use to measure impact drivers and/or dependencies?</i> | <p><b>Impacts:</b></p> <ul style="list-style-type: none"> <li>– Potential damage to protected areas: hectares of the World Heritage site potentially affected.</li> <li>– Habitat fragmentation: number of ecological corridors crossed by or affected by the project or by supporting infrastructure (e.g., pipeline, roads).</li> <li>– Potential impacts to threatened species: Potential demographic changes of threatened species (number of individuals affected, identification of any species that fall below critical thresholds such as minimum breeding numbers).</li> <li>– Area of coastal habitat lost (mangrove and sea grasses).</li> </ul>   | <p><b>Impacts:</b></p> <ul style="list-style-type: none"> <li>– Greenhouse gas emissions: tons of CO<sub>2</sub>e.</li> <li>– Water use: cubic meters of fresh water extracted from fresh water reserves (surface waters and groundwater aquifers).</li> <li>– Water discharges: tons of ammonia released to surface waters.</li> <li>– Waste: tons of hazardous and non-hazardous waste produced.</li> </ul> <p><b>Dependencies:</b></p> <ul style="list-style-type: none"> <li>– Energy: total quantity of energy (in gigajoules) used by companies in the portfolio.</li> <li>– Water: total quantity of water (in cubic meters) extracted from fresh water reserves (rivers as well as aquifers).</li> </ul> | <p><b>Dependencies:</b></p> <ul style="list-style-type: none"> <li>– Natural flood control and protection: hectares of habitat providing such function.</li> </ul> <p><b>Impacts:</b></p> <ul style="list-style-type: none"> <li>– Probability of floods (likelihood of occurrence) and severity of events.</li> </ul>   |
| <i>How will you collect the required data?</i>                                      | <ul style="list-style-type: none"> <li>– Primary data</li> </ul> <p>Data to be collected through site surveys and analyzed by the environmental consultant conducting the environmental assessment, with the support of the project developer.</p>  | <ul style="list-style-type: none"> <li>– Secondary data</li> </ul> <p>Data to be provided by the ESG research provider from their existing databases and other publicly available data (e.g., from company reports).</p>   | <ul style="list-style-type: none"> <li>– Primary and secondary data</li> </ul> <p>Modeling and impact assessment to be conducted by the Capital Insurance due diligence team. Also, modeling and impact data to be sourced from the public meteorological office.</p>  |



**Table 3.7: continued**  
Case studies for the Measure and Value Stage

|  | Bank for @ll  | Asset manager Triple Capital   | Capital Insurance   |
|--|---|--|---|
| <i>Which changes in natural capital and trends are relevant to your assessment?</i>              | <p><b>Impacts:</b></p> <ul style="list-style-type: none"> <li>- Potential damage to protected areas: loss of high conservation value hectares.</li> <li>- Habitat fragmentation: increase in edge/surface area ratios, changes in habitat block isolation.</li> <li>- Potential impacts to threatened species: changes in population density and loss of high conservation value hectares.</li> <li>- Mangrove and seagrass area destroyed by footprint of pipeline and liquefaction plant.</li> </ul>  | <p><b>Impacts:</b></p> <ul style="list-style-type: none"> <li>- Greenhouse gas emissions: increase in atmospheric concentration of CO<sub>2</sub>e.</li> <li>- Water use: change of water availability.</li> <li>- Water discharges: changes in pH, changes in composition of species.</li> <li>- Waste: increase of air pollutants and GHG concentration due to incineration.</li> </ul> <p><b>Dependencies:</b></p> <ul style="list-style-type: none"> <li>- Energy: changes in energy availability.</li> <li>- Water: changes in water availability.</li> </ul> | <p><b>Dependencies:</b></p> <ul style="list-style-type: none"> <li>- Loss of habitat providing natural flood defense function as a result of development.</li> <li>- Changes in sea level and flood patterns as a result of climate change.</li> </ul>  |
| <i>Output from the complete valuation of relevant natural capital-related costs and benefits</i> | <ul style="list-style-type: none"> <li>- Financial cost (e.g., changes in capital costs, changes in operating costs) valued by estimating the cost of mitigation and compensation measures.</li> <li>- Public (societal) cost of damages to biodiversity and ecosystem services valued through value transfer.</li> </ul>   | <ul style="list-style-type: none"> <li>- The financial value (in US\$) associated with the portfolio's impacts and dependencies under low, current, and high price scenarios for emissions/ discharges and for consumptive dependencies.</li> <li>- The social value (in US\$) associated with the portfolio's impacts and dependencies (e.g., the societal costs associated with GHG emissions, air emissions, water discharges and use, and production and disposal of waste).</li> </ul>  | <ul style="list-style-type: none"> <li>- Financial (US\$) estimate of the damage that would be caused to insured firms under different climate change scenarios.</li> <li>- Financial (US\$) estimate of the flood-related payouts that would need to be made under different climate change scenarios and of how these differ from current and expected payouts patterns.</li> </ul> |
| <i>Key assumptions, sources of data, methods used</i>  | <ul style="list-style-type: none"> <li>- Key assumptions: Recovery rates of habitat restoration and species populations affected, habitat restoration costs, biodiversity values for habitat impacts transferred from other studies.</li> <li>- Data sources: On-site ecological surveys, literature on habitat and species restoration recovery rates and restoration costs, Environmental Valuation Reference Inventory (EVRI).</li> <li>- Methods used: Market prices for the financial costs and value transfer for the societal values.</li> </ul> | <ul style="list-style-type: none"> <li>- Key assumptions: Price scenarios (for emissions/ discharges and materials) and external damage valuation factors used.</li> <li>- Data sources: ESG research provider databases and company sustainability reports.</li> <li>- Methods used: Market prices for the financial costs and value transfer for the societal costs.</li> </ul>  | <ul style="list-style-type: none"> <li>- Key assumptions: Change in habitat cover providing flood defense functions, global emissions trends and predicted frequency and severity of flooding events.</li> <li>- Data: IPCC reports (IPCC 2000) and public meteorological office reports.</li> <li>- Methods used: Damage costs.</li> </ul>   |

# APPLY STAGE

## What next?



The Apply Stage helps you interpret your results and identify what next.

This Stage provides guidance on how to validate and verify your assessment and results and the actions you will take to apply results and integrate them into existing processes.

| Stage                 | Sections                                |
|-----------------------|---|
| <b>04</b> Apply stage | 4.1 Collate results                     |
|                       | 4.2 Validate and/or verify findings     |
|                       | 4.3 Disseminate results and take action |
|                       | 4.4 Actions                             |
|                       | 4.5 Outputs                             |
|                       | 4.6 Case studies                        |





# 04 Apply stage

## 4.1 Collate results

Before you can interpret your results, you first need to bring the data, indicators, and other information from the Measure and Value Stage together in a way that is appropriate to your assessment and objective. This is likely to involve some form of analytical approach such as cost-benefit analysis, Environmental Profit and Loss Accounting (EP&L), or Total Contribution (see A4S 2015). For an online directory of tools and methodologies that are applicable to the Apply Stage, see the Natural Capital Toolkit ([www.naturalcapitaltoolkit.org](http://www.naturalcapitaltoolkit.org)). If your assessment is designed to support a “total impact” or “net value” application, or to compare options using financial net present values (NPVs), you may need to add up the different values that you measured. Irrespective of the approach adopted, you need to be clear about what can and cannot be added together to avoid double counting (see box 4.1).

### Box 4.1. Double counting

When aggregating values, remember to avoid including the same value twice. For example, if the aim of the assessment is to determine the societal total net impact of a project, when assessing the impacts on climate change you will need to consider damages from greenhouse gas emissions using the social cost of carbon. You will then need to remove related costs already internalized, such as the cost of CO<sub>2</sub> emission permits, to avoid double counting.

### Box 4.2. Social discount rates

When assessing financial costs or benefits, it is appropriate to use your financial institution’s normal financial discount rate, such as the standard “hurdle rate” used for project appraisal or the weighted average cost of capital (WACC), to express future costs or benefits in present value terms.

If, however, the aim is to assess societal costs or benefits, the discount rate applied should reflect the balance of preferences across all the affected stakeholders for consumption now versus consumption in the future. This is referred to as a societal or social discount rate (SDR).

Social discount rates vary but are almost always lower than the financial discount rates used by companies, principally because SDRs attempt to reflect the well-being of future generations as well as generations alive today. Typical social discount rates range between 2–5%, but in some contexts higher, lower, and even negative discount rates can be justified. In situations where there is debate about the appropriate discount rate to use, it is common to test the sensitivity of results and conclusions using multiple discount rates.



### Box 4.3. Sensitivity analysis

There will inevitably be some estimations, approximations, and assumptions in natural capital assessments. To understand what level of confidence you have in your results, you should test how changes in assumptions or key variables affect the results of your assessment. This will allow you to test whether your results hold under a range of conditions or for a range of data inputs, which may reflect varying levels of confidence. For example, it might enable you to identify “switching values”, or the value that might “flip” a particular parameter (i.e., making the results moving from positive to negative). A sensitivity analysis would also allow you to identify whether your results are particularly dependent on specific variables or assumptions (e.g., by testing elasticity of results to changes in 1% of all key assumption to identify those especially sensitive).

Some examples of possible sensitivity analysis are:

- The CO<sub>2</sub> permits you are using give you an average value of US\$30 per ton, but you could test your results against a range between US\$5 per ton and US\$70 per ton, to identify how sensitive your carbon impacts are, to different carbon pricing estimates.
- If you used a discount rate of 7% and obtained a positive profitable result, you might then experiment to find which discount rate could make the project unprofitable.
- You have assumed that the project you are assessing would be allowed to extract 10 million liters of water per year from a reservoir, based on the efficiency of the technology used. However, changes in technology or regulation changes might mean that lower/higher values will be possible. What would the effects be if this amount was 5 million or 15 million liters per year?
- If you conducted a net present value analysis using project data for the next three years but are not sure about the lifetime of the project, what would the effects be of using 5, 7, or 10 years as the frame of reference?



## 4.2 Validate and/or verify findings

There will always be some estimation or approximation involved in a natural capital assessment. You should avoid false precision in the numbers that are presented and should ensure that uncertainties (or the range of possible values) are clearly communicated internally and externally.

Different types of checks require different levels of effort (e.g., systematic or random, process audits, external validation), so you need to decide what levels of validation and/or verification are required for your assessment, and the desired level of credibility.

### 4.2.1 Key points of validation and verification

Validation and verification may cover either the assessment process or the results or both together. The level of scrutiny in verification and validation processes will differ depending on the expectations of the intended audience and confidence in the data and results.

A non-exhaustive list of sample questions to consider when validating and verifying your assessment, either internally or externally, is provided below as a starting point.

**Table 4.1:**  
Sample validation and verification questionsw

| Aspect under validation and verification | Sample question   |
|--|---|
| <i>Relevance</i>                         | <ul style="list-style-type: none"> <li>- Do the results address the objective of the assessment?</li> <li>- Was the scope of assessment appropriately defined? Did the scope capture all of the natural capital impacts and dependencies that are relevant to (a) the financial institution, (b) stakeholders?</li> <li>- Were baselines and spatial and temporal boundaries selected appropriately?</li> </ul>   |
| <i>Rigor</i>                             | <ul style="list-style-type: none"> <li>- Were data relevant and as complete as possible for the entity or portfolio, given the time and resources available?</li> <li>- Were the data and data sources reliable, including the use of proxies, averages, and/or directly measured data?</li> <li>- Was information on data uncertainties provided qualitatively and, if available, quantitatively?</li> <li>- Are the assumptions reasonable and appropriate?</li> <li>- What scientific and estimation uncertainties were considered?</li> </ul> |
| <i>Replicability</i>                     | <ul style="list-style-type: none"> <li>- Was a sensitivity analysis undertaken and across how many different variables or assumptions?</li> <li>- Was the documentation of the assessment process (including scoping, measuring, and valuing) appropriate and transparent?</li> <li>- Was the documentation of the collection and calculation of data appropriate and transparent?</li> <li>- Was the documentation of the results and their implications appropriate and transparent?</li> </ul>   |
| <i>Consistency</i>                       | <ul style="list-style-type: none"> <li>- Was the chosen scope applied consistently throughout the assessment?</li> <li>- Were baselines and spatial and temporal boundaries applied consistently?</li> <li>- Are the assumptions used consistently?</li> <li>- Were data collected from different sources consolidated appropriately and, where applicable, in a consistent manner?</li> </ul>  |

#### Glossary

##### **Verification:**

Independent process involving expert review to check that the documentation of the assessment is complete and accurate and gives a true representation of the process and results. "Verification" is used interchangeably with terms such as "audit" or "assurance".

##### **Validation:**

Internal or external process to check the quality of the assessment, including technical credibility, the appropriateness of key assumptions, and the strength of results. This process may be more or less formal and often relies on self-assessment.



The completed review should include a summary statement of the level of confidence that may be placed on the assessment process and results, as well as any caveats around the assumptions used and remaining uncertainties. The statement of confidence may be qualitative (e.g., using a scale from “very low” to “very high”). The review may also highlight actions that could be taken to improve confidence in the results. You will then need to decide if you intend to undertake any of these actions, which may involve revisiting part of your assessment.

## 4.2.2 Informing future assessments

Upon completing a natural capital assessment, it is important to reflect on the process as a whole and on the lessons learned from the validation and verification process to inform future assessments and identify what could be improved.

For example, your verification process may provide limited confidence in the results. If this is because of the caveats and/or assumptions on which your results are based, you could ask whether additional information would reduce uncertainty and enhance the robustness of your conclusions. You could decide to re-run the assessment with new data to improve the assessment so that the results can be used as a credible basis to inform your decision. Another example could be where you find that, although you are comfortable proceeding based on your results, other stakeholders may require additional information to be convinced of the credibility of the assessment and results. You may, therefore, decide to report and explicitly discuss the implications of key assumptions, thereby providing stakeholders with additional insights into the robustness of the process.

As a general rule, if there is uncertainty in the results (e.g., due to lack of data) but you are unable to go back and revisit the assessment (e.g., due to resource constraints), you should take a precautionary approach to decision making. This is particularly important if decisions taken based on the results of the natural capital assessment might surpass important ecological limits and thresholds. In such circumstances, you may need to postpone making a decision until you have reinforced the assessment as appropriate, for example with stronger scientific evidence or expert opinion.

### Box 4.4. Suggestions for informing future assessments

As part of your review, try to answer the following questions:

- Did the results of the assessment help inform the decision as per your objective? Did the assessment, for example, provide the right information and metrics to be integrated in your financial decision making?
- How much time, funding, and other resources were expended to complete the assessment? Was this a cost-effective use of resources? Could the assessment have been done more cheaply, more quickly, or better?
- What were the major gaps, limitations, strengths, or weaknesses identified by different stakeholders?
- What were the impacts of the assessment on relationships with external stakeholders?
- Did you gather any additional information that was not part of the initial objective which can still be valuable?
- Overall, was the assessment worth the effort? Was it timely?



## 4.3 Disseminate results and take action

### 4.3.1 Provide internal decision makers with the information needed to inform their decisions

For assessment results to effectively inform decision making, you will need to provide relevant parties with the information that they need in a suitable format. This may include information on the assessment process, on the results, or on the assumptions, uncertainties, or limitations.

Where possible, information should be shared through existing processes within your organization. For example, you might add content to existing management board papers, corporate risk processes, or responsible investment updates.

Box 4.5 shows some real examples of companies and financial institutions taking decisions to manage their natural capital risks and opportunities based on outcomes of natural capital assessments.

#### Box 4.5 Examples of business decisions based on natural capital assessments

##### Fashion Company

Fashion value chains are exposed to natural capital risks and opportunities at almost every stage of their sourcing and processing. Natural capital assessments are therefore a useful tool in the fashion industry. Some brands have experimented with Environmental Profit & Loss (E P&L) accounts, to put a value on the natural capital used throughout the operations and supply chain of the business.

This exercise enabled one brand to identify the areas of highest risk and to focus on reducing impacts in these areas by working with suppliers to develop more efficient, less impactful, and alternative raw material supplies. This has resulted in significant cost savings for parts of its supply chain, for example through reduced water consumption.

##### Beverage company

In 2015, a beverage company conducted a global, plant-level water-risk assessment, looking at risk from both the business perspective (the manufacturing facility) and the societal perspective (the local community and watershed). The findings of the assessment have helped to reinforce the company's water stewardship strategy.

Improved water management and stewardship allows the company to maintain its water neutrality status, in which the company commits to replenishing as much water as it uses for its beverages.

##### Chemical Company

A chemical company decided to assess the business value of ecosystem services. A pilot project looked at a wastewater treatment facility which needed upgrading at a cost of US\$40m. The assessment compared this option with the construction of a wetland to filter wastewater and concluded that the wetland was the better option, being hugely cheaper (US\$1.5m) and quicker to implement, and providing beneficial side-effects such as the elimination of algal bloom. The company estimates total savings to date of more than US\$280m from the project.



#### **Water Authority**

In 2016, a water and sewer authority issued a US\$25m environmental impact bond to finance the construction of green infrastructure to manage storm water runoff. The bond had a unique “pay for success” structure, which involved payment from investors to the water authority if the performance of the infrastructure was less than expected (less than an 18.6% reduction in runoff) and the reverse payment if the performance was better than anticipated (greater than a 41.3% reduction in runoff).

#### **Pension Fund**

As part of its responsible investment strategy, a national pension fund agreed targets to reduce negative impacts from water use across its portfolios by 20% from 2015 to 2020 relative to its benchmark. It also set a target of 25% of the portfolio to be invested in clean technology and other sustainable opportunities, including water and waste treatment, sustainable agriculture, and forestry. The fund noted how this strategy would allow them to identify opportunities to allocate capital to those investments with mutual economic and societal value.

More detail on all of these studies is available via the Natural Capital Coalition and Natural Capital Hub ([naturalcapitalcoalition.org/hub](http://naturalcapitalcoalition.org/hub)).

### **4.3.2 Decision making at the entity and portfolio level**

The people involved in the decision-making process must be able to access sufficient background information to understand and have confidence in the assessment process and its results. This information may include the objectives of the assessment, the process that was followed, and the quality and reliability of the results obtained.

The sort of decisions financial institutions may want to make include (Ceres 2015; NCFI 2015; NCFI and UNEP 2015; Trucost 2012; UNEP FI 2008, 2013; VBDO and CREM 2016):

- Excluding certain investments or sectors from portfolios due to their negative impacts on natural capital or adding certain investments or sectors because of their contribution to enhancing natural capital (e.g., to reduce exposures to water-stressed areas, to increase exposures to commercial opportunities associated with ecosystem services, to divest from sectors that have a high natural capital impact).
- Preferentially supporting one investment over another on the grounds of its natural capital risks or opportunities.
- Preferentially supporting certain sectors over others on the grounds of their natural capital risks or opportunities.
- Encouraging companies or other entities to take action to minimize specific impacts, to reduce specific dependencies, or to take advantage of financial opportunities presented by the conservation of natural capital.
- Selecting or recommending a specific location (e.g., for project financing) or specific entity or activity to receive financial support or investment.
- Setting, implementing, and monitoring portfolio-wide or asset-specific objectives relating to natural capital impacts or dependencies.
- Explicitly accounting for natural capital-related externalities in decision-making (e.g., through including a “shadow” carbon or water price).
- Identifying new opportunities for the provision of financial services or impact investments. For example, there could be the potential to issue green bonds, to establish impact investment funds, to develop new insurance products, or to provide debt or equity to investments that have a positive (direct or indirect) influence on natural capital, including landscape-scale management or production methods that can demonstrate a positive impact.



### 4.3.3 Translate the outcomes to policy

If you do not already have a policy on natural capital, you may use the knowledge and information collected from your natural capital assessment to inform the development of a dedicated natural capital policy, sovereign risk strategy, or sector-based credit policy, or to explicitly integrate natural capital into your organizational strategy. If you already have a natural capital policy, you should review the policy in the light of the findings from the natural capital assessment.

Different organizations inevitably adopt different approaches to policy development and implementation, whether as a dedicated policy or as an integrated part of relevant organizational strategy and statements (e.g., investment beliefs, responsible investment policies, environmental policies).

It is suggested that, at minimum, a natural capital commitment should (NCFCA and UNEP 2015, VBDO and CREM 2016):

- Define an ambition or vision for the organization’s activities; for example, “natural capital-related risks and opportunities will be explicitly considered in all decisions”, or “we strive to minimize our negative impacts on natural capital and to have a net positive impact on natural capital”.
- Explain how the policy is to be implemented (e.g., in investment decision-making, in risk assessment processes, in active ownership activities, in underwriting, in lending).
- Explicitly assign responsibilities for policy implementation and policy oversight.
- Include commitments to measure, value, and report on the organization’s natural capital impacts and dependencies.

### 4.3.4 Define next steps for natural capital assessment

You might also decide to carry out another natural capital assessment, or to extend your current assessment. Natural capital assessments can stimulate new ways of thinking about how the activities, projects, and companies that you support financially relate to the natural environment. For example, an assessment may flag significant risks associated with dependencies on ecosystem services within your portfolio that you were not aware of, or may reveal previously unrecognized risks or opportunities. In extreme cases, a natural capital assessment may fundamentally challenge or support your existing business model (e.g., you may decide not to provide financial support to specific sectors or to activities in particular countries or regions, or you may decide to increase the level of financial support you provide to specific sectors). Table 4.2 provides some ideas for further assessments.

**Table 4.2:**  
Examples of extending future assessments

| If you’ve already considered...  | Could you now consider...?   |
|--|--|
| An individual entity   | A portfolio  |
| Natural capital-related risks (e.g., insecure water supplies)            | Natural capital-related opportunities (e.g., new products or markets)        |
| A qualitative or quantitative valuation                                  | A monetary valuation   |
| One site   | Comparing several sites  |
| One product (e.g., a specific equity fund)                               | A range of different products (e.g., other equity funds, fixed income funds) |
| One geographical area (e.g., property lending in a particular catchment) | Other geographical areas (e.g., property lending in a particular country)    |
| A specific impact (e.g., water consumption)                              | Other natural capital impacts (e.g., biodiversity impact)                    |



**Table 4.2: continued**  
Examples of extending future assessments

| If you've already considered...                               | Could you now consider...?   |
|---|--|
| A specific dependency (e.g., flood regulation)                | Other natural capital dependencies (e.g., pollination services)  |
| Natural capital impacts                                       | Natural capital dependencies   |
| Value to your organization                                    | Value to society   |
| A measurement method or tool for use by internal stakeholders | A measurement method or tool for use by other stakeholders (e.g. clients, civil society organizations) |

In those cases where natural capital information is needed for ongoing decision making, a plan for regular monitoring and assessment should also be considered.

### 4.3.5 Communication and disclosure

Sharing information about your natural capital assessment and the decisions informed by it in a clear and transparent way can help to strengthen relationships internally and externally, build the case for further assessments, facilitate the access to information to other stakeholders conducting natural capital assessments, and integrate natural capital into the way you operate. Financial institutions can also make public commitments, such as joining the Natural Capital Finance Alliance and signing the Natural Capital Declaration or the Business and Biodiversity Cancun pledge.

Stakeholders with whom you may want to share assessment outcomes and the decisions it informed include (ACCA, Fauna & Flora International, and KPMG 2012):

- Clients
  - Banks: deposit holders or borrowers
  - Insurance: policyholders
  - Asset managers: institutional asset owners and/or consumer investors
- Civil society. Sharing the results of a natural capital assessment can be a starting point for dialogue with civil society
- Shareholders or owners
- Regulators. The results of a natural capital assessment may help meet wider social and environmental reporting requirements
- Peers in the sector and relevant sector initiatives

As natural capital assessments are relatively new, sharing the results can help stimulate other financial institutions to conduct their own natural capital assessments, and therefore further the conversation within the sector.





## 4.4 Actions

1. Collate your results from the Measure and Value Stage. Section 4.1 describes how your approach to this might vary depending on the type of information collected.
2. Validate and/or verify your findings; section 4.2.1 describes how your approach to this may vary depending on your ultimate application and intended audience).
3. Share your results as needed, whether internally or externally. Section 4.3.4 offers some guidance points.
4. Take action; explore and implement how your results might inform better decision making within your financial institution (see sections 4.3.1 and 4.3.2 for examples and suggestions).
5. Record your reflections and learnings so that you might be able to adapt and inform any future assessments you choose to do (sections 4.2.2 and 4.3.3 offer more guidance).

## 4.5 Outputs

After completing the Apply Stage, you should have the following outputs:

- Clarity on the caveats, assumptions, and uncertainties in the natural capital assessment, and the implications for the results of your natural capital assessment.
- Validation and/or verification of process and results
- Key messages for internal and external communication
- Agreed actions you will take



## 4.6 Case studies

**Table 4.3:**  
Case studies for the Apply Stage

|  | Bank for @ll  | Asset manager Triple Capital  | Capital Insurance  |
|--|---|---|--|
| <i>Context</i>                                 | <p>Bank for @ll is a signatory to the Equator Principles. The bank's project finance team is reviewing a funding request from one of its clients for a major natural gas project comprising:</p> <ul style="list-style-type: none"> <li>– A gas extraction field</li> <li>– A gas pipeline (400 km)</li> <li>– An onshore gas liquefaction plant</li> </ul> <p>The onshore gas plant will be located close to a marine UNESCO World Heritage natural site. The bank is concerned about the effects of the project on biodiversity, and hence its acceptance by the UNESCO committee. As a signatory to the Equator Principles, the Bank cannot afford the reputational risk of investing in a UNESCO-disapproved project.</p> | <p>Triple Capital is a signatory to the Principles of Responsible Investment (PRI), with long-standing commitments account for environmental, social, and governance (ESG) issues across all asset classes and to engage with the companies and other entities it invests in.</p> <p>Triple Capital is exploring whether natural capital assessment(s) can help it to better understand and manage natural capital-related risks and opportunities, and also help it to respond to those clients with a particular interest in natural capital.</p> | <p>Capital Insurance provides business interruption insurance to many of its clients. This insurance frequently covers losses as a result of flooding or other extreme weather events, many as a result of climate change.</p> <p>Capital Insurance routinely assesses weather- and flood-related risk as a standard part of its due diligence processes. It now wants to explore whether it is fully accounting for its exposure to climate change-related risks at the portfolio level and how it might improve processes for assessing these risks.</p> <p>Related to the increase in extreme weather events, Capital Insurance also wants to explore the extent to which its portfolio is dependent on natural flood defenses, and the value of this dependency.</p> |
| <i>Caveats, assumptions, and uncertainties</i> | <p>Average, minimum, and maximum values for similar ecosystem services were considered in the sensitivity analysis.</p>   | <p>Breakeven points of prices and damage factors were used to identify critical impacts and dependencies. These assumptions were varied to test whether higher/lower breakeven points or different assumptions would lead to substantially different results.</p>   | <p>Higher and lower (plus/minus 10%) probability of occurrence of flooding events and trends in global emissions were tested in the sensitivity analysis.</p>  |
| <i>Validation/verification</i>                 | <p>An external verification process confirmed that the sources of data, methodology, and the assumptions made were "fit for purpose" but that these needed to be better communicated as part of the wider communication efforts around the results of the assessment.</p>   | <p>An internal validation process recommended that the project team fully document the data sources used and the assumptions made in the assessment.</p>  | <p>An internal validation process, involving internal audit and the insurance underwriting team, confirmed the robustness of the analysis.</p>   |



**Table 4.3: continued**  
Case studies for the Apply Stage

|   | Bank for @ll  | Asset manager Triple Capital  | Capital Insurance  |
|---|---|---|--|
| <i>Key messages for internal and external communication</i> | <p>The natural capital assessment confirmed that the project could proceed and would have limited, acceptable impact on biodiversity in the UNESCO World Heritage Site so long as appropriate mitigation measures were adopted.</p> <p>The natural capital assessment team at Bank for @ll informed the entity's (the mining company) senior management about the mitigation measures that would be expected to be adopted in order for finance to be provided.</p>   | <p>The natural capital assessment confirmed the potential for such assessments to add value to investment decision making and to prioritize companies for engagement.</p> <p>However, the costs of natural capital assessments remain expensive. Reducing these costs will require ESG research and data providers to broaden their product offerings.</p>  | <p>Capital Insurance has strengthened its analysis of weather-related risks and opportunities, thereby enabling the insurer to make better underwriting decisions. The institution particularly needs to monitor the extent of its dependency on flood protection more regularly.</p>  |
| <i>Agreed actions to take</i>                               | <p>Bank for @ll makes meeting the conditions on mitigation measures a condition of providing finance to the company.</p> <p>Bank for @ll decides to make natural capital an explicit focus of its project due diligence processes, with the requirement to conduct full natural capital assessments as part of the environmental impact assessment process for high-impact projects, particularly in environmental sensitive, or high conservation value, areas.</p> <p>Bank for @ll sets up an internal working group to develop a formal policy (and measurement framework) on not investing in projects that result in a net loss of biodiversity.</p> | <p>Triple Capital uses the results of the natural capital assessment to prioritize companies for engagement. It focuses in the first instance on companies that have significant exposures to natural capital-related risks, with the aim of encouraging these companies to ensure that they have robust natural capital management systems and processes.</p> <p>The natural capital assessment has identified investment opportunities in particular in the area of ecosystem services. Triple Capital is using these insights to identify companies that are potential beneficiaries of these investment themes. It will then conduct a detailed investment analysis of these companies, with the aim of adding two or three companies to its investment portfolios.</p> | <p>Based on the results of the natural capital assessment, Capital Insurance has designed and started to implement a strategy to reduce its exposure to certain flood-prone areas.</p> <p>Capital Insurance will develop a screening tool that enables it to assess client risk based on the client's sector and geography. While not a formal target, Capital Insurance aims to reduce its exposure to flood risk by 20% over the next 10 years.</p> <p>Capital Insurance may, in time, also start to offer preferential services to those entities who can evidence active management and protection of the natural flood defenses on which they depend.</p> |

## 5 Annex 1: Examples of valuation techniques

Annex 1 illustrates a selection of examples of where different valuation techniques have been applied to value either different ecosystems, ecosystem services, sectors or country wide natural capital issues, trying also to identify papers that were of potential interest to the broad finance sector or produced by a financial institution (e.g., the World Bank) although some are not finance focused.

| Valuation type         | Technique               | Natural capital in general | GHG emissions  | Carbon sequestration | Air emissions   | Water supply    | Water quality  | Flood protection | Biodiversity            | Soil |
|------------------------|-------------------------|----------------------------|----------------|----------------------|-----------------|-----------------|----------------|------------------|-------------------------|------|
| Qualitative valuation  | Expert opinion          |                            |                |                      |                 |                 |                |                  | 18                      |      |
|                        | Relative valuation      | 11                         |                |                      |                 | 2               |                |                  | 2, 11 <sup>1</sup> , 13 |      |
| Quantitative valuation | Indicators              |                            |                |                      |                 |                 |                |                  | 18                      |      |
|                        | Multi-criteria analysis |                            | 3 <sup>2</sup> |                      |                 |                 | 8              |                  |                         | 8    |
| Monetary valuation     | Market prices           | 10                         | 16             |                      |                 | 17              |                |                  |                         |      |
|                        | Change in production    |                            | 16             |                      |                 | 7 <sup>3</sup>  |                |                  |                         | 2    |
|                        | Damage costs            |                            | 1, 2, 16       | 2                    | 1 <sup>4</sup>  |                 |                | 5 <sup>5</sup>   |                         |      |
|                        | Replacement cost        |                            |                |                      |                 | 4               |                |                  |                         |      |
|                        | Hedonic pricing         |                            |                |                      |                 | 6               |                |                  |                         |      |
|                        | Travel cost             |                            |                |                      |                 |                 |                |                  |                         |      |
|                        | Contingent valuation    |                            |                |                      | 14              |                 |                |                  |                         |      |
|                        | Choice experiment       |                            |                |                      |                 |                 |                |                  |                         |      |
| Value transfer         |                         |                            | 9 <sup>6</sup> | 16 <sup>7</sup>      | 16 <sup>8</sup> | 16 <sup>9</sup> | 9 <sup>7</sup> |                  | 9 <sup>7</sup>          |      |

<sup>1</sup> See Table 3.2

<sup>2</sup> Within the Social and Environmental Index section, one of the five indicators considered is CO<sub>2</sub> emissions.

<sup>3</sup> See Section 5 on Applications and Examples.

<sup>4</sup> See Appendix C (the economic valuation is particularly described in Appendix C4).

<sup>5</sup> See Section 9 on Damages and Benefits.

<sup>6</sup> Chapter three has several examples of value transfer to estimate the importance of different ecosystem services.

<sup>7</sup> Techniques used in the primary valuation studies are: market price, change in production, damage cost and contingent valuation.

<sup>8</sup> Techniques used in the primary valuation studies are: market price and damage cost.

<sup>9</sup> Techniques used in the primary valuation studies are: damage cost and contingent valuation.

<sup>10</sup> Techniques used in the primary valuation studies are: market prices, change in production, damage cost, replacement cost, hedonic pricing, travel cost, contingent valuation, choice experiment.

<sup>11</sup> Techniques used in the primary valuation studies are: market prices, change in production, damage cost, hedonic pricing and contingent valuation.



## References in the table:

- 1) Minjares, R.; Wagner, D.V.; Akbar, S. 2014. Reducing black carbon emissions from diesel vehicles: impacts, control strategies, and cost-benefit analysis. Washington DC; World Bank Group. [Online] Available at: <http://documents.worldbank.org/curated/en/329901468151500078/Reducing-black-carbon-emissions-from-diesel-vehicles-impacts-control-strategies-and-cost-benefit-analysis>
- 2) Laplante, B. 2005. Economic analysis of the environmental and social impacts of the Nam Theun 2 Hydroelectricity Power Project. Washington, DC: World Bank. [Online] Available at: <http://documents.worldbank.org/curated/en/422771468151780439/Economic-analysis-of-the-environmental-and-social-impacts-of-the-Nam-Theun-2-Hydroelectricity-Power-Project>
- 3) Marcelo, D.; Mandri-Perrott, X.C.; House, R.S.; Schwartz, J.Z. 2016. Prioritizing infrastructure investment: a framework for government decision making. Policy Research [Online] Available at: <http://documents.worldbank.org/curated/en/805021467996728921/Prioritizing-infrastructure-investment-a-framework-for-government-decision-making>
- 4) López-Morales, C.A., Mesa-Jurado, M.A. 2017. Valuation of hidden water ecosystem services: The replacement cost of the aquifer system in Central Mexico. *Water*, 9 (8). [Online] Available at: [https://www.researchgate.net/publication/318822183\\_Valuation\\_of\\_Hidden\\_Water\\_Ecosystem\\_Services\\_The\\_Replacement\\_Cost\\_of\\_the\\_Aquifer\\_System\\_in\\_Central\\_Mexico](https://www.researchgate.net/publication/318822183_Valuation_of_Hidden_Water_Ecosystem_Services_The_Replacement_Cost_of_the_Aquifer_System_in_Central_Mexico)
- 5) Beck, M., Narayan, S., Trespalacios, D.M., Quiroz, A. 2017. Valuing protective services of mangroves in the Philippines: technical report . Washington, D.C. : World Bank Group. [Online] Available at: <http://documents.worldbank.org/curated/en/278971501667825477/technical-report>
- 6) Trojanek, R., Tanas. J., Raslanas, S. and Banaitis, A. 2017. The Impact of Aircraft Noise on Housing Prices in Poznan. *Sustainability* 2017, 9 (11), 2088. [Online] Available at: [https://www.researchgate.net/publication/272183595\\_THE\\_IMPACT\\_OF\\_AIRCRAFT\\_NOISE\\_ON\\_HOUSE\\_PRICES](https://www.researchgate.net/publication/272183595_THE_IMPACT_OF_AIRCRAFT_NOISE_ON_HOUSE_PRICES)
- 7) Bloomberg. 2015. Water Risk Valuation Tool. Integrating natural capital limits into financial analysis of mining stocks. In collaboration with Natural Capital Declaration and UNEP-Finance Initiative and Global Canopy Programme [Online] Available at: [https://www.bbhub.io/sustainability/sites/6/2015/09/Bloomberg\\_WRVT\\_09162015\\_WEB.pdf](https://www.bbhub.io/sustainability/sites/6/2015/09/Bloomberg_WRVT_09162015_WEB.pdf)
- 8) Chowdhury, R.K. and Rahman, R. 2008. Multi-criteria decision analysis in water resources management: the malnichara channel improvement. *International Journal of Environmental Science & Technology* 5: 195-204. Online [Available at: <https://tspace.library.utoronto.ca/bitstream/1807/62555/1/st08023.pdf>
- 9) Mani Muthukumara S. [editor]. 2014. Greening India's growth: costs, valuations and trade-offs. London; New York: Routledge. [Online] Available at: <http://documents.worldbank.org/curated/en/701131467993496463/Greening-Indias-growth-costs-valuations-and-trade-offs>
- 10) Schramade, W. 2016. Integrating ESG into valuation models and investment decisions: the value-driver adjustment approach, *Journal of Sustainable Finance & Investment*, 6:2, 95-111. [Online] Available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2749626](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2749626)
- 11) ACCA, Fauna and Flora International and KPMG. 2012. Is natural capital a material issue? [Online] Available at: <http://www.accaglobal.com/content/dam/accaglobal/PDF-technical/environmental-publications/natural-capital.pdf>
- 12) Yang, H.J, Lim, S.Y., Yoo Seung-Hoon, Y. 2017. The Environmental Costs of Photovoltaic Power Plants in South Korea: A Choice Experiment Study. *Sustainability* 2017, 9 (10), 1773. [Online] Available at: <http://www.mdpi.com/2071-1050/9/10/1773>
- 13) ISIS Asset Management (F&C Asset Management). 2004. Is biodiversity a material risk for companies? An assessment of the exposure of FTSE sectors to biodiversity risk. [Online] Available at: <https://www.cbd.int/financial/privatesector/uk-privaterisk.pdf>
- 14) Vlachokostas, C., Achillas, C., Slini, T. Moussiopoulos, N. Baniyas, G., Dimitrakis, I. 2011. Willingness to pay for reducing the risk of premature mortality attributed to air pollution: a contingent valuation study for Greece. *Atmospheric Pollution Research*, Volume 2, Issue 3, July 2011, Pages 275-282. [Online] Available at: <https://www.sciencedirect.com/science/article/pii/S1309104215304840>

- 15) Nandagiri, J.L. 2015. Evaluation of Economic Value of Pilikula Lake Using Travel Cost and Contingent Valuation Methods. Aquatic Procedia, Volume 4, 2015, Pages 1315-1321. [Online] Available at: <https://www.sciencedirect.com/science/article/pii/S2214241X15001728>
- 16) Trucost (2015) Natural Capital Risk Exposure of the Financial Sector in Brazil. Commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and Conselho Empresarial Brasileiro para o Desenvolvimento (CEBDS). [Online] Available at: <http://cebds.org/wp-content/uploads/2015/07/GIZ-Natural-Capital-Risk-Exposure.pdf>
- 17) CoBank. 2015. California Drought in 2015 and its Economic Impact on Agriculture. By D. Kowalski and L. Shaling. CoBank's Knowledge Exchange Division. [Online] Available at: <http://www.cobank.com/Knowledge-Exchange/-/media/Files/Searchable%20PDF%20Files/Knowledge%20Exchange/2015/Front%20Page%20-%20California%20Drought%20-%20June%202015.pdf>
- 18) ASN Bank, CREM and PRé Consultants. 2016. Towards ASN Bank's Biodiversity footprint. A pilot project. August 2016. [Online] Available at: <https://www.asnbank.nl/over-asn-bank/duurzaamheid/biodiversiteit/biodiversiteit-in-2030/biodiversiteit-in-2030.html>

# Glossary

|                                 |  |
|---------------------------------|--|
| <i>Abiotic services</i>         | 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).  |
| <i>Biodiversity</i>             | The variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems (UN 1992).  |
| <i>Dependency pathway</i>       | A dependency pathway shows how a particular business activity depends upon specific features of natural capital. It identifies how observed or potential changes in natural capital affect the costs and/or benefits of doing business.  |
| <i>Economic value</i>           | The importance, worth, or usefulness of something to people—including all relevant market and non-market values. In more technical terms, the sum of individual preferences for a given level of provision of that good or service. Economic values are usually expressed in terms of marginal/incremental changes in the supply of a good or service, using money as the metric (e.g., \$/unit).  |
| <i>Ecosystem services</i>       | The most widely used definition of ecosystem services is from the Millennium Ecosystem Assessment (MA 2005): “the benefits people obtain from ecosystems”. The MA further categorized ecosystem services into four categories: <ul style="list-style-type: none"> <li>– Provisioning: Material outputs from nature (e.g., seafood, water, fiber, genetic material).</li> <li>– Regulating: 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).</li> <li>– Cultural: Non-material benefits from nature (e.g., spiritual, aesthetic, recreational, and others).</li> <li>– Supporting: Fundamental ecological processes that support the delivery of other ecosystem services (e.g., nutrient cycling, primary production, soil formation).</li> </ul> |
| <i>Entity</i>                   | A single organization (public or private), project, or activity, or an individual asset which is supported through banking, investment, and insurance activities.  |
| <i>Impact driver</i>            | An impact driver is a measurable quantity of a natural resource that is used as an input to production (e.g., volume of sand and gravel used in construction) or a measurable non-product output of business activity (e.g., a kilogram of NOx emissions released into the atmosphere by a manufacturing facility).  |
| <i>Impact pathway</i>           | An impact pathway describes how, as a result of a specific activity, a particular impact driver results in changes in natural capital and how these changes affect different stakeholders.   |
| <i>Market value</i>             | The amount for which something can be bought or sold in a given market.  |
| <i>Materiality</i>              | In the Natural Capital Protocol and Supplement, an impact or dependency on natural capital is material if consideration of its value, as part of the set of information used for decision making, has the potential to alter that decision (adapted from OECD 2015 and IIRC 2013).   |
| <i>Natural capital</i>          | The stock of renewable and non-renewable natural resources (e.g., plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people (adapted from Atkinson and Pearce 1995; Jansson et al. 1994).   |
| <i>Natural Capital Protocol</i> | A standardized framework for business to identify, measure, and value direct and indirect impacts (positive and negative) and/or dependencies on natural capital. <a href="http://naturalcapitalcoalition.org/protocol/">http://naturalcapitalcoalition.org/protocol/</a>  |
| <i>Portfolio</i>                | A collection of multiple entities or assets held, or supported by, your financial institution. This includes your full portfolio, and/or a subset such as an asset class, sector, or region.   |
| <i>Price</i>                    | The amount of money expected, required, or given in payment for something (normally requiring the presence of a market).   |
| <i>Value (noun)</i>             | The importance, worth, or usefulness of something.   |
| <i>Verification</i>             | Independent process involving expert review to check that the documentation of an assessment is complete and accurate and gives a true representation of the process and results. “Verification” is used interchangeably with terms such as “audit” or “assurance”.  |
| <i>Validation</i>               | Internal or external process to check the quality of an assessment, including technical credibility, the appropriateness of key assumptions, and the strength of results. This process may be more or less formal and often relies on self-assessment.   |



## References

We would like to thank those who contributed to resources consulted in formulating and developing this supplement. The valuable work below was considered and leveraged during the drafting process:

A4S Chief Financial Officer Leadership Network. 2015. Capex: A practical guide to embedding sustainability into capital investment appraisal. Available at: <https://www.accountingforsustainability.org/content/dam/a4s/corporate/home/KnowledgeHub/Guide-pdf/A4S%20Capex.pdf.downloadasset.pdf>

ACCA (the Association of Chartered Certified Accountant), Fauna & Flora International, and KPMG. 2012. Is natural capital a material issue? Available at: <http://www.accaglobal.com/content/dam/acca/global/PDF-technical/environmental-publications/natural-capital.pdf>

ASN Bank, CREM and PRé Consultants. 2016. Towards ASN Bank's Biodiversity footprint. A pilot project. August 2016. [Online] Available at: <https://www.asnbank.nl/over-asn-bank/duurzaamheid/biodiversiteit/biodiversiteit-in-2030/biodiversiteit-in-2030.html>

Atkinson, G. and D. Pearce. 1995. "Measuring sustainable development." In: Bromley, D. W.(ed.) Handbook of Environmental Economics. Blackwell, Oxford, UK, pp. 166-182.

Bank for International Settlements. 2016. Summary of debt securities outstanding – end September 2016. Available at: <http://stats.bis.org/statx/srs/table/c1>

Beck, M., Narayan, S., Trespalacios, D.M., and Quiroz, A. 2017. Valuing protective services of mangroves in the Philippines: technical report. Washington, D.C.: World Bank Group. [Online] Available at: <http://documents.worldbank.org/curated/en/278971501667825477/technical-report>

Bloomberg. 2015. Water Risk Valuation Tool. Integrating natural capital limits into financial analysis of mining stocks. In collaboration with Natural Capital Declaration and UNEP-Finance Initiative and Global Canopy Programme [Online] Available at: [https://www.bbhub.io/sustainability/sites/6/2015/09/Bloomberg\\_WRVT\\_09162015\\_WEB.pdf](https://www.bbhub.io/sustainability/sites/6/2015/09/Bloomberg_WRVT_09162015_WEB.pdf)

CCI (Cambridge Conservation Initiative). 2016. Biodiversity at the heart of accounting for natural capital: the key to credibility. Available at: <http://www.conservation.cam.ac.uk/resource/working-papers-and-reports/report-biodiversity-heart-accounting-natural-capital>

Ceres. 2015. An investor handbook for water risk integration. Available at: <https://www.ceres.org/issues/water/water-and-esg-risk>

Chatham House. 2016. Managing the risk of stranded assets in agriculture and forestry. Available at: <https://www.chathamhouse.org/publication/managing-risk-stranded-assets-forestry-and-agriculture#>

Chowdhury, R.K. and Rahman, R. 2008. Multi-criteria decision analysis in water resources management: the malnchara channel improvement. International Journal of Environmental Science 7 Technology 5: 195-204. [Online] Available at: <https://tspace.library.utoronto.ca/bitstream/1807/62555/1/st08023.pdf>

CIMA, EY, IFAC and NCC. 2014. Accounting for natural capital the elephant in the boardroom. Available at: [http://www.ey.com/Publication/vwLUAssets/Accounting-for-natural-capital/\\$File/EY-Accounting-for-natural-capital.pdf](http://www.ey.com/Publication/vwLUAssets/Accounting-for-natural-capital/$File/EY-Accounting-for-natural-capital.pdf)

CISL (University of Cambridge Institute for Sustainability Leadership). 2015. Doing business with nature. Available at: <http://www.cisl.cam.ac.uk/publications/natural-resource-security-publications/doing-business-with-nature-report>

CoBank. 2015. California Drought in 2015 and its Economic Impact on Agriculture. By D. Kowalski and L. Shaling. CoBank's Knowledge Exchange Division. [Online] Available at: <http://www.cobank.com/Knowledge-Exchange/-/media/Files/Searchable%20PDF%20Files/Knowledge%20Exchange/2015/Front%20Page%20-%20California%20Drought%20-%20June%202015.pdf>

eftec. 2010. "Valuing Environmental Impacts: Practical Guidelines for the Use of Value Transfer in Policy and Project Appraisal. Value Transfer Guidelines submitted to Department for Environment, Food and Rural Affairs. [Online] Available at: <http://www.eftec.co.uk/eftec-projects/valuing-environmental-impacts-practical-guidelines-for-the-use-of-value-transfer-in-policy-and-project-appraisal>

FSB-TCFD (Financial Stability Board – Task Force on Climate-related Financial Disclosures). 2017. Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures. [Online] Available at: <https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf>

- IFC. 2012. Performance Standards on Environmental and Social Sustainability. Available at: [http://www.ifc.org/wps/wcm/connect/115482804a0255db96fbffd1a5d13d27/PS\\_English\\_2012\\_Full-Document.pdf?MOD=AJPERES](http://www.ifc.org/wps/wcm/connect/115482804a0255db96fbffd1a5d13d27/PS_English_2012_Full-Document.pdf?MOD=AJPERES)
- IIRC. 2013. International Integrated Reporting Framework. International Integrated Reporting Council [Online] Available at: <http://integratedreporting.org/wp-content/uploads/2015/03/13-12-08-THE-INTERNATIONAL-IR-FRAMEWORK-2-1.pdf>
- IPCC (Intergovernmental Panel on Climate Change). 2000. Special Report: Emissions Scenarios: Summary for policymakers. Available at: <https://www.ipcc.ch/pdf/special-reports/spm/sres-en.pdf>
- ISIS Asset Management (F&C Asset Management). 2004. Is biodiversity a material risk for companies? An assessment of the exposure of FTSE sectors to biodiversity risk. [Online] Available at: <https://www.cbd.int/financial/privatesector/uk-privaterisk.pdf>
- Jansson, A., Hammer, M., Folke, C., and Costanza, R. (eds). 1994. Investing in Natural Capital: The Ecological Economics Approach To Sustainability. Island Press: Washington, DC
- Laplante, B. 2005. Economic analysis of the environmental and social impacts of the Nam Theun 2 Hydroelectricity Power Project. Washington, DC: World Bank. [Online] Available at: <http://documents.worldbank.org/curated/en/422771468151780439/Economic-analysis-of-the-environmental-and-social-impacts-of-the-Nam-Theun-2-Hydroelectricity-Power-Project>
- López-Morales, C.A., Mesa-Jurado, M.A. 2017. Valuation of hidden water ecosystem services: The replacement cost of the aquifer system in Central Mexico. *Water*, 9 (8). [Online] Available at: [https://www.researchgate.net/publication/318822183\\_Valuation\\_of\\_Hidden\\_Water\\_Ecosystem\\_Services\\_The\\_Replacement\\_Cost\\_of\\_the\\_Aquifer\\_System\\_in\\_Central\\_Mexico](https://www.researchgate.net/publication/318822183_Valuation_of_Hidden_Water_Ecosystem_Services_The_Replacement_Cost_of_the_Aquifer_System_in_Central_Mexico)
- MA. 2005. Millennium Ecosystem Assessment: Ecosystems and human wellbeing. Biodiversity synthesis. Washington DC: Island Press.
- Mani Muthukumara S. (ed.). 2014. Greening India's growth: costs, valuations and trade-offs. London; New York: Routledge. [Online] Available at: <http://documents.worldbank.org/curated/en/701131467993496463/Greening-Indias-growth-costs-valuations-and-trade-offs>
- Marcelo, D., Mandri-Perrott, X.C., House, R.S., and Schwartz, J.Z. 2016. Prioritizing infrastructure investment: a framework for government decision making. Policy Research [Online] Available at: <http://documents.worldbank.org/curated/en/805021467996728921/Prioritizing-infrastructure-investment-a-framework-for-government-decision-making>
- Minjares, R., Wagner, D.V., and Akbar, S. 2014. Reducing black carbon emissions from diesel vehicles: impacts, control strategies, and cost-benefit analysis. Washington DC; World Bank Group. [Online] Available at: <http://documents.worldbank.org/curated/en/329901468151500078/Reducing-black-carbon-emissions-from-diesel-vehicles-impacts-control-strategies-and-cost-benefit-analysis>
- Moody's. 2016. Climate Change and Sovereign Credit Risk Infographic. [Online] Available at: [https://www.moody.com/sites/products/ProductAttachments/Climate\\_trends\\_infographic\\_moodys.pdf?WT.z\\_referringsource=TB-ESGhub-climatetrends](https://www.moody.com/sites/products/ProductAttachments/Climate_trends_infographic_moodys.pdf?WT.z_referringsource=TB-ESGhub-climatetrends)
- Mulder, I. 2007. Biodiversity, the next challenge for financial institutions. Available at: [https://www.iucn.org/sites/dev/files/import/downloads/ivo\\_bb\\_report.pdf](https://www.iucn.org/sites/dev/files/import/downloads/ivo_bb_report.pdf)
- Nandagiri, J.L. 2015. Evaluation of Economic Value of Pilikula Lake Using Travel Cost and Contingent Valuation Methods. *Aquatic Procedia*, Volume 4, 2015, Pages 1315-1321. [Online] Available at: <https://www.sciencedirect.com/science/article/pii/S2214241X15001728>
- Natural Capital Coalition. 2016a. Natural Capital Protocol. Available at: <http://naturalcapitalcoalition.org/protocol/>
- Natural Capital Coalition. 2016b. Natural Capital Protocol: Apparel Sector Guide. Available at: [http://naturalcapitalcoalition.org/wp-content/uploads/2016/07/NCC\\_Apparel\\_WEB\\_2016-07-12.pdf](http://naturalcapitalcoalition.org/wp-content/uploads/2016/07/NCC_Apparel_WEB_2016-07-12.pdf)
- Natural Capital Coalition. 2016c. Natural Capital Protocol: Food and Beverage Sector Guide. Available at: [http://naturalcapitalcoalition.org/wp-content/uploads/2016/07/NCC\\_FoodAndBeverage\\_WEB\\_2016-07-12.pdf](http://naturalcapitalcoalition.org/wp-content/uploads/2016/07/NCC_FoodAndBeverage_WEB_2016-07-12.pdf)
- Natural Capital Coalition, NCF, and VBDO. 2017. Report on the Engagement process on the Finance Sector Supplement. Available at: [http://naturalcapitalcoalition.org/wp-content/uploads/2016/11/Finance-Sector-Supplement-Engagement-Report\\_revised.pdf](http://naturalcapitalcoalition.org/wp-content/uploads/2016/11/Finance-Sector-Supplement-Engagement-Report_revised.pdf)
- Natural Capital Hub. n.d. Available at: <https://naturalcapitalcoalition.org/hub/>

- NCFA. 2015. Integrating water risk into corporate bond credit analysis. Available at: [http://naturalcapitaldeclaration.org/documents/wgi/INTEGRATING%20WATER%20STRESS%20REPORT\\_FINAL.pdf](http://naturalcapitaldeclaration.org/documents/wgi/INTEGRATING%20WATER%20STRESS%20REPORT_FINAL.pdf)
- NCFA and UNEP. 2015. Bank and investor risk policies on soft commodities. Available at: [http://www.naturalcapitalfinancealliance.org/documents/wgi/NCD%20-%20SOFT%20COMMODITIES%20RISK%20\(SUMMARY\).pdf](http://www.naturalcapitalfinancealliance.org/documents/wgi/NCD%20-%20SOFT%20COMMODITIES%20RISK%20(SUMMARY).pdf)
- OECD. 2015. "Glossary of Statistical Terms. Organisation for Economic Co-operation and Development." [Online] Available at: <https://stats.oecd.org/glossary/>
- Schramade, W. 2016. Integrating ESG into valuation models and investment decisions: the value-driver adjustment approach, *Journal of Sustainable Finance & Investment*, 6:2, 95-111. [Online] Available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2749626](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2749626)
- Trojanek, R., Tanas, J., Raslanas, S., and Banaitis, A. 2017. The Impact of Aircraft Noise on Housing Prices in Poznan. *Sustainability* 2017, 9 (11), 2088. [Online] Available at: [https://www.researchgate.net/publication/272183595\\_THE\\_IMPACT\\_OF\\_AIRCRAFT\\_NOISE\\_ON\\_HOUSE\\_PRICES](https://www.researchgate.net/publication/272183595_THE_IMPACT_OF_AIRCRAFT_NOISE_ON_HOUSE_PRICES)
- Trucost. 2012. Carbon and water risk for South Africa's top companies, bonds and equity funds. How corporate emissions expose investors to carbon taxes and thirsty assets are vulnerable to climate change impacts. Available at: <https://www.trucost.com/publication/wwf-report-carbon-water-risk-south-africas-top-companies-bonds-equity-funds/>
- Trucost. 2013. Natural capital at risk: the top 100 externalities for business. Available at: <http://naturalcapitalcoalition.org/wp-content/uploads/2016/07/Trucost-Nat-Cap-at-Risk-Final-Report-web.pdf>
- Trucost. 2015. Natural Capital Risk Exposure of the Financial Sector in Brazil. Commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and Conselho Empresarial Brasileiro para o Desenvolvimento (CEBDS). [Online] Available at: <http://cebds.org/wp-content/uploads/2015/07/GIZ-Natural-Capital-Risk-Exposure.pdf>
- UN. 1992. "Convention on Biological Diversity: Text of the Convention." United Nations [Online] Available at: <https://www.cbd.int/doc/legal/cbd-en.pdf>
- UNEP FI. 2008. Biodiversity and ecosystem services - bloom or bust? Available at: <http://www.unepfi.org/publications/ecosystems-publications/biodiversity-and-ecosystem-services-bloom-or-bust/>
- UNEP FI. 2010. CEO Briefing: demystifying materiality - hardwiring biodiversity and ecosystem services into finance. Available at: [http://www.unepfi.org/fileadmin/documents/CEO\\_DemystifyingMateriality.pdf](http://www.unepfi.org/fileadmin/documents/CEO_DemystifyingMateriality.pdf)
- UNEP FI. 2013. Global insurance industry statement. Available at: [http://www.unepfi.org/fileadmin/documents/2013\\_global\\_insurance\\_industry\\_statement.pdf](http://www.unepfi.org/fileadmin/documents/2013_global_insurance_industry_statement.pdf)
- UNEP FI. 2016. ERISC Phase II: How food prices link environmental constraints to sovereign credit risk. Available at: [http://www.unepfi.org/fileadmin/documents/ERISC\\_Phase2.pdf](http://www.unepfi.org/fileadmin/documents/ERISC_Phase2.pdf)
- van Leenders, L. and Bor, A. 2016. Finance for one planet. CoP financial institutions and natural capital. Available at: <https://www.rvo.nl/sites/default/files/2016/10/Finance%20for%20one%20planet%202016%20-%20CoP%20Financial%20Institutions%20and%20Natural%20Capital.pdf>
- VBDO (Dutch Association of Investors for Sustainable Development) and CREM. 2016. Natural Capital & Financial Institutions. Available at: <http://www.vbdo.nl/files/news/VBDOCREMNaturalCapitalGuide.pdf>
- Vlachokostas, C., Achillas, C., Slini, T., Moussiopoulos, N., Baniyas, G., and Dimitrakis, I. 2011. Willingness to pay for reducing the risk of premature mortality attributed to air pollution: a contingent valuation study for Greece. *Atmospheric Pollution Research*, Volume 2, Issue 3, July 2011, Pages 275-282. [Online] Available at: <https://www.sciencedirect.com/science/article/pii/S1309104215304840>
- Yang, H.J, Lim, S.Y., Yoo Seung-Hoon, Y. 2017. The Environmental Costs of Photovoltaic Power Plants in South Korea: A Choice Experiment Study. *Sustainability* 2017, 9 (10), 1773. [Online] Available at: <http://www.mdpi.com/2071-1050/9/10/1773>

# List of figures, tables and boxes

## List of figures

|                   |   |
|-------------------|---|
| <i>Figure 0.1</i> | Key questions and outputs for each Stage of the Supplement                                      |
| <i>Figure 1.1</i> | Natural capital stocks, flows, and value  |
| <i>Figure 1.2</i> | Conceptual model for natural capital and the finance sector                                     |
| <i>Figure 1.3</i> | Soft commodities and natural capital risks  |
| <i>Figure 1.4</i> | The process of integrating natural capital information  |
| <i>Figure 2.1</i> | Generic steps in an impact pathway  |
| <i>Figure 2.2</i> | Generic steps in a dependency pathway   |
| <i>Figure 3.1</i> | Process diagram showing impact drivers and dependencies associated with producing a plastic cup |

## List of tables

|                  |   |
|------------------|---|
| <i>Table 0.1</i> | Key questions to be answered and outputs for each Stage of the Supplement               |
| <i>Table 1.1</i> | Examples of natural capital-related risks and opportunities for finance                 |
| <i>Table 1.2</i> | The additional value of a natural capital approach                                      |
| <i>Table 1.3</i> | Types of natural capital analysis   |
| <i>Table 1.4</i> | Case studies for the Frame Stage  |
| <i>Table 2.1</i> | Examples of objectives for different types of analysis                                  |
| <i>Table 2.2</i> | Examples of target audiences  |
| <i>Table 2.3</i> | Examples of impact drivers to consider  |
| <i>Table 2.4</i> | Examples of dependencies to consider  |
| <i>Table 2.5</i> | Case studies for the Scope Stage  |
| <i>Table 3.1</i> | Examples of quantitative indicators for different impact drivers                        |
| <i>Table 3.2</i> | Examples of quantitative indicators for different dependencies                          |
| <i>Table 3.3</i> | Examples of primary and secondary data sources  |
| <i>Table 3.4</i> | Examples of changes in natural capital for different impact drivers                     |
| <i>Table 3.5</i> | Examples of measurement and estimation methods for assessing changes in natural capital |
| <i>Table 3.6</i> | Example outcomes of valuation techniques applied across different focuses               |
| <i>Table 3.7</i> | Case studies for the Measure and Value Stage  |
| <i>Table 4.1</i> | Sample validation and verification questions  |
| <i>Table 4.2</i> | Examples of extending future assessments  |
| <i>Table 4.3</i> | Case studies for the Apply Stage  |

## List of boxes

|                |   |
|----------------|---|
| <i>Box 0.1</i> | The Natural Capital Protocol  |
| <i>Box 1.1</i> | Market failures and distortions: focus on externalities and subsidies           |
| <i>Box 1.2</i> | The relevance of natural capital for sovereign credit risk and bond markets     |
| <i>Box 1.3</i> | Soft commodities and natural capital risks: one example from a forest ecosystem |
| <i>Box 2.1</i> | Impact and dependency pathways  |
| <i>Box 2.2</i> | Other terms for value perspectives  |
| <i>Box 4.1</i> | Double counting   |
| <i>Box 4.2</i> | Social discount rates   |
| <i>Box 4.3</i> | Sensitivity analysis  |
| <i>Box 4.4</i> | Suggestions for informing future assessments                                    |
| <i>Box 4.5</i> | Examples of business decisions based on natural capital assessments             |

Introduction

Frame stage: Why?

Scope stage: What?

Measure and value stage: How?

Apply stage: What next?

Annex 1: Examples of valuation techniques

References

# Acknowledgments

Connecting Finance and Natural Capital: a Supplement to the Natural Capital Protocol has been developed through a collaborative effort. The Natural Capital Coalition, Natural Capital Finance Alliance (NCFA) (formerly the Natural Capital Declaration), and the Dutch Association of Investors for Sustainable Development (VBDO) led the process and there were contributions from almost 200 other organizations, through an open engagement process.

## For developing the Supplement

Mark Gough, Natural Capital Coalition; Stephanie Hime, Little Blue Research; James Hulse, NCFA; Marie Morice, NCFA; Anders Nordheim, UNEP-FI; Hannah Pitts, Natural Capital Coalition; Marta Santamaria, Natural Capital Coalition; James Spurgeon, Sustain Value; Rory Sullivan, Natural Capital Coalition; Frank Wagemans, VBDO.

## For contributing to the Supplement development

Nagwa Ahmed, Natural Capital Coalition; Henrik Dinesen, Natural Capital Coalition; Joseph Harris-Confino, Natural Capital Coalition; Jennifer Hole; Alison Jones, Natural Capital Coalition; Caroline van Leenders, The Netherlands Enterprise Agency; Raj Singh, NCFA, Rudy Verstappen, VBDO.

## For providing oversight and guidance

Rosemary Bissett, National Australia Bank; Drew Fryer, S&P; Dr. Frank Hawkins, IUCN; Yohan Hill, S&P; Angelica Laskewitz, VBDO; Martin Lok, the Ministry of Agriculture, Nature and Food Quality of the Government of the Netherlands; Courtney Lowrance, Citi Group; Richard Mattison, S&P; Emily McKenzie, WWF and Natural Capital Project; Ivo Mulder, UN Environment; Vanessa Otto-Mentz, Santam; Bilal Rahill, IFC; Julie Raynaud, Kepler Cheuvreux; Namita Vikas, YesBank; Xander den Uyl, Stichting Pensioenfonds ABP; Elizabeth White, IFC; Eva Zabey, WBCSD.

## For funding the development of the Supplement

This project has been made possible by generous funding and support from The Rockefeller Foundation, International Finance Corporation (IFC) with the support of the Swiss State Secretariat for Economic Affairs (SECO) and the Ministry of Foreign Affairs of the Government of the Netherlands, United Nations Environment Programme (UN Environment), and the Dutch Ministry of Agriculture, Nature, and Food Quality.

## For taking part in the engagement process that contributed to Supplement development

ABN AMRO; ACCA; Access Bank plc; ACTIAM; AECOM; Agence Francaise de Developpement; Agricultural University Athens; Aichmi Advisory & Services; Amadeis; Amborcreatie; Anglia Ruskin University; Anteo; ANZ; Applied Genomics Ltd; Arabesque Asset Management; Arcadis; ASN Bank; AXA France; Bancomext; Bankinter; Banorte; Banque Publique d'Investissement; Barclays; BirdLife International; BNP Paribas; BSI; CAF Groupe; Cairns Advisory; Caisse des Depots et Consignations; California FarmLink; Castlefield Investment Partners; CDC Biodiversite; CDP; Climate Disclosure Standards Board; CIB; Clarmondial; CNP Assurances; CNSEG; Connexis; Conservation International; Cornell University/Credit Suisse; Credit Suisse; CREM; Cumulus Consultants Ltd; DBSA; Deloitte; Deutsche Asset Management; DHI Group; Dividendee; Dow Chemical; DSM; Dutch Ministry of Economic Affairs; Earthmind; Ecoacsa; EDF; Edmond de Rothschild; eftec ltd; Energetics; Enetjarn Natur; ERM; Escarus; European Commission; European Investment Bank; EY; Fasecolda; Fauna & Flora International; First Rand; FMO; Food and Drink Federation; Forestry Commission; Fundacion Vida Silvestre Argentina; Global Canopy Programme; Global Environment Facility; Global Impact Investing Network (GIIN); Global Nature Fund; Global Ocean Trust; Global Water Fund; GLS Banke; Green Investment Bank; Green Planet Consulting; Guggenheim Partners; Handshake; Higher Ground Foundation; iAM Consulting; ICMIF; IFAC; IFC; Impact Capitalyst; INGBank; Institut du Developpement Durable et des Relations Internationales (IDDRI); Instituto de Credito Oficial (ICO); Intesa Sanpaolo; Investec; IUCN; IUCN NL; J. Safra Sarasin; Kepler Cheuvreux; Kering; Kowat Control Biomimetico S.L.; KPMG; M&S; Marine Stewardship Council; Ministere des Affaires Etrangeres et du Developpement International, France; Ministry of the Environment, France; MIROVA; MS&AD; N2 INC; NABBS; National Australia Bank; Natixis; Natural Capital Solutions; Natural Resources Law Limited; Naturalogic; Nature Services Peru; Nature^Squared; NBAD; Norges Bank Investment Management; Piraeus Bank; Principles for Responsible Investment; Profundo; PwC; Rabobank Group; Ramboll Environ; RBC; Reforestamos Mexico; Restore the Earth Foundation; RVO - Netherlands Enterprise Agency; S&P Global; Santander; Skanska; Societe Generale; SSG Advisors; Standard Bank group; Sustainable Business Australia; Sustainable Finance Lab; Swiss Association for Responsible Investors; Swiss Federal Office for the Environment; Swiss Re; Synergiz; Taka Solutions; TD Bank; The Mauritius Commercial Bank Limited; The World Bank; TNC; Trucost; UBS; UN Environment (UNEP); UNEP FI; UNEP-WCMC; UniCredit; Unilever; University of Western Macedonia; Univest Company; Valuing Nature; WBCSD; Wema Bank; WHEB Group; Wolfs Company; WWF; Yes Bank.

---

**Suggested citation**

Natural Capital Coalition, Natural Capital Finance Alliance, VBDO 2018. "Connecting Finance and Natural Capital: A Supplement to the Natural Capital Protocol". (Online) Available at: [www.naturalcapitalcoalition.org](http://www.naturalcapitalcoalition.org)



This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License  
© ICAEW 2016



NATURAL  
CAPITAL  
COALITION



@NatCapCoalition #NatCapProtocol



[naturalcapitalcoalition.org](http://naturalcapitalcoalition.org)



Designed and produced by **Radley Yeldar**  
[www.ry.com](http://www.ry.com)