



**NATURAL
CAPITAL
COALITION**
A PART OF THE TEEB COMMUNITY
Valuing nature in business



Valuing natural
capital in business

TAKING STOCK: EXISTING INITIATIVES AND APPLICATIONS

Why should business and investors be interested in natural capital and this project?

For businesses to be viable in the long term the ecosystems and resources they depend on must be maintained, yet when it comes to the natural environment we are seeing a rapid depletion of capital. Economic invisibility has been a major reason for the neglect of natural capital. The current business model creates significant environmental externalities that are not priced eg, damages from climate change, pollution, land conversion and depletion of natural resources. As a result, there is a growing case for understanding the dependencies business has on natural capital, the risks and opportunities associated with this relationship and their real value. Integrating natural capital in business decision making leads to better business decisions with the benefits of greater resilience, improved security of supply and ultimately a sustainable business model. Valuing natural capital specifically can improve business decisions on risk management, supply chain sourcing decisions, new markets/investments, saving costs, sustaining revenues and environmental performance.

One of the challenges at present is the lack of a harmonised framework for how to value natural capital and apply it in business decision making. This is what the Coalition's Natural Capital Protocol project aims to do.

We have an open call for business, investors and wider interested stakeholders to participate and shape the future. By participating business and investor participants can gain an early mover understanding and practical application of natural capital valuation.

Natural Capital Coalition

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Valuing natural capital in business

TAKING STOCK: EXISTING INITIATIVES AND APPLICATIONS

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1. INTRODUCTION

This publication is a stock take of existing initiatives and applications relevant for valuing natural capital. This provides a baseline of existing initiatives in order to inform the Natural Capital Protocol project. It is also intended to be a useful resource to demystify the growing volume of natural capital relevant initiatives emerging from the private and public sectors. The following existing initiatives have been reviewed and are summarised:

- Business engagement initiatives.
- Methodologies, tools and initiatives relevant to measuring, managing and valuing natural capital in business and investor decision making.
- Initiatives relevant to using natural capital valuation in business applications eg, strategy, management (at organisation or supply chain levels), reporting and disclosure.
- Policy initiatives that define natural capital accounting classifications, metrics and indicators that can inform future target setting and new market initiatives relevant to business.

This publication is designed to be in support of *Towards a Harmonised Protocol*.



2. EXISTING INITIATIVES VALUING NATURAL CAPITAL

This section provides an overview of current initiatives for valuing natural capital under the following categories:

- Business engagement
- Valuation techniques
- Methodologies and tools for business
- Data and databases

2.1 Business engagement

Several key initiatives are in place to engage early adopter business across a range of sectors on natural capital. They focus on awareness raising, encouraging business commitments, evidence and business-focused publications and support. An overview is below.

KEY BUSINESS HUB

A4S Chief Financial Officer Leadership Network

Launched in December 2013, the [A4S Chief Financial Officer Leadership Network](#) focuses on the role CFOs play in integrating environmental and social issues into financial decision making. The Network has come together to demonstrate leadership on how companies should respond to challenges including climate change, a rising and ageing global population, rapid urbanisation, and increased consumption which are putting unprecedented pressure on natural resources and the fabric of society. It will focus on developing and sharing successful strategies so these become the 'norm' across all businesses.

BSR Ecosystem Services Working Group

[Business for Social Responsibility \(BSR\) Ecosystem Services Working Group](#) focuses on emerging risks and opportunities associated with corporate reliance on, and impacts to, ecosystem services. The programme tracks the development of new environmental performance expectations associated with ecosystem services, as well as new decision-making aids and policy uptake. Key business-focused publications, webinars and events participants include AngloGold Ashanti North America Inc., Barrick Gold, BG Group, BP plc, Chevron Corporation, The Dow Chemical Company, DuPont, Eni S.p.A., Exxon Mobil Corporation, Freeport-McMoRan Copper & Gold Inc., Royal Dutch Shell, and The Walt Disney Company.

CPSL Natural Capital Leaders Platform

[Cambridge Programme for Sustainability Leadership \(CPSL\) Natural Capital Leaders Platform](#) convenes companies with significant environmental impacts and dependencies which are taking action to review, value, redesign strategies, set targets and report on natural capital use. The Platform operates as an important hub for private sector involvement in environmental decision making. Through the collaborative efforts of over 40 global companies and academics since its conception, the Platform has created a breadth of business-relevant expertise and developed innovative tools with both an intellectual and practical focus. These practical collaborations are coordinated under the banner of the Platform. Two recent examples are a practical bottom-up approach to value a company's environmental impacts and a web-based selection guide to options for companies interested in context-based metrics. Both are vital for measuring and managing location-specific natural capital environmental impacts and these were published at the end of 2013.

EU Business and Biodiversity Campaign

The [European Business and Biodiversity Campaign](#) was initiated by a consortium of European NGOs and companies led and coordinated by the Global Nature Fund (GNF). Among other things the GNF is also working on natural capital accounting and ecosystem valuation. They did a study drawing practical lessons from existing applications in the corporate context.

EU Business and Biodiversity Platform (B@B)

[B@B](#), initiated by the European Commission, provides a network for European businesses to share experiences, best practices and conduct research biodiversity conservation. Phase 2 is just starting and will run for three years, implemented by ICF-GHK. It is open to all business sectors and comprises three work streams. One work stream, led by Sustain Value and supported by the ACCA, is focusing on natural capital accounting for business. It intends to categorise alternative options businesses have, develop a decision tree to help companies decide which approach is best for them, and identify best available guidance and tools for them to use.

KEY BUSINESS HUB

Global Partnership for Business and Biodiversity

The [Global Partnership for Business and Biodiversity](#) stems from the ongoing engagement of the Convention on Biological Diversity (CBD) with the business sector. The CBD Secretariat, along with various partners, has been endeavoring to 'encourage establishment of the national and regional business and biodiversity initiatives by facilitating a forum of dialogue among parties and other governments, business, and other stakeholders, with a particular focus on the global level'. The overall mandate of the national initiatives is to 'encourage dialogue amongst stakeholders and to help raise awareness of biodiversity and sustainability issues amongst the business community. They should also work to assist companies in understanding and mainstreaming the goals of the Convention and the Aichi Targets.'

IUCN Business and Biodiversity Programme

The [IUCN Business and Biodiversity Strategy](#) aims to encourage transformational and demonstrable change at the company and sectoral level in how biodiversity is valued as well as managed by businesses in order to conserve and restore biodiversity. Additionally, it ensures that IUCN is committed to working with companies that are willing to challenge their traditional business model, which focused on maximising profits without due consideration of the costs incurred by nature and society, and to move towards a model that reflects and accounts for detrimental impacts that operations have on nature and society. IUCN has worked with many large companies to manage their biodiversity impacts and has worked with a smaller number of companies to value their ecosystem impacts for improved decision making. IUCN's valuation work with Holcim and Rio Tinto, undertaken by the IUCN Economics Programme, has informed their decision making on ecosystem restoration and water management.

Leaders for Nature (LFN)

[LFN](#) are the IUCN NL business network of 20 multinationals and major Dutch enterprises working together on greening the economy. The network focuses on biodiversity and ecosystems as part of wider sustainability and business policies. It operates in the Netherlands and India. In July 2013, six LFN companies, the Dutch government, and NGOs, agreed to develop a joint vision and action plan on transparency on natural and social capital.

Natural Value Initiative (NVI)

Flora & Fauna International and Gaia Values lead the [Natural Value Initiative \(NVI\)](#). The NVI supports financial institutions to address ecosystem services in their operations. To date, the NVI has released a series of publications and tools that address biodiversity and ecosystem services within the extractive, fisheries, pharmaceutical, and agricultural sectors.

The Nature Conservancy (TNC) and The Dow Chemical Company

Launched in January 2011, [The Nature Conservancy \(TNC\) and The Dow Chemical Company](#) are collaborating on a five-year project to recognise, value and incorporate nature into global business goals, decisions and strategies. Scientists from both organisations are working together at three pilot sites (North America, Latin America, and Asia Pacific) to implement and refine models that support corporate decision making related to the value and resources nature provides. These sites serve as 'living laboratories'— places where methods and models can be validated and tested, so they can be used to inform more sustainable business decisions at Dow, and hopefully influence the decision making and business practices of other companies.

The Parceria Empresarial Pelos Serviços Ecosistêmicos (PESE) – the Brazilian Business and Ecosystem Services Partnership (BCSD)

[PESE](#) is a partnership among companies and environmental sustainability organisations to demonstrate the business benefits of ecosystem services in Brazil. It focuses on the profitable business opportunities that come from healthy ecosystems. Led by the World Resource Institute (WRI), BCSD, and Getulio Vargas Foundation with support from nited States Agency for International Development (USAID), this initiative encompasses implementation and new case studies, using the WRI Ecosystem Services Review capacity-building workshops. The initiative builds an established Brazilian corporate ecosystem services community of practice in Brazil. Case studies are available for Anglo American, Danone, Andre Maggi Group, Votorantim, and Walmart.

KEY BUSINESS HUB

Valuing Natural Capital Business Hub (the Hub)

The Hub is a dynamic online portal designed to help companies uncover opportunities to enhance their bottom lines by integrating nature's value into their strategy, operations, accounting and reporting. A truly open and collaborative space, the Hub helps companies and organisations learn from each other's work, forge meaningful connections and avoid duplication in their efforts to incorporate the value of nature's assets into their businesses. Corporate leaders, facility managers and others making capital, investment, sourcing and brand decisions will benefit from this new free resource, which currently features the work of more than 41 leading companies.

The Hub provides:

- A database of company case studies for benchmarking and learning.
- Tools to help make the internal business case for action.
- Implementation assistance in the form of goal-setting and action frameworks, tools, and data sources.
- Collaboration opportunities for businesses to join together on specific challenges, common commodity streams, supply chains or geographies, and projects.
- Networking with a growing online community of sustainability professionals focused on natural capital via the 2degrees Network

World Business Council for Sustainable Development (WBCSD) Corporate Ecosystems Programme

WBCSD is an association of about 200 companies which has been working on ecosystems for over 15 years. A key focus has been on developing a business toolkit that includes the [Corporate Ecosystem Services Review \(ESR\)](#) developed with WRI, the [Guide to Corporate Ecosystem Valuation](#) (including additional resources and case studies) developed with ERM, IUCN, PwC, WRI, and 14 road tester companies, [Eco4Biz](#), to help companies navigate through existing tools as well as a capacity-building programme called [Business Ecosystems Training](#). WBCSD has many related projects on forest solutions, food & biomaterials, and water, including the [Business Guide to Water Valuation](#) (including additional resources and case studies) and the [Global Water Tool](#). An increased focus of the organisation has been on reporting with [Reporting Matters](#). As of 2013, WBCSD was the first-ever global non-profit business organisation to be an official member of IUCN.

2.2 Valuation techniques

Economists have developed various techniques to understand what nature's benefits are worth to people. Valuation involves estimating the economic value of environmental benefits – typically in monetary (dollar) terms, but also in biophysical or social metrics. Valuation techniques assess the importance of ecosystem services compared to other things people need and care about. Estimating the value of ecosystem services requires understanding of both the biophysical processes that underpin provision and people's preferences for those benefits.

A variety of valuation techniques exist. Different techniques are applicable for certain contexts and objectives as illustrated below.

Figure 1: Techniques for measuring ecosystem service values

Family and methods	Description	Example output
Market valuation		
Market-based direct valuations based on market prices	<ul style="list-style-type: none"> • In a well-functioning market, the market price depicts the marginal benefit of a good/ service • Net benefit can be calculated by combining price with quantity and cost estimates • Market information may require additional analysis to deliver real values eg, correcting for taxes and subsidies 	Net Present Value of harvested timber (£/ha)

Family and methods	Description	Example output
Non-market valuation		
Cost based <ul style="list-style-type: none"> • Avoided damage costs • Replacement costs 	<ul style="list-style-type: none"> • Costs incurred in the absence of the service, measuring prices of equivalent non-ecosystem services 	Value of avoided water treatment costs (£)
Revealed preference <ul style="list-style-type: none"> • Hedonic pricing • Travel cost 	<ul style="list-style-type: none"> • Use observed behaviour to identify value in a surrogate market 	Time and travel costs incurred in recreation
Stated preference <ul style="list-style-type: none"> • Contingent valuation • Choice experiments 	<ul style="list-style-type: none"> • Methods based on surveys in which people give responses to hypothetical situations that demonstrate values 	Willingness to pay for conserving a specific species
Valuation without using primary data		
Value transfer <ul style="list-style-type: none"> • Point, function and meta-analysis transfer 	<ul style="list-style-type: none"> • Apply existing value estimates to new cases with similar characteristics 	

When goods are traded in a market, it is relatively simple to estimate their financial value: the price of the goods multiplied by the quantity of goods sold, corrected for market distortions such as taxes and subsidies. Some environmental benefits like timber, wild fish and meat are typically traded in markets, making it relatively straightforward to estimate their value.

Value is easier to measure with the existence of market prices but many benefits from nature are not traded in existing markets. To estimate the value of these benefits, economists use non-market valuation techniques, which can be categorised into revealed preference and stated preference approaches. Revealed preference techniques involve observing the actual behaviour of people in associated or surrogate markets, thereby revealing their preferences and values. For example, we can isolate the effects of beautiful scenery on house prices, using this as an estimate of the aesthetic value of that ecosystem.

Avoided damage cost methods assess the costs of damages that would be incurred without a specific ecosystem service and provide a direct measure of economic value. For example, the value of protection from coastal ecosystems can be based on estimates of damage to people and property likely to arise if they were lost or degraded, which may be estimated through a combination of both market prices and non-market valuation techniques.

Replacement cost methods examine the cost of replacing a specific ecosystem service, such as the cost of replacing mangroves and sea grass beds with sea-walls in order to maintain coastal protection. These cost-based methods are a proxy for value and only hold true under certain conditions.¹

These approaches can be useful in validating the scale of values obtained from direct measures of economic value. Stated preference approaches involve asking people to state their values for particular benefits from nature through a questionnaire or survey. Stated preference methods therefore rely on hypothetical rather than actual behaviour. Revealed preference techniques are generally considered more reliable and less controversial than stated preference approaches because they use actual market behaviour. However, revealed preference approaches often rely on intensive statistical modelling and require a market for an end product to which an ecosystem service contributes. When there are no linked markets, such as when estimating the value people place on a species from simply knowing that it exist, stated preference techniques are the only available option.

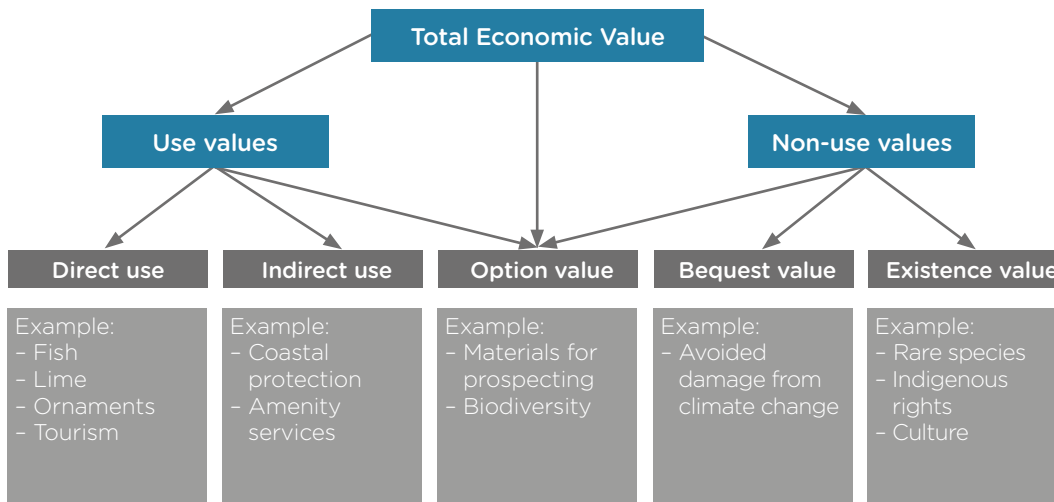
In some cases, none of these valuation techniques are feasible because the data is unavailable, the scale is very large, or estimates must be produced speedily. A common solution is to 'transfer' published estimates of value. For example, a study may transfer published per hectare values of wetlands to a different wetland where no valuation studies exist. This technique is known as 'benefits transfer' or 'value transfer'.

Although it is often the only available pragmatic option, it may not always be the ideal way to estimate environmental values because it is challenging to match or tailor the context of existing valuation studies to new locations with different environmental, social and economic conditions. Benefits transfer also needs a lot of data with the possibility to transfer or multiply errors if the data quality is poor.

However, best practice guidance is available on the appropriate use of value transfer depending on the decision context and providing a step-b-step guide (see UK Defra’s value transfer guidance).

The Total Economic Value (TEV) is one of the most commonly used conceptual frameworks for understanding all components of social well-being, and hence all constituents of value. The application of TEV to ecosystem services is illustrated below in Figure 2.

Figure 2: TEV Application for Ecosystem Services²



Source: Amended and based on Sarkis, S., van Beukering, P., McKenzie, E. (eds) (2010) *Total Economic Value of Bermuda's Coral Reefs: Valuation of Ecosystem Services*, Technical Report, Department of Conservation Services, Government of Bermuda.

The TEV framework details all aspects of anthropocentric value (value to people) that can be considered in terms of both use eg, ecosystem services used for production and non-use eg, ecosystem services that have a value to people without being used. Ecosystems and species within them may also be considered to have intrinsic value or rights, regardless of giving value or satisfaction to people. It should be noted that the examples given may have different types of values eg, genetic material has both option value and current direct use value, if used in the pharmaceutical industry.

The natural capital accounting and ecosystem service valuation methods and tools outlined in this mapping typically take an anthropocentric approach, which asserts that nature has value in so far as it gives utility or well-being to humans. Economists tend to support this view point which is inherent in tools such as cost-benefit analysis. Some methods and tools also take a 'biocentric approach' which asserts that nature's value consists in the ability to provide well-being or utility to humans and to other species. Some ecosystem service tools, such as InVEST, include models that value ecosystem services in terms of benefits to people, but also allow users to map and quantify impacts on biodiversity and risks to habitat, without valuing these characteristics in terms of how they affect humans. This allows comparison of trade-offs and synergies between values to people and intrinsic value or rights of ecosystems and species. Many complementary biodiversity assessment tools are described in Annex 1.

2.3 Methodologies and tools for business

Economists have been applying various valuation techniques for decades. Three recent innovations are relevant to businesses interested in applying these techniques.

- The development of valuation tools that draw on the techniques in 2.2 above and aim to make valuation easier, quicker, cheaper and more streamlined.
- The integration of valuation techniques into geographic information systems,³ which ensure analyses and results are spatially explicit ie, mapped.
- The application and tailoring of these tools and valuation techniques to business decisions.

Existing methodologies and tools for natural capital impacts, dependencies assessment and valuation are mainly framed in the context of biodiversity and ecosystem services, with the exception of some recent tools that incorporate wider environmental impacts eg, global warming potential, emissions to air, water and waste as well.

2.3.1 Assessing natural capital impacts and dependencies

Methodologies and tools for biodiversity and ecosystem services, measurement and management, target different levels of application including high-level hot spot analysis, landscape and watershed level, site and product level. Also, tools for specific types of ecosystems and sectors. There are a significant volume of tools already available and growing. Several publications have collated existing tools for measuring and managing ecosystem services and biodiversity to clarify what and how these can be used.^{4,5,6} The most recent of these is *Eco4Biz* (2013) from WBCSD. Furthermore, several voluntary standards which provide guidance on ecosystem services measurement and management are in place. Annex I draws and builds on these publications to provide an overview of key tools, guides and standards for business to understand and manage their impacts, dependencies on ecosystem services and biodiversity.

To identify the current valuation tools available that can form the building blocks for a harmonised protocol on natural capital valuation in business, the following criteria were used.

- Enable an assessment and in some cases, economic valuation of ecosystem services and/or biodiversity, in the context of business decision making.
- Have been trialed by business.

The guides, methodologies and tools below are key examples that meet these criteria and are applicable to all sectors with the exception of some eg, the Natural Value Initiative which is sector specific.

EXAMPLES – GUIDES, METHODOLOGIES AND TOOLS

ARIES

Developed by the Basque Centre for Climate Change, the University of Vermont, and Conservation International with the collaboration of Earth Economics and UNEP-WCMC, [Artificial Intelligence for Ecosystem Services \(ARIES\)](#) is an integrated ecosystem service modeling methodology and web-accessible platform. It allows users to model, map and quantify ecosystem service flow, and delivery between source and use locations. It focuses on service delivery in terms of identifying beneficiaries and their location, then models the transfer of benefits between ecosystem sources and user endpoints. By doing so, it can distinguish between possible and actual ecosystem service values. It can be used for baseline studies and assessments of different future scenarios, including the effects of climate and land cover change. It quantifies data-related uncertainties through Bayesian probabilistic modelling. User-provided data input is only required to achieve accuracy beyond what is possible using the data already available in the ARIES database, which includes publicly available global datasets as well as data provided by authorities for specific case studies. By using computer learning and reasoning, model structure may be automatically specialised for each application context, to provide the highest model detail possible without requiring costly expertise for model customisation. ARIES has primarily been used by academic, NGO and governmental actors to date. There have been corporate applications, mostly from the extractive sector, none of which are publicly available.

EXAMPLES - GUIDES, METHODOLOGIES AND TOOLS

Co\$ting Nature

Developed by [King's College London](#) (models), [AmbioTEK](#) (software), and [UNEP-WCMC](#) (applications), [Co\\$ting Nature](#) is a web-based tool for analysing ecosystem services, identifying beneficiaries of those services and assessing the impacts of human interventions such as land use change upon them. It calculates a baseline for current ecosystem service provision and allows a series of interventions or scenarios of change to be used to understand their impacts on ecosystem service delivery. The system processes and manages data, analyses and helps visualise the results of models. The software calculates the spatial distribution of ecosystem services for water, carbon, hazard mitigation and tourism services and combines these with maps of conservation priority, threatened biodiversity and endemism, to understand the spatial distribution of critical ecosystems. These data are combined with analysis of current human pressures and future threats on ecosystems and their services, to visually assess conservation priority and thus environmental risks of development. Add data are supplied globally and users can upload their own data. The tool has been used experimentally by a number of companies but no public summaries are available.

Ecologically Based Life Cycle Assessment

The Centre for Resilience, Ohio State University [Ecologically Based Life Cycle Assessment](#) is an online accounting system software that quantifies the direct and indirect role of various natural resources for supporting various economic activities. It complements other life cycle assessment (LCA) tools by taking into account a broad range of ecosystem services when seeking to understand the environmental impacts of products. Eco-LCA combines an economic input-output model of more than 400 sectors of the US economy with an ecological resource consumption model based on representing their flows in physical units of mass and energy. Eco-LCA quantifies how industrial activities use or affect ecosystem services in terms of mass, energy, and advanced thermodynamic concepts of available energy or energy. Eco-LCA is being extended to account for the role of biogeochemical cycles: integrating the carbon and nitrogen cycles into the 2002 input-output model of the US economy. New insights on carbon enable the model to be used to quantify the effect of economic activities on CO₂ emissions due to land use and land use change within the country, and the role of carbon sequestration. An inventory of the nitrogen profile of various sectors of the 2002 US economy can be used for LCA or hybrid LCA of various products. Eco-LCA can be adapted to other contexts, for example, it is being adapted to the Indian economy.

Green Infrastructure Valuation Toolkit (GIVT)

[Infrastructure valuation tools](#) was published by Natural England in September 2013.

This report was commissioned to draw together a number of the most widely used tools and assess them against research standards for natural science and economics. The aim is to help people, who want to value green infrastructure, choose the best tool for them choose the best tool for them.

Natural Capital Project - InVEST

Developed by partners in the Natural Capital Project - Stanford University, University of Minnesota, WWF, and The Nature Conservancy - [Integrated Valuation of Environmental Services and Trade-offs \(InVEST\)](#) is a free, open-access software tool for mapping, quantifying and valuing ecosystem services at the site or landscape scale. InVEST quantifies nature's benefits in both biophysical terms, such as water flows and economic terms, such as avoided cost or net present value. To obtain outputs in terms of economic value, InVEST uses various valuation techniques with limited data requirements, such as market prices and avoided damage costs. InVEST models are process based and therefore can capture change in ecosystem services value. These models produce maps and associated tables that depict the ecosystem service returns of alternative business decisions and help companies manage trade-offs in operations, investments and management. InVEST can be used for basic risk screening, or for scenario planning and sensitivity analysis. It has been used by a number of businesses, including Lafarge and Dow Chemical. Tier 1 InVEST models are designed to run on globally available data..

EXAMPLES – GUIDES, METHODOLOGIES AND TOOLS

Natural Value Initiative (NVI)

Flora & Fauna International and Gaia Values lead the [NVI](#). As part of NVI, for Fisheries, Sustainable Seafood Finance (SSF) has developed a tool for financial institutions to identify and improve the sustainability performance of mainstream seafood companies in their portfolio. The SSF tool uses well-established performance indicators based on internationally recognised standards for seafood companies to deliver measurable improvements 'in the water'. The SSF-team is Fauna & Flora International through the Natural Value Initiative along with North Sea Foundation, Synnervate, and Scomber.

PUMA and Kering Environmental Profit and Loss (E P&L)

The E P&L is a means of placing a monetary value on environmental impacts along the entire supply chain of a business. By valuing environmental impacts in monetary terms it provides an overarching metric to assess and compare risk and opportunity across operations, products and supply chains. [Puma](#) and its parent company Kering conceived and developed an E P&L with the support of Trucost and PwC, and published PUMA's 2010 E P&L results in 2011. Bottom up data sources are used to quantify environmental key performance indicators (eKPIs) across the supply chain, supplemented with top-down environmentally extended input out modelling data to simplify impact assessment. The eKPIs include: greenhouse gases (GHGs), water consumption, air pollution (sulphur dioxide, nitrogen oxides, particulates, carbon monoxide and ammonia), land use and waste generation. Kering evolved the methodology to include water pollution and is currently implementing E P&L analysis across its 22 luxury and sport and lifestyle brands and supporting E P&L adoption outside the Group.

PWC Total Impact Measurement and Management (TIMM)

PwC's TIMM framework helps business leaders and stakeholders understand how a business' activities contribute to the economy, public finances, the environment and wider society. By valuing social, environmental, tax and economic impacts, business is now able to compare the total impacts (both positive and negative) of their strategies and investment choices. It allows leaders to see at a glance not only the impact, but also the trade-offs between alternative strategies and to identify the optimal decision for stakeholders. TIMM assigns a monetary value, to both individual and aggregate business impacts, which means that like-for-like assessments and comparisons can be made for the first time across a comprehensive range of impacts, so providing more relevant information for decision making. The tool is supported by a flexible suite of data and valuation methodologies across the TIMM quadrants (economic, social, environmental and tax). Each corporate application is different, but as an example, measurement for the environmental quadrant commonly involves a hybrid method of Life Cycle Assessment – focusing on primary data collection wherever possible and combining this with Life Cycle Inventory data, multi-regional environmentally extended input output modelling, and material flow analysis to produce comprehensive but efficient results.

Simple Effective Resource for Valuing Ecosystem Services (SERVES)

A subscription-based tool for rapid, preliminary estimates of the value of an area's ecosystem services. SERVES uses benefits transfer to obtain an estimate for the value of ecosystem services through the analysis of valuation studies which have been previously carried out to value similar goods or services in similar geographies and contexts. SERVES is a component of the Earth Economics [Ecosystem Service Valuation Toolkit](#), developed by Earth Economics.

Systain

Systain's estell used by Otto GroupThe Otto Group has measured and valued the use of natural capital covering all major activities of the group. The scope includes downstream activities, environmental and social hot spots. The Otto Group uses estell, an extended multi-regional input output model covering 45 regions and 130 sectors, to gain transparency on the impacts caused by business activities. The model identifies resource consumption, environmental pollution and social hotspots caused by a company in its own operations and its respective supply chain. Estell aggregates and evaluates the environmental impacts to external costs and thus generates an Environmental Cost Statement. Systain's tool has been used by different corporates, including for the carbon and water footprint of Siemens' full supply chain and has been the fact base for the further development of Otto Group's sustainability strategy. First results have been displayed in the current Otto Group's sustainability report.

EXAMPLES – GUIDES, METHODOLOGIES AND TOOLS

Techno-Ecological Synergy (Eco-Synergy)

Ohio State University has developed an approach called Eco-Synergy that enables the assessment and design of sustainable products and processes by accounting for ecosystem services. Eco-Synergy is an assessment method and design philosophy, combined with a set of analytic tools, which helps companies to systematically assess their operations with respect to the capacity of ecosystems to provide needed services, and to identify beneficial synergies between technological and ecological systems. Current projects using Eco-Synergy include design of residential systems, biosolids management, and assessment of bio-based materials. ECO-LCA and Eco-Synergy are being integrated with models of ecosystem services such as InVEST for valuing the impact of land use and land cover changes on ecosystem services, and Century for quantifying the impact of agricultural practices on carbon and nitrogen cycles. This is one example of using a series of tools in combination to support a range of applications for natural capital.

Total Contribution

Developed by The Crown Estate with advice from nef consulting and its partners Route2 Sustainability and Landman Economics, Total Contribution is a way to measure the broader value that a company creates across economic, social and environmental indicators. As well as covering direct impacts Total Contribution goes further to account for the impacts of supply chains (indirect) and the enabled contribution of others on The Crown Estate land. Supported by recognised models and academic research the confidence in the calculations is clearly set out in the methodology and the results help to develop better decision making, highlighting unsustainable activity and identifying opportunity to collaborate on enhancing positive impacts. Total Contribution is a scalable tool and is now being used to incorporate the value of ecosystem services and natural capital accounting.

Trucost Natural Capital Analyzer

The Natural Capital Analyzer enables companies to assess the environmental impacts and natural capital costs associated with company operations and supply chains through a secure online data platform. Using the Natural Capital Analyzer, companies can screen high-impact operating sites and suppliers, assess financial risk and opportunity from regional natural capital cost scenarios, including carbon taxes, water availability and land use, and manage natural capital impacts through customisable dashboards and reports. Companies can apply Trucost's natural capital costs, or apply tailored economic or natural capital costs. The EKPIs include: greenhouse gases, water consumption, air pollution (sulphur dioxide, nitrogen oxides, particulates, carbon monoxide and ammonia), land use and waste generation.

WBCSD *Business Guide to Water Valuation*

The *Business Guide to Water Valuation* builds on the *Guide to Corporate Ecosystem Valuation* to provide more clarity on the terms and concepts related to the valuation of water and of all the water-related ecosystem services. It draws on business practice and incorporates 25 case studies.

WBCSD *Guide to Corporate Ecosystem Valuation (CEV)*

World Business Council for Sustainable Development (WBCSD) *Guide to Corporate Ecosystem Valuation (CEV)* provides a framework and resources for improving corporate decision making through valuation of ecosystem services. It was developed by WBCSD with ERM, IUCN, PwC, WRI and 14 road tester companies. The guide provides a screening process to help businesses decide whether valuation is likely to be useful. It also provides a step-by-step process to illustrate how to undertake valuation to inform various corporate decision contexts. The guide helps business users new to valuation understand concepts, engage in the valuation process and evaluate and interpret results. Users would still require experts to conduct the valuation study. CEV also aims to help readers navigate jargon around environmental valuation and is supported by other resources including, the BET training. The 14 road tester businesses are from a range of sectors: and include Holcim (cement and aggregates) and AkzoNobel - Eka Chemicals (chemicals for the pulp and paper industry).

EXAMPLES – GUIDES, METHODOLOGIES AND TOOLS

WRI WBCSD Corporate Ecosystem Services Review (ESR)

The World Resource Institute (WRI) in collaboration with WBCSD and the Meridian Institute, developed the *Corporate Ecosystem Services Review* (ESR) to help business managers develop strategies to address the risks and opportunities arising from a company's impact and dependence on ecosystem services. The handbook presents a methodology and structured questions to identify priority ecosystem services, possible risks, opportunities, and to prioritise a set of strategies. It is supported by a Dependence & Impact Assessment Tool spreadsheet and training materials. It also includes a set of case studies from corporate road testers, including Mondi and Rio Tinto. The ESR provides a framework for initial assessment of risk and opportunities, which is a very useful precursor to identify priorities for conducting a valuation. However, it does not include valuation and can be used in conjunction with the WBCSD CEV.

New initiatives in development focusing on natural capital valuation methodology and tools development for business use include the following:

EXAMPLES – INITIATIVES DEVELOPING METHODOLOGIES AND TOOLS

B Team

The *B Team*, launched in October 2013, is a group of global business leaders convened and co-chaired by Sir Richard Branson and Jochen Zeitz. The B Team aims to create a future where the purpose of business is to be a driving force for social, environmental, and economic benefit. The B Team will undertake strategic interventions to catalyse and accelerate better ways of doing business in support of this vision. The E P&L Consortium is one such intervention the B Team has proposed to scale up the efforts of business to: better understand the costs to society of the environmental impacts of their activities, establish a level playing field for transparent reporting, and help drive innovation to reduce these impacts to operate within planetary boundaries.

Climate Earth Natural Capital Management System (NCMS)

NCMS is a cloud-based software system that allows a company to gain insight and actively manage the risks and opportunities associated with natural capital consumption. Browser based reporting and analysis aligns with organisational structure. NCMS uses a 'big data' approach to model impacts across value chains and apply valuations. The NCMS has been piloted by Webcor Builders, a California-based general contractor.

Environmental Risk, Opportunity and Valuation Assessment (EROVA) Tool

EROVA is a flexible framework-based tool that helps companies evaluate their impacts, dependencies, risks, and opportunities associated with natural capital eg, biodiversity and minerals and other environmental parameters such as GHG emissions, noise and dust. The approach allows qualitative, quantitative, and monetary valuation of landholdings and project impacts, as well as assessing the distribution of values and impacts among stakeholders. The methodology draws upon WRI's ESR, WBCSD's Guide to CEV and IFC's Performance Standard 6, among other initiatives. The tool was developed by Sustain Value in conjunction with Antofagasta Minerals S.A. It has been successfully piloted on and applied to several mining related projects. The EROVA Natural Capital Group has been established to encourage other companies to help further develop the approach and broaden its application.

Externality Valuation Assessment Tool (E.Valu.A.Te)

Developed by the CPSL Natural Capital Leaders Platform, it represents a suite of resources that brings together comprehensive guidance for environmental externality assessment, stimulated directly by business needs. This has resulted in an online tool that guides users through the evaluation process for environmental externalities. E.Valu.A.Te provides more evidential support around the process of valuation using a stepwise, bottom-up approach. The work, driven by business, aims to generate the critical mass required to address the unintended impacts of business upon natural capital. There is a full SABMiller case study that punctuates the tool as well as the practical guide that supports it.

EXAMPLES - INITIATIVES DEVELOPING METHODOLOGIES AND TOOLS

Natural Capital Declaration (NCD)

The UNEP Finance Initiative (UNEP FI), The Global Canopy Programme (GCP) and Latin American business school Fundacao Gerulio Vargas (FGV), hosted [Natural Capital Declaration](#) is commencing development of methodologies for incorporating natural capital in investor applications. Over 40 financial institutions are working with the NCD.

True Price

During 2014–2015, [True Price](#) is developing and testing a protocol to calculate true prices, profits and returns for business. True Price is the quoted price plus the net social and environmental costs throughout the supply chain. Similarly, True Profits and True Returns take social and environmental costs into account.

University of Oxford's Smith School Stranded Assets Programme

University of Oxford's Smith School is developing a methodology for incorporating valuation in balance sheets. In particular their focus is on 'stranded assets', where environmentally unsustainable assets suffer from unanticipated or premature write-offs, downward revaluations, or are converted to liabilities.

Combining methodologies and tools

In many instances, using combinations of methodologies and tools may be most useful in addressing specific decisions facing business and investors. It is also useful in validating, comparing and evaluating the complementarity of different approaches. One example is in the Daule Basin of Ecuador where the hydrological ecosystem services tool WaterWorld was applied with the Resource Investment Optimisation System (RIOS) tool, (see Annex 1 for more details). The tools were used in combination to define the ecosystem service impacts of potential investments in land use, and land and water management made by the proposed Daule Water Fund.

Stakeholders needed to define the business case for their investments and optimise land use and land management investments in the catchment area, to reduce the impacts of continued agricultural expansion on water quality, soil erosion, and sedimentation. This could be done through investment in sufficient, spatially targeted, appropriate and effective management options.

WaterWorld was used to address questions of where in the catchment particular interventions might yield the most positive impact, and the catchment-level impact of making investments in these areas. RIOS was used to assess which of these spatial interventions could be invested in given the available resources from the water fund. Coupling the tools proved complementary.⁷

In further work to support Water Funds, [InVEST](#), Soil and Water Assessment Tool (SWAT), and Fog Interception for the Enhancement of Stream flow in Tropical Areas (FIESTA) models were run using data from the watershed in the East Cauca Valley in Colombia to determine critical areas in the watershed for immediate water fund investments. Comparison of model results is helping to inform the use of ecosystem service models and tools for water fund projects throughout the region.⁸

2.4 Data and databases

To simplify business use of valuation, software tools and databases are required to enable primary valuations and benefits, or value transfer for sector, or product specific impacts in different geographies. A number of early stage databases can be built on but significant further data collection and database development is needed. Further the quality, currency and easy availability of the data is inconsistent and limited at present. Existing databases and data sources relevant to natural capital include:

- benefits transfer databases (ie, values from existing studies); and
- global databases used to inform ecosystem service tools.

A few databases are readily available in an open access format and others are commercial proprietary databases. Some examples are included in the table below.

In addition to existing databases, some initiatives are facilitating data access opportunities for natural capital assessments, such as the Group on Earth Observations (GEO) System of Systems and Biodiversity Observation Network ([GEOSS](#) & [Geo BON](#)) and the NASA and European Environment Agency supported Eye on Earth.

KEY EXAMPLES – DATA & DATABASES

BENEFITS TRANSFER DATABASES

Earth Economics: Ecosystem Valuation Toolkit (EVT)

[EVT](#) houses the world's largest bibliographic database of ecosystem service papers, including more than 44,000 paper abstracts on marine and terrestrial ecosystem services.

Ecosystem Service Valuation Database (ESVD)

[ESVD](#), initially developed for the TEEB initiative,⁹ contains more than 1,350 data points from more than 300 case studies on both marine and terrestrial ecosystem services.

ENVALUE Database

The [ENVALUE](#) environmental valuation database, developed by the New South Wales Environmental Protection Agency and first released in 1995, is a systematic collection of environmental valuation studies presented in an on-line database.

Examples of global databases with environmental, social, and economic information relevant to natural capital assessments are outlined below.

GLOBAL DATABASES

Environmental Valuation Reference Inventory (EVRI)

EVRI is a searchable storehouse of more than 2,000 empirical studies on the economic value of environmental benefits and human health effects. It has been developed as a tool to help policy analysts use the benefits transfer approach.

Eye on Earth

Eye on Earth is a 'global public information network' for creating and sharing environmentally relevant data and information online through interactive map-based visualisations. Eye on Earth enables users to explore interactive maps made by others and discover new ways of seeing the environment, contribute environmental observations, or data to expand the knowledge base, and create custom maps and share them within closed groups, or publically.

FAO databases

The Food and Agricultural Organisation (FAO) hosts a series of databases relevant to natural capital assessment eg, [FAO Aquastat Database](#) (2012) providing time series on water data and the [Global Agro-Ecological Zones data](#) portal 3.0 (2012) on sustainable management of natural resources for food and agriculture in support of policy decisions at all scales.

Global Ecosystems Model (GEM) and Madingley Model

Microsoft produced the first prototype of a [Global Ecosystems Model](#) (GEM) called its [Madingley Model](#). This is designed to assist decision makers to understand the various pressures ecosystems are subject to, devise metrics to measure the impacts of these pressures and develop strategies to mitigate these impacts.

Group on Earth Observations (GEO) – System of Systems and Biodiversity Observation Network (GEOSS & GEO BON)

Sophisticated monitoring systems, which consist of satellite, air, land and ocean-based instruments are being interlinked through the Group on Earth Observations (GEO) to form a Global Earth Observation System of Systems (GEOSS). The biodiversity arm of this expanding system of systems, called the Biodiversity Observation Network or GEO BON, brings together diverse, stand-alone observation instruments and systems tracking trends in the world's genetic resources, species and ecosystems. GEO BON is creating a global platform for integrating biodiversity data with data on climate and other key variables. Among others, links are provided to the Global Biodiversity to the Global Biodiversity Information Facility (GBIF) which provides free and open access to data records gathered from hundreds of data providers around the world, as well as the World Data Base on Protected Areas (WDPA), which contains information from governments and organisations intended for ecological gap analysis, environmental impact analysis and private sector decision making.

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Integrate Biodiversity Assessment Tool (IBAT)

[IBAT for business](#) is an innovative tool designed to facilitate access to accurate and up-to-date biodiversity information to support critical business decisions. The tool is the result of a ground-breaking conservation partnership among BirdLife International, Conservation International, International Union for Conservation of Nature and UNEP World Conservation Monitoring Centre.

IUCN Knowledge Products

IUCN's best-known [knowledge products](#), are the IUCN Red List of Threatened Species™ and Protected Planet (including the World Database on Protected Areas), as well as emerging ones such as the IUCN Standard for identification of areas of global significance for biodiversity ('key biodiversity areas'), and the IUCN Red List of Ecosystems.

Natural Capital from Space

(SMART) (Reporting Toolkit and Spatial Monitoring)

The Natural Capital from Space and the SMART consortium are two initiatives providing a range of natural resource data using remote sensing and satellite technology suitable for business use. These are coordinated by [Zoological Society of London \(ZSL\)](#), indicators and monitoring programme. Current applications of SMART include Roundtable on Sustainable Palm Oil (RSPO) endorsed monitoring of High Conservation Value within oil palm concession sites for business and investor use.

Proteus Partnership

Hosted by the UNEP World Conservation Monitoring Centre the [Proteus Partnership](#) is a collaboration with 15 companies in the oil, gas and extractives sectors on making data and information on biodiversity available for businesses to improve their environmental practices. Focus areas to date include providing integrated access to spatial data on threatened species and other important biodiversity; and increased access to quality data on coastal and marine ecosystems. Partners include Anglo American, BHP Billiton, BP, Chevron, ConocoPhillips, ExxonMobil, Rio Tinto, Shell, and Total.

UNEP World Conservation Monitoring Center (WCMC)

WCMC provides a range of databases relevant to the status of biodiversity and ecosystem services that are relevant to business and policy applications. The WCMC Business, Biodiversity and Ecosystem Services (BBES) programme was created in 2009 to provide data, tools and guidance to a range of business sectors. The programme is a core centre for ecosystem services and biodiversity measurement in business and ongoing indicators development work. Examples are Protected Areas Programme manages the [World Database on Protected Areas, species database and datasets, tools and report on key conservation areas including mangroves, wetlands, tropical forests and coral reefs](#).



3. EXISTING INITIATIVES APPLICATIONS FOR VALUING NATURAL CAPITAL IN BUSINESS

This section provides an overview of existing initiatives in areas of application for natural capital valuation in business to include:

- Strategy
- Management
- Reporting and disclosure

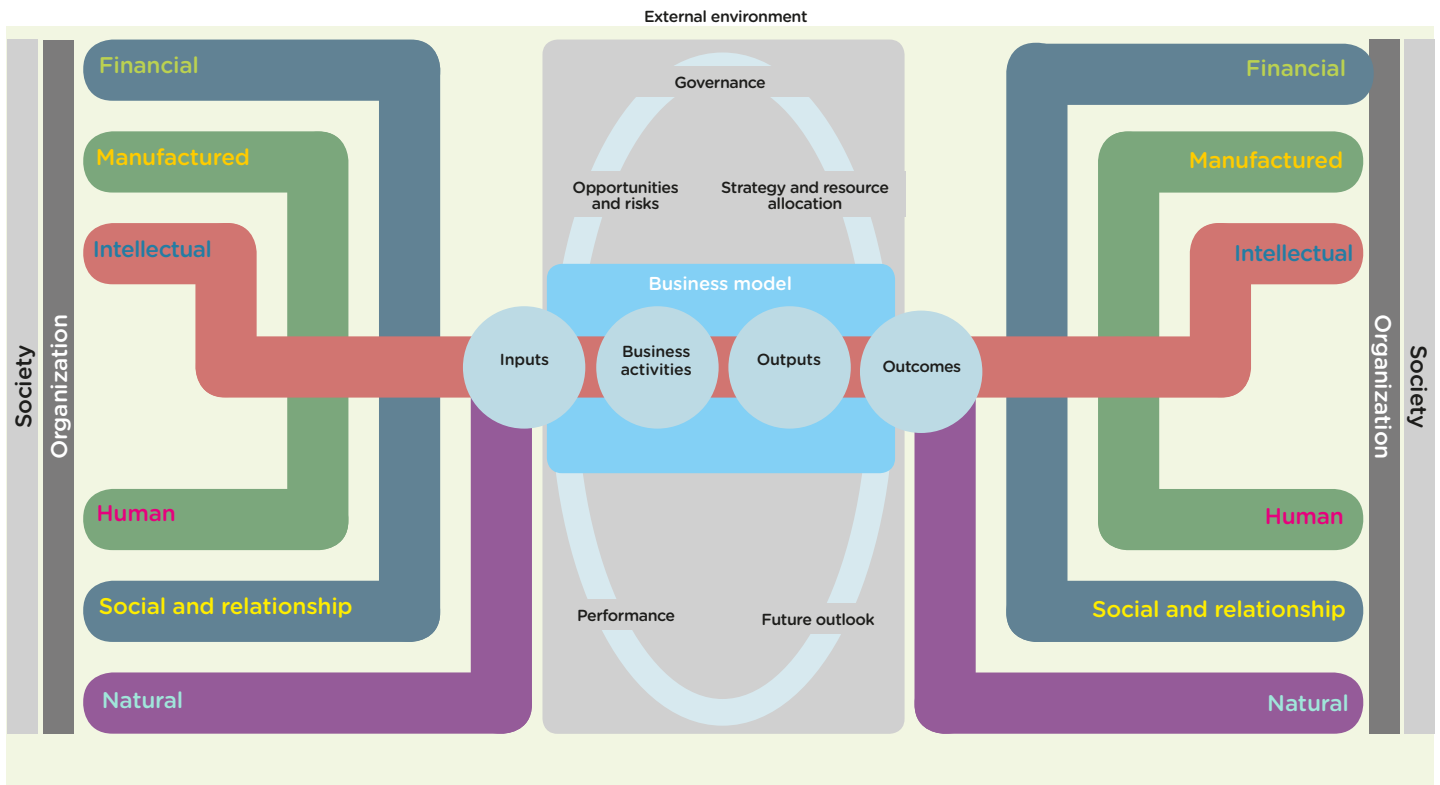
3.1 Strategy

Valuing natural capital is particularly suited to informing strategic decision making and planning. Existing applications integrating natural capital include holistic business model frameworks eg, Integrated Thinking and Reporting <IR> as well as related sustainable value and long-term value creation concepts. In terms of IR guidance, natural capital should be integrated in the business model with the other five forms of capital:

- manufactured eg, buildings equipment;
- financial eg, financing and funds available;
- intellectual eg, knowledge-based tangibles like intellectual property and copyright;
- human eg, people’s competencies and experience;
- social eg, key relationships, shared norms and values.¹⁰

In IR, the business model is ‘the chosen system of inputs, business activities, outputs and outcomes that aims to create value over the short, medium and long term.’¹¹ The capitals are inputs into the business which are converted to outputs (products, services, by-products, and waste). The business activities and outputs have an impact on the capitals, the organisations and wider stakeholders. <IR> guidance is for the strong links between the capitals and the tradeoffs to be accounted for. Figure 2 illustrates this business model and how the capitals are highly interconnected.

Figure 2: Position of business model relative to other system elements



Source: International Integrated Reporting Council. Used with permission.

3.2 Management

Many initiatives are well established for measurement and management of the environmental and social impacts of business. These include Environmental Management Systems, Environmental and Social Impact Assessment (ESIA), Risk Management, Green Supply Chain Management, Green Procurement. They focus on business activities at an organisation eg, factory or supply chain level. Many sector specific initiatives, tools and databases are also available to support these activities with good uptake.

For a comprehensive understanding of supply chain, environmental impacts business increasingly measures its impact on the environment using approaches such as Life Cycle Assessment (LCA) (full or simplified credible approaches covering all environmental impacts) and footprinting such as for carbon and water. A range of internationally recognised standards supported by guides and tools are available as outlined below.

Figure 3: Standards and guides: measuring environmental impacts in business

ISO 14040/44 Life Cycle Assessment (all environmental impacts).
ISO 14067 Carbon Footprint (GHG emissions only).
ISO 14064 Water Footprint (draft water).
EU Product Environmental Footprint (PEF) Guide (all environmental impacts).
EU Organisational Environmental Footprint (OEF) Guide (all environmental impacts of an organisation).
WRI/WBCSD GHG product supply chain standard (GHG emissions).
French Grenelle II BPX 30-323 measurement and labelling (all environmental impacts).

These standards and guides provide the methodology for a business to measure the environmental impacts across its value chain (cradle to gate) or full supply chain (cradle to grave ie, including use and end of life). The toolkit to assess social impacts across supply chains including codes of practice, standards, guidance and tools eg, ethical trading initiative, Sedex and sector-specific initiatives, are also well developed.

Several international initiatives focus on simplified measurement and management approaches based on LCA to develop sector and product-specific guidance, tools and databases. Availability of tools and uptake in sectors eg, agriculture/food/beverage, construction, chemical, transport and some consumer goods is increasing. Examples are below:

- **The Sustainability Consortium** Sustainability Management & Reporting Standards – covering all material environmental impacts across product supply chains for consumer goods sectors. Ecosystem Services are included in their eKPIs and Category Sustainability profiles. The Consortium has over 100 businesses engaged whose combined revenues total over \$1.5tn with research and NGO partners.
- **The Sustainable Apparel Coalition** – over 100 leading apparel and footwear brands, retailers, suppliers, non-profits, and NGOs developing metrics and tools eg, the Higg Index to measure the environmental and social impacts of apparel and footwear products.

The environmental impacts categories defined in international LCA and footprinting standards are designed to be consistent to ensure meaningful measurement. These are below and are based on specific methodologies (in brackets).

Figure 4: Environmental Impact Categories used in LCA and Footprinting standards

Global Warming Potential (GWP) (IPCC 2007).
Water eutrophication (ReCIPE 2008/CML 2002).
Marine eutrophication (ReCIPE 2008).
Acidification (ReCIPE 2008).
Operational and embodied water use (water footprint).
Product waste (solid and liquid).
Non-renewable resources depletion (EDIP 97(2004).
Aquatic toxicity (Usetox).
Land Use and Land Use Change (IPCC EFDB).

Biodiversity and ecosystem services are not directly covered in LCA and footprinting impact indicators specifically, but there is some cross over. For example, initiatives such as The Sustainability Consortium, Trucost's modelling and Eco LCA aim to combine LCA indicators with ecosystem services in their eKPIs and metrics. Some initiatives eg, UNEP/SETAC Life

Cycle Initiative,^{12,13} and the EU Business and Biodiversity Campaign¹⁴ are developing impacting indicators so that some ecosystem service considerations can be incorporated in LCA in future. At UNEP/SETAC an international panel of LCA experts completed the Land Use Life Cycle Impact Assessment (LULCIA) project in 2013.¹⁵ This establishes preliminary methods for incorporating land use impacts on biodiversity and ecosystem services, two recognised indicators of ecosystem quality into LCA. Further, impact indicators have been proposed for the three ecosystem services identified by the Millennium Ecosystem Assessment as most impacted by anthropogenic interventions – Erosion Regulation Potential (ERP), Freshwater Regulation Potential (FWRP), and Water Purification Potential (WPP).¹⁶ For each category, an impact indicator is suggested: erosion resistance for ERP, groundwater recharge for FWRP, and physiochemical filtration and mechanical filtration for WPP. These impact categories and indicators are in Figure 5¹⁷ below. Others suitable for future indicators include carbon sequestration and nutrient retention.

Figure 5: Trial LCA Impact Indicators for the Ecosystem Services Erosion Regulation Potential, Freshwater Regulation Potential and Water Purification Potential

Impact category	Erosion Regulation Potential (ERP)	Freshwater Regulation Potential (FWRP)	Water Purification Potential (WPP)	
	Ecosystem's ability to resist erosion	Shows the soil's capacity to regulate peak water flows	Soil's ability to absorb dissolved soil particles (physiochemical) and clean the water entering the groundwater supply (mechanical)	
Indicator	Erosion resistance	Groundwater recharge	Physiochemical filtration	Mechanical filtration
	Measured in (tons of soil eroded)/(ha*yr)	Millimeters of water recharged into the water table per year	Centimoles of cation fixed/kg soil	Rate of H ₂ O passing through soil (cm/day)

Source: Saad, R. et al (2013), 'Land use impacts on freshwater regulation, erosion regulation and water purification: a spatial approach for a global scale', *The International Journal of Life Cycle Assessment*.

3.2.1 Environmental and social risk management

Existing assessment tools such as ESIA are already well established with well developed guidance. Looking at the investor, the IFC Performance Standards 6 provides a leadership example of a risk management framework that already incorporates ecosystem services and biodiversity. A summary is below.

IFC Performance Standards IFC's Performance Standards for Environmental and Social Sustainability have become globally recognised as a benchmark for environmental and social risk management in the private sector. IFC Performance Standards define IFC clients' responsibilities for managing their environmental and social risks and impacts. Additionally, through the Equator Principles, 78 commercial financial institutions globally use IFC's standards, and IFIs, European development finance institutions, and OECD export credit agencies refer to them. In particular, IFC Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources applies to IFC-financed projects where biodiversity-related issues are present. In these cases, IFC will require the client to perform relevant risk assessment and implement mitigation measures in accordance with a mitigation hierarchy (avoid, minimise, restore).

3.3 Reporting and disclosure

3.3.1 Corporate and sustainability reporting

There are several voluntary initiatives for sustainability reporting with good uptake from business and this area is growing. Holistic reporting schemes, for example, integrated reporting and sustainability specific, such as Global Reporting Initiative (GRI), provide the frameworks defining the sustainability criteria to include in corporate reporting and disclosure. GRI cross-sectoral guidance is widely used guidance for corporate reporting, with over 3500 companies now producing GRI-guided sustainability reports. Some sector-specific guidance for the mining, oil and gas, food and drink, as well as cement industries also include some biodiversity and ecosystem services-related indicators. Examples of key initiatives that incorporate Biodiversity and Ecosystem Services and sustainability reporting to varying degrees are below.

EXAMPLES – CORPORATE & SUSTAINABILITY REPORTING

Global Reporting Initiative (GRI)

GRI is widely used guidance for sustainability corporate reporting. The fourth generation of GRI standards, the [G4](#), launched in May 2013 and requires companies to perform and report a materiality assessment. If this identifies 'aspects' relating to natural capital, the company must disclose the management approach being used for that aspect. The GRI also identifies eKPIs to provide specific performance data. The G4 guidelines have four specific biodiversity indicators (EN11-14), including operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas. In addition to its reporting framework, the GRI has produced specific guidance detailing approaches for reporting on ecosystem services. GRI also has a tool under development called, 'Approach for reporting on ecosystem services.' This is a list of questions and parameters to report on for corporate decision makers and reporting staff to use.

IFAC ISAE 3000

Internal and third-party assurance adds value by providing credibility to disclosures. Assurance can apply to an organisation's published reports and to its underlying systems and processes, as well as its products, services, and governance. The audit and assurance of sustainability related disclosures has been maturing, particularly aided by the International Standard on Assurance Engagements ([ISAE 3000](#), [Assurance Engagements Other than Audits or Reviews of Historical Financial Information](#), issued by the International Auditing and Assurance Standards Board (IAASB)). This is the predominant international standard used by accounting firms undertaking corporate responsibility assurance.

Integrated Reporting <IR>

Developed by the International Integrated Reporting Council (IIRC), [<IR>](#) provides a framework for a strategic evaluation and reporting of material sustainability risks and opportunities and their pertinence to a company's business planning and financial results.

Report or Explain Campaign Forum

The [Report or Explain Campaign Forum](#), originally lead by Aviva Investors and now hosted by GRI, is a coalition of institutional investors, NGOs, church groups and UN agencies. It aims to make public and large global private corporations integrate material environmental, social and governance issues in their annual report and accounts, on a report or explain basis.

UNEP World Conservation Monitoring Centre (WCMC) – An Approach for Reporting on Ecosystem Services

To inform the GRI G4, [UNEP-WCMC](#) in conjunction with the GRI and CREM published the guide which proposes indicators that organisations could use to assess and report their impacts on biodiversity and ecosystem services. Some examples of the reporting indicators for ecosystem services include:

- nature and the amount of natural resources harvested, produced, traded, or consumed, such as crops, fish, timber and fibres by a corporation in relation to the safe ecological limits;
- the volume of water consumed by corporations and its relation to total water availability in areas of operation, including identification of water sources;
- economic cost to a corporation due to climate-related disasters, such as flooding, and crop failure;
- the volume of inputs from sources complying with credible and internationally recognised responsible production standards, including through labelling; and
- AA1000.

AccountAbility's AA1000 series are principles-based standards addressing accountability in governance, business models and organisational strategy, as well as providing operational guidance on sustainability assurance and stakeholder engagement. They support IR and assurance.

3.3.2 Financial accounts, reporting and investors

The incorporation of natural capital into non-statutory accounts eg, 'shadow' balance sheet and profit and loss is growing in interest. However, there is limited guidance for doing this in the key standards and guidelines that determine what is included in accounts and financial reports. Financial reporting is determined by the two main accounting systems, US Generally Accepted Accounting Principles (US GAAP), set by the FASB, and International Financial Reporting Standards (IFRS). US GAAP is used principally in the United States, although the Security and Exchange Commission is looking to switch to IFRS by 2015 (the system used in the European Union and many other countries).

While risk assessment and disclosure is incorporated in these systems, natural capital specifically is not incorporated but could be in future to integrate this thinking at source. Studies have considered the status of inclusion of sustainability criteria and specifically biodiversity and ecosystem services in financial reporting and disclosure standards and found that in practice significant risks and opportunities are unquantified. As they currently cannot be easily valued they are excluded from financial accounts with limited disclosure to date.^{18,19,20}

A lack of awareness of the business materiality of natural capital and accounting frameworks to incorporate it were identified as key causes. The application of IFRS such as those on business combinations and International Accounting Standards (IAS), the pre-2001 equivalent of IFRS (such as those on impairment of fixed), agricultural or intangible assets, can be influenced by natural capital loss in some sectors. Hence, integrating these factors into such standards would facilitate uptake in mainstream financial reporting.

Business stakeholders, and in particular investors, largely judge corporate performance on the basis of measures of financial materiality. Unless natural capital represents a direct cost of doing business, it is often not included in materiality calculations. Particularly this is the case for biodiversity and ecosystem services due to their low values or, values that are not reflected in markets. The ACCA series *Is natural capital a material issue?* and the SASB *Sustainability Accounting Standards and Sector Materiality Maps* are examples of initiatives aiming to rationalise the materiality of natural capital to business, finance and accounting communities. Beyond the existing Socially Responsible Investment initiatives, there has been growth in natural capital initiatives targeting the investor community. These include commitments such as the Natural Capital Declaration, requirements from IFC and Equator banks regarding ecosystems impacts disclosure, and publications to establish the materiality of incorporating natural capital in investor assessments, to better understand risks and opportunities across client portfolios.

In the accounting profession, Environmental Management Accounting,²¹ Environmental Cost Accounting and Life Cycle Costing are existing techniques to assess the financial costs of environmental impacts to inform business decision making. They incorporate monetary information on environment-related costs, earnings, and savings. Traditionally, these techniques incorporate direct costs already established in the market as distinct from externalities. More recently Life Cycle Costing guidance provides an approach for determining direct and indirect costs of environmental and social impacts to a business. Current guides²² provide a model for calculating costs incurred by producers, ownership costs of consumers, and the real costs imposed on other affected stakeholders. This incorporates externalities from environmental impacts, as defined in Life Cycle Assessment and some social impacts. Biodiversity and Ecosystem Services are not explicitly included.

Examples of key initiatives, guides, and tools relevant to the financial accounting, reporting and investor communities are outlined below.

EXAMPLES – FINANCIAL ACCOUNTING, REPORTING AND INVESTMENT

Association of Chartered Certified Accountants (ACCA) publications

ACCA have produced a series of natural capital publications for the business and investor audience. ACCA, and Flora and Fauna International produced *Is natural capital a material issue?* This provides an evaluation of the relevance of biodiversity and ecosystem services to accountancy professionals and the private sector. ACCA have recently published a follow up *Improving natural capital reporting and finding the tools to help* which highlights key natural capital reporting initiatives.

Climate Disclosure Standards Board (CDSB)

CDSB is an international organisation committed to the integration of climate change-related information into mainstream corporate reporting. Consideration of expanding this to a wider natural capital framing is underway. CDSB's *Climate Change Reporting Framework* is a voluntary reporting framework designed to elicit climate change-related information in mainstream financial reports, which is of value to investors.

CDP

CDP provides a global system for companies and cities to measure and disclose on climate (GHG emissions), water and forests in line with international best practice measurement standards. CDP now holds the largest collection globally of primary climate change, water and forest-risk information which can be accessed for strategic business, investment and policy decisions.

Cross Sector Biodiversity Initiative

The International Council on Metals and Mining (ICMM), the global Oil and Gas industry association for Environmental and Social Issues (IPIECA) and the Equator Principles Association launched the Cross-Sector Biodiversity Initiative (CSBI) in Washington, D.C. in February 2013. The Initiative aims to develop and share good practices and practical tools to apply the IFC Performance Standard 6 on biodiversity conservation.

Equator principles

The *Equator principles*²³ factor ecosystem services impacts and dependencies into their credit risk management framework for determining, assessing and managing environmental, and social risk in project finance transaction as well as project related corporate loans. Over 70 financial institutions are participants. Work groups focus specifically on developments relating to biodiversity, climate change and social risk. The *Biodiversity for Banks (B4B) programme*, co-launched by the Equator Principles Association, World Wildlife Fund (WWF) and the *Business and Biodiversity Offsets Programme (BBOP)*, is designed to help financial institutions overcome the challenges of incorporating risks associated with biodiversity and ecosystem services into their lending decisions.

Global Initiative For Sustainability Ratings (GISR)

Ceres, the investor-environmentalist coalition, in partnership with the Tellus Institute has launched the *Global Initiative for Sustainability Ratings (GISR)*. GISR's mission is to create a world-class corporate sustainability ratings standard by 2015, aimed at transforming the definition of value and value creation by business. The standard and accompanying accreditation process will be applicable to all current and future raters, company and credit, integrated and issue-specific. GISR will be a standard-setter. It will not directly rate companies, instead, accreditation will serve as a benchmark of excellence for ratings organisations. The GISR Standard will comprise three components: principles, issues and indicators. Version 1.0 of Component 1: principles will be released in late 2013, followed by issues and indicators to form a complete Version 1.0 by late 2015. Contact Emily Kilroy, emily.kilroy@ratesustainability.org.

EXAMPLES – FINANCIAL ACCOUNTING, REPORTING AND INVESTMENT

IFAC Sustainable Value Investor Guidelines

For professional accountants working in business, IFAC's sustainable value guidelines focus on project and investment appraisal to support decision making on value creation. For project and investment appraisals and capital budgeting, which involve assessing the financial feasibility of a project, the guidelines advocate the use of Discounted Cash Flow (DCF) analysis as a supporting technique to (a) compare costs and benefits in different time periods and (b) calculate net present value (NPV). NPV utilises DCF to frame decisions, to focus on those that create the most value.

Intrinsic Value Exchange (IVE)

IVE is an online natural asset stock exchange designed to value and price natural and societal assets, such as assets like clean air and water, ecosystems, wildlife, human health and potential. IVE's mission is to transform intrinsic value into financial capital so societal and environmental values can be directly incorporated into economic decision making. IVE aggregates data on natural and societal assets and translates this data into market price. With a market price, the real-time value of un-priced assets and services is determined and can create a relative value map for accurately pricing negative externalities.

Natural Capital Declaration (NCD)

The [Natural Capital Declaration](#) (NCD) is a global finance-led and CEO-endorsed initiative to integrate natural capital considerations into financial products and services, and to work towards their inclusion in financial accounting, disclosure and reporting. The NCD is the cumulative result of in-depth consultations with the finance community and other stakeholders, and is signed by the CEOs of financial institutions. In Phase II of the initiative, signatory financial institutions are setting about implementing the commitments in the Declaration through the NCD Roadmap. This is to be done through a Steering Committee of signatories and supporters and four working groups, supported by a secretariat formed of the UNEP Finance Initiative and the Global Canopy Programme (GCP).

Natural Value Initiative Ecosystem Services Benchmark

[Ecosystem Services Benchmark](#) is an investor-focused toolkit in the Natural Value Initiative. The published version of which focuses on the food and beverage sector, but has also been applied to extractive and pharmaceutical sectors. The target audience are financial asset managers and insurers. The ideal application is assessing companies with an investment portfolio.

Sustainability Accounting Standards Board (SASB) Materiality Maps

SASB produces sustainability accounting standards for use by publicly-listed corporations in disclosing material sustainability issues for the benefit of investors and the public. SASB's Materiality Map™ presents the relative priority of sustainability issues on an industry-by-industry basis, allowing users to compare and contrast the materiality of 40 plus issues across industries and sectors.

Trucost EBoard

EBoard enables investors to compile the environmental impacts and costs of over 4,500 of the world's largest companies (representing 93% of global markets by market capitalisation) all the way along the supply chain to raw materials extraction. Investors can assess the implications of stock selection and sector allocations by comparing portfolio performance to underlying benchmarks with up to 10 years' time series environmental impact data. EBoard analytical tools support fundamental analysis, best in class analysis, investment screening, scenario analysis, risk monitoring, engagement and thematic research. The EKPIs include: GHGs, water consumption, natural resource use, air, water, pollution, and waste generation.



4. LINKS WITH POLICY INITIATIVES

At government level, Green Economy initiatives are underway in many countries to improve national environmental accounting frameworks to include natural capital, incorporate Beyond GDP performance metrics, develop new market instruments eg, 'Payments for Ecosystem Services' and apply natural capital accounting at a country level.

The UN System of Environmental-Economic Accounting (SEEA) provides the standard for national statistics and indicators that reflect the interrelationships between the economy, the environment and the society. Programmes such as World Bank Wealth Accounting and Valuation of Ecosystems Services (WAVES), provide a multi-stakeholder platform to integrate the value of natural resource in national economic accounts in line with this standard. New classification systems are in development. They provide greater standardisation for defining, classifying, and measuring ecosystem services and increasing their relevance for economic accounting. These include the Common International Classification of Ecosystem Services²⁵ (CICES) informing the SEEA and US EPA-supported Final Ecosystem Goods and Services (FEGS). FEGS constructs a novel ecosystem services categorisation to arrive at definitions and classifications that are consistent with industry and trade classification systems. This facilitates integration in accounting systems. Overall, these policy initiatives provide the wider enabling framework for natural capital valuation in business. The classifications, methodologies and metrics for valuation in business will need to be consistent with those developed in the public sector to enable progress to be measured. Furthermore, it is important to future proof business metrics if natural resource benchmarking targets are set by policy makers.

Examples of key policy initiatives, relevant to both national accounting metrics, indicators, and new markets, are below.

EXAMPLES - POLICY INITIATIVES

Ecosystems Market Task Force (EMTF)

EMTF was a business-led initiative (2011-2013) chaired by Ian Cheshire, Kingfisher Group with Defra as secretariat that reviewed the opportunities for UK business from expanding green goods, services, products, investment vehicles and markets, which value and protect nature's services. Its [final report](#) affirms that business is often unaware of its true reliance on nature and that a new approach is needed to maximise opportunities and manage future risks. It makes recommendations for both Government and business where interventions would assist in the creation and development of new markets, enhancing opportunities for growth that also benefit the environment.

EU Mapping and Assessment of Ecosystems and their Services in Europe (MAES)

MAES is one of the key actions of the EU Biodiversity Strategy to 2020. The initial methodological work on biophysical mapping and assessment is expected to be delivered by 2014. The results from this work will be used to inform policy decisions and policy implementation in many policy areas dependent on ecosystems and their services. This work will also contribute to the assessment of the economic value of ecosystem services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020.

Final Ecosystem Goods and Services Classification System (FEGS-CS)

The US Environmental Protection Agency (EPA) is working with other governments to develop defined and standardised approaches for defining and classifying ecosystem services so they can be measured, quantified, and valued in a reliable and consistent way for policy and business applications. The EPA has adopted the concept of Final Ecosystem Goods and Services (FEGS) as a foundation for defining, classifying, and measuring ecosystem services. FEGS is defined as the 'components of nature, directly enjoyed, consumed or used to yield human well-being'²⁹. [The Final Ecosystem Goods and Services Classification System \(FEGS-CS\) for identifying Final Ecosystem Goods and Services \(FEGS\)](#)³⁰ was published in 2013. Associated metrics and indicators are to follow. The National Ecosystem Services Classification System (NESCS) is in development by EPA which combines the FEGS-CS with economic production functions to define, quantify and value FEGS. Overall the FEGS-CS constructs a novel ecosystem services categorisation providing definitions and classifications that are consistent with industry classification systems and aimed for use in accounting systems. This provides an evolution in defining and classifying ecosystem services to facilitate natural capital accounting in policy and business applications due to the following characteristics:

- Consistently defined units of account to measure the contributions of nature to human welfare that are comparable with the definition of conventional goods and services found in GDP and the other national accounts. Current definitions of 'ecosystem services' while heuristic, are not suited to accounts.
- Definition of terms from which individual goods and services can be specified.
 - Metrics and indicators that can be estimated in the environment.
 - Specific, identifiable linkages between ecosystem services and human well-being.

EXAMPLES – POLICY INITIATIVES

Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)

IPBES was established in April 2012, as an independent intergovernmental body open to all member countries of the United Nations. It provides a mechanism recognised by both the scientific and policy communities to synthesise and critically evaluate relevant information and knowledge on the state of the planet's biodiversity, its ecosystems and the essential services they provide to society.

Natural Capital Committee (NCC)

NCC was set up in 2012 in response to the UK Natural Environment White Paper, reports to the UK Economic Affairs Committee. As part of its terms of reference, the NCC is tasked with advising the UK Government on how it should prioritise action to protect and improve natural capital, so that public and private activity is focused where it will have greatest impact on improving wellbeing in our society. Thus, the development of natural capital accounts, at the national and corporate level, forms a central part of the NCC's ambitions and work programme. In November 2013 the Committee appointed a consortium of eftec, RSPB and PwC to undertake an experimental project on corporate natural capital accounting. The aim of this project is to work with a small group of organisations to pilot corporate natural capital accounts and then use the lessons from the pilots to produce high level guidance and a template account which will be useful for other organisations to follow and use.

Payments for Ecosystem Services (PES)

PES schemes are in place and growing in a range of countries in particular where natural capital is most at risk. The *State of watersheds payments* report highlights transactions totalling more than \$8bn in 2011 and with evidence of a substantial step up in new watershed PES programmes in 2012 with China leading the way [source: www.ecosystemmarketplace.com]. The criteria and metrics for defining a PES are evolving. One example is the woodland carbon code and pilot peatland code which provide the metrics and guidance for enabling investment in woodland creation and peatland restoration. A case example is outlined in Figure 6. Examples are [Payments for Ecosystem Services \(PES\): best practice guide](#).

Sustainable Development Goals and Biodiversity Indicators Partnership (BIP)

As part of the draft post-2015 Sustainable Development Goals on managing natural resources sustainably, the **BIP** has produced the 'Statistics and indicators for the post-2015 development agenda',²⁶ outlining indicators for disaster risk and resilience, governance and human rights, inequality, population, rule of law, sustainability and well being. Two BIP indicators are currently used to monitor progress towards the pre-2015 Millennium Development Goal (MDG) Target 7 on environmental sustainability, in particular target 7.b; 'to reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss.' These MDG BIP indicators are: coverage of protected areas, developed by UNEP-WCMC; and the Red List index, developed in partnership with IUCN, BirdLife International and ZSL.

The Economics of Ecosystems and Biodiversity (TEEB)

TEEB study hosted by the United Nations Environment Programme is an international initiative to raise awareness on the global economic benefits of biodiversity and ecosystem services. Its objective is to highlight the growing cost of biodiversity loss and ecosystem degradation and to draw together expertise from the fields of science, economics and policy to enable practical actions. It provides an evidence base and ongoing guidance documents to facilitate action. The *TEEB in Business and Enterprise* publication³¹ provides the business case and examples for business action to measure and manage natural capital.

The Economics of Land Degradation (ELD)

ELD is an initiative for a global study on the economic benefits of land and land based ecosystems. The initiative highlights the value of sustainable land management and provides a global approach for analysis of the economics of land degradation. It aims to make economics of land degradation an integral part of policy strategies and decision making by increasing the political and public awareness of the costs and benefits of land and land-based ecosystems.

EXAMPLES - POLICY INITIATIVES

UN Convention on Biological Diversity (CBD)

The UN Convention on Biological Diversity and particularly its [Aichi Biodiversity Targets for 2020](#), strategic goals, [Target 5](#) and [Target 15](#) are key policy drivers for improving the status of biodiversity and enhancing ecosystem services through reducing ecosystem degradation and increasing restoration. [CBD - The Ecosystem Approach](#) is the organising framework for implementing the Convention. Principle 5 states that 'conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach'. Further guidance for inclusion of biodiversity in impact assessment is available to support meeting targets through the Convention on Biological Diversity Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment.

UN System of Environmental-Economic Accounting (SEEA) and Common International Classification of Ecosystem Services (CICES)

[SEEA](#) is the international standard for national accounts to report on the interrelationships between the economy, the environment and society. It was agreed among UN Member States in 2012 and is currently being implemented. It is the second existing statistical standard, after the System of National Accounts (SNA) used for GDP. It provides an agreed set of definitions and concepts for use in collection, compilation, and analysis of data. Information compiled using the SEEA framework relates the environment to the economy, bringing together statistics of supply and use of resources in physical and monetary terms. Policy relevant indicators can also be derived from the SEEA framework eg, natural resource use intensity by industries, emissions to air, and water use intensity. [SEEA Briefing notes](#)²⁷ provide further details. Part II of the revised SEEA currently in development will contain a framework for experimental ecosystem accounting, which will provide a description of the structure and scope of ecosystem accounting. The development of the conceptual framework for SEEA Experimental Ecosystem Accounting is being coordinated by the United Nations Statistics Division, the [European Environment Agency](#) and the [World Bank WAVES global partnership](#). [CICES](#)²⁸ developed from EEA environmental accounting work is informing the revised SEEA.

Wealth Accounting and Valuation of Ecosystem Services (WAVES)

[WAVES](#) is a global partnership of UN agencies, governments, international institutes, non-government organisations and academics to ensure that the national accounts used to measure and plan for economic growth include the value of natural resources. WAVES implements environmental accounting where there are internationally agreed standards, and develops standard approaches for other ecosystem service accounts. WAVES projects are underway in Colombia, Costa Rica, Madagascar, Botswana and Philippines.

Figure 6: UK Woodland Carbon Code and pilot Peatland Code

Planting woodland to remove CO₂ from the atmosphere is a way of compensating for emissions while also providing many other social and environmental benefits. Investors in carbon capture projects need confidence that the woodlands will be well managed and really will capture the CO₂ claimed. Certification against the Woodland Carbon Code meets this need by providing this evidence. The Code is a voluntary standard. It certifies the creation of carbon credits which are independently verified and tracked on a carbon registry. Income from selling carbon credits helps to recoup the costs of creating the woodland. The Code has already generated a wide range of woodland creation projects across the country to abate carbon dioxide emissions in the atmosphere. The Peatland Code is the voluntary standard for peatland restoration projects in the UK that want to be sponsored on the basis of their climate and other benefits. During its pilot phase, this draft Peatland Code is designed to support funding from businesses interested in restoring damaged peat bogs. It provides standards and robust science to give business supporters confidence that their financial contribution is making a measurable and verifiable difference to UK peatlands.

ANNEX I: Business tools and standards for biodiversity and ecosystem services assessment and management

This annex summarises tools that either:

- do not include valuation but enable users to understand how businesses interrelate with ecosystem services or biodiversity, which is a key precursor or complement to conducting valuation; or
- enable ecosystem service valuation but as yet are not tailored for applications in a business context.

Existing tools focus on multiple ecosystem services, as well as single ecosystem service such as carbon, or a specific hydrological service. In the main we have included tools focusing on multiple ecosystem services with some examples of a single service, in particular for water as these are growing in business use. Most tools are generic: however, key sector specific tools for the energy, mining and fisheries sectors are available. These are listed separately below. A range of sources inform this list to include recent collations of tools for measuring and managing ecosystem services and biodiversity to clarify by BSR and WBCSD.^{32,33}

Generic tools

- The new BESMETRICS4BIZZ project from Arcadis aims to develop appropriate BES indicators for business. Also an 'open-source' BES navigator will be developed to provide guidance on how BES can be integrated into business decisions.
- The [Biodiversity Accountability Framework](#) is a self-assessment framework to understand business interdependence with biodiversity. The accompanying [Business and Biodiversity Interdependence Indicator \(BBII\)](#) uses 23 criteria to create a composite indicator which characterises the interactions between businesses and biodiversity.
- The [Biodiversity and Business Checklist](#) was developed by companies in various sectors to evaluate strengths and weaknesses related to biodiversity conservation for products, services, business activities, factors or a whole company.
- [Biodiversity in the Global Water Tool](#) enables users to assess which company sites are in biodiversity hotspots.
- [Biodiversity Check](#) provides a first overview on the companies' relation to biodiversity and examines the direct impacts on biodiversity, for which the company is clearly responsible and which it can influence. Biodiversity Check also takes into account indirect effects which the company can influence through dialogue with its stakeholders.
- [Biodiversity Risk and Opportunity Assessment](#) enables users to identify the impacts and dependencies of business operations on biodiversity in landscapes of interest.
- The Business and Biodiversity Offset Programme (BBOP) [Standard on Biodiversity Offsets](#) enables project developers to manage biodiversity-related risks by providing an auditable approach to achieve no net loss of biodiversity, and helps auditors determine whether an offset has been designed and implemented in accordance with BBOP principles.
- [Bilan Biodiversité Footprint Guidelines](#), a French guide developed in 2012 by Synergiz and Natureparif to identify business biodiversity impacts.
- [The Corporate Biodiversity Management Handbook](#) provides guidance and case studies to help businesses develop and implement biodiversity management plans.
- [Coastal Resilience](#) is a suite of tools that enables decision makers to assess risk and identify nature-based solutions to reduce socio-economic vulnerability to coastal hazards. These tools allow users to interactively examine storm surge; sea-level rise; natural resources; vulnerable communities and assets and to develop risk reduction and restoration solutions.
- [DataBasin](#) is an online information platform that allows users to download and upload data and apply spatial information to address conservation challenges.

- [The Eco-Health Relationship Browser](#) illustrates the linkages between human health and ecosystem services – benefits supplied by nature. This interactive tool provides information about US ecosystems, the services they provide, and how those services, or their degradation and loss, may affect people. Scientific studies have documented the many tangible and intangible services and health benefits that are provided by our surrounding ecosystems. This tool is designed so that users can easily explore the services ecosystems provide and how those services affect human health and well being. It is important to note that the studies summarised in this tool are by no means an exhaustive list.
- [Ecometrix](#) is a 'site-specific and parcel-level tool' developed by EcoMetrix Solutions Group and Parametrix. It targets managers in research and development, operations, remediation, and sustainability. It is an environmental measurement and modeling tool that supports sustainable infrastructure, restoration projects, and enterprise-level decision making.' It provides quantitative values related to impacts or benefits of decisions on landscapes and affected communities.
- The [Ecosystem Services Review for Impact Assessment](#) tool, developed by WRI, helps users incorporate ecosystem services into Environmental and Social Impact Assessment. It involves identifying priority ecosystem services and relevant stakeholders, assessing project impact and dependence on priority ecosystem services and designing measure for mitigation.
- [GLOBIO](#) is a tool to assess past, present and future impacts of human activities on biodiversity. Since 2002 the model has been extensively used for environmental assessments on the global to national scale. GLOBIO is based on cause-effect relationships, derived from the literature. To use GLOBIO no detailed species data are needed. Instead, the model uses spatial information on environmental drivers as input. This input is mainly derived from the Integrated Model to Assess the Global Environment (IMAGE).
- The [Integrated Biodiversity Assessment Tool \(IBAT\)](#) provides biodiversity information, including threatened species, Key Biodiversity Area and Legally Protected Areas, to help users identify biodiversity risks and opportunities within a specific project area.
- The [Integrated Biodiversity Impact Assessment System \(IBIS\)](#) predicts the impacts of products on biodiversity based on a scoring system.
- The [Land Change Modeler \(LCM\) for Ecological Sustainability](#) is an integrated software environment for analysing land cover change, projecting its course into the future, and assessing its implications for habitat and biodiversity change. It analyses past land cover change modeling, the potential for change, predicting the course of change into the future, assessing the implications of that change for biodiversity, and evaluating planning interventions for maintaining ecological sustainability. The IDRISI software includes a comprehensive suite of image processing tools, making it an excellent choice for land cover mapping applications with remotely-sensed data. Tools are provided for image restoration, enhancement, classification and transformation. Special techniques are included for soft classification and hyper spectral image analysis. IDRISI also provides a host of machine learning tools.

Types of analysis available with IDRISI

- (1) Inventory and baseline land resource mapping.
 - (2) Land change and time series analysis.
 - (3) Agricultural monitoring.
 - (4) Natural resource monitoring.
 - (5) Satellite image processing.
 - (6) Error assessment and uncertainty management.
- The [Local Ecological Footprinting Tool \(LEFT\)](#) assesses the environmental impact of projects, such as concessions for extractive industry, in terms of biodiversity, threatened species, connectivity, resilience and fragmentation.
 - The [LIFE Methodology](#) is a self-assessment methodology to evaluate a company's impacts on biodiversity and subsequent mitigation and/or compensation measures through biodiversity conservation actions. Use of the methodology is necessary to obtain LIFE certification.

- **The Marine Integrated Decision Analysis System (MIDAS)** is a spatial decision support system to help marine managed area (MMA) managers and users quickly analyse and visualise outcomes from the interaction of socio-economic, governance, and ecological factors of MMAs. Users can input data for 15 critical determining factors, five each for socio-economic, governance, and ecological factors. The tool then displays possible outcomes such as state of governance, livelihoods, ecosystem health, outcomes related to MMA effectiveness, and maps of the spatial distribution of risk.
- **Measuring and Monitoring Ecosystem Services at the Site Scale** is a guide to help users measure ecosystem services at the site scale, primarily targeting non-expert conservation managers with limited capacity and resources.
- **Multi-scale Integrated Models of Ecosystem Services (MIMES)** is a multi-scale, integrated suite of models that assess the value of ecosystem services under land management and land use scenarios (<https://code.google.com/p/mimes/>). The target audience is land managers, policy analysts, and scientists. Developed by Affordable Futures, MIMES can be run at global, regional, and local levels to quantify the effects of land and sea use change on ecosystem services as well as human and built capital. The ongoing work of MIMES is archived at a Google Code site: <http://uvm.edu/giee/mimes/>
- **Nature Serve Vista** is a conservation planning support tool that supports users to evaluate, create, implement and monitor land use and resource management scenarios designed to achieve conservation, use and management goals.
- **Normative Biodiversity Metric (NBM)** assesses the land a company owns with a measure of ecosystem pristineness and endangered species presence.
- **Resource Investment Optimization System (RIOS)** is a free, open-access software tool that supports the design of cost-effective investments in watershed services. It was developed by partners in the Natural Capital Project – Stanford University, University of Minnesota, WWF and The Nature Conservancy. RIOS combines biophysical, social and economic data to help users identify the best locations for protection and restoration activities in order to maximise the ecological return on investment, within the bounds of what is socially and politically feasible. RIOS was developed through an extensive stakeholder engagement process, including input from more than 11 water funds across Latin America. Water funds are conservation financing mechanisms that gather investments from water users – investors are primarily large businesses and government agencies. They direct the funding towards the protection and restoration of key lands upstream that filter and regulate water supply. RIOS can be used to answer questions, such as: which set of watershed investments (in which activities, and where) will yield the greatest returns towards multiple objectives? What change in ecosystem services can I expect from these investments? How do the benefits of these investments compare to what would have been achieved under an alternate investment strategy?
- **Social Values for Ecosystem Services (SolVES)** is designed to assess, map, and quantify the perceived social values of ecosystem services, such as aesthetics and recreation. These non-monetary values, often corresponding to cultural ecosystem services, can be analysed for various stakeholder groups as distinguished by their attitudes and preferences regarding public uses, such as motorised recreation or logging. SolVES derives a quantitative, 10-point, social-values metric, the Value Index, from a combination of spatial and non-spatial responses to public value and preference surveys, and calculates metrics characterising the underlying environment, such as average distance to water and dominant landcover. SolVES was developed by the Geosciences and Environmental Change Science Center (GECSC), in collaboration with the University of Wyoming.
- **WaterWorld**, developed by **King's College London** (models), **AmbioTEK** (software), is a global version of the AguAAndes model for the development and implementation of land and water related policies globally, enabling intended and unintended consequences to be tested. It enables process-based modeling of water quality, water quantity and some other regulating services. It incorporates detailed spatial datasets at 1-square km and 1 hectare resolution for the entire world, spatial models for biophysical and socioeconomic processes along with scenarios for climate, land use and economic change. A series of interventions (policy options) are available which can be implemented and their consequences traced through the socio-economic and biophysical systems. The model integrates with a range of geobrowsers to visualise outcomes. Typical applications include water resources assessment, water security analysis and hydrological ecosystem services accounting as well as climate impacts analysis and land and water management. It has been used in a variety of **applications**, including looking at pipeline leakage and its impacts on water quality in Ecuador with PetroEcuador.

Sector specific tools

Most existing methodologies and tools for measuring natural capital impacts, dependencies and conducting valuation are generic: however, a few sectoral initiatives are in place for the energy, mining and fisheries sectors in particular. Examples include the following:

- IPIECA (The global oil and gas industry association for environmental and social issues) Ecosystem service guidance: biodiversity and ecosystem services guide and checklists (2011)
- The [Energy & Biodiversity Initiative](#), Conservation International, has several guides for integrating biodiversity into EIA, EMS and on indicators for the oil and gas sector:
 - [Integrating Biodiversity into Environmental and Social Impact Assessment Processes](#)
 - [Integrating Biodiversity into Environmental Management Systems](#)
 - [Biodiversity Indicators for Monitoring Impacts and Conservation Actions](#)
 - International Council on Mining and Metals (ICMM) [Mining and Biodiversity Good Practice Guidance](#)
- IFC' [A Guide to Biodiversity for the Private Sector](#) provides generic and sector specific guidance on the business case for biodiversity management including for the agribusiness, cement, tourism, mining, forestry, energy, water and retail sectors.
- Sustainable Seafood Finance (SSF) Tool Guidelines (April 2013 draft), part of the [NVI](#), is a resource for banks and seafood companies to jointly identify and address the sustainability risks associated with the sector. It uses Marine Steward Council standard criteria, focuses on natural resource related risks including ecosystems, and is in accordance with IFC Performance Standard Nr 6.

Standards

- [European Water Stewardship](#) voluntary standard for water in European industry and agriculture (the recognised regional Standard of the Alliance for Water Stewardship) has recently incorporated ecosystem service assessment into the next version available in 2014. The standard is applicable for business use and focuses at the local water shed level to provide best practice for measurement and management.
- [Business and Biodiversity Offsets Programme \(BBOP\)](#), hosted by Forest Trends and Wildlife Conservation Society, is an international collaboration between companies, financial institutions, government agencies and civil society organisations. The members have developed standards and guidelines on best practice in following the mitigation hierarchy (avoid, minimise, restore, offset) to achieve no net loss or a net gain of biodiversity.
- [BS 42020:2013 Biodiversity. Code of practice for planning and development](#) – this standard with associated smart guide intends to help organisations fulfil their obligation to support local biodiversity targets. It deals with planning and development of new buildings and changes in land use and how these activities impact upon biodiversity. The main users are authorities, developers, planners, and ecologists.

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Other Coalition publications

Organisational Change for Natural Capital Management – Based on data collected from 26 early adopter companies (60% of them with \$10bn+ revenues each) across several industry sectors this provides real life evidence on the drivers and barriers for natural capital management.

Natural Capital at Risk – Top 100 Externalities of Business – This identifies the priority business sectors and world regions with the highest environmental externality costs in order to clarify the financial risk and opportunity this presents to business and investors.





NATURAL CAPITAL COALITION

A PART OF THE TEEB COMMUNITY
Valuing nature in business


About Natural Capital Coalition


The Natural Capital Coalition is a multi-stakeholder, not for profit platform, to build the business case and support the uptake of natural capital valuation, management and disclosure in business and investor decision making. Established in November 2012, as TEEB for Business Coalition, we rebranded in January 2014 to Natural Capital Coalition.

Our **founder members** are pioneers on natural capital and make up our **board and advisory groups**. **New business and stakeholder members** are joining on an ongoing basis.

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