NCAVES – STATE OF PLAY OF BUSINESS ACCOUNTING AND REPORTING ON ECOSYSTEMS

Background Paper

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This work was undertaken as part of the project advancing the SEEA Experimental Ecosystem Accounting. This note is part of the Project "Natural Capital Accounting and Valuation of Ecosystem Services" (NCA VES) which has been established to advance the knowledge agenda on environmental-economic accounting, particularly ecosystem accounting, by initiating pilot testing of the System of Environmental Economic Accounting (SEEA) Experimental Ecosystem Accounting (EEA) in five strategic partner countries to the European Union (EU), namely Brazil, China, India, Mexico and South Africa. The United Nations Statistics Division (UNSD), the United Nations Environment Programme (UN Environment) and the Secretariat of the Convention on Biological Diversity are the implementing agencies of the project "Natural Capital Accounting and Valuation of Ecosystem Services. This project is funded by the European Union.

[1]*The views and opinions expressed in this report are those of the author and do not necessarily reflect the official policy or position of the United Nations or the European Union.*

United Nations

System of Environmental Economic Accounting

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1 Introduction

The Project **"Natural Capital Accounting and Valuation of Ecosystem Services"** has been established to advance the knowledge agenda on environmental-economic accounting, particularly ecosystem accounting, by initiating pilot testing of the System of Environmental Economic Accounting (SEEA) Experimental Ecosystem Accounting (EEA) in five strategic partner countries to the European Union (EU), namely Brazil, China, India, Mexico and South Africa. The United Nations Statistics Division (UNSD), the United Nations Environment Programme (UN Environment) and the Secretariat of the Convention on Biological Diversity are the implementing agencies of the project. This project is funded by the European Union.

The main objectives of the project include a) improving the measurement of ecosystems and their services (both in physical and monetary terms) at the (sub)national level; b) mainstreaming biodiversity and ecosystems in (sub)national level policy-planning and implementation; and c) contributing to the development of internationally agreed methodology and its use in partner countries.

As part of the objective to mainstream ecosystem accounting and promote its use in partner countries, the project also includes a **workstream on business accounting**. While it's true that businesses and governments often have different aims when it comes to environmental accounting and are attempting to capture different kinds of information, it's clear that the work undertaken by governments can be hugely useful to that of businesses, and vice versa. Therefore, this workstream aims to:

- contribute to the alignment of natural capital accounting between the public and private sectors;
- explore how to harness synergies between the public and private sectors in the collection and use of statistics and data for natural capital accounting;
- provide a technical methodological contribution at the level of methods or of indicators that promotes alignment.

To reach these objectives, there is a need to bring together the public and private sectors to look at the intersection of business accounting and the SEEA, particularly with regards to ecosystems and ecosystem degradation and restoration. One of the main activities of the workstream is the **organization of a scoping workshop**.

To prepare this workshop two main activities will take place:

1. a literature review of current practices in business accounting and reporting related to ecosystems and ecosystem degradation and restoration
2. interviews with 10 to 12 companies to explore their interests and needs in terms of business accounting and reporting related to ecosystems and ecosystem degradation and restoration

This **background paper** mainly includes the results of the literature review. It also includes the questionnaire for the interviews with selected companies (in Annex 1). The **findings of the business consultation** as well as **first options for aligning national and corporate natural capital accounting** will be presented in a second document.

The workshop might take place around mid-October 2019 in New York. After the workshop, a workshop report will be prepared, which will form the basis of a concise roadmap for aligning private and public-sector approaches to natural capital accounting that suggests concrete areas of work that UNSD can facilitate between companies and the national statistical offices of the project countries and the statistical community at the global level.

2 Scope

It is important to define a clear scope with regard to the topic of this report and the workshop. The proposed focus is on business accounting and reporting in relation to ecosystems and ecosystem degradation and restoration. As such, the scope covers 3 distinct elements:

- *'ecosystems' and 'ecosystem degradation and restoration'*
- *'business'*
- *'accounting and reporting'.*

Given the mixed audience for this workstream, i.e. national account experts and businesses, there is a risk that different languages are used. Therefore, a clarification of key concepts is essential. This document aims to avoid misunderstandings and misinterpretations as much as possible by providing terms and definitions for each of the applied concepts (Table 1). Two principal resources are the SEEA Glossary[1] and the Natural Capital Protocol[2], the latter representing the business perspective. Other resources are applied if relevant.
Before discussing these scope elements, it's important to understand some basic concepts on ecosystem accounting, as applied in the SEEA EEA Framework (see Box 1)[3]. In Box 2 these concepts are considered from a business perspective of the Natural Capital Protocol. It's interesting to notice that the business focus is more on flows than on stocks.

Box 1: Recording stocks and flows for accounting (SEEA EEA Technical Recommendations)

The terms stocks and flows are commonly used in measurement discussions but can be applied in different ways from those intended from an accounting perspective. For accounting purposes, the stocks refer to the underlying assets that support production and the generation of income. Stocks are measured at the beginning and end of each accounting period (e.g. the end of the financial year) and these measurements are aggregated to form a balance sheet for that point in time. Information about stocks may be recorded in physical terms (e.g. the hectares of plantation forest) and in monetary terms.

For ecosystem accounting, the stocks of primary focus are the ecosystem assets (EA) (e.g. forests, wetlands, rivers) delineated within the area in scope of the accounts, i.e. the Ecosystem Accounting Area (EAA). Conceptually, information about each ecosystem asset, for example information on its extent, condition and monetary value, can be recorded at the beginning and end of each accounting period and thus contribute to understanding the potential for the stock to support the generation of ecosystem services into the future (ecosystem capacity).

Two types of flows are recorded in accounting, namely (i) changes in stock and (ii) flows related to production, consumption and income. Changes in stock include additions to stock as a result of investment or, in the case of ecosystem assets, natural growth and improvements in condition; and reductions in stock due to extraction, degradation or natural loss.

Concepts of production, consumption and income are all flow concepts. For ecosystem accounting, the relevant flows relate to the supply and use of ecosystem services between ecosystem assets and beneficiaries including businesses, governments and households. Benefits as described in ecosystem accounting are also flows.

[1] https://seea.un.org/sites/seea.un.org/files/documents/seea_glossary_terms_languages_v2.pdf
[2] https://naturalcapitalcoalition.org/natural-capital-protocol/
[3] page 3 of Technical Recommendations, see https://seea.un.org/sites/seea.un.org/files/technical_recommendations_in_support_of_the_seea_eea_final_white_cover.pdf

Box 2: Estimating changes in natural capital stocks and/or flows (from Box 6.1 in the Natural Capital Protocol)

Whether a company's assessment should focus on natural capital stocks and/or flows depends on the objective as identified in the Scope Stage. Of the large number of company natural capital assessments conducted to date, the majority have been primarily concerned with flows, and for this reason the Protocol provides significantly more guidance on measuring and valuing flows as opposed to stocks.

In many cases, it is simpler to estimate changes in flows and also unnecessary to estimate changes in the underlying natural capital stock. This is the case, for example, if a company is undertaking a high-level assessment of the impacts of air pollution, using value transfer. In some situations, understanding changes in the state of the stock may be important. This may be the case when assessing dependencies on provisioning services or assessing site-level biodiversity impacts, where changes in the stock are directly observable (e.g., the volume of standing timber in a forest) or can be inferred from flows (e.g., a reduced stock due to clearing two hectares).

ECOSYSTEMS AND ECOSYSTEM DEGRADATION AND RESTORATION

As specified in Box 1, the reference to **degradation and restoration** refers to changes in the ecosystem assets, such as improvements in condition ('*restoration*') or reductions in stock due to extraction, '*degradation*' or natural loss. The focus on degradation and restoration assumes that we will focus on the state of ecosystems where businesses have impacts or dependencies on.

Ecosystem extent and ecosystem condition are SEEA EEA indicators for the level of degradation/restoration. Ecosystem condition is defined by the state of several characteristics of natural capital such as air, soil, water and biodiversity.

However, within the context of this specific study and for keeping the discussions manageable we propose to *limit the focus of this research to water and biodiversity including ecosystem services and to the business risks and opportunities of respectively non-action and action by businesses. This also includes climate change risks related to degradation of ecosystems as well as opportunities related to ecosystem restoration.* Water and biodiversity are typical landscape scale elements that often go beyond the direct land footprint of companies and therefore are interesting to make the bridge to (sub)national level information (e.g. river basins, ecosystems). The same applies to climate change adaptation.

Issues such as GHG emissions and its impacts have global impacts, which exceed the landscape scale. Moreover, GHG emission accounting is far less challenging than for instance biodiversity accounting. While we acknowledge that changes in the state of air quality or quantity might also be relevant for including in the discussions in some cases, we have left it out of scope for the current report and upcoming workshop.

BUSINESS

The term 'business' covers both private and public companies[4] and includes the investment community.

ACCOUNTING AND REPORTING

Business Accounting and Reporting in the context of environmental performance refers to a structured method that is used to record, assess, value, and report environmental impacts and dependencies for a

[4] From a statistical point of view it is not very precise to refer to companies. Countries keep track of companies in their business registers, delineating between legal units, establishments, enterprises, enterprise groups etc. This might be an issue which requires further alignment.

given entity such as a company or a project. Both the terms Natural Capital Accounting (NCA) and Natural Capital Assessment are applied. In fact, it's not the same. The most recent draft of the Biodiversity Supplement to the Natural Capital Protocol applies the following definitions:

- **Natural capital assessment:** the process of identifying, measuring and valuing relevant ("material") natural capital impacts and/ or dependencies, using appropriate methods. Natural capital assessment is the method most typically used in the private sector. The majority of assessments will use natural capital information to answer a specific question or inform a decision. A key step in the process is to identify an objective prior to undertaking the assessment (a so-called business application) - the aim is not about collecting a set of indicators.
- **Natural capital accounting**: the process of compiling consistent, comparable and regularly produced data using an accounting approach on natural capital and the flow of services generated in physical and monetary terms. The majority of applications are done at a national level and by the public sector. Natural capital accounts are a possible output from a natural capital assessment.

NCA is part of Corporate Social Responsibility (CSR) but CSR also includes the social component or social capital. NCA comprises all principal environmental components insofar relevant and material, i.e. 1) air or atmospheric components including greenhouse gases regulating climate, air pollutants affecting air quality, ozone depleting substances; 2) water or aquatic components including water pollution, use, droughts and floods; 3) land-related components including land fragmentation, use, contamination; and 4) biodiversity related to plants and animals. Natural Capital accounts[5] (i.e. the findings of a natural capital assessment) provide line managers and executives with a solid information basis for understanding and managing environmental risks and opportunities that are relevant for the organization. It also provides a robust basis to support non-financial reporting related to environmental **impacts** and **dependencies**. A common term for external reporting by businesses is disclosure.

This specific research will cover business impacts as well as business dependencies on ecosystems.

[5] Businesses will generally not refer to 'natural capital accounts' but rather to the findings of their natural capital assessments. Natural capital accounts is not a familiar concept yet amongst businesses

Table 1: Terms and definitions on key concepts in the field of ecosystem and natural capital accounting

Concepts	SEEA Glossary	Natural Capital Protocol	Other
Ecosystem	An area containing a dynamic complex of biotic communities (e.g., plants, animals and microorganisms) and their non-living environment interacting as a functional unit to provide environmental structures, processes and functions.	A dynamic complex of plants, animals, and microorganisms, and their non-living environment, interacting as a functional unit. Examples include deserts, coral reefs, wetlands, and rainforests (MA 2005a). Ecosystems are part of natural capital.	
Natural capital	Not defined	The stock of renewable and non- renewable natural resources (e.g., plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people	All renewable and non-renewable environmental resources and processes that provide goods or services that support the past, current or future prosperity of an organization. It includes: • air, water, land, minerals and forests • biodiversity and ecosystem health (IIRC, 2013).
Degradation	Degradation considers changes in the capacity of environmental assets to deliver a broad range of ecosystem services and the extent to which this capacity may be reduced through the action of economic units, including households.	Not defined	The simplification or disruption of ecosystems, and the loss of biodiversity, caused by disturbances that are too frequent or severe to allow natural ecosystem recovery in a relevant or 'reasonable' period of time. Degradation resulting from various factors, including climate perturbations and extreme events, as well as human activities, generally reduces flows of ecosystem goods and services."(IUCN, 2012)
Depletion	Depletion, in physical terms, is the decrease in the quantity of the stock of a natural resource over an accounting period that is due to the extraction of the natural resource by economic units ***occurring at a level greater than that of regeneration***.	Not defined	
Extraction	Extractions are reductions in stock due to the physical removal or harvest of an environmental asset through a process of production.	Not defined	
Restoration	Not defined	Not defined	The process of actively managing the recovery of an ecosystem that has been degraded, damaged or destroyed as a

			means of sustaining ecosystem resilience and conserving biodiversity (CBD, 2011)
Natural capital dependency	Not defined	A business reliance on or use of natural capital.	
Natural capital impact	Not defined	The negative or positive effect of business activity on natural capital.	
Impact driver	Term is not applied, although it comes back under specific types of impact drivers such as 'natural resource inputs', 'solid waste', 'land use', 'wastewater', etc.	An impact driver is a measurable quantity of a natural resource that is used as an input to production (e.g., volume of sand and gravel used in construction) or a measurable non-product output of business activity (e.g., a kilogram of NOx emissions released into the atmosphere by a manufacturing facility).	
Natural capital assessment	Not defined	The process of measuring and valuing relevant ("material") natural capital impacts and/or dependencies, using appropriate methods.	
Ecosystem asset	Asset: a store of value representing a benefit or series of benefits accruing to an economic owner by holding or using the entity over a period of time. It is a means of carrying forward value from one accounting period to another.	Not defined	
Ecosystem extent	Not in glossary but key concept	Not defined (see assessment boundaries)	
Ecosystem condition	Not in glossary but key concept	In the Protocol this is called 'state'	
Measurement		The process of determining the amounts, extent, and condition of natural capital and associated ecosystem and/or abiotic services, in physical terms.	
Valuation		The process of estimating the relative importance, worth, or usefulness of natural capital to people (or to a business), in a particular context. Valuation may involve qualitative, quantitative, or monetary approaches, or a combination of these.	

3 Current practices in business accounting and reporting on ecosystems and ecosystem degradation and restoration

This section provides an overview of the main standards, frameworks and approaches for business accounting and reporting on their relationships with ecosystems. Most of them are voluntary while some are regulatory. The difference between standards, frameworks and approaches is arbitrary. However, the objective of this paper is not to establish a complete and well-structured classification system of these standards or frameworks. The objective is rather to compile a non-exhaustive overview in order to provide an insight in the actual situation.

This section is structured as follows:

- Voluntary framework for natural capital assessment: Natural Capital Protocol
- Voluntary target-based approaches for natural capital accounting and reporting: Planetary Boundaries and SDGs
- Voluntary standards on natural capital reporting: GRI, CDP and IIRC
- Voluntary standards on monetization of natural capital impacts and dependencies: ISO 14007 and ISO 14008
- Voluntary accounting and reporting approaches based on integrated reporting thinking: E P&L
- Voluntary thematic accounting approaches: water assessment, biodiversity assessment
- Regulatory frameworks for non-financial reporting: the EU Non-Financial Reporting Directive

3.1 Voluntary framework for natural capital assessment: Natural Capital Protocol

The Natural Capital Protocol, launched in 2016, is a decision making framework that enables organizations to identify, measure and value their direct and indirect impacts and dependencies on natural capital. The Protocol Framework (Figure 1) covers four stages, “Why”, “What”, “How” and “What Next”. These stages are further broken down into nine Steps, which contain specific questions to be answered when integrating natural capital into organizational processes. Although set out in a linear way, the Protocol is iterative and allows users to adjust and adapt their approach as they progress through the framework.

The Protocol is applicable within any business sector, to organizations of all sizes and in all operational geographies. The Protocol is also applicable at multiple organizational levels and scopes, for example at a product, project or organizational level.

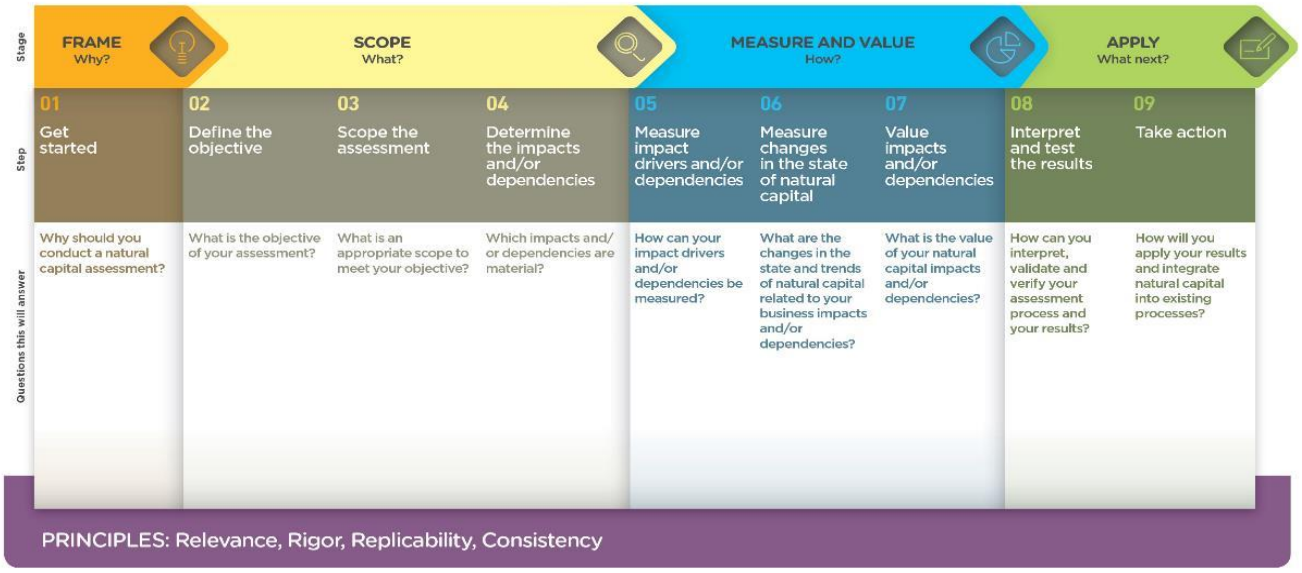

Figure 1: The Natural Capital Protocol Framework

There are many existing approaches that businesses will be using to measure and value their impacts and dependencies, inform their decision making and strategy, and engage with stakeholders. The Natural Capital Protocol is complementary to all of these and provides a standardized framework to help include natural capital in decision-making (see Figure 2). The Protocol does not provide a framework for external financial reporting, although decisions can be reported.

The foundational concepts of natural capital stocks and flows according to the NCP are similar to those that are applied by SEEA (see Figure 3). Natural capital is another term for the stock of renewable and non-renewable natural resources on earth (e.g., plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits or "services" to people. These flows can be ecosystem services or abiotic services, which provide value to business and to society. Ecosystem services are conceived as the benefits to people from ecosystems, such as timber, fiber, pollination, water regulation, climate regulation, recreation, mental health, and others[6]. Abiotic services are benefits to people that do not depend on ecological processes but arise from fundamental geological processes and include the supply of minerals, metals, and oil and gas, as well as geothermal heat, wind, tides, and the annual seasons. Biodiversity is critical to the health and stability of natural capital as it provides resilience to shocks like floods and droughts, and it supports fundamental processes such as the carbon and water cycles as well as soil formation. Therefore, biodiversity is both a part of natural capital and also underpins ecosystem services.

[6] Note that the SEEA defines ecosystem services not as benefits, but as contributions to benefits (to avoid double counting with products already within the SNA (e.g. crops).

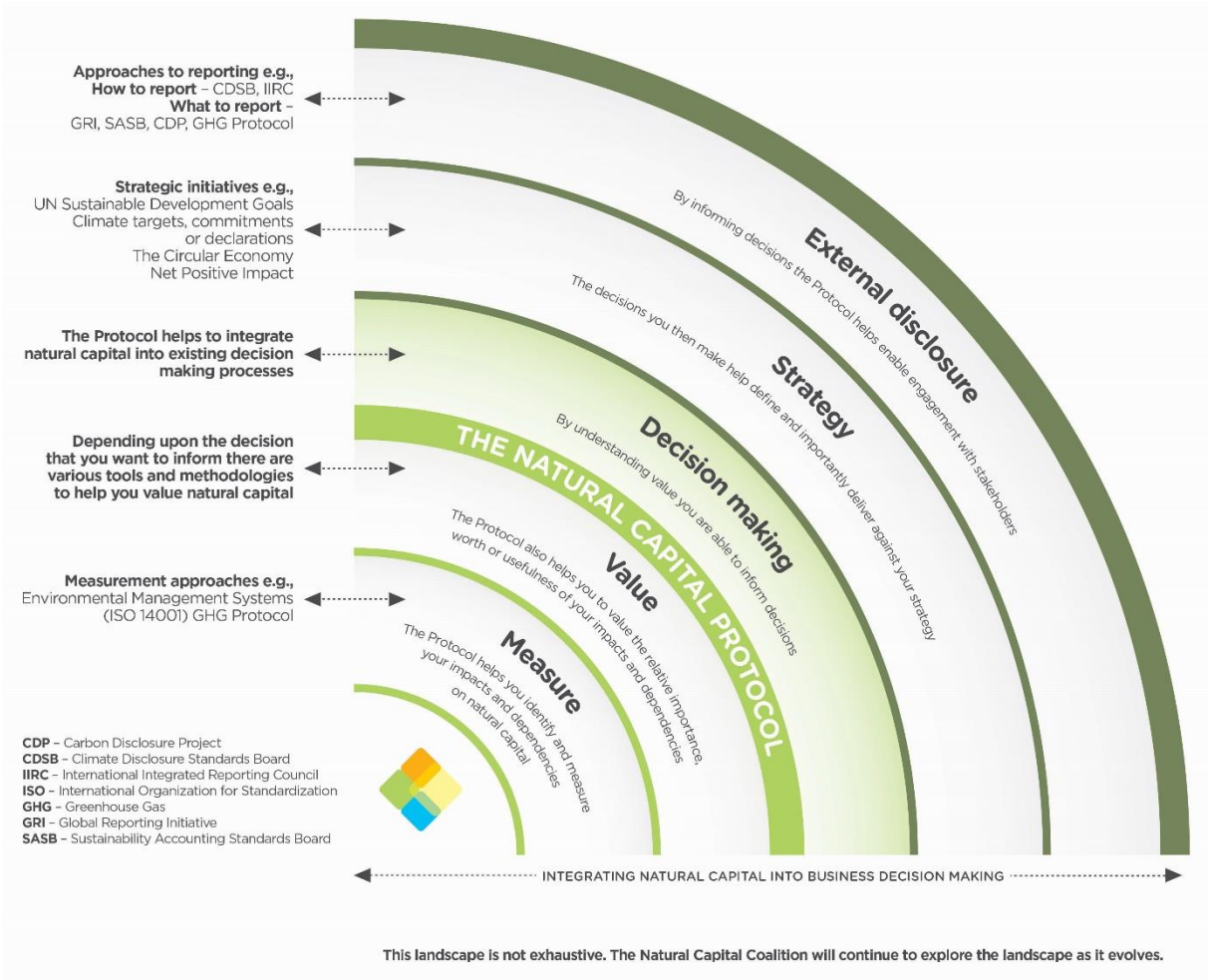

Figure 2: Landscape of natural capital assessment and reporting approaches and frameworks (from the Natural Capital Protocol)

For the purposes of a natural capital assessment, the Protocol distinguishes between value to business and value to society. Clearly, this simplification does not reflect the reality that business is, in fact, wholly part of society.

Figure 3: Natural capital stocks, flows, and values (Natural Capital Protocol)

The link between business impacts and dependencies on natural capital on the one hand and how this ends up in risks and opportunities for businesses is clearly visualized in Figure 4).

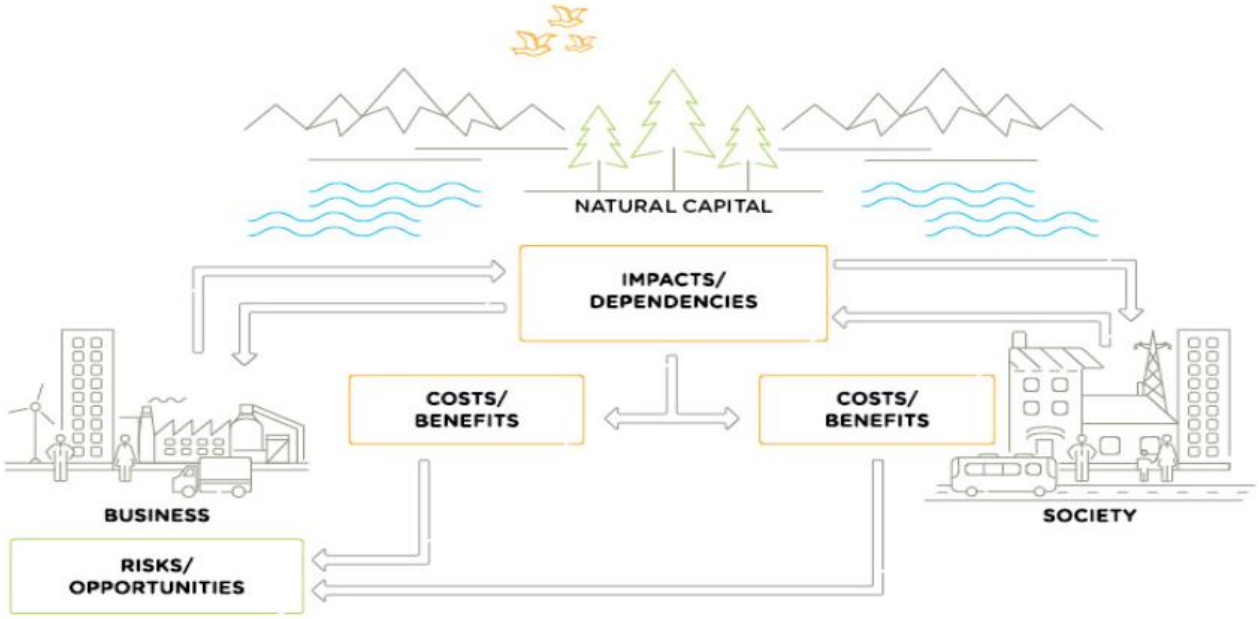

Figure 4: Conceptual model on interactions between natural capital, business and society (Natural Capital Protocol)

Every business depends on natural capital and has impacts on natural capital. These impacts and/or dependencies create costs and benefits for business and society, generating risks but also creating opportunities. Natural capital impacts and/or dependencies can directly affect business performance; they may also generate positive or negative effects on particular stakeholders or on society as a whole. Stakeholder and societal responses to these effects can create additional risks and opportunities.

3.2 Voluntary target-based approaches for natural capital accounting and reporting: Planetary Boundaries and SDGs

3.2.1 Planetary Boundaries

The Planetary Boundaries approach of Rockström et al. (2009)[7], updated by Steffen et al. (2015)8, if applied at a landscape scale, is an excellent approach for communicating real impact as it allows to measure the extent of exceedance of the carrying capacity of the ecosystem, and as such provides good indications for operational business risks (e.g. water scarcity).

Nine planetary boundaries have been identified (see Figure 5), all of which are aimed at giving a global threshold. However, three of these have a clear global scale threshold (climate change, ocean acidification and stratospheric ozone depletion) and five of the boundaries have a more regional operating scale (biosphere integrity, biogeochemical flows, land system change, freshwater use, and atmospheric aerosol loading). Figure 5 shows that the planetary boundaries have already been transgressed for four earth system processes (biosphere

[7] Rockström, J. et al. , Planetary boundaries: exploring the safe operating space for humanity. 2009, Ecology and Society 14(2): 32.
[8] Steffen W., Richardson K., Rockström J., Cornell S.E., Fetzer I., Bennet E.M., Biggs R., Carpenter S.R., de Vries W., de Wit C.A., Folke C., Gerten D., Heinke J., Mace G.M., Persson L.M., Ramanathan V., Reyers B., Sörlin S. Planetary Boundaries: guiding human development on a changing planet. Science, Vol 347 issue 6223; 13 Feb 2015, DOI: 10.1126/science.1259855

integrity, biogeochemical flows, climate change, and land-system change). For a few earth system processes, the boundaries are not yet defined. Within Figure 5 the green zone is the safe operating space (below the boundary), yellow represents the zone of uncertainty (increasing risk), and red is the high-risk zone. The planetary boundary itself lies at the inner heavy circle.

Inspired by the concept of planetary boundaries, the Dutch energy company Eneco took the initiative to link global, regional and local boundaries to business practice. To this end Eneco developed One Planet Thinking (OPT) [9] which has the objective to pass a healthy and resilient planet to next generations. A methodological framework is the scientific basis for the OPT initiative. It includes the development of pragmatic but scientifically robust methods and indicators that allow assessing the degree of exceedance of Eneco's pressures on the planetary boundaries. Bridging the gap between planetary boundaries and business practice is challenging as the indicators of earth system processes (e.g. atmospheric CO_2 concentration in ppm, or Biodiversity Intactness Index) are not easily translated to boundaries for individual companies. However, companies use resources and emit substances to air, water and soil that will eventually affect the earth system processes. Through this cause-effect chain, the business activities are linked to the planetary boundaries. Eneco's initiative fits within the One Planet Thinking program, an initiative by WWF, in partnership with IUCN-NL, which supports companies and governments to work within the safe boundaries of our planet. The initiators of One Planet Thinking envision further developing the methodological framework in a shared effort with the academic community and through case studies with companies, via an open source platform.

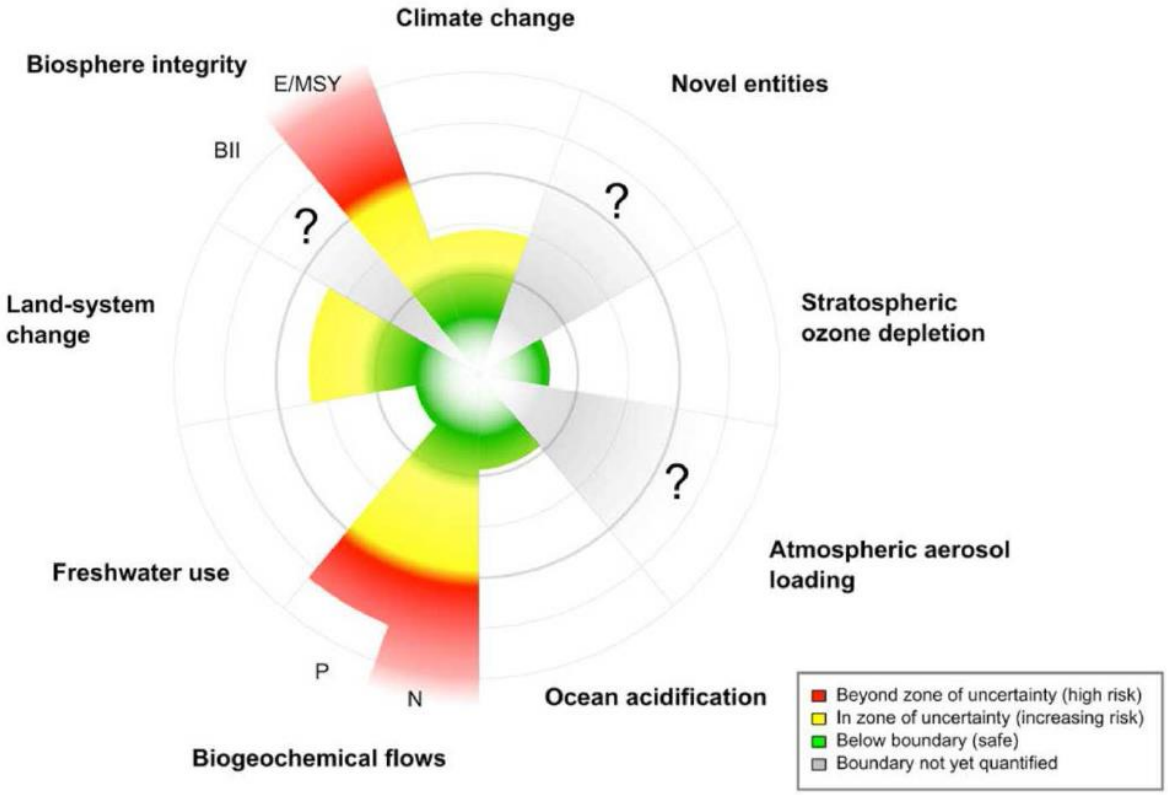

Figure 5: The current status of the control variables for seven of the nine planetary boundaries (from Kerkhof et al. 2015)

[9] see https://www.eneco.com/what-we-do/one-planet/

In May 2016, on behalf of Eneco, Arcadis developed a protocol for applying the planetary boundaries concept to business pressures on biodiversity, the so-called One Planet Thinking protocol on biodiversity[10]. Despite the inherent complexity of measuring biodiversity impacts and the numerous challenges to scale down and operationalize the planetary boundaries concept, the feasibility of applying the planetary boundaries concept to biodiversity impacts by businesses was demonstrated. Challenges related to measuring biodiversity impacts of individual companies, the need to assess these impacts at a regional or local scale and the ways planetary boundaries can be identified at a local or regional scale, are all described in a clear step-by-step process. Within this paper the methodological framework is applied on a main driver for biodiversity loss, i.e. nitrogen emission and the associated deposition, and illustrated by means of a case study, i.e. an energy production facility in The Netherlands. Main challenges were to translate the concept of global boundaries to local boundaries and the allocation issue (i.e. which part of the pressure on a local ecosystem can be attributed to the company in question, in this case Eneco).

In order to keep the method pragmatic the paper proposed to assess the impacts on locally present, or potentially present, threatened (Red List) and protected (e.g. Natura 2000 in Europe) species and habitats[11], and by expressing the impacts **in terms of exceedance of habitat and species specific thresholds for each pressure factor**. An example of this are **critical deposition values for nitrogen deposition in sensitive habitats**. For the purposes of a local scale Planetary Boundaries assessment on biodiversity a most suitable planetary boundary indicator is the 'local or regional conservation status' of species and habitats. If the conservation status is 'favorable' it can be assumed that the planetary boundaries for biodiversity are not exceeded, at least within the affected area. The concept of 'favorable' or 'unfavorable' conservation status (FCS, UFCS) has a legal status in the EU as both the Birds and Habitats Directives (the cornerstone legislation of the EU Natura 2000 network) are aiming to bring all protected species and habitats in FCS. Companies aiming to be OPT compliant should therefore do efforts to bring habitats and species, which are affected by company pressures, in favorable conservation status.

Figure 6 shows the visualisation of the overshoot of the boundary for nitrogen deposition as a result of the Enecogen power plant in the Natura 2000 area Solleveld & Kapittelduinen. The local boundary has been exceeded with an average factor 1.12 in a total area of 203 hectares. This factor is a weighted average of several habitat types as shown in the second sphere. In this second sphere the green dashed line indicates the boundary and per habitat the exceedance is presented (not at scale). Finally, in this area there are 27 species possibly affected by the exceedance of the local boundary for nitrogen deposition.

[10] Lammerant J., Ohm J., Thelen D., Nijhof B., Meijer G. Development of a Protocol for Applying the Planetary Boundaries Concept to Nitrogen Emissions, as an example of Business Pressures on Biodiversity (non-published peer reviewed paper)

[11] An often used definition for natural habitats is given the context of the EU Habitats Directive: *natural habitats* means terrestrial or aquatic areas distinguished by geographic, abiotic and biotic features, whether entirely natural or semi-natural.

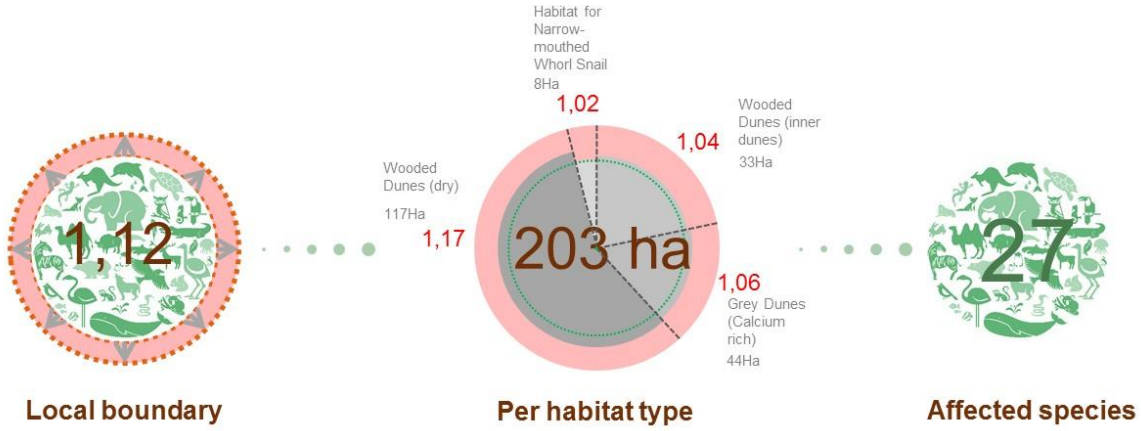

Figure 6: Visualisation of the overshoot of the boundary for nitrogen deposition as a result of the Enecogen power plant in the Natura 2000 area Solleveld & Kapittelduinen (from Lammerant et al., 2016).

The concept of 'ecosystem threshold' is critical when applying a planetary boundary approach. Adding such information to SEEA EEA condition accounts would be very useful for this type of NCA approaches by businesses.

3.2.2 Sustainable Development Goals

The Sustainable Development Goals (SDGs) were introduced in 2015 by the United Nations as a resolution titled '*Transforming our world: the 2030 Agenda for Sustainable Development*'. They cover, as is widely known, 17 overall goals. An interesting way to present these SDGs is the so-called wedding cake (see Figure 7).

The Corporate Reporting Dialogue partners (see 3.3) have released a position paper[12] supporting the development of better reporting guidelines for the Sustainable Development Goals (SDGs). The paper, entitled "SDGs and the future of corporate reporting", identifies how corporate reporting can illustrate which SDGs are relevant to a company's business model, enabling both companies and investors to focus on those SDGs most likely to impact financial performance. The paper also articulates the importance of driving integration of financial and non-financial information to demonstrate how companies create value for stakeholders over the short and long-term. It has become increasingly apparent in recent years that sustainable development is of critical importance for a stable financial system, i.e. if social thresholds or planetary boundaries are not taken into account, these can have serious consequences for both the economic performance of companies and the financial stability of economies. The work of the Task force on Climate-related Financial Disclosures[13] demonstrates the recognition of such risks.

[12] https://corporatereportingdialogue.com/publication/sdgs-and-the-future-of-corporate-reporting/
[13] https://www.fsb-tcfd.org/about/

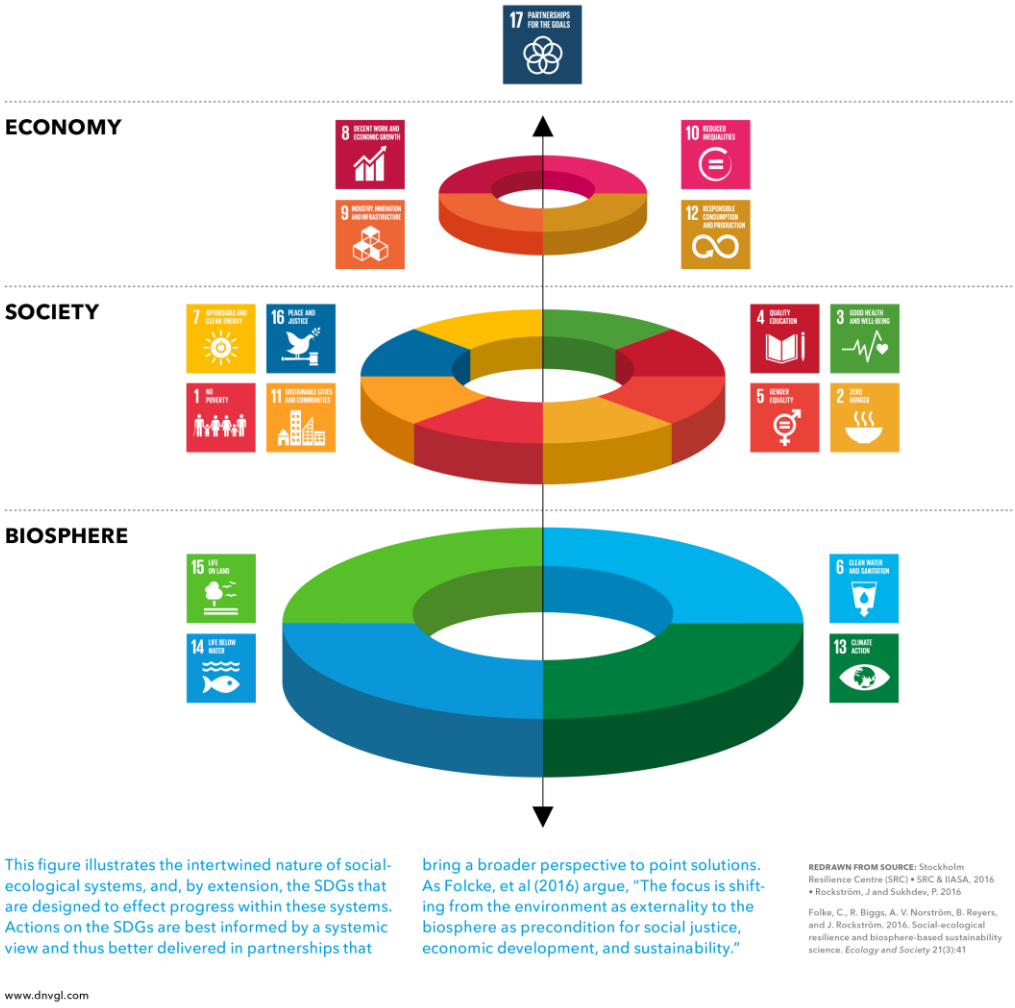

Figure 7: Importance of natural capital related Sustainable Development Goals

Recently GRI[14] and the UN Global Compact[15], the world's largest corporate sustainability initiative, have developed a 'Reporting on SDGs Action Platform'[16], an initiative that intends to accelerate corporate reporting on the Global Goals. The Action platform has created three SDG reporting tools:

- The first tool, the report '*The Analysis of Goals and Targets*'[17] offers a menu of illustrative actions businesses can take to contribute to each SDG target and maps possible disclosures (including indicators) that business can use to report against the SDG targets. The disclosures and indicators – both qualitative and quantitative – are taken from globally accepted disclosure frameworks for businesses, such as GRI Standards or CDP.
- The second tool, *Integrating the SDGs into Corporate Reporting: A Practical Guide*[18] outlines three steps for companies to embed the SDGs in existing business and reporting processes in alignment with GRI

[14] https://www.globalreporting.org/Pages/default.aspx
[15] https://www.unglobalcompact.org/
[16] https://www.globalreporting.org/information/SDGs/Pages/Reporting-on-the-SDGs.aspx
[17] https://www.globalreporting.org/resourcelibrary/GRI_UNGC_Business-Reporting-on-SDGs_Analysis-of-Goals-and-Targets.pdf
[18] https://www.globalreporting.org/resourcelibrary/GRI_UNGC_Reporting-on-SDGs_Practical_Guide.pdf

Standards and recognized principles. The publication is meant to be used together with other relevant tools released by GRI, the UN Global Compact and their partners as part of a company's regular reporting cycle.

- Finally, the third publication, I*n Focus: Addressing Investor Needs in Business Reporting on the SDGs*[19] provides additional information about investor-relevant aspects of corporate SDG reporting.

3.3 Voluntary standards on natural capital reporting

Companies can rely on a wide range of voluntary reporting frameworks related to corporate non-financial performance. The GRI Standards[20] are widely used. GRI has published specific standards on water and biodiversity. Also CDP, formerly the Carbon Disclosure Project, is a commonly used reporting framework. CDP runs the global disclosure system that enables companies, cities, states and regions to measure and manage their environmental impacts. Focus areas are climate change, water and forests. As an example, CDP Water[21] provides guidance for disclosing company water performance. Sector tailored questionnaires on water security are provided[22] .

The International Integrated Reporting Council (IIRC)[23] is a global coalition of regulators, investors, companies, standard setters, the accounting profession and NGOs. The IIRC mission is to establish integrated reporting and thinking within mainstream business practice as the norm in the public and private sectors. IIRC has convened the **Corporate Reporting Dialogue initiative**[24], designed to respond to market calls for greater coherence, consistency and comparability between corporate reporting frameworks, standards and related requirements. It aims to communicate about the direction, content and ongoing development of reporting frameworks, standards and related requirements; identify practical ways and means by which respective frameworks, standards and related requirements can be aligned and rationalized; and share information and express a common voice on areas of mutual interest, where possible, to engage key regulators. Participants are GRI, CDP, CDSB (Climate Disclosure Standards Board), FASB (Financial Accounting Standards Board), IASB (International Accounting Standards Board), IIRC, ISO and SASB (Sustainability Accounting Standards Board). Part of the Corporate Reporting Dialogue initiative, **the Better Alignment Project** is a two-year project focused on driving better alignment in the corporate reporting landscape, to make it easier for companies to prepare effective and coherent disclosures that meet the information needs of capital markets and society. Participants of the Corporate Reporting Dialogue have committed to driving better alignment of sustainability reporting frameworks, as well as with frameworks that promote further integration between non-financial and financial reporting.

3.4 Voluntary standards on monetization of natural capital impacts and dependencies: ISO 14007 and ISO 14008

The area of monetary valuation of environmental impacts and natural resources is huge and complex. ISO has been preparing two standards in this field.

The ISO 14008 standard on 'Monetary valuation of environmental impacts and related environmental aspects' is available since March 2019. The standard does not set out how an organization determines the specific 'cost and

[19] https://www.globalreporting.org/resourcelibrary/addressing-investor-needs-SDGs-reporting.pdf
[20] https://www.globalreporting.org/information/about-gri/Pages/default.aspx
[21] https://www.cdp.net/en/water
[22] https://guidance.cdp.net/en/guidance?cid=10&ctype=theme&idtype=ThemeID&incchild=1&microsite=0&otype=Questionnaire&tags=TAG-598%2CTAG-607%2CTAG-600
[23] https://integratedreporting.org/the-iirc-2/
[24]

benefits' associated with its organizational operation in an Environmental Management context, nor clarify why and how monetary valuation can be used and communicated as part of an existing environmental management approach or system. These aspects are covered in the ISO 1400725 standard on 'Environmental management: Determining environmental costs and benefits' which is expected to be published this year (see below). The ISO 14008 standard provides organizations a common framework including established methods as well as common terms within the field of monetary valuations. Although the deliverable is a requirement standard, in accordance with ISO's neutrality principle, it does not mean that it will be used for the purpose of conformity assessment. The framework ensures a higher degree of transparency regarding the numbers and how impacts and aspects have been valued in monetary terms as requirements relate to documentation and justification of methods chosen. With such a framework more specific standards could be developed in the area. One example is the current development of ISO 14007.

The ISO 14007 offers organizations guidance on determining and communicating the environmental costs and benefits associated with their environmental aspects, impacts and dependencies on natural resources and ecosystem services. This standard will provide direction on decisions that organizations make with regard to identifying and setting the boundaries of their environmental costs and benefits to be considered and also to selecting the type of data to use in order for them to effectively start the process of determining costs and benefits. Overall, measuring both "non-financial" and "financial" information will better inform an organization's decision-making on sustainability.
This International Standard is applicable to any organization regardless of size, type and nature, and applies to the environmental aspects, impacts and dependencies of its activities, products and services that the organization determines are to be included among its environmental costs and benefits.

The rationale for ISO to engage in this area is that there is already a strong trend in monetary assessments by government (i.e. the polluter pays principle), private sector (in reporting, risk assessment etc.) and academia. ISO brought much needed transparency and a common language to this work.

3.5 Voluntary accounting and reporting approaches based on integrated reporting thinking: Environmental Profit and Loss (E P&L)

An Environmental Profit and Loss account (E P&L) is a company's monetary valuation and analysis of its environmental impacts including its business operations and its supply chain from cradle-to-gate. An E P&L internalizes externalities and monetizes the cost of business to nature by accounting for the ecosystem services a business depends on to operate in addition to the cost of direct and indirect negative impacts on the environment. The primary purpose of an E P&L is to allow managers and stakeholders to see the magnitude of these impacts and where in the supply chain they occur.

The E P&L analysis provides a metric to measure and monitor the footprint of the company's operations and suppliers all the way to the initial raw materials. It is a tool to build awareness of the importance of nature to the sustainability of businesses; enhance visibility across a company's supply chain, deepen understanding to focus sustainability efforts and implement better-informed operational decisions; improve specificity for risk management regarding environmental dependencies and impacts; and support a more holistic view of a company's performance, while bringing clarity and transparency to stakeholders at all levels and identifying new opportunities to enhance the sustainability of a company's products.

[25] https://committee.iso.org/sites/tc207sc1/home/projects/ongoing/iso-14007.html

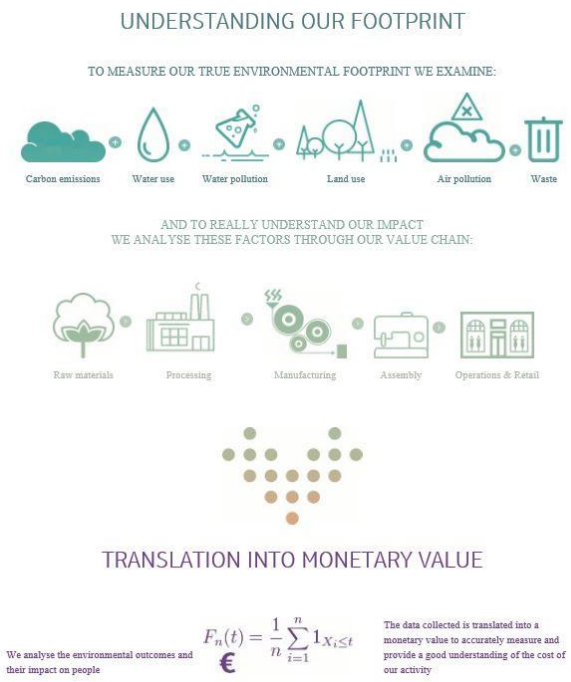

Figure 8: Infographic on E P&L (Kering)

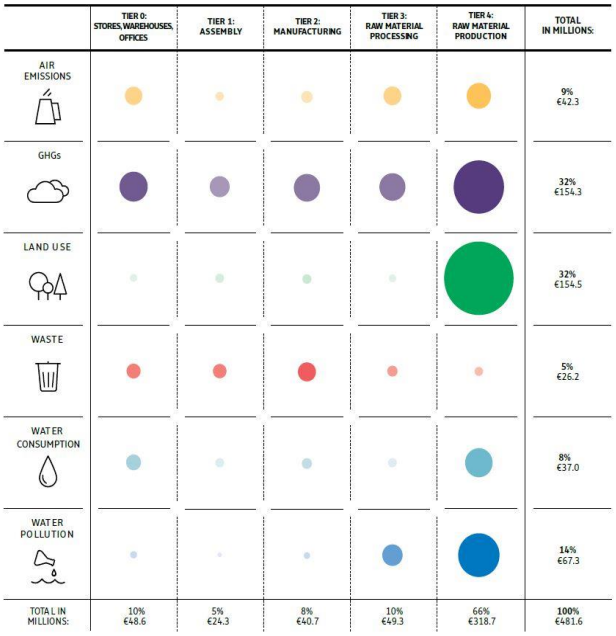

Figure 9: E P&L impacts across supply chain tiers split by impact area (Kering)[26]

The E P&L and the associated methodology were developed with the support of PWC and Trucost and first applied by Puma in 2011. The E P&L used existing input-output models and developed new valuation methodologies, building on a large volume of work in the fields of environmental and natural resource economics such as TEEB, the UN study on The Economics of Ecosystems and Biodiversity. Kering, the parent company for Puma, is continuously working to refine the methodology and has released its Environmental Profit and Loss Accounting methodology in an open source mode[27] (see Figure 8). Nowadays, several companies apply E P& L (standalone or as part of Integrated Profit & Loss, I P&L – see Box 3), such as Kering (see Figure 9), Novo Nordisk, Vodafone, Philips, etc.

Box 3: Integrated reporting

I P&L is an example of Integrated Reporting (IR), a concept developed by the International Integrated Reporting Council (IIRC)[28]. IIRC is a global coalition of regulators, investors, companies, standard setters, the accounting profession and NGOs. The IIRC's mission is to establish integrated reporting and thinking within mainstream business practice as the norm in the public and private sectors. IIRC published the IR Framework[29]. The following extract on the stock and flow of capitals is relevant for this research:

> 2.10 All organizations depend on various forms of capital for their success. In this Framework, the capitals comprise financial, manufactured, intellectual, human, social and relationship, and natural, although organizations preparing an integrated report are not required to adopt this categorization.

26 https://keringcorporate.dam.kering.com/m/08af8fea0ef3060f/original/kering_EN_developpementdurable_publishes_2017_group_epl_results-pdf.pdf

27 https://www.kering.com/en/sustainability/environmental-profit-loss/methodology/

28 http://integratedreporting.org/the-iirc-2/

29 http://integratedreporting.org/wp-content/uploads/2015/03/13-12-08-THE-INTERNATIONAL-IR-FRAMEWORK-2-1.pdf

2.11 The capitals are stocks of value that are increased, decreased or transformed through the activities and outputs of the organization. For example, an organization's financial capital is increased when it makes a profit, and the quality of its human capital is improved when employees become better trained.

2.12 The overall stock of capitals is not fixed over time. There is a constant flow between and within the capitals as they are increased, decreased or transformed. For example, when an organization improves its human capital through employee training, the related training costs reduce its financial capital. The effect is that financial capital has been transformed into human capital. Although this example is simple and presented only from the organization's perspective, it demonstrates the continuous interaction and transformation between the capitals, albeit with varying rates and outcomes.

3.6 Voluntary thematic accounting approaches: water assessment, biodiversity assessment

Apart from comprehensive environmental accounting approaches, businesses can rely on a plethora of thematic accounting approaches such as specific approaches on water accounting and biodiversity accounting.

3.6.1 Water accounting

In the field of water, a well-known approach is the **Global Water Tool™**[30], developed by WBCSD. It is a free, publicly available resource for identifying corporate water risks and opportunities which provides easy access to and analysis of critical data. It includes a workbook (data input, inventory by site, key reporting indicators, metrics calculations), a mapping function to plot sites with datasets, and a Google Earth interface for spatial viewing.

The Global Water Tool™ supports companies operating in multiple countries in starting their water management journey and helps companies build long-term water management strategies which minimize risk and build long-term resilience. Users can quickly map their locations and water use data against water, sanitation, population and biodiversity datasets, as well as stress indicators on a country and watershed basis, and in turn assess risks related to their global operations, supply chains, new projects and prioritize action. Key benefits are 1°/ an increased understanding of water use/needs of operations in relation to local externalities (including staff presence, industrial use and supply chain, water consumption and efficiency) to make informed decisions, and 2°/ performing a first level screening through maps or charts capturing key water performance and risk indicators of water consumption, efficiency and intensity; these metrics can then be used for communication with internal and external stakeholders and reporting under corporate disclosure initiatives like the Global Reporting Initiative, **CDP Water** (see below), Bloomberg and Dow Jones Sustainability Index.

For discussing the links between corporate and national level ecosystem data, it's interesting to note that the external datasets[31] used in the tool were developed by Food and Agriculture Organization (FAO) AQUASTAT (country level), World Health Organization and UNICEF Joint Monitoring Program (country level), United Nations Population Division (UNDESA) (country level), World Resources Institute (WRI) (country and watershed level), International Water Management Institute (IWMI) (watershed level) and Conservation International (CI)(watershed level).

[30] https://www.wbcsd.org/Programs/Food-Land-Water/Water/Resources/Global-Water-Tool
[31] https://docs.wbcsd.org/2017/06/GWT_Datasets_%20July%202015.pdf

The tool is compatible with **GEMI's Local Water Tool™**[32] to build water management plans at a specific site or operation. The GEMI Local Water Tool™(LWT) is a free tool for companies and organizations to evaluate the external impacts, business risks, opportunities and management plans related to water use and discharge at a specific site or operation. The information generated in the **GEMI LWT™** may be used by companies for internal or external communication at their discretion. The **GEMI Local Water Tool™(LWT) for Oil and Gas** is a tool customized for petroleum companies. Total is one of the users of this tool.

3.6.2 Biodiversity accounting

In the light of the growing attention for natural capital accounting (NCA) and a clear demand for methodologies for including ecosystems and biodiversity into NCA, several attempts are ongoing to develop pragmatic biodiversity metrics for businesses and FIs. Faced with these multiple approaches and based on requests from its members, the EU Business @ Biodiversity Platform (EU B@B Platform)[33], in particular Workstream 1 on Natural Capital Accounting[34] and Workstream 3 on Financial Institutions and Biodiversity[35] conducted a critical assessment of 10 biodiversity accounting approaches developed for or by businesses and FIs[36]. The report provides an overview of different methodological approaches, compares their key features and identifies key obstacles faced by these approaches as well as gaps that need to be covered. These approaches[37] were subsequently discussed in a technical workshop in March 2019[38], which was jointly organized by the EU B&B Platform and the Aligning Biodiversity Measures for Business initiative[39], led by UNEP-WCMC and funded by Boticário Foundation (Brazil).

A key objective of this workshop was to start defining common ground principles for biodiversity accounting approaches for business. The proliferation of diverging methodologies and metrics increases confusion amongst businesses and financial institutions on which approach to apply for which purpose. It also makes comparison between methods and metrics challenging, e.g. for investors willing to compare corporates on their biodiversity performance. One of the key objectives of both the EU B&B Platform and the Aligning Biodiversity Measures for Business initiative will therefore be to encourage convergence between methodologies by identifying and working towards common ground (in terms of definitions, interpretations of key concepts such as baseline and area of influence, data sources, indicators, etc.) and to clarify which approaches support which type of business decisions (referred to as business applications in the literature).

On 23 May 2019 the public consultation on the Biological Diversity Protocol has been launched[40]. The BD Protocol is designed as a comprehensive biological diversity **accounting and reporting framework for businesses**. The

[32] http://gemi.org/localwatertool/
[33] http://ec.europa.eu/environment/biodiversity/business/index_en.htm
[34] http://ec.europa.eu/environment/biodiversity/business/workstreams/natural-capital-accounting/index_en.htm
[35] http://ec.europa.eu/environment/biodiversity/business/workstreams/finance/index_en.htm
[36] http://ec.europa.eu/environment/biodiversity/business/news-and-events/news/news-106_en.htm
[37] http://ec.europa.eu/environment/biodiversity/business/assets/pdf/2019/Overview%20of%20biodiversity%20measurement%20approaches.pdf
[38] http://ec.europa.eu/environment/biodiversity/business/news-and-events/news/news-140_en.htm
[39] The Aligning Biodiversity Measures for Business initiative is a collaboration between 22 institutions engaging in corporate biodiversity indicator development. It aims to form a common view amongst key stakeholders on the measurement, monitoring and disclosure of corporate biodiversity impact and dependencies and to build on this to help integrate more credible and comprehensive indicators of corporate contribution to global biodiversity goals into corporate reporting and global policy frameworks, see also http://ec.europa.eu/environment/biodiversity/business/assets/pdf/2019/The%20Aligning%20Biodiversity%20Measures%20for%20Business%20Initiative.pdf
[40] https://naturalcapitalcoalition.org/public-consultation-opens-on-the-biological-diversity-protocol/

BD Protocol is an output of the Biodiversity Disclosure Project (BDP), managed by the National Biodiversity and Business Network (NBBN) of South Africa and hosted by the Endangered Wildlife Trust (EWT). While the GHG Protocol Corporate Accounting and Reporting Standard was the benchmark standard for the vision and structure of the BD Protocol, the BD Protocol is aligned to the Natural Capital Protocol. It helps provide biodiversity-specific guidance to measuring changes in the state of biodiversity (step 6 of the Natural Capital Protocol). The BD Protocol is an example of applying biodiversity accounting concepts in an analogous way as advocated by the SEEA EEA Technical Recommendations, although similarities and differences need to be further explored. The BD Protocol includes guidance on how to:

- Develop and manage a **biodiversity impact inventory** according to the appropriate organisational and value chain boundaries;
- Account for net changes in biodiversity, in accordance with the impact mitigation hierarchy and the associated equivalency principle;
- Apply the biodiversity accounting framework to build **Statements of Biodiversity Position and Performance and account for biodiversity gains and losses over time**; the BD Protocol defines a company's biodiversity footprint as the total land footprint of an organisation, which can be expressed in any surface area metric (e.g. hectares, square miles or square kilometres) and is made up of two components – the positive biodiversity footprint and the negative biodiversity footprint of the organisation – reflecting the land cover condition. The biodiversity footprint of a business is thus equal to the sum of all positive and negative impacts on land cover types within the company's biodiversity impact inventory, that is the equation of the Statement of Land Cover Position. These positive and negative footprints should be expressed in an appropriate relative surface area indicator, such as hectare, square mile or square kilometre equivalents, while their respective share of total footprint may be shown as percentages.
- Disclose or report on an organisation's impacts on biodiversity in a coherent and meaningful manner. The BD Protocol recommends to use quantitative, non-monetary information about the scale of a company's biodiversity positive and negative impacts, across the selected value chain boundaries of the company's biodiversity impact inventory.

3.7 Regulatory frameworks for non-financial reporting: the EU Non-Financial Reporting Directive

According to the KPMG Global Survey 2017 on CSR reporting[41] governments, regulators and stock exchanges continue to play a key role in driving up corporate responsibility reporting rates around the world. In the three countries which have experienced the greatest increases in reporting since 2015 -Mexico (+32 percentage points), New Zealand (+17 percentage points) and Taiwan (+11 percentage points) -a mix of new regulation, stock exchange requirements and investor pressure have been instrumental in increasing reporting.

The EU NFRD (Non Financial Reporting Directive)[42] is operational since 2018 and requires large companies to disclose certain information on the way they operate and manage social and environmental challenges. The idea is that this helps investors, consumers, policy makers and other stakeholders to evaluate the non-financial performance of large companies and encourages these companies to develop a responsible approach to business. The Directive only applies to large public-interest companies with more than 500 employees. This covers approximately 6,000 large companies and groups across the EU, including listed companies, banks, insurance companies and other companies designated by national authorities as public-interest entities. The Directive gives companies significant flexibility to disclose relevant information in the way they consider most useful and this lack of standardization has resulted in poor outcomes during the first year (2018 reporting year). The general information that most companies provide does not allow readers to understand their impacts and by extension their development, performance and position, as required by the Directive[43]. The Commission is working on an adapted version of the Directive.

[41] https://home.kpmg/content/dam/kpmg/campaigns/csr/pdf/CSR_Reporting_2017.pdf
[42] https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/non-financial-reporting_en
[43] http://allianceforcorporatetransparency.org/assets/2018_Research_Report_Alliance_Corporate_Transparency-66d0af6a05f153119e7cffe6df2f11b094affe9aaf4b13ae14db04e395c54a84.pdf

4 Trends in corporate ecosystem accounting and reporting and related initiatives

The corporate environmental and reporting scene is evolving rapidly. Below a number of observations and ongoing initiatives are described. These are important for guiding the discussions with participating companies and for shaping the workshop. It is clear that there is an increased demand for standardization of corporate environmental accounting, not only from the investor's community but also from other stakeholders (NGOs, public authorities, etc…) and even from the business community.

4.1 Global trends in corporate non-financial reporting

Companies are facing an increased demand from governments, investors and wider society (e.g. NGOs) to disclose information about their non-financial performance, as part of corporate CSR reporting. This includes information on how companies affect ecosystems. It's interesting to discuss some substantial changes corporate CSR reporting is facing in the years to come. A number of key messages from the latest biannual KPMG Global Survey 2017 on CSR reporting[44] (based on assessment of top 100 companies in 49 countries and the global top 250 companies) are very relevant in that respect:

- 'Get ready for **more reporting regulation.** Governments and stock exchanges are bringing in new layers of regulation for environmental, social and governance (ESG) disclosure. Voluntary guidelines are rapidly transitioning into mandatory reporting requirements in many parts of the world.'
- 'Reporting integration is the new normal and **"non-financial" is the new financial.** Environmental and social issues such as climate change, water scarcity and human rights will increasingly be seen as financial rather than non-financial issues. Transparency about the financial risks and opportunities and the likely effects on the business's value creation will be key!'.
- 'From here on, it's all about **reporting impacts** instead of just statistics. Traditional CSR has focused on reporting statistics (e.g. how many cubic meters of water a company has saved, how many tons of carbon it has reduced or how many employees it has sent on training programs). Such statistics lack real meaning without information on **context and impact**. The future of corporate responsibility reporting is all about communicating impact, not statistics. Financial stakeholders need to know what impacts a business is having on society and the environment, and how this could impact the business performance in the future. They want to see that the company understands these impacts and to understand what the company's response is.'
- 'SDGs are fueling demands for impact data. It is not just civil society and NGOs that want this information, a number of large institutional investors is exploring how they can align their investment approaches with the SDGs.'

Not mentioned in the KPMG survey is the growing **tendency towards harmonization and standardization of non-financial accounting and reporting approaches**. This is illustrated by the Better Alignment Project (see 3.3) and the Aligning Biodiversity Measures for Business initiative (see 3.6.2) which are both initiatives seeking more common ground between accounting and reporting approaches. This tendency is further confirmed by the initiatives described below.

4.2 Initiatives

4.2.1 EU Natural Capital Accounting Program (under development)

At the EU level, DG ENV aims to put environmental accounting much higher on the agenda for the next European Commission and is preparing a Natural Capital Accounting Program that would form part of a strengthened sustainable finance strategy for the period beyond 2020. It complements ongoing work, including work on an EU taxonomy, accounting, and non-financial reporting that is already part of the action plan on financing sustainable growth.

The lack of harmonized methods and metrics available for measuring and managing environmental risks is a key obstacle for scaling sustainable investments[45]. A taxonomy is being established to help investors in the process of establishing what are sustainable investments according to agreed ESG criteria[46]. That is expected to be most suitable for financial intermediaries and products such as bonds or loans. However, it might turn less suitable to support (large) corporate or project managers in measuring and managing environmental risks. For that purpose, environmental accounting is expected to offer important complementing options notably in 'grey' sectors that require managing a large and complex environmental footprint that may change rapidly over the years.

The implementation of standards and guidelines for corporate and project level environmental accounting is considered as an essential additional and complementarity step to the elaboration of a taxonomy for sustainable investments and to the obligatory reporting of non-financial performance by the EU's largest companies. It is the missing piece of the puzzle. Corporates are disclosing sustainability performance information in a totally non-comparable way, and at the end, with little or no useful information on related business risks – information which is essential for investors. As a result, there is an increasing sustainability reporting fatigue combined with a quest for harmonization comparable to financing accounting.

This demand is not only coming from the Commission or government agencies, but also from businesses themselves. There are a growing number of companies showing interest in environmental accounting, based on traditional businesses accounting frameworks. The I P&L ('integrated profit and loss') and E P&L ('environmental profit and loss') are examples of such approaches, relying on managerial and cost accounting methods which are the two primary forms of accounting used by business. Management accounting provides disaggregated information on specific components of a business's operations and is used internally to inform day-to-day operations and set future strategic directions. Financial accounting provides information on the business as a whole and is used in decision making by external entities, primarily in the investment community. As financial accounts are external facing, they are subject to well-established accounting rules and standards.

The relatively new practice in corporate environmental accounting may be useful joined up with work on national environmental accounting, for example to ensure the latter can provide the necessary context of the former.

The Program comprises five intertwined strategic work streams that can together establish a solid environmental accounting framework in support of assessing and comparing the position and performance of a given entity in terms of environmental risks. Together with the taxonomy and provisions on non-financial reporting, it should

[45] Cf. the Report of the High-level Expert Group on Sustainable Finance published in January 2018 and the March 2018 Action Plan for Financing Sustainable Growth.

[46] The process for defining those criteria is ongoing albeit focused so far solely on climate mitigation and adaptation criteria while ensuring other environmental criteria are not harmed. The outcome will be used by financial intermediaries to determine sustainable assets and/or rate the sustainability of investment portfolios.

enable a fully functioning management information system that can support robust sustainable finance and investment decisions by 2025 at the latest. The Program consists of 5 key components (see Box 4).

Box 4: Natural Capital Accounting Program

1. Corporate Environmental Accounting Standards and Guidelines (CEAS)
2. Project Environmental Accounting Standards and Guidelines (PEAS)
3. National Environmental Accounting Standards and Guidelines (NEAS)
4. Product Environmental Footprint Standards (PEFS)
5. Default External Cost Data Bases (DEC)

The common features that these respective accounting work streams share include the holistic coverage of the natural environmental also known as the natural capital components including air, water, land, and biodiversity and the possibility to combine total monetized impacts.

Corporate Environmental Accounting Standards (CEAS)

CEAS builds on the growing practice of monetized natural capital accounting adopted by large companies in various sectors with support of financial service companies. It follows pioneering work on "Environmental Profit & Loss Accounting" by Puma, PwC and Trucost that gradually evolved into a standard method developed and applied by Kering (see 2.1 Frameworks and Standards). It allows measuring the environmental performance of businesses for all material components of the natural capital (including impacts or dependencies across the value chain) and comparing it with other business also over time. Because it builds on managerial or cost accounting methods (used to allocate costs and revenues to specific products and business divisions and subsequently support the management of cost or profit centres), CEAS-based information will blend easier with data driving executive decision-making and scaling "green investment". Several large corporations have confirmed an interest to work with DG ENV and other public partners on developing generally accepted environmental accounting principles (also known as E-GAAP), ultimately applicable at the global level, similar to the practice in traditional finance where accounting helps informing investment decision makers in corporate and financial companies and institutions.

The NCA programme is now generally considered a priority area by ENV senior management and other informed partners, including leading practitioners. Hence it will likely become a strategic action for the next Commission (2020-2025).

4.2.2 Initiatives to align national environmental accounting and corporate environmental accounting

There is increased interest in aligning national level natural capital accounting with corporate level natural capital accounting (see Box 5 on the KIP INCA project[47] and Box 6 on the Combining Forces initiative by the Natural Capital Coalition[48]). Such alignment has the potential to create significant drivers for corporate action on natural capital.

Similar developments are underway with regard to **monetisation** of impacts and dependencies on natural capital. Stakeholder consultation by Cambridge Conservation Initiative and the Natural Capital Coalition to scope out the nature of support required by companies on natural capital accounting identified guidance on valuation of

[47] http://ec.europa.eu/environment/nature/capital_accounting/pdf/KIP-INCA-ScopingPaper.pdf
[48] https://naturalcapitalcoalition.org/projects/combining-forces-on-natural-capital/

biodiversity (monetary and non-monetary) as lacking. Currently, therefore, biodiversity is likely to be less well represented in this trend than other issues for which valuation is more straightforward. Clear, simple communication of the value of biodiversity within the context of non-financial reporting will be important, translating the increased evidence of operational, reputational, legal, market and financial risks related to poor biodiversity performance into tangible costs and benefits for business and FIs. A recent workshop by the EU Business & Biodiversity Platform in collaboration with UBA (German Ministry for Environment) and the Natural Capital Coalition (10 April 2019) confirmed that there is an increasing demand from business (e.g. option appraisal in context of projects, procurement) and investors to monetise both environmental externalities (societal values) and business impacts of their decisions. Efforts to harmonize assessment of environmental costs and benefits and associated monetary valuation at an international level covering the private and public sector have already begun through the development of ISO 14007[49] and 14008[50] with a focus on describing flexible, process-based approaches, including delineation of potential valuation options (see 3.4).

Box 5: KIP INCA

An integrated natural accounting system for ecosystems and their services and associated data sets is being developed by the EU Knowledge Innovation Project (KIP INCA). This will aim to provide a multi-purpose tool that can be used for decision making for a range of policies, at different stages of the policy cycle, and that national authorities and research centres can access. It can enable to explicitly account for the range of ecosystems and their services and demonstrate in monetary terms the benefits of investing in nature and the sustainable management of resources. KIP INCA involves: DG ENV[51], Eurostat[52], EEA[53], JRC[54], RTD[55], and links with Member State activities and MAES[56].

NCA and the work of KIP INCA can provide added value in a range of specific policy contexts including (inter alia): 'In the context of the Union's promotion of environmentally responsible business practices, NCA has potential in providing a concrete basis for business performance reporting by explicitly mapping out impacts and/or dependencies on natural resources and placing a monetary value on them. At this moment this angle has hardly been explored by the KIP INCA initiative.

Box 6: Combining Forces initiative

The 'Combining Forces' program was established to bring together the public and private sectors' thinking on natural capital (Natural Capital Coalition, 2017). The objective of Combining Forces is to foster a greater mutual understanding of different approaches to the assessment of natural capital and to co-ordinate efforts to ensure that our relationship with nature is accounted for and included in decision-making. In November 2018 a paper was published to identify the way ahead[57]. It contains an interesting analysis of how current NCA approaches can be distinguished on the basis of the public/private angle and the internal decision-making/external disclosure angle.

[49] https://committee.iso.org/sites/tc207sc1/home/projects/ongoing/iso-14007.html
[50] https://www.iso.org/standard/43243.html
[51] Directorate General on Environment (European Commission)
[52] https://ec.europa.eu/eurostat
[53] European Environment Agency https://www.eea.europa.eu/
[54] Joint Research Centre https://ec.europa.eu/jrc/en
[55] https://ec.europa.eu/info/departments/research-and-innovation_en
[56] http://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/index_en.htm
[57] Spurgeon, J., Obst, C., Santamaria, M., Gough, M., and Spencer R., (2018) Combining Forces: Priority Areas for Collaboration. A thought leadership paper on advancing Natural Capital Approaches.

At a very broad level, natural capital approaches for the private and public sectors can be used in two main ways. On the one hand, some approaches are used primarily for compiling accounts, reporting and disclosure and undertaking comparisons over time. The latter can be within and across companies, sectors and countries. On the other, some approaches are used primarily for internal decision-making, for example in making choices between alternative scenarios.

Accounting or disclosure focused approaches equate closely with 'financial accounting' and the 'System of National Accounts'. These approaches typically look at stocks of natural capital comparing two points in time (e.g. balance sheets and asset accounts) and record the changes in stocks between the two points in time and the associated flows of services and benefits (e.g. Environmental Profit & Loss accounts[58] and ecosystem service supply and use accounts). Key desirable features include repeatability and consistency to allow for comparison (e.g. between years, companies or countries) and assessment of performance and outcomes over time. As such, there is considerable benefit to be gained from consistency, so standardization of definitions, measurement boundaries (e.g. of assets and income) and rules around valuation is of very high importance.

Internal decision-making approaches equate closely to 'management accounting' and approaches for 'option/investment appraisals'. In the private sector, the Natural Capital Protocol has been developed specifically to support companies to include their relationship with natural capital within decision-making through a non-prescriptive, process-based approach. Its initial focus was on internal decision making rather than external disclosure. There is less need for a prescriptive and consistent approach between organizations when undertaking such assessments, as long as the best decision is made. Given the vast spectrum of potential internal decisions to be made in so many different contexts, the critical issue here is that measurement boundaries and approaches to valuation simply need to be 'fit for purpose'. Key desirable features thus include flexibility while sticking to key principles. However, there are benefits from having consistency to techniques and approaches within decision-making, as evidenced by the existence of many guidelines and books on management accounting and environmental valuation techniques. When trying to demonstrate 'creating shared value' or when managing shared dependencies, transparency and standardization of approaches would certainly be beneficial, especially in the eyes of stakeholders.

The ideal end point is that the information created through natural capital approaches is useful and in this respect, it will be important to establish where there is most need for consistency, and where it makes sense to retain flexibility. It's clear that the Combining Forces initiative is a key actor in the field of corporate environmental accounting.

4.2.3 WBCSD's Redefining Value program[59]

WBCSD's project on Purpose Driven Disclosure (PDD)[60] is relevant in the context of this research. This project seeks to understand how environmental, social and governance (ESG) information influences management decisions and actions in business and among investors. It's called "purpose-driven disclosure" because it looks at the link between companies' external ESG disclosures and investor actions, and how these influence sustainable outcomes. WBCSD aims to help companies disclose relevant, decision-useful information – that is, information with a purpose – to encourage the flow of capital to more sustainable companies and outcomes.

[58] Although E P&L is also used for internal decision making
[59] https://www.wbcsd.org/Programs/Redefining-Value
[60] https://www.wbcsd.org/Programs/Redefining-Value/External-Disclosure/Purpose-driven-disclosure

4.2.4 The Value Balancing Alliance

Very recently, given the increasing request from investors and other stakeholders for ensuring comparability of results BASF has launched the Value Balancing Alliance (see Figure 10). It is a 3-years not-for-profit alliance which is established to standardize calculations and ensure comparability of results. The Alliance will also perform pilots in management accounting and make outcomes publicly available.

Figure 10: Participants in the Value Balancing Alliance (from Net Impact Approaches conference, London, 23 May 2019)

5 Actual level of business accounting and reporting on ecosystems and ecosystem degradation and restoration

At this moment business accounting and reporting with regard to 'ecosystem quality' or 'ecosystem condition' is quite poor. Even in terms of risk reporting, i.e. the risks for the company due to ecosystem degradation, there is much room for improvement. The analysis considers three risk perspectives related to ecosystem degradation, i.e. water, climate change and biodiversity.

5.1 Water related risks

Already in 2007 in 'Corporate Reporting on Water: A Review of Eleven Global Industries'[61], the Pacific Institute has evaluated how global companies recognize, address, and report their water-related risks and practices. Using a framework1 of ten activities for managing water-related business risks, the authors analyzed corporate sustainability and corporate social responsibility reports from 139 of the largest companies in 11 water-intensive industry sectors. This analysis reveals several patterns and gaps in corporate water reporting which might still be quite valid today:

- The **vast majority of companies in water-intensive industries now report water information as standard practice**. The few companies not reporting in these sectors are the exception, not the norm.
- **Lack of context in water reporting** undermines the understandability and usefulness of the data provided. Only half the reports have information on company water policies or a description of water-management objectives. Fewer provide industry averages for any of the measures reported, or comparisons among their own facilities.
- Despite some standardization in the field, **water measurement methods and definitions remain inconsistent**. Companies use various definitions and scoping boundaries to report water use and wastewater information, making comparison and benchmarking difficult.
- **Information on companies' water-related risks is not widely reported**. Only one in five reporting companies mentions water risks and challenges or describes programs to assess water risks.
- **Quantitative water-related targets are not commonly published**. Only 30% of the reports provide quantitative targets and even these often do not cover all the indicators reported by the company.
- **Supply chain issues are often overlooked**. Only 1 in 10 reports mentions supply chain considerations in relation to water management. Not a single company reports on the actual water use or wastewater data of their suppliers.
- Despite regional vulnerabilities, **site-specific information is rarely considered or provided**. Many companies recognize their water-related risks are location-specific. However, only 18% of the reports include local or facility-level water performance information.
- **Water recycling data are not reported**. Although many companies mention their focus on water recycling, only 1 in 10 reports include water recycling amounts or rates.

The recent CDP's Global Water Report 2018[62] is based on data from 2.114 high impact companies who provided data about their efforts to manage and govern freshwater resources through CDP. The report brings some alarming messages. With 19% of water withdrawals coming from industry, and a further 70% from agricultural

[61] http://www.pacinst.org/wp-content/uploads/2013/02/corporate_reporting_on_water3.pdf
[62] https://6fefcbb86e61af1b2fc4-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/004/232/original/CDP_Global_Water_Report_2018.pdf?1554392583

supply chains, companies have a massive role to play in meeting SDG6. There is also a clear economic imperative for action: in 2018 water-related financial losses reached US$36 billion. **Yet, despite a growing awareness of water risks companies are not yet reducing withdrawals**.

Water withdrawals in 2018: About the same Higher Lower First year of measurement

Figure 11 shows the evolution in terms of water withdrawals between 2017 and 2018 for company 'at risk' facilities. It's clear that the 5 project countries of the NCAVES project are facing serious water risks.

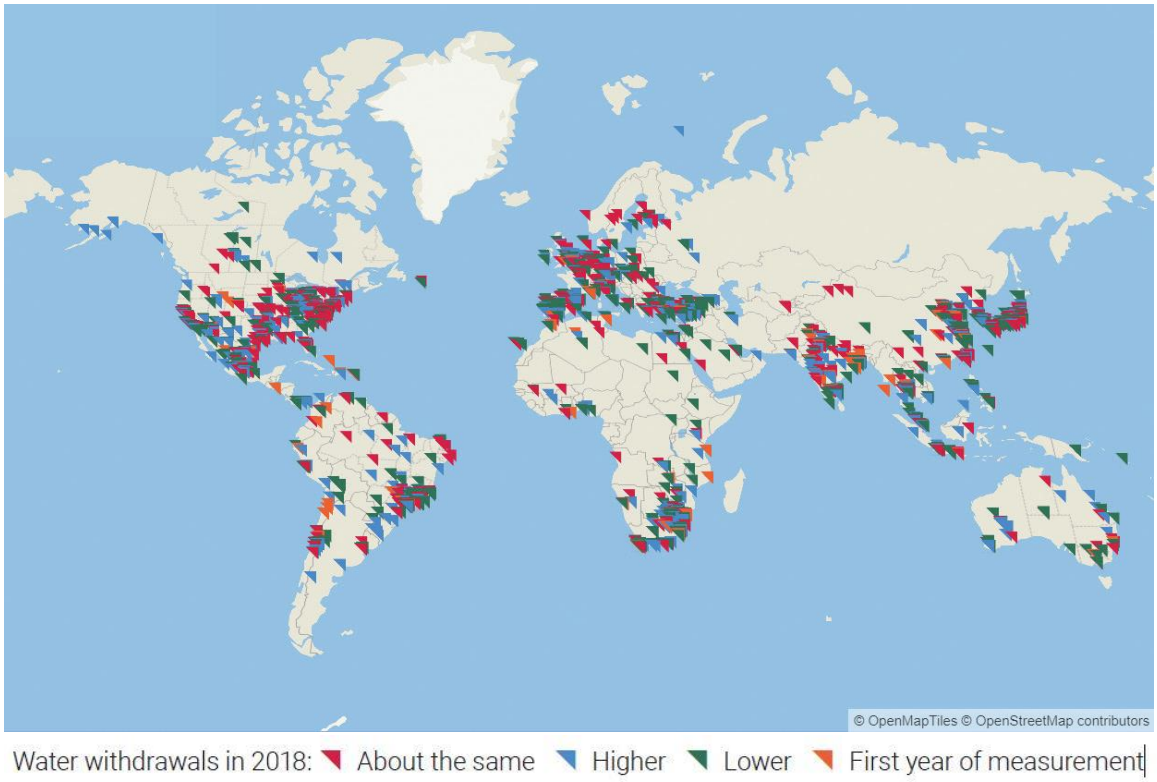

Figure 11: Facilities at risk across the world (CDP Global Water Report 2018)

This year, CDP examined 296 of the world's largest companies that have consistently reported water information through CDP between 2015 and 2018. This cohort identified more substantive water risks year-on-year (75% in 2018, up from 70% in 2015) and the number setting targets to reduce water withdrawals doubled over the four-year period. But this ambition has not translated into actual reduced dependence on water resources, with an almost 50% increase in the number of companies reporting higher water withdrawals.

This worrying trend holds both for company-wide water withdrawal figures and figures for sites facing substantial water risks, with the biggest increases among companies in the Food, Beverage & Agriculture, Manufacturing and Mineral Extraction sectors, and those operating in Asia and Latin America (see Figure 12). Further, while there has been a modest reduction (7%) in the number of companies reporting withdrawals from non-renewable groundwater, companies reporting higher withdrawals from all other sources, including renewable groundwater and surface water, has risen on average 35%.

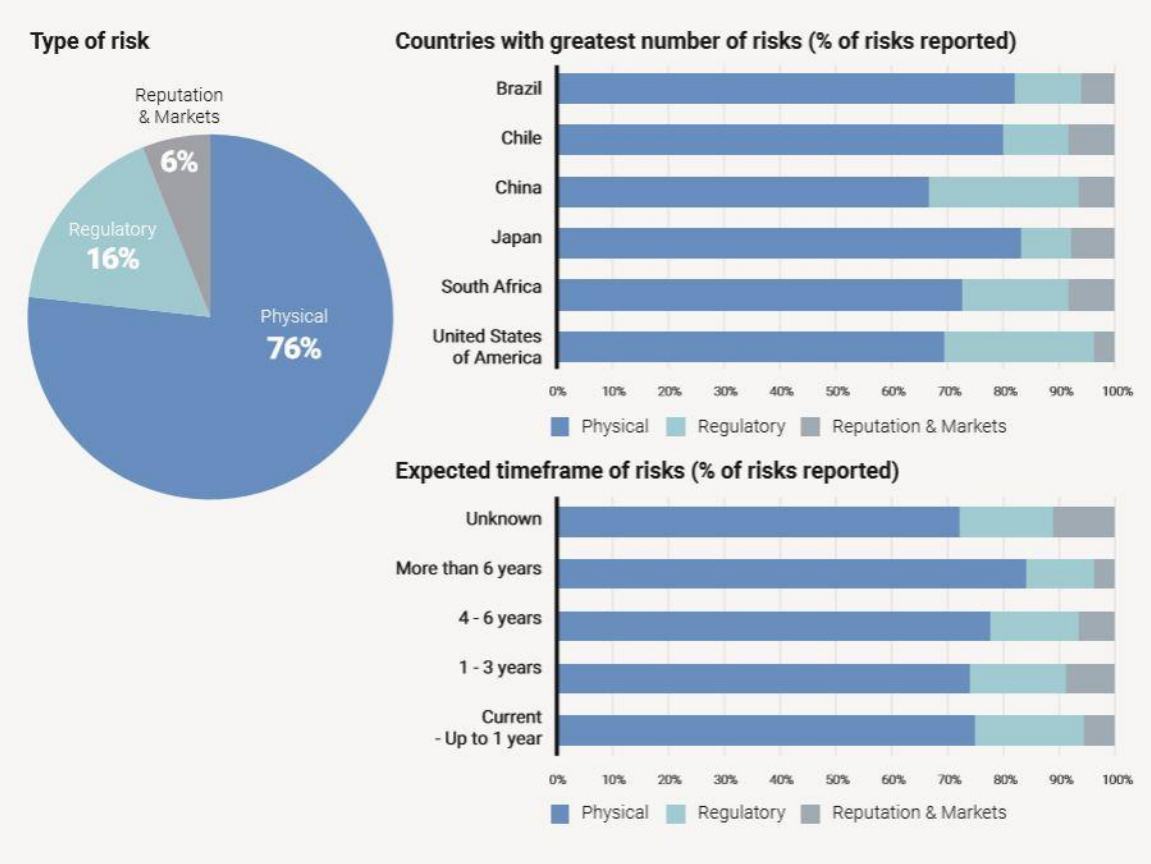

Figure 12: Water related business risks (CDP, 2018)

5.2 Climate change related risks

KPMG's Global Survey 2017 on CSR reporting[63] provides useful information on the level of climate risk reporting by businesses. Of those companies that do acknowledge climate change as a financial risk in their financial reporting, a relatively high proportion of both the N100 (63 percent) and G250 (76 percent)[64] provide some narrative description of the potential impacts. Very few, however, are currently quantifying the potential impact of those risks in financial terms or modeling it using scenario analysis or other methodologies as the Task Force on Climate-related Financial Disclosures (TCFD)[65] recommends. There are five countries where a majority of the top 100 companies already acknowledge climate change as a financial risk in their annual financial reports. One of them is South Africa where climate change impacts have been high on the business agenda as severe droughts have affected the country in recent years.

When looking at N100 companies, this survey shows that Forestry, Food, Oil & Gas, Utilities and Automotive sectors (which broadly correspond to the TCFD priority sectors) have a higher than average rate of acknowledging climate risk. On the other hand, Financial Services, Construction & Materials and Transport & Leisure have a lower than average rate. It should be noted, however, that there were no industry sectors in 2017 in which a majority of N100 companies acknowledge the financial risk of climate change.

[63] https://home.kpmg/content/dam/kpmg/campaigns/csr/pdf/CSR_Reporting_2017.pdf
[64] top 100 companies in 49 countries and the global top 250 companies
[65] https://www.fsb-tcfd.org/about/

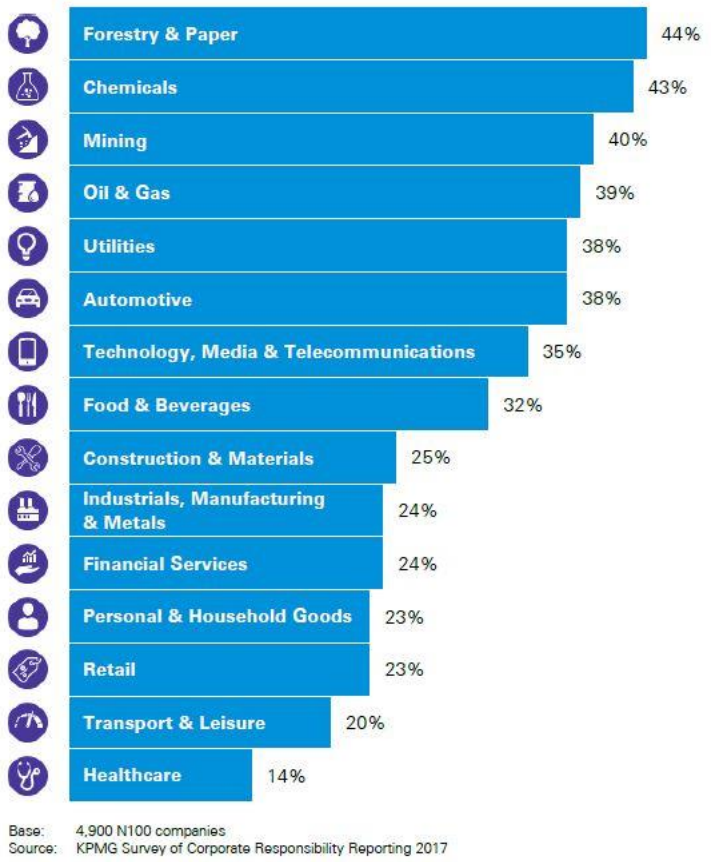

Figure 13: Level of climate risk disclosure by business sectors in 2017 (KPMG, 2017)

5.3 Biodiversity related risks

Several studies have revealed that corporate biodiversity disclosure is very poor (see Box 7).

Box 7: Assessment of Fortune Top 100 Biodiversity Disclosure (Addison et al., 2018 [66])

The study assessed the sustainability reports of the top 100 of the 2016 Fortune 500 Global companies (hereafter the Fortune 100), to understand what commitments, activities, and biodiversity performance businesses are publicly disclosing. The study offers a global snapshot of the biggest corporations around the world, across multiple sectors of business, and revealed that of the top Fortune 100 companies, 86 have publicly available sustainability reports. Almost half (49) of the Fortune 100 companies mentioned 'biodiversity', 'nature', 'species', or 'ecosystem' in their sustainability reports. This could be as brief as a single mention in the context of other environmental issues (e.g., climate), through to a dedicated biodiversity chapter, with clear biodiversity commitment(s) and disclosure of biodiversity-related activities. Whilst this figure of 49 might look impressive, a closer look at which companies were making commitments that were specific, measurable & time bound, revealed that only five of the Fortune 100 did so (Walmart, Hewlett Packard, AXA, Nestlé and Carrefour). For example, Walmart's commitment: "To conserve one acre of wildlife habitat for every acre of land occupied by Walmart U.S. through 2015". Beyond Walmart's commitment, none of the remaining Fortune 100 had adopted quantifiable biodiversity commitments (e.g. no net loss or better).

[66] https://prueaddison.com/2018/09/26/advancing-corporate-biodiversity-accountability/

SDG 14 and 15 are the least well reported of the SDGs by companies, in part because of a perceived lack of materiality, but also because of a lack of indicators to enable that reporting[67]. Therefore, it will be important to investigate how biodiversity accounting approaches and related metrics can feed assessment of SDG 14 and SDG 15 progress.

The annual review of corporate sustainability reports by WBCSD confirms this picture (see Figure 14).

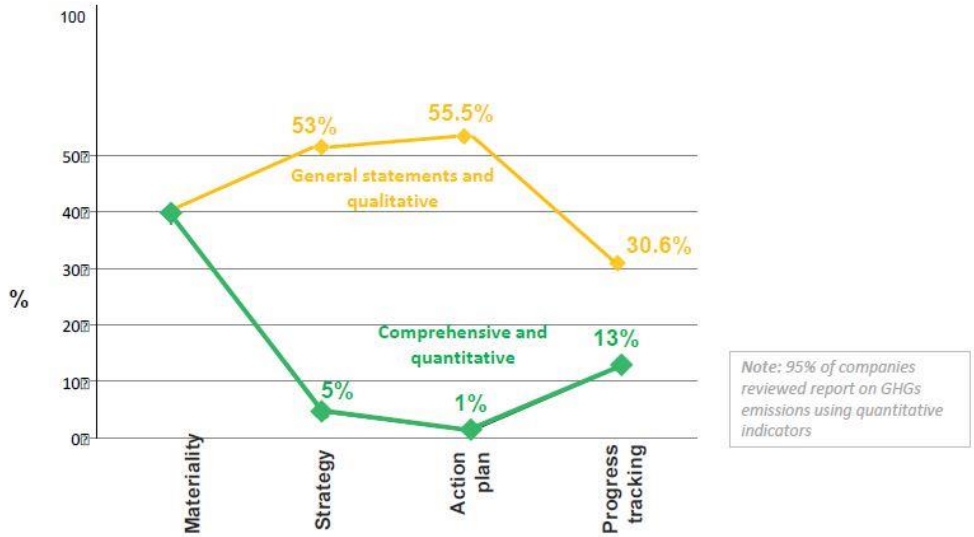

Figure 14: Gap between business biodiversity commitments at strategic level and concrete action plans (WBCSD, 2016)

[67] https://home.kpmg/uk/en/home/insights/2018/04/analysis-sdg-reporting-in-top-250-global-companies.html
https://www.unglobalcompact.org/library/5361

SEEA

6 Consultation with the business community

6.1 Objective

From the literature review it's clear that reported (pilot) cases on how companies can use or have used national environmental accounting data for corporate environmental accounting, be it for internal decision making or reporting/external disclosure, are hard to find. Therefore, engaging with a number of businesses to explore the possibilities of such exercise, will be extremely useful.

6.2 Selection of businesses

In order to obtain a range of experiences ten to twelve businesses will be identified . These companies need to fulfill the following requirements:

- track record in sustainability reporting
- links to (one or more of) the five project countries
- willing to engage in this journey by sharing their key data needs and interests
- interested to collaborate on the workshop.

For the selection and recruitment of participating companies a longlist was prepared, exceeding the envisaged number of 10 to 12 companies as only part of the contacted companies might be interested to engage. The longlist has been compiled on the basis of:

- personal knowledge about frontrunner companies and personal contacts of the author
- suggestions by Natural Capital Coalition; NCC has also made some introductions
- suggestions by WBCSD; WBCSD has also made some introductions
- suggestions by NCA VES country representatives (
- suggestion by other experts

As the selection of companies is still ongoing at the moment of finalizing this paper, we do not include a final list in this paper.

6.3 Initial proposal of issues for discussion with companies

The below draft questionnaire focuses on those issues which are relevant for the research under the business workstream of the NCAVES project. The key objective of the business consultation is to explore synergies between national or subnational level ecosystem accounting and corporate ecosystem accounting (or natural capital accounting)[68]. In particular we are interested in:

- the type of data that are or could be offered by national statistics offices (ANSOs) to businesses and provide added value for the internal decision-making or external disclosure by businesses in terms of natural capital accounting
- the potential alignment in terms of the accounting approach.

Another objective is to discuss their interest and potential engagement in the workshop and their expectations of the workshop.

[68] See Section 2 on Scope. In fact, natural capital is a broader concept than ecosystems. Ecosystems are part of natural capital as natural capital also includes non-renewable stocks. However, within the scope of this study (no focus on non-renewable stocks) both terms, i.e. ecosystem accounting and natural capital accounting, can be used interchangeably.

The questionnaire will be sent in advance of the interview. The interview will take 45 to 60 minutes. Efficiency will be maximized by careful preparatory work by the interviewer, i.e. getting familiarized with the information on NCA and NC disclosure which is available on the company's webpage. This also allows to make the interview much more tailored to the specific situation of the interviewed company. Therefore, in particular in Section 1 of the questionnaire (on the company's current approach in terms of natural capital accounting and disclosure) questions will not always followed rigorously.

ANNEX 1: QUESTIONNAIRE FOR BUSINESS CONSULTATION

Background

If there is one clear message on corporate sustainability reporting that increasingly pops up in 2019, then it is the request of investors, NGOs and other key stakeholders for greater transparency and disclosure on both current and future impacts of business activities. As a consequence, businesses are looking for credible and comparable accounting and reporting approaches. This tendency is reflected by the growing number of initiatives aimed at identifying common ground between accounting approaches or even standardization, both between the 'capitals' (e.g. integrated reporting) and between thematic approaches (e.g. in the field of biodiversity metrics).

At a national level, this standardization has already taken place, at least to a large extent. Therefore, it's worth exploring to what extent businesses can rely on what's already available and even more if there is room to adapt these national level approaches to make them also 'fit for purpose' by the private sector. While it's true that businesses and governments often have different aims when it comes to environmental accounting and are attempting to capture different kinds of information, it's clear that the work undertaken by governments can be hugely useful to that of businesses, and vice versa.

The System of Environmental-Economic Accounting (SEEA) Central Framework and the SEEA Experimental Ecosystem Accounting (SEEA EEA) were both developed under the auspices of the UN to provide frameworks for environmental accounting. The SEEA Central Framework looks at individual environmental assets (e.g. water, air etc.) and was adopted by the UN Statistical Commission as the first international standard for environmental-economic accounting in 2012. The SEEA EEA complements the SEEA Central Framework by adopting a spatial approach to look at ecosystems and was endorsed by the UN Statistical Commission as the basis for commencing testing and further development of this new field of national accounting.

The Project **"Natural Capital Accounting and Valuation of Ecosystem Services"**[69] has been established to advance the knowledge agenda on environmental-economic accounting, particularly ecosystem accounting, by initiating pilot testing of the SEEA EEA in five strategic partner countries to the European Union (EU), namely Brazil, China, India, Mexico and South Africa. The main objectives of the project include a) improving the measurement of ecosystems and their services (both in physical and monetary terms) at the (sub)national level; b) mainstreaming biodiversity and ecosystems in (sub)national level policy-planning and implementation; and c) contributing to the development of internationally agreed methodology and its use in partner countries.

As part of the objective to mainstream ecosystem accounting and promote its use in partner countries, the project also includes a **workstream on business accounting**. This workstream aims to:

- contribute to the alignment of natural capital accounting between the public and private sectors;
- explore how to harness synergies between the public and private sectors in the collection and use of statistics and data for natural capital accounting;
- provide a technical methodological contribution at the level of methods or of indicators that promotes alignment.

[69] The United Nations Statistics Division (UNSD), the United Nations Environment Programme (UN Environment) and the Secretariat of the Convention on Biological Diversity are the implementing agencies of the project "Natural Capital Accounting and Valuation of Ecosystem Services. This project is funded by the European Union.

To reach these objectives, there is a need to bring together the public and private sectors to look at the intersection of business accounting and the SEEA, particularly with regards to ecosystems and ecosystem degradation and restoration. One of the main activities of the workstream is the **organization of a scoping workshop**.

To prepare this workshop two main activities will take place:

1. a literature review of current practices in business accounting and reporting related to ecosystems and ecosystem degradation and restoration
2. **interviews with 10 to 12 companies to explore their interests and needs in terms of business accounting and reporting related to ecosystems and ecosystem degradation and restoration**

The workshop is planned to take place end of September or early October 2019 in New York. The subsequent workshop report will form the basis of a concise roadmap for aligning private and public-sector approaches to natural capital accounting that suggests concrete areas of work that UNSD can facilitate between companies and the national statistical offices of the project countries and the statistical community at the global level.

Questionnaire

You are kindly requested to read the questions carefully in advance of the interview, so you can prepare the interview well. We don't expect you to provide a written reply on these questions, as we will try to harvest all useful information by means of an interactive interview by phone or skype, which offers the flexibility to discuss some issues more in detail while we can skip other issues, all depending on your specific expertise, experience and interests. The interview should not take longer than 60 minutes.

Efficiency will be maximized by careful preparatory work by the interviewer, i.e. getting familiarized with the information on NCA and NC disclosure which is available on the company's webpage. This also allows to make the interview much more tailored to the specific situation of the interviewed company. Therefore, in particular in Section 1 of the questionnaire (on the company's current approach in terms of natural capital accounting and disclosure) questions will not always be followed rigorously.

Please note that the provided information will be treated confidentially. Findings of the interviews will be anonymized, unless you explicitly confirm that reference to your company is allowed. You will have the opportunity to check and validate the interview notes.

IDENTIFICATION OF INTERVIEWEE

Name:

Function:

Company:

Country:

Contact email address:

Contact telephone number:

Date of interview:

QUESTIONS

SECTION 1: Description of natural capital accounting and disclosure practices

The aim of this section is to get a clear understanding of the company's current approach in terms of natural capital accounting and disclosure.

During the interview we will touch upon issues such as:

- main drivers for NCA in the company, and business applications
- selection of relevant NC elements (water, land use, air, biodiversity, ecosystem services, ..) and why the company has decided to focus on these elements (or not)
- ambition level: what (e.g. zero impact, planetary boundaries, quantified target levels), why and how
- the way impacts and dependencies are valued, i.e. qualitative, quantitative, monetized, and how this is translated into risks (and maybe opportunities)
- is local context (e.g. carrying capacity of local ecosystem, protection status, future threats, …) factured in, and which challenges are faced in terms of data and interpretation?
- value chain scope (production sites, supply chain, ...)
- possibility to report by country (for multinationals)
- integrated reporting or not
- strengths and weaknesses of current approach, challenges, room for improvement, future plans

SECTION 2: Accounting approach and data collection

This section aims to explore synergies between national or subnational level ecosystem accounting and corporate ecosystem accounting (or natural capital accounting)[70]. In particular we are interested in:

- the type of data that are or could be offered by national statistics offices (NSOs) to businesses and provide added value for their internal decision-making or external disclosure in terms of natural capital accounting
- the potential alignment in terms of the accounting approach

The questions below specifically *focus on water and biodiversity (including ecosystem services) and to the business risks and opportunities of respectively non-action and action by businesses. This also includes* ***climate change*** *risks related to degradation of ecosystems as well as opportunities related to ecosystem restoration.* Water and biodiversity are typical landscape scale elements that often go beyond the direct land footprint of companies and therefore are interesting to make the bridge to (sub)national level information (e.g. river basins, ecosystems). The same applies to climate change risks and adaptation.

2.A. TYPE OF DATA

Practice shows that companies need more subnational data for ecosystem related assessments, such as water scarcity data in water catchment areas or sensitive biodiversity features within the area affected by company activities. Therefore, companies often rely on tools and/or specific datasets that provide these data (see Box 1). In many cases these datasets go into a much higher level of detail than national level data. The question is in how far companies have sufficient data with these tools and to what extent national or subnational statistical data at an appropriate level of detail can fill the gaps.

Box 1: Examples of ecosystem related data sources often used by companies

Water:

- Global Water Tool and Local Water Tool
- ….

Biodiversity:

- IBAT
- Globio
- Recipe
- ENCORE
- ….

Climate risk:

- ??

[70] In fact, natural capital is a broader concept than ecosystems. Ecosystems are part of natural capital as natural capital also includes non-renewable stocks. However, within the scope of this study (no focus on non-renewable stocks) both terms, i.e. ecosystem accounting and natural capital accounting, can be used interchangeably.

WATER SCARCITY

1. *What type of information do you use now?*
2. *Can you easily find this information? Which information sources do you use? Regional or country related differences?*
3. *What are the strengths and weaknesses of this information? (e.g. completeness, granularity level, accurateness, user friendliness, …)*
4. *What kind of information are you lacking and looking for?(e.g. future water availability on your production sites?)*

BIODIVERSITY

5. *What type of information do you use now?*
6. *Can you easily find this information? Which information sources do you use? Regional or country related differences?*
7. *What are the strengths and weaknesses of this information? (e.g. completeness, granularity level, accurateness, user friendliness, …)*
8. *What kind of information are you lacking and looking for?(e.g. presence of protected sites, protected species, sensitivity of species and habitats to pressures, specific ecosystem services, …)*

CLIMATE RISKS AND ADAPTATION

9. *Are you assessing current and future climate risks (e.g. droughts, floods) potentially affecting your production sites or your distribution network (e.g. transport)?*
10. *What type of information do you use now?*
11. *Can you easily find this information? Which information sources do you use? Regional or country related differences?*
12. *What are the strengths and weaknesses of this information? (e.g. completeness, granularity level, accurateness, user friendliness, …)*
13. *What kind of information are you lacking and looking for?*

2.B. ACCOUNTING APPROACH

Discussing business interest in potential alignment or synergies with the ecosystem accounting approach as developed by SEEA EEA assumes a basic insight and understanding of key concepts and terms applied by SEEA EEA. Therefore, the below clusters of questions are preceded by a short description of key characteristics of SEEA EEA (the numbers refer to the paragraphs in the updated Technical Recommendations (2017) on SEEA EEA).

GENERAL CONCEPT OF ECOSYSTEM ACCOUNTING

- (1.5) **Ecosystem accounting** is a coherent framework for integrating measures of ecosystems and the flows of services from them with measures of economic and other human activity. In the SEEA Central Framework, environmental assets are accounted for as individual resources such as timber resources, soil resources and water resources. In ecosystem accounting as described in the SEEA Experimental Ecosystem Accounting (SEEA EEA), the accounting approach recognises that these individual resources function in combination within a broader system by taking a spatial approach.
- (1.11 – Box 1.1) Recording stocks and flows for accounting
    - For accounting purposes, the **stocks** refer to the underlying assets that support production and the generation of income. Stocks are measured at the beginning and end of each **accounting period** (e.g. the end of the financial year) and these measurements are aggregated to form a balance sheet for that point in time. Information about stocks may be recorded in physical terms (e.g. the hectares of plantation forest) and in monetary terms.
    - For ecosystem accounting, the **stocks of primary focus** are the **ecosystem assets (EA)** delineated within **the area in scope of the accounts, i.e. the Ecosystem Accounting Area (EAA)** (as the SEEA is implemented, this is usually a country or region) (see 1.15). Ecosystem assets are usually continuous areas of a homogenous ecosystem type such as forests, wetlands or rivers (see also footnote[71]). Conceptually, information about each ecosystem asset, for example information on its extent, condition and monetary value, can be recorded at the beginning and end of each accounting period and thus contribute to understanding the potential for the stock to support the generation of ecosystem services into the future (ecosystem capacity).
    - Two types of flows are recorded in accounting, namely (i) changes in stock and (ii) changes in flows related to production, consumption and income:
        - **Changes in stock include additions to stock as a result of investment or, in the case of ecosystem assets, natural growth and improvements in condition; and reductions in stock due to extraction, degradation or natural loss**.
        - Concepts of production, consumption and income are all flow concepts. For ecosystem accounting, the **relevant flows relate to the supply and use of ecosystem services between ecosystem assets and beneficiaries including businesses**, governments and households. Benefits as described in ecosystem accounting are also flows.
- (1.15) **Spatial structure and ecosystem assets**. An area referred to as the **ecosystem accounting area**, such as a country or region within a country, defines the scope of the set of ecosystem accounts. The ecosystem accounting area is considered to comprise multiple ecosystem assets (generally represented in accounts

[71] (3.8) SEEA EEA allows for considerable flexibility in the way in which these different areas may be delineated in practice. Both relatively coarse and relatively fine delineations may be applied, for example, linear landscape elements such as hedgerows may be distinguished as specific ecosystem assets. Further, the criteria used to delineate ecosystem assets may be quite varied, involving ecological factors only or also taking into account aspects of ecosystem use and management.

in terms of homogenous and continuous areas of different ecosystem types such as forests, lakes, desert, agricultural areas, wetlands, etc.). While the total area being accounted for will generally remain stable, the configuration of ecosystem assets and types, in terms of their area, will change over time through natural changes and land use changes. For accounting purposes, each ecosystem asset is considered a separable asset where the delineation of assets is based on mapping mutually exclusive ecosystem asset boundaries. **Ecosystem extent accounts** record the compositional changes within an ecosystem accounting area, with information about different ecosystem assets usually grouped to show a summary for the different ecosystem types.

- (1.16) **Ecosystem condition**. Each ecosystem asset will also change in condition over time. An **ecosystem condition account** for each ecosystem asset is structured to record the condition at specific points in time and the changes in condition over time. These changes may be due to natural causes or human/economic intervention. Recording the changes in condition of multiple ecosystem assets within a country (or sub-national region) is a fundamental ambition of ecosystem accounting.
- (4.2) The ecosystem condition account captures, in a set of key indicators, the state or functioning of the ecosystem in relation to both its ecological condition and its capacity to supply ecosystem services. Furthermore, (4.5) indicators in the ecosystem condition account should also reflect the relevant trends, policy priorities (e.g. preservation of native habitat) and pressures on ecosystems (e.g. deposition levels of acidifying compounds versus critical loads for such compounds). Generally, different ecosystem types require different indicators. For example, condition indicators relevant for forests will be less relevant for cropland.
- (1.17) The measurement of ecosystems often overlaps with the measurement of **biodiversity**. In the ecosystem accounting framework, biodiversity is considered to be a key component in the measurement of ecosystem assets rather than being considered an ecosystem service in its own right.
- (1.67) A distinction has been drawn between **ecosystem accounts** and **thematic accounts**. Ecosystem accounts are those covering specifically stocks and changes in stocks of ecosystem assets, and flows of ecosystem services, and may be compiled in both physical and monetary terms. Thematic accounts are those for specific topics **including land, carbon, water and biodiversity**. Data from thematic accounts may be used in compiling ecosystem accounts and may also provide important contextual information in their own right and support analysis of ecosystem accounting information.
- (2.28) Asset accounts are designed to record information on stocks and changes in stocks (additions and reductions) of ecosystem assets. **This includes accounting for ecosystem degradation**. The **ecosystem monetary asset account** records this information in monetary terms, based on valuation of ecosystem services and connecting to information ecosystem extent and condition.
- (2.11) There are **five core ecosystem accounts**:

1	**Ecosystem extent account**	**physical terms**
2	Ecosystem condition account	physical terms
3	Ecosystem services supply and use account	physical terms
4	Ecosystem services supply and use account	monetary terms
5	Ecosystem monetary asset account	monetary terms

This is well visualized in the below figure.

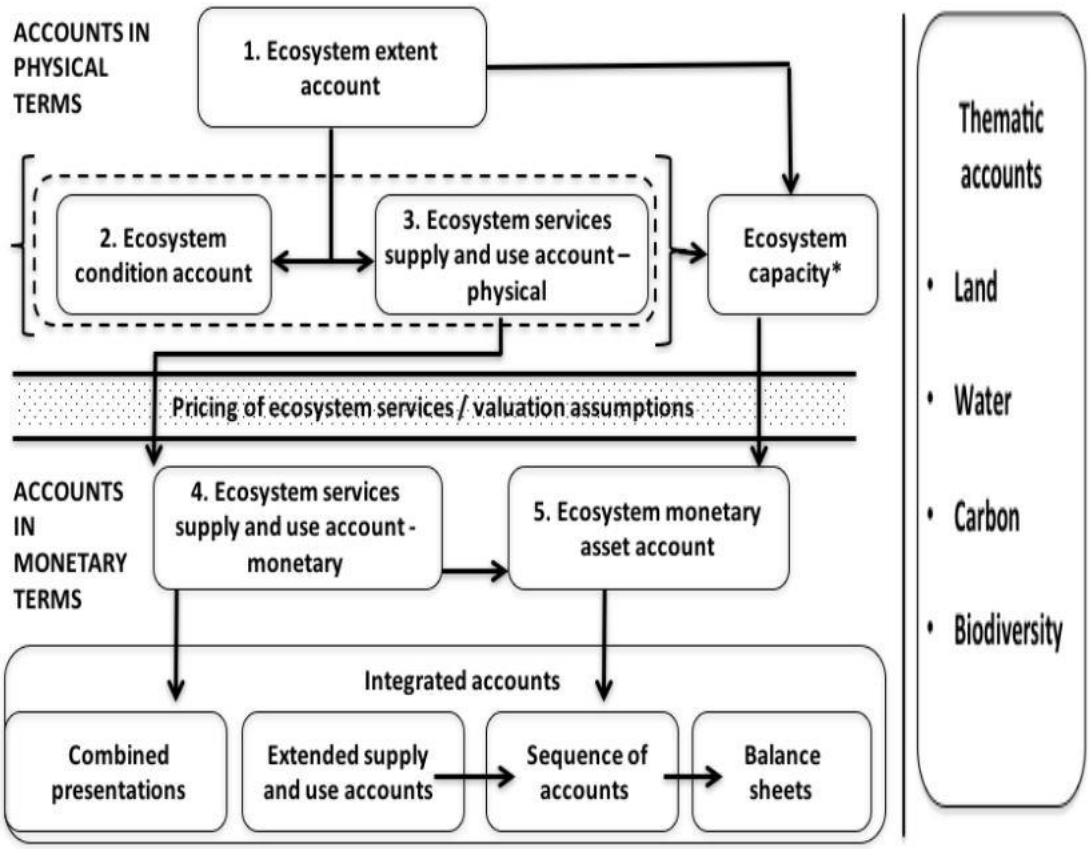

Figure 15: Connections between ecosystem and related accounts and concepts (Technical Recommendations SEEA EEA)

Questions

14. Now that you've heard about these general concepts of ecosystem accounting as applied in SEAA EEA, do you think that there are promising concepts for being applied in a business context too? (balance sheet approach, i.e. stocks and changes in stocks (ecosystem assets such as forests, grasslands, …), flows and changes in flows of ecosystem services[72], principle of accounting period similar to e.g. a financial year)

15. Do you think this would fit well in integrated reporting?

16. Do you think that it would be feasible to collect ecosystem related data that are aligned with the time period in financial accounting?

17. What is your opinion regarding the 'ecosystem asset' as the main unit in the balance sheet? Is it applicable to business, and if so to which business sectors in particular? For instance, would it make sense for an agri-food company to classify its land in the supply chain in ecosystem asset classes (e.g. extensive grassland, intensive grassland, cropland, …) to be able to monitor extent and condition (see next question)?

18. Are 'ecosystem extent' and 'ecosystem condition' workable concepts for measuring changes in stocks and flows? These are reflected by the term 'state' (and 'change in state') in the Natural Capital Protocol.

[72] In the Natural Capital Protocol, the concept of stocks and flows is also applied.

ECOSYSTEM SERVICES

- (1.18) **Supply of ecosystem services**. Either separately, or in combination, ecosystem assets supply ecosystem services. Ecosystem service accounts focus on the supply of ecosystem services (including provisioning, regulating and cultural services) to economic units, including businesses and households.
- (1.20) **Basket of ecosystem services**. Generally, each ecosystem asset will supply a basket of different ecosystem services. The conceptual intent in accounting is to record the supply of all ecosystem services over an accounting period for each ecosystem asset within an ecosystem accounting area.
- (1.21) **Use of ecosystem services**. For each recorded supply of ecosystem services, there must be a corresponding use. The attribution of the use of ecosystem services to different economic units is a fundamental aspect of accounting. In the SEEA EEA, ecosystem services are defined to support data integration with the production of goods and services that is currently recorded in the standard national accounts. Depending on the ecosystem service, the user (e.g. household, business, government) may receive the ecosystem service while either located in the supplying ecosystem asset (e.g. when catching fish from a lake) or located elsewhere (e.g. when receiving air filtration services from a neighbouring forest).
- (1.22) **Linking to benefits**. Flows of ecosystem services are distinguished from flows of benefits. In the SEEA EEA, the term benefits is used to encompass both the products (goods and services) produced by economic units as recorded in the standard national accounts (SNA benefits) and non-SNA benefits that are generated by ecosystems and consumed directly by individuals and societies (e.g. regulated water flow, reduced concentrations of emissions in the air).

Questions

19. Ecosystem services: in corporate natural capital accounting, ecosystem services are mainly referred to in the context of dependencies (e.g. water provisioning, natural flood defense, pollination, …); the perspective in the SEEA EEA approach is somewhat different and looks at the capacity of ecosystem assets to generate ecosystem services; very few businesses consider ecosystem services generation as a business opportunity which can deliver business value; how does your business view ecosystem services?

20. Does your business monetize any ecosystem services? If not, is this something your business would consider?

APPLICATIONS OF ECOSYSTEM ACCOUNTING

At the national or subnational level ecosystem accounts provide several important pieces of information in support of policy and decision making relating to environment and natural resources management, recognising that the management of these resources is of relevance also in economic, planning, development and social policy contexts. Typical applications are the following:

- (1.39) Detailed, spatial information on ecosystem services supply.
- (1.40) Monitoring of the condition of ecosystem assets.
- (1.41) Highlighting the ecosystem assets, ecosystem types and ecosystem services of particular concern for policy makers.
- (1.42) Monitoring the status of biodiversity and indicating specific areas or aspects of biodiversity under particular threat.
- (1.43) Quick response to information needs.
- (1.45) Monitoring the effectiveness of various policies.
- (1.46) Use in economic and financial decision making.

Questions

21. Can businesses benefit from the presence of such detailed, comprehensive, spatially referenced and regularly updated ecosystem accounts for their own range of business applications? Which are these business applications?

22. An often-applied business application is the identification and assessment of business risks related to ecosystem degradation e.g. operational risks (e.g. due to decreasing availability of water). In the specific case of water availability, would data on water levels be sufficient? Or would you welcome additional information such as trends and predictions of future water levels (under several scenarios), data on pressures (who else is extracting ground water?), data on policy priorities (e.g. protection status) or data on the minimum acceptable water level (threshold values)[73] in order not to disturb other human activities (such as transport on rivers) or not to harm biodiversity values (e.g. in wetlands dependent on sufficiently high water levels)?

23. If your company has adopted a 'zero impact' or a 'planetary boundaries' approach, would information on ecosystems' capacity for providing services be interesting?

24. If your company is aiming for No Net Loss or Net Gain, you will need to define a baseline. Ecosystem accounts might provide this information on condition that the granularity is sufficiently high. Would this be a promising application for you?

25. If your company is looking for aligning its water and/or biodiversity targets with science-based targets which have been established at a higher level[74] (e.g. extent and condition of specific ecosystem types such as threatened habitats), do you think that (sub)national ecosystem accounts are in principle well suited for establishing these science-based targets for water and biodiversity?

[73] See SEEA EEA Technical Recommendation 4.5 "Indicators in the ecosystem condition account reflect the general ecological state of an ecosystem, its capacity to supply ecosystem services and the relevant trends. The indicators selected should be relevant for policy and decision making, for instance because they reflect policy priorities (e.g. preservation of native habitat); pressures on ecosystems (e.g. deposition levels of acidifying compounds versus critical loads for such compounds)..

[74] Science-based targets for GHG emissions have been developed under the Paris Agreement on Climate Change, and may be developed for other ecosystem elements such as biodiversity

26. If your company considers investment in ecosystem restoration projects[75], would ecosystem accounts including biodiversity accounts be useful for estimating the return on investment when comparing options for ecosystem restoration?

27. Do you see other business applications?

SECTION 3: Workshop

Under this section a free discussion with regard to the interests of the company in the workshop, their expectations and their potential involvement.

[75] Conservation NGOs such as WWF, IUCN and CI observe increasing interest from investors and industry to finance ecosystem restoration projects. See e.g. https://www.iucn.org/theme/forests/projects/cpic-conservation-finance-initiative