TRANSPARENT

CORPORATE NATURAL CAPITAL ACCOUNTING from building blocks to a path for standardization

Understanding the landscape, leading applications, challenges and opportunities

April 2021







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About Transparent

The lack of standardization across corporate environmental assessment methods, including natural capital accounting standards and practices, continues to hamper the mainstreaming of environmentally sustainable activities and assets across the economy as well as correct corporate identification of and management of environmental risks. Transparent aims to develop the first set of natural capital accounting principles and corporate implementation guidelines tested by industry practitioners. It is supported by the Life program grant by the EU Commission and led by the Value Balancing Alliance in consortium with the Capitals Coalition and the World **Business Council For Sustainable** Development. The consortium supports the implementation of the Green Deal targets by developing pragmatic solutions for corporate natural capital management accounting and decision making.



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About WBCSD

WBCSD is a global, CEO-led organization of over 200 leading businesses working together to accelerate the transition to a sustainable world. We help make our member companies more successful and sustainable by focusing on the maximum positive impact for shareholders, the environment and societies. Our member companies come from all business sectors and all major economies, representing a combined revenue of more than USD \$8.5 trillion and 19 million employees. Our global network of almost 70 national business councils gives our members unparalleled reach across the globe. Since 1995, WBCSD has been uniquely positioned to work with member companies along and across value chains to deliver impactful business solutions to the most challenging sustainability issues.

Together, we are the leading voice of business for sustainability: united by our vision of a world in which more than 9 billion people are all living well, within planetary boundaries, by 2050.



valuing nature

About Valuing Nature

Valuing Nature supports organizations to integrate the value of human, social and natural capital into decision making, by providing innovative methodologies, data and expertise.

Samuel, as the lead consultant, has 12 years of experience supporting multinational companies, foundations and family offices in driving their sustainability and business strategy towards long term value creation. He has supported over 50 of the world's largest companies with impact valuation, social return on investment, impact investing portfolio assessment, life cycle assessment, strategy and management, risk assessment, and extra-financial reporting. Impact transparency is critical at all levels for companies to reduce risks, reduce negative externalities and scale their positive impact. It supports as well better decision making and corporate strategy, generating business opportunities along the way.

Prior to founding Valuing Nature, Samuel spent six years at Quantis International, where he led the LCA and water sustainability practices and business development for key accounts and customized services, in geographies such as Latin and North America, and Europe.

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Context

Natural capital accounting has emerged as a key process and tool to aid business assessments, understanding, management and action related to nature. The Capitals Coalition, together with a wide range of actors including the World Business Council for Sustainable Development (WBCSD) and the Value Balancing Alliance (VBA), have contributed to developments in the field. But challenges remain relating to methods, valuation and business applications, with calls for standardization increasing. The VBA, Capitals Coalition and WBCSD are all contributing through the Transparent project¹ to develop standardized natural capital accounting practices to be applied in the European Union (EU) and globally.

Objective and method

This report seeks to inform the standardization process. It focuses particularly on measurement and valuation, analyzing some of the leading practitioners from businesses and resources in this field to help identify potential gaps and development opportunities. We set out by reviewing the initiatives, research, standards, methods, reporting frameworks and other key resources to develop an overall map of the corporate natural capital accounting landscape. We then interviewed ten leading companies to explore best practices, learnings, challenges and where they see a need for standardization. The analysis and findings are relevant for advanced practitioners and those seeking to progress methodological development and standardization.

¹ https://capitalscoalition.org/project/transparent/

Landscape and resource mapping analysis

The landscape and resource mapping shows a dynamic field supporting the development and deployment of natural capital accounting in the private sector. Standards already exist, providing mostly overall frameworks and approaches, such as the Natural Capital Protocol, ISO 14007 and 14008 (environmental impact valuation).

We noted gaps in the following areas, which could represent an opportunity for development and/or standardization:

- Impact assessment and valuation methods
- General rules of natural capital accounting
- Valuation factor datasets
- Reporting frameworks for natural capital accounting
- Guidance for governance, strategy and performance
 management connected to natural capital accounting

Business cases analysis

When analyzing business applications and experiences, we observed that:

- Business cases were oriented towards impact on society and mostly driven by a need to first raise awareness internally and externally. There are opportunities to develop approaches relating to dependencies and business value.
- The cases reviewed were relatively comprehensive in terms of scope and capitals covered (natural, human and social capital), usually covering the broader aspects of air, water, land² and human health related to natural capital across the entire value chain (supply chain, direct operations and downstream operations). Eight out of ten companies covered natural, human and social capitals.

² Biodiversity remains often addressed indirectly but is maintained as specific category in the development of standardized natural capital accounting methods, considering the importance of strengthening the methods and metrics allowing to cover the direct impacts on plant and animal species.

- In general, looking at two important drivers for decisionmaking, transparency and business integration, most business applications are at an early stage of maturity and impact, but progress is being made.
- Materiality is not used to inform the choice of impact drivers despite requirements in protocols and current trends in reporting. Companies tend to measure a comprehensive set of impacts through the models and methods they are using, rather than basing the choice of impact drivers on a materiality assessment.
- Life Cycle Assessment (LCA)³ is used by seven out of the ten companies surveyed, showing the opportunity to strengthen the connection to and use of the Product Environmental Footprint (PEF)/Organization Environmental Footprint (OEF) method⁴ as a critical contributor to natural capital accounting. Input-Output (IO) model outputs can also be easily adapted to an impact assessment framework based on LCA, which would further ensure consistency in the models used and standardization.
- Given the reliance of natural capital accounting on underlying existing methods and data sources such as IO and LCA, a stronger connection with those approaches needs to be made for any standard developed on natural capital accounting.

Interview insights

The interviews with leading companies provided additional insights. We first explored how natural capital accounting has supported change:

All companies interviewed cited that natural capital accounting results were used first and foremost for **awareness raising** at all levels of companies and with key stakeholders (e.g. investors, NGOs, authorities, etc.). Limited wider use cases and applications were observed.

³ Both the inventory (data sources) and the impact assessment methods

⁴ Different LCA impact assessment methods exist in parallel to the PEF/OEF. It is difficult to know which LCA impact assessment method in particular is used by businesses, the most commonly used are ReCiPe and the PEF/OEF.

- Businesses have high expectations about the potential of natural capital accounting to be used for decision-making, in particular to challenge expectations and assumptions, analyze trade-offs, perform comparative assessment, identify options, etc.
- To realize the potential of informing and influencing decisionmaking, key challenges must be addressed. These include lack of granularity, data type/format, business value connection, uncertainties and lack of external drivers.

Following these insights, we explored how natural capital accounting is connected to companies' strategy and governance. Governance is mainly ensured by a range of executives (Vice Presidents, directors, senior management) but more could be done to engage board members. There is interest in using natural capital accounting to assess impact and demonstrate progress aligned with business purpose and corporate strategy, supporting performance evaluation processes. Strategy and performance management application and integration challenges must be addressed.

Most of the interviewees mentioned progress engaging with different colleagues and building understanding across their businesses, which they considered an important step in the deployment of such an approach more widely in companies. Assessments targeting well defined objectives and scopes provided key insights to stakeholders and informed specific decisions. In general, the most important added value of natural capital accounting is its capacity to translate complex topics into one single language, understandable by a wide range of corporate divisions and stakeholders. Natural capital accounting is breaking silos and providing objective sustainability measures in context. This can result in the stronger internal decisionmaking processes accounting for natural capital value.

Interviewees noted that standardization is not a silver bullet but could be of great value if done right, using established practices and consultation with a wide range of stakeholders and experts. It could lower the cost of entry for newcomers and ensure a wider adoption of the approach across the private sector. Standardization needs to be balanced with experimentation and development activities in the field of natural capital accounting. Some interviewees raised standardization challenges, given methodological gaps, limited experience and limited alignment within existing applications. Specifically, the lack of consistent impact pathways and valuation techniques must be acknowledged and addressed.

Our recommendations for standardization

Based on the analysis outlined in this report, we recommend focusing the standardization effort on:

- Method: a standard method should be defined in terms of value chain scope and impact indicators and pathways covered for key natural capital categories (e.g. air, water, land, resources and biodiversity). Within this method, three specific aspects require attention:
 - a. **Impact pathway definition:** across natural and societal impact, dependencies and business impact. Each of those perspectives requires the definition of pathways connecting impact drivers to the relevant impacts and their value. Those pathways need to be clear and comprehensive while avoiding double counting and addressing the need for additivity.
 - b. Valuation techniques and factors: impacts defined by the impact pathways can be valued through different approaches, connected to different valuation techniques. Consistent use of valuation techniques is critical to ensure relevant insights from the results and connection to decision-making contexts. The same impact drivers can be valued through different techniques which will lead to different results. Providing sets of valuation factors, in line with defined indicator lists of the standardized method, is crucial to enable more companies to apply natural capital accounting and ensure comparability of results and relevance of insights. Valuation techniques will need to be clearly and explicitly connected to decision-making and business use in a way that is accessible for wellinformed practitioners who do not necessarily possess a detailed academic background or interest.

- c. Accounting rules: natural capital accounting relies on many implicit or sometimes explicit accounting rules which can lead to reduced comparability of different studies. The choice of baseline can have a significant impact on results and it is particularly important to ensure a consistent baseline across capitals. The additivity of natural capital accounting results needs to be defined whenever net results are used or communicated. Other accounting rules (not exhaustive) such as exchange rates, discounting, value chain scope, the use of inflation for adjusting valuation factors, etc. would also need to be defined. A deeper review of implicit accounting rules would support standardization efforts.
- 2. **IO and LCA alignment for the purpose of natural capital accounting:** as LCA is already the basis of many of the natural capital accounting case studies. IO models can be adapted to be aligned with a LCA framework. This relates to the recommendation to standardize impact pathways and valuation factors. In practice, alignment should cover impact drivers and impact indicators between IO and LCA methodologies and should connect the impact pathways found in LCA literature with typical ones used for IO.
- 3. **Decision-making applications:** standardized natural capital accounting should prioritize relevance for decision-making at strategic and executive level, providing transparency, reliability, consistency and reduced uncertainties. Standardization should also support integration across business functions, units and applications (e.g. product development, strategic guidance, investment appraisal, resource management and risk assessment). The connection between decision-making applications and valuation techniques needs to be strengthened.

- 4. Development of dependencies and business value pathways: the need to use natural capital accounting beyond the usual view of impact to society needs to happen quickly. This is important to derive more added value and relevance for businesses applications and support decision-making contexts.
- 5. Development of integrated multi capital accounting framework: the interviews showed that leading businesses already cover natural, human and social capital in their accounting applications. Multi-capital approaches and thinking must be advanced.

Conclusion

Standardization is important and could highly benefit the field of natural capital accounting. Standardization should build on existing methods while leaving room for new and innovative approaches to solve current challenges of natural capital accounting. A balance of development and standardization must be pursued, with standardization processes allowing for developments over time and flexibility in application. Overall, there is a need to clearly inform and align businesses on the base rules of natural capital accounting to ensure consistency and added value across all cases of natural capital accounting. **We believe that advancing natural capital accounting and, in** general, impact valuation standardization will benefit businesses and stakeholders in multiple ways. It has the potential to:

- Increase the visibility and credibility of the approach, supporting sustainable development.
- Provide relevant, robust and insightful results that are better connected to decision-making contexts and business strategies, enabling sustainable business.
- Lower the barrier to entry, including resources and costs, enabling more companies to develop capitals accounting and impact valuation and building momentum, knowledge and capacity.
- Align with and accelerate the sustainable finance agenda.
- Provide an easier connection with reporting standards and practices to inform a variety of external stakeholders.

1 INTRODUCTION

Nature loss and degradation is occurring at a faster pace than ever before.⁵ Change in land and sea use, direct exploitation, climate change, pollution and invasive species are important drivers of nature loss and degradation. Most, if not all, are driven by our economic and business activities.⁶ Business as usual is no longer an option.

We need to urgently transform business practices to consider long term societal value in decision-making and support the delivery of a fair, just and more sustainable world. To get there we must work together to:

- broaden what we measure and value, building awareness and understanding among decision makers and stakeholders;
- standardize approaches and methods to provide a common basis for decisionmaking;
- support integration into current performance management dominated by financial criteria; and
- further develop the financial and regulatory system to provide marketbased incentives for companies to transition towards a green and inclusive economy.

These steps are recognized in the European Green Deal which called for unprecedented action in support of the transition towards a truly sustainable future. It recognized the importance of supporting business and stakeholders by promoting standardized natural capital accounting practices in the EU and globally.

This report addresses the need to standardize natural capital accounting and, in particular, measurement and valuation. This field has garnered significant interest from the private sector and beyond in recent years, evidenced by the development, piloting and implementation of the Natural Capital Protocol and associated guidance. Transparent partners, in particular the Capitals Coalition, have played a central role in stimulating the community around multi-capital accounting and impact valuation, convening stakeholders, initiatives and partners.

5 WWF (2020) Living Planet Report 2020 - Bending the curve of biodiversity loss

6 Dasgupta, P. (2021) The Economics of Biodiversity: The Dasgupta Review. London: HM treasury

There is demand from businesses and stakeholders for greater standardization to lower the barrier to entry for new companies seeking to measure value to society through natural (as well as human and social) capital accounting. It would also ensure more added value and relevance and aid better integration of accounting results in companies' strategies, decision-making and accounting practices. External stakeholders such as investors want greater alignment in the methodologies and accounting practices (in particular the valuation step) to enable comparability to inform investment decisions.

To guide the standardization imperative for natural capital accounting with a particular focus on measurement and valuation, we reviewed existing resources in parallel to exploring leading companies' approaches by:

- Evaluating existing resources that support practitioners in this field. This included more than 30 resources covering initiatives, research providers, frameworks/standards and methods. We particularly focused on identifying gaps in resources that may be addressed through standardization. These resources were identified by the Capitals Coalition, Value Balancing Alliance and WBCSD, as well as Valuing Nature.
- Interviewing 10 leading companies to analyze application of natural capital accounting and identify best practices, trends and future needs — with a particular focus on integration, use cases, application and standardization.

 Exploring public information on natural capital accounting application, methodologies and case studies from those same companies, when available.

The companies interviewed were ABN AMRO, BASF, DSM, Kering, Lafarge-Holcim, Nestle, Natura, Novartis, Olam and Philips. Interview notes were kept confidential and provided the basis of insights presented in this report in a synthesized way.

2 LANDSCAPE MAPPING AND ANALYSIS OF RESOURCES

INSIGHTS

- The amount of knowledge generated through the identified initiatives, research, frameworks and standards is significant and demonstrates dynamism in the field of natural capital accounting.
- It is important to understand relationships, dependencies
 and connections between initiatives, research, frameworks
 & standards (see mapping below). This analysis supports
 the identification of gaps and challenges that could be
 addressed by standardization.
- Further work is needed on the development and standardization of methods and valuation factors.
 Development, standardization and improved access are required to lower the barrier of entry, consistency, replicability and relevance of measurement and valuation, as well as comparability across applications, businesses and sectors.
 Methods can be built on the basis of existing impact assessment methods, such LCA and PEF/OEF⁷ for example, which provide a good basis for natural capital accounting measurement and valuation.
- Corporate governance, strategy and performance
 management are other areas where resources, initiatives
 and frameworks are relatively absent for the specific
 purpose of natural capital accounting.
- Lastly, reporting guidance (e.g. disclosure frameworks and standards) is not providing solutions to address natural capital accounting and valuation in particular, whetherthrough external initiatives (GRI, SASB, CDP, etc.) or corporate reporting guidance (P&L integration, value added statement, sustainability or annual reporting, etc.).

7 The PEF/OEF is a harmonised methodology for the calculation of the environmental footprint of products and organisations developed in collaboration with a wide range of stakeholders, led by the EU commission.

The mapping and analysis of resources sought to identify existing knowledge and initiatives that support natural capital accounting and valuation approaches for business. The objective of the analysis was to identify connections, dependencies and gaps in the landscape. Gaps represent opportunities for standardization. To aid navigation and description of the natural capital accounting ecosystem, we created the following classification system:

- Initiatives: Multi-stakeholder efforts to develop knowledge around natural capital accounting and produce research, methods and frameworks.
- Research providers: Organizations sharing knowledge developed for the purpose of advancing application.
- Framework/standards: Principles, structure, steps and rules of natural capital accounting, issued by public and/or private bodies.
- **Methods:** A practical application of a framework, especially to support translation of output into impact with an explicit list of indicators and valuation factors.
- Valuation factors: Specific quantitative indicators that allow for the translation of an impact driver into a monetized impact.

The Figure 1 provides an overview of the classification with a select number of examples indicated in each box. This review is not exhaustive — it provides an illustrative overview of some of the most visible and current resources selected by the authors and partners to the project (Capitals Coalition, VBA and WBCSD), while recognizing that more resources exist. On the left hand side are the initiatives and research activity providing support to the entire field of natural capital accounting. In the middle are the frameworks/ standards under which methods are developed, which in turn use valuation factors (some of the methods mentioned contain sets of valuation factors). To the right, reporting channels and approaches are listed. Governance, strategy, policy and performance management are underlying requirements for the integration of natural capital accounting in business decision-making. The classification shows that initiatives and research support the development of natural capital accounting through frameworks/standards, methods and valuation factors, which in turn can be used for reporting and disclosure. Governance, strategy, policy and performance management are foundations for the field of natural capital accounting as key drivers of change in business.

Figure 1: Classification of business relevant natural capital accounting landscape with a particular emphasis on valuation (not exhaustive)

nitiatives Capitals Coalition Impact Valuation The Economics Roundtable		Framework/standards Natural Capital Protocol (2016) BSI 8632 (2021)*			ISO 14007 (2019) ISO 14008 (2019)		Corporate reporting (channels) Annual report	
A4S VBA	WBCSD Redefining Value		Methods GIST impact 360 PwC TIMM	KPMG TV VBA Impa	act	TEEB Ecological and Economic Foundations		Financial results and P& integration
Research (providers)				Statement	nt	Impact Weighted Accounts		Sustainability report
Harvard Business School University of Oxford Impact Institute	TEEB Audencia University of Cambridge		Valuation factors CE Delft (2020) True Price – Monetisation Factors (2020)		TEEB Valuation Database (2010) Environmental Valuation Reference Inventory			Dedicated report (e.g. added value statement)

Corporate governance, strategy, policy and performance management

* At time of writing in development

Healthy dynamism and progress are evident in the field of natural capital accounting. This is demonstrated by the many initiatives that are producing published research and providing solutions to problems defined at corporate, project, process and product levels. The initiatives gather momentum and engage an ecosystem of organizations around their own activities, which supports the deployment of natural capital accounting. Research providers play an important role in facilitation by providing varied content, case studies, working papers, etc.

Frameworks/standards have mostly been published in recent years and many businesses are using these as references in their applications. Those frameworks and standards are playing an important alignment role in the field, notably in terms of structuring steps and processes and bringing together key concepts and definitions. The standards that provide principles, structures and steps for natural capital accounting for business include:

- Natural Capital Protocol provides a clear framework with defined steps and rules to assess natural capital impact and dependencies to support internal decision-making and external disclosure.
 The Natural Capital Protocol does not provide prescriptive methods and valuation factors, leaving this choice to the practitioner.
- ISO 14007 and 14008 propose a standard to value environmental costs and benefits and, more widely, to value environmental impacts and related environmental aspects in monetary terms.

Standardization efforts to date have provided a sure foundation for natural capital accounting.

But gaps and challenges remain relating to methods and valuation factors and disclosure approaches. Methods are mostly kept within consultancies and have not been fully developed into readily applicable approaches. The same is true of valuation factors, although we have recently seen valuation factors being published by CE Delft and True Price. The high cost for businesses of developing natural capital accounting, through either internalization of knowledge or contracting an external service provider, represents a barrier to entry for those new to the field and those seeking to advance implementation and action.

Methods and valuation factors represent a space where standardization could bring clear added value to ensure a lower barrier to entry, consistency and relevance of assessments, and comparability across applications and companies. Standardization of methods and valuation factors is part of the role of the Capitals Coalition and the Value Balancing Alliance. By methods, we mean the set of indicators to be used (e.g. emissions to air, water eutrophication, resource use, etc.), the pathways defined for each indicator (e.g. GHGs emissions affecting the agriculture sector, which will be made less productive or will extend area at the expense of biodiversity) and the valuation technique to be used (e.g. loss of productivity of the agricultural sector could be reflected as a damage cost as malnutrition, or market price reflected by agricultural commodity price increase, or by the mitigation cost of extending the productive area or investing in innovations, or by the cost of adaptation changing agricultural practices, etc.). The methods should also set other rules and calculations principles covering, for instance, the baseline to be used, additivity rules across pathways and indicators and justification of exclusion, etc. Methods and valuation factors are, for the moment, left to the practitioner to develop and apply, leading to high complexity, resource needs and costs and low comparability.

Availability of methods and valuation factors is only one key technical challenge. From our business interviews, the importance of governance, strategy, policy and performance management considerations was also emphasized. Research and guidance addressing corporate governance, strategy and performance models that include natural capital accounting (and other capitals) and impact valuation in general are mostly absent. How, for example, can business incorporate the measurement and valuation of natural capital in resource allocation, costing, risk assessment, project appraisal and product development decisionmaking processes? For high level engagement, sustainability topics have seen the emergence of global commitments and initiatives which have driven uptake. Examples include the Sciencebased Targets initiative (SBTi), the WASH pledge for access to safe water, sanitation and hygiene, the CEO Water Mandate, the Guiding Principles on Business and Human Rights, etc. A highlevel initiative for, or related to, natural capital accounting might be an interesting next step to promote wider adoption of the approach. Business for Nature⁸ is beginning to build some momentum in this regard.

Reporting has been identified as another critical area to address. None of the current reporting initiatives and frameworks provide guidance on reporting natural capital accounting results. Current reporting standards address natural capital topics from a qualitative and quantitative, input-output perspective only, covering the reporting of GHG emissions, water and land use etc., for example. They do not however provide any guidance on the reporting of valuation implications and results.

https://www.businessfornature.org/

In the absence of such guidance, leading companies are using different formats including:

- Added value or integrated impact statement where a company provides financial results and human, social and natural capital impact on the same scale. The lack of additivity of values measured is an issue.
- Integrated Profit and Loss (P&L) where human, social and natural capital is presented in parallel or reconciled with the financial P&L. These applications are still under development and are not often publicly communicated.
- Separate natural capital accounting and impact valuation results in a specific chapter of the annual report, the sustainability report or a dedicated report.

Setting a standard around reporting/disclosure will be critical to allow information to be used efficiently both internally and externally and by a range of stakeholders, including shareholders. Reporting standardization could cover the transparency of assumptions and data used, how impact is reported and communicated (e.g. aggregation, etc.) and how to connect the impact results with other financial and business information (e.g. integrated P&L tables). Half of the companies interviewed mentioned that they could use reporting and disclosure guidance for internal and external engagements. Some have shown a particular interest in using impact valuation to support investor relations by demonstrating progress and impact aligned with purpose and strategy.

Overall, existing resources cover significant ground despite the gaps explored in this analysis (summarized in **Table 1**). This reflects a growing maturity. The development of initiatives, research, frameworks and standards is well under way or already achieved, while methods, valuation factors, reporting/disclosure frameworks, governance/strategy models and performance management tools are still to be developed.

Table 1: Illustration of resource landscapematurity and availability per theme in thenatural capital accounting field. Maturity/availability score is based on the analysisabove and on professional judgement.



3 BUSINESS CASES ANALYSIS

3.1 Overall trends

INSIGHTS

- Business cases reviewed were oriented towards impact on society, mostly driven by a need to first raise awareness internally and externally. There are opportunities to develop approaches relating to dependencies and business value.
- The cases reviewed **were relatively comprehensive in terms** of scope and capitals covered (natural, human and social capital). They usually covered the broader aspects of air, water, land and human health related to natural capital, across the entire value chain (supply chain, direct operations and downstream operations). Eight out of ten companies covered natural, human and social capitals.
- In general, looking at two important
 drivers for decision-making transparency
 and business integration most business
 applications are at an early stage of maturity
 and impact, but progress is being made.
- Materiality is not used to inform the choice of impact drivers, despite requirements in protocols and current trends in reporting. Companies tend to measure a comprehensive set of impacts through the models and methods they are using, rather than basing the choice of impact drivers on a materiality assessment.

- Companies using impact valuation tend to provide high level, aggregated results and little information on the method applied in external communications.
- LCA is widely used by seven out of the ten companies surveyed, showing the opportunity to strengthen the connection to and use of the PEF/OEF method as a critical contributor to natural capital accounting. IO model outputs can also be easily adapted to an impact assessment framework based on LCA. This would further ensure consistency in the models used and standardization.
- Given the reliance of natural capital accounting on underlying existing methods and data sources, such as IO and LCA, a stronger connection with those approaches needs to be made for any standard developed on natural capital accounting.

The number of companies well advanced in natural capital accounting (and impact valuation) remains modest to date (for leading applications). S&P Global identified in a 2019 analysis that, based on their extensive review of corporate practices, only one third of the companies reviewed (259 companies) and conducting impact valuation are doing so based on standard definitions.⁹ This number is likely over-estimated when considering more comprehensive applications (e.g. full corporate value chain assessment, multiple indicators, valuation approaches etc.).

We focus our analysis on 10 leading companies to provide relevant insights into the development and application of natural capital accounting. The companies analyzed are active in the following main activity sectors: basic materials (Olam, DSM, BASF and Lafarge-Holcim), consumer goods (Natura, Nestle, Kering), healthcare (Novartis, Philips) and financials (ABN AMRO).

The following insights were derived from a desktop review of the information available from each company:

- Business application: Descriptions of business applications were not provided publicly in the majority of the cases, apart from general awareness raising and understanding and some limited case studies. During the interviews, some additional context was provided.
- **Pathway chosen:** All of the cases considered a societal impact pathway as opposed to value to business pathways, although a few studies mentioned the latter in specific contexts.
- Impact vs. dependencies: All of the cases considered impact, with dependencies not mentioned at this stage.

- Value chain scope and capitals covered:
 All of the studies took a full value chain approach covering supply chain, direct operations and downstream operations (including use phase in half the cases), looking at global impact across social, human and natural capitals. Only two out of the 10 companies focused only on natural capital.
- Materiality: Materiality assessments were not directly mentioned by any of the cases. This is probably due to the standard approaches used for natural capital accounting that companies and their consultants are using, arising from IO modeling or LCA. Given that it is possible to measure all indicators, the results themselves are used as materiality assessment instead of other approaches.
- Corporate vs. product view: All businesses had a mix of cases at corporate and product level, without showing clear trends. Usually, products and corporate assessments are based on the same method. The sum of the product impact will provide the corporate impact. The corporate impact can usually be broken down into brands or business units, and then into products.
- Assurance/verification: This was not common across the cases reviewed, although one application used an assurance process and another an external expert review. The cost of auditing was mentioned as a barrier and its added value was questioned given that it is known that a lot of assumptions and secondary data sources are used, with relatively high uncertainties. An audit will not necessarily help in improving the assessment but it will help build trust for executives.

9 S&P Global website (accessed December 2020), analysis referred to in the following article: https://www.spglobal.com/esg/csa/insights/impact-valuation

- Aggregation level of public results: All results were highly aggregated in external communications. This prevents readers from analyzing the results in detail and deriving valuable insights, even when methodological reports were published in parallel to the results.
- Results placement: Results were communicated through separate publications (case studies, whitepaper), sustainability report (three cases), dedicated reports (five cases) and annual reports (three cases).
- Underlying impact method and data sources: All the applications were based on either LCA or IO modeling, or both. LCA was used in seven of the applications. Six different consultants were involved in the 10 applications.

Figure 2: Illustrative maturity model for the embedding of Natural Capital Accounting into business

The following diagram, Figure 2, provides an illustrative maturity model for the integration of natural capital accounting and impact valuation into decision-making and more broadly to support business purpose. It has been derived from the We Value Nature¹⁰ uptake ladder (maturity scale), with some adaptation and extension. It covers the scope of the assessment, desired outcomes, stakeholders impacted and communication/transparency required for each level of maturity. This model is illustrative. Depending on the company, sector and context, the parameters of each level of maturity will vary greatly. Currently, most of the case studies of companies reviewed are between the step 1. (awareness raising) and 2. (pilot study). Only a couple of companies showed the beginnings of integration of natural capital accounting into their strategy, commitments and decisions (maturity step 3 & 4). The current level of transparency of publicly available information on case studies is relatively low, while identified impacted stakeholders are mostly absent from the communications of companies.

Maturity steps	1. Awareness raising	2. Pilot study	3. Strategy integration and corporate commitment	4. Management integration to inform decision making	5. Business purpose and company culture
Scope	Full value chain	High level assessment or small scope case study	Full company value chain/multiple business units or product ranges	Granular impact valuation results at the level of the context of decision making	Full company value chain, relevant to each employee's work
Outcome	Awareness (no assessment yet)	Building the business case, simple trade off analysis, validation of current choices and awareness raising	Corporate commitment explicitly using impact valuation Change of strategy directly influenced by impact valuation	Decision making are influenced and/or based on impact valuation to address trade-offs and drive the business	Stakeholder capitalism: where every employee takes decision based on a balanced value perspective including all stakeholders
Stakeholders impacted/covered	-	Maybe 1-2	Key stakeholders (3–5)	Specific to decision making (>1)	All stakeholders
Communication/ transparency	- Most of maturit	One off publication/high level the companies interviewed v y model, with a couple gettin within the cor	Annual sustainability report — Methodology report — Results overview were located in the first 2 stag g close to the 3rd stage of int porate strategy.	Annual sustainability report — Full methodology report — Detailed results ges of the tegration	Annual report and extra-financial reporting completed by integrated P&L and balance sheet

10 https://wevaluenature.eu/media-item/185

We focused next on the analysis of the most common indicators (and data) considered for natural capital accounting. This was found to be informed by the underlying method chosen, LCA or IO for 100% of the business cases reviewed. Here, we introduce both approaches before developing some insights.

LCA has been in use for more than twenty years in academia, public and private sectors. This term regroups standards, impact methods (indicators) and data sources. It is based on the ISO 14040 and 14044 standards norms and has been the focus of important research and publications. LCA methods are usually published by academic institutes and are entirely open source. LCA relies on a bottom-up approach which gathers inputs (i.e. resource use materials & energy) and outputs (i.e. emissions to air, soil, water and waste) from specific processes (e.g. electricity production, PET production, transportation, etc.). These inputs and outputs are processed through to an impact assessment method (such as the PEF/OEF method — EU Commission Recommendations 2013/179/EU) to calculate impacts indicators. Databases are widely available and have compiled tens of thousands of activities, with specific data quality requirements and verification. These are used widely by most multinational companies. Data providers are mostly academic-led initiatives and private companies (consultants) who often work closely together. Datasets are usually defined at a fine granular level such as kg of Polyethylene terephthalate (PET), tons of goods transported over a distance, etc. allowing for connections to company data for the purpose of the LCA. LCA is very commonly used by companies to assess environmental impact at corporate and product levels.

Environmentally extended input-output (EEIO) datasets are an alternative, complementary source for performing natural capital accounting. EEIO (or IO) datasets are used in economic models to assess natural capital impact drivers. IO datasets are published by statistical offices from selected countries. These are gathered by a few initiatives into global IO databases, reflecting macro conditions. Such tables originally focused on economic indicators (e.g. added-value, taxes, output, etc.) but have been extended to include social and environmental flows and indicators. Those indicators are based on a top-down approach, at country or sector level, connected to economic flows (e.g. economic output). When used to calculate the environmental impact of a company, corporate financial data is used (e.g. for instance the purchases of a company) to calculate the average impact representative of a sector, based on the corresponding sector impact drivers scaled accordingly to the corporate financial flow. IO provides a macro (or topdown) analysis at activity sector level and per country. This differs to LCA which starts from a granular and bottom-up approach. The capacity of analysis is different for LCA and IO models: LCA is more granular (results detailed on steps of the value chain and associated processes) but less comprehensive, while IO models are more comprehensive (if including social and financial data) but less granular — although they are measuring the same thing. IO models are sometimes used in combination with LCA in the same study to accommodate available data, different expectations in terms of precision and granularity of analysis, and resources available (IO models are usually less costly to deploy than LCA). One important limitation of IO models and datasets is that they only cover the supply chain of a business and are usually complemented by different models (e.g. LCA) to assess their direct and downstream operations (including use phase).

In the end, for a similar scope of assessment, the results from both approaches are usually comparable. Decisions to use one or the other data sources and models may consider:

- Corporate data availability: financial data will lead to the use of IO datasets and models, while physical flows (tons of purchasing, tons of packaging, tons of active ingredients, MJ of energy used, m³ of water consumed, etc.) will lead to the use of LCA.
- **Consultant background:** LCA consultants will obviously use more often LCA, but typically manage IO modeling as well. LCA software and databases often include IO datasets as well. Other consultants with a background in economics might use IO datasets and models more frequently.
- Company experience in using either approach
- Level of detail of results and assessment objective: the level of detail obtained by both approaches can differ greatly and may answer different assessment objectives.
- Cost: IO and LCA assessment costs are very similar for a similar scope. However, it is typical to observe a factor 10 in the cost of similar studies, with similar levels of details and granularities, ranging from US 50'000 up to US 500'000. The final cost depends less on the complexity or quality of the study than on other factors.

More than anything, LCA and IO approaches are complementary (although overlapping on some aspects), especially when considering the assessment of human and social capital complementing natural capital accounting. In summary, when developing natural capital accounting, the different pieces of the puzzle which need to be put together cover:

• **Standards:** the Natural Capital Protocol should be used, within which the LCA standard (ISO 14040 and 14044) can support natural capital accounting (for impact to society in particular and for quantitative assessments).

- Methods: the LCA also provides different methods (PEF/OEF, ReCiPe, etc.) that translate impact drivers or elementary flows (input from or output to nature) into environmental impact indicators (equivalent more or less to change in natural capital, step 06 of the protocol). IO datasets and models do not readily provide methods and these have to be developed according to each study based on the definition of impact pathways. Some consultants have developed their own collection of impact pathway definitions which, together, constitute methods that overlap greatly with, or even rely, on LCA methods.
- Datasets: both LCA and EEIO provide datasets as the basis of their respective modeling, which are compliant with the methods defined. EEIO cover the entire world economy per definition but are not very granular to specific activities or regions. LCA datasets cover tens of thousands of individual processes in the economy (e.g. electricity mix, transportation, packaging, etc.) which need to be combined together in a consistent LCA model to reflect a company's impact. Often, the same model can combine both types of data sources together with primary data sources (typically coming from the company on its purchases, direct operations, distribution or use of products).

The **standards** provide a frame, rules, steps and process to develop natural capital accounting, while the **datasets** are the basis of the quantification of impact, transformed into impact with the help of **methods.** The last step of **valuation** is done using very different approaches and will typically inform different types of decisions or be used in different contexts. **Figure 3** provides a visual representation of those elements connected together, in line with the Natural Capital Protocol step 05 (measure impact drivers), 06 (measure changes) and 07 (valuation).

Figure 3: Illustration of the use of LCA and IO standards, datasets and methods in line with the Natural Capital Protocol steps

Steps of the Natural Capital Protocol



When looking in more detail at the **methods** used by LCA and IO, we can compare the typical **indicators** and underlying **impact pathways** defined in each approach. It is important to note that the final objective is the same (i.e. measuring impact on society). There is a clear need for both methods to be aligned.

Table 2 provides a benchmark of the indicatorscovered by common LCA and IO methods, usingthe EU PEF/OEF (2013) method as referenceon the side of LCA and PwC method on theside of IO. We decided to use the EU PEF/OEFenvironmental impact indicators as a reference,given that it is widely accepted in the privatesector and has been co-developed togetherwith a wide range of stakeholders (includingcompanies). We identified in the cases reviewedwhether they used LCA, IO, or both and whichindicators were covered directly, indirectly

(e.g. through a broader indicator definition, for instance "water pollution" instead of eutrophication, ecotoxicity, etc.) or not covered.

LCA based natural capital accounting has a high correspondence with the PEF/OEF method indicators. IO based natural capital accounting is much less aligned with PEF/OEF method indicators at the moment, because it focuses on impact drivers (output) primarily and it addresses the PEF/OEF impact indicators through custom built impact pathways developed for the valuation of the impact drivers considered. IO based natural capital accounting could be further aligned with PEF/OEF or LCA frameworks by aligning the list of impact drivers considered for valuation with the LCA impact indicators and ensuring that impact pathways are standardized. **Table 2:** Gap analysis of PEF/OEF method impact indicators with LCA and IO based natural capital accounting method, and their general coverage of LCA indicators, based on the review of business cases covered in this analysis.

PEF/OEF indicators	LCA based NCA coverage	IO based NCA coverage			
Climate change	Covered	Covered			
Ozone depletion	Covered	—			
Human toxicity (cancer/non-cancer)	Covered	Indirectly through air or water pollution (partially)			
Particulate matter	Covered	Indirectly through air pollution			
lonizing radiation (human health)	Covered	-			
Photochemical ozone formation (human health)	Covered	Indirectly through air pollution			
Acidification	Covered	—			
Eutrophication — Terrestrial	—	—			
Eutrophication — Freshwater	Covered	Indirectly through water pollution (partially)			
Eutrophication — Marine	Covered	Indirectly through water pollution			
Ecotoxicity — Freshwater	Covered	Indirectly through water pollution (partially)			
Land use	Covered	Covered			
Water use	Covered	Covered			
Resources use minerals and metals	Covered	—			
Resource use, fossils	Covered	—			
Other indicators not in the PEF/OEF method					
Biodiversity	Assessed through land use (IO) and other indicators for LCA				
Waste	Addressed through different impact pathways for LCA and IO				

The valuation part (step 07 of the Natural Capital Protocol) is where most of the LCA methodologies stop their analysis. The ReCiPe method is the only method for which valuation factors have been published (CE Delft, at EU level). In general, for both the IO and LCA based natural capital accounting, valuation factors need to be developed based on the existing list of valuation techniques that exist. No readily available existing solution exists.

Figure 4 illustrates in more detail the working of LCA- and IO-based natural capital accounting using an air pollution example. LCA relies on a standardized process that is relatively comprehensive in its scope. It starts by categorizing flows or emissions to nature (or flows from nature) arising from an activity into what they call midpoints (intermediate impact indicators) which usually reflect distinct environmental issues. In the case of air emissions, these midpoints are particulate matter emissions, troposphere ozone formation, ionizing radiation, stratospheric ozone depletion and human toxicity (toxic substance emissions). These are further categorized in their effects on human health (such as respiratory diseases, cancer and other diseases) and environmental impacts (not covered in this example). These impact pathways are usually predetermined in published academic methods and used by a wide range of researchers, consultants and businesses. A list of characterization factors (CFs) is published together with the method so that calculations can be done easily and ensure replicability and relevance. When used for natural capital accounting, the valuation is usually done on an area of protection — in this case human health expressed in DALY (Disability Adjusted Life Years — a common indicator used by the World Health Organization).

When looking at IO models, these are based on the definition of broad impact driver, usually relying on less flows (given that IO datasets are less comprehensive than LCA databases) than LCA. Typical emissions covered might include only SO₂, PM_{2.5}, PM₁₀ and ozone (O₃). Impact pathways are defined by the consultant or organization performing the analysis. They can be more or less transparent, complex and comprehensive. A typical methodology for air pollution might include societal impacts on human health, visibility, agriculture, forests and timber, man-made materials and other ecosystems (all or only a few of those impacts). In the case of human health impact, the method would typically use the DALYs indicator (even relying on LCA methods in some cases). The lack of standardization makes assessments based on IO output prone to additional gaps and uncertainties, although there is no reason why they could not be standardized and potentially aligned with LCA methods.

Within the context of method development, we specifically recommend aligning LCA and IO models using:

- A list of impact drivers/indicators aligned with LCA impact categories to obtain a comprehensive coverage of environmental impact.
- A definition of impact pathways aligned with LCA, although LCA does not usually address the final valuation step of the impact pathways, which would need to be addressed separately.

Figure 4: Simplified illustration of LCA and IO based natural capital accounting workings using air pollution as a basis of comparison, outlining the standardized approach from LCA compared to the more open approach of IO models.



3.2 Interview insights

The key questions we used to structure the company interviews were as follows:

- How has natural capital accounting changed your business?
- How is natural capital accounting connected to your company's strategy and governance?
- Which natural capital accounting method has been most successful in terms of influencing decision-making?
- Which aspects of natural capital accounting could be readily standardized? Which aspects need more development?

It is important to note that, during the interviews, interviewees referred more broadly to capitals accounting and impact valuation in general, rather than solely natural capital accounting.

3.2.1 How has natural capital accounting changed your business?

INSIGHTS

- All companies interviewed cited that natural capital accounting results were used first and foremost for awareness raising at all levels within the company and with key stakeholders (e.g. investors, NGOs, authorities, etc.). Limited wider use cases and applications were observed.
- Businesses have high expectations about the potential of natural capital accounting to be used for decision-making, in particular to challenge expectations and assumptions, analyze trade-offs, perform comparative assessment, identify options, etc.
- To realize the potential of informing and influencing decision-making, key challenges such as lack of granularity, data type/format, business value connection, uncertainties and lack of external drivers, must be addressed.

Awareness raising is cited as the first and main use of natural capital accounting at the current time. This may seem limited, but awareness raising builds critical knowledge and understanding among internal stakeholders that leads to a change in perception, engagement and ways of working. As such, awareness raising is an important first enabling step and is critical for making change happen.

Through discussion with the interviewees, we also identified that natural capital accounting provided a common language that facilitates exchange across departments and functions within a company, frequently involving sustainability, finance, HR, R&D, scientists, operations, etc.

Discussions with companies focused on technical challenges and limitations of natural capital accounting that reduce internal impact and need to be addressed to enhance natural capital accounting and influence decision-making processes.

These included:

- **Granularity** of the results not matching financial and other management information.
- Value perspective covering mostly societal value at the moment. More specific results connected to business value would be beneficial, considering dependencies, value to business (direct, indirect, intangible), rate of internalization of societal value, etc.
- Frequency of update is currently too slow compared with financial results used in decision-making. The changes are not granular enough and do not address underlying changes in businesses, focusing instead on methodology changes, for instance.
- Maturity and relevance of methods are not addressing all current sustainability challenges, such as plastics and packaging, etc. This makes it hard to use only natural capital accounting to help solve these challenges.

- Uncertainties connected with models, methodologies, assumptions, parameters and data used, when compared with other management and financial accounting processes and outputs.
- Balance and objectivity showing aggregated results with a net positive impact on the society but failing to address the real issues and tradeoffs faced by the business was identified by some companies as an issue. It was interesting to note that those results were perceived as counterproductive and potentially negatively impacting the movement to use natural capital accounting to improve business performance.

Some mentioned that natural capital accounting has a limited role to play in tactical and operational decision-making. Instead, it should be used to inform the strategic direction of a company (e.g. as a prioritization tool to provide a different lens to long term value creation), upstream of decision-making processes that could use more specific and precise quantitative indicators. There is, however, an opinion among interviewees that solutions can be developed so that natural capital accounting is used as a way to track and manage business performance in a comprehensive manner, complementing and even replacing other established financial indicators and management information.

In the meantime, the following uses were highlighted:

- Assessing progress and impact aligned with corporate purpose
- Supporting strategy development
- Supporting materiality assessments
- Trade-off analysis for investments, product innovation and development, project appraisal, etc.
- Challenging the status quo and influencing expectations and assumptions
- Stakeholder communication and engagement

3.2.2 How is natural capital accounting connected to your company's strategy and governance?

INSIGHTS

- Governance is usually ensured by a range of executives (VPs, directors, senior management) but more could be done to engage board members.
- There is interest in using natural capital accounting for assessing impact and demonstrating progress aligned with business purpose and corporate strategy, supporting performance evaluation processes.
- Strategy and performance management application and integration challenges must be addressed.

Governance arrangements connected to the board (responsibilities, oversight etc.) do not generally consider natural capital accounting and impact valuation at the current time, although a few companies mentioned that remuneration might be tied to related metrics in the future. The most senior roles providing oversight of natural capital accounting vary across directors and VPs, with some engaging CEOs/executive committees. Some companies mentioned the education gap that exists for top executives, CEOs and the board to be able to consider such information at the moment. In order to address some governance disconnects, natural capital accounting and, more generally, capitals accounting and impact valuation must find its place in current discussions on stakeholder capitalism. It is one of the few techniques that considers the critical question 'what value, to whom?' and explores trade offs and relationships between different stakeholders and capitals.

Interviewees shared challenges relating to the application and placement of natural capital accounting within corporate processes. Some questioned the relationship with other key performance indicators and raised challenges associated with locating the right decisionmaking context or formulating the right question to promote understanding and conversations. Others shared that natural capital accounting in its current form seems to be more suited to higher level overviews and prioritization, supporting engagement with a broad range of internal actors and/or external stakeholders, due to its capacity to translate complex and diverse topics. Some interviewees challenged the capacity of current approaches to be deployed widely across a company to support the range of decision-making at different levels. To realize that potential, more experience, technical capacity, guidance and resourcing is required.

To ensure natural capital accounting influences and changes decision-making, gaps relating to strategy, performance management and governance will need to be addressed in parallel to the development of methods.

3.2.3 Which natural capital accounting method was most successful in terms of influencing decision-making?

INSIGHTS

- Common successes related to engagement and building understanding. Specific case studies described included the use phase of products, resource use, circularity, etc.
- Some interviewees believe that the best outcomes are achieved if questions
 addressed are well framed and the scope of analysis is well defined. However, this does not mean that the range of impact drivers considered needs to be reduced, as the method adds value by providing a

comprehensive picture of natural capital impacts.

In general, the added value of natural capital accounting is its capacity to translate different complex topics into one single language, understandable by a wide range of stakeholders. Natural capital accounting is about breaking silos, providing objective metrics and obtaining a holistic view of a company in context. Instead of receiving answers on the methods themselves, answers were mainly oriented towards specific case studies where natural capital accounting played a role in raising awareness and confirming or informing business decisions.

For example, natural capital accounting helped:

- Confirm that strategic decisions were already aligned with maximizing societal value.
- Inform prioritization of suppliers and materials for product design, shaping a new way of addressing relationships with suppliers to ensure a lower impact.
- Confirm and consolidate the total value of product developments and innovations including environmental and/or social aspects.

- Assess the relationship between business and societal value, highlighting where business and societal value are aligned.
- Projection of P&L accounting for the expected internalized externalities.
- Change perceptions of the business among external and internal stakeholders, including the CEO and investors.

Business cases where natural capital accounting was used successfully were often connected to a specific method and valuation technique. **Table 3** provides an illustrative list of some of the connections between valuation techniques, methods and business decision-making uses and contexts.

Example of methods and valuation technique	Example of business use (illustrative)
Damage cost	Strategic prioritization and options Risk assessment and severity (operations)
Mitigation or solution cost	Risk response and management Budgeting and costing
Revealed/stated preferences	Risk assessment and severity (reputation) Market opportunity
Market prices and taxes	Investment and business case appraisal
Dependencies valuation (which relies on a mix of other valuation techniques, e.g. market based, or business value derived)	Risk assessment and severity (supply & operations)
Rate of internalization of costs (mix of techniques: market prices, taxes, mitigation/ solution costs, etc.)	Financial planning and performance forecasting/scenarios

Table 3: Illustration of key methods or valuation techniques and business uses (non-exhaustive)

Some interviewees mentioned that natural capital accounting cases which identified business and societal pathways in parallel were the most successful at influencing internal stakeholders. They highlighted the disconnect between societal value and business value, which can be assessed, understood and addressed by this joint approach (business value in parallel to societal value). A few companies mentioned that case studies with a smaller scope were more specific and easier to understand and, ultimately, changed perceptions of decision makers more effectively than very high-level approaches. However, most companies also identified the added value of natural capital accounting being in translating complex topics into a common language that can be understood by a wide range of stakeholders. Natural capital accounting is about breaking silos and obtaining a holistic view of a company in society.

3.2.4 Which aspects of natural capital accounting could be readily standardized? Which aspects need more development?

INSIGHTS

- Standardization is not a silver bullet but could be of great value if done right. It must be well targeted in terms of scope and rely on established practices and consultation with a wide range of stakeholders.
- Standardization is a high priority for method scope, impact pathways, valuation factors, accounting rules and reporting. Progress on method scope, pathways and valuation factors is most needed in the short term.
- The lack of relevance and consistency
 of impact pathways and valuation
 techniques limits the utility of natural
 capital accounting results for decisionmaking at the moment, as different impact
 drivers can have different associated values
 depending on the valuation technique.

- A balance between development, experimentation and standardization needs to be found.
- Development of dependencies and business value pathways is needed to derive more added value and relevance for business applications and better support for decision-making contexts.
- Development of integrated multicapital accounting framework is crucial as well to deliver the full potential of value accounting for businesses. 8 out of 10 companies interviewed also covered human and social capital in their accounting applications.

Standardization could lower the barrier of entry for newcomers and help increase the use of natural capital accounting approaches. Standardization is needed for credibility, comparability, transparency and robustness. It can support a level playing field and ensure a more balanced, transparent and objective approach to natural capital accounting. It is important that the questions what, why and for whom are answered. Standardization should not prevent innovation and the development of new methods. Standardization challenges — given methodological gaps, limited experience and limited alignment in existing applications must also be acknowledged.

We asked each interviewee where they felt standardization could add value if it was pursued. Answers included:

- Method scope which issues to cover, impact indicators and/or impact drivers.
- Impact pathways how to connect activities, output or impact drivers, outcome and impact, and valuation factors.
- Valuation factors how to monetize the impact measured.
- Accounting rules baseline, additivity, aggregation, models, valuation techniques, etc.
- Integration with financial reporting P&L and balance sheet.

Interviewees agreed that standardization on method scope, impact pathways and valuation factors were the short-term priorities. This will help provide a default method for more relevant and clear results that can be connected to decision-making questions and contexts. Four key challenges must be addressed:

- 1. Consistent scope across indicators **assessed.** Scope relates to the value chain elements covered — including supply chain, direct operations and downstream operations (e.g. distribution, use phase and end of life). Different indicators are sometimes measured across different scopes along the value chain of a company. When considering capitals accounting more broadly (human, social and natural capital accounting), it is common to see occupational safety or employee training/ development, for example, covering only direct operations while other indicators, such as GHG emissions, cover a larger scope along the value chain in the same study. The reason for this is likely related to difficulties in accessing data and lack of knowledge of existing methods, etc.
- 2. Consistent definition of impact used across indicators. It is common to see different indicators being defined at the level of output, outcome or impact in the same assessment. This can result in a lack of comparability of results and lead to confusion. It is particularly the case when human, social and natural capital impact indicators are assessed in a same study. It is common to see taxes, wages and profit being defined by their monetary flow, or by a simple weighted version of it, reflecting an output of the system rather than an impact. In the case of human and social capital, an impact is often defined by a significant change in guality of life of the person affected by the impact (positively or negatively). While other indicators such as safety or health directly measure this qualityof-life change, wages and taxes only measure an output which contributes to a quality of life change (which is not assessed). In the latter case, the safety and health indicators are not directly comparable to the wages and taxes indicators, despite being expressed in the same unit (monetary units). When considering only natural capital impact indicators, valuation factors usually connect output (i.e. impact drivers) to impact.

There is, however, no clear or consistent definition of a natural capital impact, which is expressed in regard to societal values (market, damage and mitigation costs, willingness to pay, etc.). In some instances human health is used as a definition of impact, while in others our willingness to pay or the economic cost of damage or mitigation is used.

3. Consistent valuation techniques used across indicators. Valuation techniques are numerous and can range across damage costs, market prices, revealed or stated preferences, mitigation cost, etc. These valuation techniques implicitly reveal a possible scenario and decision-making context (e.g. if a mitigation or solution cost is measured, it will inform how much it costs to reduce or avoid the societal impact. If a damage cost is measured, it highlights how much cost society absorbs and is used typically for prioritization. Willingness to pay may highlight the potential importance of an impact for a population and, as such, the potential risk for a company, etc.). In a decision-making context, clarity regarding what measure we are using is important to ensure consistency across indicators. In current natural capital accounting case studies, it is common to mix valuation techniques across indicators which are aggregated or directly compared together. For instance, climate change is usually measured in terms of damage cost while water pollution uses mitigation cost or revealed preference. Land use might be a mix of market prices, mitigation and damage costs, etc. Additionally, the same impact driver or output can be valued using different valuation techniques, leading to different valuations (e.g. climate change can be valued as: a damage cost — a typical value is US100/ tCO₂e; a mitigation cost — which can range from US5-30/tCO2e; a compensation costs — typically US2-10/tCO₂e; or a potential

internalized cost through taxes — this can be around US20-40/tCO₂e). Connecting valuation techniques to the decision-making context and ensuring consistent use of such valuation techniques is important.

4. Consistent definition of impact pathways.

To take an example, it is common to value water use or depletion as the potential additional economic cost (or subsidy) to deliver this water, in parallel to the human health cost of water born diseases and malnutrition arising from water scarcity for food production. Those are different pathways and these are often not fully additive given that the first one (additional cost to deliver water) avoids the second and third (disease and malnutrition). In the absence of additional investments in water delivery, then the second and third impact might occur (although unlikely). Accounting for the three pathways together would not be fully correct. This would lead to additivity issues which would need to be disclosed as methodological limitations (pending improvements) to be considered when used in support of decision-making. It is not uncommon to identify accounting issues in different indicators from air pollution, land use, biodiversity, etc. For instance, some companies attempt to quantify biodiversity separately from land use and other indicators. In most cases, the quantified biodiversity exists on land that is accounted for in the land use indicator. Changes in ecosystem services usually accounted for in the land use indicator relies on the biodiversity of the land, leading to double counting if both land use and biodiversity are accounted for separately. Beyond accounting issues, being able to use standardized impact pathways will ensure more consistency across natural capital accounting studies. This will help to increase comparability and relevance of results for decision-making contexts.

4 RECOMMENDATIONS ON STANDARDIZATION

The area of natural capital accounting is well populated with initiatives, research and frameworks/standards. Despite this, we identified specific gaps in methods, impact pathways, valuation factors and reporting guidance that it would be worthwhile addressing through ongoing efforts to standardize natural capital accounting practices. The interviews with 10 leading companies confirmed this as a priority to ensure a lower barrier of entry for new organizations and to add value through better consistency, comparability and robustness of natural capital accounting.

Based on the analysis outlined in this report, we recommend focusing the standardization effort on:

- Method: a standard method should be defined in terms of value chain scope and list impact indicators and pathways for key natural capital categories (e.g. air, water, land, resources and biodiversity). Within this method, three specific aspects need particular attention:
 - a. Impact pathway definition: across natural and societal impact, dependencies and business impact. Each of those perspectives requires the definition of pathways connecting impact drivers to impacts and their value. Those pathways need to be clear and comprehensive while avoiding double counting and addressing the need for additivity.
 - b. Valuation techniques and factors: impacts defined by the impact pathways can be valued through different approaches connected to different valuation techniques. Consistent use of valuation techniques is critical to create relevant insights from results and a better connection to decision-making contexts.

The same impact drivers can be valued through different techniques which will lead to different results. Providing sets of valuation factors, in line with the defined indicator lists of the standardized method, is crucial to ensure a low barrier to entry for new companies to apply natural capital accounting and also comparability of results and relevance of insights. Valuation techniques need to be clearly and explicitly connected to decision making context and business uses and be accessible to well-informed practitioners who do not necessarily possess a detailed academic background or interest.

- c. Accounting rules: natural capital accounting relies on implicit and sometimes explicit accounting rules which can reduce the comparability of different studies. The choice of baseline can have a significant impact on results and it is particularly important to ensure a consistent baseline across capitals. The additivity of natural capital accounting results needs to be defined whenever net results are used or communicated. Other accounting rules such as exchange rates, discounting, value chain scope, the use of inflation for adjusting valuation factors, etc. (not exhaustive) also need to be defined. A deeper review of implicit accounting rules would support standardization efforts.
- 2. **IO and LCA alignment for the purpose of natural capital accounting:** LCA is already the basis of many of the natural capital accounting case studies. IO models can be adapted and aligned with a LCA framework. This relates to the above recommendation to standardize impact pathways and valuation factors. In practice, alignment should cover impact drivers and impact indicators between IO and LCA methodologies and should connect the impact pathways found in LCA-based methods that are consensual, widely accepted and used (e.g. PEF/OEF), with typical ones used for IO.
- 3. Decision-making applications: standardized natural capital accounting should prioritize relevance for decision-making at strategic and executive level to ensure transparency, reliability, consistency and reduced uncertainties. Standardization should also support integration in different business functions, units and applications (e.g. product development, strategic guidance, investment appraisal, resource management and risk assessment). The connection between decision-making applications and valuation techniques needs to be strengthened.

- 4. **Development of dependencies and business value pathways:** the broader use of natural capital accounting beyond the usual view of impact to society needs to happen quickly to derive more added value and relevance for businesses applications and decision-making contexts.
- 5. Development of integrated multi capital accounting framework: our interviews showed that leading businesses already cover natural, human and social capital in their accounting applications. Multi-capital approaches and thinking must be advanced.

Conclusion

Standardization is important and could highly benefit the field of natural capital accounting. Standardization should build on existing methods while leaving room for new and innovative approaches to solving current challenges of natural capital accounting. A balance of development and standardization must be pursued with standardization processes allowing for developments over time and flexibility in application.

Overall there is a clear need to inform and align all businesses on the base rules of natural capital accounting to ensure greater consistency and added value across all cases of natural capital accounting. We believe that advancing natural capital accounting and, in general, impact valuation standardization will benefit business and its stakeholders in different ways.

It has the potential to:

- Increase the visibility and credibility of the approach to support sustainable development.
- Provide more relevant, robust and insightful results that are better connected to decisionmaking contexts and business strategies, enabling sustainable business.
- Lower the barrier to entry, including the resources and costs for new companies to develop capitals accounting and impact valuation, building momentum, knowledge and capacity.
- Align with and accelerate the sustainable finance agenda.
- Allow easier connection with reporting standards and practices to inform a variety of external stakeholders.

Acronyms

- EEIO Environmental Extended Input Output
- IO Input Output
- LCA Life Cycle Assessment
- NCA Natural Capital Accounting
- **OEF** Organization Environmental Footprint
- P&L Profit & Loss
- **PEF** Product Environmental Footprint

Key resources¹¹

Initiatives and research providers

Audencia – https://faculte-recherche.audencia.com/en/chairs/multi-capitalintegrated-performance/

A4S - https://www.accountingforsustainability.org/en/index.html

University of Cambridge - https://www.cisl.cam.ac.uk/

Capitals Coalition - https://capitalscoalition.org/

Harvard Business School — Impact Weighted Accounts – https://www.hbs.edu/impact-weighted-accounts/Pages/default.aspx

Impact Institute - https://www.impactinstitute.com/

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University of Oxford - https://www.smithschool.ox.ac.uk/

TEEB - http://www.teebweb.org/

The Economics of Mutuality – https://eom.org/

VBA - http://value-balancing.com

WBCSD Redefining Value – https://www.wbcsd.org/Programs/Redefining-Value

¹¹ Considered in this report, not exhaustive

Frameworks, standards & methods/valuation factors

BSI 8632 Natural Capital Accounting for Organizations – Specifications – https://standardsdevelopment.bsigroup.com/projects/2019-02487#/section

CE Delft — Environmental prices handbook – https://www.cedelft.eu/en/ publications/2191/environmental-prices-handbook-eu28-version

Environmental Valuation Reference Inventory – https://www.evri.ca/

ISO 14007 Environmental management — Guidelines for determining environmental costs and benefits – https://www.iso.org/standard/70139.html

ISO 14008 Monetary valuation of environmental impacts and related environmental aspects – https://www.iso.org/standard/43243.html

Natural Capital Protocol – https://naturalcapitalcoalition.org/natural-capital-protocol/

True Price — Monetization Factors – https://trueprice.org/monetisation-factors-for-true-pricing/

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Company applications and acknowledgement

ABN AMRO

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Key definitions

These selected definitions are drawn from the Natural Capital Protocol and the Capitals Coalition report on "Improving nature's visibility in financial accounting"¹² wherever possible.

Impact Valuation — Natural, human and social capital impact, valued through processes estimating the relative importance, worth, utility or usefulness to different stakeholders.

Natural Capital — The stock of renewable and non-renewable natural resources that combine to yield a flow of benefits to people and society.

Natural Capital Accounting — Compilation of consistent and comparable data on natural capital and its flows of services generated, using an accounting approach to show the contribution of the environment to the economy or business and the impact of the economy or business on the environment.

Natura capital impact — The negative or positive effect of business activity on natural capital.

Natural capital dependencies — A business reliance on or use of natural capital.

Natural Capital Assessment — The process of measuring and valuing natural capital impacts and/or dependencies, using appropriate methods to address a specific question or inform a decision.

Value — In the context of natural capital assessment: the importance, worth, utility or usefulness of something to people and society.

Valuation technique — The specific method used to determine the importance, worth, utility, or usefulness of something in a particular context.

Impact pathways — Impact pathways describe how, as a result of a specific business activity, a particular impact driver results in changes in natural capital and how these changes impact different stakeholders. Impact pathways are often defined in terms of input, activity (impact driver), output (change in natural capital) and outcomes/impacts.

12 https://capitalscoalition.org/wp-content/uploads/2020/04/NatCap_VisFinAccount_final_20200428.pdf

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