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**PROFESSIONAL
ACCOUNTANTS
CHANGING
BUSINESS FOR
THE PLANET**

A simple guide to natural capital
management for performance managers

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PROFESSIONAL ACCOUNTANTS CHANGING BUSINESS FOR THE PLANET: **A SIMPLE GUIDE TO NATURAL CAPITAL MANAGEMENT FOR PERFORMANCE MANAGERS**

This guide is derived from ACCA's desk-based research and information from our contributors, who have provided valuable insights through their participation in the roundtables and interviews that we conducted as part of this project. We have provided many examples and links to other organisations with natural capital management expertise to support readers further in connecting to more detail. In providing such links, ACCA does not endorse any commercial activities associated with these organisations.



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Executive summary

Performance and management accounting insight are the fuel for successful decision-making, just as oxygen and nutrients are for the function of the human body.

You, the performance manager, are the highly valued business partner, employing integrated thinking that connects and balances the trade-offs between the material capitals and help leadership, managerial and operational business functions set and execute strategy, manage risks and realise opportunity. In all this, you are also enabling the connection between these activities and meaningful external reporting.

The Introduction, part one of this series (ACCA 2020a), established the call for businesses to improve management of natural capital, the loudest call from the planet, telling us that a failure by business to manage its use of and impact on natural capital will lead business, society and much of the life on the planet to become unsustainable. Further, society, policymakers and investors hearing this call are demanding better management of all capitals used by business, as it is this that will help us collectively achieve the United Nations Sustainable Development Goals, five of which focus on nature (see ILO 1996–2021). Therefore, businesses must implement better natural capital management and depend on performance managers to help them. A great way of doing this, especially for those new to natural capital management, or with limited resources, is by conducting a product life cycle assessment (LCA), modified to include simplifications and adaptations that integrate the results with performance management. There are a few key steps, which will be explained in this guide.

So, what skills do you need? Appreciating and integrating natural capital with performance management requires some scientific literacy and creativity, and, potentially, collaboration with other experts such as natural capital scientists, especially if you intend to explain fully, in quantitative terms, the outcome for nature of, say, the change in flora and fauna due to business activity, as doing this requires scientifically valid measures.

Further, to integrate natural capital with planning, directing and controlling performance management calls for:

- thinking and action that are dynamic and therefore remain relevant, valid and reliable, meaning you should be vigilant to how changes in events and stakeholder views can create material issues for business and nature (obvious examples at the time of writing this guide being COVID-19 and Brexit, with their implications for supply chains), and
- information systems that connect natural capital with performance management information for leadership, managerial and operational decision making, meaning that you must be the engineer of these systems, collaborating with IT experts to facilitate this.

Obtaining this integrated natural capital performance insight needn't be daunting, and this guide is here to help you. Integrated natural capital performance measurement is not a one-off activity so there is always room for continual improvement.

Key Steps

- STEP 1:** Determine the connections required between the LCA and performance management.
- STEP 2:** Determine the products on which to conduct the LCA.
- STEP 3:** Determine the scope of the product LCA, natural capital dependency and impact to be measured.
- STEP 4:** Collect the data for the product LCA, and for inclusion in dependency and impact metrics.
- STEP 5:** Prepare the product LCA metrics for use in performance management activity.



**BUSINESSES MUST IMPLEMENT BETTER
NATURAL CAPITAL MANAGEMENT
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1. Introduction

Key messages

As a performance and management accountant:

- you are the organisation's sustainability trailblazer, the main source of forward-looking directing, planning and control insight that the business requires so that it can design and implement successful natural capital management strategies
- you must have the insight to appreciate and strive for a fair balance between the interconnected and interdependent material capitals used and affected by business operations
- you are central to defining the information systems and processes that support the development of insight.



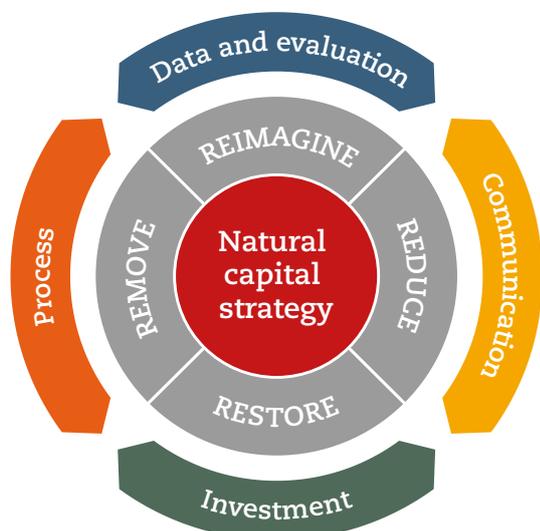
As vital as oxygen is to the human body, travelling through networks of veins and arteries, providing fuel for organ function, so too is the directing, planning and control information provided by the performance and management accountant across the business functions that collectively develop and implement strategy.

Where nature is material to business operations, both the introduction to this series and the leaders guide (Machado 2020 and ACCA 2020a; ACCA 2020c) highlight the need for natural capital management strategies (see Figure 1.1).

These strategies often call for transformation of the business model or supply chain. And successful development and implementation of these transformations demands forward-looking performance management insight that links strategy across all business functions, from governance, resource allocation, risk and opportunity management to performance reporting (IIRC 2013: 24–30). Further, this also requires recognition of the interconnectivity between the material capitals used by the business or changed by business activity (See Figure 1.2). That means historical analysis and forecasting must extend to proactive value creation (see Figure 1.3) therefore integrated thinking, decision-making and actions (ACCA and PwC 2020: 17–36). Proactive value creation is enabled by valid and timely information, and reliable systems and processes.

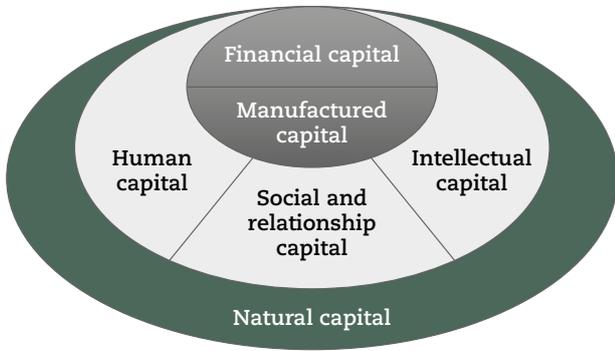
In driving value creation, you, the performance manager, operating in roles of management and performance accounting, are the sustainability trailblazer and business transformer, and your success will be underpinned by your skills as a data navigator and assurance advocate (ACCA 2020b: 8) (see Figures 1.4 and 1.5).

FIGURE 1.1: Four strategic options for managing natural capital



Source: ACCA 2020a

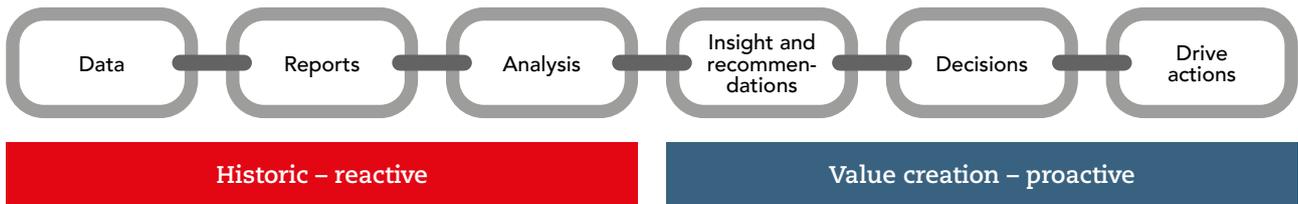
FIGURE 1.2: The interconnected multi-capitals



This is one of many ways to depict the capitals. Typically, financial and manufactured capitals are the ones organisations most commonly report on. The IIRC takes a broader view by also considering intellectual, social and relationship, and human capitals and natural capital, which provides the environment in which the other capitals sit.

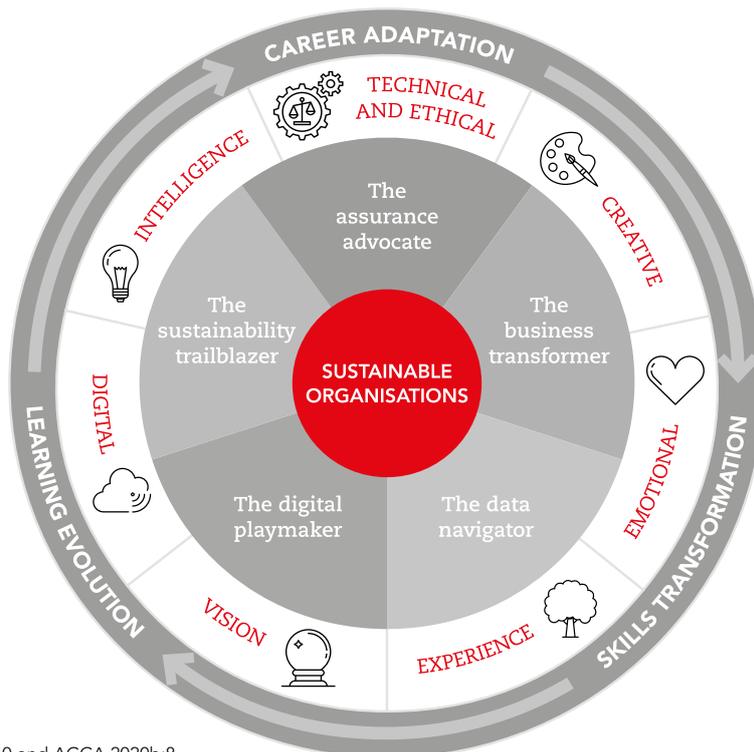
Source: Incite 'Sustainability 2.0: A Guide to Competing in a Changing World'

FIGURE 1.3: The six stages of business partnering



Source: ACCA and PwC 2020

FIGURE 1.4: The sustainability trailblazer and the career zones



Source: ACCA and PwC 2020: 60 and ACCA 2020b:8

FIGURE 1.5: The sustainability trailblazer and the career zones**The assurance advocate**

The assurance advocate brings new levels of trust and integrity to organisational operations. They may focus on enterprise risk, helping drive transparency and understanding of emerging issues affecting business performance, or be at the forefront of shaping future forward-looking audit practices as the capabilities of digital tools and technologies expand. They could be driving best practices in emerging control frameworks or helping organisations meet ever-growing regulatory demands or managing complex tax issues. They may even be auditing algorithms in the future. They are essential to the strong stewardship of sustainable organisations for the future.

The business transformer

The business transformer is the architect of organisational change. They could be driving major business change initiatives or transforming finance operations. They may be leading innovative smaller accountancy firms that transform client businesses. They could be exploring growing careers in external advisory services driven by technological innovation and economic growth. Or they may be leading smaller enterprises as digital platforms open the door to new commercial opportunities. They are critical to creating change, driving the strategies of organisations, and supporting sustainable organisations for the future.

The data navigator

The data navigator is a true business partner. They see extraordinary opportunities from the expansion of data and use emerging tech and analytical tools to drive insights that deliver business outcomes and sound financial management of the organisation. They champion ever-growing multi-rich data sets and use smart data to generate brilliant forward-looking analysis to support decision-making. This could be exploring new geographic market opportunities or building the case for investment. They understand that the currency of good information is at the heart of building sustainable future organisations.

The digital playmaker

The digital playmaker is a technology evangelist. They see remarkable possibilities for emerging digital tools in transforming the organisations in which they work. They are champions of technology adoption and data governance within the organisation. They look to connect across teams and functions to leverage the power of technology. They may focus on digital implementation programmes or have specialised expertise in particular finance and business technologies. They understand that digital transformation in today's global economy is the lifeblood of future sustainable organisations.

The sustainability trailblazer

The sustainability trailblazer is at the heart of performance management in the organisation. They play a key role in establishing frameworks that capture, evaluate and report on the activities that truly drive value and in ways that are much more transparent and meaningful to the outside world. They will transform management accounting fit for a multi-capital world and see emerging opportunities with better external disclosures to ever-growing stakeholder groups. They understand that aligning the pursuit of profit with the pursuit of purpose is integral to building sustainable future businesses.

This guide provides you with the key mechanisms and examples for better appreciation and integration of natural capital impacts and dependencies across the value and supply chain, and into standard performance management (see Box 1.1).

In section 3, we highlight the capabilities, process and systems requirements central to success.

In some organisations, especially small and medium-sized enterprises (SMEs), you may also be the corporate reporter, preparing reports for external audiences, therefore you should also engage with the corporate reporter guide (ACCA 2021) in this series.

**Box 1.1: Functions of the performance manager**

- **Directing:** strategic option development and selection, investment appraisal and process design
- **Planning:** budgeting and costing
- **Control:** setting and monitoring metrics to measure strategic performance and act as risk mitigation and opportunity realisation intervention triggers.

**THE SUSTAINABILITY TRAILBLAZER
IS AT THE HEART OF PERFORMANCE
MANAGEMENT IN THE ORGANISATION.**

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2. Integrating natural capital impacts and dependencies with performance management

Key messages

- Integrated performance management product LCAs enable integrated thinking and action, which is the frame for proactive value creation.
- Integrating thinking and action is possible when natural capital cost, benefits, risks and opportunities are well understood and connected to strategy.
- Getting started with product LCAs is made easier with modifications of simplification or using proxy measures, which can help manage the challenge of generating relevant, timely and reliable information.
- Enhance reliability and relevance of the product LCA by reducing dependency on proxy measures over time.
- Engagement with affected stakeholders or those on whom your product is dependent is central to a successful product LCA.

Recognising and appreciating the interconnected nature of the different capitals is an important step in their optimal management. To generate value creation insight you should integrate costs, benefits, risks and opportunities related to the material capitals into performance management activity and output. In this section, we start by helping you understand the business needs for integrated capitals insight, before outlining the approach you should take.

2.1 Understand the business need for natural capital performance management

Making decisions for sustainable value creation decision-making is rarely achieved through intuition but borne from diligent collection and evaluation of data on the interconnected capitals. This data supports performance management (see Box 1.1), for which we provide detail and examples in sections 2.3 and 2.4 respectively, below.

The business leaders' guide (ACCA 2020c) highlights that decision making across the organisation needs to be related to natural capital management. Therefore, the content and presentation of your integrated natural capital

performance management insight must be relevant to the decision-making authority of the various leadership, managerial and operational functional groups, such as the board, finance, organisational risk management and the production process. Your insights should:

- include a fair balance of qualitative and quantitative indicators across the capitals
- consider the short and the long term
- address the dynamic nature of materiality, taking into account external stakeholders, whose views may result in action that eventually filters into your business, so you must allow for how 'materiality' changes over time or in response to specific events, such as COVID-19 and Brexit, which have raised materiality issues among supply chains (Eccles 2020) and
- relate to progress against strategy, risk, business forecasting and governance systems, etc (IIRC 2019).

A good place to start is by accessing and comparing the terms of reference for the meetings of each leadership, managerial and operational functional group, considering where capitals information would be useful, and

connecting to where each group’s decision-making has, or should have, an impact. In doing this, you can proactively add value, by identifying and including reporting on currently excluded capitals or improving decision-making impact. For example, an organisation may claim to have a sustainability agenda, but impact will be limited if sustainability-related findings, recommendations or decisions are not included as part of the work of risk or operational process groups.

A final but important consideration is the information that will be reported externally and how this will be done, because external information should be consistent with and verifiable against internal performance management reporting and activity. You will therefore need to work closely with colleagues in corporate reporting roles to ensure this happens, collaborating on issues such as the relevance, validity, reliability of data and fulfilment implications, such as time and resources.

2.2 What is a product life cycle assessment (LCA) and why conduct one?

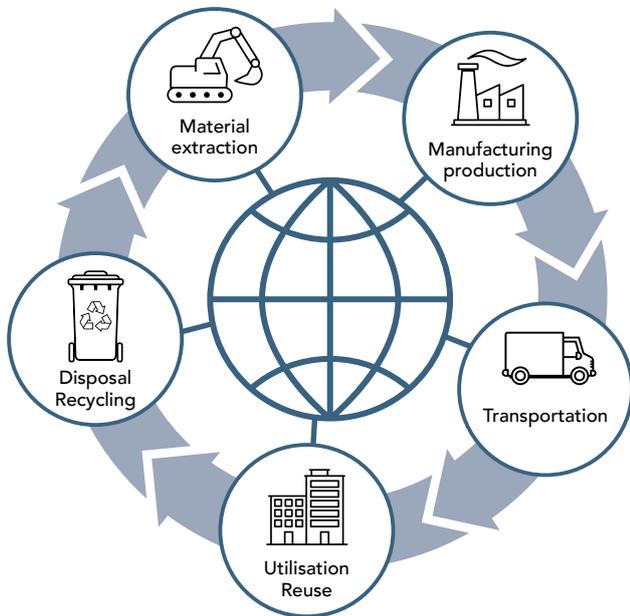
Informing and executing a strategy that manages natural capital requires appreciation of the business model’s natural capital inputs and outputs, together with their interconnections with the other capitals. The value and supply chain that appreciates the capitals, including nature, is called a product life cycle assessment (see Figure 2.1).

‘THE PRODUCT LIFE CYCLE ASSESSMENT IS A TOOL FOR THE SYSTEMATIC EVALUATION OF THE ENVIRONMENTAL ASPECTS OF A PRODUCT OR SERVICE SYSTEM THROUGH ALL STAGES OF ITS LIFE CYCLE.’

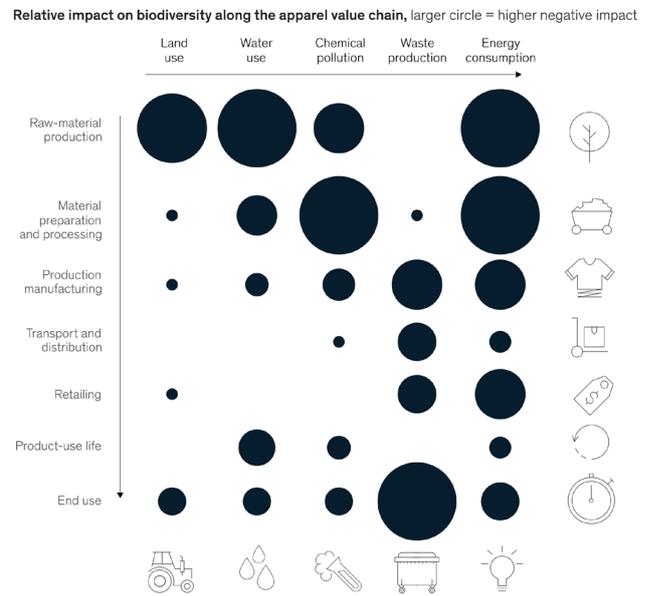
Martin Lok, Deputy Director, Natural Capital Coalition (Natural Capital Coalition 2015)

It is for you to define what is meant by a ‘product’ in the context of your business, and for the purposes of this guide it should be taken as including both goods and services.

FIGURE 2.1: The produce life cycle and worked example



Source: Adapted from NIST



Source: Granskog et al. 2020

*Includes yarn preparation, fabric preparation (weaving and knitting), and dyeing.
 †Includes cut, make, and trim (CMT) and washing and finishing.
 Source: Expert interviews; McKinsey analysis

The product life cycle for the clothing sector has been assessed, and indicates that a strategy for managing natural capital should focus on:

- raw material production – land, use of water and energy
- raw material processing – chemicals and energy
- end use – waste.

Policymakers (UNEP n.d.), standard setters (ISO 2006–07) and sustainable businesses (WBCSD 2016) with natural capital high on their agendas deem product LCA to be an effective mechanism for guiding action on the natural capital strategic business model. The benefits of (business case for) conducting product LCAs include compliance with policymaker requirements and helping build brand and market, because they aid:

- the identification of opportunities for improving environmental performance across the product life cycle
- the definition of the natural capital metrics for internal and external reporting
- the identification of the interconnections and trade-offs between the capitals for decision making, therefore increasing the potential for operational effectiveness and efficiency
- the identification of data needs, including signposting stakeholder engagement requirements to acquire this data and to communicate natural capital management strategic interventions.

A product LCA can be resource intensive (financial cost, time and people), especially the first time, for SMEs or those new to natural capital management, but the benefits are likely to outweigh the cost of these resources. To help you, this guide provides a modified product LCA approach, integrating it with key performance management directing, planning and control activities.

Conducting a product LCA is not a one-time activity, so initial foundational work will not have to be repeated, allowing you to focus on continual improvement.

2.3 How to conduct an integrated performance management product LCA

Once you know your performance management directing, planning and control requirements for decision-making (see section 2.1), you need to integrate natural capital information, and conducting a product LCA will help you do this. The steps of an integrated performance management product LCA are as follows.

STEP 1: Determine the connections required between the LCA and performance management.

STEP 2: Determine the products on which to conduct the LCA.

STEP 3: Determine the scope of the product LCA, natural capital dependency and impact to be measured.

STEP 4: Collect the data for inclusion in dependency and impact metrics.

STEP 5: Prepare the product LCA metrics for use in performance management activity.

There is plenty of guidance for conducting product LCAs, including LCA consultants who can provide specific advice or conduct the LCA (see Box 2.1).



Box 2.1: Conducting an LCA – sources of guidance

NATURAL CAPITAL COALITION

Natural Capital Coalition (2019), *Data Use in Natural Capital Assessments. Assessing Challenges and Identifying Solutions. Full Report*

Natural Capital Coalition (2016), *Natural Capital Protocol*

Natural Capital Coalition (n.d.), *Natural Capital Protocol Application Program*

UNIVERSITY OF CAMBRIDGE INSTITUTE FOR SUSTAINABILITY LEADERSHIP (CISL)

CISL (2020), *Measuring Business Impacts on Nature: A Framework to Support Better Stewardship of Biodiversity in Global Supply Chains*

ACCOUNTING FOR SUSTAINABILITY (A4S)

A4S (2019 – updated version), *Essential Guide to Natural and Social Capital Accounting: An Introduction to Integrating Natural and Social Capital into Accounting and Decision Making*

EU Business @ Biodiversity Platform (2019), *Assessment of Biodiversity Measurement Approaches for Businesses and Financial Institutions: Critical Assessment of Biodiversity*

FINDING AN LCA CONSULTANT

EPD International (n.d.), *List of LCA Consultants*

Step 1: Determine the connections required between the LCA and performance management

This step will help you determine the data connections between the product LCA and performance management, so that you have the data to produce the performance management outputs you have previously decided you need. You should think about the following questions.

- Where is natural capital information needed? For example, strategic option selection investment appraisal, budgeting, risk management and control, measuring progress of your 4Rs strategy, forecasting and/or external reporting (see Box 1.1).
- How natural capital information should be presented? The groups using this information will help determine the answer (see section 2.1), whether monetary values, banding or rating scales for the metrics. Step 5 explores the practicalities of doing this.
- Collect the data to include in your metrics, the remainder of the guide helps with this.

Step 2: Determine the products on which to conduct the LCA

In this step we identify the products on which to conduct the LCA.

Businesses often have more than one product offering, and so when conducting a product LCA, especially the first time, consider prioritising products, such as those deemed strategic to achieving business purpose, or grouping products that use similar capitals (resources) and processes. Prioritise products that have similar natural capital impact features, such as those:

- with gas emissions linked to climate change and pollution, for example CO₂
- that significantly change land or water use, such as monocultures
- that introduce invasive species or are linked to waste
- that create light and/or noise pollution.

There is plenty of opportunity to learn and use data from organisations that have conducted product LCAs and made them publicly available, so identify who they are in your industry. Don't be afraid to contact them: these sustainability-focused organisations are often very willing to share and advise, because they recognise that change for nature is best pursued collectively.

Step 3: Determine the scope of the product LCA, natural capital dependency and impact to be measured

This step helps you determine the metrics that will inform integrated capitals performance management insight.

To determine the metrics, you need to decide the scope, dependency, impacts and boundary (see Figure 2.2), appreciating that decisions affect feasibility of gathering data for and quality of performance management insight. Product LCAs may require natural capital data you may not readily hold or, when new to this, be sufficiently skilled to conduct an assessment without help, scientific literacy being one such example. In Steps 3 and 4, we provide guidance on simplifying the approach and enhancing your scientific literacy.

Scope

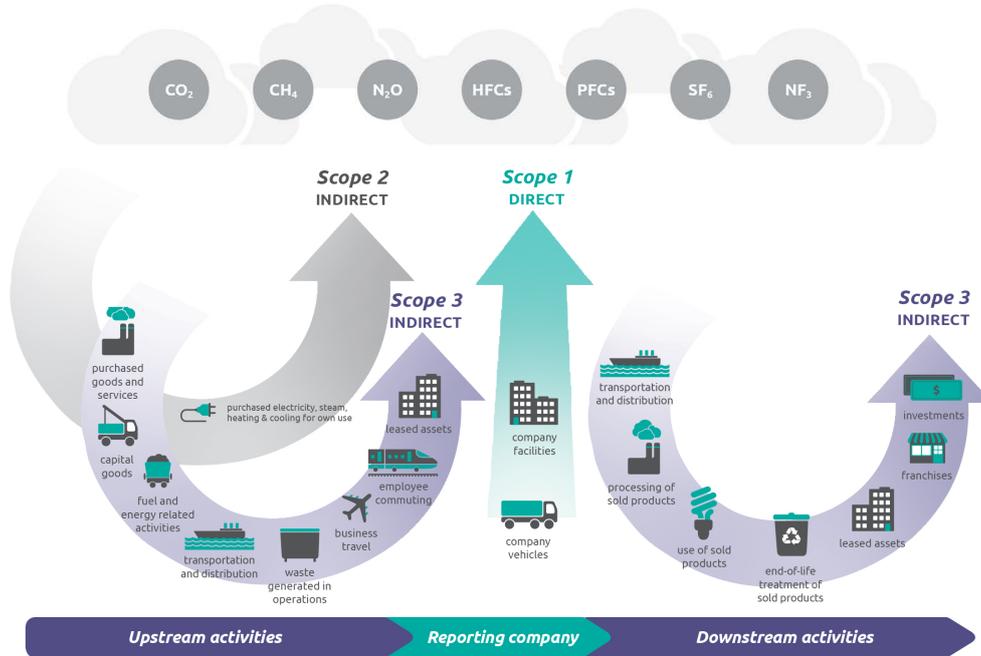
The main output from this stage is the product life cycle map (see Figure 2.4), from which you will define what is in scope for the LCA for your product.

In defining the scope, you are deciding on the starting and stopping points, and on which product process stages in between will be part of the product LCA. So you will need to consider whether to start from the production of your raw materials (cradle) or their entry to organisation (entry gate) to leaving the organisation (exit gate), end use (grave) or their use as raw material for another product (ie that product's 'cradle') (Liebsch n.d.). The most complete of the assessments and the one required for circular economy strategies is 'cradle to cradle'. In making these decisions, consider where the most likely opportunities may exist to achieve the best natural capital management, which could make your organisation a sustainability trailblazer and be most valued by your key stakeholders. You also need to be mindful of the data needs, so think about where data gaps are likely to be for each stage of the product life cycle in a 'cradle to cradle' scenario, and how they could be filled. For example, can you use data from organisations that have conducted and made publicly available product LCAs for products like yours? Or how can you engage with your external stakeholders up and down the supply chain? From here you can work backwards to address where the balance between data gathering and ambition of strategy lies, the outcome is the scope of the product LCA. This approach is equally relevant for impact, dependency and boundary considerations here.

FIGURE 2.2: Definitions of scope, dependency, impacts (outputs, outcomes) and boundary

TERM	DEFINITION	EXAMPLES AND CONSIDERATIONS
<p>Scope</p>	<p>The extent (start and end points) to which the organisation intends to recognise, measure and potentially manage natural capital. The scope, start and end points could be:</p> <ul style="list-style-type: none"> ■ cradle (raw materials for your product or your waste as a raw material for another product) ■ grave (end use for your product) ■ gate (organisation boundary, the physical entry or exit)  <p>Source: Liebsch (n.d.)</p>	<ul style="list-style-type: none"> ■ 'Cradle to cradle' is the most complete, therefore likely to yield the most opportunities for identifying natural capital management strategies ■ Engagement with external stakeholders will be required to acquire the data to support more complete LCAs
<p>Dependency on nature</p>	<p>The need to use nature as raw materials or in processes across the life cycle</p>	<p>Use of land and water together with their flora and fauna (ACCA and NBA 2013)</p>
<p>Impact on nature</p>	<p>The output to nature, ie what is put into the environment or the outcome for the environment, specifically the positive or negative change to nature</p>	<ul style="list-style-type: none"> ■ Outputs include chemical emissions and waste products ■ Outcomes are the impacts, including their significance for the existence and/or quality of nature and societal well-being, for example flora and fauna lost owing to outputs such as felled trees or toxic emissions to water that reduce fish stocks and/or make water undrinkable ■ Outcomes are typically what interest stakeholders most and indicate precisely the aspect of nature that needs a natural capital management strategy, but are usually more difficult (although not impossible) for accountants to measure, because they usually need science-based measures (IIRC 2013)
<p>Boundary</p>	<p>The extent to which nature will be considered:</p> <ul style="list-style-type: none"> ■ Scope 1 – direct impacts owned or controlled by the business ■ Scope 2 – indirect impacts from energy consumed by the business in the production of goods and services ■ Scope 3 – all other ancillary impacts arising from the organisation's value chain 	<ul style="list-style-type: none"> ■ Scope 1 – land, water plus flora and fauna ■ Scope 2 – emissions to air, soil and water from the fossil fuels used to create the energy purchased ■ Scope 3 – emissions associated with other resources or processes used by the business in production or its disposal <p>Please see Figure 2.3 which illustrates this.</p>

FIGURE 2.3: Overview of GHG Protocol scopes and emissions across the value chain



Source: World Resources Institute and WBCSD 2013

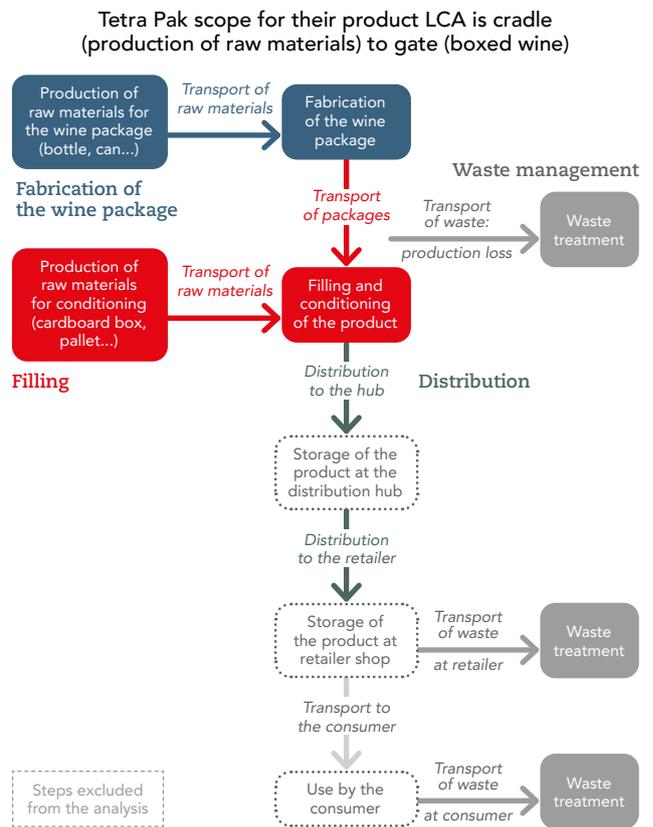
Dependency, impacts and boundaries

With the scope of the product LCA determined, you now need to make decisions relating to which metrics you will measure to help monitor progress against your natural capital strategy. These metrics cover dependencies (inputs), impacts (outputs and outcomes), and boundary (level of detail related to impacts) (see Figure 2.2). Step 4 collects the data for inclusion.

As a minimum, dependency metrics should be ones related to the most important contribution from nature to the product, and where strategic or tactical options (reduce, remove, restore and reimagine success) (see Figure 1.1) are likely to exist. In the wine packaging example, a dependency to focus and collect metrics on could be paper (see Figure 2.4) because it is a major component, further assuming that currently paper is sourced from virgin wood, then there are non-recycled and recycled options, for example clothing or paper destined for landfill. For the paper, sourced from virgin wood, the dependencies are water and plants used in pulping and land.

The most valuable product LCAs are ones that will identify the specific natural capital risks and issues, usually quantitative impact outcomes (see Figure 2.2), for which strategic interventions (see Figure 1.1) can then be developed. Quantitative impact outcome metrics enable better comparison and inclusion with the other capitals, for example:

FIGURE 2.4: Tetra Pak wine packaging scope example



Source: Adapted from Tetra Pak

- conversion of nature impact into monetary values for inclusion within risk measures or costings for a natural capital management strategy (covered in step 5)
- comparison of nature capital with human capital, say to highlight that a change in nature of 'X' will have an implication for employee skills to manage it of 'Y'.

Scientific measures are typically needed for quantitative impact outcomes, for example to approximate the change together with its significance for the variety and quantity of flora and fauna arising from rising temperatures due to CO₂ or wastewater polluting rivers. Product LCAs are simplified by selecting output-related impact quantity metrics, for example litres of wastewater or kilos of CO₂ emitted, from which the outcome should be described qualitatively, thereby reducing the need for scientific data and its conversion into performance management measures. If you decide to measure outcomes quantitatively, you will need to decide the time frame that the measure covers.

Simplification of the boundary is possible when you focus on scope 1 and 2 (see Figure 2.3). Scope 3 requires a deeper dive for information and therefore can be included in future continual improvement iterations of the product LCA.

Finally, non-financial reporting standards and frameworks are a great source of guidance, helping identify specific dependency, impact and boundary metrics (see Box 2.2). Explore the materiality map developed by SASB for your industry, it will help you start selecting natural capital

metrics to measure. From here you can connect to other initiatives, such as the Global Reporting Initiative (GRI), which also includes guidance on selecting dependency and impact output metrics but extends beyond SASB guidance by including nature and society outcome metrics (See Figure 2.5).

Step 4: Collect the data for inclusion in dependency and impact metrics

In this step, we outline how you can gather the data for inclusion in the quantitative metrics and measures that you have identified as needed in Steps 1 and 3.

Gathering data requires resource the first time you do it, because processes need to be put in place. This effort does not need to be replicated as you will use the processes regularly in creating performance management directing, planning and control related insight. Further, gathering data need not be daunting, especially if in the planning stages (Steps 1 to 3) you have taken the suggested simplifications. Remember, you can add complexity that increases relevance by extending future product LCAs to widen the scope, quantify outcomes, and extend the boundary to Scope 3.

Dependency and output Scope 1 impact data should be held in standard process and costing datastores. Further, dependency and impact data, specifically that relating to other scopes, can be obtained as proxy measures, for example from organisations in your industry that employ sustainability reporting, and from national databases such as the ones held by the OECD (see Box 2.3).

FIGURE 2.5: Impact and boundary scope example

	Emissions and Resource Use	Environmental Change	Change in Wellbeing
Water Consumption	Water consumption in m3	Increasing water scarcity	Malnutrition and disease
Water Pollution	Release of specific heavy metals, nutrients, toxic compounds in kg	Reduced water quality	Health impacts, eutrophication, economic losses
Waste	Hazardous and non-hazardous waste in kg	Climate change, disamenity and contamination	Reduced enjoyment of local environment, decontamination costs
Air Pollution	Emissions of pollutants (PM2.5, PM10, NOx, SOx, VOCs, NH3) in kg	Increase in concentration of pollution	Respiratory disease, agricultural losses, reduced visibility
Greenhouse Gas Emissions	Emissions of greenhouse gases (CO ₂ , N2O, CH4, CFC's etc) in kg	Climate change	Health impacts, economic losses, change in natural environment
Land Use	Area of tropical forest, temperate forest, inland wetland etc in hectares	Reduced ecosystem services	Health impacts, economic losses, reduced recreational and cultural benefits

Source: PUMA 2018

PUMA's reporting addresses the input dependency and output (resource use and emissions) together with the outcome for nature and society (environmental change and change in well-being)



Box 2.2: Potential impacts, measures and other sources of guidance

Theme	Expanded Metrics and Disclosures	Sources
Climate Change	Science-based target to reduce GHG emissions Define and report progress against a science-based target to reduce GHG emissions.	SBTi
	TCFD-aligned reporting Enhance TCFD aligned reporting with financial metrics.	TCFD
	Impact of greenhouse gases Report wherever material along the value chain: Valued societal impact of greenhouse gas emissions.	NCP, ISO 14008
Nature Loss	Impact of land use Report wherever material along the value chain: Valued societal impact of use of land and conversion of ecosystems.	NCP, ISO 14008
Fresh water availability	Impact of fresh water consumption Report wherever material along the value chain: Valued societal impact of water consumption.	NCP, ISO 14008
Air pollution	Fine particulate matter Report wherever material along the value chain: Tonnes of PM2.5 emitted in urban areas.	GRI (305-7), SASB (120a.1)
	Impact of air pollution Report wherever material along the value chain: Valued societal impact of air pollution.	NCP, ISO 14008
Water pollution	Nutrients Report wherever material along the value chain: Tonnes of phosphate and nitrogen used or produced.	Adapted from: GRI (303-1)
	Impact of water pollution Report wherever material along the value chain: Valued societal impact of water pollution, including excess nutrients, heavy metals and other toxins.	NCP, ISO 14008
Solid waste	Single use plastics Report wherever material along the value chain: Tonnes of single-use plastic disposed of.	New Metric
	Impact of solid waste disposal Report wherever material along the value chain: Valued societal impact of solid waste disposal, including plastics and other waste streams.	NCP, ISO 14008
Resource availability	Resource circularity Tonnes and % of circular inflow / outflow.	WBCSD & KPMG Circular Transition Indicators

Source: WEF 2020: 16

DEPENDENCIES AND IMPACT INDICATORS

International Organization for Standardization (ISO 2006-07a): 'ISO 14040:2006: Environmental management – Life Cycle Assessment – Principles and Framework' and (ISO 2006-07b): 'ISO 14044:2006: Environmental management – Life cycle assessment – Requirements and guidelines'

SASB (2018), 'SASB Materiality Map'

GRI standards from 301 to 308 relating to nature and the environment, <https://www.globalreporting.org/>

Task-Force on Climate-Related Financial Disclosures (TCFD n.d.), 'Metrics and Targets'

APPROACH TO DETERMINING RELEVANT INDICATORS

Accounting for Sustainability (A4S 2019 – updated version), *Essential Guide to Natural and Social Capital Accounting: An Introduction to Integrating Natural and Social Capital into Accounting and Decision Making*



Box 2.3: Scientific measures and databases

EMISSIONS: Ecoinvent (n.d.), 'Ecoinvent – the World's Most Consistent & Transparent Life Cycle Inventory Database'

NATURE LOSS: See Organisation for Economic Co-operation and Development (OECD.stats 2021) 'Threatened Species'

Don't be afraid to use proxy measures, even the most sophisticated of organisations do, but remember proxies may require adjustments to reflect your local environment or use. Always communicate the limitations associated with using the proxy (see Box 2.4).

Many impact outcome metrics employ science-based metrics and data (CISL 2020), for example changes in volume and variety of fauna and flora (outcome) due to

hectares of forest felled or emissions to air (output), water and soil (output) (see Box 2.5). You may need to connect with natural capital specialists or their work (see Box 2.3). The Biodiversity Impact Metric (BIM) defines the change in nature together with the significance of the change for a selected area, which in the next step we outline how you can use the BIM in performance management. The BIM enables identification of the key geographical areas with biodiversity change risk.



Box 2.4: European Space Agency use of proxies

The European Space Agency (ESA) uses many specialist materials and custom-made components, such as chemically treated rubber to withstand the weather conditions associated with space missions.

In its LCA, ESA used simplifications for when data relating to natural capital impact of these specialist materials was difficult to obtain. ESA used organisation data to determine the base materials of the chemically treated rubber, then for each base material it used measurements for the natural capital impact when the base material is employed in more general commercial activity by business and society, making subjective adjustments to recognise ESA's different use.

The use of proxy measures meant ESA could complete the natural capital impact measurement. ESA recognised and communicated the limitations of the subjective adjustments.

Source: Golsteijn 2018



Box 2.5: Science based measures for nature loss and worked example

$$\text{Biodiversity Impact Metric} = \text{Land area} \times \text{Proportion of biodiversity lost} \times \text{Biodiversity importance}$$

The biodiversity impact metric (BIM) calculates the change to nature, including its significance, so it measures not only the loss or gain of flora and fauna but also how important this is to the area concerned, therefore providing an indication of where the Key Biodiversity Areas (KBA) are located. The higher the BIM, the more problematic is the outcome for nature (see Figure 2.6).

Data relating to land area will come from the organisation's datastores.

Biodiversity lost and its importance are both scientific measures and are obtained from national databases (see Box 2.3).

- The proportion of biodiversity lost is expressed as a 0% to 100% scale, and based on the type of land use, for example farming, including kind (organic, monoculture, intensive, etc), buildings, depositing waste. The closer to 100% loss, the bigger the problem.
- The relative biodiversity importance is the balance between the variety and rarity of species in the location. The bigger the value, the bigger the problem, so loss of insects such as bees, which are vital for pollination, might be very important for flora and therefore would have a high rating.

FIGURE 2.6: An example for cocoa plantations, also presented on a map highlighting the key biodiversity at risk areas

Worked example of the Biodiversity Impact Metric for cocoa supply chains using fictional data values

Country	Tonnes sourced	Yield (kg/ha)	Land area (ha)	Proportion of biodiversity lost (with 1 representing 100% loss)	Biodiversity importance (range rarity)	Metric results	
						Impact/ tonne (weighted hectares)	Impact-weighted hectares
Côte d'Ivoire	5,000	522	9,579	0.90	1.33	2.29	11,431
Ghana	5,000	510	9,804	0.90	1.37	2.42	12,107
Dominican Republic	100	461	217	0.90	1.53	2.98	298
Nigeria	100	180	556	0.90	0.96	4.80	480
Cameroon	50	403	124	0.90	1.31	2.92	146
Liberia	50	142	352	0.90	1.40	8.87	443
Sierra Leone	50	361	139	0.90	1.29	3.22	161
Company total	10,350		20,770			2.42^a	25,066
Global average		436		0.90	1.35	2.79	

^aWeighted average across all source countries

Data sources

Tonnes sourced: Business data.

Yield (kg/ha): From credible sources including a business's own data, otherwise FAO country-level yield estimates used.

Land area (ha): Estimated using the volume of raw material purchased (tonnes)/agricultural yield (tonnes per hectare).

Proportion of biodiversity lost: Global Mean Species Abundance values for different land use types and intensities.

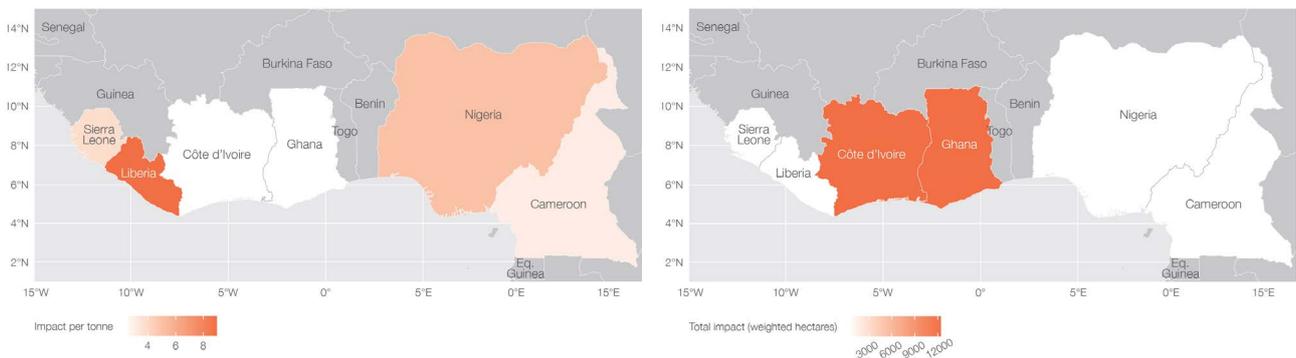
Intense (0.90) used for the global average as detailed intensity and land use information is unknown.

Biodiversity importance: Range rarity for cocoa-producing regions (an average that is weighted according to the land area used for production in each region).

Biodiversity heat map (key biodiversity areas (KBA)) showing:

- impact per tonne sourced
- total impact across all cocoa sourced.

Countries not sourced from are shown in grey.



Source: CISL 2020

Step 5: Prepare the product LCA metrics for use in performance management activity

The result of the previous steps will be a set of metrics, all expressed in different ways, for example kilos of CO₂, litres of toxic wastewater, science-based measures for biodiversity change or BIM. In this step, we outline how to prepare the data so that it can be used in performance management activity, such as that described in section 2.4.

These may need to be placed on a common scale, so that they can be integrated with data relating to other capitals, such as financial capital, or visualised like that in the value chain, shown in section 2.2 (see Figure 2.1) and environmental profit and losses (see Figure 2.7).

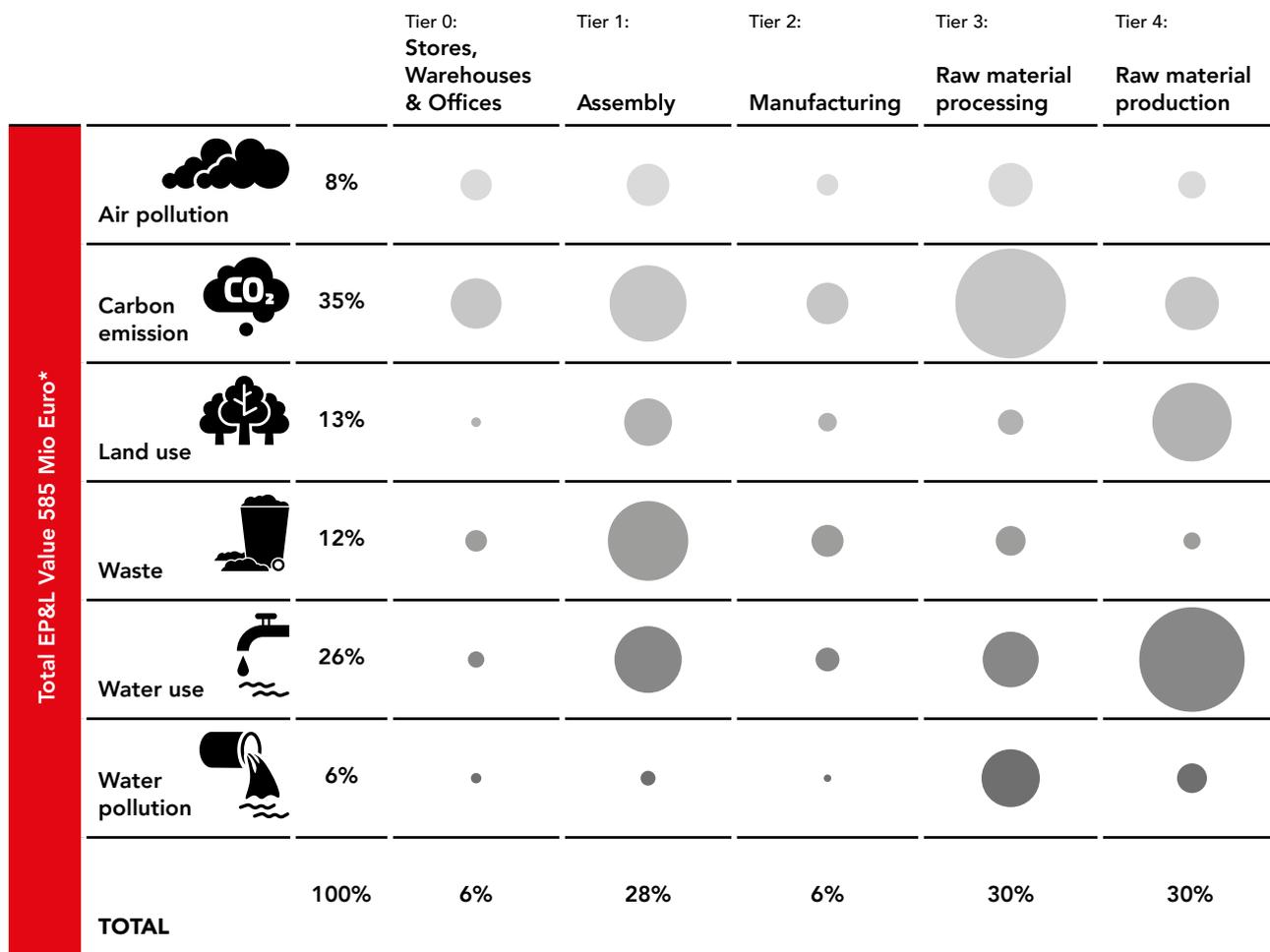
In this step we provide guidance on some available approaches (see Box 2.6).

Box 2.6: Creating a common scale guidance

Greenstone (2019), *Beyond CSR Reporting: How to Value Natural Capital*

A4S (2019 – updated version), *Essential Guide to Natural and Social Capital Accounting: An Introduction to Integrating Natural and Social Capital into Accounting and Decision Making*

FIGURE 2.7: Puma eP&L



* without value-channel footwear

Source: Adapted from PUMA 2018

Monetisation

As a professional accountant your first instinct will be to monetise metrics. However, in addition to the multitude of standard valuation techniques you use, for example net present value, net realisable value, replacement cost etc, there is the additional complexity associated with assigning monetary values to these metrics (CO₂, toxic waste, BIM). Therefore, in the first instance, assess whether monetisation is needed (see Figure 2.8).

That said, assigning monetary values to natural capital dependencies and impacts (CO₂, toxic waste, BIM) is possible and one of the following methods may be of use.

- **Market value of:**
 - acquiring the natural capital again
 - fixing the negative impact on nature resulting from business activity, using prices set by others, such as governments, some of which set a price per kilo of carbon or nature lost.
- **Non-market valuation including:**
 - cost-basis:
 - historical cost
 - avoided damage, for example, value of avoided water treatment costs because the organisation has put in place system to limit emissions to soil and water
 - replacement cost.
 - Value gained from use, being the proportion of total revenue derived from nature’s contribution, where the proportion is the importance of nature relative to the capitals used to generate value.
 - Revealed or stated preference, being the amount the organisation is willing to pay in a hypothetical situation to fix a problem, for example to reverse the negative impacts of a toxic leak of effluent to the sea.

FIGURE 2.8: Examples from A4S of considerations for when and where to use monetisation

TYPE OF MEASURE	WHEN USEFUL?
Qualitative	<ul style="list-style-type: none"> ■ Initial consideration of issues or where you wish to cover a large number of issues ■ Detailed data is unavailable
Quantitative	<ul style="list-style-type: none"> ■ Data is already being collected, eg water usage through bills ■ Comparison against targets, eg corporate carbon reduction target ■ Investigating net impacts ■ Impacts or risks have a strong ethical or political dimension ■ Areas where severe, long term or irreversible impacts are likely and an absolute level therefore needs to be set
Monetary – Shareholder value	<ul style="list-style-type: none"> ■ Developing a business case for an investment decision ■ Making trade offs between different issues, eg carbon / water / jobs or across different geographies from a purely financial or value at risk perspective ■ Assessing the financial impact of risks and opportunities ■ Communicating the potential market value of an opportunity or risk to your investors
Monetary – Societal value	<ul style="list-style-type: none"> ■ Making trade offs between different issues or across different geographies taking into account the full value chain risks and impacts ■ Understanding potential future risks ■ Focusing on 'license to operate' or reputational benefits ■ Projects have significant community benefits ■ Communicating with stakeholders ■ Maximising positive impact for all stakeholders including the environment

Source: Adapted from A4S 2019 – updated

Once you have selected your monetisation approach, to determine the impact multiply the metric by the unitised monetary value. Therefore, to calculate the monetised value of nature lost owing to tree felling or contamination, take the BIM statistic and multiply by the selected monetary value per hectare of land.

Depending on what you want to use the measures for, a lower level of sophistication could be acceptable, for example, if your strategy is to restore damage to nature then future restoration costs basis is needed. Whereas, if you want to compare potential strategic options against each other, then using a consistent measure such as historical cost, could be effective.

Finally, if monetisation is unnecessary then an alternative such as a banding and rating system can work well.

Banding scales

Quantitative banding scales can be a good alternative to monetisation, especially when the purpose of the measurement relates to achieving targets for managing specific impacts, for example CO₂ emissions of less than ‘x’ grams, between ‘x’ and ‘y’ grams, or over ‘y’ grams. The bands can be determined according to target thresholds of industry best practice or potentially from policymakers who may have different penalties or incentives attributable to each band.

Rating systems

Qualitative rating systems, for example red, amber, green ratings, are especially useful when providing quantitative information is less feasible. These rating systems work well when used as compliance (see Box 2.7) and risk indicators, addressing likelihood vs. impact and/or signposting availability of alternatives or ease of switching from away from a natural capital resource.

2.4 Including product life cycle findings in performance management

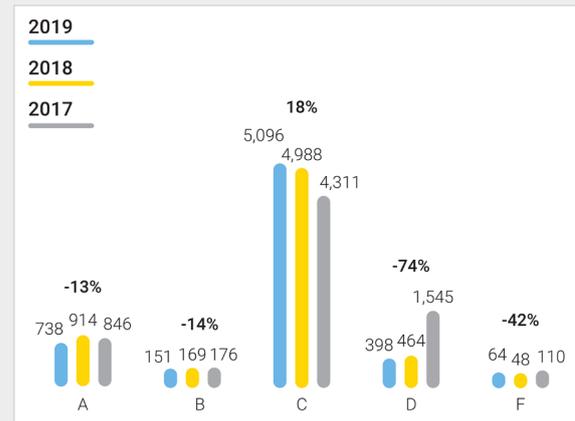
The data, once converted for performance management purposes, will aid:

- directing: strategic option development and selection, investment appraisal and process design
- planning: budgeting and costing
- control: performance measurement, including intervention triggers and controls, and supporting external reporting and assurance.

Box 2.7: Rating system to evaluate supply chain

Li & Fung has established a rating system for measuring factory performance of its suppliers and help making procurement decisions. Supplier factories rated A (best) typically will be approved for supply for longer periods, with the lower-performing being subject to remedial actions that are agreed with the supplier. This rating and remedial system has enabled the number of its supplier factories with a D rating to decrease by 14%.

The rating parameters were defined from the product LCA findings, outlining the conditions that would meet better outcomes for nature, among other integrated capitals.



Source: Li & Fung Ltd (2019)

While most quantitative performance management information is monetised to enable comparable measurement, within Step 5 we identified other measurement mechanisms, such as banding and rating systems, including how they could be used in decision making. Qualitative information is also extremely important and as a minimum should be provided to aid understanding of the quantitative measures.

Directing and planning

Strategic option selection and investment appraisals are considered here, but principles can be applied to other aspects of directing and planning.

Strategic option selection and development were identified as key activities for business leaders. These leaders, using the product LCA you conduct, define strategic goals and options and decide between them. Our Leaders’ guide (ACCA 2020c) identifies the need for integrated

thinking, across the capitals, specifically considering how the strategic actions deal with the natural capital issue relative to the impact on the other capitals used by the organisation (See Figure 1.2), for which the long-term financial capital impact was proposed as a simplification to the analysis (see Figure 2.9). The Leaders’ guide (ACCA 2020c) provides an example of this on page 17.

In this instance, monetisation of natural capital impacts and dependencies, including strategic commitments, is useful because monetary values can be included in costings and investment appraisal systems (see Box 2.8).

Investment appraisal calculations such as net present value (NPV) include only those costs that are expected to result in cash flows. These standard NPV appraisals should be supplemented with adjusted versions that include cash flows associated with natural capital that may not yet be committed, such as natural capital restoration, for example

reintroducing flora and fauna, which then take property, plant and equipment decommissioning cash flows beyond what would typically be included in the standard NPV.

Finally, while the examples included here used monetisation, bandings or ratings can be used too. You can use ratings or bandings as part of a condition to be met for a specific directing or planning option to proceed, so a financially viable strategic option only proceeds if it does not breach a natural capital threshold band or risk rating.

Control

The product LCA enables a detailed process understanding, from which strategy is identified and new processes, in which metrics act as control indicators, are developed and monitored. Using the example of the painkiller packaging (see Box 2.8), if CO₂ emissions breach a set target for a production stage, then that stage would be subject to investigation to understand and repair the breach.

FIGURE 2.9: The natural capital integrated thinking matrix



Source: ACCA 2020c



Box 2.8: Example of integrating natural capital into costing appraisal systems

Integrated capitals analysis has been conducted on packaging for an over-the-counter painkiller, using LCA techniques. The analysis showed that the CO₂ emissions from the material-components (packaging) are higher than those from production activity (Figure 2.10). The CO₂ breakdown, along with total cost analysis, revealed that there were opportunities to reduce both CO₂ and product costs.

The LCA data was then put through data analytic modelling for three different scenarios:

- reducing the box weight by 10%
- increasing the packaging density (to save box and blister material)
- relocating the packaging production to another country (Figure 2.11).

The best outcome results from increasing packaging density, reducing costs by 3% (financial capital) and CO₂ emissions by 5% (natural capital), although it does increase production time by 5%, hence potentially increasing employee time because modifications are needed for production processes (human and manufactured capital).

Source: McKinsey & Company 2020 (Figure 2.10 and 2.11)

FIGURE 2.10: Original CO₂ analysis

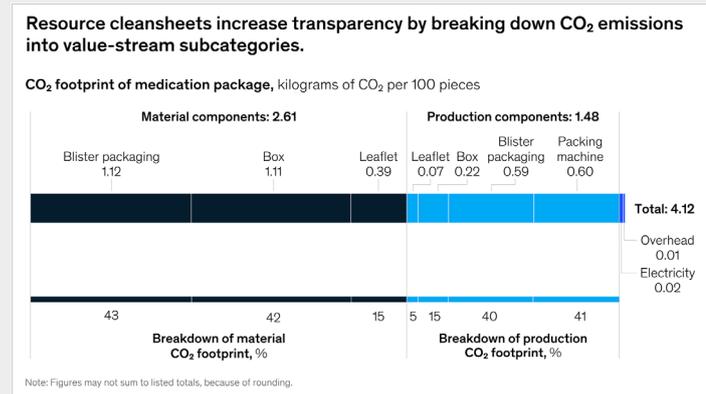


FIGURE 2.11: Three strategies for carbon abatement of medication packaging

Cost impact, € per 100 pieces	Reduce box weight by 10%			Increase tablet density per package		Relocate production		
	Original	New	Change	New	Change	New	Change	
Overhead	0.32	0.32	0.00	0.32	0.00	0.18	-0.14	
Production	1.38	1.38	0.00	1.40	0.03	1.11	-0.27	
Material	1.38	1.31	-0.07	1.27	-0.11	1.37	-0.01	
Total	3.08	3.00	-0.07	2.99	-0.09	2.66	-0.42	
Net change			-2.4%		-2.8%		-13.6%	
CO ₂ impact, kilograms of CO ₂ per 100 pieces	Original	New	Change	New	Change	New	Change	
	Overhead	0.01	0.00	-0.01	0.01	0.00	0.01	0.00
	Production	1.48	1.47	-0.01	1.51	0.03	1.75	0.27
	Electricity	0.02	0.02	0.00	0.02	0.00	0.04	0.02
	Material	2.61	2.50	-0.11	2.38	-0.22	2.61	0.00
Total	4.11	4.00	-0.12	3.92	-0.19	4.41	0.29	
Net change			-2.8%		-4.7%		7.1%	
Abatement cost, € per metric ton of CO₂			-583		-474		No abatement	

Note: Figures may not sum to listed totals, because of rounding.



3. Implementation considerations for the performance manager

Key messages

- Integrated thinking and action are only possible with the right supporting information systems, processes and people skills.
- Information systems must connect insight into the material capitals with knowledge requirements of the different organisational decision-making groups; this enables integrated capital management.
- Pilot the product LCA, initially focusing on internal audiences, and apply the tenets of good corporate reporting as adapted for performance managers.
- Employ skills of professional scepticism, collaboration and integrated capitals thinking, underpinned by vision and a focus on continual improvement.

Connecting life cycle assessments with the performance management activities of directing, planning and control is only possible with the appropriate information systems and processes, and capable people.

3.1 Information systems

The information systems you use should connect tailored performance management information on the material capitals with the needs of the organisation's decision-

making groups. This connectivity enables integrated thinking to be used to realise organisational purpose and effective natural capital management. Therefore, you will need to identify the connections, from the points where the data is sourced, including from the product LCA, through to how it will be manipulated (see Figure 3.1) (IIRC and <IR> Technology Initiative 2016). The design of information systems should consider the points raised in Figure 3.2.

FIGURE 3.1: Information system connectivity across the capitals

	Source	Consolidation	Scope	Connected to
1 Financial Capital KPIs Ex: EBIT				1 2 3 4 5 6
2 Manufactured Capital KPIs Ex: Services backlog				1 2 3 4 5 6
3 Human Capital KPIs Ex: Employee retention				1 2 3 4 5 6
4 Intellectual Capital KPIs Ex: R&D investment				1 2 3 4 5 6
5 Natural Capital KPIs Ex: CO2 emissions				1 2 3 4 5 6
6 Social Capital KPIs Ex: Contribution to the local communities' employment				1 2 3 4 5 6

Legend: IT Systems Excel Word (Qualitative) IT Systems Manual Global Local

Source: Adapted from IIRC and <IR> Technology Initiative 2016

FIGURE 3.2: Areas for consideration and their expected learning outcomes

AREAS FOR CONSIDERATION	EXPECTED LEARNING OUTCOME
Users and their needs	<ul style="list-style-type: none"> ■ Level of aggregation and disaggregation ■ Format of data, for example dashboard or manipulable for further analysis ■ Connectivity required to external systems, for example ESG investors
Current technology infrastructure	Gap analysis leading to future data coverage needs across the material capitals over the required time frame
Data sources	Connectivity to external sources of information such as suppliers and national databases

3.2 Process

A shift towards a multi-capital approach to performance management is a journey that takes courage to start because for some people it will require a step into less familiar territory and involves learning the language of the natural sciences, but this journey needs to start somewhere and lends itself to continual improvement. The above outline approach for the integrated performance management product LCA has provided several ways of making the journey less daunting. You should consider starting that journey by piloting first, focusing on internal audiences and always with an eye to what can be audited reliably. This will determine what data you collect and how you collect it, while giving better support to corporate reporters. Applying the tenets of corporate reporting (see Box 3.1), as adapted for performance management, will help you.

3.3 Capabilities

This guide has presented new ways of adding value through integrating natural capital management measures into standard performance management activity, which calls for certain capabilities, specifically those of mindset and skills.

As a professional accountant, you possess the qualities associated with stewardship, which here should be combined with innovative and creative thinking, for example in the design of strategic options, information systems and control mechanisms, and in setting metrics to measure performance of natural capital management strategies. Stewardship, connectivity and vision come together to drive appreciation of risks together with their impacts (see Figure 3.3).

Vision is also fundamental in appreciating the technical concept of dynamic and external impact materiality (CDP, CDSB, GRI, IIRC and SASB 2020: 5), ie how natural capital can be material to the organisation over time in relation to a specific event that results in an issue becoming material. An example is COVID-19, which has propelled sustainability campaigns among governments and business, or which needs to be seen from the perspective of different stakeholders (SASB, Chevron and Santander n.d.) (see Figure 3.4).

Understanding and working with the concept of dynamic materiality and the materiality of sustainability issues for external stakeholders are just two examples of the technical skills needed. Others include:

- improving your natural capital scientific literacy
- connecting natural capital to the business and the other material capitals
- awareness of the growing action by policymakers, and
- developing mechanisms to identify and capture natural capital data from new sources.

These are all underpinned by an open and curious mindset. Learning these new skills that will help make you a valued business partner calls for a passion for lifelong learning and continual improvement.

Box 3.1:
Tenets of corporate reporting

- Relevance and materiality
- Completeness
- Reliability – neutral and free from error
- Comparability
- Verifiability
- Timeliness
- Understandability

Source: ACCA 2018

Finally, as the connector of integrated capitals insight and recommendations for those within the organisation, such as business leaders, you will need excellent communication skills, being able to articulate complex natural capital impacts that are often expressed in specialist, for example scientific, terms and extract their business implications. An ability to collaborate is also

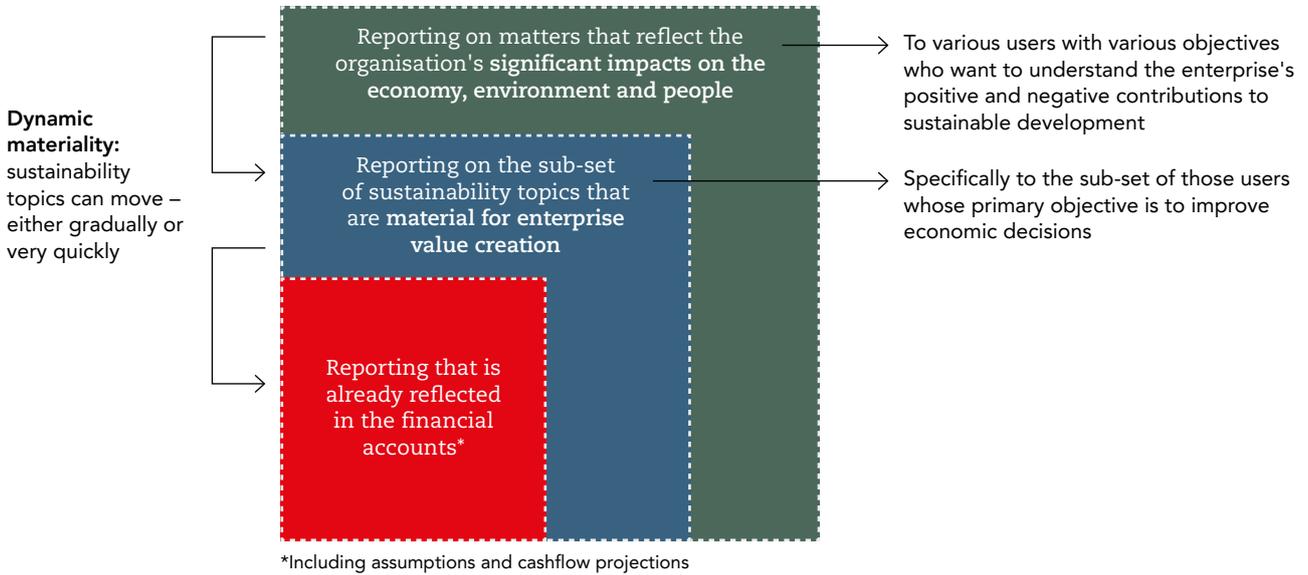
needed, to engage with stakeholders and obtain their data for inclusion in product LCAs, working with business functions to develop processes that aid executing strategy and with corporate reporters who reframe internal performance management reporting, combining it with financial reporting for external stakeholders, such as investors.

FIGURE 3.3: Using stewardship and vision to appreciate risks – examples of possible climate-related risks and opportunities, with their potential financial impacts, that may be identified by companies

	RISKS	POTENTIAL FINANCIAL IMPACTS
Policy and legal	<ul style="list-style-type: none"> ■ Increased pricing of GHG emissions ■ Enhanced emissions-reporting obligations ■ Mandates on and regulation of existing products and services ■ Exposure to litigation 	<ul style="list-style-type: none"> ■ Increased operating costs ■ Write-offs, asset impairment, and early retirement of existing assets due to policy changes ■ Increased costs and/or reduced demand for products and services resulting from fines and judgments
Technology	<ul style="list-style-type: none"> ■ Substitution of existing products and services with lower emissions options ■ Unsuccessful investment in new technologies ■ Costs to transition to lower emissions technology 	<ul style="list-style-type: none"> ■ Write-offs and early retirement of existing assets ■ Reduced demand for products and services ■ Research and development (R&D) expenditures in new and alternative technologies ■ Capital investments in technology development ■ Costs to adopt/deploy new practices and processes
Physical	<p><i>Acute</i></p> <ul style="list-style-type: none"> ■ Increased severity of extreme weather events such as cyclones and floods <p><i>Chronic</i></p> <ul style="list-style-type: none"> ■ Changes in precipitation patterns and extreme variability in weather patterns ■ Rising mean temperatures ■ Rising sea levels 	<ul style="list-style-type: none"> ■ Reduced revenue from decreased production capacity ■ Write-offs and early retirement of existing assets ■ Increased operating and capital costs ■ Reduced revenues from lower sales/output ■ Increased insurance premiums and potential for reduced availability of insurance on assets
	OPPORTUNITIES	POTENTIAL FINANCIAL IMPACTS
Resource efficiency	<ul style="list-style-type: none"> ■ Use of more efficient modes of transport ■ Use of more efficient production and distribution processes ■ Use of recycling ■ Move to more efficient buildings ■ Reduced water use and consumption 	<ul style="list-style-type: none"> ■ Reduced operating costs ■ Increased production capacity, resulting in increased revenues ■ Increased value of fixed assets ■ Benefits to workforce management and planning
Products and services	<ul style="list-style-type: none"> ■ Development and/or expansion of low emission goods and services ■ Development of climate adaptation and insurance risk solutions ■ Development of new products or services through R&D and innovation ■ Ability to diversify business activities ■ Shift in consumer preferences 	<ul style="list-style-type: none"> ■ Increased revenue through demand for lower emissions products and services ■ Increased revenue through new solutions to adaptation needs ■ Better competitive position to reflect shifting consumer preferences, resulting in increased revenues
Resilience	<ul style="list-style-type: none"> ■ Participation in renewable energy programmes and adoption of energy-efficiency measures ■ Resource substitutes/diversification 	<ul style="list-style-type: none"> ■ Increased market valuation through resilience planning ■ Increased reliability of supply chain and ability to operate under various conditions ■ Increased revenue through new products and services related to ensuring resiliency

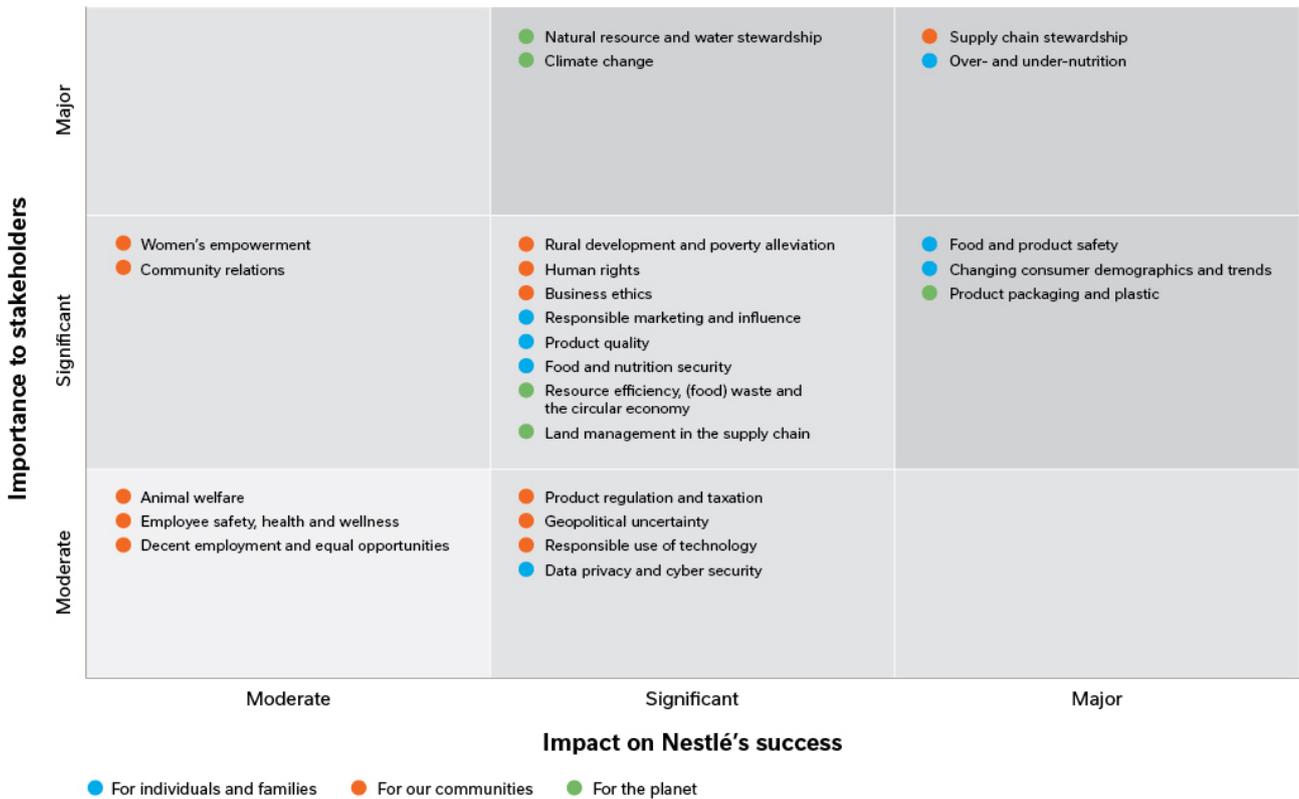
Source: Adapted from TCFD 2017

FIGURE 3.4: Dynamic and external impact materiality



Source: Adapted from CDP et al. (2020): 5

Example from Nestlé – external and internal impact materiality



Source: Nestlé (2021)

**STEWARDSHIP, CONNECTIVITY
AND VISION COME TOGETHER TO
DRIVE APPRECIATION OF RISKS
TOGETHER WITH THEIR IMPACTS.**

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References

- A4S (Accounting for Sustainability) (2019 – updated version), *Essential Guide to Natural and Social Capital Accounting: An Introduction to Integrating Natural and Social Capital into Accounting and Decision Making*, <[https://www.accountingforsustainability.org/content/dam/a4s/corporate/home/KnowledgeHub/Guide-pdf/Natural%20and%20Social%20Capital%20Accounting%20\(2019\).pdf.downloadasset.pdf](https://www.accountingforsustainability.org/content/dam/a4s/corporate/home/KnowledgeHub/Guide-pdf/Natural%20and%20Social%20Capital%20Accounting%20(2019).pdf.downloadasset.pdf)>, accessed 12 January 2021.
- ACCA (2018), *Tenets of Good Corporate Reporting*, <<https://www.accaglobal.com/gb/en/professional-insights/global-profession/Tenets-of-good-corporate-reporting.html>>, accessed 11 January 2021.
- ACCA (2020a), *Professional Accountants Changing Business for the Planet: A Guide to Natural Capital Management*, <https://www.accaglobal.com/uk/en/professional-insights/global-profession/Professional_accountants_changing_business_planet.html>, accessed 11 January 2021.
- ACCA (2020b), *Future Ready: Accountancy Careers in the 2020s*, <https://www.accaglobal.com/uk/en/professional-insights/pro-accountants-the-future/future_ready_2020s.html>, accessed 11 January 2021.
- ACCA (2020c), *Professional Accountants Changing Business for the Planet: A Simple Guide to Natural Capital Management for Business Leaders*. Downloadable from <https://www.accaglobal.com/gb/en/professional-insights/global-profession/Professional_accountants_changing_business_planet.html>, accessed 12 January 2021.
- ACCA (2021), *Professional Accountants Changing Business for the Planet: A Simple Guide to Natural Capital Management for Corporate Reporters*. Downloadable from <https://www.accaglobal.com/gb/en/professional-insights/global-profession/Professional_accountants_changing_business_planet.html>, accessed 12 January 2021.
- ACCA and NBA (2013), *Capitals Background Paper for IR*, <<https://integratedreporting.org/wp-content/uploads/2013/03/IR-Background-Paper-Capitals.pdf>>, accessed 12 January 2021.
- ACCA and PwC (2020), *Finance Insights – Reimagined*, <<https://www.accaglobal.com/uk/en/professional-insights/pro-accountants-the-future/FinanceInsights-reimagined.html>>, accessed 11 January 2021.
- CDP (Carbon Disclosure Project), CDSB (Climate Disclosure Standards Board), GRI (Global Reporting Initiative), IIRC and SASB (Sustainability Accounting Standards Board) (2020), *Statement of Intent to Work Together towards Comprehensive Corporate Reporting*, <<https://29kjwb3armds2g3gi4lq2sx1-wpengine.netdna-ssl.com/wp-content/uploads/Statement-of-Intent-to-Work-Together-Towards-Comprehensive-Corporate-Reporting.pdf>>, accessed 13 January 2021.
- CISL (University of Cambridge Institute for Sustainability Leadership) (2020), *Measuring Business Impacts on Nature: A Framework to Support Better Stewardship of Biodiversity in Global Supply Chains*, <<https://www.cisl.cam.ac.uk/resources/publication-pdfs/measuring-business-impacts-on-nature.pdf>>, accessed 12 January 2021.
- Eccles, R.G. (2020), 'Dynamic Materiality in the Time of COVID-19', [website article], Forbes, 19 April <<https://www.forbes.com/sites/bobeccles/2020/04/19/dynamic-materiality-in-the-time-of-covid-19/?sh=1c201ac64f07>>, accessed 12 January 2021.
- Ecoinvent (n.d.), 'Ecoinvent – the World's Most Consistent & Transparent Life Cycle Inventory Database' [website] <<https://www.ecoinvent.org/>>, accessed 12 January 2021.
- EPD International (n.d.), 'List of LCA Consultants' [website], <<https://www.environdec.com/Creating-EPDs/List-of-LCA-consultants/>>, accessed 12 January 2021.
- EU Business @ Biodiversity Platform (2019), *Assessment of Biodiversity Measurement Approaches for Businesses and Financial Institutions: Critical Assessment of Biodiversity*, <https://ec.europa.eu/environment/biodiversity/business/assets/pdf/European_B@B_platform_report_biodiversity_assessment_2019_FINAL_5Dec2019.pdf>, accessed 12 January 2021.
- Golsteijn, L. (2018), 'LCA Basics: Life Cycle Assessment Explained' [website article] 2 October <<https://pre-sustainability.com/articles/life-cycle-assessment-lca-basics/>>, accessed 13 January 2021.
- Granskog, A., Laizet, F., Lobis, M. and Sawers, C. (2020), 'Biodiversity: The Next Frontier in Sustainable Fashion' [website article], 23 July <<https://www.mckinsey.com/industries/retail/our-insights/biodiversity-the-next-frontier-in-sustainable-fashion>>, accessed 12 January 2021.
- Greenstone (2019), *Beyond CSR Reporting: How to Value Natural Capital*, <<https://www.greenstoneplus.com/natural-capital-ebook?hsCtaTracking=fcd183-0f9b-4895-bca9-cb90354d65ac%7C64dba1c7-56f0-4185-b26c-f63d54158c2f>>, accessed 13 January 2021.
- IIRC (International Integrated Reporting Council) (2013), *Integrated Reporting*, <<https://integratedreporting.org/wp-content/uploads/2013/12/13-12-08-THE-INTERNATIONAL-IR-FRAMEWORK-2-1.pdf>>, accessed 11 January 2021.
- IIRC (International Integrated Reporting Council) (2019), *Integrated Thinking and Strategy: State of Play Report*, <https://integratedreporting.org/wp-content/uploads/2020/01/Integrated-Thinking-and-Strategy-State-of-Play-Report_2020.pdf>, accessed 12 January 2021.
- IIRC and <IR> Technology Initiative (2016), *Technology for Integrated Reporting: A CFO Guide for Driving Multi-capital Thinking*, <https://integratedreporting.org/wp-content/uploads/2016/10/Technology-for-Integrated-Reporting_CFOguide.pdf>, accessed 12 January 2021.
- ILO (International Labour Organization) (1996–2021), 'Relevant SDG Targets Related to Environment and Green Jobs' [website article] <https://www.ilo.org/global/topics/dw4sd/themes/green-jobs/WCMS_558559/lang-en/index.htm>, accessed 11 January 2021.
- ISO (International Organization for Standardization) (2006-07a), 'ISO 14040:2006: Environmental management – Life Cycle Assessment – Principles and Framework' [website] <<https://www.iso.org/standard/37456.html>>, accessed 12 January 2021.

ISO (International Organization for Standardization) (2006-07b), ISO 14044:2006: Environmental management – Life cycle assessment – Requirements and guidelines', <<https://www.iso.org/standard/38498.html>>.

Li & Fung Ltd (2019), *Annual Report 2019: Our Supply Chain*, <https://www.lifung.com/wp-content/uploads/2019/08/LiFung_AR_our-supply-chain2019.pdf>, accessed 13 January 2021.

Liebsch, T. (n.d.), 'Life Cycle Assessment (LCA) – Complete Beginner's Guide' [website article] <<https://ecochain.com/knowledge/life-cycle-assessment-lca-guide/>>, accessed 12 January 2021.

Machado, S. (2020), 'Introduction and Leaders' Guide to the Series Professional Accountants Changing Business for the Planet' [online introduction], <https://www.accaglobal.com/uk/en/professional-insights/global-profession/Professional_accountants_changing_business_planet.html>, accessed 11 January 2021. The main report can be accessed from this page.

McKinsey & Company (2020), 'Design cost-effective carbon-abated products with Resource Cleansheets' [website article], <<https://www.mckinsey.com/business-functions/operations/our-insights/design-cost-effective-carbon-abated-products-with-resource-cleansheets>>, accessed 13 January 2021.

Natural Capital Coalition (2015), 'Measuring Sustainability – Life Cycle Assessment' [website article], 2 August <<https://naturalcapitalcoalition.org/measuring-sustainability-life-cycle-assessment/>>, accessed 12 January 2021.

Natural Capital Coalition (2016), *Natural Capital Protocol*, <www.naturalcapitalcoalition.org/protocol>, accessed 12 January 2021.

Natural Capital Coalition (2019), *Data Use in Natural Capital Assessments. Assessing Challenges and Identifying Solutions. Full Report*, <<https://naturalcapitalcoalition.org/wp-content/uploads/2019/02/Full-Report.pdf>>, accessed 12 January 2021.

Natural Capital Coalition (n.d.), *Natural Capital Protocol Application Program*, <<https://naturalcapitalcoalition.org/natural-capital-protocol/protocol-application-program/#:~:text=The%20Natural%20Capital%20Protocol%20Application,and%20dependencies%20on%20natural%20capital>>, accessed 12 January 2021.

Nestlé (2021), 'Materiality' [website page] <<https://www.nestle.com/csv/what-is-csv/materiality>>, accessed 11 January 2021.

NIST <<https://www.nist.gov/el/systems-integration-division-73400/lifecycle-graphic>>.

OECD.stats (2021) 'Threatened Species' <https://stats.oecd.org/Index.aspx?DataSetCode=WILD_LIFE> and <https://ibat-alliance.org/country_profiles>, accessed 13 January 2021.

PUMA (2018), 'Puma's EP&L: We Treat Nature as Our Partner', <https://about.puma.com/en/sustainability/environment/measuring_environmental_footprint>, accessed 12 January 2021.

SASB (Sustainability Accounting Standards Board) (2018), 'SASB Materiality Map' [website] <<https://materiality.sasb.org/>>, accessed 12 January 2021.

SASB, Chevron and Santander (n.d), 'Double and Dynamic: Understanding the New Perspectives of Materiality' [YouTube video] <https://www.youtube.com/watch?v=UIPXkFs_7Gw>, accessed 13 January 2021.

Tetra Pak wine packaging LCA, <<https://www.tetrapak.com/content/dam/tetrapak/publicweb/gb/en/sustainability/documents/lca-nordic-wine-comparative-2010.pdf>>.

TCFD (2017), <<https://assets.bbhub.io/company/sites/60/2020/10/FINAL-TCFD-Annex-Amended-121517.pdf>>.

TCFD (Task-Force on Climate-Related Financial Disclosures) (n.d.), 'Metrics and Targets' [website] <<https://www.tcfdfhub.org/metrics-and-targets/>>, accessed 12 January 2021.

UNEP (UN Environment Programme) (n.d.), 'The Life Cycle Initiative' [website report] <<https://www.unenvironment.org/explore-topics/resource-efficiency/what-we-do/life-cycle-initiative>>, accessed 12 January 2021.

WBCSD (World Business Council for Sustainable Development) (2016), *The Business Case for the Use of Life Cycle Metrics in Construction and Real Estate*, downloadable from <<https://www.wbcd.org/Programs/Circular-Economy/Factor-10/Resources/Business-case-for-LCA-metrics>>, accessed 12 January 2021.

WEF (World Economic Forum) (2020), *Toward Common Metrics and Consistent Reporting of Sustainable Value Creation*, <http://www3.weforum.org/docs/WEF_IBC_ESG_Metrics_Discussion_Paper.pdf>, accessed 12 January 2020.

World Resources Institute and WBCSD (World Business Council for Sustainable Development) (2013), *Technical Guidance for Calculating Scope 3 Emissions* <https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf>, accessed 12 January 2021.

