

Capitals Protocol

Part of the Integrated
Decision-Making Framework

Technical guidance
on integrated capitals'
assessments

July 2025



Request to share reflections and suggestions

The *Capitals Protocol – Technical guidance on capitals’ assessments* is part of the *Integrated Decision-Making Framework* developed by the Capitals Coalition and its partners. This groundbreaking framework supports all types of organizations (from business to finance and government) to integrate the value of natural, social, human, and produced capitals into decision-making. The *Integrated Decision-Making Framework* consists of the *Capitals Protocol* and the *Governance for Valuation*.

The Capitals Protocol is based on extensive work and testing by the Capitals Coalition network and other organizations. If you have comments or reflections, or would like help in applying the Capitals Protocol, please contact **info@capitalscoalition.org**.



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Executive Summary

In an increasingly complex world, decision-makers need reliable, consistent, and comprehensive information to guide their actions. Information must not only be trusted but must also reflect the real dependencies and impacts that organizations have on nature, people, society, and the economy. Only then can decisions truly create long-term value and resilience.

However, despite the logic of this approach, most decisions continue to prioritize short-term financial outcomes, often overlooking critical impacts on natural, social, and human systems. These issues — while just as real and measurable — are rarely captured in a form that enables fair comparison or integration into mainstream decision-making.

To address this gap, the **Capitals Protocol – Technical Guidance on Four Capitals Assessments** offers a practical, stepwise approach to incorporate the value of all capitals — natural, social, human, and produced — into organizational decision-making. Developed with real-world applications in mind, it helps decision-makers to scope, assess, and act on a broader set of information, while aligning with existing frameworks and tools.

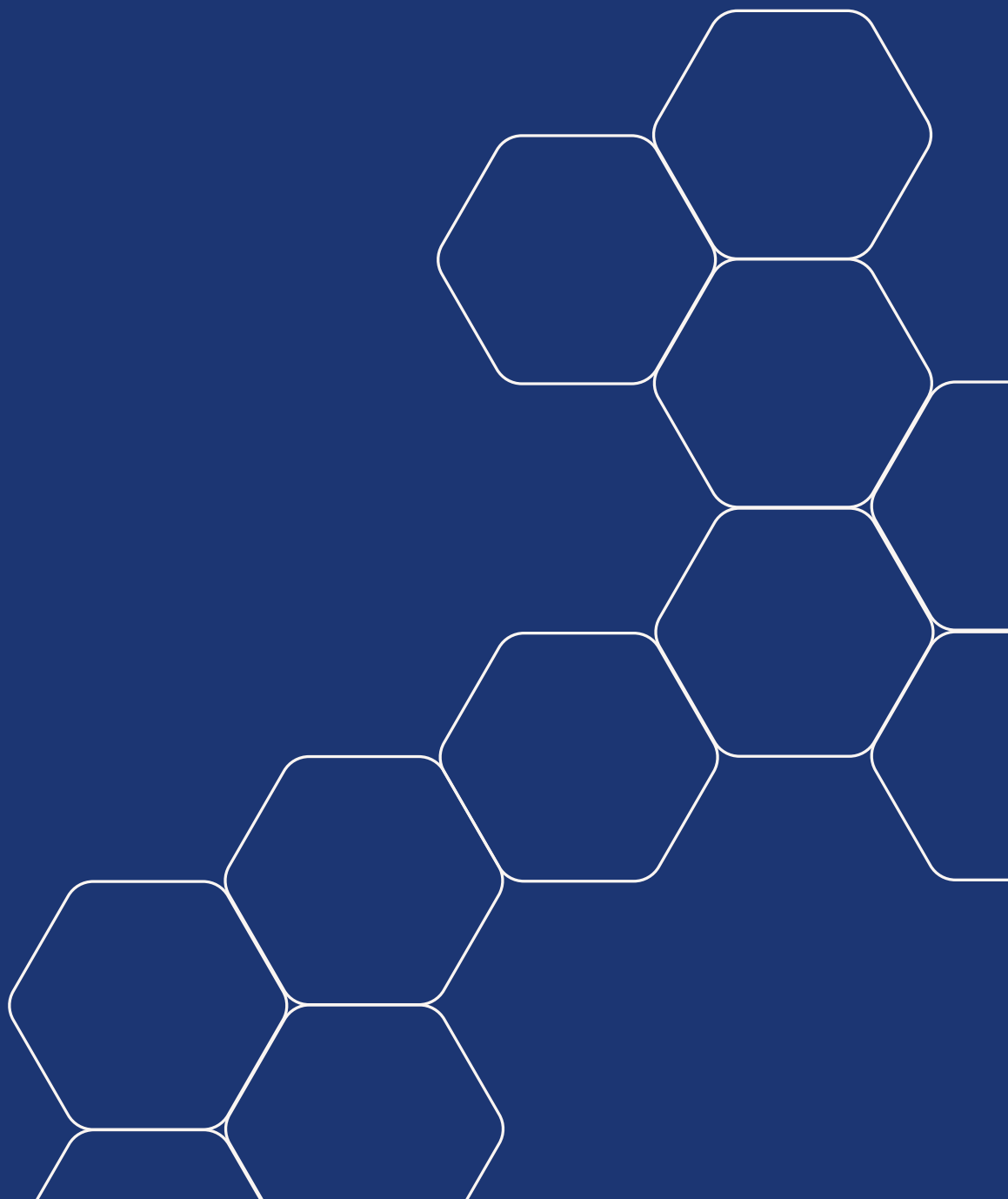
Structured in three clear stages — **Assemble, Assess, and Act** — the Protocol provides guidance for **decision-makers, practitioners, and regulators**, supporting holistic thinking and improved governance. It is accompanied by the partner guide, **Governance for Valuation**, which reinforces the rigor and integrity of the process.

The Protocol builds on well-established methodologies, including the **Natural Capital** and **Social & Human Capital Protocols**, as well as systems thinking approaches. A defining strength is its treatment of trade-offs between different capitals, ensuring more balanced and transparent outcomes. Its development has been highly inclusive, shaped by a diverse group of experts who reached consensus on this shared framework.

In essence, the Capitals Protocol helps shift decision-making toward a more complete understanding of value — bridging the gap between ambition and action in today's economy.



Introduction



Purpose of this document

How can decision-makers be confident that the information informing their decisions is complete, consistent, and trustworthy? How can they help understand the full impact of their decisions – not just on financial performance, but on people, nature and society and the broader system that they rely on. And what kind of information do they actually need to do that?

Financial accounting has a long-established foundation of rules, standards, and practices that give decision-makers confidence in the numbers they use. The use of such practices and standards gives decision-makers confidence that the figures provided to them are sufficiently reliable. But when it comes to understanding the value of natural, social, and human capital, we're not there yet. While tools like the Natural Capital Protocol, Social & Human Capital Protocol, TNFD's LEAP approach, and ISO 14054 provide helpful guidance, most of them focus on single issues – or only partially link multiple capitals – without addressing the full interdependencies between them.

The Capitals Protocol was developed to fill this gap. It provides a practical and decision-useful stepwise approach to integrate the value of all capitals (natural, social, human, and produced) into decision-making. It is technical guidance on how to carry out capitals assessments, manage impacts and dependencies, and reveal the true value of the assets a business relies upon. It is based on systems thinking to ensure that decision impacts are considered with a focus on long-term value, across timescales and geographies. By applying a capitals lens, the Protocol helps create a consistent way to capture and express the complex interconnected value flows that influence resilience and performance.

Despite a growing interest in this area, there is still a lack of clear guidance on what qualifies as “good enough” capitals information. As a result, decision-makers often lack confidence in the quality and relevance of the data they have. That is where the companion guide, Governance for Valuation, comes in. It promotes transparency around how capitals information is generated and assessed – so users can better judge its reliability and suitability for their needs.

Together through the Integrated Decision-making Framework, the Capitals Protocol and Governance for Valuation offer a powerful foundation for more informed, balanced and confident decision-making.

Intended audiences

The Integrated Decision-Making Framework and its technical guidance documents, such as this Protocol, are developed to support three types of users:

- **Decision-makers** – Those responsible for making decisions in all types of organizations including business, finance, and government. If the Capitals Protocol has been followed in preparing the information presented to a decision-maker, and the Governance for Valuation is used to ensure suitability of the valuation approach, then they can be confident that a robust process has been followed for the stated objective. For a high-level introduction to the purpose, structure, and available technical guidance that the Integrated Decision-Making Framework provides, the Primer on Integrated Decision-Making is the best starting point.
- **Practitioners** – Technical knowledge experts supporting decision-makers. For practitioners, the Capitals Protocol provides detailed technical guidance on how to conduct an integrated assessment and measure and value impacts and dependencies on four capitals. And the Transparency Requirements and Confidence Criteria from the Governance for Valuation ensures the valuation approach is fit-for purpose and technically robust.
- **Regulators** – Supporters of decision-making and governance in business and institutions. An integrated approach, as set out in the Capitals Protocol, can contribute to smart regulation by providing a robust process to look at the independence of issues and a framework by which to develop integrated policy. Requiring the application of governance across sectors and markets, can deliver consistent outputs to improve confidence and reliability. For a high-level introduction on the purpose, structure, and available technical guidance that the Integrated Decision-Making Framework provides, the Primer on Integrated Decision-Making is the best starting point.

Structure of the document

Following this introduction, the Protocol first presents the conceptual foundations for integrated decision-making, including systems thinking, the concept of capitals, and their relevance for organizations and decision-making. The rest of the document sets out the three stages needed to ensure that the information gathered is relevant and useful for decision-making:

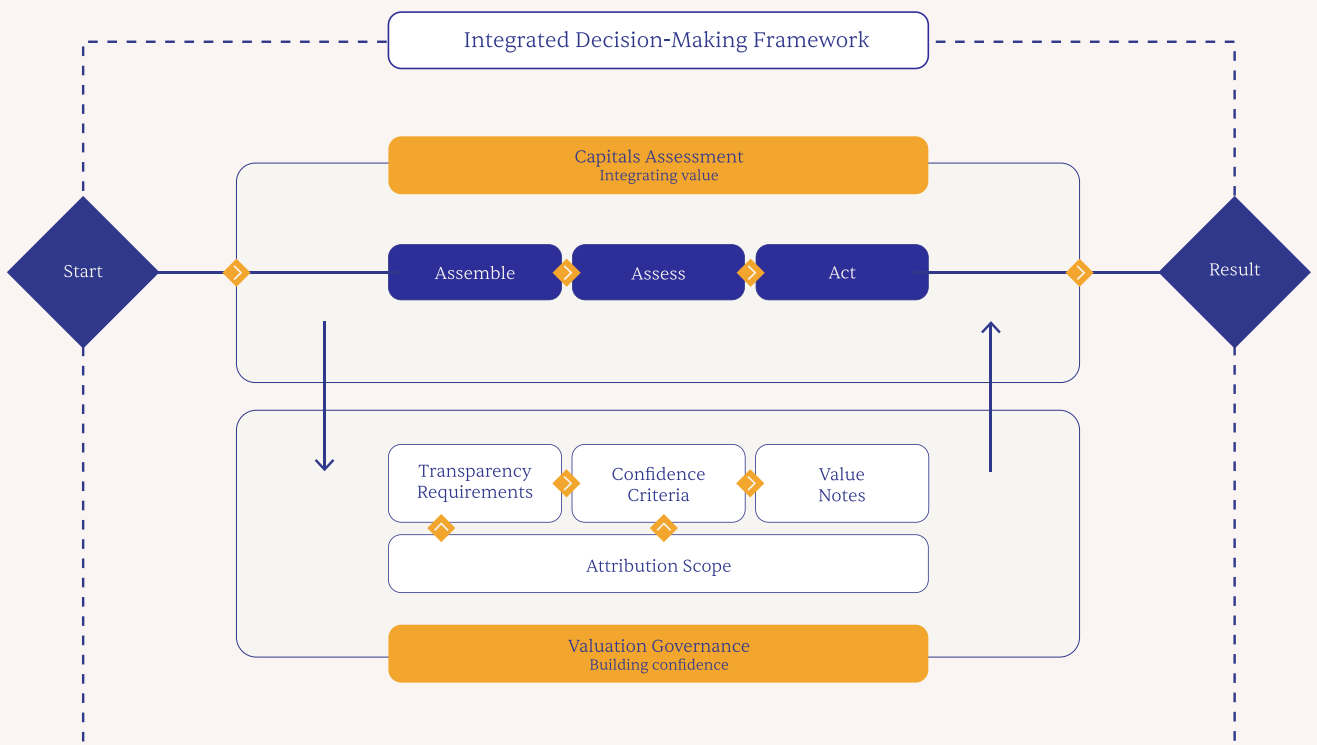
- **Assemble** – For a first scoping of impacts and dependencies
- **Assess** – For measuring and valuing material impacts and dependencies
- **Act** – For making the decision and integrating it into organizational actions and strategy

To provide guidance for practitioners on how the value of four capitals can be systemically included in decisions, these stages are divided into seven steps to ensure that the values of nature, society, people, and finance are all considered consistently and appropriately.

Integrated Decision-Making Framework

The Integrated Decision-Making Framework is made up of the Capitals Protocol and the Governance for Valuation. Both are technical documents with distinct roles to support practitioners that prepare capitals information for decision-makers and regulators.

How these two documents combine is visualized below, building from a simple model in figure 1 to more detailed expressions in figures 2 and 3.



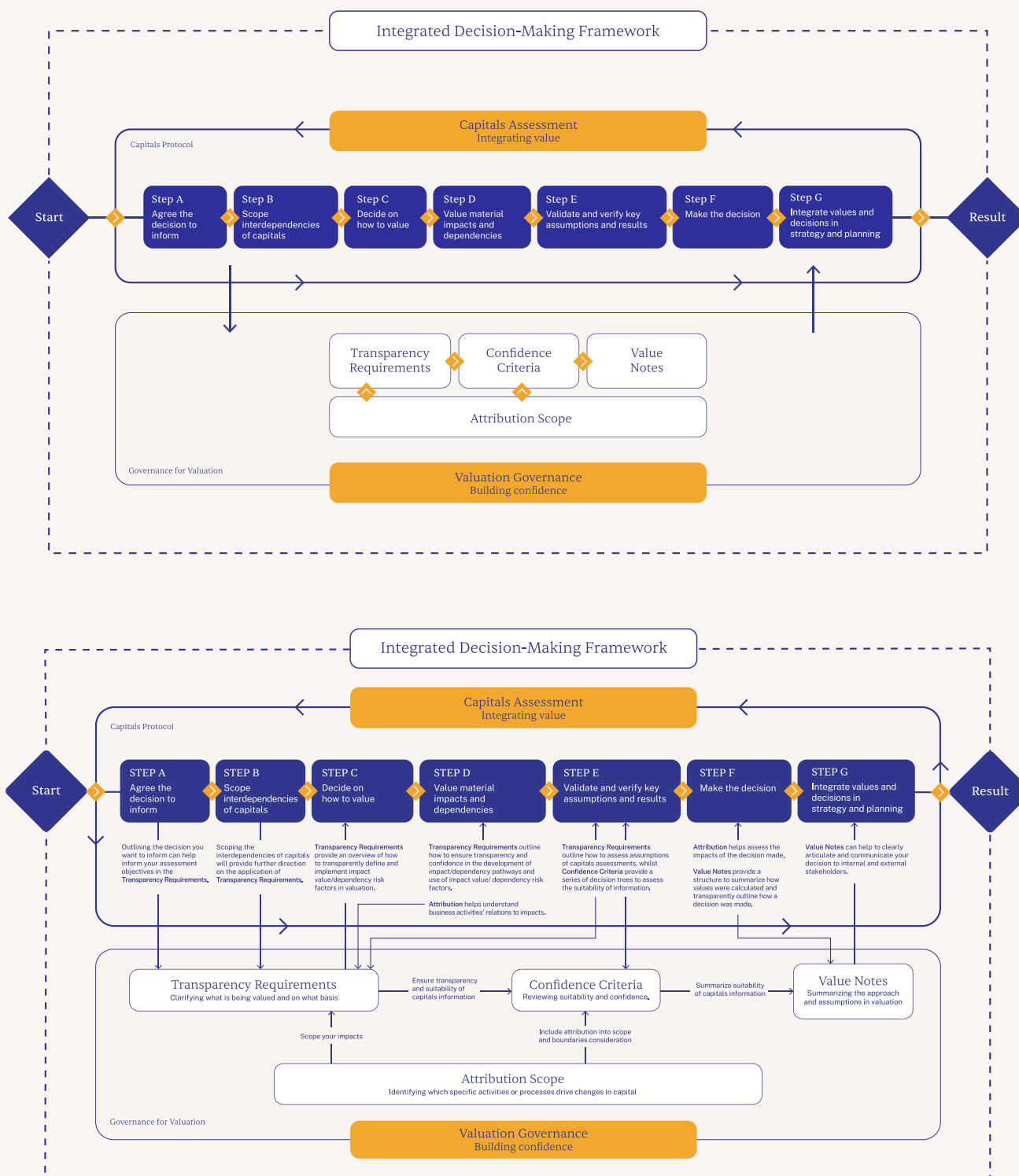


Figure 1,2,3. A visual representation of how the Capitals Protocol relates to the Governance for Valuation

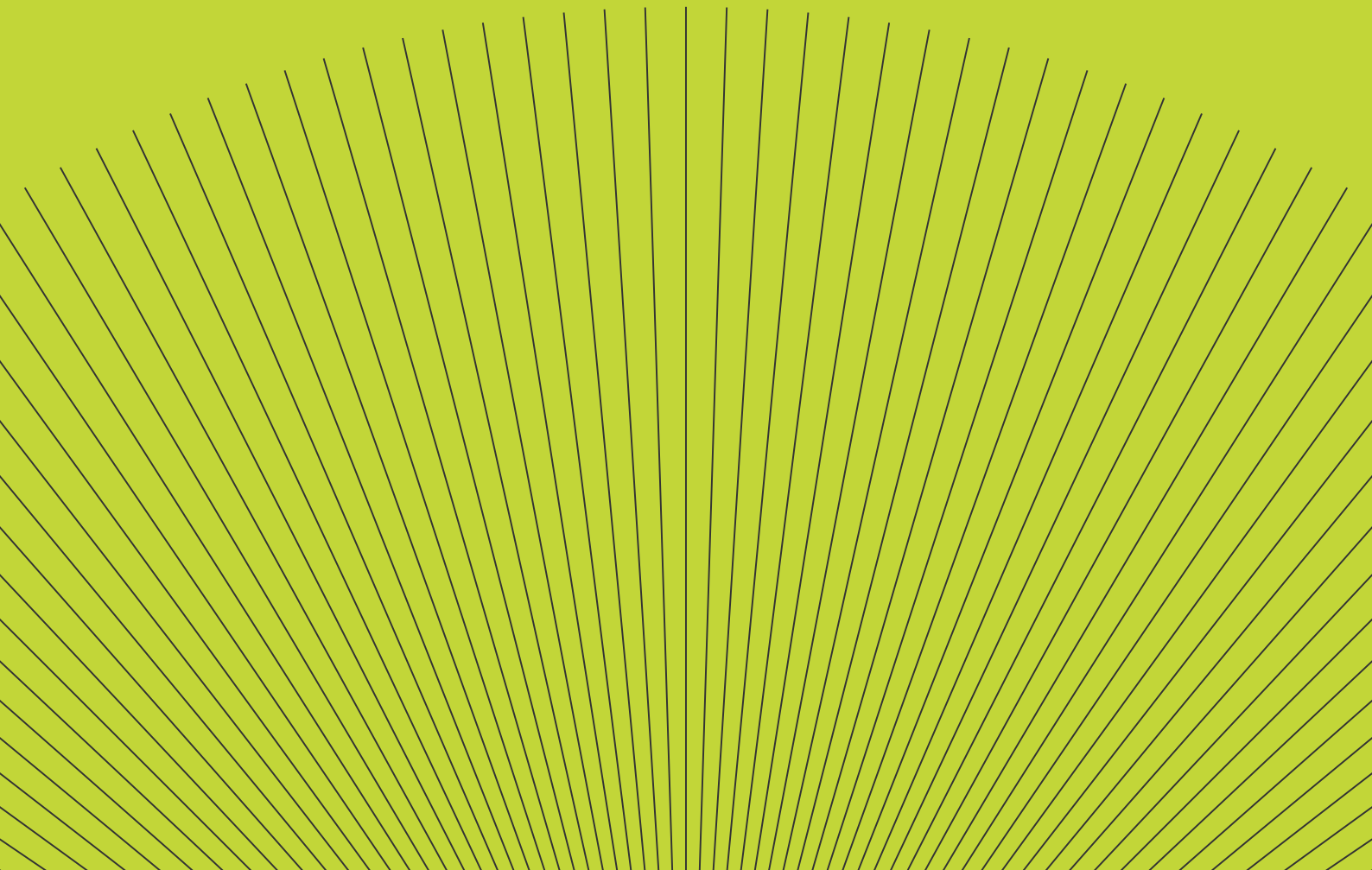
It is important to recognize that the seven steps in the Capitals Protocol are iterative. To optimize the new insights at each step, it may be important to revisit prior steps to reach the eventual decision and resulting action. Together, the seven steps aim to underpin a decision and leverage the opportunity of integrating the value of all capitals into current and future strategy.

To support the practical and consistent application of the seven steps, the Capitals Protocol includes a glossary of terms; detailed technical reference tables such as options for indicators, dimensions, or issues to acknowledge, or options to consider; use cases; and practical templates.

To increase the usability and accessibility of the Protocol, we have included the following resources:

- Stage Introductions - A short description of aim and structure and the inclusion of relevant requirements for integrated decision making.
- A Glossary of terms –including definitions of technical terms used.
- Tables –Detailed technical references such as options for indicators, dimensions or issues to acknowledge, or options to consider, are listed.
- Boxes – to provide additional, more detailed background information or explanations.
- Recommended best practices –included to inspire and help raise the level of ambition.
- Suggested iteration –To help users identify the main points where iteration (the repeating of actions) can be useful.
- Alignment with other frameworks/guidance –Remarks are included throughout the Protocol, to help readers understand comparability and alignment with other frameworks and guidance.
- Case studies –Hypothetical case studies based on real world examples but simplified for illustrative purposes.

Context



The conceptual foundations for integrated decision-making

Why does business need to include the four capitals in its decisions?

Today's business environment is increasingly shaped by volatility, resource constraints, social inequality, and growing demands for transparency. Natural systems are becoming less predictable, resources more costly, and public scrutiny more intense due to technological advances and digital visibility. In this context, businesses can no longer rely solely on traditional financial metrics to manage risk or drive performance.

To remain competitive and resilient, organizations must understand their broader value drivers — not just financial capital, but also their dependencies and impacts on natural, social, and human capital. These factors affect everything from supply chain stability and brand reputation to access to capital and long-term profitability.

This is where the Capitals Protocol comes in.

It offers a practical, business-relevant approach to understanding how an organization depends on nature and people, and how actions impact them in return. This dual focus — on both dependencies and impacts — is critical to managing strategic risks and identifying opportunities for innovation, efficiency, and value creation.

Every business interacts with people and nature — through energy and resource use, employment practices, communities, and more. Some of these interactions are already reflected in financial statements, like salaries and procurement costs. But many others — such as environmental degradation or health impacts from poor working conditions — remain invisible “externalities”.

That is starting to change. Regulatory shifts, legal pressures, market expectations, investor demands, and consumer awareness are all important drivers for change. Leading businesses are acting voluntarily, recognizing that accounting for value is not just about compliance, it is a strategic imperative for long-term success - that it will reduce risk, help identify opportunity and create value for business, their investors, and society.

The Capitals Protocol provides a structured way to do just that — helping make more informed, future-fit decisions in a fast-changing world.



The basis of integrated decision-making

What are the key steps to unlocking long-term value?

To create decision-useful information, a holistic approach is needed. This involves using “capitals” to express value consistently, acknowledging different perspectives, and outlining a clear governance structure to drive rigor.

The Integrated Decision-Making Framework is grounded in this holistic approach and rooted in systems thinking. It considers the interrelations between human and non-human components across temporal and spatial scales. Systems thinking focuses on long-term value and involves identifying the drivers of change as determined and impacted by feedback loops, delays, and non-linear relationships.

An integrated capitals approach or “integration” is the term used by the Coalition to refer to a capitals assessment that includes all capitals and their interdependencies, and applies systems thinking as an integral aspect. Integration is an open term that can refer to various types of assessment. There is no limit to how large or small an integrated assessment can be so long as it recognizes the system dynamics around it.

Core components of integration include:

- Thinking beyond siloes (planet, people, profit) and accepting that a business’s operations are part of a larger interconnected system.
- Including the value of four capitals (natural, human, social, and produced) in decision-making.
- Considering impacts to stakeholders at an increasingly granular level (e.g., which groups, which subgroups, where, when) to better understand a business’s influence.
- Driving rigor through governance and structuring information around four capitals, to make all externalities fully visible so they can be factored into organizational decision-making.

To operationalize systems thinking for decision-making, “inclusive” and “capital” are key concepts.

The concept of inclusive is used to express how different stakeholders must be included in decision-making in a consistent and fair way. To build support for the outcome of integrated decision-making, all relevant stakeholders (within and outside an organization) must be included and empowered to share their views on how impacts and dependencies on all capitals are valued.

A capital is any form of asset that creates a flow of value to people. Historically, the concept of capital has been used to describe a stock of financial assets, but there are many other forms of capital that are often overlooked or undervalued. Using capital to refer to all of these assets allows value to be expressed in a consistent manner.



Like the OECD, the World Bank, and many other organizations, the Capitals Coalition references four forms of capital:

- Natural capital: The stock of renewable and non-renewable resources that combine to yield a flow of benefits to people.
- Social capital: The networks together with shared norms, values, and understanding that facilitate cooperation within and among groups.
- Human capital: The knowledge, skills, competencies, and attributes embodied in individuals that contribute to improved performance and wellbeing.
- Produced capital: The human-made goods and financial assets that are used to produce goods and services consumed by society.

All capitals provide value to people, but it is important to recognize that nature underpins and encompasses all life on Earth. Without the foundation of natural capital, all other capitals would ultimately fail. Figure 4 summarizes the interrelations between the capitals and the ultimate dependency of social, human, and produced capital on nature. An individual's existence and wellbeing (human capital) begin with a dependence on their environment, and social capital grows from this shared existence and experience. Produced capital is created and sustained only from the foundations of the other capitals around it. The produced economy cannot outgrow the society it sits within, and society cannot outgrow the planetary boundaries of Earth.

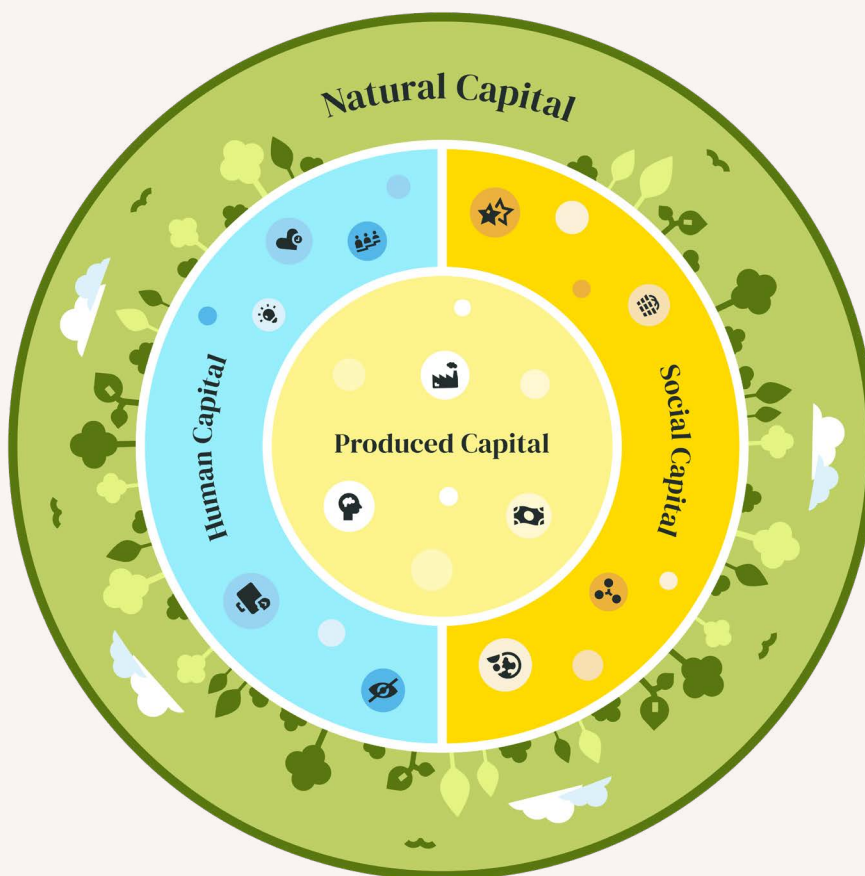


Figure 4. The nested capitals diagram. Demonstrating that produced capital is constrained by the society it sits within, in turn this is limited by physical planetary boundaries and natural capital.

Whilst a growing number of organizations have looked at how they depend on and impact one or two capitals, there has been little guidance on how business activities lead to impact and dependency pathways across all four capitals (see Box 2). The world is complex with many competing issues. The integrated approach helps decision-makers to recognize and better understand complexity rather than ignore it. This approach highlights how a single business activity causes change across multiple capitals, and how these changes can lead to secondary effects. By acknowledging complexity, a business can reduce risk and identify opportunities for better informed decisions that are not made in isolation. An integrated decision-making process based on capitals draws on core systems thinking concepts such as feedback loops, non-linear change, and tipping points to move beyond a linear framing of impact and dependency pathways toward one that is more representative of the real world.

Box 2. The concepts underpinning a four capitals approach

Stocks, flows, and value

The capitals approach conceptualizes capitals in terms of stocks and flows. Every capital represents a stock, valuable because of the flows of benefits (goods and services) it can generate over time. Stocks describe the “state of the system” (e.g., the amount of water in a lake, the number of employees in an organization, the strength of a commercial relationship, or the amount of money in the bank), while flows describe the “benefits” people can harvest or use from that system (e.g., the amount of timber harvested from a forest, the CO₂ absorption capacity of an ecosystem, the amount of labor from a population, the interest gain from financial capital in a bank, or the cooperation of organizations within a value chain).

Impacts and dependencies

At its most basic level, integrated capitals decision-making is about understanding how a business influences and is influenced by other systems, using systems thinking with a capitals lens. These connections are understood as impacts and dependencies.

- Impacts are a positive or negative change in one or more dimensions of wellbeing, following a change in capitals (stock or flow), as a result of human activities. An impact is generated by an impact driver, which is a measurable input to, or output from, human activities that results in impacts (e.g., volume of sand and gravel used in construction, or a kilogram of Nox emissions released into the atmosphere from transportation).
- Dependencies are a reliance on or use of a capital stock or flow. They can be framed as inputs to operations, whether of resources (water, timber, employees, cash flow) or services (flood protection, human innovation, the relationships with customers and suppliers). A dependency is where a business relies on these inputs to operate.

The consideration of both impacts and dependencies is essential for building a more complete picture of how a business interacts with all four capitals. Impacts and dependencies are often deeply interrelated. For example, a business can depend heavily upon capital stocks such as a reliable water supply (natural capital) or a healthy workforce (human capital) to operate yet impact those same dependencies by over extracting the water resource or affecting employee health through overwork or exposure to industrial chemicals.



How the Integrated Decision-Making Framework strengthens the landscape

Trends in the landscape

The creation of sustainable taxonomies and corporate disclosure standards, including the ISSB global baseline for investor-facing sustainability disclosure, marks the entry of policy and regulation on how the private sector accounts for impact. At the same time, voluntary initiatives have continued to emerge to drive the integration of sustainability issues not just in disclosures but in business strategy and management itself. Whilst these cover a wide range of topics and areas, including dependencies, impacts, risks, and opportunities (DIRO), they often only focus on single issues or sectors. Some examples on single issues include e.g., among many others, the Natural Capital Protocol, Task Force on Nature-related Financial Disclosure's LEAP Model, Social and Human Capital Protocol, and Social Value International's Standards. Single sectors examples include e.g. UNEP FI's holistic impact methodology, deployed under the Principles for Responsible Banking, and the IFRS/SASB Standards, consisting of a set of 77 industry-based disclosures about sustainability-related risks and opportunities.

Movements towards an integrated approach

Some significant efforts have been made towards a more integrated approach, where all the relevant capitals to an organization's business model are measured and valued through applying systems thinking and assessing the inter-connections between them.

In the corporate sphere there have, to date, been three significant frameworks for capitals management; these are the IFRS's Integrated Thinking Principles and Integrated Reporting Framework, and the Integrated Performance Management framework, jointly developed by AICPA & CIMA and WBCSD in 2023.

The Integrated Decision-Making Framework now produced by the Capitals Coalition is complementary to all these and focuses on the internal process that can be followed to integrate sustainability into decision-making via a capitals approach (see figure 4). These four frameworks are together supported by other applications, piloting, tools and resources, including the International Foundation for Valuing Impacts (IFVI) methodology.

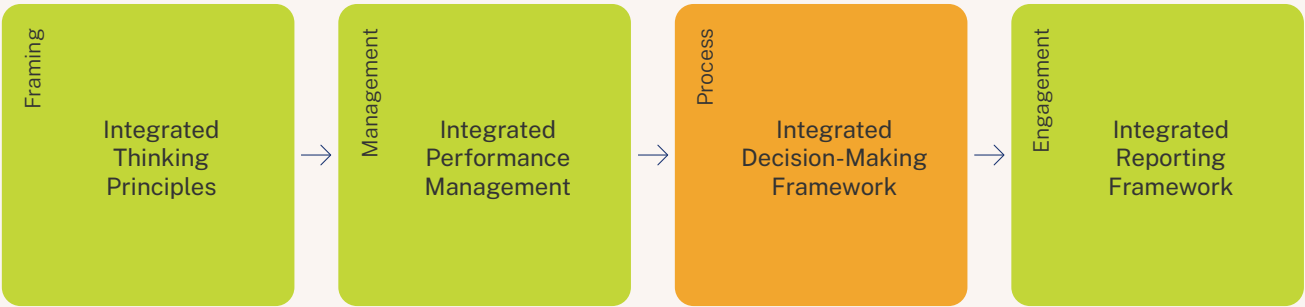
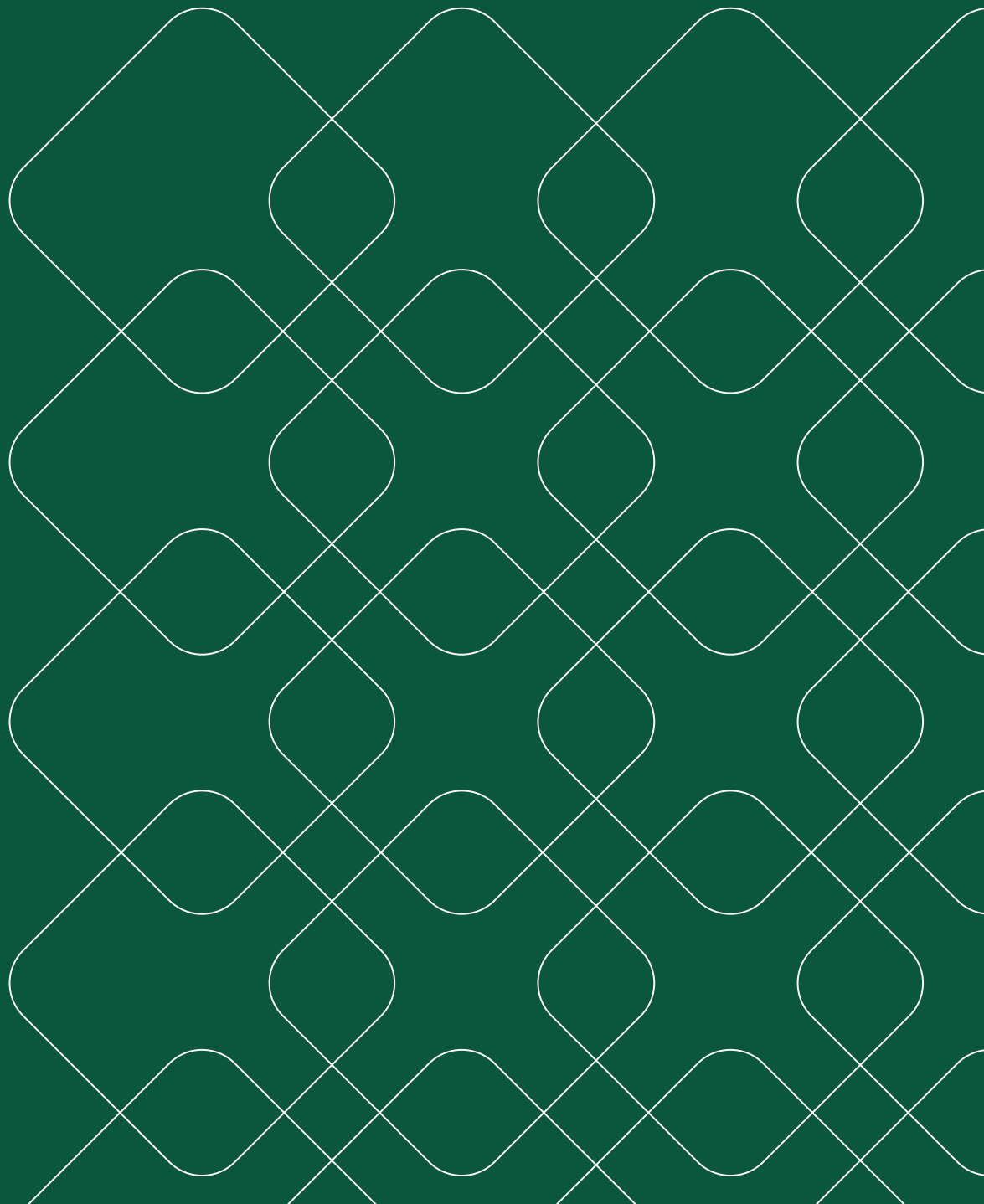


Figure 4. How the Integrated Decision-Making Framework strengthens the landscape

Assemble



The Assemble Stage – A high-level run-through

Purpose: A first scoping of the purpose of an integrated capitals assessment and identification of potentially relevant impacts and dependencies.

Structure: This stage is structured around three required steps for integrated decision-making that will help clarify the decision to inform, scope impacts and dependencies, and decide on how to value these.

- **STEP A | Agree on the decision to inform:** Start by considering the key purpose, or question, the assessment is seeking to answer.
- **STEP B | Scope interdependencies of capitals:** Map how the business interacts with the capitals through an understanding of the interdependencies of all four capitals.
- **STEP C | Decide on how to value:** Make an initial decision on how to understand the value the impacts and dependencies these capitals create, both to the business and society.

The outcomes of these steps will inform a first scoping of the Transparency Requirements, part of the Governance for Valuation.

See Figure 1,2,3 to see how the steps from the Assemble Stage fit into the Integrated Decision-Making Framework.

Key output: Decisions around the scope and process of a capitals assessment to take into the Assess Stage of the Protocol.

The function of the Assemble Stage is to set the parameters for the upcoming Assess Stage. It is meant as a collaboration with the decision-makers, who will inform what information is useful for decision-making, and practitioners, who will inform what is practical, achievable, and within scope.

While this Stage in many cases will be the start of a capitals journey, it can also be the assembly point for a review of progress or a further building of the integrated assessment, e.g. for new decision to be made, if capitals thinking is already integrated into business models.

Relevance of the Assemble Stage for different audiences:

Although the Assemble Stage, as the Capitals Protocol as a whole, primarily aims to support practitioners in preparing capitals information for decision-making, it also supports other audiences:

- **Decision-makers** – If the Assemble Stage is implemented, a decision-maker can be confident that there is clarity on the valuation approach needed for the decision at hand, and that a consistent scoping has taken place to identify relevant impacts and dependencies.
- **Practitioners** – The Assemble Stage provides detailed technical guidance for practitioners on how to conduct an integrated assessment and measure and value impacts and dependencies on four capitals. It is especially helpful to those relatively new to integrated decision-making, or at the start of the first assessment for an organization.
- **Regulators** – An integrated approach, as set out in the first stage of the Capitals Protocol, contributes to preparing decision-useful information by delivering a first consistent scoping of impacts and dependencies on capitals.

How to get started:

Each of the three required steps are outlined in table one, describing the key questions to be dealt with and outputs to deliver.

Although the available guidance is detailed and can be overwhelming, it is important to keep the application as simple as possible. Based upon the chosen business application, a broad and shallow approach (i.e., assessing multiple impacts across the entire company or value chain) or a narrow and deep approach (i.e., assessing fewer issues and a tighter scope with more detailed analysis) may be preferred. Setting a broad or deep scope from the start might require more time and resources. One option is to begin with a more basic assessment with a commitment to expand the scope as knowledge and institutional capacity increase.

Guiding questions	Sub-steps	Outputs
STEP A Agree the decision to inform		
What is the decision to inform?	Sub-step A1 Define the decision to make and the information needed to underpin it	Output A1 A specific objective and rationale for the decision(s) to be made
Who will make the decision and who must be involved?	Sub-step A2 Identify who will make the decision	Output A2 List of the people who will be involved in making the decision and their needs
Who will be affected by the decision?	Sub-step A3 Identify stakeholders and the appropriate level of engagement	Output A3 List of stakeholder groups related to the objective
STEP B Scope interdependencies of capitals		
Which are the significant relationships with capitals?	Sub-step B1 Describe relations and interdependencies on capitals	Output B1 Description of the significant relationships and interdependencies between the capitals
Which are the boundaries of the assessment (in terms of value chain, geography, and time frame)?	Sub-step B2 Define boundaries	Output B2 Defined boundary in terms of value chain, geography, and time frame
Which are the material activities?	Sub-step B3 Map business activities against impacts and dependencies	Output B3 Map of material activities within the scope
STEP C Decide on how to value		
Which are the baselines and scenarios to use as a starting point?	Sub-step C1 Define baselines and scenarios	Output C1 A description of baselines and scenarios to be used in the valuation approach
Which valuation approach and impact value/dependency risk factors will be used?	Sub-step C2 Decide which types of value to consider	Output C2 A defined valuation approach and a list of impact value/dependency risk factors that will be used The Transparency Requirements from the Governance for Valuation provide practical directions for this output

STEP A | Agree on the decision to inform

Implementing Step A will help to answer the following questions:

What is the decision to inform?

Who will make the decision and who must be involved?

Who will be affected by the decision?

Outputs:

A1 | A specific objective and rationale for the decision(s) to be made

A2 | List of the people who will be involved in making the decision and their needs

A3 | List of stakeholder groups related to the objective

It is extremely important to start by clarifying what decision(s) will be made and therefore what information will be needed to inform the decision(s). Fully understanding the purpose, and the intended audience, of the decision(s) ensures an appropriate scope is selected and a robust process followed. There are many types of decisions and variables to consider. For example, decisions on strategy, investment, risk management, product design, procurement, and human resource management will each require different information and involve different stakeholders.

Completing Step A includes the following sub-steps:

- **Sub-step A1** | Define the decision to be made and the information needed to underpin it
- **Sub-step A2** | Identify who will make the decision
- **Sub-step A3** | Identify stakeholders and the appropriate level of engagement

Suggested iterations

During an assessment guided by the Capitals Protocol, there will be opportunities to revisit and update choices, assumptions, and decisions. Since the purpose of the Capitals Protocol is to integrate capitals thinking into everyday business decision-making, the process described herein is not a standalone linear pathway. Once Step G, Integrate the decision(s) and values of all capitals in business planning and strategy, is completed, returning to Step A will allow a user to revisit new questions or update the assessment based on findings from prior iterations.

A1 | Define the decision to be made and the information needed to underpin it

The assessment objective should articulate in detail the reason for conducting the assessment. Ideally the objective should be specific, measurable, attainable, relevant, and time-bound (SMART). Articulating the objective and the anticipated benefits can help to:

- Justify an appropriate level of staffing and other resources to undertake the assessment
- Confirm who needs to be involved in the assessment, based on what parts of the business and wider society are most likely to be affected
- Improve engagement with internal and external stakeholders
- Integrate the results into decision-making

For users with a clear objective, sub-step A1 provides an opportunity to define it in more detail. For those still trying to select a starting point, consult table A.1 for suggestions of how assessments can be used. Whilst there are currently no steps to disclose results of a capitals assessment, disclosure may become a step in the future. Understanding a systems approach may help to identify additional risks and opportunities not considered as part of current disclosures.

Type of application	Examples of specific objectives
Evaluate impacts and dependencies and assess risks and opportunities	To understand key impacts and dependencies, and associated risks and opportunities, to prioritize management actions To identify and evaluate potential investment opportunities
Estimate total/net impact values and commit to targets	To determine whether something is contributing towards net zero or net positive initiatives (e.g., nature positive, water positive, socially equitable or positive) To inform setting ambitious targets and actions To establish an appropriate amount of ecological restoration and compensation, or compensation to impacted individuals or parties To determine the total holistic value of an asset /land holding (e.g., corporate social and environmental balance sheet)
Compare options and transform outcomes	To compare multiple options (e.g., investment options) to optimize trade-offs between capitals and values and decide on a preferred option To evaluate something to help obtain a permit/license to operate To prioritize items from a long list (e.g., high-risk sites/products/activities) To facilitate transformation of the way companies and stakeholders operate
Internal and/or external communication and reporting	To generate a range of outputs informing internal and/or external stakeholders of the approach and results of the above applications To prioritize or contextualize information for non-financial (sustainability) reporting To report on the impact of a project or series of projects (e.g., to investors in the organization's green, social, or sustainability bonds) To help inform and/or educate staff internally to transform behaviors and inform strategy

Table A.1 Potential objectives for an assessment

Social Value UK, (2022). Standard for Applying Principle 1. Retrieved from <https://socialvalueuk.org/wp-content/uploads/2022/12/Standard-for-applying-Principle-1.pdf>. At times involving affected stakeholders early in the scoping process (Assemble stage) benefits the impact assessment and in consequence the decision on what to measure and how. Power dynamics may be addressed by listening to words before numbers as raised in finding 1 in a discussion paper on "Valuing what matters: pluralism, power, and business decision-making" by the Value Commission.



A2 | Identify who will make the decision

Identifying the target audience and understanding what drives them is key in defining the assessment objective as it will influence the way the assessment is conducted, the type of outputs to be delivered, and the desired outcomes. The target audience refers to the primary users of the assessment output (i.e., the individuals who will read and use the output to make decisions). The target audience could be internal decision-makers and/or external audiences such as shareholders, investors, civil society, or regulators.

Linked to this target audience are those stakeholders who may need to authorize or fund the assessment at the outset. This could be the same as the internal target audience. It will be important to develop a strong case for the need to carry out the assessment.

Specificity in describing the target audience is beneficial. This can be considered in conjunction with sub-step B1 which involves a more thorough stakeholder mapping exercise. Otherwise, the target audience may be identified through internal discussions, involving others as necessary.

Think carefully about whether the assessment is for an internal or external audience, or both, as this may influence whether validation and/or verification are necessary. It will also help to determine the level of detail needed for the assessment, whether this is, for example, a high-level portfolio assessment or standardized and predefined approach (e.g., for disclosure purposes). The selection of the target audience will guide the plan for communicating results (see sub-step F1).

Internal target audiences may include:

- Shareholders
- Senior executives and directors (i.e., board members or C-suite managers)
- Heads of sustainability, environment, health and safety, site managers, and operations
- Departments such as finance, strategy, procurement, marketing and communications, reporting, public or government affairs, investor relations, human resources, or auditing and compliance
- Employees and contractors

For a list of potential external audiences and stakeholders, see table A.2.

A3 | Identify stakeholders and the appropriate level of engagement

A stakeholder² is any individual, organization, sector, or community with an interest in the outcome of a decision or process. The list of relevant stakeholders will almost certainly be longer than the audience and will include people who can provide information to inform the assessment, offering potentially diverse perspectives, and experts who can help verify, validate, and interpret the results.

Table A.2 lists stakeholder groups and subgroups to consider for the assessment. This list is not exhaustive, and smaller subgroups will exist within these stakeholder groups. Furthermore, individual stakeholders within these stakeholder groups may belong to another stakeholder groups (e.g., employers may be shareholders or local residents), they may have protected characteristics, or they may be treated differently within a business (e.g., workers with different wages, above and below living wage).

Various stakeholders may inform the assessment. Internal stakeholders may provide considerable insights (e.g., procurement staff knowledge of the value chain and volume of inputs purchased). External stakeholder input can provide greater robustness, insight, and credibility to results, and their inclusion is particularly important for integrated assessments since awareness of interconnections and

² The term "affected communities" may be used interchangeably with the term "affected stakeholders" while both terms may include the other. For clarity and consistency with familiar business language we have used the term affected stakeholders and defined in table A.2 that this includes affected communities.

systemdynamics may be greater outside the business. Of course, stakeholder engagement is time- and resource-intensive so thoroughness must be balanced against a need for a proportional approach; sub-step A3 offers guidance on navigating this.

Relationships with stakeholder groups and networks represent a business's social capital and provide a social license to operate. Poorly designed and managed stakeholder engagement can pose a risk of certain groups being excluded from decisions that affect them, lead to an inaccurate understanding of impacts, and result in poor and inappropriate decisions, and may ultimately have negative consequences for a business, even leading to long-term business or project failure. High-quality, continuous stakeholder engagement can enrich the assessment process and strengthen the quality and credibility of results and can be vital for maintaining trust as part of an organization's social capital.

If it becomes clear during stakeholder identification that communication with stakeholders is vitally important, the assessment's target audience may be updated accordingly. This is a potential co-benefit of conducting a capitals assessment.

Stakeholder groups are not homogenous and are comprised of subgroups, potentially defined by age, gender, disability, cultural background, religion, ethnicity, etc. Since subgroups may be marginalized in particular contexts, it is important to consider within this step whether the assessment might include impacts to vulnerable groups and, if so, to approach this with care and attention. It is also worth considering that even within these groups, stakeholders will be affected differently. For example, a workforce may be paid differently and therefore the impact a business will have on them could be negative (where they are underpaid for example) or positive (payment above a living wage). Dependencies from within these groups will similarly differ.

Stakeholder groups	Cross-cutting subgroups
Affected communities	• Age • Gender • Ethnicity • Disability • Cultural background • Religion • Income
Indigenous Peoples and local communities	
Rights-holders	
Own workforce	
Value chain workers	
Consumers and end-users	
Business partners and investors	
Regulators and public administrations	
Civil society groups	

Table A.2 Stakeholder groups and subgroups

Box A.1 Considering stakeholders

Assessments that seek to apply an integrated capitals approach towards better decision-making necessarily engage relevant stakeholders and consider their perspectives both in formulating the question at hand and its potential answers. The inclusion of stakeholders is in essence acknowledging that one has the power to impact another either directly or indirectly. Stakeholders may be entities or individuals within the business or within its value chain. Stakeholder engagement best practice addresses issues of power dynamics and value biases with strategies of shared interest and mutual understanding in decision-making processes. However, this ideal is often met with challenges in practice. For the purpose of this guidance, a stakeholder is defined as “an entity or individual that can reasonably be expected to be significantly affected by the organization’s activities, products, and services, or whose actions can reasonably be expected to affect the ability of the organization to successfully implement its strategies and achieve its objectives.”

Engaging stakeholders in capitals assessment requires consideration of diverse value perspectives, and willingness to explore ways of embedding such values in decision-making. It can, in the short-term, help to identify opportunities for win-win outcomes, while supporting implementation of more sustainable and equitable outcomes for society in the long term. Engagement also allows for more transparent and more accountable decisions that recognize the experiences of those who are impacted by changes in capitals associated with proposed interventions. For example, Indigenous Peoples and local communities (IPLCs) have proven highly effective in the protection of ecosystems through their knowledge, community-led practices, and institutions. Indeed, IPLCs’ close relation with nature – from a cultural, social, and spiritual perspective – makes such groups particularly susceptible to adverse impacts from nature loss. Thus, where relevant, it will be important to consult with Indigenous Peoples and local communities to ensure acceptable outcomes for all stakeholders.

There are multiple handbooks and guidelines to support the process of identifying relevant stakeholders and appropriate means to engage these groups. Considering stakeholders in an integrated assessment must comply with international instruments and statutory national laws associated with the respective stakeholder group.

Key Insights from “Valuing What Matters” Discussion Paper

The incorporation of a variety of stakeholder views helps to reflect the complexity of real-world conditions, leading to more accurate assessments and better-informed decisions. Research initiated by the Value Commission and developed with the support of Social Value International has explored the practice of including various stakeholder perspectives in the process of impact valuation – for example, the process to identify and measure the relative importance or worth of an impact experienced by individuals. This research, through interviews with practitioners from different global contexts, led to the discussion paper “Valuing what matters: pluralism, power, and business decision-making.”³ The paper distills some key issues and complexities associated with incorporating pluriform values, while also exploring aspects such as how to decide what to value, information flow between affected stakeholders and decision-makers, and how to improve the process of valuing impacts together with stakeholders.

Overall, the discussion paper explores inclusive and transparent approaches to valuing impacts and highlights five key findings: (1) imbalanced power dynamics and trust deficits may hinder community participation; (2) organizations with a focus on social impact engage more inclusively; (3) monetary valuation is useful, but risks oversimplification; (4) transparency and feedback loops build trust; and (5) involving affected stakeholders enhances data reliability and holistic decision-making. The paper emphasizes that meaningful valuation starts with dialogue and aims to foster best practices through practitioner insights and broader engagement.

These findings reflect the foundations of the Transparency Requirements on which the Confidence Criteria and Value Notes are subsequently compiled in the Governance for Valuation. Additionally, the paper adds further insight to important considerations with regard to stakeholder engagement in the Assemble and Assess stages of the Capitals Protocol (see steps A to D). Essentially, decisions regarding what to value should be based on genuine consultations with affected stakeholders to understand their experiences and priorities.

All potentially affected stakeholder groups and subgroups relevant to the business who may be impacted by the assessment objective, as set out in sub-step A1, should be considered. An early prioritization exercise based on where engagement may need to focus can help to refine the boundaries of the assessment. This might be based on stakeholder exposure to the anticipated consequences, their influence in affecting the outcomes, or their resilience to respond to the anticipated outcome. Consult Social Value International’s Principle 1 on Involving Stakeholders⁴ and TNFD’s guidance on affected stakeholders.⁵

Systems thinking within an integrated capitals approach requires keeping an open mind as to who might be affected by what and how. Expect the list of stakeholders to evolve as the assessment proceeds and reveals the extended impact pathways in more detail.

Stakeholders most impacted will need a say in the decision-making process to maintain the business’s social capital. Stakeholder analysis or mapping can be useful in completing this step. Stakeholder analysis typically involves identifying potential stakeholders, analyzing their characteristics, and mapping them to prioritize the preferred nature and level of engagement. Be sure to consider all the stakeholder groups and subgroups shown in table A.2. If the business, or industry peers, have already mapped out the most important stakeholders, this can be a starting point. If not, a wealth of guidance on stakeholder analysis and mapping is available. Stakeholders can also be mapped using an impact influence grid.

³ Discussion paper by the Value Commission: [Valuing what matters: pluralism, power, and business decision-making. \[2025\]](#)

⁴ The Principles of Social Value provide the basic building blocks for anyone who wants to make decisions that take a wider definition of value into account, in order to increase equality, improve wellbeing and increase environmental sustainability. See Social Value International. (n.d.) The Principles of Social Value. Social Value International. Available at: <https://www.socialvalueint.org/principles>. [Accessed 13 September 2024]

⁵ Taskforce on Nature-related Financial Disclosures (TNFD), 2023. Draft Guidance on Engagement with Affected Stakeholders. TNFD Beta Release v0.4. Retrieved from <https://tnfd.global/publication/tnfd-v0-4-annex-4-9/>.

The process for stakeholder engagement should be systematic, comprehensive, logical, and practical – but also fit for purpose. For example, it will not be practical to consult all stakeholder groups directly in a full value-chain assessment. Early considerations should therefore be made during the assessment as to which stakeholders should be engaged and the best methods to use.

Box A.2 Nature as a stakeholder

The valuation used in environmental and welfare economics is anthropocentric and related, almost exclusively, to instrumental value (i.e., value that serves a particular use to people). However, other forms of value exist, not defined by their relevance to human utility.

A 2022 IPBES report⁶ discusses the intrinsic value of nature (i.e., nature for nature's sake). While it is not possible to quantify intrinsic value (by definition), governments are exploring ways to incorporate this concept into policy. As one example, nature has been given legal rights in Ecuador. This measure was taken after a legal ruling that mining in a protected rainforest violated the rights of nature. As a result of the ruling, the government subsequently revoked mining permits.

Businesses may wish to recognize, in some way, the value created for nature itself as a stakeholder, beyond one that is instrumental. The measurement and valuation approaches for doing so are considerably harder and less explored than for instrumental value. Instead, a business can recognize that healthy and functioning ecosystems are important for nature as its own entity, and that this is a co-benefit of good management. Going further still, a business can choose to see nature itself as a key stakeholder for whom the business wishes to make management decisions to create positive outcomes. For example, the clothing manufacturer Patagonia chose to make “Earth,” or nature, its sole beneficiary from profits generated by the company. This led the company to change its approach to impacts and dependencies and to how it generates value. By expanding the concept of who was the key stakeholder, the company made nature-centric decisions part of its business-as-usual approach through both reducing impacts and distributing any profits (Patagonia Works 2022).

Recommended best practice – Stakeholder involvement

Plan to engage with internal and external stakeholders who will be affected by the business's actions to the maximum extent that resources allow:

If a resultant decision has potentially significant societal impacts, stakeholder engagement should include key potentially affected societal stakeholders and be undertaken in thorough detail; for example, site-level assessments should engage with local stakeholder groups. Where external consultation has not been undertaken, this should be made clear in any external communication.

Where the objective is to make an internal decision with limited implications for external stakeholders, stakeholder engagement may be more limited and internal only. This limitation should be stated clearly within any outputs.

Where the scope of the assessment is too broad to consult all affected stakeholders directly, make a plan to collect information from a representative sample. This might include using focus groups, a survey, and/or the best and most current available research.

⁶ https://files.ipbes.net/ipbes-web-prod-public-files/2022-12/Values_IPBES%20Side%20Event_8%20December.pdf

It is important to recognize that stakeholder engagement is reiterative. It is a cross-cutting exercise in a capitals assessment that can be employed throughout several of the required steps:

- In scoping stages (Step B) to ensure that spatial and temporal boundaries are suitably reflective of potential impacts to stakeholders.
- When developing pathways (Step D) to ensure that potential dynamics and consequences are considered early, and to inform or contribute to the prioritization process.
- In the measurement of capital changes, trends, and dynamics (Step D) to ensure contextual, local, and expert knowledge contributes to understanding relevant systems. Or when building the initial pathways (Step B), to make sure nothing is missed from the outset.
- In conducting primary (first-hand) valuation (Step D), to provide accurate valuations. Engaging stakeholders in valuation at earlier stages will provide information about why, and how much, stakeholders will be affected.
- When communicating results (Step F), making sure to communicate transparently to all affected groups.⁷

Suggested iterations

Stakeholder groups not identified as relevant to the assessment objective during sub-step A1 may be identified at this point. If so, reconsider the assessment objective and update accordingly.

⁷ Transparency and feedback loops are essential to building trust. The difficulties of navigating power imbalances, building trust, and creating genuine dialogues with communities can be achieved with high levels of transparency about the valuations and the creation of effective feedback mechanisms (see the Value Commission discussion paper Valuing What Matters for more insights).

STEP B | Scope interdependencies of capitals

Implementing Step B will help to answer the following questions:

Which are the significant relationships with capitals?

Which are the boundaries of the assessment (in terms of value chain, geography, and time frame)?

Which are the material activities?

Outputs:

B1 | Description of the significant relationships and interdependencies between the capitals

B2 | Defined boundary in terms of value chain, geography, and time frame

B3 | Map of material activities within the scope

As the scope and interconnections can be vast and numerous, it is important to set appropriate boundaries regarding value chain, depth, and time frame. Engaging with stakeholders at this point is important to ensure that relevant content is included and that an appropriate boundary is established.

Integrated decision-making requires an understanding of the way that actions and consequences relate to each other. It requires the consideration of impacts and dependencies on all forms of capital as well as the relevant interdependencies and feedback loops between them, both balancing and reinforcing loops.

Using a systems approach to map the links between relevant activities, across all stocks of capital, will help identify the flows of benefits that can be derived from each and how they affect one another. A systems approach can help a business to anticipate and better manage a broader set of related impacts including potential unintended consequences, both positive and negative.

Completing Step B includes the following sub-steps, keeping in mind that this process is iterative rather than a linear sequence:

- **Sub-step B1** | Describe relationships with and interdependencies on capitals
- **Sub-step B2** | Define boundaries
- **Sub-step B3** | Map activities against impacts and dependencies

The scope of the assessment represents the extent of the system to be assessed, including organizationally, geographically, temporally, and a range of other variables. Considering the scope of an assessment in terms of a “system” can facilitate a more robust understanding of the activities, stakeholders, and capitals that are linked to a problem or opportunity. This provides more informed framing to understand how challenges can be solved, opportunities realized, and implications considered.

There is no definitive boundary to draw around a system, and these scoping decisions will be driven primarily by the objective and available resources. “We must define our own boundaries for clarity, yet boundaries can produce problems when we forget that we’ve artificially created them” (Meadows 2008).⁸ To conduct a truly integrated assessment within a systems-thinking approach requires considering both impacts and dependencies, especially considering that these are often not mutually exclusive. Compromising on some of these choices may be necessary to ensure that the assessment remains feasible and useful.

“We can rarely mark a real boundary, because systems rarely have real boundaries. Everything is connected to everything, and not neatly.”

Donella Meadows, Thinking in Systems, 2008

Alignment remark

Whereas the Natural Capital and Social & Human Capital Protocols included options on some elements of scoping, the Capitals Protocol has removed these as they are not optional in an integrated capitals assessment. The Capitals Protocol assumes the inclusion of both impacts and dependencies and requires that value is considered from the perspectives of both the business and society. Further explanation is provided in activities B1.1 and B1.2.

B1 | Describe relationships with and interdependencies on capitals

Complete sub-step B1 through the following activities:

- B1.1 Describe relationships with and interdependencies on capitals
- B1.2 Identify consequences to the business and society

B1.1 | Describe relationships with and interdependencies on capitals

The consideration of both impacts and dependencies is essential for building a more complete understanding of risks and opportunities.

Impacts and dependencies are often deeply interrelated. For example, a business can depend heavily upon capital stocks such as a reliable water supply or a healthy workforce to keep its operations financially viable over the long term, yet also be impacting those same dependencies by unknowingly over-extracting the water resource or by negatively affecting employees’ health through overwork or exposure to industrial chemicals.

Understanding both sides of this relationship with each capital stock is necessary to contextualize the business within its surrounding system. While the decision to include either impacts or dependencies or both was prominent in the Natural Capital and Social & Human Capital Protocols, it is no longer optional in the Capitals Protocol which requires identifying both impacts and dependencies, also known as “relationships with capitals.” In the interest of resourcing, consider identifying those deemed significant or potentially material. The significant ones will be those whose lack of consideration could influence the final decision. Transparency about the process and criteria used to select significant relationships with capitals is important. Note that limiting mapped impacts may reduce opportunities to understand hidden impacts and dependencies. This stage includes mapping causal relationships and interconnections, but not yet assessing the value of these relationships.

Consider starting at a high level (e.g., what extractive processes take place, which skills and communities does the business rely upon, what infrastructure is used) and from here becoming more specific. Mapping the more obvious impacts and dependencies may help to reveal other impacts and dependencies not considered

⁸ Meadows, D. 2008. Thinking in Systems: A Primer. Chelsea Green Publishing.

before. Using examples from previous single capital assessments and grey literature may provide guidance and inspiration for understanding the business's impacts and dependencies.

A key output of this step is a description of impacts and dependencies between capitals. These relationships may only need to be measured in relative terms to provide useful information, although valuation will help to describe the relative importance of these connections.

Recommended best practice – impacts and dependencies

To apply an integrated assessment, users of the Capitals Protocol must consider both impacts and dependencies to gain a full understanding of the business's interaction with the capitals.

B1.2 | Identify consequences to the business and to society

The Natural Capital and Social & Human Capital Protocols identified two distinct “value perspectives” or points of view from which an impact can be perceived and therefore valued; “impact to business” and “impact to society.” These perspectives are not dissimilar to the approach encouraged by “double materiality.” Both previous Protocols offered a choice as to whether a business considered one or both of these perspectives. The Capitals Protocol goes further by considering both perspectives to be essential. The capitals approach is centered around the idea that business decisions can be made that ultimately lead to win-win outcomes through a deeper understanding of trade-offs between people, planet, and financial outcomes for both business and society through understanding impacts and dependencies.

Consequences for business and society will have a higher degree of uncertainty when compared to the status quo. Therefore, while it may feel prudent to stick with business as usual, this shouldn't be used as a reason not to take action. ACT further in this document discussed in more detail the need to make decisions based on capitals information, despite higher uncertainty.

Recommended best practice

The Capitals Protocol requires users to consider value from the perspective of both the business and society.

B2 | Define boundaries

Complete sub-step B2 through the following activities:

- B2.1 Define the operational boundary
- B2.2 Define the value-chain boundary
- B2.3 Define the spatial boundary
- B2.4 Define the temporal boundary

B2.1 | Define the operational boundary

The operational boundary refers to the part or parts of a business or portfolio to be included in a capital assessment. Selection of the operational boundary should be guided by the chosen objective. The operational boundary levels are typically:

- **Corporate level** spanning any geographical scale including regional, international, or global depending on the business and its value chain (see sub-step B5). Incorporating systems thinking at the global scale can be complex but illuminating. Reasonably covering the breadth of a large scope may require sacrificing some level of detail but can lead to discovery of unanticipated material issues. Choosing a corporate-level boundary will require effort to gather, consolidate, and communicate information across the business.
- **Project- or site-level** will be more contained than a full corporate assessment, but may still extend to multiple sites, activities, and locations. This scope is most likely to require focusing on a landscape and/or specific community and offers great opportunity for in-depth systems thinking that factors in contextual ecological and societal dynamics and thresholds. Consideration of baseline will be particularly important at this scale of system.
- **Product-level** relates to products, materials, and/or related services and might carry the scope across multiple locations and stakeholder groups depending on how much of the value chain is included (see Appendix 2 on value-chain boundaries). This narrower focus can allow for a more detailed systems-thinking assessment of impacts and dependencies.

Each of these levels relates to different scales of system with their own characteristics. These may align with Scope 1, 2, or 3 boundaries for greenhouse gas emission reporting.

B2.2 | Define the value-chain boundary

The value-chain boundary refers to the part of the value chain that will be included in the assessment. The Capitals Protocol considers three major parts of the value chain: upstream, direct operations, and downstream. While the obvious choice is to start with the direct operations of the business, the most material issues may be found upstream or downstream. For example, the fossil fuel extractive industry experiences the largest land footprint in its upstream and direct operations stages, whereas carbon emissions are largest in the downstream stage.

An upstream value-chain boundary (also referred to as cradle-to-gate) includes all suppliers and raw materials used by the business. Upstream issues can be harder to influence than direct operations but, with good relationships and communication, can yield some of the greatest risk and opportunity management options. They can be managed through establishing suitable procurement policies and steps.

A direct operations value-chain boundary (also referred to as gate-to-gate) covers activities over which the business has direct operational control, including majority-owned subsidiaries. Direct operations will only represent a partial slice of the business's impacts and dependencies but will likely be the most straightforward in terms of data collection, monitoring, and influence over decision-making. In the interest of maximizing information on risks and opportunities, the Capitals Protocol does not recommend assessing only direct operations.

A downstream value-chain boundary (also referred to as gate-to-grave) covers activities linked to the purchase, use, reuse, recovery, recycling, and final disposal of the business's products and services. It can often be the most difficult to influence due to the lack of direct control. The downstream value chain may not be limited to a defined geography, for example where services are provided in virtual spaces (e.g., over the internet).

When selecting a value-chain boundary, be careful not to exclude a part of the business or portfolio that is likely to have a significant impact on any of the capitals. For example, a business that relies on sourcing extractive resources should try to include the extraction source where possible. Similarly, where a product is likely to have significant downstream impacts, these should be included (for example, technological products such as social media platforms). To be aligned with the concept of a circular economy, an assessment needs to consider upstream, direct operations, and downstream.

Recommended best practice

Consider all three parts of the value chain to the extent feasible as this will yield the most comprehensive systems-thinking insight. To focus assessment resources, consider tracking certain issues or stakeholder groups in more detail across certain parts of the value chain.

B2.3 | Define the spatial boundary

The spatial boundary refers to the geographic system the assessment will consider. This choice will be heavily influenced by operational and value chain decisions. The assessment's spatial boundary could be global, international, national, or sub-national, or might be defined by a natural or social system such as a river catchment, ecosystem, or community. The spatial boundary is likely to change once the nature of the business's impacts and dependencies is better understood; for example, it may be found that air pollutants are being dispersed further than first understood. Select an initial boundary and adjust as needed.

When defining the spatial boundary consider:

- **Does the nature of the business's activities require point geographies** (e.g., a factory) and/or line geographies (e.g., freighting goods across country by road or rail)? How could potential impacts be dispersed? How far away might these impacts be felt and how might they be carried (e.g., wind and dispersion patterns, the location at which products are used or create effects)?
- **Where impacts and dependencies are related to a natural system, what is the nature and extent of that system?** For example, if assessing coastal activities consider how far up and down the coastline, or out to sea, or underground, impacts and dependencies might be relevant. In human and social systems consider knock-on effects (e.g., to health). Are families, dependents, and communities affected?
- **What processes pass in and out of these geographies?** Are they residential areas, pilgrimage routes, or ecological migratory routes?
- **Are business activities conducted near areas of high cultural or ecological value, such as heritage or spiritually important sites or areas of high conservation value?** Give careful attention to this consideration.
- **Which virtual spaces might be affected by the chosen operational and value-chain boundary?** Are there online groups or communities that could be affected by the business's activities?

B2.4 | Define the temporal boundary

The temporal boundary refers to the time frame that will be assessed whether days, months, years, or decades. Depending on the objective, the assessment might need to consider past, present, and/or future impacts, all of which need defining with clear boundaries.

Alignment remark

Activity B2.4 relates to the TNFD principle of temporal orientation. Nature-, social-, and human-related risks and opportunities should be analyzed across short-, medium-, and long-term time frames and should consider variability across time horizons for operational and strategic planning. This may require extending beyond traditional planning horizons.

When defining the temporal boundary consider:

What is the expected lifetime of the project or outcome of the activities or operations being assessed?

Include consideration of any end-of-life/decommissioning phases (including the lifetime of associated waste such as plastic or radioactive/polluting materials) and timelines linked to impacts arising from that. Where human health is directly affected (e.g., through exposure to potentially harmful chemicals), the chosen timescale should be at least the average life expectancy in the operating location.

What are the temporal dynamics that affect capitals within the system, over the chosen timescale? Are they seasonal, do conditions change during public holidays? Is the region politically volatile?

Consider all natural, human, social, and produced capital dynamics and consider that they will occur over different timescales; natural capital restoration may take centuries, human capital impacts on health and education will be lifelong, produced financial capital outcomes may be instant but at the cost of longer-term value creation.

Allocating benefits derived from hybrid assets to different aspects of their make-up (i.e., natural, human, social, and produced) could prove important for accounting purposes. Natural assets, for example, will likely have a longer lifecycle than produced assets. Social discount rates applied to different forms of capital will affect how decisions are made. Hybrid assets such as trees planted on urban streets, some forms of intellectual capital, or agriculture are examples where this may need to be considered.

Recommended best practice – Historic impacts

The objective of an assessment may necessitate considering issues such as historic carbon emissions, land tenure disputes, or forced labor over a long historical period. Assessments of, and reparations for, issues such as these are sensitive and require respectful stakeholder engagement. Local issues with respect to land, water, and resources are best addressed in conjunction with local experts and community representatives to understand the nature of historic impacts and how they are valued today.

B3 | Map activities against impacts and dependencies

Completing this sub-step requires identifying all relevant activities associated with priority impacts and/or dependencies. Table B.1 provides an example of activity mapping for an agri-food company.

Company undertaking assessment	Organizational focus	Value-chain element	Priority capitals impact and dependencies
Mango juice producer	Corporate	Upstream (raw materials)	Impact drivers: water use, pesticide use, fertilizer use, labor rights, workers' living conditions, food loss Dependencies: water supply, land access, access to infrastructure and technology, health of workers, pest control, skills and knowledge
		Operations	Impact drivers: water use, GHG emissions, waste generation, nutritional content of product, labor rights, food waste Dependencies: water supply and purification, laws and regulation, health of workers, skills and knowledge of workers, energy
		Downstream (distribution, retail, and consumption)	Impact drivers: GHG emissions, waste generation, nutritional content of food, use of substances harmful for consumers, food safety practices, employee health and safety conditions, salaries and benefits, labor rights, workers' representation, food security, food waste Dependencies: energy, health of workers, social acceptance and trust, laws and regulation, accessibility to infrastructure and technology
Chicken producer	Product	Operational (chicken farming including chicken feeding, egg collection, and distribution)	Impact drivers: water use, GHG emissions, fertilizer use, soil use, animal welfare conditions, safety practices, labor rights, food loss and waste Dependencies: water supply and purification, pest control, health of workers, social acceptance and trust, access to infrastructure and technology

Table B.1 Illustrative example of activity mapping for an agri-food company

Suggested iterations

Since all decisions that define the assessment scope are interrelated, it is important to regularly review prior decisions, rather than deciding once and then progressing through the sub-steps in a linear sequence. As the scope is defined in more detail, revisit the objective set in sub-step A1 to check that the assessment is set to collect the most useful information, and/or whether the objective has evolved based on subsequent outputs.

STEP C | Decide on how to value

Which baselines and scenarios will serve as a starting point?

Which valuation approach and value impact/dependency risk factors will be used?

Outputs:

C1 | A description of baselines and scenarios to be used in the valuation approach

C2 | A defined valuation approach and a list of impact value/dependency risk factors that will be used

The Transparency Requirements from the Governance for Valuation provide practical directions for this output.

While most businesses capture financial, environmental, people, and production data, it is only when these data are combined with a value factor (based on scientific or social studies and research) and the necessary context that they can be used to inform a decision. For example, knowing that an organization uses 100 cubic meters of water is meaningless without the context of the region where the operation is based, the water stress of that region, and details such as other users of the water including population numbers. Full guidance on valuation can be found later in this document and in the Governance for Valuation document.

Based on the outputs from Step B, an appropriate set of value factors must be selected that meet the desired outcomes. This requires considering multiple forms of value (e.g., instrumental, relational, intrinsic), identifying short-, medium-, and long-term perspectives, and not prioritizing one capital over the others. Suitable baselines and comparative scenarios should also be established and evaluated.

There are an increasing number of impact value/dependency risk factors available for use. The Governance for Valuation gives an indication of some repositories of these factors. In addition, the section on Transparency Requirements from the same document will help to address the credibility and suitability of value impact/dependency risk factors which can vary significantly.

Chosen impacts should include changes in value to society, either solely or in combination with value to business. This is a fundamental part of applying a capitals approach as it demonstrates the impact on social capital (which provides social license to operate) and helps describe the wider societal landscape in which the businesses operates.

Deciding how to value impacts and dependencies is an iterative process. Further along in an assessment, when the capitals system and its constituent impact and dependency pathways are mapped, it may become clear that the selected valuation approaches are not fit for purpose. In this case, revisit the decision and update the list of chosen valuation factors to complement the revised valuation approach.

Box C.1 Impact value factors and dependency risk factors

What is an impact value factor?

An impact value factor is an expression of the relative importance, worth, or usefulness of changes in capitals to people.

Impact value factors describe the direct and indirect changes in wellbeing people experience associated with a change in one or more capitals as a result of an activity. They are typically expressed as impact per unit input (e.g., fresh water extraction) or output (e.g., gross value added) and are specific to a given context (e.g., change in wellbeing associated with incidents of chronic bronchitis per kg of particulate air emissions in a suburban British town, or additional lifetime earnings per person trained in a specific skill in a specific country). Value factors represent an incremental impact, allowing them to be scaled based on the extent of a business's activities.

Impact value factors reflect a specific impact pathway and can be expressed in different ways. Quantitative metrics include monetary (e.g., lost economic output, willingness to pay for an increase in wellbeing) and non-monetary units (e.g., an index of life satisfaction, disability-adjusted life years). For example, the UK Government publishes recommended damage cost values for different air pollutants (the average for NO_x is £8,148 per ton emitted) which is built up from estimates of impacts on human health, the economy, and the environment. Qualitative assessments would use more descriptive terminology of impacts experienced by different individuals or groups.

What is a dependency risk factor?

A dependency risk factor is an expression of the potential exposure, sensitivity, or vulnerability of an organization's performance to changes in the capital(s) on which it depends. While impact value factors can be developed for use by different businesses because a change in, for example, water availability to a certain population is the same no matter which business caused the change. But the same is not true of dependencies because dependency values are specific to a business – they represent the importance of a capital input or state to that business.

However, dependency risk factors can be developed for use by many businesses, such as the likelihood that flooding of a given severity will increase in frequency by a given amount or the likelihood of political and social unrest over a certain period of time.

For more detail on how to build confidence in using impact value and dependency risk factors see the Governance for Valuation.

The Governance for Valuation does not provide specific factors for use in assessment but facilitates a process to develop and/or adapt value factors. The choice of factors is dictated by, inter alia, the (desired) scope of the assessment, availability of data, and expert judgment on the appropriateness of selection. Various online databases provide rich sources of information.

A non-exhaustive list of providers of publicly available value factors can be found at the Capitals Coalition's website.⁹ This list will grow as more providers become available.

⁹ Note: The available list is not exhaustive and should not be interpreted as an endorsement. The Capitals Coalition have not conducted a formal review or quality assessment of these sources

Completing Step C includes the following sub-steps:

- **Sub-step C1** | Define baselines and scenarios
- **Sub-step C2** | Decide which types of value to consider

C1 | Define baselines and scenarios

Baselines

The systems boundary is the full extent of the system you are assessing will require the need to include a baseline. A baseline is the starting point or benchmark against which to compare changes in capitals. Most assessments require an explicit baseline to enable the drawing of meaningful conclusions. It is best to establish a baseline for each of the capitals in any systems approach, where resources allow. Consider the context and interrelationships with external factors that can influence the state of the capitals within the baseline scenario.

Consider what works best in the company's business-as-usual system and what impacts and externalities are most in need of reduction or currently feel unavoidable.

The type of baseline will vary depending on the nature of the assessment. Examples include:

- The historical situation over a specified period of time, such as a comparison of this year's emissions to last year's.
- The state of a capital (e.g., biodiversity or air quality for natural capital) at a point in time, for example, the state immediately before a project began.
- A sector-or economy-wide average level of a given capital impact or dependency (i.e., an industry benchmark).

When undertaking an assessment that covers an extended period (e.g., to assess the impacts of a project over 20 or 50 years), consider how the baseline would have changed over the same period. For example, even without the company's project, the state of the capitals would have changed due to other external pressures (e.g., population influx, climate change, or the impacts of other businesses). The changes that would have occurred independent of a project are sometimes referred to as "business as usual," or a "future projection" scenario (i.e., what is projected to happen anyway). Considering these trends allows comparison of "with project" and "without project" scenarios in a meaningful way. Table C.1 outlines some issues to consider when choosing a baseline for different organizational focus and value chain options.

Corporate	Project or Site	Product
- The baseline may include data for previous years, or data from the start and end of last year. - It may be helpful to align baselines with financial reporting and/or strategic time frames. - Benchmarks against the performance of other companies (within and between sectors) may be illuminating.	- Baselines and/or alternative options or scenarios are often required for project-level assessments. - Compare one option to another, compare a range of options, or compare one or more alternatives to a baseline scenario. - Project baselines are often based on detailed surveys to assess the stock (extent and condition) of each capital. - Project- or site-level baselines can either be a fixed point in time (e.g., when the company took control of the site, or a previous condition some years earlier), or one that evolves over time (usually in a gradual and predictable way, such as “business as usual”).	- Determining a baseline for product assessments can be challenging, especially when using life-cycle assessment tools. - It is worth reviewing other similar assessments before setting a baseline for a product.
Value Chain		
- Input-output tables with significant sector disaggregation can provide useful information on the structure of industrial value chains, and with suitable extensions can also provide information on impacts and dependencies across different capitals along the value chain. - Establishing an appropriate baseline across an entire value chain may require certain simplifying assumptions, such as that the study value chain and the baseline value chain are located in the same geographic regions and exhibit other structural similarities. These assumptions may be used in models to understand baselines. Good communication and relationships with suppliers and customers may enable access to real world data that can demonstrate where a business’s value chain might be outperforming industry standards.		
Adapted from Natural Capital Protocol, 2016		

Table C.1 Considerations when choosing a baseline

Scenarios

If comparing impacts against a baseline, the chosen scenario, or option, is then the point of comparison. Scenarios are storylines describing a possible future where the changes that are being assessed occur. Scenarios explore aspects of, and choices about, the future that are uncertain. Defining these scenarios clearly is particularly important if a capitals assessment will be used to “compare options.”

When defining scenarios in integrated capital assessments, consider opportunities where solutions create beneficial changes across and between capitals (e.g., “smart interconnection options” may combine climate and nature-based solutions or increase social benefits while reducing material consumption).

Types of scenario to consider include¹⁰:

- Intervention scenarios or real alternatives being considered (e.g., for comparing alternative development projects or project locations, or comparing alternative materials used within particular products);
- Exploratory scenarios assessing possible unexpected futures. This may include some sensitivity analysis (sometimes used in risk assessments);
- Vision scenarios describing explicitly desirable or undesirable futures (also used in risk and strategy assessments), such as a science-based or just transition target that the business aims to achieve. Vision scenarios can be used to inform potential business-as-usual scenarios as well.

A counterfactual is a form of scenario that describes a plausible alternative state of the site and the natural, social, human, and produced conditions that would result if the company did not operate. More than one counterfactual can be considered to account for different perspectives (e.g., from stakeholders or experts).

Note that these scenarios provide a starting point but are not exhaustive and other scenarios may be appropriate for the objective. Numerous resources on scenario analysis are available.

If the intended use of a capitals assessment is to compare options, use of scenarios is recommended.

Revisiting and updating scenarios later in the assessment is advisable, such as when there is greater understanding of the business’s impacts and dependencies on different capitals from a systems-thinking perspective at the end of Step D. Data required to generate scenarios, or options, will be much less intensive or accurate than data required to make decisions.

C2 | Decide which types of value to consider

The value placed on impacts and dependencies can be expressed in different ways; the three general types of valuation are qualitative, quantitative, and monetary. The choice of which to use will be determined by the type of decision to be informed, and the nature of the considerations therein.

In some cases, a qualitative or quantitative valuation may be sufficient. Other cases may call for a mix of all three types of valuation, for example where certain impacts are not easily monetized, or when reliable data are unavailable for some variables. For example, stakeholders such as local communities might prefer to focus on qualitative and quantitative valuation approaches which have more transparent methodologies. Alternatively, if the assessment’s audience includes government bodies or non-governmental organizations, they may be interested in the monetary valuation of non-market impacts. Certain forms of monetary valuation can reflect the preferences and priorities of citizens or identify opportunities for governments to save costs as a result of welfare improvements or improved efficiency in the use of resources. Internal stakeholders may be more interested in performance against quantitative targets or key performance indicators alongside impacts on departmental budgets.

¹⁰ McKenzie, E., Rosenthal, A., Bernhardt, J., Girvetz, E., Kovacs, K., Olwero, N. and Toft, J. 2012. “Developing scenarios to assess ecosystem service tradeoffs: Guidance and case studies for InVEST users.” [Online] https://www.researchgate.net/publication/269037004_Developing_scenarios_to_assess_ecosystem_service_tradeoffs_Guidance_and_case_studies_for_InVEST_users [Accessed 14 June 2024].

Many of the benefits, especially intangible values, which often arise from human and social capital are difficult or impossible to accurately quantify and assign a monetary value to. Failure to understand or include these types of value could lead to decisions that don't adequately reflect them and, as a result, a breakdown in relationships between key stakeholder groups.

Assessments commonly start with a qualitative review, then proceed to quantitative measurement, and finally to estimation of monetary values as required, each potentially contributing to the next. Try to avoid assuming that monetary valuation is always the best option; qualitative or quantitative approaches will give more appropriate insight and will be a better use of resources for some objectives. For example, for an early effort to assess the relative importance of a range of issues to a business's largest stakeholder groups, qualitative valuation through surveys is likely to be the most effective approach. Moving along the continuum from qualitative to quantitative to monetary value, generated values grow more consistent, making it easier to compare options and assess trade-offs on a like-for-like basis, however values also lose detail. For example, impacts in a single comparable unit (monetary value) are easier to compare against other monetary values. Qualitative expressions are hard to compare against each other in a way that gives a clear decision outcome. Mapping a system in quantitative and qualitative terms can help explain relationships between capitals and stakeholders and can provide clear guidance for leverage points in a system. Appendix 2 sets out the different options for valuation with respect to qualitative, quantitative, and monetary approaches.

Table C.2 describes some considerations when selecting a method of valuation. These provide guidance on how to value impacts and dependencies and what to consider when assessing the values in decision-making processes.

Type of value	Considerations
Qualitative	• May be appropriate when there are insufficient data to allow quantitative measurement. • Can be useful when there are many different impacts or dependencies, or many different perspectives on them. • Can be appropriate when particular impacts or dependencies have a strong moral or ethical dimension or when important stakeholders find monetary values difficult to accept or interpret. • Can be appropriate when assessing spiritual, religious, aesthetic, recreational, and other cultural values. • Establishing consistency in qualitative valuation can be difficult and therefore meaningful comparison is not normally possible unless using consistent definitions for what represents high, medium, and low value. • Outputs may be subject to bias and tend to be difficult to validate or reproduce.
Quantitative	• Good for assessing progress towards a quantifiable target (e.g., carbon emissions, a living wage). • Can be measured on natural scales (e.g., volume of water) and constructed scales (e.g., areas with high biodiversity value). Measures might be direct measures (e.g., abundance of fish) or proxy indicators (e.g., area and condition of coral reefs as a proxy for fish productivity). • Appropriate when impacts and/or dependencies have a strong moral or ethical dimension or when important stakeholders find monetary values difficult to accept or interpret. • Can be difficult to compare between or among multiple impacts or dependencies (e.g., volumes of water vs. tons of emissions). • Not all impacts or dependencies can be measured in quantifiable terms (e.g., spiritual, religious, historical significance, and political security).

Monetary	• If monetary values are estimated correctly and on a consistent basis (using the methods of welfare/wellbeing economics), they should be broadly comparable and offer meaningful information to help assess trade-offs between options (see Box D.3 for further discussion). • Essential for determining financial or economic values where these are required for decision-making (e.g., CAPEX decisions). • Useful for determining financial value at risk and/or potential changes in (net) revenues. • May be time consuming and expensive, especially if primary research is required to generate data. • Some lower-cost monetary valuation methods are available (e.g., value transfer). • Some stakeholders may find it difficult to accept or interpret monetary valuation of certain benefits (e.g., spiritual values). In such situations, special efforts may be required to explain the advantages and also to acknowledge the limitations of monetary valuation (see Box C.2).
Adapted in part from A4S (2015)	

Table C.2 Considerations when deciding types of value to use

It is important to communicate the chosen valuation approach in a consistent manner. A transparency report is the recommended approach for this, as suggested in the Governance for Valuation (see Box C.2).

Box C.2 Governance for Valuation: Transparency Requirements, Confidence Criteria, and Value Notes

The Governance for Valuation supports users of capitals information to better understand how such information (i.e., impact value/dependency risk factors) has been generated, judge its fit for purpose, and concisely summarize its use to inform the decision at hand.

The approach consists of three key components:

- **Transparency Requirements:** For outlining methodology decisions in developing capitals information through a capitals assessment.
- **Confidence Criteria:** For determining suitability and confidence, based on information in Transparency Reports.
- **Value Notes:** To summarize findings of suitability and confidence, for internal or external reporting.

In addition to these three components, Attribution Scopes are included to consider the extent to which a business is responsible for an impact in the system.

Suggested iterations

With the scope outlined following the steps above, iterate taking into consideration the available timeline and resources. If a technical provider or consultant will be brought in to help with the assessment but has not yet been, this is the time to bring them in.

- **Timescale:** How quickly does the assessment need to be completed? Has enough time been factored in for the expected duration of work?
- **Funding/resources:** What budget and human resources are available? Are there other sources of funding available from within the business or externally that could help finance the assessment? Review table D.12 for a relative cost indication of the various valuation techniques.
- **Capacity:** What skills are available within the business to undertake an assessment?
- **What additional skills, if any, are needed?** Depending on the business decision under consideration, a range of skills and expertise may be needed including environmental economics, research, data analysis, mathematical or statistical modeling (from calculating averages and estimations to using complex statistical and econometric packages), stakeholder mapping and engagement, and communications. This list of skills is not meant to be exhaustive but a starting point.
- **Data availability and accessibility:** What constraints on data are anticipated, and/or what steps are necessary for translation into other languages?
- **Stakeholder relationships:** To what extent do relationships with stakeholders need to be identified and established to conduct the study, and potentially to implement solutions? Revisit the desired stakeholder engagement in sub-step B1.
- **Note:** Be prepared to revisit selected baselines in C1, if planning issues with anticipated scenarios identified here are likely to affect what is achievable.

Box C.3

Never Sleep Coffee International (Assemble)

The **scope** of the capitals assessment includes:

Objective: For a pilot coffee farm supplier, determine both the financial and societal returns on investment, considering impacts to nature and people, to evaluate and build a business case for switching from conventional coffee farming to regenerative coffee farming and inform discussions with potential investors.

Value-chain boundary: Upstream – focus on coffee farming, not processing or manufacturing.

Geographic boundary: The watershed/landscape covering the potential area of impact of the pilot coffee farm.

Scenarios: Comparing the existing scenario (business as usual for the existing farm) with a shift to becoming a regenerative farm – both over a 25-year period.

Key stakeholders: Coffee farm workers, local people in the river catchment /nearby communities, financial institutions, certification bodies.

Regenerative activities include:

- Adding livestock for natural fertilizer
- Growing fruit and nut trees for shade and cover crops
- Moving to living wages
- Training for employees on regenerative agriculture, health and safety (heat, water, pesticide management, equipment use, etc.), and biodiversity
- Linking with other stakeholder groups (NGOs/government agencies) to promote regenerative agriculture in the region
- Becoming Regenerative Agriculture certified

Identifying impacts and dependencies Natural capital

- Water contamination from use of fertilizers and pesticides and the associated downstream impacts on local communities and ecosystems
- Soil quality and carbon sequestration
- Biodiversity (birds, mammals, plants, etc.)
- Heat/sun affecting coffee yields

Human capital

- Health impacts on workers from increased heat resulting from climate change
- Knowledge and skills of farmers and workers (on regenerative agricultural practices, health and safety, and biodiversity)

Produced capital

- Financial gains over the long term from coffee yields plus yields from fruit and nut trees integrated into production
- Cost of equipment (such as pesticide dispersant tools) and infrastructure (e.g., water butts, irrigation, suitable housing for workers)

Social capital

- Social License to Operate (SLO)
- Trust
- Relationships/network (e.g., through regenerative agriculture certification program)
- Brand image/reputation
- Traceability

Systems thinking and connections

Adopting a systems-thinking approach highlighted the need to consider the following feedback loops within their assessment and decision-making:

- How different capitals will trade off against each other and how they interact with each other
- Whether impacts on one capital will have a further knock on effect to further capitals in-turn
- How understanding the capitals will have impacts on long term viability and sustainability of the coffee company

Box C.4

Smart Chips (Assemble)

The **scope** of the capitals assessment includes:

Objective: Assess the best option to meet their coastal protection needs bearing in mind the financial cost and considering impacts to local stakeholders – in particular comparing the financial and societal return on investment (RoI) of an artificial grey infrastructure coast and flood defense option with that of a green infrastructure nature-based solutions option.

Value-chain boundary: The direct operations (manufacturing site) – including construction, operation/maintenance, and decommissioning of the artificial flood defense – but also the supply chain, in terms of the materials needed for the coastal protection schemes.

Geographic boundary: Taking a “mountain to reef” perspective from inland to the sea – and also some distance along the coastline – covering the potential area of impact.

Scenarios: Artificial defenses: Construction of a sea wall compared to nature-based solutions: Restoration of mangroves – both over a 50-year period. Key stakeholders: Staff, local communities, NGOs, other businesses, government.

Key features of the options:

- **Artificial defenses:** Construction of a sea wall is based on quarried rocks and cement (lime, sand, and gravel). The sand is from an inland river, the lime is made from limestone from a nearby cliff/cave system heated using mangrove charcoal, and the gravel is from crushed rock from a nearby quarry.
- **Nature-based solutions:** Restoration of mangroves is undertaken in front of the manufacturing site and also for a few kilometers along the coastline to act as a coastal defense. The company collaborates with other stakeholders facing the same problem; works with local NGOs and local communities training local people to do the planting and to build a boardwalk and canoeing area within the mangroves for ecotourism.

Identifying impacts and dependencies

Natural capital

- Coast protection impacts include reduced flooding and erosion due to planting mangroves
- Alternative scenarios highlight increased flooding and erosion caused by installing an artificial defense
- Co-benefits from mangrove planting that include carbon sequestration and the possibility of blue carbon credits, as well as enhanced biodiversity and fisheries (from the nursery and breeding service provided by the mangroves)
- Recreational impacts (mangrove ecotourism gain and river recreation loss from dredging sand)
- Sense of place (i.e., restoration of a previously intact ecosystem with links to historic cultural values)

Human capital

- Health and safety – reduced flood risk along coastline
- Skills among local community from training in mangrove nurseries and planting mangroves

Produced capital

- Access to international/government funds/grants for nature-based solutions / community projects
- Cost of investment

Social capital

- Jobs for local communities
- Social networks through collaboration
- Trust/Social Licence to Operate (SLO)/goodwill/reputation

Systems thinking and connections:

Adopting a systems-thinking approach highlighted the need to consider the following within their assessment and decision-making:

- Relevant issues and impacts within the wider terrestrial (landscape/watershed) and marine (seascape) areas as well as system connections between the two
- Links between mangroves, fisheries, biodiversity, human health, and local community benefits and livelihoods
- Traceability

Box C.5

Renew Energy (Assemble)

The **scope** of the capitals assessment includes:

Objective: To compare three existing leasehold sites to identify a preferred site that will generate the optimum financial and societal value and provide sufficiently robust evidence for potential investors interested in financing a just transition.

Value-chain boundary: Direct operations – but covering the construction, operation, and decommissioning of the windfarms, and transmission lines from the windfarm to existing electricity networks.

Geographic boundary: The relevant landscape/catchment areas of potential impacts (e.g., visual, noise, and employment) for the windfarms and transmission lines.

Scenarios: Construction, operation, and decommissioning of windfarms and transmission lines for each of the three sites relative to their business-as-usual baseline over a 25-year period.

Key stakeholders: Local people in nearby potentially affected communities, direct beneficiaries of Community Benefit Fund, property owners, construction and operational workers. Statutory consultees covering environmental and social issues also consulted as part of an associated Environmental and Social Impact Assessment.

Natural capital

- Impacts on land use at the windfarm sites and along the transmission lines – mainly agricultural land
- Vulnerable bird and bat species that may be affected by the turbines and transmission lines
- Visual and noise impacts to nearby houses from the wind turbines and transmission lines, including their impact on property values

Human capital

- Operational health & safety of construction, operation, maintenance, and decommissioning
- Training of locals – retraining/upskilling fossil fuel workers, and apprenticeships for youth (unemployment)
- Improved education, such as for local schools and sponsoring BSc/ MSc places and courses on renewable energy

Social capital

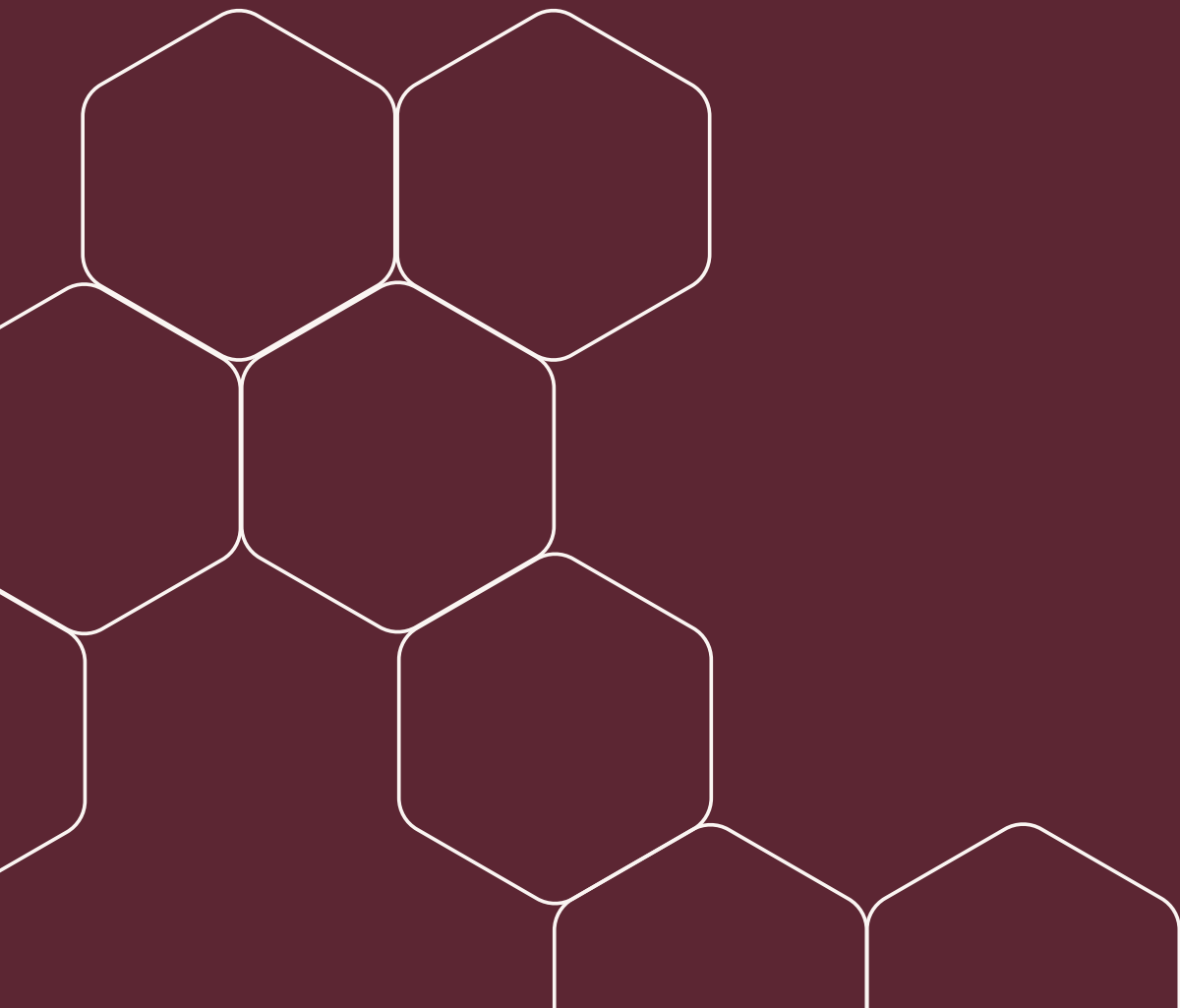
- Jobs/employment/apprentice opportunities for poorer/more vulnerable communities
- Cheaper energy to local/vulnerable energy-poor communities
- Enhanced trust/reputation of Renew Energy
- Increased social networks for local communities

Systems thinking and connections

Adopting a systems-thinking approach highlighted the need to consider the following feedback loops within their assessment and decision-making:

- The presence of other nearby onshore wind farms and the opportunities in the local supply chain that can emerge from a clustering effect. With greater demand, there is increased incentive to develop capacity in the local economy to support the industry with stocks/flows of produced and human capital
- Community acceptance – as local communities experience the benefits of wind farms directly, their support for renewable energy projects is likely to increase

Assess



The Assess Stage – A high-level run-through

Purpose: To measure and value impacts and dependencies as a means of providing trusted data that can underpin decision-making. This includes information about the capitals-relevant stocks, flows, impacts, dependencies, risks, and opportunities in a business's system that together inform decisions in a useful and business-relevant way.

Structure: This stage is structured around two required steps for integrated decision-making that help set out what needs to be considered in order to understand the significance, worth, or importance, in other words the value, of business impacts and dependencies on the capitals.

- **STEP D | Value material impacts and dependencies:** Prioritize the impacts and dependencies that will be measured and valued.
- **STEP E | Validate and verify key assumptions and results:** To ensure confidence in valuation, test key assumptions and consider ethical implications of the decision.

See Figure 1, 2, 3 to see how the steps from the Assess Stage fit into the Integrated Decision-Making Framework.

Like the other stages, the Assess Stage should be iterative; as a deeper picture of the business's activities and how it impacts and depends upon the capitals emerges, refer to assessment outputs from the Assemble Stage to determine if the chosen scope is still appropriate. To communicate a summary of the methodology choices made, use the Transparency Requirements of the Governance for Valuation, but now at a more granular level, building on the insights gained into impacts and dependencies.

Key output: Accessible, decision-useful information that enables decision-makers in the organization to fulfill the purpose set out in the Assemble Stage.

The Assess Stage of the Capitals Protocol, carried out by internal or external data preparers, focuses on considering a business's activities and describing how they relate to the four capitals (i.e., the natural, human, social and financial assets that create value for people now and into the future). Some of these capitals will create benefits directly for the business, others will create benefits for society more widely. Understanding, measuring, and valuing these flows of benefits will help to evaluate the impacts and dependencies relevant to an organization.

Relevance of the Assess Stage for different audiences:

Although the Assess Stage, like the Capitals Protocol as a whole, primarily aims to support practitioners in preparing capitals information for decision-making, it also supports other audiences:

- **Decision-makers** – If the Assess Stage is implemented, a decision-maker can be confident that a robust process has been followed to understand impacts and dependencies on capitals in a consistent way and that the valuation approach used is fit-for-purpose and can be trusted and communicated.
- **Practitioners** – The Assess Stage provides detailed technical guidance on how to conduct an integrated assessment and measure and value impacts and dependencies on four capitals.
- **Regulators** – The detailed integrated approach for valuing impacts and dependencies on four capitals, as set out in this stage of the Capitals Protocol, helps to describe and value interdependencies between capitals in a consistent way.

How to get started:

Each of the two required steps are outlined together with key questions to answer and outputs to deliver.

Previous steps helped to describe the business's context and value chains. To begin the Assess Stage requires:

- Ensuring the business has internal access to measurement and valuation skills (qualitative, quantitative, and/ or monetary, as appropriate), finding external support, or developing the necessary skills before beginning.

- Gathering available data for the analytical work required.
- Identifying relevant stakeholder groups for consultation and consideration when carrying out valuation.

Please note that the Capitals Protocol itself does not provide detailed instructions on how to apply specific measurement or valuation methods. Users should refer to the extensive academic, practitioner, and policy literature on these methods and should refer to the Governance for Valuation to ensure transparency and confidence in the use of impact value/dependency risk factors –either from use of secondary or primary data collected as part of this stage.

Guiding questions	Sub-steps	Outputs
STEP D Value material impacts and dependencies		
Which are your priority impact drivers and dependencies?	Sub-step D1 Select priority impacts and dependencies	Output D1 Map of material impact drivers and dependencies
Which are your measured impact drivers and dependencies?	Sub-step D2 Measure impact drivers and dependencies	Output D2 Measured impact drivers and dependencies
Which are the resulting changes in capitals from these impact drivers and dependencies?	Sub-step D3 Explore changes in capitals	Output D3 Description of the changes in capitals, with valued material impacts and dependencies, risks, and opportunities (as relevant), for business and society The Transparency Requirements from Governance for Valuation provide practical directions for this output
What is the value of impacts and dependencies to your business and to society?	Sub-step D4 Value impacts and dependencies	Output D4 Values of all capitals in terms of impact and dependency, indicating which stakeholders are affected
How do these impacts aggregate and where and to who do they occur?	Sub-step D5 Collate results and attribute impacts	Output D5 Statement of impacts and description of where, and to who, these are felt
STEP E Validate and verify key assumptions and results		
Is my assessment built on robust data and could the assumptions I used significantly affect the outputs?	E1 Test key assumptions and validate your confidence in the results	Output E1 Result of testing, validating, and verifying key assumptions and results Governance for Valuation provides practical criteria to ensure confidence.
How will my decisions affect different stakeholders and are they ethically right?	E2 Consider the ethical implications of your decisions	Output E2 A summary of the ethics relevant to the final decision

STEP D | Value material impacts and dependencies

Implementing Step D will help to answer the following questions:

Which are the priority impact drivers and dependencies?

Which are the measured impact drivers and dependencies?

Which are the resulting changes in capitals from these impact drivers and dependencies?

What is the value of impacts and dependencies to the business and to society?

How do these impacts aggregate and where and to whom do they occur?

Outputs:

D1 | Map of priority impact drivers and dependencies

D2 | Measured impact drivers and dependencies

D3 | Description of the changes in capitals, with valued material impacts and dependencies, risks, and opportunities (as relevant), for business and society. The Transparency Requirements from the Governance for Valuation provide practical directions for this output

D4 | Values of all capitals in terms of impact and dependency, indicating which stakeholders are affected

D5 | Statement of impacts and description of where, and by whom, these are felt

Potential impact drivers and dependencies must be mapped to understand relevant changes to the quantity and quality of capital stock and flow of value, and in turn, how these changes impact both the business in question and society. It is important to ensure all key interactions between the impacts and dependencies across capitals are considered using various scenarios. Material impacts, dependencies, risks, and opportunities both from a business and stakeholder perspective must be identified and taken forward to be valued at an appropriate level of granularity. All negative and positive impacts over time and geography should be made clear, including to which stakeholder group, especially in relation to vulnerable groups and priority ecosystems. When done effectively, this approach will provide the necessary information to make an evidence-based and ethical decision that optimizes value across all capitals.

Completing Step D includes the following sub-steps:

- **Sub-step D1 | Select priority impacts and dependencies**
- **Sub-step D2 | Measure impact drivers and dependencies**
- **Sub-step D3 | Explore changes in capitals**
- **Sub-step D4 | Value impacts and dependencies**
- **Sub-step D5 | Collate results and attribute impacts**

D1 | Select priority impacts and dependencies

This sub-step relies on understanding priority impacts and dependencies through the creation of impact and dependency pathways. An impact or dependency pathway is a theoretical causal-effect logic chain for exploring how a particular business activity can lead to changes across the capitals, and how this change affects the benefits received by different stakeholders now and into the future.

The logic chain stages of impact pathways can be used to create organization-specific pathways. Pathways appear in a simple linear format in the Natural Capital and Social & Human Capital Protocols¹ and in the TNFD LEAP Guidance.² In the Capitals Protocol they appear in an extended form to include additional elements of systems thinking, therefore capturing indirect impacts that might otherwise be overlooked.

In the previous Protocols, pathways were applied primarily to screen the significance of potential impacts and dependencies at a high level before embarking on the valuation process. In the Capitals Protocol, pathways serve a more central role and should be carried as an iterative reference point throughout the valuation and decision-making process. They can help visualize and capture complex relationships, including with which leverage points a business may be best able to intervene to manage an outcome.

It should be noted that screening of priority impacts and dependencies is done from a business perspective. Understanding these impacts and dependencies from a stakeholder perspective will help to identify the more harmful and impactful business practices being undertaken. Many impacts and dependencies may appear minor on their own but when aggregated together may have serious implications on individuals or stakeholder groups. Whilst it's impossible to map every impact and dependency, the impacts and dependencies map obtained in B3 should help to identify where aggregation becomes more significant.

Implementing this sub-step requires knowledge within the company and likely consultation with external experts, stakeholders, modeling, and literature.

There are several options for visualizing these pathways depending on the needs of the decision-maker. Some options are simpler to complete but less representative of complex systems, whereas others are more intensive yet provide a richer source of information for managing positive and negative impacts. Options include:

- **Option 1: Simple pathways** maintain the fundamental structure from the Natural Capital Protocol and the Social & Human Capital Protocol while illustrating more realistic dynamics such as one impact driver or dependency affecting a change on more than one capital simultaneously and the potential of secondary pathways.
- **Option 2: Radiating pathways** allow exploration of systems in more depth. While this option retains the same basic structure – business activities, impact drivers and dependencies, changes to capitals, and impacts to society and to the business – it does so in a less linear format that allows visualization of interconnections, compounding relationships, and, therefore, potential management interventions.
- **Option 3: Causal loop diagrams (CLD)** allow for more complexity and are well accepted in systems thinking. However, these do not reflect the structure of the Capitals Protocol.

The choice of pathways depends on various factors, including intended scope and level of detail, need to consider multiple impact drivers, resources, and expertise available.

Note that the original linear pathway format from the Natural Capital and Social & Human Capital Protocols is not fit-for-purpose in an integrated capitals assessment as it does not sufficiently illustrate interconnections. For further detail on pathways, including illustrative examples on their use in the context of capitals, please refer to Appendix 3.

¹ See the previous protocol here: Capitals Coalition. (2020) The Human and Social Capital Protocol. Capitals Coalition. Available at: <https://capitalscoalition.org/capital/human-social-capital-protocol/> [Accessed: 13 September 2024]. And Natural Capital Coalition. (2016) Natural Capital Protocol. Natural Capital Coalition. Available at: <https://capitalscoalition.org/capital/natural-capital-protocol/> [Accessed: 13 September 2024].

² Taskforce on Nature-related Financial Disclosures (TNFD). (2023). Guidance on the identification and assessment of nature-related issues: The LEAP approach. Version 1.1. TNFD. Available at: https://tnfd.global/wp-content/uploads/2023/10/TNFD_LEAP_Guidance_v1.1_October2023.pdf [Accessed 2 July 2024].

Complete sub-step D1 through the following activities:

- D1.1 Map business activities, impact drivers, and dependencies
- D1.2 Identify the change in capitals due to the business
- D1.3 Identify the change in capitals due to external factors
- D1.4 Identify system dynamics
- D1.5 Define the consequences of the change in capitals
- D1.6 Consider secondary pathways
- D1.7 Prioritize which impacts and dependencies to take forward into valuation

D.1.1 Map business activities, impact drivers, and dependencies

Alignment remark

In the TNFD framework and the LEAP approach, this activity corresponds to:

- E1: Identification of environmental assets, ecosystems services, and impact drivers
- E2: Identification of dependencies and impacts

Business activities describe the operations taking place within the assessment’s chosen scope. In the Capitals Protocol, business activities create impact drivers and/or dependencies. Generally, any output generated by a business is an impact driver, while any input that a business relies upon is a dependency but can also be an impact driver (e.g., water consumption is both a resource that a business can depend upon, as well as a driver of impact in local water bodies) (see Box D.1).

An impact driver is a measurable input to production or a measurable non-product output of business activity such as changing land use in hectares or training programs for staff.

A dependency is a reliance on, or use of, something by business. For example, fuel purchased for vehicles, an educated workforce, or local infrastructure to transport goods. Within the input-activity-output-outcome-impact logic, or the driver-pressure-state-impact-response logic, impact drivers and dependencies are known by a different name (see table D.1). See Appendix 4 for an extended explanation of the translation of some of the terms used in different existing frameworks.

Capitals Protocol	Business activity	Impact driver or dependency	Change in capitals	Impact (or value)	Act Stage
Driver-pressure-state-impact-response logic	“Driver”	“Pressure”	“State”	“Impact”	“Response”
Input-activity-output-outcome-impact logic	“Activity”	“Input” and “Output”	“Outcome”	“Impact”	

Table D.1 Alternate terminology used in describing impact and dependency pathways

Box D.1 What's the difference between impact drivers and dependencies?

Some business activities have needs that can be both an impact driver and a dependency. For example, the consumption of water has an impact on local water supplies, while also being critical to business operations. In these instances, it is important to list the activity as both an impact driver and a dependency. This distinction will become more important when it is time to measure the extent of the impact driver and/or dependency. Using the same example, the extent of a business's water consumption as an impact driver will be most effectively measured in terms of the volume of water the business consumes in relation to local availability. However, the extent of the dependency on that water consumption will be most effectively measured in terms of how much money the supply costs financially, and/or the proportion of product reliant on that water. Measuring both allows better understanding of the full context later in the process.

Note that dependencies may be within or outside the business's control (e.g., machinery may be within a business's control but a stable climate or educated population may not be). While a business may not be able to influence dependencies directly, it is wise to understand these future threats and mitigation options.

At this point it is helpful to:

1. Identify all relevant business activities.
2. Identify all relevant impact drivers and dependencies.

Identify all relevant business activities

Referring to the scope chosen in the Assemble Stage, identify all relevant business activities associated with the assessment. For example, if the scope includes understanding the potential integrated capitals impacts from the construction of a factory extension, then associated business activities might include the financial investment in plans and construction, hiring of local or non-local firms, purchase and sourcing of construction materials, use of local roads for construction material haulage, the building works themselves, community outreach if needed, hiring and training of new staff, and greater production volumes and operating costs from the extension when operational. Also consider any ongoing impacts from the day-to-day running of the factory such as pollution and the type of product being created, whether this has unintended consequences downstream such as health impacts from consumable products or social impacts from media outputs.

Alternatively, the scope might include business-as-usual activities (e.g., from an existing product or factory or from extractive processes such as mining or fishing). As resources allow, all potentially relevant businesses activities should be mapped to capture the full range of impacts and dependencies as well as possible. Having a wider range of businesses activities mapped can help to identify compounding impacts and give wider context to impacts and dependencies.

Identify all relevant impact drivers and dependencies

Every business activity identified above will translate into impact drivers and/or dependencies. Considering these in terms of inputs and outputs from each activity working within the full range of the scope (i.e., organizational and value-chain boundaries) might help to organize the process.

At this stage it is not necessary to precisely quantify impacts but to assess their relative impact. This will allow prioritization of those that require further study. It may not be possible to identify which impacts are material to a decision without having conducted valuation. This creates a resourcing dilemma to explore as many impact pathways as possible within resourcing allowances and creates incentives for an iterative approach as the business's integrated assessments mature within and across assessments. Table D.2 provides suggestions of possible impact drivers and dependencies that could be associated with a business's activities, noting that these lists are not exhaustive.

Basic quantification of impacts and dependencies to understand connections and the underlying system may enable better understanding of impacts and dependencies and could prove enough for decision-making, compared to even the final measuring and valuation.

Capital	Examples of impact drivers	Examples of dependencies
Natural	Air emissions (i.e., GHG, Non-GHG) Water and other resource use Land use Solid waste Water pollution	Energy Water Nutrition Materials Regulation of physical environment Regulation of biological environment Regulation of waste and emissions
Human	Wages Provision of training and education Health and safety practices Practices for diversity, inclusion, and equity Working conditions Product safety practices	Experience Skills and knowledge Workforce availability Health of workers
Social	Workers' representation Networking Collaboration opportunities Community investment Reputationally damaging events Personal data security protocols	Community relationships Social networks Property rights Social acceptance and trust Law and order Shared norms
Produced	Development of new systems and procedures Knowledge creation Expenditure Taxes Wear and tear of equipment Net interest Profit Financial investments	Accessibility to infrastructure and technology Subsidies Public and open-source knowledge

Table D.2 Example impact drivers and dependencies by capital

Completing this activity will result in a list of impact drivers to explore in more detail. Subsequent activities might reveal other important impact pathways, and these should be included in an iterative fashion.

D.1.2 Identify the change in capitals due to the business

Alignment remark

In the TNFD framework and the LEAP approach, this activity corresponds to:

- E2: (5.5.4) Changes in the state of nature

The next step is to map how the business’s activities may cause a change (positive or negative) in the quality and/or quantity of the stocks and flows of each capital. (External trends and their impacts to capital assets are addressed in Step D1.3.) Understanding how business-driven pressures are impacting the flow of benefits or losses now and into the future is key. In Thinking in Systems, Donella Meadows asserts that “if you understand the dynamics of stocks and flows — their behavior over time — you understand a good deal about the behavior of complex systems.” Table D.3 provides examples of different types of capitals and how different business activities change their underlying stocks and flows of benefits.

Capital	Activity	Example changes in stocks	Example changes in flows
Human capital: skills	Investment in woodworking training	Increase in woodworking skills	Workers are now able to produce high-quality wood items for sale as part of the business enterprise. Individuals are also able to contribute these skills to local projects.
Produced capital: infrastructure	Investment in a paved road	New or improved road	The business benefits from easier and quicker access to its sites. The road may also create public benefits for locals who are now able to access wider areas more easily.
Natural capital: peatland	Peat bog restoration	Increase in peat bog extent and condition	Peatland stops emitting potent GHG methane, it also reduces run-off rates decreasing risk of flooding to work sites and communities downstream.
Social capital: engagement opportunities	Consultation through facilitated workshop	Enhanced community-business synergies	Increased buy-in from participants. Improvement in communication between business and community actors, and also in 'bridging capital' between consultation groups.

Table D.3 Example changes to capital stocks and flows from business activities

Try to consider multiple causal changes across these stocks (i.e., for each business impact driver and dependency consult table D.3). For example, the impact driver of removing trees on site (terrestrial ecosystem use) will cause multiple changes in natural capital including reduced soil quality, increased water runoff, reduced carbon sequestration, and reduced biodiversity. Similarly, multiple impact drivers can compound pressure on a single capital. For example, multiple impact drivers that affect human health will impact human capital. Avoid focusing on only the most obvious changes. For example, the business activity of running delivery vehicles might result in a higher concentration of particulate matter in the area, but it may also increase the delivery of basic services to isolated communities. Understanding the trade-offs and needs of stakeholders in this instance might prompt a change to electric vehicles or cargo bikes. Consider trends in the business's activities that might affect interactions with capital stocks and flows within the temporal scope of the assessment (e.g., is consumption of a natural resource likely to increase? Will new stakeholders be engaged? Are technological advances or market shifts within the time period likely?) Box D.2 provides further insights on potential trade-offs between quantity and quality.

Step B raised the issue of net changes in capital as part of the discussion of baselines and scenarios. Assessments that consider net changes in capital stocks and flows over time will need to include at least two scenarios, for example, change relative to the baseline (or business-as-usual) scenario compared to change resulting from an investment decision. The assessment will also need to consider relevant pathways for each scenario included. There may be different assumptions to consider for each of the changes represented in each scenario. For example, considering changes in natural capital under different climate change scenarios will require different assumptions for each. Complete the analysis for this activity several times, once for each scenario of interest, then calculate net changes based on the differences in results from one scenario to another.

Where possible, try to allocate impacts from impact pathways, which will include but are not limited to business activities, to the different capital assets (natural, human, social, or produced). This will help to indicate the long-term viability of these capitals and the business.

Box D.2 Quality and quantity of stocks and flows

Quantity and quality are descriptors of different attributes of capital. Understanding the differences between these descriptors and how to value them is fundamental to the capitals approach. High quantity and quality are both desirable but, in reality, these attributes may be traded off against each other or against the resources needed to attain them, as illustrated by the following examples:

- **Natural capital:** Crops can be high quality and consumable by people but require higher inputs. Boosting productivity of crops may be detrimental to taste or nutritional quality. Similarly, an amenity parkland may be large in extent but of low quality with few people willing to use it, or a smaller but more diverse park with higher quality grass may be more attractive increasing use and therefore value creation.
- **Human capital:** A large workforce is not necessarily better if they are underqualified. Similarly, a business may need to employ one expert with a deep cross-cutting understanding of a topic rather than several employees with a similar, more shallow, level of understanding.
- **Social capital:** One strong relationship or social network is invariably stronger than many superficial relationships. Similarly, low levels of trust with different groups can increase an endeavor's risk whereas deeper connection can help facilitate cooperation and trust.
- **Produced capital:** In finance, one good investment is much preferable to several poor investments. Specialist equipment that is efficient, robust, and long-lasting represents a better investment compared to buying cheap equipment that doesn't work and breaks quickly.

D1.3 Identify the change in capitals due to external factors

Alignment remark

In the TNFD framework and the LEAP approach, this activity corresponds to:

- E2: (5.5.3) Consideration of external factors

Activity D1.3 considers external factors that may influence changes in the quality and/or quantity of capital stocks and flows. This is particularly important for scopes that are forward-looking (e.g., the lifespan of a project) but can also help explain changes witnessed in backward-looking historic assessments. External factors can include anything that's beyond a business's control or influence and can be human or natural in origin, although this distinction can often be superficial since the extent of human influence is increasingly affecting natural processes. For this reason, any potential changes do not have to be classified under these categories, but doing so may help in considering the range of potential external factors:

- **Natural changes:** All environments, habitats, and species are in a natural dynamic state and shifts in this state can affect all four capitals. For example, predator-prey relationships and disease outbreaks may affect wildlife populations. Natural disasters such as tsunamis or earthquakes, the constantly changing routes of rivers and coastal geomorphology, and aging populations and changes in population dynamics are also examples.
- **Human-induced changes:** Within the natural capital sphere, ecosystems are changing as a result of human pressures (e.g., land-use change, urbanization, population growth, increased water use, pollution) while human capital changes due to government policy (e.g., education policies). All stakeholder groups, including other businesses, government agencies, or individuals, have the potential to affect change across the capitals.

The range of external changes and trends affecting the capitals can be immense, as all businesses operate in sensitive ecological and social systems which are impossible to model entirely. To keep an assessment manageable and relevant, refer to the original spatial and temporal scope (sub-steps B6 and B7) and focus on the trends that are most likely to occur within that system boundary. Table D.4 offers some examples of external factors.

Capital	Examples of external factors
Natural	• Severe weather events (droughts, floods, storms, fires, etc.) • Availability of suitable quantity and quality of water (e.g., due to other industries and urban expansion)
Human	• Impacts to human health such as pandemics or pollution from other businesses and industries • Changes in access to education • Changes in availability of a local workforce
Social	• Local political stability • Public trust in business and other institutions
Produced	• Governments changing the nature or amount of particular grants, subsidies, or taxes • Provision and quality of public infrastructure such as roads (especially accessing more remote areas linked to business operations) and ports • Governments investing in innovation and intellectual capital that may become publicly available

Table D.4 Examples of external factors affecting stocks and flows of capital

The majority of external factors related to produced capital may have already been identified in existing company-wide materiality assessment processes; review any such previous findings to confirm they have sufficiently considered systems thinking and interconnectivity.

Keep careful records of the external factors considered in the assessment. Use the chosen pathway format to record external factors, whether a table, flow diagram, radiating diagram, causal loop diagram, or other format. This information will be important when interpreting results and degrees of confidence in their likelihood may vary.

D1.4 Identify system dynamics

Activities D1.2 and D1.3 considered the business-induced and external factors that might affect changes in the capitals. Understanding these relationships requires consideration of system dynamics. Activity D1.4 now adds key elements of system dynamics, including feedback loops, non-linear relationships, and tipping points, which are further explained in this section.

Systems often behave in unpredictable and non-linear ways, and understanding these elements is important to capturing the essence of what a system is.³ Applying this lens to a capitals assessment moves the exercise closer to the complexities of the real world, and therefore lends more realistic insights on which to base decision-making.

The list of complex system dynamics relevant to a pathway can be endless, so focus on recording those feedback loops and non-linear relationships that could move a change in capitals closer to a tipping point or threshold.

Feedback loops

A feedback loop is formed when a change in a stock affects the flow into or out of that stock. Feedback loops can cause stocks to maintain their level within a range, grow (positive feedback), or decline (negative feedback). In any case, the flows into or out of the stock are adjusted because of changes in the size of the stock itself. Not all systems have feedback loops.

³ Meadows, D. 2008. Thinking in Systems: A Primer. Chelsea Green Publishing.

Forms of feedback loop include:

- **Balancing feedback loops:** Mechanisms that resist further change in one direction. A balancing feedback loop counters change in one direction with a change in the opposite direction. It seeks to stabilize the system. For example, in some forests, localized fires create initial disturbances, however, local adaptations of plants and animals mean that these forests quickly grow back, and due to ecological succession, where plants and animals return over time, the status quo is quickly re-established. In social systems, this type of feedback loop may reduce the amount of change or progress within a community as the balancing loop moves back towards the status quo.
- **Reinforcing feedback loops:** These are found whenever behaviors or events inside the loop reinforce one another, for better or worse (e.g., polar ice caps melting due to climate change tend to speed up global warming as there is less white ice to reflect the sun's rays back into the atmosphere). An example of reinforcing feedback loops within social and financial capital systems is microfinance, a form of local credit used to reach those without access to traditional banking systems. The integration of local social capital into this system of peer lending can lead to positive feedback loops of economic empowerment and poverty reduction. Outcomes for human capital reinforce the ability of local economies to thrive. Negative social reinforcement could come in the form of social media "echo chambers," for example.

Recommended best practice

Any feedback loop that appears as balanced, or in effect a mitigated change, should be reviewed by relevant experts who can confirm that no unique aspects of the capital stock are being lost in the exchange. For example, even though a company may be cyclically harvesting and replanting trees of the same species in the same site, capital such as established habitats and site soil quality will still be impacted through this cycle and should not be disregarded.

Linear and non-linear relationships

Understanding the systems in which business activities take place may help to explain the different types of relationships at play between capitals, impacts, and dependencies. For example, simple cause-effect relationships are characterized by simple impact pathways. More complicated pathways with compounding and mitigating systems effects can lead to non-linear responses. These can be understood better by understanding the system as a whole and how single impact drivers can affect capitals through different pathways.

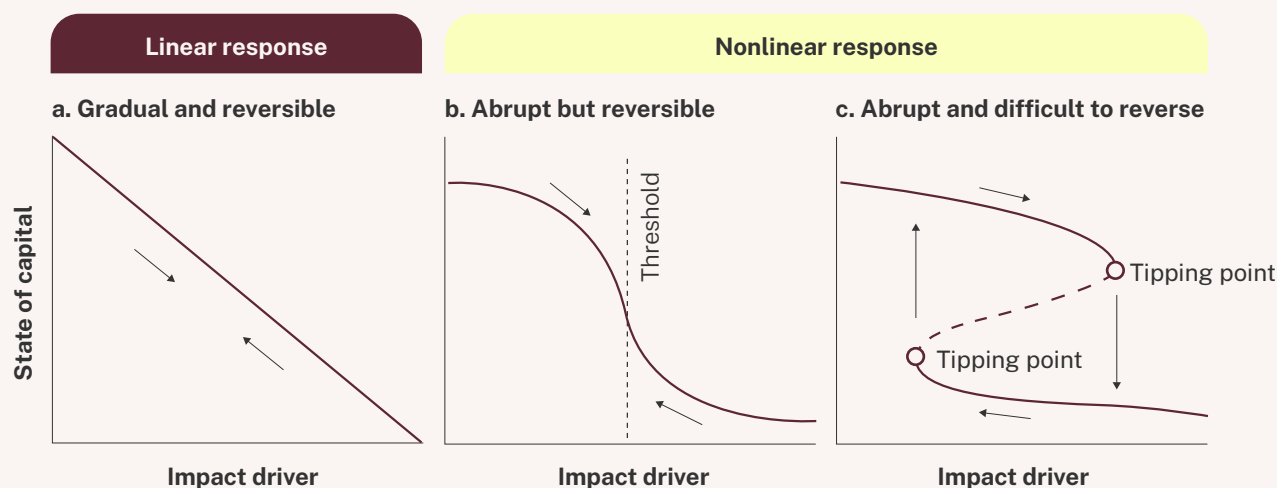
These relationships can be:

- **Linear relationships:** These are straight-line responses between two variables. A linear relationship might dictate straightforward responses such as hours worked by an individual and money earned, or how much tax is due for emitting a pollutant based on its volume. These are most likely to respond to produced capital markets and can be reflected by input-output tables. It is unusual to find a purely linear causal relationship in the real world, so the many variations between two variables should be factored into any capitals assessment.
- **Non-linear responses:** These are less predictable, and might include time lags or disproportionate responses. A non-linear relationship will not respond in a linear manner and may respond depending on the type of feedback system in place. For example, in systems where reinforcing feedback loops exist, changes may start to occur exponentially (e.g., disease in a population), while other systems may have more stabilizing responses such as predator-prey relationships or financial market

stabilization. Some systems will have alternative stable states where change can be rapid between states once enough pressure is applied, but the system will stabilize to this new state.

- **Delayed responses:** Sometimes changes at the flow level are not immediately reflected in the supporting stocks; flows can act as delays or buffers to changes in stocks. For example, where activities impact worker health this may take years or even decades to become apparent, such as the long-term effects of asbestos or other carcinogens. Plastic accumulation in ecosystems is another example.

These system dynamic changes, linear and nonlinear, are shown in graphical form in Figure D.1. The figure is in relation to natural systems but the same or similar dynamics are in play in human, social, and produced capitals systems (e.g., social movements, clustering of industries in a local area, or confidence in financial markets).



Adapted from Smith, J. (2019). [Type of responses in ecological systems due to a change in an environmental driver](#).

Figure D.1 Illustrations of response types to system shocks, state of capital measured against impact drivers

Tipping points and thresholds

A tipping point is a critical point in the state of a system whereby a small intervention can lead to large, long-term, and irreversible changes to the state of that system and profoundly alter its mode of operation. Crucial to tipping points is the presence of strongly reinforcing feedback loops that can amplify a small initial change into a long-term and irreversible transition.

Environmental tipping points gained a lot of attention in global climate change research to understand the conditions for system transitions when it comes to the atmosphere and the biosphere. However, tipping points can occur in all systems whether social, environmental, or economic, across all four capitals, on global and local scales. Box D.3. describes existing frameworks supporting threshold identification, while table D.5 provides examples of tipping points across the capitals.

Capital stock	Tipping point
Natural	• The Albedo effect: At the poles, exposed ground absorbs more heat than ice. Global warming is decreasing ice cover, leading to more exposed ground, warmer surface temperatures, and, subsequently, an increase in the rate of melting ice. There are concerns that this positive feedback loop will lead to a tipping point whereby icesheets at the poles fully collapse. • Amazon rainforest dieback: The Amazon rainforest partly self-regulates its moist climate via the transpiration of water from trees. Deforestation reduces the number of trees transpiring water leading to drier conditions. This creates a feedback loop whereby dry conditions lead to forest dieback, further reducing transpiration and creating drier conditions. Scientists have warned that if a certain proportion of the Amazon is deforested, the rainforest could reach a tipping point whereby the dry conditions lead the entire system to transition into a savannah.
Human	• Silicon Valley talent pipeline: Silicon Valley has developed a reputation as a hub of talent and entrepreneurship which has encouraged further investment in human capital and infrastructure in the area. This, in turn, has encouraged and attracted more human capital to the area, increasing even further investment and entrepreneurship with additional businesses relocating there. Once this tipping point is reached it becomes difficult for other areas to attract talent and entrepreneurs as the level of investment required to create a similar hub becomes prohibitive. • Investment in employee training: If a car manufacturer trains its employees in problem solving, this investment in human capital can trigger a positive feedback loop. As employees become more skilled and knowledgeable, they are better able to identify and solve problems, which leads to higher quality products and more efficient processes. This investment in human capital can also help to build a culture of continuous improvement and collaboration within the company, further developing skills and creating positive feedback loops for improvements.
Social	• Uptake of solar panels: When a certain number of people in a population adopt solar panels, evidence suggests a tipping point can be reached as there is a “contagion” effect whereby the social acceptance, normality, and even prestige of solar panels leads to uptake spreading rapidly. This will be compounded by increased affordability when markets react to increased demand. • Carbon markets and access to information: Easy access to the right information can lead to tipping points being reached. For example, the TIST smallholder tree planting scheme has spread to over 100,000 farmers in 15 years because it was designed to facilitate information sharing in a scalable way, while providing smallholder farmers with the capability to access international voluntary carbon markets. This scheme could not happen at a smaller scale due to administrative constraints, so needs large scale uptake to work. Without a critical mass it is unattractive and would not reach its intended target, but once the target looks achievable the social tipping point is reached as small land holders rush to participate before they miss out.
Produced	• Availability of electric vehicle charging infrastructure: Once there is a critical mass in terms of availability of charging infrastructure (a network effect), the range from charging becomes significant, and the cost of electric cars begins to fall, there is potentially a tipping point whereby electric vehicles sales overtake fossil-fuel powered vehicles, eventually making them obsolete. • The price of electric vehicles: A competitive price can signal to consumers the availability of a plausible alternative to an incumbent technology while stimulating demand. For example, across Europe, where electric cars have reached purchase price parity with equivalent petrol/diesel cars – notably in Norway – there has been a highly non-linear increase in market share.

Table D.5 Examples of tipping points

Box D.3 Existing frameworks supporting threshold identification

There are many reputable frameworks for identifying thresholds or “red line” boundaries across the capitals. These are points beyond which a system cannot function properly (most obviously in natural capital) or that are socially constructed from an ethical perspective (e.g., the use of child and/or slave labor in value chains). Frameworks for identifying thresholds within a single capital include:

- **Planetary Boundaries**, which denote the biophysical limits within which humanity can continue to develop and thrive for generations to come, and which refer to the natural capital limits of living on one planet (Rockström et al. 2009).
- **Climate scenarios of the United Nations Framework Convention on Climate Change (UNFCCC)**, which are projections used to understand potential future climate conditions based on varying levels of greenhouse gas emissions. These scenarios, known as Representative Concentration Pathways (RCPs) and Shared Socioeconomic Pathways (SSPs), outline different trajectories for emissions and their impact on global temperatures, sea levels, and weather patterns. RCPs range from low-emission pathways (RCP2.6), aiming to limit global warming to 1.5°C above pre-industrial levels, to high-emission pathways (RCP8.5), which could lead to catastrophic warming exceeding 4°C. SSPs integrate social, economic, and technological factors, describing different global futures, from sustainable development to scenarios with high inequality and continued reliance on fossil fuels.
- **The Universal Declaration of Human Rights** provides clear red lines for the creation of social and human capital targets. Respecting the rights and freedoms of all human beings, as enshrined in this UN-adopted document, should form the basis of any organization's target setting.
- **International Labour Organization (ILO) conventions** are international treaties designed to improve labor standards and promote decent work conditions globally. They set minimum standards for labor rights, including freedom of association, the right to collective bargaining, the elimination of forced labor, the abolition of child labor, and the elimination of discrimination in respect to employment and occupation. There are over 190 conventions, with some of the most notable being Convention No. 87 on Freedom of Association, Convention No. 98 on the Right to Organize and Collective Bargaining, Convention No. 29 on Forced Labor, and Convention No. 138 on Minimum Age.
- **The Future-Fit Business Benchmark** is a framework designed to guide companies towards sustainable and socially responsible business practices. It sets clear, science-based targets that align with environmental, social, and economic sustainability. The benchmark identifies a set of "Break-Even Goals" which represent the minimum standards a business must meet to avoid causing harm. These include goals related to climate change, water use, waste management, employee wellbeing, and ethical supply chains. Additionally, the benchmark includes "Positive Pursuits" that encourage companies to create net positive impacts, such as enhancing biodiversity and improving health and education outcomes.
- **Social Value International, Principle 8** reflects the importance of considering the subjective, contextual perspective of thresholds, in addition to the scientific or global-level thresholds (Social Value International 2022). Principle 8 references working within stakeholders' interests towards:

- A level and rate of positive impact on wellbeing that meets, as a minimum, societally agreed thresholds.
- A level and rate of positive impact on wellbeing where targets have been set with representatives of the affected stakeholder group.
- The risk appetite of the affected stakeholders; That is to say a stakeholder group might prefer a riskier option with a bigger potential positive impact on wellbeing over a low-risk option with low impact on wellbeing.
- Avoiding a negative impact on wellbeing unless stakeholders have accepted this for the benefit of another stakeholder (tolerance).

Additional integrated frameworks for looking at systems dynamics and multiple capitals at the same time include:

- **Safe and Just Earth System Boundaries:** Another concept to consider is “maximum allowable significant harm” (Rockström et al. 2023). This concept refers to the significant harm that is done to people and communities as a result of environmental damage. Scientific modeling can estimate thresholds and tipping points of ecological systems, but these do not account for the negative impact on societies up to that point. Understanding earth system boundaries demonstrates that impacts to societies and individuals health and wellbeing will occur up to and beyond these earth system boundaries. The earth boundary represents the tipping point where the impact becomes fundamentally unsustainable or self-perpetuating. These boundaries consider a “safe and just corridor” that combines biophysical and social thresholds to ensure sustainable development that is both ecologically safe and socially equitable. The framework aims to balance environmental limits with the need to achieve social foundations, such as health, education, and equity.
- **The Doughnut Economics model** depicts the economy in a doughnut shape with two concentric rings. The inner ring represents the social foundation, which includes basic human necessities like food, water, health, education, and equity. The outer ring represents the ecological ceiling, comprising planetary boundaries such as climate change, biodiversity loss, and pollution. The safe and just space for humanity lies within the doughnut between these two rings, where social needs are met without exceeding ecological limits. This model aims to create an economy that serves all people while preserving the planet's health.

D1.5 Define the consequences of the change in capitals

Alignment remark

In the TNFD framework and the LEAP approach, this activity corresponds to:

- E2: (5.5.5) Ecosystem service provision

The next activity is to map how identified changes in each capital might affect stakeholders or the business. In the Capitals Protocol, an impact must be described in the ways that it affects people – whether whole stakeholder groups, subgroups, or individuals, and/or the business itself – to be valued. An impact is any positive or negative contribution to either society or business.

Consequences of impacts on a business

A business may be affected by the consequences of its own impacts on the capitals, either directly (for example, through an increased cost of emission permits, or delays in production due to injuries) or indirectly (for example, through reputational costs and benefits, delays in permitting, or the relative ease or difficulty of recruiting or retaining employees).

For impacts on produced capital, consequences will likely be more direct and predictable, although understanding the consequences of changes in stocks of intellectual capital or public assets (such as a loss of public infrastructure) might require more interrogation to understand impact to the business.

Many jurisdictions are beginning to introduce environmental market mechanisms whereby companies are required to pay for their use of or impacts to natural capital or get paid for environmental enhancements they provide. Examples include purchasing (or selling) carbon credits or biodiversity offsets in response to causing loss to ecosystems or species through their activities. These new markets may create new costs and/or benefits for a business. Social offsets may offer a means of compensating for unavoidable negative impacts to people by a business's activities. However, the use of offsets requires careful thought. While potentially creating a net gain at a systems level, offsets do not remove the harm caused and should always be presented in full detail, including full consideration of the negative impact they are intended to offset.

Internalization of externalities through shadow market prices, administrative charges, or taxes may be scaled according to the amount of resources used, or externalities generated. These can be considered as policy impact drivers, and can have financial consequences or impacts for a business.

Assessments with scopes extending over several years will need to consider not only potential future direct impacts to the business, but also the possibility that future impacts may arise indirectly through the company's impacts on society (also referred to as “outside in” perspective). These indirect future impacts are assessed as part of “business impacts to society.” While understanding impacts to society is more demanding, it is helpful in ascertaining the potential risks and opportunities of the business's impacts being internalized at some point in the future.

Consequences of a business's impacts to society

Changes in capital resulting from a business's activities may affect society.

A business's impacts on society include all positive or negative contributions experienced by individuals, communities, or organizations that are not captured through current market systems and are external to the business — these are often referred to as externalities. These changes in capital stocks and flows can be triggered by business impact drivers and dependencies (e.g., use of water and timber, investments in new technologies, health and safety measures, safeguarding policies). Impacts to society can be experienced by stakeholders over the long and short term and can be multifaceted.

In the case of air emissions, for example, a particular business activity may result in emissions of NO_x (the impact driver). These emissions may result in reduced air quality (the change in natural capital), which in turn may lead to a range of impacts on society, such as increased respiratory complaints, reduced visibility, loss of agricultural output, or a reduction in other ecosystem services. The impacts on society from air emissions will vary depending on the “receptors” that are affected (e.g., people, buildings, agriculture). The location of different receptors is important, due to the way air pollution disperses, as is consideration of how impacts change over time and how they can build up through cumulative effects (refer back to activity D1.4 on system dynamics). In the case of air pollutants, chemicals released into the atmosphere may have significant impacts only when they accumulate and breach certain thresholds, which may vary depending on the receptor.

External factors and system dynamics beyond a business's control can also influence valuation. For example, social impacts such as changing cultural dynamics or political unrest can change the risks and opportunities to a business in the long term. Conversely, public produced capital from governments, such as infrastructure investment, can present new opportunities. When completing this activity, consider the current and expected future socioeconomic context, as well as relevant changes in capitals over the assessment period, along with other contextual variables included in the scope of the assessment.

Impact on society is the consequence, positive or negative, of one or more dimensions of individual or collective wellbeing. Table D.6 sets out the main dimensions of wellbeing as defined by the OECD. Box D.4 expands on the reasons to focus on wellbeing when assessing impacts.

Recommended best practice

Any feedback loop that appears as balanced, or in effect a mitigated change, should be reviewed by relevant experts who can confirm that no unique aspects of the capital stock are being lost in the exchange. For example, even though a company may be cyclically harvesting and replanting trees of the same species in the same site, capital such as established habitats and site soil quality will still be impacted through this cycle and should not be disregarded.

Key dimensions	Description
Income and wealth	Income and wealth of workers directly involved in production is within the scope of company influence. Income and wealth of workers is strongly linked to wellbeing outcomes. There can be a trade-off between worker pay and business financial sustainability.
Work and job-quality	The working environment including the nature of tasks and the physical and social conditions under which employees work, the characteristics of the firm or organization where work takes place, work time scheduling, and the intrinsic rewards associated with the job
Housing	Access to safe and affordable housing
Health	The wellness of an individual as measured through physical and mental health states. Indicators can include but are not limited to self-reported health, mental wellbeing, and absenteeism
Knowledge and skills	The skills and knowledge an individual has that can help them carry out their job, which may be useful outside of the workplace as well. These can be tracked through understanding perceived learning, training, and self-realization.
Subjective wellbeing	Self-reported wellbeing can act as a proxy for many underlying drivers including physical and mental health, relationship health, and self-actualization. Care should be taken to ensure this metric is measured consistently and that local contexts are accounted for (e.g., some cultures may be more pessimistic on self-reporting).
Safety	Physical, mental, and emotional safety, including at work. This includes safety from physical accidents, long-term exposure to unsafe environments and working conditions, access to safety equipment, and knowledge.
Work-life balance	The ability of individuals to effectively manage their responsibilities at work and in their personal lives, allowing them to participate fully in both domains without one negatively impacting the other.
Social connections	The various interpersonal relationships and networks that individuals maintain within their communities and societies. These connections encompass relationships with family, friends, colleagues, neighbors, social groups, and communities. Social connections contribute to individuals' sense of belonging, social support, and overall wellbeing.
Civic engagement	The active participation of individuals in their communities and societies. Civic engagement involves citizens taking an active role in shaping and influencing public policies, decision-making processes, and community development. This participation can take various forms, including voting in elections, engaging in community organizations, volunteering, participating in public consultations, and contributing to civil society initiatives.
Adapted from the OECD Well-being Framework Note that the OECD Well-being Framework includes environmental quality as a key dimension. For the purposes of the Capitals Protocol, we have removed this as we see natural capital as underpinning all the above rather than as a separate dimension.	

Table D.6 Dimensions of wellbeing

Box D.4 Why wellbeing?

The concept of “value” necessarily includes consideration of the ultimate aims of economic activity. Money and GDP are both terms that are used as proxies to demonstrate a person’s or country’s ability to achieve wellbeing. The issue with relying on proxy indicators is that they often do not accurately reflect the underlying reality. Financial wellbeing does not connote overall wellbeing.

Wellbeing, more than a synonym for being “well” or “healthy,” is a wider concept that includes happiness and prosperity and is linked to the ability to freely enjoy life in a way that an individual sees fit. Wellbeing can be measured in a variety of ways that include, but are not limited to, life satisfaction, mental and physical health, social connection and relationships, financial wellbeing, and civic engagement. Wellbeing cannot be fully expressed in quantitative terms and qualitative measures will likely be required. A business may wish to align measures of wellbeing to frameworks such as the OECD’s Better Life Index, Maslow’s hierarchy of needs, the Capability Approach (Sen and Nussbaum), the Sustainable Development Goals, or the Human Development Index.

When considering contributions to wellbeing, make sure to consider the perspectives of all stakeholder groups and subgroups within the assessment’s scope. A suggested typology is offered in Step B.

Where possible, use knowledge gained from stakeholder consultation to inform impact pathways on the capitals. Pre-made impact pathways can be useful in some circumstances and can reduce the resources needed to map pathways. Consulting stakeholders provides access local knowledge, and better understanding of local context and values that individual stakeholder groups hold. Considering wellbeing from stakeholders’ perspectives can be a good way to start an impact assessment or to iterate existing impact pathways.

Some assessments may go further and consider the value of impacts to nature itself. While these values cannot be reflected via measurements of instrumental value to people, it can nevertheless be acknowledged that nature has an intrinsic value for itself. This portion of the total economic value won’t create value for the business or people but may form part of a decision-making process based more closely on ethical outcomes.

Remember that at this stage of the Protocol the importance, worth, or significance of consequences to stakeholders have not yet been valued using the valuation sub-steps. Try not to overlook consequences suspected to be less significant. Sub-step D2 offers more guidance on how to prioritize which issues to take forward. Box D.5 provides considerations for employing the precautionary principle to consequences with uncertain outcomes. Box D.6 discusses the concept of attribution, which assists in understanding a business’s contribution to wider, more systematic impacts.

Recommended best practice

Try to be as specific as possible when noting who is likely to be affected by which consequences. This will assist valuation in sub-step C2.

Box D.5 The precautionary principle

Building impact and dependency pathways, particularly across a large scope such as at a corporate level, can become a theoretical exercise in simplifying the real world into a digestible format. Consulting subject matter experts and engaging stakeholders are valuable ways of ensuring decisions are informed by more than an internal team guessing what may happen in reality. Even with robust input, the consequences of certain changes in capital stocks and flows can never be predicted with certainty. For this reason, it is important to be guided in decision-making by the precautionary principle, particularly where people's lives and wellbeing could be irrevocably or seriously affected. Significant external events will still happen, but these can be managed under normal business risk approaches.

The 1992 Rio Declaration on Environment and Development defines the Precautionary Principle as *“where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”* Since then, the principle has featured in many international treaties, including the UN Convention on Biological Diversity (CBD) and UN Framework Convention on Climate Change (UNFCCC), and is prominent in calls for a moratorium on deep-sea mining. Principle Seven of the UN Global Compact states that businesses should support a precautionary approach to environmental challenges because prevention is more cost-effective than remediation. Systematically managing risks enables businesses to avoid the high physical and reputational costs that environmental damage incurs. The precautionary principle should be applied when the potential for negative consequences is high but uncertain. An example is the European REACH (Registration, Evaluation, Authorization, and restriction of Chemicals) regulations, which shift the burden of proof by requiring chemical producers to assess the toxicity of their products to ensure that they are safe.

Box D.6 Attribution of impact drivers to business activities

Often, such as when accounting for downstream impacts from the use of sold products, impact drivers and impacts may not be attributable to the activities of a sole business. For example, an entity producing intermediate goods that are further processed into an end product will need to account for the impacts associated with this end product, even if the entity is not solely responsible for the impact.

This is also true for processes generating more than one product (i.e., multiple, co-, or by-products). There are a number of different ways of partitioning or allocating inputs, outputs, and impacts in such cases of multifunctionality, for example, based on physical relationships (mass, volume, energy use) or other relationships (such as economic value). The choice of allocation method can significantly impact accounting results. ISO 14044, environmental management systems, presents a hierarchy of solutions to deal with allocation, while the EU Organization/Product Environmental Footprint (OEF/PEF) methodology provides further specific guidance. An assessment should be transparent about the allocation rule applied.

Note that attribution of impact drivers does not dictate whether or not to engage in managing a problem; climate change and plastic waste are diffuse problems that occur in the public commons and only systematic approaches to management by all parties will provide sustainable positive outcomes. See sub-step D6.2 for further discussion on allocating influence when making a decision.

Adapted from Transparent Standardized Natural Capital Management Accounting 2023.

Consequences of the business's dependencies

The dependency of a business on the capitals primarily affects the business itself. Dependencies are often addressed within risk analysis and can be part of either the capital stock (natural, human, or social resources) or the flows that the stock provides (e.g., ecosystem services, capabilities, cooperation, and trust). Understanding dependencies will help a business to identify and manage risks as well as opportunities to invest in the capitals, which may simultaneously yield benefits for society.

Variations in resource availability will affect costs and benefits and may result in the necessity of identifying substitute resources, which may be more expensive. Understanding dependencies may help to highlight resource availability more effectively. Potential costs and benefits associated with business dependencies fall into two categories: consumptive, goods a business relies upon (for example, water and timber), and non-consumptive, goods or services nature and people provide that are often unseen and unpriced (for example, erosion control and consumer trust). When capitals decline in quantity or quality, they provide reduced benefits (e.g., flood protection or productivity of workers). This may lead to increased risk (e.g., flood risk or loss of market share) or an increased cost to replace the function of these services from capitals. An assessment may identify opportunities to invest to ensure the long-term provision of these flows in a changing world.

D1.6 Consider secondary pathways

The final element in building a draft pathway is to consider whether any of the identified impacts might themselves have significant consequences that call for developing a secondary pathway. Secondary pathways take an impact and reconsider it as an impact driver which creates a new chain of impact. Secondary pathways are a helpful tool for more thorough understanding of impacts of high concern or high priority for a business's strategy. Secondary pathways can bring to light interconnections, risks, and opportunities that might otherwise be overlooked – in particular raising awareness of unintended consequences.

The number of potential secondary pathways can be endless, so focus on those where there is a direct level of attribution identified and where also any of these conditions take place:

- The quality or duration of human lives are affected.
- Protected areas or threatened species are affected.
- A system is moved beyond a threshold or tipping point.
- The issue or stakeholder group is judged as otherwise important in relation to the company's strategic priorities.

Some examples of secondary pathways are considered in Table D.7

Examples of secondary pathways		
Subject	Direct impact	Broader impact
Overfishing can lead to piracy through a chain of socioeconomic and environmental impacts	Depletion of fish stocks: Overfishing depletes local fish populations, reducing the availability of fish for local communities that depend on them for food and livelihood.	This sequence has been particularly evident in areas such as the Somali coast, where overfishing by foreign vessels significantly contributed to the rise of piracy.
	Economic hardship: As fish stocks decline, local fishermen struggle to make a living, leading to economic distress in coastal communities.	
	Desperation and alternative livelihoods: Faced with diminishing resources and few alternative job opportunities, some individuals turn to piracy as a means of survival.	
	Increased maritime crime: With local economies collapsing, piracy becomes more appealing, leading to an increase in maritime crime as individuals seek to capture valuable cargo or hold vessels for ransom.	
	Security and governance issues: Weak governance and lack of effective maritime security further exacerbate the problem, allowing piracy to flourish in regions affected by overfishing.	
Rewilding can lead to increased land prices through several mechanisms	Increased biodiversity and ecosystem services: Rewilding efforts enhance biodiversity and restore ecosystems, making the land more valuable for its environmental benefits.	These factors contribute to a higher perceived and market value of rewilded lands.
	Investment opportunities: Investors see rewilded areas as attractive for sustainable projects and carbon and nature offset initiatives, driving up demand and prices.	
Education of girls leads to lower fertility rates, higher wages, and decreased environmental impacts	Lower fertility rates: Educated girls are more likely to have fewer children, as education increases awareness of and access to family planning.	These changes highlight the broad social, economic, and environmental advantages of improving education for girls.
	Higher wages: With better education, women can secure higher-paying jobs, improving their economic status.	
	Reduced environmental impacts: Lower fertility rates and higher economic status for women lead to reduced strain on resources and the environment, contributing to sustainability.	

Table D.7 Examples of secondary pathways

D1.7 | Prioritize which impacts and dependencies to take forward into valuation

Alignment remark

In the TNFD framework and the LEAP approach, this activity corresponds to:

- E2: (5.5.6) Prioritizing dependencies and impacts

The assessment has now generated a pathway or map of how the business's activities can influence changes in capital stocks and flows and ultimately impact the wellbeing of society and business. This won't be perfect and will be full of assumptions but is a useful starting point on which to iterate and improve understanding when measuring and valuing impacts and dependencies.

Having compiled a list of potential impacts and dependencies, both primary and secondary, the next step is to prioritize those to take forward into measurement and valuation. Business activities generate a long list of potential impacts, and an integrated approach often makes this list even longer with the addition of secondary impacts and the uncertainty of interaction across different systems. Conducting a valuation of these impacts all at once can, depending on the approach chosen, be resource- and time-intensive and most businesses will not initially be able to value everything to the same extent; furthermore, valuing everything may not be necessary to fulfill the assessment objective. To keep an assessment focused and fit-for-purpose, prioritization is needed, for which some suggested prioritization criteria and questions are provided below. This is a form of pre-materiality. Later on in this process, mapping impact and dependency pathways using a systems perspective may identify further material impacts and dependencies. Therefore, this activity should be seen as iterative.

Recommended best practice

Ideally, all potential impacts to business and society will be valued at some point or to some degree. Resource constraints may prevent valuing them all using intensive valuation approaches (e.g., primary valuation) but all can be valued using a simpler method (such as qualitative valuation within a diverse and qualified group) and thereby considered within the assessment. At this point in an assessment, it is important to conduct a preliminary prioritization of how to allocate resources across the list of potential impacts.

Key questions for prioritization should be:

- Which of these impacts and dependencies need to be prioritized in the subsequent valuation process because of their potential significance for society and/or the business?
- Which of these impacts and dependencies will be included in the valuation exercise using a less resource-intensive valuation approach?
- Which of these impacts and dependencies will not be prioritized in this exercise, but revisited for valuation at a later iteration?
- Which of these impacts and dependencies have been indicated as material by affected stakeholders?
- Are there any impacts and dependencies that can comfortably be dropped entirely?

If the assessment began with a specific objective and clear focus, this activity may serve to solidify confidence in these. However, even in such a case the pathway exercise can raise new questions about relationships and causality that hadn't been considered and are important to explore further with valuation. It is worth keeping an open mind while working through this activity.

Box D.7 Prioritization and materiality

The Capitals Protocol does not require a full materiality assessment at this point in the process. It is preferable to conduct a proper materiality assessment including insights from the valuation process. Assessing materiality therefore comes at the end of Step D of the Capitals Protocol.

Prioritization is an approach to focus resources on the issues that are most pertinent to the chosen scope. Prioritization serves to identify which impacts and dependencies require more focused exploration using valuation, and/or which may justify a simpler approach or a revisit at a later point. It is not recommended to remove any impact or dependency from the list entirely.

Choosing criteria for prioritization can be linked to categories of risks and opportunities. As each category has corresponding stakeholders whose actions may likely influence the business, involving stakeholders in prioritization can build trust and reduce risk of oversight. Some examples of categories of risks and opportunities include:

- **Societal impact and stakeholder trust:** The extent to which an impact or dependency may generate significant impacts to society, and what this might mean for the business.
- **Operational:** The extent to which or risk that an impact or dependency may significantly affect business operations, project implementation, or the value of existing or new product(s).
- **Legal and regulatory:** The extent to which an impact or dependency may trigger a legal process or liability (e.g., emission fees, import barriers, community compensation). Some regulations or reporting steps will dictate the types of impacts and dependencies that need to be assessed.
- **Financing:** The extent to which an impact or dependency may influence access to capital, investor interest, or insurance conditions.

For each potential risk and/or opportunity, consider magnitude (or amount) and likelihood (probability) (these are also known as severity) from the perspectives of all relevant stakeholder groups and subgroups and the business. Consider impacts that may not be problematic now but could become a risk in the future. A risk assessment matrix useful to this purpose is shown in Figure D.2.

Severity of impact	Serious harm	Low risk	High risk	High risk
	Some impact	Low risk	Medium risk	High risk
	Minimal impact	Low risk	Low risk	Low risk
		Remote	Reasonably possible	More likely than not
		Likelihood		

Figure D.2 An example risk assessment matrix

Sub-step D4 expands on how to conduct a materiality assessment. At this stage in the process, prioritize using the best available internal knowledge. While it is valuable to consider views outside of the company in evaluating priorities, gathering these types of data will follow in the measurement and valuation sub-steps.

Remember to keep records of the prioritization process. This provides an important reference for future use and documents the rationale for certain issues being removed from the valuation, postponed until a later time, or explored in the future using different techniques.

Suggested iterations

With assessment pathways forming and a short list of priority issues, revisit the objective set in sub-step A1 to confirm that the most useful and necessary information will be collected, and whether the assessment objective has evolved based on the outputs of this step.

D2 | Measure impact drivers and dependencies

This sub-step sets out how to select appropriate measures for priority impact drivers and/or dependencies and provides examples of a range of potential indicators. Revisit the assessment pathways to identify the relevant impact drivers and dependencies.

By the end of the action, each priority impact driver and dependency should be measured (in qualitative and/or quantitative terms). In some cases, it may not be practical to measure impact drivers and/or dependencies directly, and it will be necessary to make informed estimations instead. This is discussed later within this sub-step.

Complete sub-step D2 through the following activities:

- D2.1 Confirm the impact drivers and dependencies to measure
- D2.2 Choose appropriate indicators to measure impact drivers and dependencies
- D2.3 Identify sources of information to measure impact drivers and dependencies
- D2.4 Collect and collate data

D2.1 Confirm the impact drivers and dependencies to measure

In activity D1.1 all relevant business activities within scope were mapped against impact drivers and dependencies. Referring to the pathway where these were plotted, work backwards from the priority impacts to identify the impact drivers and dependencies that are at the source of those pathway chains.

Take the time to identify any assumptions in this previous work and seek extra information or input to confirm them. Identifying impact drivers and dependencies requires in-depth knowledge of a business's processes and supply chain, so conducting an internal review with relevant departments at this point would be beneficial.

Make sure to confirm that the impact drivers and dependencies in the pathway are as representative as possible to best inform the rest of the assessment.

D2.2 Choose appropriate indicators to measure impact drivers and dependencies

With the impact drivers and dependencies now confirmed, next identify appropriate indicators that capture the extent of those impact drivers and dependencies, and the type of data needed. In this context, an indicator is the form of measurement used to gauge the state or level of the impact driver and/ or dependency. Selecting the right indicators requires careful consideration as they may be used to track the social or environmental performance of a business over time, or for comparison across business units and with other companies.

Measurement of the priority impact drivers and/or dependencies can be either qualitative or quantitative.

Qualitative indicators may be based on professional judgment and can be informed by the opinions of stakeholders. Qualitative measures may involve a subjective assessment of high, medium, or low, or other defined criteria.

Quantitative indicators are typically in physical units, such as the amount of a pollutant emitted (e.g., tons), the amount of a resource consumed (m³ water, hours worked), or the number of hours of training provided to workers (hours/year). Use of precise actual data is ideal, but where these do not exist, it is acceptable to use an estimate. However, a business may elect to measure selected indicators once these have been identified.

The data required to measure impact drivers and dependencies may be the same. For example, data on the use of water can be used to identify dependency on water and to identify the scale of impact, or impact driver. Likewise, employee training can be used to identify dependency on training and the scale and impact of training (the impact driver). For simplicity, data for impact drivers and dependencies are discussed separately in this activity.

Particularly when measuring impact drivers and dependencies on social and human capital, be aware of indicators that are vague or subjective and therefore open to discretionary use. Sometimes this can be resolved by clarifying definitions, for example, specifying what a business considers a minor or serious health and safety incident. In other cases, subjectivity or vagueness are the result of using ratios or percentages that lack appropriate context. For example, indicators such as total number of incidents or number of incidents per 10,000 people are both valid, but their combined use would provide a more complete picture of performance.

Make sure to distinguish data that are available internally, publicly, or commercially. What is most important is choosing indicators that meet an assessment’s needs.

It is equally important that the indicators chosen are suitable for measuring changes in the capital stocks and for valuation. For this reason, the selection of indicators should be coordinated with the selection of measurement and valuation methods in other sub-steps. For example, an appropriate indicator for measuring the impacts of reducing the cost of a training program (the impact driver) will depend on what types of impacts on staff employees (human capital) are considered material, from the perspective of the business or society.

In relation to natural capital, chemical oxygen demand (COD) is often used as an indicator of the impact of industrial effluent on water quality. It measures the amount of organic compounds in water, so can be a useful measure of eutrophication risk (excessive algal growth which uses up available oxygen in water and affects wildlife). However, COD does not provide information on the toxicity of effluents and therefore cannot be used to assess the impacts on human health associated with pollutant discharges.

In ideal cases, an impact driver or dependency can be measured or estimated directly (e.g., the volume of water consumed or the mass of solid waste). In other cases, intermediate or proxy indicators are required. These provide a useful shortcut, which must then be combined with other information to measure or estimate the impact driver or dependency. For example, energy- or fuel-use data can indicate the volume of GHG and other emissions to air. Various published guides are available which provide emission factors (or conversion factors) to translate kilowatt hours (kWh) of electricity consumed or liters of fuel used into grams of emissions. Where possible, indicators should be disaggregated by location and other factors that allow for understanding the context when doing valuation.

Table D.8 presents sample indicators for different categories of impact driver. This is relevant for impacts on a business and business impacts on society only.

Capital	Impact driver	Example qualitative indicator	Example quantitative indicator
Natural	Greenhouse gas emissions	Large to small	Tons of CO2e
	Non-GHG emissions	High to low	Tons of PM2.5 released to air
		Severe to minor	
	Land use		Hectares of land occupied
	Resource use		Tons of raw material, by type
	Solid waste		Kilograms of waste disposed, by type
	Water use		Cubic meters of water consumed
	Water pollution		Kilograms of arsenic released to surface water

Human	Wages		Annual gross salary
	Provision of training and education		Number of hours of training
	Health and safety policies and practices		Access to preventive care for employees (percentage uptake of employee wellbeing programs, such as mental health, counseling, nutrition, and fitness)
	Practices for diversity, inclusion, and equity		Gender and ethnicity pay gap
	Working conditions		Number of employees on parental leave
	Product safety practices		Degree of implementation of product safety practices
Social	Workers' representation		Proportion of workers involved in union groups
	Networking (i.e., membership in industry bodies)		Number of membership agreements signed
	Engagement and collaboration opportunities		Number of engagement agreements signed
	Community investment		Value of annual community fund contribution
	Reputationally damaging events		Number of reputationally damaging events
	Personal data security protocols		Number of data breaches
Produced	Development of new systems and procedures		Number of new procedures developed per year
	Knowledge creation		Number of patents filed
	Expenditure		Money spent on items
	Taxes		Total taxes paid
	Wear and tear of equipment		Money spent fixing equipment Depreciation
	Net interest		Total net interest paid
	Profit		Total profit/net return
	Financial investment		Amount invested

Table D.8 Sample indicators for different categories of impact drivers

Table D.9 provides example indicators for different dependency categories. The indicators for dependencies that are business inputs (e.g., financial capital or industrial knowledge) will often be the same as indicators for impact driver inputs. This is relevant if business dependencies are part of the analysis.

Selecting appropriate indicators to assess dependence on regulating ecosystem services or social capital flows is more challenging. Relevant indicators may relate to proxies such as the area and quality of habitats that provide a service (e.g., 10 hectares of mature forest providing a water filtration service), or they may be more specific to the service itself (e.g., 8 million liters of water filtered per year).

Capital	Dependency	Example of qualitative indicator	Example quantitative indicator
Natural	Energy	Large to small	Kilowatt hours of energy
	Water	High to low Severe to minor	Cubic meters or turbidity of water
	Nutrition		Joules of energy consumed
	Materials		Tons or cubic meters of wood
	Regulation of physical environment		Hectares of habitat providing water filtration; cubic meters per day of water filtered by vegetation
	Regulation of biological environment		Risk level of incident (e.g., flood frequency); resilience against disease (e.g., in trees or crops)
	Regulation of waste and emissions		Grams of pollutant assimilated per kilometer of river
Human	Experience		Number of experienced workers
	Skills and knowledge		Number of skilled workers
	Workforce availability		Minimum number of workers needed to maintain business activity levels
	Health of workers		Percentage of workforce mentally and physically healthy

Social	Community relationships		Number of engagements with community groups
	Social networks		Number of peer associations in the sector
	Protection of intellectual property rights		Number of patents owned
	Social acceptance and trust		Customer satisfaction
	Law and order		Corruption Perception Index
	Shared norms		Number and type of norms
Produced	Accessibility to infrastructure and technology		Percentage of paved roads in distribution routes
	Subsidies		Amount of subsidies received
	Public knowledge and open-source knowledge		Number of open-source databases regularly used by staff

Table D.9 Sample indicators for different categories of dependencies

Note: Identifying indicators used by peers or recommended through guidance and standards or by association bodies can be a good starting point.

D2.3 Identify sources of information to measure impact drivers and dependencies

In choosing which data sources to use to qualitatively or quantitatively measure impact drivers and/or dependencies, there are many potential sources which include:

Primary data: Data collected by the business (or an externally contracted party) specifically for the assessment. This offers more precise results but can also be more time-consuming and require more specialized skills. Some sources of primary data include:

- Internal and reported business data, including data collected by the business, such as the number of apprenticeships and internships and recruitment of new employees from human resources, hours of employee volunteering, employee engagement studies, spending with suppliers, or sales team performance
- Data collected from customers or suppliers for the assessment
- Data related to the above can be derived from surveys, interviews, and focus groups conducted by the business to gather the views of a specific stakeholder group and/or subgroup
- Data relating to privately owned produced capital should be available from a business's finance department. The finance department may already have monetary value data because of established valuations and use of market-based values

Secondary data: Data originally collected and published for another purpose or a different assessment. Secondary data sources include:

- Published, peer-reviewed, and grey literature (e.g., life-cycle impact assessment databases; industry, government, or internal reports)
- Government statistical bureaus or World Bank/UN databases, such as household budget surveys, demographic health surveys, or other routine data collection databases (Social Value International n.d.)⁴
- Interviews with third parties/proxies, including interviews with experts such as local NGOs, that can provide insight into communities that may be inaccessible to the business
- Data from employer and business organizations (e.g., labor and employment data, statistics concerning skills in demand)
- Past assessments
- Data from audit/certification programs

Modeled data: Data based on primary data collected elsewhere and transferred into a model using value factors.

- Estimates derived using modeling techniques (e.g., environmental and social extended input-output (EIO) analysis, productivity models, population forecasting models)
- Data will not have local context and will come with a huge amount of uncertainty. Follow guidance in the Protocol about managing uncertainty. Remember that “all models are wrong, but some models are useful”

Primary data will deliver more precise results and match the business’s activities most closely. However, collecting these data can involve significant effort and specialist skills and primary data are only correct at the time and place of capture. Therefore, most businesses use a combination of primary and secondary data as this is more practical and is sufficient to inform decisions.

Issues that make primary data more complex to collect include the need to define a representative sample, develop a survey method that is free of bias, determine the minimum sample size, and allocate the resources for data collection, verification, and other tests. Training or specialist assistance may be necessary to ensure that relevant data are collected correctly, and to determine the statistical significance of results. Also, impact drivers vary over time, for example due to seasonal variation in production or where there are significant spatial variations.

In cases where direct measurement of impact drivers and dependencies is not practical, it is necessary to make informed estimates instead. Techniques that rely on secondary data include the direct application of results from other situations, as well as adjusted estimates based on modeling. Use of secondary data requires careful consideration of underlying assumptions, conversion factors, and other procedures to ensure the data used are appropriate for a given situation. Some common approaches when using secondary data to estimate the measurement of impact drivers and dependencies are presented in table D.9.

One important factor to be aware of with surveys and focus groups – whether designing primary data collection or when interpreting secondary data – is sampling and sample bias. Instead of collecting information from all individuals or households in the community, businesses may select a representative sample instead. Based on that sample, businesses may then produce an estimate of the indicators of interest and then generalize it to the entire population. In such cases it is important to ensure the sample is of sufficient size and shares the same key characteristics as the population it represents. Please consult the best practice literature and guidance on designing surveys, interviews, and focus groups.

⁴ Social Value International (n.d.) “Global Value Exchange 2.0” Available at: <http://www.globalvaluexchange.org/>

Recommended best practice

For both primary and secondary data used, an assessment should carefully document the characteristics of the relevant study population. This way, if value transfer becomes necessary, it can be applied alongside the necessary information. Refer to the Governance for Valuation documents to ensure that transparency and confidence in the use of impact value/dependency risk factors – either from use of secondary or primary data collected as part of this stage.

D2.4 Collect and collate data

The data collection (or estimation) process will depend on the scope and purpose of the assessment. Key points to consider include:

- Collect relevant primary data where practical and appropriate. Note that the collection of primary data often takes longer than anticipated, so plan carefully for this. To make sure that information is gathered correctly, it may be necessary to train data collectors in advance. Refer to the Governance Framework for Valuation to ensure Transparency Requirements are met for impact value/dependency risk factors generated through primary data collection.
- Check the quality of the data and consider validating the data-collection process (sub-step E1). Conduct or commission secondary data collection and/or modeling as needed, based on the methods discussed above. Review and validate the data estimation process and resulting data as this may have implications for testing assumptions and how results from the assessment are being applied, communicated, and/or reported. See table D.10 on considerations for selecting secondary data. Refer to the Governance Framework for Valuation to ensure Transparency Requirements are met for impact value/dependency risk factors derived from secondary data.
- For ongoing data collection, consider using data sources which are already being collected and can be accessed quickly and efficiently (e.g., gauge measurements, recurring surveys, and other types of monitoring data).

Considerations	Questions to ask
Scientific validity	• Do the data come from a reputable source? • Have the data undergone a (scientific) peer review?
Quality assurance, controls	• Are all primary data sources and modeling assumptions used in the data source clear – and are they representative for my needs? • What kind of verification/validation/assurance process has the data source undergone (if any)? • Has this been documented (i.e., is there any assurance statement available)?
Temporal reference	• Which base/reference year does the data source refer to – and is this representative for my purposes? • Which time period do the data refer to (month/year/etc.)? • Do the data reflect seasonal variations (if relevant)? • Are data adjustments needed (inflation, year)?
Geographic specificity	• Does the data source offer a worldwide breakdown to (sub-) country level? • Does the data source adequately reflect local variations?
Technological representativeness	• Does the data source reflect the technology or processes relevant for my business?
Practical issues	• Does the data source cover all impact drivers or a limited number of them? • Is the data source updated regularly? • Can I work with the data format or is specialist software required? • Can I use the data source directly or are additional modeling steps required (e.g., mapping data to categories in my systems)? • What are the costs of using the source (if any)? • Can I make any adjustments to the data myself, or will I need to rely on external support for this? • Are there any formal issues to consider (e.g., copyright, licensing)?
Source: Transparent (2023)	

Table D.10 Considerations for selecting secondary data sources

D3 | Explore changes in capitals

Complete sub-step D3 through the following activities:

- D3.1 Confirm the changes in capitals and system dynamics
- D3.2 Assess magnitude of changes
- D3.3 Undertake or commission measurement

D3.1 Confirm the changes in capitals and system dynamics

In sub-step D1, the assessment:

- Identified how impact drivers and dependencies may cause a change in the quality and/or quantity of the stock of each capital within the scope.
- Considered additional system dynamics including feedback loops, non-linear relationships, and tipping points.

Referring to the pathway where these were plotted, work backwards from priority impacts to identify: (i) the changes in capitals and (ii) system dynamics that have influenced those pathway chains.

Take the time to identify any assumptions in the previous work and seek extra information or input to confirm them. This might involve speaking again with key stakeholders or experts.

Being confident about which changes in capitals need to be measured will make completing the following activities more efficient.

Suggested iterations

Revisit the pathways from sub-step D1 to confirm the assumed:

- Changes in capitals
- Feedback loops, non-linear relationships, and tipping points

In some cases, it may be necessary to quantify system dynamics through direct measurement; in other cases, this can be done through estimation. For example, site-level analysis of ecosystem services may require modeling current conditions to understand preexisting pressures on the system. The additional impacts of the business are then introduced to the model to determine the portion of change in the system that can be attributed to the business's activities.

Alternatively, it may be sufficient to consider system dynamics in qualitative terms, in order to validate the assumptions implied by the choice of assessment methods. For example, some air pollution models assume that the ambient level of pollution is already above the threshold where health impacts occur, and use a linear relationship to assess the impacts of additional pollution. In this example, it is only necessary to confirm that the assumption is reasonable, rather than attempting to quantify the level of external pressure.

Some system dynamics are very hard to quantify and will always remain uncertain. For example, the consequences of artificial intelligence on young people are currently difficult to predict or quantify. In such instances, refer to the best expertise and literature available to understand potential consequences. This includes engaging stakeholders to ascertain their perspectives on anticipated impacts.

D3.2 Assess magnitude of changes

With the relevant changes in capitals now confirmed, next select the most appropriate method(s) for measuring or estimating changes in the capitals, and (where relevant) determine the likelihood of external factors or system dynamics affecting changes.

Measuring can be challenging and costly and identifying the right assessment methodology will be important. Making an appropriate choice depends on the level of detail required (or practical within the available time and resources), and the scope (geographic or value chain) under consideration. Rather than being comprehensive in its guidance, the Capitals Protocol aims to help users make an informed choice from the wealth of existing methods.

Methods to assess changes in capitals

Where changes in capitals are not directly observable or measurable, it is often possible to estimate changes using modeling methods (see Box D.8). For example, modeling may be used to estimate likely changes in capitals associated with activities in the supply chain, where the precise location of those activities is not known. Examples of this include, but are not limited to, standard environmental impacts of raw material extraction through mining practices or where child labor is common in industries or countries that products are sourced from. In such cases, modeling allows integration of local knowledge into analysis, generating more relevant estimates of changes in natural capital. By working closely with businesses upstream and downstream in the value chain a business may be able to demonstrate where it is outperforming modeling assumptions and thus ahead of the market in this regard.

To help select the appropriate method(s) to estimate changes in capitals, refer to table D.11 and consider the following questions to help guide the decision:

- Is the change under consideration directly measurable or must it be estimated or modeled?
- What level of precision is required to meet the assessment objective and also feasible, given the available time and resources? If the level of uncertainty is known will this help to make a decision useful?
- Does the selected method require quantitative estimates of external pressures and the status and trends of natural capital in the business's specific context, or can the assessment use qualitative validation of key assumptions when using estimates transferred from another context?
- What available local/contextual data are necessary to understand changes in the local environment?
- What are the technical demands of applying different methods?

Capital	Impact driver	Change in capitals	Example of direct measurement	Example of standardized modeling method
Natural	Greenhouse gas emissions	Change in global mean temperature	Measure instances of extreme weather conditions over time	Life cycle impact assessment models and characterization factors
	Non-GHG emissions	Change in concentration of pollutants in air	Direct measurement of air quality – concentration of pollutants	Life cycle impact assessment models and characterization factors
	Land use	Change in species abundance	Measure change in richness and evenness of species between different land uses	Life cycle impact assessment models and characterization factors

	Resource use	Change in resource scarcity	Remote sensing measurement of natural resource stocks	Natural resource modeling based on consumption drivers and patterns
	Solid waste	Change in odor, views, and groundwater quality where seepage of pollution occurs	Direct measurement of odor, views, and air/water/soil quality	Life cycle impact assessment models and characterization factors
	Water use	Change in water availability	Direct measurement of water levels and flow	Water consumption model
	Water pollution	Change in concentration of pollutants in water	Direct measurement of water quality – Chemical and biological oxygen demand (COD, BOD)	Life cycle impact assessment models and characterization factors
Human	Wages	Change in access to goods and services by workers' families	Survey on family consumption with a cohort of workers	Consumption models
	Provision of training and education	Change in knowledge and skills of workers	Survey on certified qualifications	Training impact simulation model
	Health and safety policies and practices	Change in risk of occupational illness and injuries	Tracking workers unable to work due to occupational illness and injury, both mental and physical	Health and safety models
	Practices for diversity, inclusion, and equality	Change in diversity, skills, and worldviews	Tracking diversity and inclusion among workers	Diversity and inclusion model
	Working conditions	Change in job satisfaction and life satisfaction	Survey on job satisfaction of workers	Job satisfaction model
	Product safety practices	Change in rate of non-communicable diseases	Tracking safety and quality of products	Safety and quality of products model
Social	Workers' representation	Change in sense of ownership of the workforce	Survey of workforce	Employee engagement model
	Networking (i.e., membership in industry bodies)	Collaboration with others and change in organization-level connections	Tracking collaborative agreements	Collaborative networks model

	Engagement and collaboration opportunities	Change in collaboration and enhanced synergies	Tracking enhanced synergies	Collaborative networks model
	Community Investment	Change in annual contribution of the business to the community fund per year	Tracking community fund	Community fund forecasting model
	Reputationally damaging events	Change in customer retention rate	Direct tracking of customer retention	Customer retention forecasting model
	Personal data security protocols	Change in customer trust	Survey to customers	Customer trust forecasting model
Produced	Development of new systems and procedures	Change in ways to organize knowledge through systems and procedures	Tracking procedures	Procedure forecasting model
	Knowledge creation	Change in intellectual property	Tracking patent submission	Patent forecasting model
	Expenditure	Change in financial capital availability	Accounting systems	Financial modeling
	Taxes	Change in financial capital availability	Accounting systems	Financial modeling
	Wear and tear of equipment	Change in stock of equipment	Inventory of equipment	Equipment forecasting model
	Net Interest	Reduction in bank balance	Review of bank statements / calculation of projected interest payments	Financial modeling
	Profit	Increase in bank balance	Review of bank statements/calculation of projected profits	Financial modeling
	Financial investment	New factory, machinery, etc.	Records of what has been purchased	n/a

Table D.11 Examples of measurement and estimation methods for assessing changes in the capitals

Remain open to using a mix of methods if this allows use of the best available data. However, mixing different methods requires careful consideration to ensure consistency across different parts of an assessment. For example, if life cycle impact assessment (LCIA) factors are used to estimate changes associated with unobservable activities in the supply chain, while direct measurement methods are used for the business's own operations, it will be important to verify that both methods are based on the same principles and assumptions and therefore comparable to a reasonable degree.

Box D.9 expands further on the importance of assessing changes in the stock of capitals, rather than just the flows. Box D.10 expands on additional aspects to consider when measuring changes in capitals.

Box D.9 Estimating changes in stocks and flows

Of the large number of corporate capital assessments conducted to date, the majority have been primarily concerned with flows, and for this reason the guidance in this Protocol provides significantly more guidance on measuring and valuing flows as opposed to stocks. However, it is recognized that increasing efforts are needed to better understand and manage stocks of capital. This is especially the case for natural capital where stocks are being depleted at an alarming rate.

In many cases, it is simpler to estimate changes in flows and also unnecessary to estimate changes in the underlying capital stock. This is the case, for example, if undertaking a high-level assessment of the impacts of air pollution using value transfer (see Box D.13 on value transfer).

In some situations, understanding changes in the state of the stock may be important to understand and ensure the long-term flow of benefits and is central to the capitals approach. This may be the case when assessing dependencies on natural capital stocks that provide provisioning services or assessing site-level biodiversity impacts, where changes in the stock are directly observable (e.g., the volume of standing timber in a forest) or can be inferred from flows (e.g., a reduced stock due to clearing two hectares).

Temporal and spatial connections between the stock of a capital and the flow of benefits should be considered explicitly. In some cases, flows may arise at different geographic or temporal scales than stock changes. For example, the benefits of carbon sequestration accrue globally, while changes in carbon stocks (e.g., in biomass) may be assessed locally.

Box D.10 Key aspects to consider when measuring changes in capitals

Measuring changes to capitals can be challenging, with various aspects to consider including:

- **Time lags:** For example, planting trees in upland areas can reduce soil erosion and sedimentation of water bodies downstream, but it may take several years before any results are observable. This is particularly true for integrated assessments where changes in different capital stocks might occur at different paces. For example, in some circumstances forests may need upwards of 100 years to fully mature and provide the final set of ecosystem services, whereas the social cost of lost farming jobs from the same land may be immediate. For educational and training programs, there may well be a time lag before full impacts are realized (e.g., programs on safety, contraception, disease control).

- **Distance:** Changes in capitals often occur far away from the location of the impact driver. For example, a pollution event in a river will lead to changes in natural and other capitals downstream across the whole catchment. Impact drivers that occur upstream in the supply chain can also lead to changes in capitals a great distance from a company's direct operations. Just because these changes are out of sight, it does not mean they are unimportant or that they should be excluded from further consideration.
- **Dispersed impacts:** Promoting behavior change through social media campaigns can lead to many people changing their behavior but across countries, regions, or even globally – with effects occurring widely but highly dispersed.
- **Attribution:** Caution is required when a business is not the only actor contributing to an observed change. Reasonable estimates of the influence of others on an observed change are important.
- **Non-linear relationships:** Your work to confirm system dynamics such as feedback loops, non-linear relationships, and tipping points in activity D1.4 will inform your confidence of variables in a capitals assessment in situations where systems responses don't respond in a linear fashion.
- **Confounding factors:** Changes may be difficult to attribute to a particular impact driver where there are multiple influencing factors that cannot easily be disentangled, such as the many drivers of species decline (e.g., habitat loss and fragmentation, illegal harvest, invasive alien species, competition with other species, climate change), or the many social determinants of health (e.g. diet, air quality, exercise, social connections, education). To combat this difficulty, proxies and modeling can be used (WBCSD 2013), although this carries the risk of greater assumption and uncertainty. These approaches are appropriate for high-level assessments but not recommended for detailed assessments that could inform operational decisions.

Box D.11 Attribution of changes in capitals

Many different actors may have contributed to an identified net change in the state or condition of a capital (for example, a training program funded by multiple parties, or a company selling base components that other businesses combine with other products for multiple end applications). In such cases, it is important to acknowledge that the whole impact cannot be attributed to one business.

In some instances, acknowledgment of the attribution issue might be sufficient. In other cases, it may be possible to divide attribution between parties using a variety of methods such as, in the case of the jointly funded training course, the percentage split of financial investment provided by each party.

Attribution of final impacts is discussed again in activity D5.3.

Likelihood of change

For each factor identified which could lead to a significant change to the capitals on which the business has material impacts or dependencies, the likelihood of that factor occurring should be estimated. In addition, consider the likely extent or magnitude of change, over what timescale, and at what geographical scale. This is particularly important for assessing dependencies.

A good approach is to develop probability-weighted estimates of changes (see below for reference to calculating this). Such a risk-based approach is especially relevant for dependencies, because many external impact drivers are not under the business's direct control and therefore their precision is unknown or uncertain; hence the value of interest is "value at risk" or, conversely, the risk-weighted opportunity of increased revenues.

For changes that are directly observed in real time, the relevant probability is simply 100%. For future or unobserved changes, however, there may be uncertainty about potential changes. Various methods can be used to assess the likelihood of change, including:

- **Probability-based analysis:** Quantitative estimates of likelihood can be derived by testing the statistical significance of relationships. For example, multivariate regressions can be used to identify the key contributors to observed trends, or Monte-Carlo analysis can be used to test the potential permutations of multiple possible data points, assumptions, and judgments, in order to identify the most likely changes (central tendency).
- **Multi-criteria analysis:** Where multiple factors contribute to the likelihood of a change, multi-criteria analysis can be used to generate informed weightings of the influence of different factors on the overall likelihood of change in natural capital. This is similar to multivariate analysis above but typically uses judgments and expert opinion, rather than statistics, to produce the weightings.
- **Expert opinion and/or multi-stakeholder assessment:** In some cases, quantitative data will not be available and qualitative judgment or expert opinion is required. For example, the probability of a policy change affecting resource access rights will depend on the political context. In such cases, the views of experts and other stakeholders can help to establish a rough estimate of likelihood.

The likelihood or probability of change is then multiplied by the extent or magnitude of change, providing an estimate of the probability-weighted change in the capital.

D3.3 Undertake or commission measurement

To complete sub-step D2, the final activity is to undertake or commission an external provider to conduct measurement or estimation for each capitals change associated with each impact driver and/or dependency using the methods selected above.

For each change in capitals, and any associated trends affecting the chosen pathways, ensure that key factors, such as severity, certainty, and timescale are included. If a qualitative note of these elements was completed as part of sub-step D2, additional details and evidence can be added at this point.

D4 | Value impacts and dependencies

The process of valuation can appear daunting with so many different approaches available, each with their own caveats and sensitivities. However, valuation is fundamental to deepening insights for decision-making. The simplest option is to consider first the range of qualitative valuation approaches available – these are usually less resource intensive than quantitative or monetary approaches but can still provide valuable insights. For example, using professional judgment or engaging with affected stakeholders to rank impacts on a scale of red-amber-green can help direct future efforts.

Complete sub-step D4 through the following activities:

- D4.1 Confirm the consequences of changes in capitals
- D4.2 Select fit-for-purpose valuation techniques
- D4.3 Undertake or commission valuation

D4.1 Confirm the consequences of changes in capitals

Activities D1.2 and D1.3 identified how changes in the stock and flow of each capital might result in consequences to business or to society. These consequences should have been plotted on a pathway and prioritized in terms of how soon and in what level of detail they will be assessed. Equipped with measurements on the extent and likelihood of change and potentially relevant system dynamics from sub-step D1.4, it is highly recommended to revisit sub-steps D1 and D2 to confirm that the identification of consequences and prioritization are still appropriate. If this sub-step (D4) highlighted that a certain change in capital was more likely or more significant than first realized, now is the time to add it to the high-priority list to take forward into valuation.

This confirmation process should involve re-engaging any experts (internal and external) and stakeholder consultation processes with the findings from the valuation process to discuss whether this information changes anything about how costs and benefits might be received by society or by the business.

Suggested iterations

Revisit the pathways from sub-steps D.1 and D.2 to confirm the consequences to business and to society, and their priority.

Remember also to revisit the list of stakeholder groups and subgroups in sub-step B1 to double check that any potentially relevant groups are not missing from the valuation process.

D4.2 Select fit-for-purpose valuation techniques

Valuation is the process of determining the importance, worth, or usefulness of something in a particular context. Understanding this context is essential to meaningfully estimate value or correctly interpret results. Much of the necessary contextual information will have been identified in previous sub-steps. There are many different approaches and techniques used for valuation, and this activity will help identify the ones most fit for purpose.

Confirming type of value

The first iteration need is to reconfirm the type of valuation chosen, as covered in sub-step C2. Remember that:

- Qualitative valuation techniques are used to inform the potential scale of costs and/or benefits expressed through qualitative, non-numerical terms (e.g., medium societal welfare loss from increase in air emissions, high societal welfare gain from education campaign).
- Quantitative valuation techniques focus on numerical data used as indicators for these costs and/or benefits. These should ideally relate to the actual impact that occurs (e.g., the number of people suffering from a moderate decline in health conditions or number of people living a healthier life due to changing their diet. Both of these examples can be measured in quality-adjusted life years (QALYs) rather than simply changes in capital.

- Monetary valuation techniques translate quantitative estimates of costs and/or benefits in a single common currency. These encompass market-based, as well as welfare valuation, approaches (see table D.12).

It is important to select a valuation technique that can accurately establish the value of the impact of interest, as different valuation techniques can be quite specific as to which types of impact and value they can be applied to. Furthermore, as discussed in sub-step C2, there are a plurality of value types which cannot all necessarily be expressed in the same unit. For example, it is usually inappropriate to articulate spiritual values in monetary terms, and completely inappropriate to express intrinsic value in monetary terms. Assessment users must take care to apply the valuation techniques that are most appropriate and most accurately represent the capital assets and flow of costs/benefits that are being valued.

Suggested iterations

Revisit the choice of valuation type selected for the assessment in sub-step C2. This should be cross-referenced against the reconfirmed prioritization of consequences to business and to society (activity D1.5) to see whether any impacts justify a more or less resource-intensive approach to valuation.

Choosing a valuation technique

Various factors will influence which valuation techniques are best for an assessment. As well as identifying which are most appropriate for the chosen scope, take account of data availability, budget and time constraints, the level of stakeholder engagement desired, and the degree of accuracy required for the objective. Qualitative valuation techniques, for example, are good for eliciting contextual detail and intangible values, so can usefully be applied comprehensively and equally to all types of cost and benefit. However, they do not provide numerical precision, measures of variance within a sample, or results that can be easily compared to financial costs and benefits. When choosing a valuation technique, remember that there may be trade-offs in terms of accuracy, detail, and coverage.

All valuation methods have advantages and disadvantages (TEEB 2010),⁵ so a sequential, pragmatic approach from identifying and estimating costs and/or benefits qualitatively, followed by quantification and monetization, when possible, is usually recommended (TEEB 2011).⁶ An important valuation limitation can be uncertainty around potential future costs or benefits, particularly in proximity to critical thresholds and potentially irreversible ecosystem changes. Refer to sub-step D4 on system dynamics and box D.5 for a discussion of the precautionary approach, which will be advisable in some contexts.

Table D.12 summarizes these advantages and disadvantages and will help in selecting the appropriate technique(s). If adequate data do not exist and/or there is not time or resources for primary research, the most cost-effective approach is to use value transfer, which is a common and increasingly accepted place to start, if undertaken appropriately. While there are important limitations to the value-transfer approach, as the results are often less accurate or credible, assessments using this shortcut are generally easier and quicker, hence their popularity. More detail on value transfer is set out in Appendix 5.

Note: Expert input is recommended when choosing a method of valuation, as there are a great range of factors that influence the practicality and appropriateness of applying the various techniques.

Valuation can require navigating ethical considerations and caveats. Boxes D.12 and D.13 cover two important issues to consider when conducting an assessment.

⁵ TEEB. 2010. "The Economics of Ecosystems and Biodiversity: Ecological Economics Foundations." Edited by P. Kumar. Earthscan, London and Washington, DC

⁶ TEEB. 2011. "The Economics of Ecosystems and Biodiversity in National and International Policy Making." Edited by P. ten Brink. Earthscan, London and Washington, DC

Technique	Description	Data required	Indicative duration	Indicative budget	Skills required	Advantages	Disadvantages
Qualitative valuation							
Opinion surveys*	Surveys designed to represent views through a series of questions, (e.g., semi-structured interviews)	Stakeholder information to inform sampling frame	   Weeks - Months	\$\$	Questionnaire design, interviewing	Open ended so can capture broad information	Does not allow much quantification Results may be subject to bias from respondents
Deliberative approaches	Facilitated group discussions or focus groups that can involve debate and learning such as brainstorming sessions/workshops /focus groups/in-depth discussions	Stakeholder information to inform sampling frame	   Weeks - Months	\$\$	Questionnaire design, facilitation	Open ended so can capture broad information	Does not allow much quantification Difficult to obtain representative sample of attendees – Results may be subject to bias from respondents and sample selection, and can be hypothetical in nature
Relative valuation	Use of high/medium/low values to determine relative value of benefits (and/or costs) in categorical terms, using available data and expert judgment	Information on all parameters to be valued	 Days - Weeks	\$	Analytical	Can be very broad and include any parameters desired	Can be subjective Results may be subject to bias from respondents
Quantitative valuation							
Structured surveys*	Structured surveys or questionnaires can be used to elicit quantitative values: One-to-one surveys employing a consistent set of questions including “closed” response options (e.g., Y/N, scoring, numerical choices) that allow for statistical analysis	Stakeholder information to determine sampling frame	   Weeks - Months	\$\$	Questionnaire design, interviewing, statistics	Enables greater level of quantification	Allows less opportunity to capture broader information Results may be subject to bias from respondents
Indicators*	Various indicators can be used to quantify information, such as air emissions, yield of produce per hectare, education qualifications, members of a working group.	Information on all parameters to be valued – ideally quantified information	  Weeks	\$\$	Analytical, statistics	Can be very broad and include any parameters desired	May not capture all the relevant values
Multi-criteria analysis (MCA) using scoring and weighting**	Involves selecting a range of parameters and rating and ranking their value through scoring and weighting, using workshops, available data, and/or expert judgment. It is the scoring and weighting that is effectively the ‘valuation’ technique.	Information on all parameters to be valued – ideally quantified information	   Weeks - Months	\$\$	Analytical, statistics	· Can be very broad and include any parameters desired · Can be kept simple	· Sensitive to ratings and rankings chosen · Can become overly complicated



Monetary valuation							
Market and financial prices***	This includes several related approaches, including: - Costs/prices paid for goods and services traded in markets (e.g. timber, value of water bill or pollution permit, cost of labor) - Other internal/financial information (e.g., estimated financial value of liabilities, assets, receivables) - Other interpretations of market data (e.g., derived demand functions, opportunity costs, mitigation costs/aversive behavior, cost of illness)	Market prices of goods and/or services Costs involved to process and bring the product to market (e.g., crops)	 Days - Weeks	\$	Economics -or econometricians	A transparent and defensible method since based on market data Reflects actual willingness to pay (WTP)	Only applicable where a market exists for the good or service and price data are readily available Market prices may be distorted by imperfect competition and/or policy failures, hence not a good measure of societal value
Production function (change in production)	Empirical modelling approach that relates change in the output of a marketed good or service to a measurable change in capital inputs (e.g., the quality or quantity of ecosystem services due to changes in natural capital or productivity changes due to health and safety measures)	Data on changes in output of a product Data on cause and effect relationship (e.g., crop losses due to reduced water availability or productivity increase due to training sessions)	 Days - Weeks	\$	Economics, (potentially agronomist, hydrologist and/or process engineer, etc)	If all required data are available, the technique can be implemented fairly easily Can link dependencies to financial accounts	Necessary to recognize and understand the relationship between a change in capitals, service flows, and output of product Can be difficult to obtain data on relevant changes in capitals, the service flows and effect on production
Replacement costs	The cost of replacing a capital with an artificial substitute (product, infrastructure, or technology). May be estimated, observed, or modeled.	The cost (at market prices**) of replacing a capital (or associated flow of goods or services) with man-made equivalents (e.g., replacing flow regulation of habitat with flood defense scheme or an individual's skills with AI technology)	 Days - Weeks	\$	Basic economics, engineering	Provides surrogate measures of value for regulatory services (which are difficult to value by other means) A readily transparent method when based on market data	Does not consider social preferences for services or behavior in the absence of the services The replacement service probably only represents a proportion of the full range of services provided by the natural resource Refer to box D.15 on strong and weak sustainability for more on the interchangeability of capitals
Damage costs avoided	The potential costs of property, infrastructure, and production losses due to capitals degradation, treated as a "saving" or benefit from conserving the capital. May be estimated, observed, or modeled.	Data on costs incurred to property, infrastructure, or production as a result of decline in capitals or the loss of associated service flow Damages under different scenarios	 Weeks	\$\$	Engineering and bio-physical processes	Provides surrogate measures of value for regulatory ecosystem services that are difficult to value by other means (e.g., storm, flood, and erosion control)	- The approach is largely limited to services related to properties, assets, and economic activities - Can overestimate values

Revealed preference (direct) Stated preference	Hedonic pricing	Based on the observation that certain factors (e.g., environmental, social, human or produced) are one of the determinants of the market price of certain goods (e.g., the environmental quality of a neighborhood affects the prices of properties located there or the level of education affects the salary of employees). This technique models variations in market prices, controlling for other variables to isolate the factors of interest. The extent to which price varies with this factor reveals its value	Data relating to differences in property prices or wages that can be ascribed to the different capital qualities (e.g., status of river, area of green space, distance to communities, education level)	  Weeks	\$\$\$	Econometrics	Readily transparent and defensible method since based on market data and Willingness to Pay (WTP) Property and wage markets are generally very responsive so are good indicators of value	Approach is largely limited to costs and benefits related to property or wages The property and wage market is affected by a number of factors in addition to environmental attributes, so these need to be identified and controlled for (e.g., number of bedrooms, training required)
	Travel costs	Based on the observation that social goods and marketed goods and services are often complements (i.e., you need to spend money and valuable time on travel to visit a place where you can enjoy natural or cultural features). Measures travel and other costs incurred when visiting a natural, social, or cultural asset for recreation or leisure, to elicit a value per visit. Assumes such spending is a minimum expression of the value of individuals' experience (otherwise people would not take the trouble)	The amount of time and money people spend to enjoy a social good (e.g., visiting a site for recreation or leisure purposes) Motivations for travel	   Weeks - Months	\$\$\$	Questionnaire design, interviewing, econometrics	Based on actual behavior (what people do) rather than a hypothetically stated Willingness to Pay (WTP) Results are relatively easy to interpret and explain	Approach is limited to use of recreational benefits Difficulties in apportioning costs when trips are to multiple places or are for more than one purpose. It can be hard to differentiate what type of capital is making somewhere attractive e.g. a historical building in a beautiful natural setting
	Contingent valuation (CV)	Infers values by asking individuals their maximum willingness to pay (or willingness to accept compensation) for a specified change in the relevant non-market good or service	Socio-economic and demographic information on survey respondents	   Weeks - Months	\$\$\$	Questionnaire design, interviewing, econometrics	Captures both use and non-use values Extremely flexible - can be used to estimate the economic value of virtually anything	The results are hypothetical in nature and subject to numerous different biases from respondents
	Choice experiments (CE)	Individuals are presented with alternative goods/ options with different characteristics (i.e., various attributes or levels), as well as different prices. They are asked to choose their preferred option, from which the value for the relevant non-market good or service may be inferred	As for CV above An appropriate set of "levels" are required for key parameters (e.g., poor, medium, good, and excellent river water quality or safety levels at work)	   Weeks - Months	\$\$\$	Questionnaire design, interviewing, econometrics	· Captures both use and non-use values · Good for providing breakdown of estimated marginal changes (e.g. values per % increase in coral cover)	· Results are subject to bias from respondents and are hypothetical in nature · Choices given to respondents must be limited to what they can understand and weigh up during the duration of the survey

Value Transfer							
Value (benefits) Transfer****	Values an impact driver in one context based on valuation evidence (identified using one or more of the above techniques) determined in another context. Specific adjustments should be made to account for differences between the two contexts.	Valuations based on above techniques applied to similar studies elsewhere. A very common starting place for most companies Data on key variables from different studies (e.g., GDP per person)	 Weeks	\$	Low cost and rapid method for estimating values	· Low cost and rapid method for estimating values	· Although simple to use, it needs to be applied carefully · Results are likely to be subject to a higher level of uncertainty compared to (well-conducted) primary research. The extent to which this can be accepted is dependent on the decision-context · Existing valuation studies will be more robust and numerous for some services /impacts than for others

Table D.12 Examples of valuation techniques

Adapted from WBCSD et al. 2011, WBCSD 2013, eftec 2010, PwC 2015

The applicability of methods to valuing different components indicated in table D.12 is generally true but exceptions will occur. Expert input is likely needed to identify the most suitable technique(s) in a given context.

* Not generally considered “valuation” techniques per se, but these are approaches that can elicit and express values.

** Note that this is also considered an analytical tool used to bring together an assessment of different parameters.

*** For monetary valuation of impacts on society, market prices may be adjusted for taxes, subsidies, or other distortions.

**** Value transfer is a secondary approach or “shortcut” that draws upon previous valuations.

Box D.12 Purchasing power parity in monetary valuation

Valuing “impact to society” requires understanding the wellbeing of people. Using monetary valuation can be useful because it translates lots of different measures into a common unit. In a capitals assessment, monetary units can represent the amount people would be willing to accept to suffer a negative impact (willingness to accept), or the amount they would be willing to give up to enjoy a positive impact (willingness to pay). However, the difference in peoples’ ability to buy products and services (purchasing power) can influence the results.

An assessment applying results taken from a study conducted in a different country context using value transfer will need to account for differences in purchasing power through applying a purchasing power parity (PPP) index.

There remains a moral issue if monetary values are used in decision-making, particularly when it comes to risks to life with real world consequences. While monetary values converted with an index will give a more theoretically correct “answer,” decisions made in this way can lead to perverse incentives, as they suggest a lower monetary impact where activities are conducted in countries with lower average incomes. It is therefore good practice to have a set of results which simply use a common value for each change in capital (e.g., same value for loss of life regardless of country).

Applying a purchasing power parity approach helps reduce issues around biasing results towards people in wealthier countries, thereby making valuation fairer between stakeholders in different countries. When considering valuation techniques, lack of consideration to differences in purchasing power between different nations may exacerbate inequality, resulting in risks to the business.

Box D.13 Institutional and power dynamics

It is important to ensure that the diverse values of stakeholders are reflected during the valuation process. This means accounting for the plurality of value types that stakeholders have and choosing techniques to reflect such. It also means acknowledging the influence that institutional, power, and social dimensions have on valuation processes, how people exhibit values, and how those values are legitimized and expressed in society.

The way valuation is conducted, including the methods chosen, is in part determined by power relations in society that influence which and whose values are recognized. This is particularly pronounced in the way that monetary values and monetary logic dominates market societies. This means that people often exhibit different preferences depending on the socio-institutional environment in which they express them. It is also the case that processes of valuation, either monetary or non-monetary, are value-articulating institutions (i.e., they not only reveal values, but also contribute to shape and construct them through the valuation process itself).

When conducting valuation, work with experts who can help to design appropriate mechanisms to take into account such issues. If using value transfer, specify which authors and institutions conducted any studies used in the assessment, to minimize bias and ensure the resulting values are trustworthy and credible.

- **Valuing produced capital**

The valuation of produced capital can be a bit different, as various Accounting Standards bodies have developed internationally recognized standards for valuing specific financial, private manufactured, and some intellectual capital elements. A company's financial accountants should be familiar with the accounting practices and standards most relevant to the company. Key Accounting Standards Bodies of potential relevance include:

- **International Financial Reporting Standards**

International companies follow the International Financial Reporting Standards (IFRS), which are set by the International Accounting Standards Board and serve as the guideline for non-U.S. GAAP (Generally Accepted Accounting Principles) companies reporting financial statements.

- **Financial Accounting Standards Board**

An independent non-profit organization, the Financial Accounting Standards Board (FASB), has the authority to establish and interpret Generally Accepted Accounting Principles (GAAP) in the United States for public and private companies and non-profit organizations. GAAP refers to a set of standards for how companies, non-profits, and governments should prepare and present their financial statements. They produce Accounting Standards Codification (ASC) covering numerous topics.

- **National accounting bodies**

Individual countries may have their own accounting bodies that provide guidance on aspects of accounting – usually in line with the above. For example, in the UK the Financial Reporting Council (FRC) promotes transparency and integrity in business. It regulates auditors, accountants, and actuaries, and sets the UK's Corporate Governance and Stewardship Codes.

Established accounting frameworks do not capture non-market elements of a business's relationship with produced capital, nor do they cover any elements of public produced capital. The use of non-market valuation techniques is therefore still needed.

Changes in production, replacement costs, and damage costs avoided can be applied, as appropriate to the context. For example, a company dependent for its operations on a public road, jetty, or coast protection scheme could estimate the value provided to them by those manufactured capital assets by estimating what the cost of replacement or using an alternative route would be, or the loss of production they would forgo, if the assets did not exist. The value of dependency on public infrastructure, for example, is becoming increasingly relevant as hurricane and cyclone frequency and intensity increase globally.

Equally, if a company has built one of those produced assets, and other stakeholders are benefiting from this, those same techniques could be applied including stated preference willingness to pay approaches.

In a similar way, those same valuation techniques can potentially be applied in a situation where, for example, a company is dependent upon, or generates, public intellectual capital. Alternatively, a company may want to establish the additional societal value of an investment made in infrastructure or intellectual capital that other stakeholders benefit from.

Consider discounting

Discounting is a method of addressing the time preference that humans have for valuing immediate or near-term benefits more highly than those acquired in the distant future. It achieves this by applying a discount rate to consolidate a stream of future benefits and costs into a single equivalent present value. Discounting is often applied to generate net present value and benefit-cost ratios to compare alternative options with differing benefits accruing over potentially different time frames. Establishing who is gaining the benefits (or incurring losses) from each capital is important when considering discount rates. Where valuation relates only to private costs or benefits to a business, it is appropriate to use that business's normal financial

discount rate to express future costs or benefits in present value terms (i.e., the standard “hurdle rate” used for project appraisal, or the business’s weighted average cost of capital (WACC)).

However, it is rare that decisions relating to natural, human, social, or even produced capital have purely private consequences attributable only to the decision-maker. It is much more likely that valuation will need to consider costs or benefits accruing to third parties (in the Capitals Protocol referred to as impacts on society).

Where these future societal costs or benefits are concerned, it is appropriate to apply a discount rate which reflects the balance of preferences (among all the affected stakeholders) for consumption now versus consumption in the future — this is referred to as a societal or social discount rate (SDR).

Societal discount rates vary but are almost always lower than normal financial discount rates, principally because they attempt to reflect the wellbeing of future generations as well as generations alive today. This can be particularly important in the context of natural capital which, unlike most other forms of capital, can continue to provide benefits indefinitely if it is managed well.

Typical social discount rates range between 2–5%, but in some contexts higher, lower, and even negative discount rates can be justified (Health and Safety Executive 2001⁷, United Kingdom Treasury 2018⁸). A common approach to address potential debate about the appropriate discount rate is to test the sensitivity of results and conclusions using multiple discount rates including a discount rate of zero. A thorough discussion of discounting in the context of biodiversity, ecosystem services, and wellbeing is included in Chapter 10 of the Dasgupta Review.

See Box D.14 for a discussion of some ethical issues involved in the choice of discounting rate.

Box D.14 Ethical considerations when discounting

All valuations should consider how discounting affects those who are not able to express a value judgment. This includes non-human actors (whose value is expressed as intrinsic value) and future generations, who will be impacted by future impacts more than current ones. Discount rates are also subject to the non-linear nature of systems, as discussed elsewhere in this document. Traditional accounting often makes poor assumptions about linear benefit realization. The Capitals Protocol recommends that social discount rates should reflect explicitly moral, other-regarding judgments about the relative importance of wellbeing that exists far into the future. If discounting, apply a range of discount rates, including zero (i.e., apply sensitivity analysis), to compare the results and see how the discount rate affects the overall outcome.

D4.3 Undertake or commission valuation

Based on the assessment objective, combined with the compiled information and selected valuation techniques, it is time to undertake or commission the relevant valuations for the chosen assessment.

Note: Because significant training and applied experience is generally required to apply valuation techniques with confidence, the Protocol does not give details on application and execution of these techniques. However, further high-level guidance on each of the techniques is provided in Annex B of the Natural Capital Protocol. Numerous detailed guidance documents are available and those undertaking valuations should be familiar with the relevant guidance.

⁷ Health and Safety Executive (2001). Reducing Risks, Protecting People. Available at: <http://www.hse.gov.uk/risk/theory/r2p2.pdf> [Accessed 14 June 2024].

⁸ United Kingdom Treasury, 2018. The Green Book: Central Government Guidance on Appraisal and Evaluation. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf [Accessed 14 June 2024].

D5 | Collate results and attribute impacts

To interpret and present the results, they must be collated in a way that makes sense internally and for other relevant audiences. This is likely to involve some type of analytical framework, such as a cost–benefit analysis, appraisal summary table⁹, total profit and loss account, or total societal contribution. Taking a macro picture of performance across various capitals — social, human, natural, and produced — can identify the relative positive and negative performance for each and, in some cases, for each part of the value chain.

Collation of results will allow interpretation and support the decision-making process.

Complete sub-step D5 through the following activities:

- D5.1 Aggregate results
- D5.3 Identify who is affected
- D5.2 Identify levels of attribution
- D5.4 Conduct materiality assessment

D5.1 Aggregate results

Aggregation is the process of compiling data into a summary form. Aggregation of values is only possible when values are presented in a common unit, such as quantitative scoring or monetary estimates. When aggregating valuation results, be aware of what nuance might be lost in the process.

Rather than automatically assuming that results will be aggregated, remember that values should be presented at an appropriately granular level for the decision being made (Principle 4, Principles of Integrated Capitals Assessments, Capitals Coalition 2021¹⁰).

This means showing positives and negatives occurring within each capital. Any trade-offs between these positives and negatives should be made explicit to maintain transparency of the losses felt by capitals, sites, and stakeholders. Aggregating responsibly increases transparency and prevents unintended obscuring of impact, and, in this way, avoids potential reputational costs. Furthermore, it avoids misinterpretation if results are shared with new audiences who do not understand the nuances within the numbers. For example:

When accounting for carbon, carbon emissions need to be recorded alongside any carbon offsets.

Stating aggregated carbon emissions (emissions minus offsets) can mask an organization’s own carbon emissions. The same goes for other impacts, especially water and biodiversity, as well as impacts to humans such as injuries that are compensated for.

A loss at Site A that is offset at Site B can show “no-net-loss” or even a net gain but won’t appropriately reflect the losses felt by those at Site A.

Similarly, if a larger “Group A” sees a small increase in benefits due to a business action but at the expense of a large loss for a smaller “Group B,” the aggregated results would show a net increase for society. The distribution of benefits should be made clear to show that they are uneven.

Where losses occur in a location important to a stakeholder group, there is potential for loss of relational value, a unique form of value held between entities resulting from their historic relationship that cannot be fully compensated on a like-for-like basis. This can be particularly relevant to indigenous peoples and local communities where significant changes occur to the nature of the location.

See Box D.16 for considerations when claiming that results evidence positive or negative impacts.

⁹ An appraisal summary table sets out both monetary and non-monetary values allowing decision-makers to consider all issues together.

¹⁰ Capitals Coalition. 2021. Principles of Integrated Capitals Assessments. Available at: <https://capitalscoalition.org/publication/principles-of-integrated-capitals-assessments> [Accessed 14 June 2024].

Recommended best practice

Any aggregation of impacts should show a sufficiently granular breakdown clarifying all negative and positive impacts of the decision being made. All potentially significant negative impacts should be made clear to the final audience.

When conducting an integrated capitals assessment, avoid aggregating between capitals in any context. Extra care should be taken when dealing with monetary values as currencies can be easily and unwittingly added and subtracted in the absence of the contextual data underneath.

The Business Decision Template provides a clear way to demonstrate this granular detail and can form a basis for internal and external communications about your impacts based on decisions being made.

See Box D.15 on strong and weak sustainability.

Box D.15 Strong and weak sustainability

The reservations around aggregating between capitals are well articulated in the framing of substitutability within strong and weak sustainability (Capitals Coalition 2020).

- **Weak sustainability:** Weak sustainability assumes that capitals can be readily substituted, as long as there is an overall net gain. For example, under weak sustainability a mangrove can be replaced by a concrete coastal defense structure or cut down if the financial benefit outweighs the perceived benefits of the mangrove.
- **Strong sustainability:** Strong sustainability promotes the idea that each capital retains critical values that cannot be substituted, and that natural capital is often irreplaceable. For example, according to strong sustainability, in replacing a mangrove with a concrete coastal defense a range of other important benefits are lost, such as providing a nursery for fisheries and sequestering carbon.

Box D.16 Claiming positive impacts

It may be attractive, as part of aggregation, to claim a positive impact in a particular sphere, such as nature, biodiversity, water, education, or health. However, the integrated approach to capitals described in this Protocol highlights that such claims need to be treated with great caution due to the complexities of quantifying and verifying them. While in theory possible, claiming positive impacts that are not sufficiently backed up by a rigorous assessment methodology may lead to reputational risks and accusation of greenwashing.

As such, the following considerations should be taken into account when aggregating and interpreting results and making any claims of positive impact:

- **“Contributing to” global goals:** Rather than claiming to have a positive impact on a particular issue – especially for a broad and complex issue such as nature or inequality – it can often be more strategic and accurate to announce an organization’s contributions to relevant goals. For example, Nature Positive is an increasingly popular yet widely misunderstood concept that refers to the global goal to “Halt and Reverse Nature Loss by 2030 on a 2020 baseline and achieve full recovery by 2050.” Rather than claiming as a business to “be Nature Positive,” companies can describe their efforts to contribute to this goal depending on their most material impact pathways without running the risk of misleading stakeholders through an incomplete assessment of their positive and negative impacts. For a company to actually be Nature Positive, the individual business would need to be positive across all nature issues along its whole value chain since the company first started operating. From a produced capital perspective, company accounts can already be able to track your contribution towards national GDP figures.
- **Be specific about what any claim covers:** To claim having a neutral (e.g., net zero or no net loss) or positive impact on a particular impact category, a business must provide necessary details. Such a claim must specify what impact category it covers, for which part of the value chain, and for what time-period (e.g., just the past year or since operations began, upstream or for direct activities). Similarly, such a claim should include transparency about any impact categories and parts of the value chain that the business still negatively impacts.
- **Clear and transparent baselines:** In reference to the baseline identified in sub-step C1, the selected baseline for any assessment must not distort the actual amount of impact caused, whether positive or negative. For example, simply performing above an industry average does not justify claiming a “positive” impact.
- **Awareness of doing better vs. doing enough:** If a business is having a negative impact on nature or on society, reducing this impact may count as “doing better,” an empirical statement, while still not seen as “doing enough.” For example, a factory that reduced its polluting outputs is still having a negative impact, but to a lesser degree. This is especially the case for impacts where even a single unit of impact is seen as unacceptable, for example, child labor, slavery, or extremely toxic pollutants. Normative targets should be used to demonstrate the end goal or target based on commonly agreed foundations such as science-based targets, human rights, or sustainable development goals. It may be that a business is unable to achieve these normative goals for several years and progress is demonstrated in relative terms, but this should be seen as doing less harm rather than doing good. Some normative targets should act as red lines, where a failure to achieve them should be an unacceptable outcome. These may include child labor or slave labor in the value chain, violations of other human rights (human and social capital), or the destruction of globally significant ecosystems (natural capital).

- **To the extent that is possible, negative impacts should be offset within the scope of assessment:** As discussed later in box F.1 The mitigation hierarchy, the integrated approach requires thinking about the entire system to the greatest extent possible and appropriate. A business making or sourcing products or services within a value chain that are from highly polluting or exploitative industries or located in highly sensitive locations while claiming to be “net positive” due to investments in offsets may be distorting the truth.
- **Ensure careful consideration of impacts and trade-offs being transferred across capitals:** In much the same way that solely chasing financial profit can lead to negative impacts on social and environmental capital, impacts on nature, people, or society should not be willfully pursued at the expense of other capitals. This is covered in box D.15, Strong vs. weak sustainability.
- **Relational values should be considered:** According to relational values (i.e., the values one holds to a specific place or person), replacing an asset with another that is equally functional will likely result in a decrease in value due to the loss of specific relationships individuals have with that person or environmental asset. For example, a tree that is replaced from site A to site B may function in the same way but there may be a significant loss felt by stakeholders at site A for whom that particular tree contributed to their sense of place.
- **Present negative impacts alongside positive ones:** Granularity of results is important. Try to ensure all relevant details of positive and negative impacts are presented. A net positive impact can still represent significant positive and negative impacts. How these impacts are distributed will impact different stakeholders significantly (this is covered in box D.16). Where possible, the negative and positive impacts should be presented with information on stakeholder impact, location, and time frame.

D5.2 Identify who is affected

Throughout the collation process, alongside the valuation exercise it is important to retain clarity on the stakeholder groups and subgroups whom the valuation represents (i.e., the specific groups being affected by the impact).

This should ideally be done by conducting a distributional analysis to understand which groups are being affected to what extent by which impacts and where the groups are located. This analysis can be qualitative, quantitative, or monetary detailing which stakeholders are affected in what way.

Table B.2, already visited in Step B, lists stakeholder groups and subgroups to consider in an assessment.

D5.3 Identify levels of attribution

Attribution is an indication of the extent to which a business is responsible for an impact, whether positive or negative, within a system. Strongly related to this is how much a business controls or influences its impacts. There will be impacts (and dependencies) that a business can clearly control or influence and others where it may have a limited control or influence but can still help to manage. To understand the extent to which an organization has direct control or influence over a particular impact, it helps to consider what would have happened in the absence of the business’s activity. In the Protocol, analyzing attribution begins with Step B (sub-step B8), when considering scenarios.

The impact a business is responsible for is the difference between what happens as a result of its actions and what would have happened anyway. There are two aspects to this:

- The organization’s contribution to the depth and scale of an impact, factoring in the estimated degree of change/impact that would have happened anyway. Depth relates to the magnitude of change for a stakeholder, while scale relates to the number of stakeholders affected. An assessment should also, where relevant, take into account the extent of displacement. For example, factor in whether the business is taking market share from another business rather than providing additional value, or moving a social issue from one area to another, such as when moving costs from customers who are unable to afford food to farmers who have very thin business margins.
- The organization’s contribution to the duration of an impact factoring in how long it will last. Refer back to activity D1.4 on system dynamics to revisit the analysis of relevant feedback loops and thresholds that may have an influence here.

An assessment should use the following scale of attribution:

- **Direct:** The inclusion of activities conducted by the business, or that the business owns, or in which it has a controlling majority stake. For example, where the business is withdrawing water from a local water source.
- **Partial direct:** Where the business has worked with partners resulting in impacts and/or dependencies. The impact is still direct, and the assessment will need to attribute the part that corresponds to the business’s activities. For example, where the business is one of several companies withdrawing water from a local water system.
- **Indirect:** Where the business has commissioned activities by others or within its supply chain. For example, products sourced in the value chain that require water extraction from local water sources.
- **Enabling:** Activities that the business has enabled, or which are carried out in its portfolio (e.g., financed) or by customers and other parts of the value chain who are using the business’s products or infrastructure. For example, where companies the business invests in withdraw water from local water sources or the business creates products that are water-use intensive.

Table D.13 provides a hierarchy of the levels of attribution to use in a capitals assessment and how these might relate to the response.

Level of attribution	Description	Considerations for your response
Direct	Aspects of business conducted or owned by you, or where you have a controlling majority stake	These impacts will be more directly within your control to influence and manage
Partial direct	Work with partners resulting in impacts and/or dependencies	
Indirect	Activities commissioned by you or within your supply chain	
Enabling	Activities included in your portfolio (e.g., financed) or carried out by your customers or by other parts of your value chain	These impacts may require more collaboration to influence, whether at the sector, landscape, or global advocacy level
Adapted from Principles of Integrated Capitals Assessments, CapsCo 2021		

Table D.13 Levels of attribution and how this affects business response

Where enabling or indirect levels of attribution exist, all efforts should be made to ensure they are not avoided or ignored. In fact, including business impacts or dependencies that fall into these categories may lead to considering some of the deepest societal challenges that require a genuine systems solution to solve, such as widespread biodiversity loss, climate change, ocean plastic, the spread of non-communicable diseases, or the mental health crisis. Consider whether the actions of the business can help to influence the actions of others, possibly at the sector, landscape, or national level or through a consortium of committed parties.

The Business Decision Templates can be an effective way to clearly communicate who is affected and the level that they are affected. This could provide an important resource to communicate outcomes and demonstrate where, why and how decisions have been made. In the long term this could help to ensure that outcomes are socially sustainable.

D5.4 Conduct a materiality assessment

By this point, the assessment has described the system of interconnections, impacts, and dependencies stemming from the business's activities; developed pathways to help visualize this system; and undertaken a valuation study highlighting the significance of these impacts and dependencies, both to the business and to society. These valuations were conducted based on an initial prioritization process in sub-step D2, which served to focus resources on the most relevant and significant issues within the scope. As the assessment process moves towards decision-making, at this point a more formal materiality assessment can help to guide interventions.

In the Capitals Protocol, an impact or dependency is material if consideration of its value, as part of the set of information used for decision-making, has the potential to alter that decision. A materiality assessment is the process that involves identifying what is (or is potentially) material in relation to the assessment's objective and application. A full materiality process was not possible at sub-step D2, as the value (relative importance, worth, or significance) of the impacts and dependencies was not yet known and would have required making a judgment on incomplete information.

Businesses intending to manage all impacts identified through a capitals assessment can skip this activity since there is no need to limit analysis using the results of a materiality assessment.

A complete integrated capitals assessment will provide a comprehensive understanding of how the business's activities are:

- Creating value to the business by assessing both: (i) the impact to the business and (ii) business dependencies
- Impacting upon people, directly or indirectly, for example through changes in the state of nature, by assessing the impact to society

When assessing materiality in the context of a decision, consider the transmission channels that connect the value to the business and the value to society. This happens through many routes including operational, legal and regulatory, and financial or reputational risks or opportunities. Each of these should be considered in turn to help inform the materiality assessment.

The integrated assessment process helps to identify the material impacts and dependencies in the context of the decision to be informed, as it provides:

- Understanding of the context of business activities (covered in Step B)
- Identification of actual and potential impacts and dependencies (covered in Step D).
- Estimation of the value of impacts and dependencies which is useful in establishing the magnitude of associated risks and opportunities

Suggested iterations

With increased understanding of the impacts of the business's activities and the potential options and trade-offs, consider revisiting the baselines and scenarios set in sub-step C1 to confirm that the most useful information will be collected, and/or whether the assessment objective has evolved based on the outputs of this step.

D6 Document impacts and dependencies and explain trade-offs

Step D has been about understanding the business's impacts and dependencies and who is affected. The Act Stage will go into more detail about choosing actions to take based on this information. At the conclusion of Step D, clearly document, for example in the business decision template, what capitals are affected by the business's activities and which stakeholders, including shareholders, will be affected by decisions. Where trade-offs occur, consider how to minimize and, where appropriate, offset (recompense) stakeholders for impacts. Assessment reporting should clearly demonstrate what choices have been made with clear communication about trade-offs and why these decisions were made. The mitigation hierarchy and actions taken are explored more in the Act Stage. This Capitals Protocol will inform decision-makers of the full range of impacts and dependencies considered and will help to identify where remedial action is needed to reduce negative impacts, or redistribute benefits between different stakeholders.

STEP E | Validate and verify key assumptions and results

Implementing Step E will help to answer the questions:

Is the assessment built on robust data?

Could the assumptions used significantly affect the outputs?

How will the decisions affect different stakeholders and are they ethically right?

Outputs:

E1 | Result of testing, validating, and verifying key assumptions and results
The Confidence Criteria from the Governance for Valuation provides helpful support for this output

E2 | A summary of the ethics relevant to the final decision

To ensure confidence in assessment results, its key assumptions must be validated and verified. In addition to this, a check is needed on whether the information from the assessment is fit for purpose, applying the Confidence Criteria from the Governance for Valuation (the Confidence Criteria help assess the suitability and confidence of capitals information for decision-making). The actions and outputs of Step E address potential concerns about the accuracy and appropriateness of the valuation approach used.

Completing Step E includes the following sub-steps:

- **Sub-step E1 |** Test key assumptions and validate confidence in the results
- **Sub-step E2 |** Consider the ethical implications of assessment decisions

E1 | Test key assumptions and validate confidence in the results

E1.1 Test key assumptions

Making assumptions, estimates, and approximations is inevitable in conducting an integrated, systems-level assessment of a business's impacts. Naturally, this leads to a level of uncertainty. As modeling and analysis capacities evolve across the capitals, necessary assumptions and levels of uncertainty may decrease but, in the meantime, it is necessary to manage varying degrees of confidence when making decisions.

Natural, social, and human impacts and dependencies may be presented at a greater level of uncertainty than many businesses are used to. The level of this uncertainty should be communicated with results in such a way that these uncertainties are factored in. Rather than being seen as a reason not to use assessment results, uncertainty can be managed and can even be a useful tool in encouraging robust and thorough decision-making.

To understand the appropriate level of confidence that can be placed in assessment results requires conducting sensitivity analysis. This involves testing how changes in assumptions or key variables affect the results of an assessment (this is covered in the Transparency Requirements and Confidence Criteria of the Governance for Valuation document but also see table E.1). Sensitivity analysis may involve simulation modeling to identify critical thresholds, where small changes in the value of assumptions yield large changes in assessment results. Alternatively, it may simply involve reporting a range of potential values for a particular impact or dependency based on applying a range of different assumption levels (e.g., high, medium, and low estimates of visitor numbers or intensity of resource use). If value transfer has been used in the assessment, it is essential to conduct a sensitivity analysis as the level of accuracy is likely to be uncertain. Box E.1 provides further guidance regarding issues of potential overvaluation and undervaluation.

Assumptions you can test	How do my conclusions change if....
Number of people affected	15,000 instead of 1,500 people are affected?
Magnitude of change in a capital	Impact on DALYs changes from 0.1 to 1 or even 10
Changes in key prices	If the assumed cost of carbon is US\$100 rather than US\$25?
Changes to discount rates	A discount rate of zero, 2%, 5%, or 10% is used?
Time horizon	The assessment is carried out over a 10-, 30- or 60-year time frame?

Table E.1 Example assumptions to test in a sensitivity analysis

Box E.1 Overvaluation and undervaluation

The potential to undervalue or overvalue impacts to business and to society exists in any valuation exercise, and this could lead to poor decisions and adverse impacts on business, people, and nature. This potential can be reduced by involving relevant experts, using recognized methods, and following good practice guidance which has been developed and tested over many years.

In areas of uncertainty, it is usually preferable to choose the most reasonable assumptions, rather than defaulting intentionally towards best- or worst-case assumptions.* It is recommended that “best estimate” (or “most likely” estimate) is used alongside sensitivity analyses to test the potential implications of major variations in assumptions with large uncertainty ranges. Using reasonable assumptions produces more accurate results and therefore more decision-useful values. The assessment may already convey that something is undervalued by recognizing that not all values are possible to capture, such as in the case of intrinsic values.

The exception is areas of major uncertainty where the potential impacts of a wrong decision are very high (for example where species or ecosystems are at risk, tipping points may be breached, or human lives may be seriously affected). In these instances, an assessment should employ a precautionary approach to avoid potentially damaging undervaluation. The precautionary principle (see Box D.5) guides decision-makers to adopt precautionary measures when scientific evidence regarding a hazard is unclear and the stakes are high.

** This differs from financial accounting guidance which suggests that any assumptions required within company accounts should be “conservative” (i.e., should increase expected costs and reduce expected benefits accruing to the company).*

There are different methods of carrying out a sensitivity analysis, many of which require knowledge of statistics. Some, such as Monte-Carlo analysis, may require modeling. All methods are designed to provide information regarding the degree of confidence decision-makers can have in results, without overstating their accuracy.

In the case of monetary valuation, values may be sensitive to changes that are outside the business’s control, such as fluctuations in exchange rate, inflation, market values, and purchasing power parity. This can mean that a business’s impact could change between assessments without the business having changed its actions.

Recommended best practice

Users of the Capitals Protocol should carry out a sensitivity analysis to test assumptions and should communicate the results of the sensitivity analysis alongside assessment results.

E1.2 | Check double counting has not occurred

There is a risk that impacts and dependencies on capital assets will be counted twice, or even potentially multiple times. This issue can be exacerbated in multi- and integrated capital assessments. Ensure that capital asset impact values are explicitly categorized between the different capitals and wherever possible are not counted twice. This issue often potentially arises when valuing multiple ecosystem service values – it is thus important not to double count such values especially when several different valuation techniques have been applied. When dealing with a hybrid asset, be clear about under which capital it will be accounted for. The intention is to sufficiently categorize indicators correctly, and to organize a process that does not count any impacts or assets twice.

E1.3 | Validate and verify confidence in the results

Formal verification or external audit is not a mandatory feature of the Protocol but may be required if communicating assessment results to certain audiences (e.g., for external reporting). Different types of checks require different levels of effort (e.g., systematic or random, process audits, external validation), so it is important to decide what levels of validation and/or verification are required for the assessment, and the desired level of credibility.

Validation and verification may cover either the assessment process or results or both together. Validation of the accuracy and completeness of results will likely be required by internal colleagues involved in making the decision that the assessment is intended to inform. Verification can provide confidence to various stakeholders that the data and methodologies used are fit for purpose and that assessment results are sufficiently robust to be used as a basis for business decisions and/or external communication.

There are two general options:

- **Internal reviews** are “self-checks” that can be carried out within the company, ideally involving colleagues who were not directly involved in the assessment (e.g., internal audit department). This may be sufficient for internal decision-making. Internal reviews are often more flexible and easier to conduct but will not deliver the same level of external confidence.
- **External reviews** typically involve people from outside the company. It may be necessary or desirable to communicate assessment results to external stakeholders (e.g., for public reporting, to support customer relations, or to demonstrate compliance to regulators). In such cases, verification by independent experts can enhance the credibility of the assessment process and results. External reviews are typically more expensive and time consuming than conducting an internal review. Conducting an external review will require identifying an appropriate external party, agreeing to the scope and timetable of the review, providing documentation of assessment decisions and processes, and informing relevant stakeholders if they will be interviewed as part of the review process.

Whether conducting an internal or external review, questions may include:

- Was the scope of the assessment appropriately defined?
- Was the chosen scope applied consistently throughout the assessment?
- Were data relevant and as complete as possible, given the time and resources available?

- Were the data and data sources reliable, including the use of proxies, averages, and/or directly measured data?
- Were data collected from different sources consolidated appropriately and, where applicable, in a consistent manner?
- Was information on data uncertainties provided qualitatively and, if available, quantitatively?
- Were baselines and spatial and temporal boundaries selected appropriately and applied consistently?
- Are the assumptions reasonable, appropriate, and consistent?
- What scientific and estimation uncertainties were considered?
- Do the results address the objective of the assessment?
- Was a sensitivity analysis undertaken and across how many different variables or assumptions?
- Was documentation of the assessment process (including scoping, measuring, and valuing) appropriate and transparent?
- Was documentation of the collection and calculation of data appropriate and transparent?
- Was documentation of the results and their business applications appropriate and transparent?
- Have negative implications of trade-offs been appropriately mitigated, offset, and where appropriate, compensated?

The completed review should include a summary statement of the level of confidence that may be placed in the assessment process and results, as well as any caveats around the assumptions used and remaining uncertainties. The statement of confidence may be qualitative (e.g., using a scale from “very low” to “very high”).

The review may also highlight actions that can be taken to improve confidence in the results. The business will then need to decide whether to undertake any of these actions, which may involve revisiting part of the assessment. The Confidence Criteria and Value Notes of the Governance for Valuation provide a framework to confirm whether results are fit for the intended objective.

Box E.2 Confidence

Confidence in valuation estimates and sustainability information is typically lower than for financial information due to the lack of generally accepted accounting standards (Capitals Coalition 2023) and also often due to a lack of understanding of some of the underlying cause-effect relationships. In addition, valuation carries limitations that should be acknowledged in any decision-making process. Although confidence may be low, understanding the level of confidence is useful for decision-making processes. Having some insight and indicating the relative degree of confidence is better than no insight at all. Even knowing the magnitude of impacts, for example that the number of accidents in a workplace is between 0-1, 1-10, or 10-100, is useful to contextualize the scale of the management response needed, even though the level of confidence may be relatively low.

Confidence levels should be added, where possible, to all results. While qualitative values will often not need confidence levels, they may if applying high, medium, and low value estimates to values where great uncertainty exists. It should be noted that the UN SDG impact standards highlight that some level of risk and uncertainty is inherent in pursuing ambitious sustainability goals.

A useful resource is the Capitals Coalition (2020) document *Assuring the Capitals*, which provides further details on:

- Transparency in methodology and assumptions
- Sensitivity analysis
- Audit and assurance, internal and external, which assesses valuations against criteria

To summarize the suitability of capitals information, Value Notes, analogous to Financial Notes, can help to present any pertinent information on how figures were calculated, how they should be interpreted, and any caveats to bear in mind. See table 5 in the *Governance for Valuation*.

Recommended best practice

If there is significant uncertainty in the results (e.g., due to lack of data) but the business is unable to go back and revisit the assessment (e.g., due to resource constraints), or the underlying science is not yet well understood, it is recommended to take a precautionary approach. This is particularly important if decisions taken based on the results of the capital assessment might lead to highly significant impacts or surpass important tipping points and thresholds. In such circumstances, decision-makers may need to postpone making the decision and adopt the precautionary principle to avoid taking action that might create irreversible harm.

E2 | Consider the ethical implications of the decisions

Ethical considerations have been discussed at length throughout this document. In some cases, decisions are not immediately ethical concerns, but decisions made often have ethical implications. This document contains guidance on the following ethics-related topics:

- Considering stakeholders (Box A.1)
- Nature as a stakeholder (Box A.2)
- The precautionary principle (Box D.5)
- Purchasing power parity in monetary valuation (Box D.12)
- Institutional and power dynamics (Box D.13)
- Ethical considerations when discounting (Box D.14)
- Strong and weak sustainability (Box D.15)

In addition to this guidance, also consider how benefits are shared amongst shareholders. When applying an integrated capitals approach, chances are that a business is looking to create value for all stakeholders rather than just shareholders or vested parties. If so, there are some ethical considerations to keep in mind including, as examples:

- Consequences on the distribution of impacts across stakeholders. Maximization of benefits may not always be the best outcome from an ethical point of view. For example, a slight increase in benefits over a large population at large expense to a small population might create a larger net increase in benefits but the distribution of benefits may be hugely disadvantageous to a smaller population who do may not have much say in a decision-making process.
- Consequences for discounting across generations. Future generations are not present to be able to argue for sustainability needs. Impacts today will disproportionately impact generations to come and discounting and decision-making should consider this, where possible.
- Diverse perspectives of value. The values presented here are largely consistent with western worldviews. Different concepts of value exist and understanding local attitudes to value and things valued is important. This will inform decision-making when related to specific locations and decisions.

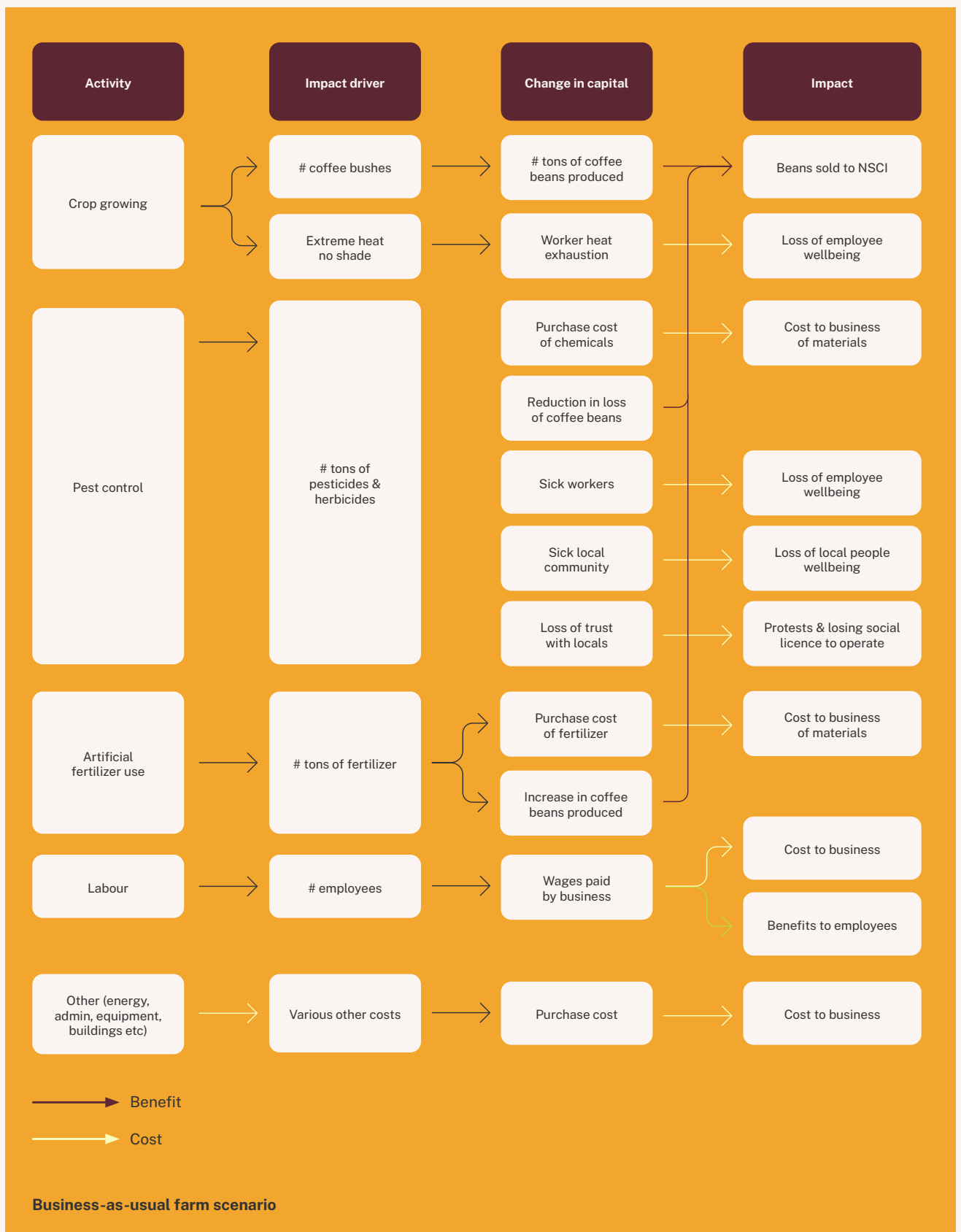
In addition to the guidance set out in this document additional sources include guidance from the Ten Principles of the UN Global Compact derived from the Universal Declaration of Human Rights, the International Labour Organization's Declaration on Fundamental Principles and Rights at Work, the Rio Declaration on Environment and Development, and the United Nations Convention Against Corruption.

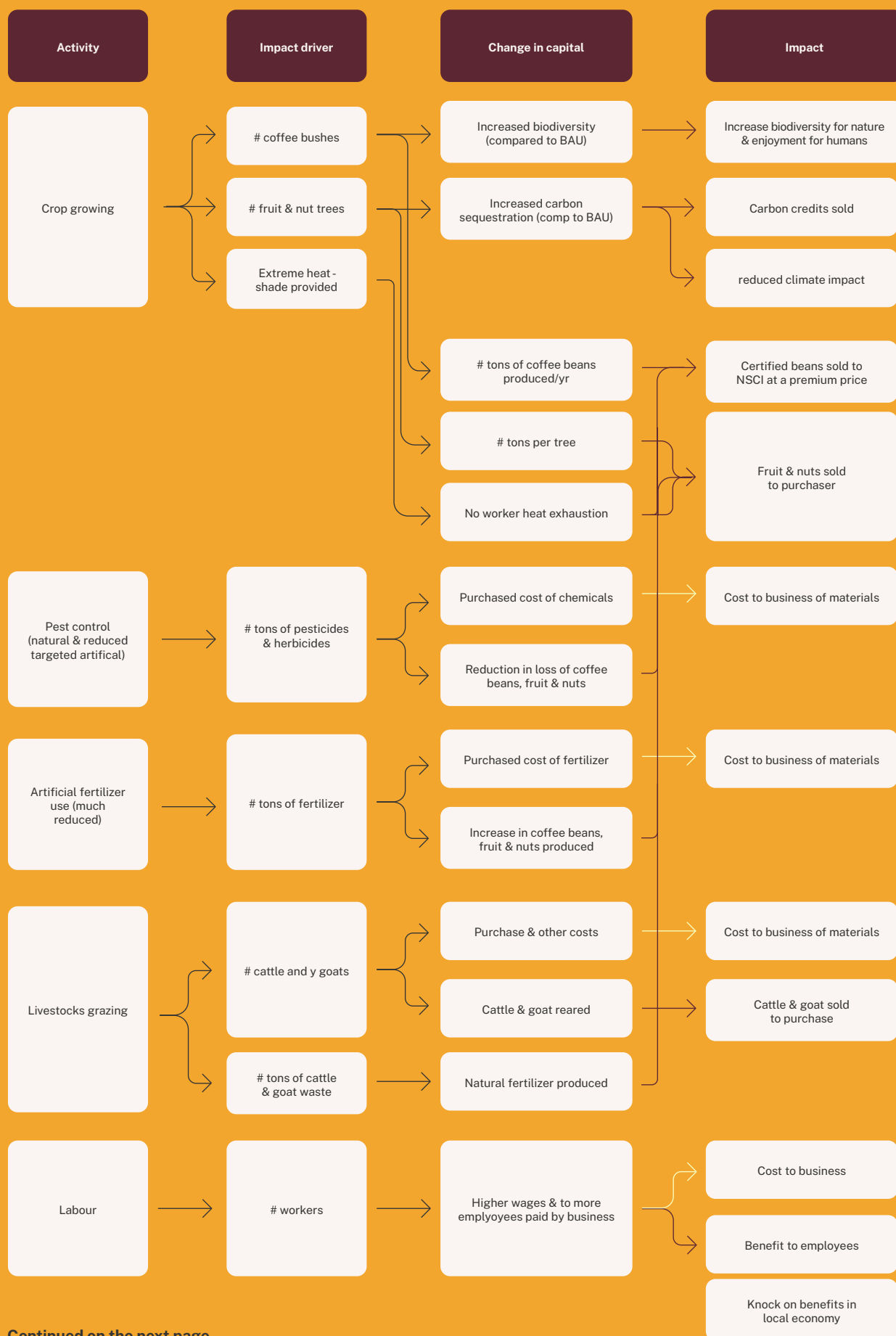
Box E.4

Never Sleep Coffee International (Assess)

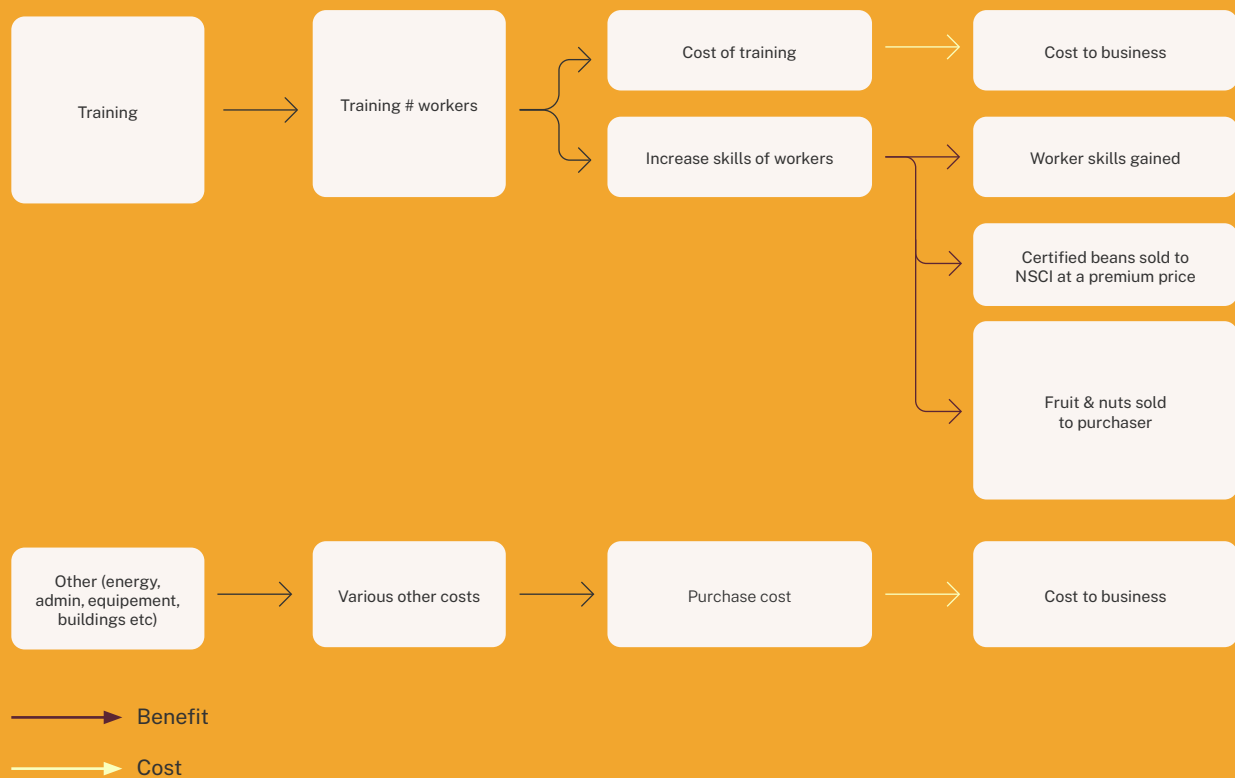
Valuation approach

After identifying key issues across the capitals that are important for the assessment, NSCI prioritized key impacts related to the baseline and scenario activities and mapped the impact pathways (figures below). The main impacts identified for carrying on in a business as-usual approach are around the various costs to business, loss of employee wellbeing, and impacts to the social license to operate. Regenerative farms were found to have a range of benefits to the local community including higher wages and increased skills, benefits to nature, and, in turn, community enjoyment of biodiversity. Though the regenerative farm scenario is not without costs, it does create profit opportunities, and these trade-offs require valuation for consideration in decision-making processes.





Continued on the next page.



Regenerative farm scenario

NSCI then used the pathways to inform an analysis of the expected financial and societal returns on investment. They quantified the impact drivers, measured changes in capital, and finally valued the costs/benefits to society. The results were then presented in an appraisal summary table (setting out the qualitative, quantitative, and monetary values).

Results

The regenerative agricultural scenario was found to produce the best overall financial and societal outcome by creating more value across all capitals for both the farming operations and wider society.

Despite not producing as much coffee annually in terms of overall quantity, the improvements in quality due to better soil health and minimal use of chemicals would enable certification as “regenerative coffee.” Moreover, the planting of fruit and tree crops would not only improve biodiversity by providing habitats for rare bird species but would yield additional produce that could also be sold by the farmers. The tree shading is also likely to provide positive health outcomes by improving working conditions related to heat stress, which would have knock-on benefits in terms of more efficient work and benefits to workers’ families and the wider community.

The regenerative model also increases the number of employees since more employees are necessary to support tending other trees and livestock. Despite costing the business more, this is offset by the additional produce generated and reduced costs for pesticides and fertilizers – also leading to social capital benefits in the wider community such as greater trust.

In contrast, although the business-as-usual model generates reasonable profits in the short term, these were predicted to decline over the long term with declining biodiversity, declining soil quality, increased regulations, and the deteriorating quality of product. Stakeholder engagement revealed local residents were increasingly affected by water contamination from fertilizers and pesticides and that trust was breaking down. Moreover, with increasing temperatures, health issues associated with heat stress were on the rise.

Validation

The sensitivity analysis undertaken demonstrated that even with low assumptions (e.g., for productivity and carbon prices) the financial and social returns on investment were still positive for the regenerative agriculture scenario.

The results were then validated and verified by an independent research team, which demonstrated confidence in the resulting outcome after assessing outputs of models and checking for uncertainty.

Box E.5

Smart Chips (Assess)

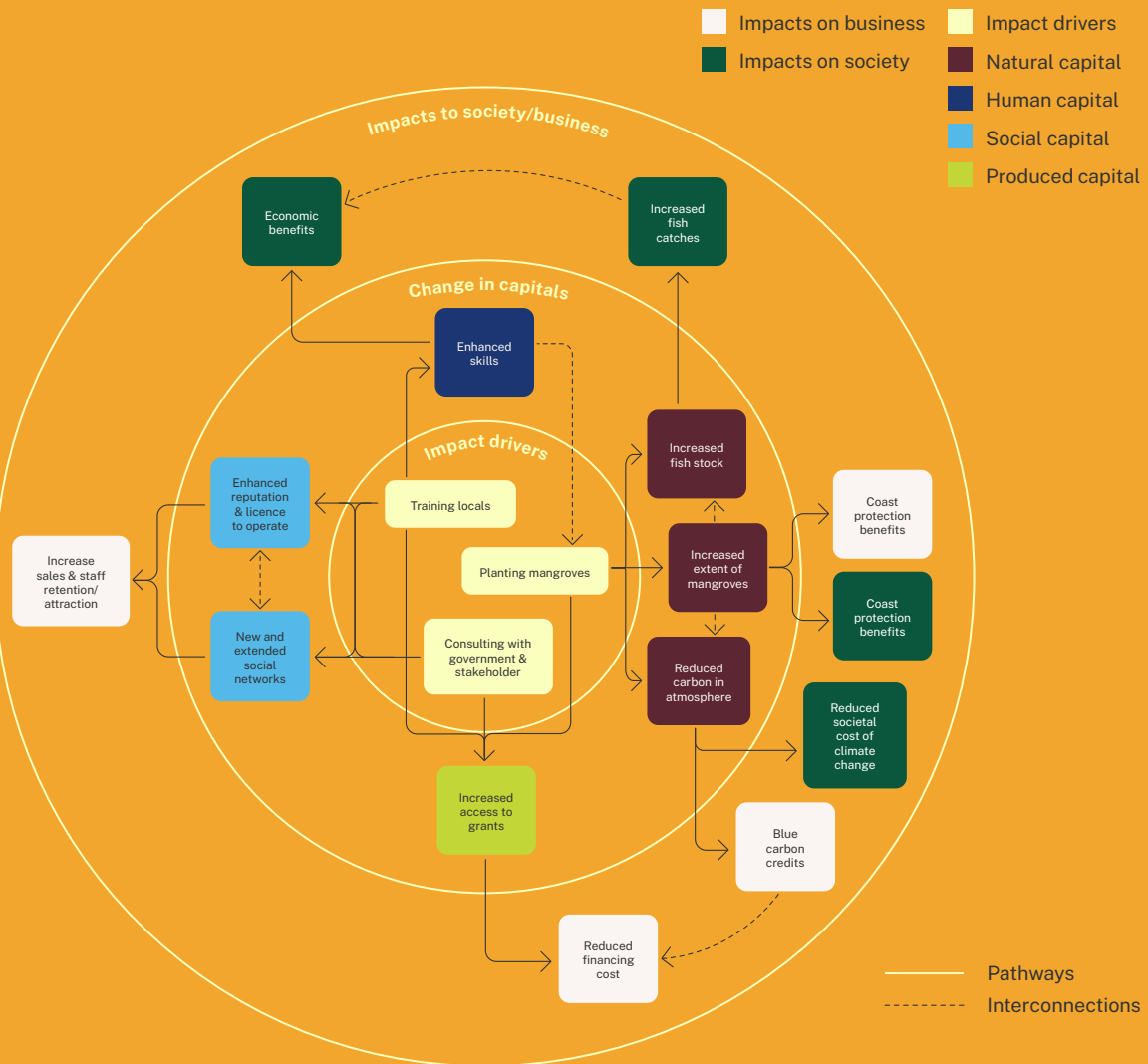
Valuation approach

Having listed potentially relevant impacts and dependencies across the capitals, Smart Chips then worked to visualize pathways through a radiating pathways diagram (figure 3 (appendix), Appendix 3) to enable them to identify potential interconnections and other systems dynamics.

The result of this process for the nature-based solutions mangrove restoration option is depicted in the diagram below. As can be seen, multiple interconnections were identified, some of which may not have been considered had this process not been conducted. In particular, they realized that by training and employing local residents and engaging with a range of other stakeholders in need of coastal protection, they could gain access to additional government funds to support the project.

Using the radiating pathways as a guide, the company then set out to conduct a financial and societal return on investment supplemented by an appraisal summary table (including qualitative, quantitative, and monetary values). This involved:

- Evaluation of financial costs of construction, operation, and decommissioning of a sea wall and mangrove planting and training
- Monetary valuation of mangrove impacts: coast protection, carbon sequestration, biodiversity protection, and enhanced fisheries
- Calculation of jobs provided and wages over time



Results

The valuation made clear that the nature-based solutions scenario produces the best financial and societal outcome. Some of the most material costs and benefits of each scenario are listed below.

Scenario 1 – Construction of seawall:

- High cost of materials and construction, and operation and maintenance.
- Exacerbates coastal erosion and flooding along the coast for other stakeholders.
- The lime for the seawall comes from a limestone quarry that was a bat cave, and mangroves elsewhere are cut to provide the charcoal to make the lime.
- Sand is dredged from a local river impacting a recreational resource of local children.

Scenario 2 – Nature-based solutions mangrove planting:

- Provides a much better overall financial and societal value return, not only for the business itself, but for all other stakeholders.
- Provides coast protection for other local communities which also supports the local economy.
- Provides additional co-benefits: carbon sequestration, enhancement of fisheries, and eco-tourism value.
- Enhances the knowledge and skills of locals who are taught how to set up mangrove plant nurseries and how and where to plant them. This training and experience enables them to supply and support other mangrove restoration schemes in the region.
- Enhances trust and reputation of the company.
- Helps to address two of the root causes of the coastal flooding threat: climate change and local communities clearing mangroves. By replanting mangroves, the company is contributing to its own, as well as global, net zero goals. By providing jobs to local communities, and catalyzing the emergence of a new tourism market, local people have new opportunities and an alternative to degrading the ecosystem. This helps ensure a just transition towards a net zero, nature positive, and equitable future.

Box E.6

Renew Energy (Assess)

Valuation approach

From the list of potential issues across all four capitals and their interconnections, Renew Energy prioritized which issues to take forward to valuation so that they could be compared across the sites.

The impacts selected, and the valuation approach chosen for each, are presented in the table below. As can be seen, a range of value types and techniques were selected, aiming for the most appropriate methodology for each issue. The mutually agreed Community Benefit Fund investment priorities are valued only for the relevant site, while all other issues are valued across all sites.

The company then gathered the necessary data and conducted a financial and a societal return on investment assessment supplemented by an appraisal summary table that sets out all the main impacts for the three sites. The appraisal summary table format allows qualitative values and quantitative units to be shown clearly alongside monetary values. A financial discount rate of 8% was applied to the financial costs and benefits, while a social discount rate of 3% was applied to the societal costs and benefits.

Results

The results from the valuation are presented in the appraisal summary table below. The table includes the expected financial costs and revenues, and predicted values, for all the impacts at each site for the 25-year project lifespan. Note that for the purposes of this case study write-up, not all impacts are identified, valued, and shown here.

Impacts	Site 1 - Education focus			Site 2 - Just transition			Site 3 - Energy efficiency		
	Quantitative		Monetary (£) & qualitative	Quantitative		Monetary (£) & qualitative	Quantitative		Monetary (£) & qualitative
	Unit	Quality		Unit	Quality		Unit	Quality	
Financial project cost			(380,000,000)			(400,000,000)			(410,000,000)
Community Benefit Fund			(8,000,000)			(8,000,000)			(8,000,000)
Financial project revenues			435,000,000			460,000,000			490,000,000
Local economy -indirect	% of costs	20	76,000,000	% of costs	25	100,000,000	% of costs	10	41,000,000
Agricultural land use	Ha	300	(1,500,000)	Ha	240	(1,200,000)	Ha	500	(2,500,000)
Biodiversity	BDD / nests	1,000	(100,000)	BDD / nests	1,200	(120,000)	BDD / nests	800	(80,000)
Visual and noise	Households	3,300	(4,950,000)	Households	3,000	(4,500,000)	Households	750	(1,125,000)
Retraining fossil fuel workers				Participants	250	50,000,000			
Local job provision (life of project)	#JobFTEs	20	8,000,000	#JobFTEs	30	12,000,000	#JobFTEs	15	6,000,000
Education	#students	350	35,000,000						
Trust / social networks	Group networks	14	High		16	High	Group networks	7	Medium
Lower Energy Discount Scheme	Households	8,000	1,200,000	Households	10,000	1,500,000	Households	1,000	150,000
Household energy efficiency support							Households	50	1,125,000
Net financial revenue (Profit)			47,000,000			52,000,000			72,000,000
Financial return on investment			12%			13%			17%
Non financial value (To society)			113,650,000			157,680,000			44,695,000
Total societal impact (Welfare value)			160,650,000			209,680,000			116,695,000
Societal return on investment			42%			52%			28%

The valuation found that Site 2 would lead to the best overall outcome. Although it was not the most profitable in terms of financial value, it created the most societal value. The Community Benefit Fund would enable 250 ex-fossil fuel employees to be retrained for more secure employment and 30 locals could also be provided jobs for 25-year FTEs, leading to multiple secondary benefits in the currently poor community. As a result of several other nearby onshore wind projects, Site 2 also had the strongest local supply chain. It would cover 25% of project costs, meaning that the community would benefit from £100 million of spending in the local economy. Moreover, the previous experience with other wind developments meant that trust and community acceptance of the project was also highest. Overall, the financial RoI was 13% compared to a societal return on investment of 52%.

Site 1 was found to have a similar financial return on investment of 12%, but to create less societal value, with a social RoI of 42%. The major societal benefits were the result of the 350 underprivileged youths receiving a better education, 20 locals with jobs for 25-year FTEs, and a poor community benefiting from £76 million spending in the local economy.

Act



The Act Stage – A high-level run-through

Purpose: Making decisions based on multiple forms of capital, ultimately embedding capitals thinking into everyday business operations.

Structure: The Act Stage concludes the integrated assessment process by helping a business to apply and act upon assessment results. This stage is structured around two required steps for integrated decision-making that will help clarify the decision to inform, scope impacts and dependencies, and decide on how to value these.

- **STEP F | Make the decision:** This step focuses on taking the outputs of the assessment and putting them into practice by making decisions based on a wider set of values that have been identified.
- **STEP G | Integrate values and decisions in business planning and strategy:** Make an informed decision based on assessment insights and communicate these and the underpinning valuation.

Implementing Value Notes from the Governance for Valuation is a key element of the Act Stage and allows a business to communicate the assumptions and approach of valuations.

See Figure 1, 2, 3 to see how the steps from the ACT Stage fit into the Integrated Decision-Making Framework.

Key output: Decisions that are integrated in the organization's strategy and actions, with Value Notes to clarify the valuation approach. Output from this stage will depend on the intended purpose of the capitals assessment but a key outcome will be the embedding of capitals thinking into the business's decisions and a shift toward more holistic values-based thinking. Assessment-informed decisions can take diverse forms, depending on the set objective, and can have a focus on risk, operational or financial management, strategy, or internal and external reporting.

Relevance of the Assess Stage for different audiences:

While the Assemble and Assess Stages above all support practitioners, the Act Stage should be primarily used by decision-makers, with support from practitioners and guided by regulators to help to understand, make the appropriate decision, and communicate the results to stakeholder groups.

- **Decision-makers** – Based on insights from the Assess Stage, an informed decision can now be made with confidence in the underpinning valuation of integrated impacts and dependencies on all capitals. Both the decision and the valuation approach used can be communicated consistently.
- **Practitioners** – The Act Stage, with its links to relevant parts of the Governance for Valuation, provides guidance for practitioners on how to communicate the valuation approach taken and its underlying assumptions.
- **Regulators** – The Act Stage, with its links to relevant parts of the Governance for Valuation, provides guidance on how to communicate results and assumptions of valuation. The Value Notes guidance is particularly relevant, as these will establish confidence and reliability by ensuring that valuation of all capitals is communicated consistently and comparably to the way in which financial information is communicated through Financial Notes.

Guiding questions	Sub-steps	Outputs
STEP F Make the decision and agree recommended actions		
How do you make an informed decision based on the results of your assessment?	Sub-step F1 Make the decision	Output F1 List of decisions that have been taken, with a summary of how values were calculated and how they should be interpreted The template for Value Notes from Governance for Valuation provides directions for the summary of how values were calculated.
What actions must you take to implement my decision?	Sub-step F2 Agree on the recommended actions	Output F2 A list of recommended actions to implement the decision
STEP G Integrate the decision(s) and values of all capitals in business planning and strategy		
What have you learned and how can this be integrated in future strategy and planning?	Sub-step G1 Integrate all capitals in business planning and strategy	Output G1 A summary of learnings from the decision-making process, and, if needed, an adjusted plan and/or strategy, incorporating the decisions and the underpinning valuation of all capitals
What should you communicate to your stakeholders?	Sub-step G2 Communicate the result	Output G2 Summary of your decision and actions, including how values were calculated and should be understood

This stage provides additional guidance to allow you to answer the following question:

How will the business apply and integrate the capitals into existing processes?

Steps F and G consider how to act upon the results, how to communicate them to inform decisions and engage stakeholders, and how to build capitals assessments into the company's policies and processes on an ongoing basis.

Previous stages outlined the steps for conducting an assessment. When undertaking the Act Stage, it is worth considering how to:

- Leverage the existing business strategy. To integrate the capitals into existing processes, rather than remaining in the business's sustainability department, results should be used in strategic and operational decision-making. Ultimately a separate capitals approach should not be needed as an integrated approach will become embedded in the business.
- Establish clear, consistent, and relevant criteria for the success of capitals assessments. This will help clarify the business case for carrying out further assessments.
- Learn from and link to other related assessment processes within the business. Sometimes projects and activities that are closely related to capitals use language that obscures the link. For example, environmental, human, and social risk management can be considered a form of capitals protection, but others within the business may not make the connection.

STEP F | Make the decision

Complying with Step F will help to answer the following question:

What lessons have been learned and how can this be integrated into future strategy and planning?

How does the business make an informed decision based on assessment results?

What should be communicated with stakeholders?

Outputs:

F1 | List of decisions made, with a summary of how values were calculated and how they should be interpreted

The template for Value Notes from the Governance for Valuation provides directions for the summary of how values were calculated

F2 | A list of recommended actions to implement the decision

The decisions made, and recommended actions agreed to, should be communicated to all relevant stakeholders inside and outside the organization. This process can be aided by using Value Notes and Board Decision Templates as found in the Governance for Valuation. Comparable to the role of Financial Notes in financial statements, Value Notes clarify the assumptions, methodology, and policies used in statements on value. In addition, Board Decision Templates¹ can be embedded into an organization's standard operation systems, to support decisions built on more complete information that considers impacts and dependencies on all capitals.

It is important to communicate all elements that contribute to results and recommended actions, including those that may be outside of the process presented in the Protocol. Other factors may well influence the final decision, such as a change in government policy or market fluctuations.

Completing Step F includes the following sub-steps:

- **Sub-step F1 |** Make the decision
- **Sub-step F2 |** Agree on the recommended actions

F1 | Make the decision

The original assessment objective may have referenced a specific decision or question that needed answering. If the assessment has remained fit-for-purpose, it is now time to see that decision through.

Of course, decisions are rarely made on objective information alone; emotions, instinct, and relationships all play a conscious or subconscious role. To an extent, the judgment of individual decision-makers dictates how benefits and impacts are distributed and, thus, who will benefit from decision-making processes (this is discussed further in sub-step G2). Applying a capitals approach can help to make decision-making more transparent, and decision-makers more accountable.

¹ Capitals Coalition (2024) Business Decision Template. Available at: <https://capitalscoalition.org/publication/decision-making-template/>.

Applying an integrated capitals approach often demonstrates that it's almost impossible to avoid impacts at one location or another, or between stakeholders, capitals, the value chain, or time periods. When deciding between alternative options, while the aim is typically to derive positive impacts, there will inevitably be negative impacts somewhere – hence trade-offs to make. This is an unavoidable truth of operating in a resource-constrained and complex world. Having integrated information provides greater insight into the consequences of decisions than any other tool. Estimating monetary values for the different positive and negative impacts or applying multi-criteria analysis can help evaluate and compare trade-offs between options. Such approaches cannot make final decisions, but they can provide enhanced insights for a better-informed result. The mitigation hierarchy (Box F.1) provides a set of principles for considering trade-offs between impacts. Creating negative impacts should always be seen as the last resort and, if unavoidable, should be offset with positive impact actions, ideally in the same location and/or in relation to the impacted stakeholders.

How decisions are made will often depend on the fundamental purpose of a business (Blueprint for Business, n.d. World Economic Forum 2023).² Maybe the business's purpose already extends beyond profit, or maybe it aims to deliver the greatest value to society within the remit of creating shareholder value. When faced with making decisions with no obvious win-win-win-win outcomes, proceed in the most meaningful way forward for the business, and all stakeholders to whom the business is accountable.

Recommended best practice

Focus on the final objective - Rather than restrict the decision to the investment options already identified, focus on the desired endpoint of your capitals assessment, and then engage systems thinking in designing a management approach to achieve it.

Do no harm - Ensure the decision does not knowingly cause significant or irrevocable harm to any capital, stakeholder group, or subgroup, on any spatial or temporal scale. If significant harm is anticipated the intervention should not be accepted and all alternatives and management options need to be considered.

Engage where negative impacts are unavoidable - Where there is an unsatisfactory or negative impact to any capital, stakeholder group, or site, either immediately or on a longer-term temporal scale, ensure that this is actively discussed and managed. Will it be addressed in the future and, if so, when? Can compensation be offered in the meantime? How will the negative impact be discussed with those experiencing it? Can the mitigation hierarchy (see Box F.1) be applied?

Be cautious around tipping points - Contributing significantly to a system tipping point should be avoided if there is any question of negative. Some thresholds will have zero tolerance, whereby any impact will have irreversible and catastrophic harm. These may include, for example, slavery, child labor, or forever chemicals. Understanding thresholds with positive consequences, conversely, can be a good way to create change that is disproportionate to the resources required to bring this about. For example, by altering the ranking of importance of multiple options for business decisions, or when values change from negative to positive (e.g., in a cost-benefit ratio) or crossing a certain threshold. Where a system is not well understood, any intervention should apply a precautionary approach. Consider worst-case scenarios related to thresholds and tipping points — try to avoid irreversible damage or start slowly with test cases where appropriate.



² Blueprint for Better Business, 2024. Homepage. Available at: <https://www.blueprintforbusiness.org/> [Accessed 14 June 2024].

Box F.1 The mitigation hierarchy and AR3T framework

The mitigation hierarchy is an approach that guides users towards limiting, as far as possible, the negative impacts from activities. It suggests the following series of sequential steps:

- **Avoid:** Avoid creating negative impacts on the capitals wherever possible.
- **Minimize:** If avoidance is not possible, efforts should be made to minimize the extent, intensity, and duration of the impacts. This includes implementing best practices and technologies to reduce harm.
- **Restore:** When impacts occur, or have occurred historically, restoration involves rehabilitating the affected stock of capital to its original or better condition. Restoration may focus on reparation for historic wrongs, investing time, money, or effort into restoring broken relationships, or investing in individuals. It may involve the renewal or repair of machinery or built assets.
- **Offset:** As a last resort, if residual impacts remain after avoidance, minimization, and restoration efforts, offsets can be implemented. Offsetting aims to compensate for the remaining negative impacts by protecting or restoring nature in other areas, or, for example, by paying some form of appropriate compensation for injuries and deaths to humans. Shortcomings of offsetting have been discussed elsewhere in the Protocol and may be considered unethical for certain impacts, depending on how they are applied and communicated.

The Science Based Targets Network (SBTN) has recently developed an updated version of the mitigation hierarchy within a nature context. Known as the AR3T framework it comprises: Avoid, Reduce, Restore & Regenerate, and Transform. The AR3T framework delineates a series of steps designed to guide companies on the key actions they can take to contribute to a nature-positive future. In particular, the first steps build on the mitigation hierarchy and an additional step is added to focus on the transformational change needed to rebalance society's relationship with nature. While AR3T has been designed in the context of nature positive, this framework can apply across all capitals when conducting an integrated assessment.

When deciding how to act to amplify positives, and mitigate or avoid negatives, the Capitals Protocol recommends a) revisiting assessment impact pathways to identify potential leverage points and b) understanding the business's influence for change.

Complete sub-step F1 through the following activities:

- **F1.1** Revisit impact pathways
- **F1.2** Collect and consider assessment learnings
- **F1.3** Determine if planning or strategy need adjustment
- **F1.4** Share assessment results with the appropriate decision-makers

F1.1 Revisit impact pathways

The impact pathways developed in Step D were not only a means to facilitate the valuation process, they are also a working representation of the complex systems in which the business operates, and a vital tool to identify where changing practices or influencing factors can influence impacts and dependencies in a positive direction. Tracing back from the impacts to be changed, whether amplifying positives or mitigating negatives, look at the system dynamics, business-driven factors, and external factors that influence the impacts' significance. Look for opportunities to influence these variables, known in systems theory as leverage points (as discussed in Box F.2).



Box F.2 Leverage points

Considering leverage points can often challenge conventional thinking as this can highlight how some of the most common mechanisms for enacting change are often the least effective. For example, intervening through quantitative parameters, such as adjusting budgets, can have little effect on the overall behavior of a system. Donella Meadow's Thinking in Systems highlights some of the more powerful types of leverage points, these include:

- **Changing the goal of the system:** Changing the purpose or goal of a system can have a far-reaching impact on its behavior and outcomes. For example, shifting the primary goal of a business from maximizing shareholder profit to creating shared value for all stakeholders can lead to profound changes in system behavior.
- **Changing the structure of information flows:** By improving transparency and access to information, feedback loops can become more effective, allowing for better decision-making and quicker responses to issues. For example, sustainability reporting initiatives work to shift global financial flows away from nature-negative outcomes and toward nature-positive outcomes by encouraging organizations to disclose their nature-related issues.
- **Altering the rules and incentives within a system:** Changing rules, such as internal company policies, or social norms can have a significant impact on system behavior by altering the incentives and constraints that shape people's actions. For example, introducing an internal price on carbon can help to steer a company towards reduced carbon emissions.
- **Changing the structure of material stocks and flows:** Introducing changes in one component of a system can result in additional changes across the entire system. For example, increasing gender equality in the C-suite can restructure decision-making processes, bringing diverse perspectives that enhance inclusivity, innovation, and balanced risk management, ultimately improving business performance and adaptability.

The Science Based Targets Network (SBTN) has recently developed an updated version of the mitigation hierarchy within a nature context. Known as the AR3T framework it comprises: Avoid, Reduce, Restore & Regenerate, and Transform. The AR3T framework delineates a series of steps designed to guide companies on the key actions they can take to contribute to a nature-positive future. In particular, the first steps build on the mitigation hierarchy and an additional step is added to focus on the transformational change needed to rebalance society's relationship with nature. While AR3T has been designed in the context of nature positive, this framework can apply across all capitals when conducting an integrated assessment.



Box F.3 Paradigm shifts:

In *Thinking in Systems*, Donella Meadows describes the biggest leverage point in a system is in creating a paradigm shift. A paradigm shift is a fundamental change in the basic concepts, experimental practices, and core assumptions of a scientific discipline. The capitals approach is just one way of viewing a business's impacts and dependencies on the world. In particular, the capitals approach views productive assets and their ability to create benefits and value now and into the future. However, the capitals approach is just one way of viewing the system and other organizations may approach it from a wellbeing, human rights, sustainable development, or other lens. It is possible to use these approaches in conjunction with each other in a wider wellbeing paradigm.

By embedding a wider set of assets, or productive sources of value, into its decision-making and shifting to a wider understanding of value, a business can shift the paradigm in which it operates away from the prevailing paradigm that focuses purely on financial outcomes. Embedding this approach throughout a business will change how the organization, as its own system, creates outcomes through reducing long-term risks, improving resilience, and creating long-term sustainability while simultaneously creating benefits for the planet and society as a whole.

F1.2 Collect and consider assessment learnings

It is advisable to collect, record, and consider the key learnings from the assessment and associated decision-making process to support further progress within the business in basing decisions around an integrated capitals approach. Ideally these key learnings, or elements of them, could be shared externally to contribute to refining the integrated capitals approach.

F1.3 Determine if planning or strategy need adjustment

Based on the assessment outcome, consider what, if any, adjustments are needed to the business's planning or strategy. This will inevitably involve discussions with multiple departments, senior executives, and board members, especially those with responsibilities for setting company strategy.

F1.4 Share assessment results with the appropriate decision-makers

Once all assessment results and recommended actions have been collected in one place, these should be shared with the relevant decision-makers. The fundamental point of a capitals assessment is to aid decision-makers in business-as-usual decisions. A completed assessment should not sit unread, or unimplemented.

F2 | Agree the recommended actions

In conjunction with communicating assessment results, the resulting proposed actions should be communicated too, whether internally and/or externally. Since it may take time to determine the final set of actions to be undertaken, at a minimum, outline the recommended actions. Follow up by communicating the actual actions in due course, if necessary, to ensure clarity and continuity in the implementation process.

The ACT-Framework and guidance, including the Nature Strategy Handbook and the twelve Sector Guides, are a helpful start for identifying potential actions. These should be supplemented with specific actions related to the other capitals.

Box F.4 High-level Business Actions on Nature in the context of integration of capitals in decision-making

The Protocol builds on the ACT-D Framework that outlines High-level Business Actions on Nature (Business for Nature and PwC 2023). In the context of determining and communicating recommended actions, ACT-D Framework guidance relevant to Commit, Transform, and Disclose is particularly relevant. Whilst ACT-D is focused on nature, it can be largely applied across the capitals. The overarching question may be broken down as follows:

For Commit:

- How will results be used? This includes guidance on how results may be used to inform business decisions, given the assessment objective and scope, and potentially to set targets.

For Transform:

- How can a capitals assessment be integrated into business decision-making?
- How does the assessment process relate to existing or new decision-making processes within the company?
- What resources or decisions would be needed to embed capitals assessments into the business's systems?

For Disclose:

- How should the results be communicated? A few considerations are provided about how to communicate the results of an assessment, as well as the assessment process, keeping in mind any confidentiality concerns.

See also Annex 1 High-Level Business Actions on Nature.

Recommended best practice

Appropriate stakeholder consultation should be maintained throughout the assessment process, including in the communication of results and actions to be taken. Depending on the nature and purpose of the assessment and prior commitments, results and other relevant information should be disclosed to relevant internal and/or external stakeholders.

Maintaining transparent communication encourages a productive relationship across stakeholder groups and keeps the business accountable for its decisions. High levels of transparency and effective feedback mechanisms are needed to address power imbalances, build trust, and create genuine dialogues with affected stakeholders.³

It is also important to consider the ethics of not acting upon knowledge of potential and realized negative impacts. This may create risks to the business's reputation and the trust upon which its social capital is built. It may also create risks of litigation or future regulation. In some cases, where there are strong connections to surrounding communities, damaging the business's social license to operate may result in operational disruptions or even stop orders.

³ Discussion paper by the Value Commission: [Valuing what matters: pluralism, power, and business decision making](#)

STEP G | Integrate values and decisions in business planning and strategy

Implementing Step G will help to answer the following questions:

What has been learned and how can this be integrated in future strategy and planning?

What should be communicated to stakeholders?

Outputs:

G1 | A summary of learnings from the decision-making process, and, if needed, an adjusted plan and/or strategy, incorporating the decisions and the underpinning valuation

G2 | A summary of the decision and actions, including how values were calculated and should be understood

The Value Notes template from the Governance for Valuation provides helpful guidance for this output.

To ensure consistency, it is important to integrate assessment results and values into ongoing business planning and strategy. Because each decision follows and builds upon previous decisions, and precedes future decisions, it is crucial to integrate decision(s) and the underpinning value factors and generated values into the organization's planning and strategy.

To complete this Step, you will need to carry out the following sub-steps:

- **Sub-step G1** | Integrate all capitals in business planning and strategy
- **Sub-step G2** | Communicate the result

G1 | Integrate all capitals in business planning and strategy

At the conclusion of a capitals assessment, a business will have new, more informed ways to think about its impacts and dependencies on different systems, capitals, and forms of value. New solutions to persistent problems may have identified, offering greater value across the capitals than has been considered before.

A capitals assessment can and should lead to new ways of thinking about how a business relates to the systems on which it relies and the interdependencies between nature, people, and the economy. Consider whether, and how, the assessment might have challenged the existing business model or management processes. For example, it may flag significant capitals dependencies that were previously not included in company risk assessments such as ecosystem services, abiotic services, social license to operate, educational development, or infrastructure provided by others. Or an assessment may reveal previously unrecognized risks or opportunities associated with indirect impacts of the business on society, through changes in natural or social capital or other interconnected capitals revealed through systems analysis and secondary pathways.

In extreme cases a capitals assessment may fundamentally challenge or support the business model, the latter being more likely in purpose-driven businesses. It is most likely that an assessment will provide a range of insights that, together with other political and organizational factors, will support more robust, better-informed decision-making.

In general, as a business begins to include all capitals more systematically in its decisions, more aspects of the business will be affected. A capitals approach to specific business applications can be considered more regularly and built into existing or new business processes. For example:

- Which systems and processes are currently used in the company, and how do integrated assessments connect, complement, or integrate with them?
- Does the company already have a strategic sustainability focus (e.g., on water, health and safety, and/or community engagement) that could be used as an entry point for further integrated capital assessments and to secure wide internal support?

For further inspiration on how to integrate capitals across different levels of the business, see the IFRS Integrated Thinking Principles (IFRS Foundation 2021).

The value of an assessment can extend far beyond the decision at hand; it may serve to build internal awareness and capacity on systems contexts, a wider range of impacts and dependencies, and potential business exposure to external pressures. While all relationships and possible pathways noted may not lead to a formal assessment, the basic concepts raised and considered through a capitals assessment serve to inform all future decisions, both major and minor, so that they are more holistic and robust at all levels. This gradual introduction of new concepts or perspectives into everyday operations may ultimately have more influence over changing business practices than a one-off integrated capitals assessment.

Finally, an assessment can generate social capital of its own through inviting engagement in new networks and initiatives that are working on capitals, valuation, or any of the material issues identified during the assessment. Reach out to the Capitals Coalition for more information and introduction to potentially relevant partners.

G2 | Communicate the results

Now that the completed assessment has been verified and the limitations on the approach assessed, it is time to share the results and rationale for any ensuing actions with stakeholders, as deemed appropriate in accord with your assessment scope. Depending on the purpose of the assessment, make a plan to communicate the results internally and/or externally. Any communication should clearly explain the assessment process and results, including assumptions, uncertainties, and limitations or trade-offs that may apply.

Given the growing level of interest in, and acknowledged challenges associated with, claiming positive impacts, it is recommended to refer back to Box D.16 on claiming positive impacts if that is one of the intentions in communicating assessment results.

Complete sub-step G2 through the following activities:

- **G2.1** Communicating internally
- **G2.2** Collect and consider assessment learnings

G2.1 Communicating internally

The Capitals Protocol introduces seven best practice points for communicating valuation results to ensure a fair and informed interpretation by decision-makers. At a minimum, these best practice points should be applied to all internal communications with decision-makers within the company. Ideally, the extent to which they can be used in communication with external stakeholders should also be considered.

Recommended best practice

When communicating valuation findings to decision-makers, apply the following best practice:

- 1. Business versus societal values.** Ensure that it is clear whether impacts and values relate to the business (i.e., financial values) or to external stakeholders (i.e., societal values). For example, highlight whether the business is creating value for the enterprise and/or creating value for local communities.
- 2. Distribution of stakeholder impacts.** Document the distribution of impacts across stakeholder groups and subgroups. For example, where funding for a project with community benefits exists, consider showing different sources of this funding and how it relates to value creation and distribution across beneficiary groups. Similarly, when assessing capital impacts, clarify their distribution among key stakeholder groups, for example, local communities, specialist user groups such as fishers, vulnerable groups, and global populations (in the case of greenhouse gas emissions).
- 3. Full disclosure of costs and benefits.** Ensure that all costs and benefits are disclosed in full granularity somewhere within the valuation; particularly where costs and benefits might be offset between capitals, stakeholder groups, or sites, or across different temporal scales. For example, when conducting an investment resulting in environmental costs and social benefits, these two items should be presented separately.
- 4. Acknowledge intrinsic values.** Ensure that, where possible, intrinsic values are clearly acknowledged within valuation, even if only qualitatively. It is not possible to value intrinsic values using monetary approaches, but this does not mean they should be left out. For example, explain the stakeholder process conducted and how you took into consideration the intrinsic values whilst not quantifiable will be affected by the number and type of organisms, and extent of natural pristine areas, affected by your decision.
- 5. Clear and transparent baselines.** Clearly state the baselines against which positive or negative impacts are claimed such as business as usual or a historic baseline. Note that the Nature Positive Initiative uses a global baseline of 2020.
- 6. Share impact pathways.** Ensure that the assessment's impact pathway(s) are made available alongside valuations to facilitate decision-making at critical leverage points. This may be in the form of a written narrative or through sharing impact pathway visualizations (see examples in sub-step D1). Developing this further can improve communication of your results, such as through creative means like an animation.
- 7. Document the valuation methodology.** Ensure that the valuation methodology and process have been documented in sufficient detail for a fit-for-purpose judgment. For example, publish assessment models and assumptions in an annex or as notes in the statement. An accounting spreadsheet can provide in-depth understanding of approaches. If confidence in the valuation results is insufficient to reliably inform a decision, the exercise can be redone.

The Governance for Valuation provides guidance to structure outputs to transparently summarize valuation information for decision-makers. These outputs take the above recommended best practice and, in a modular approach, put it into action.



At this point it is worth emphasizing that the capitals approach should not be communicated solely in the realm of the sustainability department (or equivalent) but as of material use in — the boardroom — with the process and results being useful at every level up to and including the CEO and Board. The results of the assessment should be included in management board papers, integrated into the business's corporate risk process and balance sheets, or built into a business operations program. For suggestions on communicating with different internal audiences, see the Board Decision Templates or the We Value Nature "Persona Cards."²¹ While the Persona Cards were developed for natural capital, the principle behind them can be applied for integrated capitals as well.

G2.2 Communicating externally

Sharing information about a capitals assessment can help strengthen relationships, explain decisions, and demonstrate a broader, more holistic form of cost-effectiveness or return-on-investment when looking for value returns. The original assessment purpose will help to determine audiences for external communications. It is crucial to communicate the valuation approach taken and the choices made in the assessment. Value Notes, based on the Confidence Criteria from the Governance for Valuation, provide a format for consistently communicating a summarized evaluation of the suitability of and confidence in capitals information for a given decision-maker's objectives.

External stakeholders may challenge and question not only the assessment process and results, but also the company's reasons for carrying out the assessment in the first place. Some questions to think about include:

- Who are the key external stakeholders and does the business have established relationships with them?
- Has thought been given to discussing with, and possibly being confronted by, those who might challenge the assessment or its results?
- Are there "critical friends" among conservation bodies or other external stakeholders who can challenge the assessment's conclusions in a constructive way?

Please refer to the Governance for Valuation for further information on how to report on the suitability of capitals information.

Suggested iterations

Upon concluding sub-step G2, users should have an understanding of the capitals assessment process, the relevant business system and the wider system it sits within, and any impacts, dependencies, risks and opportunities associated with the four capitals. With a better understanding of the four capitals and systems thinking, Step G should now feed back into Step A with the decision-making process becoming stronger and more integrated with each cycle.

²¹ We Value Nature. Persona Action Cards. Available here: <https://wevaluenature.eu/sites/default/files/2021-04/PERSONA%20ACTION%20CARDS.pdf> [Accessed 14 June 2024].



Box G.1

Never Sleep Coffee International (Act)

Based on the results, NSCI made an evidence-based pitch to impact-driven finance institutions that secured a loan to fund the strategy – and then helped the pilot farm put into practice the regenerative farming activities.

The farm went on to become a “Certified Regenerative” farm and, in the process, NSCI and the farm developed an extensive network of collaborators and supporting organizations providing a range of further opportunities.

NSCI then developed plans to apply the approach to other coffee farm suppliers – aiming to implement a transition to regenerative farming of 30% by 2030, and 80% by 2040.

Having collected considerable amounts of data on impacts and dependencies across environmental and social issues, they were also able to use the results from the assessment and subsequent monitoring and evaluation to inform multiple ESRs in CSRD reporting.

The process of switching to a farmer contract basis with more sustainable operations will significantly improve NSCI’s traceability – demonstrating much better supply chain sustainability credentials than their competitors.

Box G.2

Smart Chips (Act)

Smart Chips used the assessment process, and its results, to help persuade other companies, stakeholders, and the government to collaborate on the mangrove restoration initiative.

The preferred scheme is the nature-based solutions mangrove restoration option, which is a joint initiative between the business, three government departments, numerous other nearby businesses with buildings and infrastructure at risk from coastal flooding, an NGO, and several of the affected villages.

Several of the key stakeholders mentioned contribute either funds or in-kind resources. This includes significant funds made available from the regional government due to the coast protection, mangrove conservation, and fisheries benefits that they now recognize as being provided, due to the study. Blue carbon credit finance is also secured for the overall restoration scheme. This all enables a much larger-scale mangrove restoration project to go ahead in a highly cost-effective way for Smart Chips.

Furthermore, community members who previously cleared mangroves are now employed within the overall scheme. Smart Chips has become a highly regarded local company and the organization now uses integrated capitals assessments to help inform all of its major infrastructure decisions.

Box G.3

Renew Energy (Act)

Renew Energy chose Site 2 and communicated the results to all stakeholders involved, including those who engaged from the other two sites.

The company presented the assessment approach and results at several open stakeholder events and provided a summary on leaflets and their website.

The company also presented the results to several financial institutions and was awarded a loan to implement the project on the basis that it fulfills commitments through the Community Benefit Fund and Local Energy Discount Scheme and aims to ensure other benefits such as local job provision and spending in the local economy.

The company develops the project at Site 2 and delivers a successful retraining program to ex-fossil-fuel workers. Their stories are used in marketing materials and feature in the company's annual report highlighting their commitments to a just transition.

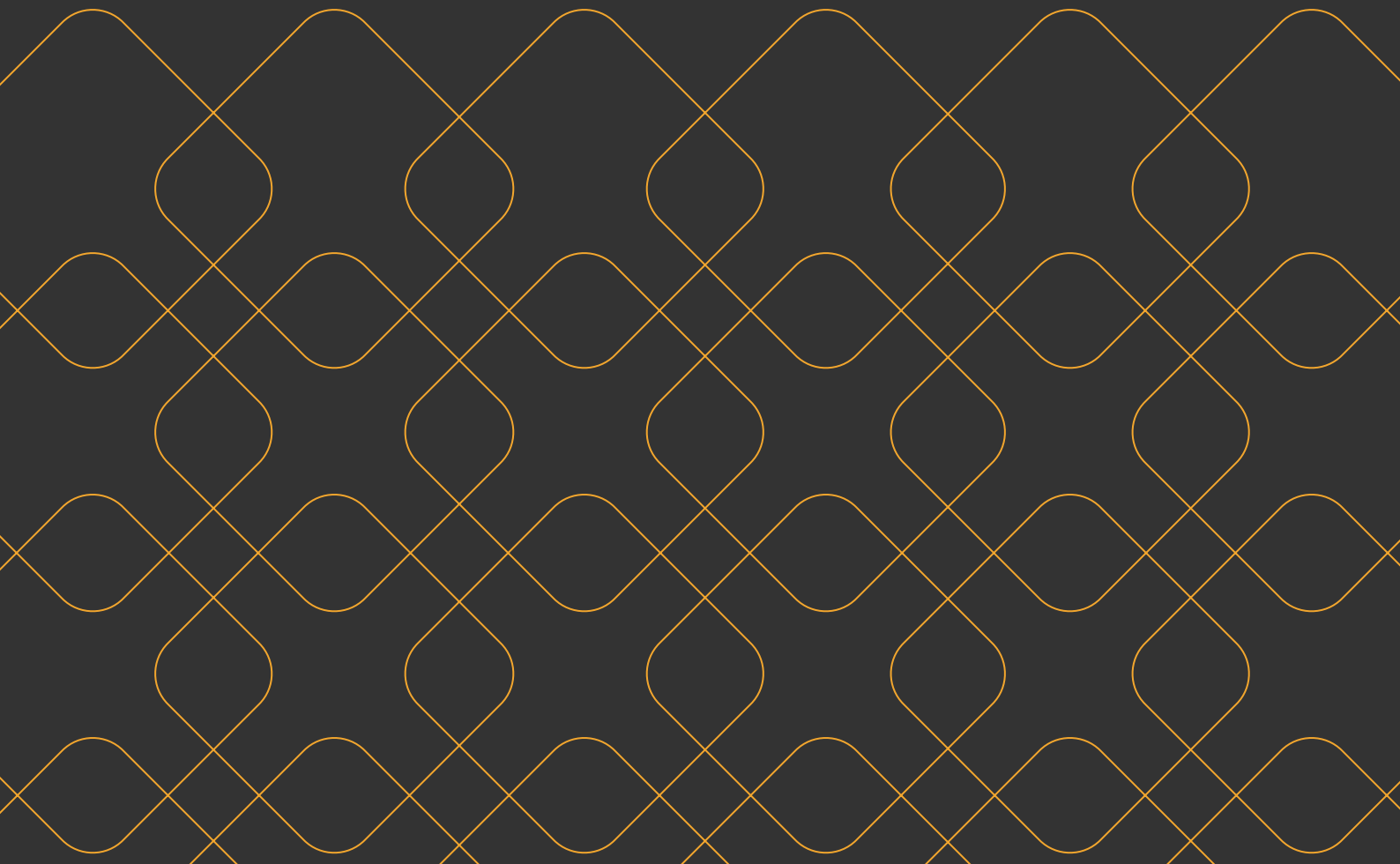
With early monitoring and evaluation results aligning with the predictions of societal benefits, Renew Energy commits to applying a similar integrated capitals approach for all their new major renewable energy developments, while continually working to adapt and improve based on internal and external stakeholder feedback. Renew Energy are now looking to implement capitals assessments to help inform all of its major infrastructure decisions.

Appendix

Glossary

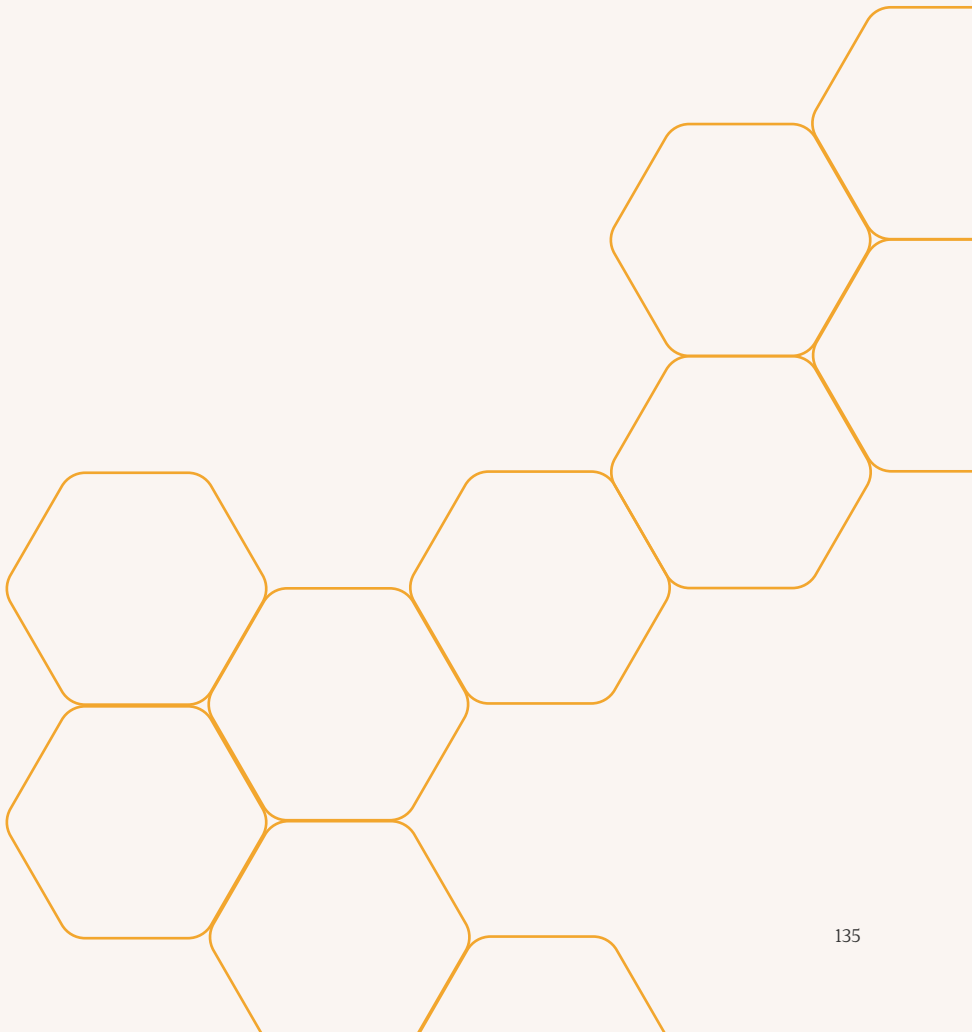
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Appendix 1 | High-Level Business Actions on Nature

The Capitals Coalition, along with Business for Nature, World Business Council for Sustainable Development, Taskforce on Nature-related Financial Disclosures, Science Based Targets Network, the World Economic Forum, and WWF, have developed the High-Level Business Actions on Nature. These were developed, with nature as a focus, to help align the process and terminology used in the action frameworks and guidance being developed for evaluating, managing, and disclosing nature-related impacts and dependencies. While developed with a focus on nature, the set of actions is equally applicable to all other capitals and hence to integrated capitals assessments as described in this Protocol.

The actions fall under the categories of Assess, Commit, Transform, and Disclose – commonly known by the acronym ACT-D. A business undertaking a capitals approach begins the journey by assessing impacts and dependencies in the Assess (A) step, the process that has been explained in this Protocol. Once a business has a clear understanding of its impacts and dependencies on the capitals, it should Commit (C) to targets for improvement. Transform (T) is then the process in which a business acts on the information and intentions set out in Assess and Commit and changes its practices to improve the value created for itself and for society. Finally, Disclose (D) is an accountability process where a business publicly communicates progress. Disclosure may be voluntary or mandatory. The disclosure process should be a positive one where a business is able to share positive impacts and dependencies on different capitals, and where if there is a negative relationship, this offers an opportunity for improvement in the next iteration of the ACT-D process. Feedback from management and other stakeholders of the disclosure process can help shape future assessments, commitments, and transformations.

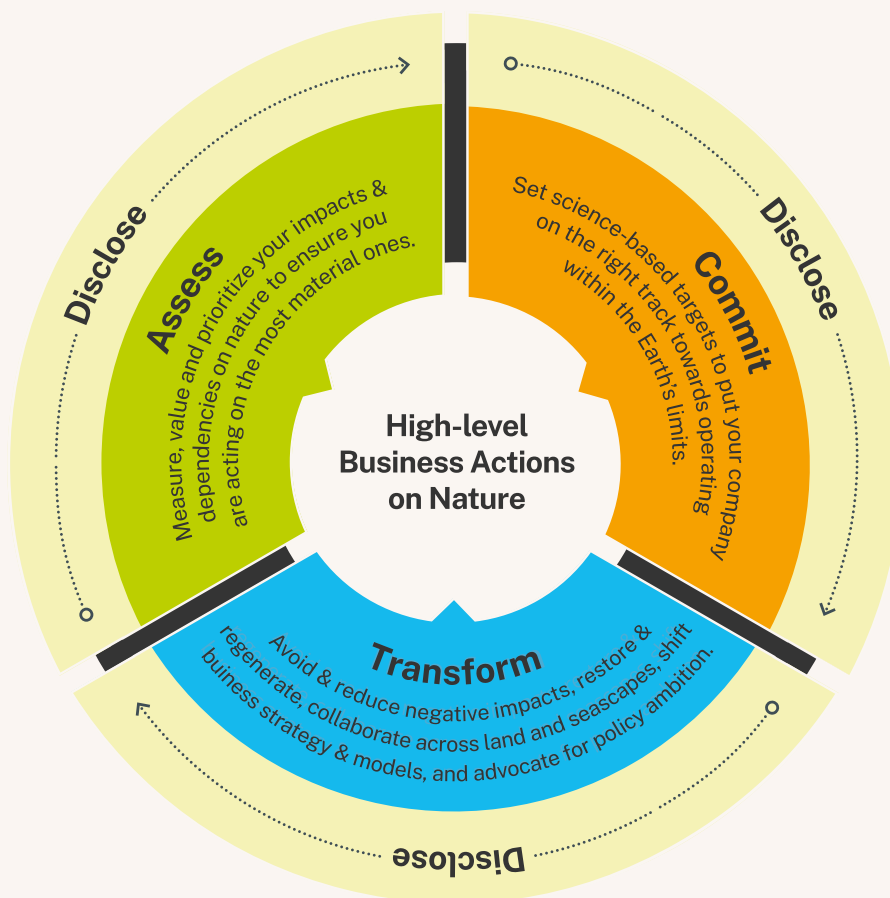


Figure 1 (Appendix). High-level Business Actions on Nature (Business for Nature, 2023)

Appendix 2 | Options for valuation

Qualitative valuation

What

This approach is usually descriptive and focuses on more subjective perceptions of change. Qualitative valuation is often useful for a preliminary identification of impacts and/or dependencies and is normally implemented through questionnaire surveys, deliberative approaches, or expert opinions. Qualitative valuation may also take the form of stories, case histories, selected quotations, or expressions of emotional responses to costs and benefits. Qualitative valuation may be the only option in situations where monetary valuation is not needed, or where some stakeholders find it difficult to accept or interpret monetary valuations, for example in relation to spiritual values.

Example

Stakeholders may use expressions such as “This is important to me,” to give reasons for why value is contained within a capital which can add context. It may be possible to quantify this by codifying these expressions such as “high, medium, or low importance” or through ranking such as “more or less important.”

Quantitative valuation

What

Valuation that uses non-monetary units such as numbers (e.g., in a composite index), areas, mass, or volume to assess the significance of costs and benefits. Quantitative valuation might look like simple measurement in units and numbers, but it should go further by adding a consideration of the context in which the numbers occur, for example, consuming 1,000 m³ of water in a drought may be equally impactful to consuming 100,000 m³ in a water-abundant area. Quantitative valuation may be undertaken, for example, through use of questionnaires (e.g., to determine the number of people affected), by applying indicators (e.g., disability-adjusted life years (DALYs)) and indices (e.g., relating water use to a water stress index), or through value-based weighting and scoring approaches (e.g., multi-criteria analysis). Quantitative valuation is useful for measuring impacts or dependencies against non-monetary targets (e.g., science-based or safe and just targets).

Example

Disability-adjusted life years, water stress indices.

Monetary valuation

What

Valuation that uses currency as the common unit to assess the significance of costs and benefits. Monetary valuation is best used to provide information on the marginal value of incremental changes in impacts or dependencies, either at a point in time or over a given period. Monetary valuation can also be used to assess trends in value as a function of changes in supply and demand conditions. Both market and non-market approaches to monetary valuation aim to measure social preferences — using observed prices in the market in the former case, and “revealed” or “stated” preference methods for impacts or dependencies that do not have explicit market prices. Monetary valuation is particularly useful in situations where there is a need to:

- Determine the societal value of impacts and/or dependencies in a common unit of measure, like US dollars, euros, etc., for ease of comparison with financial values (e.g., business costs or revenue);



- Determine the net costs and benefits of an intervention that alters the quality and/or quantity of ecosystem and/or abiotic services provided;
- Assess how costs and benefits are distributed among different stakeholders; or
- Assess the magnitude of potential financing or revenue sources.

Appropriate monetary valuation of impacts and/or dependencies should ideally be undertaken or at least guided by qualified experts, as it can be complex and easy to get wrong if you are not familiar with the underlying valuation techniques and concepts such as double counting. Even applying value transfer approaches using value factors requires careful consideration.

Example

British Pound, Japanese Yen, US Dollar (\$, €, ¥).

Appendix 3 | Examples of applicable pathways for the Protocol

This appendix provides further details on three potential pathways:

- Simple pathways
- Radiating pathways
- Causal loops

1. Simple pathway

The simple pathway maintains the fundamental structure from the Natural Capital Protocol and Social & Human Capital Protocol yet illustrates more realistic dynamics such as one impact driver or dependency affecting a change to more than one capital simultaneously and the potential of secondary pathways.

Secondary pathways are where impacts from an initial impact pathway create a significant secondary impact on a second capital and thus create an impact pathway of their own. These secondary pathways can initially be mapped qualitatively or quantitatively to understand their causal relationships and magnitude. Secondary pathways can be identified by incorporating existing real-world observations not captured by single capitals assessments, discussions with stakeholders, or modeling.

This option could be useful for larger scopes where a high level of detail may not be feasible within resourcing constraints. Care should be taken when multiple impact driver pathways have impacts on the same or similar dimensions (i.e., health), making all connections visible and avoiding double counting.

Figure 2 shows a hypothetical example of a simple impact pathway based on the decision of a retail business to change their fleet from fossil fuel vehicles to electric vehicles (EVs). In this example, the business activity is the replacement of fuel vehicles by electric vehicles for delivery in the city. This activity results in several impact drivers, such as a decrease of GHG emissions and air pollutants in the city, the delivery of training program for workers and a decrease in fuel use. These impact drivers lead to changes in the capitals, including changes in air quality and access to services for different communities, improved skills of workers, and reduced fuel costs. All these changes may have significant impacts, both on the society (e.g., reductions of societal cost of climate change, reduction of impacts on health, increase in workers income, less pressure on care homes) and on the business (increased reputation, increased resilience to fuel price shocks).



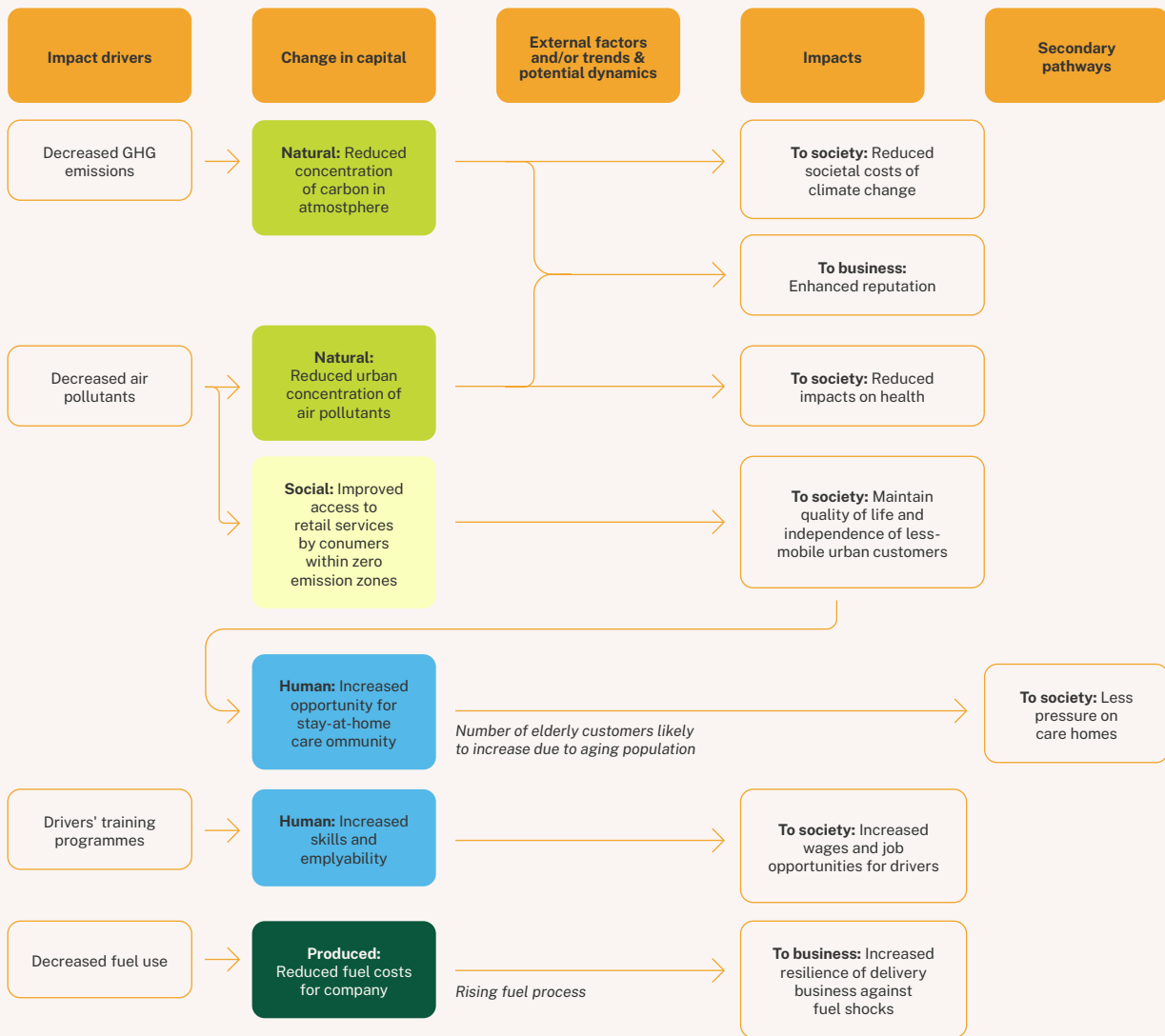


Figure 2 (Appendix). An example of a simple impact pathway

Figure 3 illustrates a simple dependency pathway using the dependency of business on the health of workers as an example. In this situation, several factors such as an increase in work intensification, a degradation of environmental quality, the expansion of unhealthy lifestyles (e.g., sedentarism), and a reduction in workers’ access to fresh food due to high prices are resulting in a decrease of their productivity and having a cost for the business, which may have to invest in holistic support of workers’ physical and mental health.

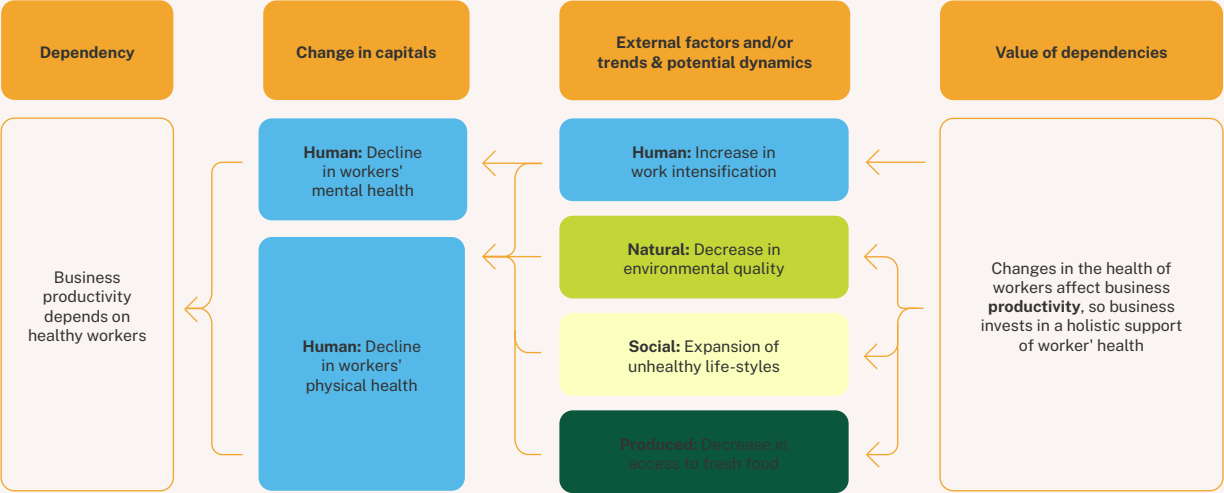


Figure 3 (Appendix). An example of a simple dependency pathway

2. Radiating pathway

A radiating pathway has space to explore systems in more depth. It retains the same basic structure of the previous Protocols, including the three main components of: impact drivers or dependencies, changes to capitals, and impacts to society and to the business, but in a less linear format that allows more space for visualizing interconnections and compounding relationships and therefore more opportunity to explore potential management interventions and identifying leverage points.

Figure 4 is an example of radiating impact pathway based on the business decision of a hypothetical business investing in coastal protection. This activity results in several impact drivers, such as planting mangroves, consulting with local stakeholders, and training locals. These impact drivers lead to changes in the capitals, including increased fish stock and extent of mangroves, reduced carbon in the atmosphere, increased access to government funds, enhanced reputation, social networks, and skills of locals. All these changes may have significant impacts, both on the society (e.g., increased fish catches and local income, reduced climate change impacts, increased coastal protection) and the business (increased coastal protection, income from blue carbon credits, reduced financing cost, increased sales and staff retention).

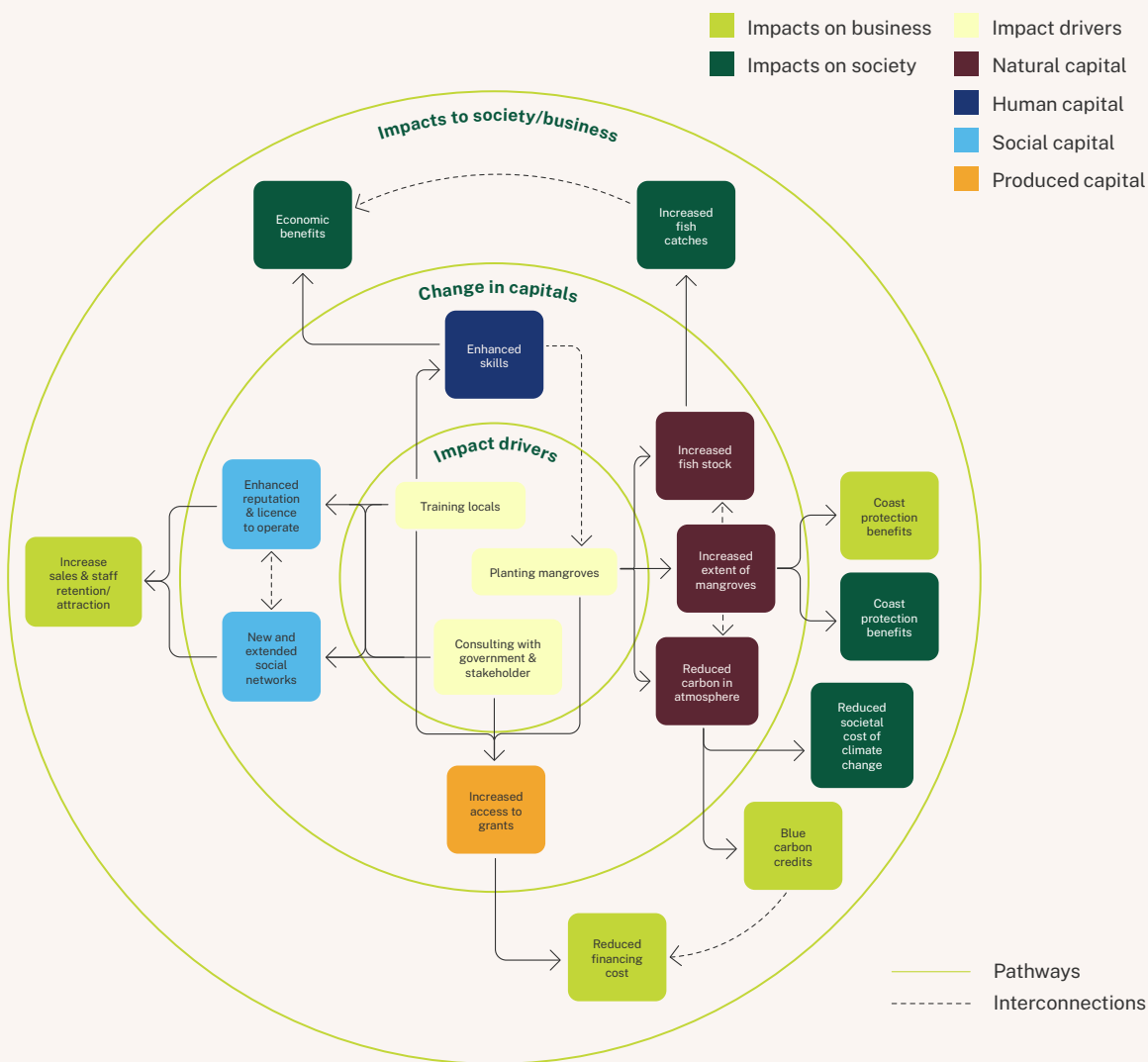


Figure 4 (Appendix). An example of a radiating impact pathway

3. Causal loop diagram

A causal loop diagram can capture less linear causal effects by showing other effects, such as reinforcing (or snowball) effects and balancing effects, which bring back the equilibrium within the system.

Requiring advanced systems thinking expertise, another option is to use a causal loop diagram (CLD) format. These are more complex and do not reflect the structure of the Capitals Protocol but are well accepted in systems thinking.

Figure 5 (appendix) is an example of a causal loop diagram based on the decision of investing in system research capabilities.

This format may suit businesses with relevant experience in these diagrams and in systems thinking with the capacity to translate the components back into the Protocol structure of business activities, impact drivers and dependencies, changes to capitals, and impacts to society and to the business to continue to follow the structure of this Protocol.

Appendix 4 | An extended explanation of translatable terms across existing frameworks

Impact and dependency pathways relate very closely to other terms used in sustainability frameworks and literature.

Term	Interpretations	In the Capitals Protocol...
Pressure	Used within the Driver-Pressure-State-Impact-Response (DPSIR) and Science Based Targets for Nature (SBTN) frameworks to show the causal relationship of “drivers” that feed into “pressures” (or direct factors), which then fuel the degradation and loss of nature. The term pressure always refers to negative impacts and is never used for positive impacts.	Impact driver
Input and Output	Used within the Input-Activity-Output-Outcome-Impact framework and Life Cycle Assessment. Used in measuring everything that flows in (e.g., resources, relationships) and out (e.g., by-products, waste) as a result of a business activity or system (e.g., product, process) that is assessed.	Dependency and/or impact driver
Outcome	Outcomes are used within the Input-Activity-Output-Outcome-Impact framework. This term refers to the immediate results of an organization's actions that matter to people and the natural environment, whether intended or unintended.	Change in the state of capital(s)
Impact	Used by impact management organizations. A narrow definition of impact refers to the effect of an organization's actions on people and nature, while some broader definitions include the results of these effects on wellbeing.	Impact
Well defined outcome	Used by social value organizations to refer to specific aspects of wellbeing or conditions of the natural environment that are most appropriate to measure.	Impact (before it is measured)
Sustainability topic	Used by sustainability reporting frameworks to denote aspects of stakeholder wellbeing (e.g., health, wealth, safety) or business activities or practices that are evidenced drivers of wellbeing (e.g., employment, diversity, inclusion). This term is synonymous with the terms “sustainability matters,” “impact areas,” “impact categories,” or “general issue categories” used by different standard setters.	Impact (when referring to wellbeing) or Impact driver (when referring to business activities)
Nature's contribution to people	Used by The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) to refer to beneficial contributions from nature, including things such as food provision, water purification, flood control, and artistic inspiration, whereas detrimental contributions include disease transmission and predation that damages people or their assets.	Ecosystem services



Appendix 5 | Value transfer

A primary valuation study based on detailed information specific to a study site or context is likely to produce the most accurate results for a capitals valuation. However, a primary study is frequently not possible due to resource, expertise, or time limitations, and is not required to meet many assessment objectives. Transferring existing valuations from other contexts (a study site) to a new ecological and/or socioeconomic context (the assessment site) — commonly described as “value transfer” or “benefit transfer” — is considered an imperfect but frequently valid alternative to primary valuation (Liu et al. 2012²³). Values may be transferred spatially (across different sites) and over time, but this must be done with great care, as most values are highly context specific. Significant expertise and applied experience are required to conduct value transfer with confidence, and to understand when it is and is not appropriate.

Updated advice on transferring values, in particular in relation to using value factors, is currently being produced by the Value Commission. Value factors are an expression of the relative importance, worth, or usefulness of changes in capitals to people. These are represented as numerical conversions typically used to translate quantified unit data into monetary value of impacts, thereby adding contextual perspective.

Value transfer can be done in various ways:

- **Unit value transfer:** the mean (or median) value estimate for an impact or dependency at the study site is used to estimate the value of a similar impact driver or dependency at the assessment site;
- **Adjusted value transfer:** the mean (or median) value estimate for an impact or dependency at the study site is adjusted to account for some key contextual factor(s), such as differences in average incomes (see Box D.12 on purchasing power parity) and the degree of change being valued, to estimate the value of a similar impact driver or dependency at the assessment site;
- **Value function transfer:** multiple valuations of one or more impact(s) or dependencies from several study sites are used to develop a function or model that can be used to estimate the value of similar impact driver(s) or dependencies at one or more assessment site(s). Value function transfers attempt to account for heterogeneity across sites in terms of factors such as the extent of an ecosystem, the valuation methods used, and socioeconomic characteristics considered relevant in the estimation of value.

Value transfer estimates are subject to various limitations and potential sources of error, most commonly associated with generalization, such as when values are transferred to assessment sites that have different ecological and/or socioeconomic characteristics than the study site. Other sources of error include measurement errors in the original study site, which may be replicated at the assessment site, as well as errors arising in the transfer itself.

To use value transfer with confidence to estimate the value of impacts and dependencies requires:

- Reliable estimates of the economic value of the impact and/or dependency based on a thorough review of previous studies. Note that more databases currently exist for natural capital than for the other capitals.
- A thorough description of the changes in impact drivers and/or dependencies on the capital under consideration (at the assessment site); this may be presented in qualitative and/or quantitative terms;
- Knowledge of how economic value changes due to the variation in impact drivers and/or dependencies on a capital at the study site(s) (i.e., the relationship between the level of impacts and/or dependencies on a capital and willingness to pay for marginal changes);

²³ Liu, S., R. Portela, A. Ghermandi, N. Rao, and X. Wang. 2012. Environmental Benefit Transfers of Ecosystem Service Valuation in van den Belt M. and Costanza R. (eds) Volume 12, 'Ecological Economics of Estuaries and Coasts'. In Wolanski E. and McLusky D.S. (eds) Treatise on Estuarine and Coastal Science. Waltham, MA: Academic Press

- Knowledge of which contextual factors determine economic value and to what extent (e.g., the number of individuals affected by the change in a capital, the benefits and costs they receive from that capital, their socioeconomic characteristics (e.g., income, age, gender, education), and the availability and price of substitute goods or services).

(adapted from eftec 2010²⁴)

Where a choice of evidence generated using different valuation methods is available, study sites for value transfer can be selected based on the guidance provided in table D.11. Where only one source of data is available, ensure it is sufficiently relevant to inform the assessment and, if so, that the degree of relevance is considered when reporting the level of confidence of the results. This is essential for ensuring that the valuation approach can be judged as fit-for-purpose for the application for which it was intended.

This can be done through consideration of similarities and differences between the study and assessment, from the perspective of impact drivers or dependencies, including changes in the magnitude of these drivers, location of the impact, the effects of impacts on specific populations, and local market constructs, among other things. The quality of the study from which valuation evidence is being transferred should also be carefully considered. This requires an assessment of data and procedures used in the original study (e.g., was the sample population representative, were best practice methodologies used). Finally, it is important to consider whether the results of a value transfer are consistent with expectations and/or whether any significant discrepancies can be explained.

²⁴ eftec. 2010. "Valuing Environmental Impacts: Practical Guidelines for the Use of Value Transfer in Policy and Project Appraisal." Value Transfer Guidelines submitted to Department for Environment, Food and Rural Affairs. [Online] Available at: <http://www.eftec.co.uk/eftec-projects/valuing-environmental-impacts-practical-guidelines-for-the-use-of-value-transfer-in-policy-and-project-appraisal> [Accessed 14 June 2024].

Glossary

Attribution - An indication of the extent to which your business is responsible for an impact, whether positive or negative, within a system.
Capitals Protocol, 2025

Baseline - The initial state or benchmark against which changes in the capital(s) or impact attributed to human activities can be compared.
Capitals Protocol, 2025

Capital - Any form of asset that translates value to people. The Capitals Protocol references four forms of capital: natural, human, social, and produced.
Capitals Protocol, 2025

Capital assessment - The process of measuring and valuing relevant ("material") capital impacts and/or dependencies, using appropriate methods.
Capitals Protocol, 2025

Capitals approach - When the value of the impacts and dependencies on capital stocks (i.e., natural, human, social, and produced capital) are taken into account to inform decision-making.
Principles of Integrated Capitals Assessments, 2021

Confidence Criteria - An approach to evaluate suitability of and confidence in capitals information for a given decision-maker's objectives, using the Transparency Requirements.
Governance for Valuation, 2025

Counterfactual - A future scenario against which changes in capitals attributed to human activities can be compared. Typically, the counterfactual describes a plausible expectation of what would happen without intervention.
Governance for Valuation, 2025

Dependency - A reliance on or use of a capital stock or flow.
Capitals Protocol, 2025

Dependency pathway - A description of how a particular business activity depends upon specific features of the different capitals. It identifies how observed or potential changes in a capital affect the cost and/or benefit of doing business.
Capitals Protocol, 2025

Ecosystem services - The benefits people obtain from ecosystems.
Millennium Ecosystem Assessment, 2005

The Millennium Ecosystem Assessment categorized ecosystem services into these categories:

- **Provisioning services:** Material outputs from nature (e.g., seafood, water, fiber, genetic material)
 - **Regulating services:** Indirect benefits from nature generated through regulation of ecosystem processes (e.g., mitigation of climate change through carbon sequestration, water filtration by wetlands, erosion control and protection from storm surges by vegetation, crop pollination by insects)
 - **Cultural services:** Non-material benefits from nature (including e.g., spiritual, aesthetic, recreational)
 - **Supporting services:** Fundamental ecological processes that support the delivery of other ecosystem services (e.g., nutrient cycling, primary production, soil formation)
- Externality** - A consequence of an action that affects someone other than the agent undertaking that action, and for which the agent is neither compensated nor penalized. Externalities can be either positive or negative.
WBCSD et al., 2011
- Feedback loop** - Formed when a change in a stock affects the flow into or out of that stock.
Meadows, 2008
- Human capital** - The knowledge, skills, competencies, and attributes embodied in individuals that contribute to improved performance and wellbeing.
Social & Human Capitals Protocol, 2021
- Impact** - A positive or negative change in one or more dimension of wellbeing, following a change in capitals (stock or flow) as a result of human activities.
Capitals Protocol, 2025
- Impact driver** - A measurable input to, or output from, human activities, that results in impacts.
Governance for Valuation, 2025
- Impact pathway** - A description of how a particular impact driver results in changes in capitals and how these changes in capitals lead to impacts.
Capitals Protocol, 2025
- Integrated thinking** - A multi-capital management approach that enables organizations to deliver their purpose to the benefit of their key stakeholders over time. Serves to create and preserve value and inform and improve decision-making based on interconnected, multi-capital information.
Capitals Protocol, 2025
- Instrumental value** - The importance of natural, social, human, and produced capital and their ability to satisfy human needs, benefits, and preferences.
Capitals Protocol, 2025



Integrated capitals assessment - A process to measure and value all relevant capitals in terms of impacts and dependencies, which explicitly takes into account systems thinking including the interconnections within and between all of the capitals.
Principles of Integrated Capitals Assessments, 2021

Leverage point - A place within a complex system (such as a corporation, an economy, a living body, a city, or an ecosystem) where a small shift can produce big changes within the entire system.
Adapted from Meadows, 2008

Materiality - An impact or dependency on capitals is material if consideration of its value, as part of the set of information used for decision-making, has the potential to alter that decision.
Natural Capital Protocol, 2016

Multi-capital assessment - A process to measure and value multiple capitals, in terms of a business's impacts and dependencies on them, showing the results for each capital side by side (i.e., in a series).
Principles of Integrated Capitals Assessments, 2021
Natural capital - The stock of renewable and non-renewable natural resources (e.g., plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people.
Principles of Integrated Capitals Assessments, 2021

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

Non-linear relationships - Non-straight-line responses between two variables, highly unpredictable and with potential to include time lags or disproportionate responses.
Capitals Protocol, 2025

Opportunity - Activities that create positive outcomes for organizations and nature, people, and/or society. Opportunities are generated through impacts and dependencies, and can occur when organizations avoid, reduce, mitigate, or manage risks, or through the strategic transformation of business models, products, services, markets, and investments that actively work to create positive impacts.
Adapted from TNFD, 2024

Produced capital - Human-made goods and financial assets that are used to produce goods and services consumed by society.
Capitals Protocol, 2025

Relational value - The importance of desirable, meaningful, and often reciprocal relationships - beyond means to an end - between humans and nature, and among humans (including across generations) through nature (i.e., sense of place, spirituality, responsibility, care, reciprocity, stewardship).
IPBES Secretariat Glossary, n.d

Risk - Potential threat (effect of uncertainty) posed to an organization that arises from its and society's dependencies and impacts on a capital.
Adapted from TNFD, 2024

Scenario analysis - Scenarios are storylines describing a possible future where the changes being assessed have occurred. Scenarios explore aspects of, and choices about, the future that are uncertain. Scenario analysis involves estimating changes to impacts and dependencies on the capitals according to these storylines.
Capitals Protocol, 2025

Secondary pathway - A description of how an impact or a dependency from an initial pathway results in a secondary impact or dependency on capitals and creates a new pathway of its own.
Capitals Protocol, 2025

Sensitivity analysis - May involve simulation modeling to identify critical thresholds, where small changes in the value of assumptions yield large changes in assessment results. Alternatively, it may simply involve reporting a range of potential values for a particular impact or dependency based on applying a range of different assumptions levels (i.e., high, medium, and low estimates of visitor numbers or intensity of resource use).
Capitals Protocol, 2025

Single capital assessment - A process to measure and value impacts and dependencies on a single form of capital.
Principles of Integrated Capitals Assessments, 2021

Social capital - The networks together with shared norms, values, and understanding that facilitate cooperation within and among groups.
Social & Human Capitals Protocol, 2021

Social discount rate - An interest rate used to discount future costs and benefits to a present value (with a focus on societal welfare).
Adapted from Social Value International, 2023

Stakeholder - Any individual, organization, sector, or community with an interest in the outcome of a decision or process.
Capitals Protocol, 2025

Systems dynamics - Interactions within the elements of a system that can influence each other over time.
Meadows, 2008

System thinking - A holistic approach to analysis that considers the interrelations between human and non-human components across temporal and spatial scales. It involves identifying the drivers of change as determined and influenced by feedback loops, delays, and non-linear relationships, and focuses on long-term value.
Principles of Integrated Capitals Assessments, 2021

Threshold (societal, ecological) - a level or range of performance, agreed by best available science or research, that separates positive/ sustainable performance on a measure from negative/ unsustainable performance.
Impact Management Platform, 2024



Tipping point - A critical point in the state of a system whereby a small intervention can lead to large, long-term, and irreversible changes to the state of that system and profoundly alter its mode of operation.
Capitals Protocol, 2025

Transparency Requirements - A framework for consistent articulation of a capitals assessment's methodology choices in a Transparency Report, to inform an evaluation of suitability and confidence using Confidence Criteria.
Governance for Valuation, 2025

Validation - Internal or external process to check the quality of an assessment, including technical credibility, the appropriateness of key assumptions, and the strength of results. This process may be more or less formal and often relies on self-assessment.
Natural Capital Protocol, 2016

(Impact) Value factor - An expression of the relative importance, worth, or usefulness of changes in the capitals to people.
Governance for Valuation, 2025

Value Notes - A summary of an evaluation of the suitability of and confidence in capitals information for a given decision-maker's objectives, based on the Confidence Criteria.
Governance for Valuation, 2025

Verification - Independent process involving expert assessment to check that the documentation of an assessment is complete and accurate and gives a true representation of the process and results.
Principles of Integrated Capitals Assessments, 2021

Vulnerable groups - Groups of people who are particularly at risk of harm from activities that may cause negative impacts on multiple capitals, depending on the local context. Vulnerable groups may include migrant workers, children or youth, indigenous peoples, local communities, women, and people with disabilities.
Adapted from TNFD, 2024



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