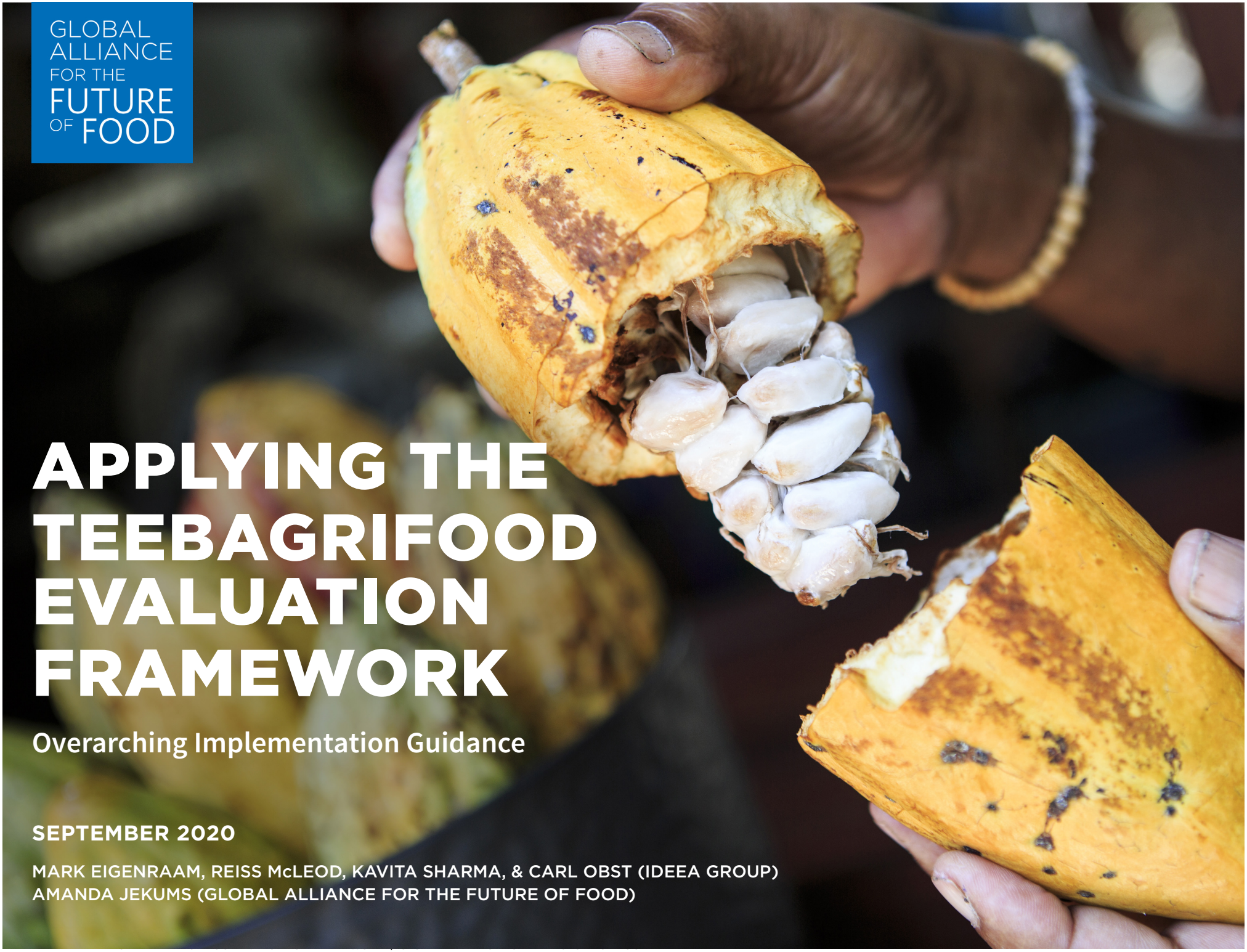

GLOBAL ALLIANCE FOR THE FUTURE OF FOOD

APPLYING THE TEEBAGRIFOOD EVALUATION FRAMEWORK

Overarching Implementation Guidance

SEPTEMBER 2020

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Applying the TEEBAgriFood Evaluation Framework: Overarching Implementation Guidance was commissioned by the Global Alliance for the Future of Food to assist in applications of the TEEBAgriFood Evaluation Framework, developed by United Nations Environment Programme. This work was conducted by the Institute for the Development of Environmental-Economic Accounting, who specialize in providing natural capital accounting services with particular expertise in the design and implementation of measurement frameworks to support decision-making.

THE TEEBAGRIFOOD INITIATIVE

Food and agriculture systems have both positive and negative impacts on planetary health and human well-being. Their outputs are significant and sustain each one of us, providing us with food, fibre, and raw materials.

In doing so, they are responsible for creating a rich array of agrobiodiversity and farming landscapes. However, collectively the sector is also one of the main drivers of deforestation, greenhouse gas emissions, and biodiversity loss. It is a sector that is simultaneously at the cutting edge of technological transformation and strongly connected to Indigenous and traditional practices that go back thousands of years.

Decisions across food systems at the farm, business, research, and government levels create the conditions for negative costs (or externalities) to multiply or be mitigated, and for positive benefits to be enhanced or constrained. For systems whose impacts are so broad and profound, standard yield per hectare productivity measures are a poor and narrow measure for developing policies and making decisions. What is missing is both a broad and comprehensive systems-based framing that helps us to understand and incorporate the relationships between agriculture, food, the environment, and human well-being, and a tool that helps us to accurately account for costs like soil erosion and toxic exposure to harmful chemical pesticide, or the benefits of healthy diets and biodiversity.

It was in this context that the United Nations Environment Programme (UNEP) launched "The Economics of Ecosystems and Biodiversity for Agriculture and Food" (TEEBAgriFood) initiative in 2015. The initiative aimed to create a universal, inclusive, and comprehensive framework and a common language to describe the range of diverse and complex food and agriculture systems coherently and comparably across spatial scales (national, regional, farm), accounting for the negative and positive externalities of these systems. The result was the development of the *TEEBAgriFood Scientific and Economic Foundations* report and the *TEEBAgriFood Framework* ("the Framework").

The vision embedded in the TEEBAgriFood Scientific and Economic Foundations report is that international organizations, governments, and businesses increasingly recognize the linkages that food systems have with our economies, societies, health, and environment, and integrate this information about eco-agri-food systems into policies, practices, targets, and accounting standards. Its ambition is that the continued application of the Framework and its common language will provide a more comprehensive understanding of eco-agri-food systems for decision-makers in the future, and a resulting shift in policy and practice toward transformational change.

The Framework surpasses standard agriculture and food-sector economics of the agri-food value chain by going beyond narrow measures of economic productivity and yield to include the measurement of the sectors' impacts on human, social, natural, and produced capital. It enables a commonly framed description of the eco-agri-food system, allowing researchers from different backgrounds, farmers of different scales and practices, policymakers from different countries, and private businesses operating across countries to use the same concepts and terminology to describe their respective contexts and consider solutions that take this context into account.

Since the launch of the TEEBAgriFood Scientific and Economics Foundations report in 2018, the TEEBAgriFood Framework has become a foundational reference for true cost accounting in food systems. A number of "proof of concept" applications have been completed, and a growing and diverse community including business leaders, policymakers, researchers, farmers, and civil society have been seeking to strengthen and mainstream the application of TEEBAgriFood.

To further this work, the Global Alliance for the Future of Food supported the development of this overarching guidance to ensure consistency and coherence across TEEBAgriFood applications. Development of a number of sector-specific guidance documents is also underway, including: TEEBAgriFood Operational Guidelines for Business (in draft by Capitals Coalition), TEEBAgriFood Country-Level Implementation Guide (in development by UNEP following their seven country-level studies in Brazil, China, India, Indonesia, Malaysia, Mexico, and Thailand), TCA Rapid Assessment for Investors (in development by Transformational Investing in Food Systems), and the Tool for Agroecology Performance Evaluation (a holistic farm-level assessment approach launched by the Food and Agriculture Organization).

We are deeply encouraged by this proliferation of interest in TEEBAgriFood. By making the real costs of food production and consumption transparent to society, governments, farmers, and businesses, the Framework becomes an instrument to transform our current eco-agri-food systems into more sustainable ones. It offers an important opportunity to debunk the linear logic of more agricultural inputs, higher yields, and lower prices that has dominated food policy since the Green Revolution, and, in so doing, set the basis for designing more sustainable food systems.

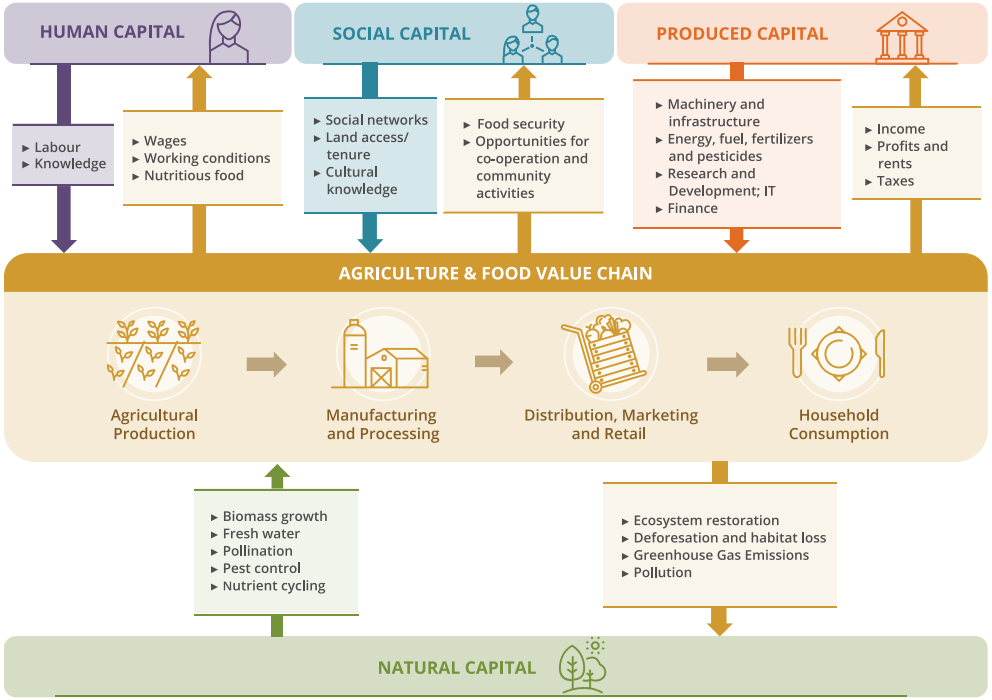
CONTENTS

INTRODUCTION

This Guidance has been developed to assist you in applying the TEEBAgriFood Evaluation Framework (2018a). By following the Guidance and using the reference materials provided in this document, you can expect to have an assessment that can be used to comprehensively assess an eco-agri-food system.

A core feature of the Guidance is a multiple capitals-based approach to systems thinking, which includes **natural, human, social,** and **produced capital.** This integrated approach enables you to articulate and explore the full range of visible and invisible connections that agricultural and food systems have with humans and the environment in **eco-agri-food systems** (see Figure 1). Taking a capitals-based approach can strengthen the quality of an assessment and reveal pathways for addressing issues within eco-agri-food systems and **agri-food value chains**.

FIGURE 1. ECO-AGRI-FOOD SYSTEM (CAPITAL STOCKS AND VALUE FLOWS)



Source: TEEB (2018a).

NATURAL CAPITAL: The limited stocks of physical and biological resources found on Earth, and the limited capacity of ecosystems to provide ecosystem services.

HUMAN CAPITAL: The knowledge, skills, competencies, and attributes embodied in individuals that facilitate the creation of personal, social, and economic well-being.

SOCIAL CAPITAL: Networks, including institutions, that share norms, values, and understandings that facilitate cooperation within or among groups.

PRODUCED CAPITAL: All manufactured capital, such as buildings, factories, machinery, and physical infrastructure (roads, water systems), as well as all financial capital and intellectual capital (technology, software, patents, brands, etc.).

ECO-AGRI-FOOD SYSTEM: A descriptive term for the vast and interacting complex of ecosystems, agricultural lands, pastures, inland fisheries, labour, infrastructure, technology, policies, culture, traditions, and institutions (including markets) that are variously involved in growing, processing, distributing, and consuming food.

(AGRI-FOOD) VALUE CHAIN: The full range of processes and activities that characterize the lifecycle of a product from production to manufacturing and processing; to distribution, marketing, and retail; and finally to consumption (including waste and disposal across all stages).

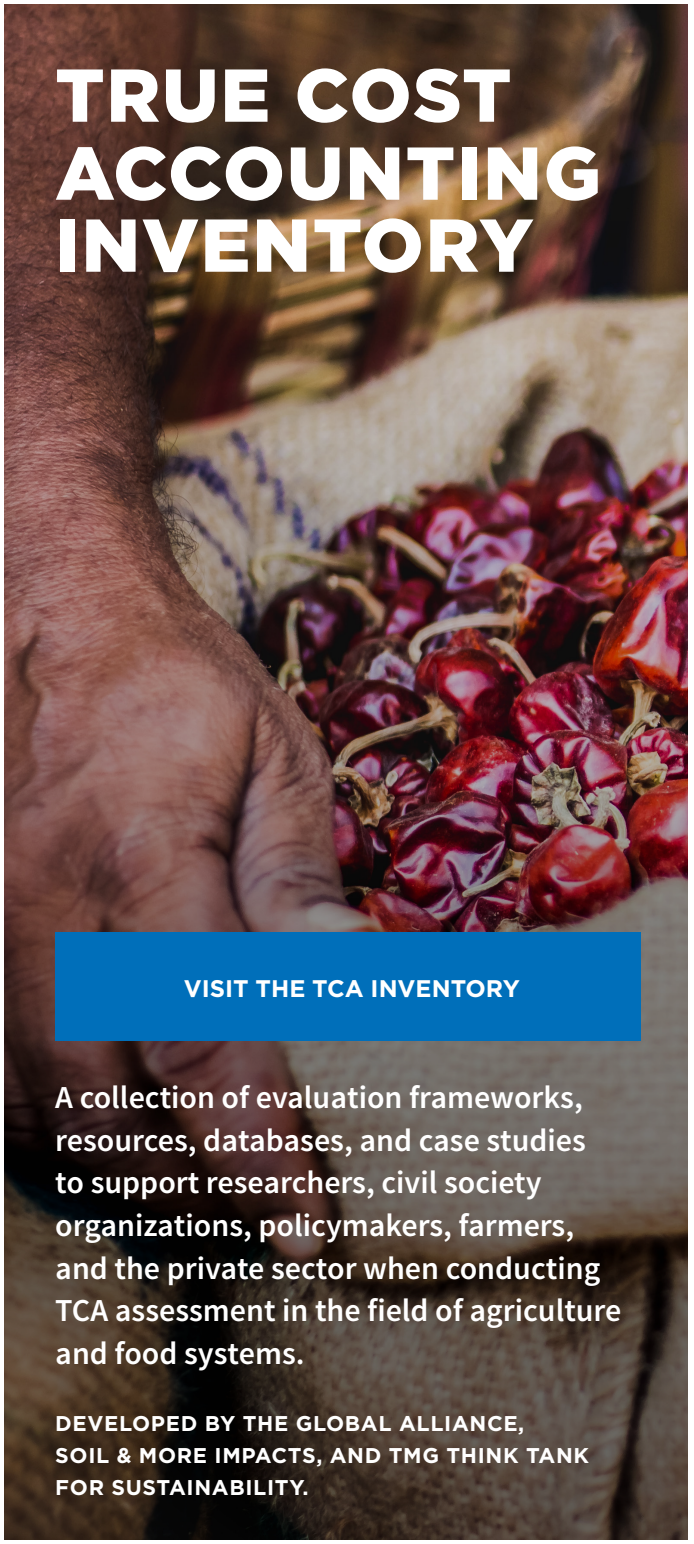
For example, the Guidance will enable you to explore how investment in social and human capital can lead to positive environmental impacts and how degradation of natural capital is connected to economic and health impacts.

Coordination across stakeholders is fundamental to developing integrated solutions across multiple capitals. This is supported by a common language that enables collaboration regardless of eco-agri-food system assessment entry points. For example, an economist interested in developing a policy based on an assessment of negative externalities will use the Guidance and terms in the same way as an ecologist who wants to complete an assessment to build awareness about the state of the environment.

The common language and approach in the Guidance provide a mechanism for collaboration across sectors, disciplines, geographies, and industries. By adopting a multiple-capital approach, it is anticipated that integrated information sets will become more widely available, replacing the current piecemeal and ad hoc assessments that exist for components of eco-agri-food systems. Current methods and approaches that are used to assess aspects of food systems can be easily adapted to meet the systems-based focus of TEEBAgriFood.

To support this, a TCA Inventory of evaluation frameworks, resources, databases, and case studies has been developed. The TCA Inventory was developed by the Global Alliance for the Future of Food, Soil & More Impacts, and TMG Think Tank for Sustainability to support researchers, civil society organizations, policymakers, farmers, and the private sector when conducting a true cost accounting (TCA) assessment in the field of agriculture and food systems. Collection of these resources is ongoing.

It is anticipated that following the Guidance will result in data and information that diverse stakeholders can share and utilize to inform decisions, policies, practices, and future assessments. It is recommended that assessments are made available via the TCA Inventory, contributing to a collective resource that over time strengthens and mainstreams the application of the Framework.



PRINCIPLES

The TEEBAgriFood Evaluation Framework has three guiding principles: universality, comprehensiveness, and inclusion. A synthesis of the Framework outlines the characteristics of these principles: "As a 'universal' Framework, its elements are defined and described in a uniform, methodical, and consistent manner, to be used in any geographical, ecological, or social context, at the level of society, the firm, or the individual. The Framework is 'comprehensive' in that it acknowledges all significant impacts or dependencies of the food system, be they economically visible or invisible, along any segment of the food value chain. A third guiding principle is inclusion, i.e., that the Framework should support multiple approaches to assessment. Although the 'accounting based' nature of the Framework directly supports analysis in line with economic theory and valuation of impacts on human well-being in monetary 'value addition' terms, this is neither possible nor appropriate for all aspects of human well-being. Qualitative, physical, or non-monetary terms can provide important insights, as can a plurality of value perspectives and assessment techniques. These three guiding principles result in a Framework design and approach that can truly represent a holistic perspective of any food system" (TEEB, 2018b).

The development of TEEBAgriFood was informed by holding up the seven indivisible principles that guide the work of the Global Alliance for the Future of Food: renewability, resilience, equity, diversity, healthfulness, inclusion, and interconnectedness. Principles can provide a powerful compass for making more informed and comprehensive decisions. Principles highlight multiple entry points for change and can help you adapt to specific contexts with sensitivity. Crucially, they ensure that siloed interventions, unintended consequences, and short-term solutions are avoided. As you start a TEEBAgriFood assessment, consider the principles that can help to guide your work.

IMPLEMENTATION PHASES

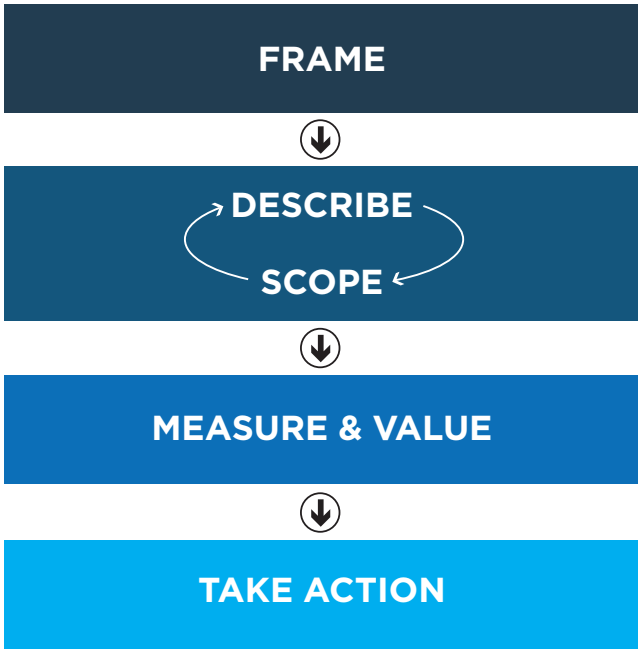
The Guidance contains four phases to implement the Framework.

In **Phase 1,** you will **frame** the issue of interest and the purpose of your assessment, and prepare to undertake it. Important components of this phase include identifying relevant stakeholders, forming an advisory committee, and outlining your plan of action.

In **Phase 2,** you will undertake an integrated process to **describe** the relevant eco-agri-food system and **scope** the focus of the assessment. This integrated process ensures that all connections and impacts relevant to the assessment are identified before determining their relative importance.

In **Phase 3,** you will **measure** impacts using a selection of models, methods, and data. Where relevant and possible, you will also **value** or monetize these impacts. The TCA Inventory has been developed to support this process.

In **Phase 4,** you will apply the results of your assessment with stakeholders and partners to **take action** and ensure your assessment has an impact on practice and policy.



These implementation phases are iterative, and you may move between phases as you identify new impact pathways or relationships. All phases and activities should be completed in an open and participatory way. The engagement process should be established in the initial stages of any assessment, and well before any measurement and valuation is undertaken.

OVERVIEW OF THE IMPLEMENTATION PHASES & STEPS

PHASE 1: FRAME	PHASE 2: DESCRIBE & SCOPE	PHASE 3: MEASURE & VALUE	PHASE 4: TAKE ACTION
Step 1: Outline your interest	Step 6: Describe the system	Step 16: Select an analytical approach & method	Step 21: Identify who is affected
Step 2: Determine the issue of interest	Step 7: Describe the agri-food value chain	Step 17: Select appropriate variables & indicators	Step 22: Apply & act on your results
Step 3: Clarify the purpose	Step 8: Describe the activities of interest	Step 18: Collect data & measure	Step 23: Communicate your results
Step 4: Identify stakeholders & form an advisory committee	Step 9: Describe the capital stocks	Step 19: Apply value to your measurement	
Step 5: Outline an action plan for your results	Step 10: Describe the flows	Step 20: Validate your study & test key assumptions	
	Step 11: Describe the outcomes		
	Step 12: Describe the impacts		
	Step 13: Assess materiality		
	Step 14: Select impacts for assessment		
	Step 15: Identify opportunities for change		

DESCRIBE is a distinguishing feature of the Guidance. Describing the eco-agri-food system relevant to your issue of interest reinforces the necessity of a multiple capitals-based approach in any comprehensive, accurate, and transparent assessment of eco-agri-food systems. This contrasts with traditional industry- or sector-based analysis that focuses on productivity, e.g., yield per hectare, profit per employee, output per week. A productivity focus is appropriate for a single input (capital) investment but does not consider the relationships between various inputs (capitals).

Implementing the describe phase is fundamental to systems thinking and enables the systematic mapping of systemic connections and effects that may not be apparent if a narrow, productivity-based approach were used. You will use a multiple capitals-based approach to support this integrated thinking. In practice, this requires understanding and mapping the relationship between the agri-food value chain and different types of capitals, including the relationships within and between the capitals.

By undertaking a systems approach, you will be equipped with a greater range of options to achieve policy and practice objectives. For example, if you are focused on addressing wetland health (low fish stocks and poor water quality), you may overlook the need to assess the underlying status of human and social capital and its contribution to a potential wetland health solution. The foundational understanding of the broader system developed during the describe phase will reveal systemic linkages and opportunities to coordinate across different areas of expertise.

The process of describing is integrated with the process of scoping to ensure all connections and effects that are relevant to the assessment are identified before determining their relative importance. It is important that this process involves diverse experts and stakeholders who can accurately and comprehensively describe the relevant eco-agri-food system. Once completed, this description is a valuable resource that should be shared.

APPLYING THE FRAMEWORK

The next section provides the necessary guidance to conduct a multiple capitals-based eco-agri-food system assessment using the TEEBAgriFood Evaluation Framework. It describes each of the four implementation phases in detail and includes examples, definitions, and additional resources.

Your assessment may focus on a specific product, practice, policy, or even an entire system or value chain. It may be looking forward or backward or at changes over time, or comparing differences. It may focus on a business, a region, or even a country. It may be concerned with specific impacts like changes to farmer income or broad impacts like regional biodiversity.

While all assessments will have somewhat different coverage, it is expected that all TEEBAgriFood-based assessments have the following features:

- Be broad and systemic in nature;
- Reflect the contributions of all four capitals; and
- Examine connections along the full value chain, including assessing the impacts of food consumption on human health.

Throughout the Guidance, examples are provided to illustrate the implementation phases, steps, and activities. It's important to note that the examples have been simplified for illustrative purposes only and do not attempt to be entirely comprehensive.

DOWNLOAD THE GUIDANCE WORKSHEETS

PHASE 1: FRAME

PHASE 1: FRAME

This phase involves determining the question or issue of interest related to the aspects of the eco-agri-food system you are planning to assess, clarifying the purpose of your assessment, identifying the stakeholders who can help you to meet your objectives and who will be impacted, and outlining an action plan for your results.

EXPECTED OUTCOMES

During the Frame phase, you will:

1. Develop an outline of your interest;
2. Draft a question or statement regarding the eco-agri-food system issue of interest;
3. Create a clear statement on the purpose of your assessment;
4. Make a comprehensive list of stakeholders and form a group of engaged and diverse stakeholders who will function as your advisory committee; and
5. Outline your action plan.

STEP 1: OUTLINE YOUR INTEREST

When undertaking an assessment you will likely have some understanding of the agri-food value chain or eco-agri-food system related to your interest in conducting an assessment. This outline will be expanded on in the following phases, but it is helpful to be as comprehensive as possible in this phase.

ASSESSMENT EXAMPLE (STEP 1)

A region in Brazil contains both natural rainforest and agricultural land (two types of natural capital). The agricultural land was created by clearing natural rainforest 20 years ago. It is now used to raise cattle. The global demand for Brazilian beef is increasing, and the company wants to increase production. They have submitted a proposal to the agriculture ministry to clear a section of the rainforest and convert it to agricultural land so that they can increase production of cattle. Effectively, they are asking to change the stock of natural capital from one type to another, and we are interested in the impacts that are associated with the change.

STEP 2: DETERMINE THE ISSUE OF INTEREST

What is the central issue you are trying to address and what are potentially related questions? Summarizing your issue as a research question, a problem statement, or a hypothesis will provide a useful guide throughout your assessment.

When considering the issue of interest, keep the four capitals — natural, human, social, and produced — in mind and consider the various ways they may be linked to the eco-agri-food system issues you are assessing. Consider which stage or stages of the agri-food value chain are important for you to complete your assessment and any geographic or temporal boundaries.

ASSESSMENT EXAMPLE (STEP 2)

Presented as a research question, you could state this issue as:
"What would be the health, social, and environmental impacts of clearing this section of rainforest to increase cattle production?"

Presented as a hypothesis, you could state this issue as:
"Clearing rainforest to increase cattle production has negative impacts on health, well-being, and ecosystems."

STEP 3: CLARIFY THE PURPOSE

The purpose of the assessment is correlated to the issue. The purpose helps you to explore why this issue is important in your context and the intended use of the assessment. A key consideration of the purpose is potential stakeholders. Considering who the assessment may impact or who the assessment is intended to inform will have significant impacts on how you shape your purpose and objectives.

As you are clarifying the purpose of the assessment, you may begin to think about how you will conduct your assessment — comparing and contrasting scenarios, measuring impacts, bringing attention to an element of the system, or a combination of those.

The intention of the Framework is to provide a common articulation of different eco-agri-food systems to support a broad suite of applications that analyze different products, systems, policies, diets, and measures of economic activity.

ASSESSMENT EXAMPLE

In this case, the issue of interest is to:
Assess the impacts of deforestation for agriculture production in order to inform decisions on the proposal made by the company to clear a portion of rainforest and convert it to agricultural land.

For additional information on how the Framework can be used in an interdisciplinary manner, refer to the *TEEBAgriFood Scientific and Economics Foundations report* (2018a; Section 6.4.1).

STEP 4: IDENTIFY STAKEHOLDERS & FORM AN ADVISORY COMMITTEE

There are three key groups of stakeholders to consider during the framing stage: 1) assessment audience, 2) partners, and 3) people who may impact or be impacted by the findings. The audience are those whom your assessment intends to inform. It is important that the outputs of the assessment are relevant to intended audiences so that the assessment is fit for its purpose. When considering your audiences, plan for how you will engage with them and communicate the results to them.

Partners are experts who can help to accurately and comprehensively describe the relevant eco-agri-food system and design the assessment. People who may be impacted by the findings are also experts. They can often provide insights into lived experiences that may not be accessible otherwise. Ethics considerations should be made in all circumstances involving individuals, either as stakeholders or as study participants.

Forming an advisory committee of stakeholders with diverse understandings of the issue, interests, expectations, and power will help to ensure that your assessment is accurate, comprehensive, and inclusive.

ASSESSMENT EXAMPLE

Stakeholders:
Local and national government policymakers, researchers, biodiversity experts, anthropologists, farmers, businesses, public health officials, community members, journalists, trade organizations, etc.

Advisory Committee:
Specific individuals representing a diverse group of stakeholders.

PHASE 1: FRAME

STEP 5: OUTLINE AN ACTION PLAN FOR YOUR RESULTS

Once you have completed your assessment, you will want to apply the results. Typically the purpose of these assessments is to influence practice and policy. Before you start your assessment, consider your primary audience, your goals, and the strategy and information you will need to influence change and take action on your issue of interest. Doing this now will help guide your work so that it will have an impact.

ASSESSMENT EXAMPLE

Audience: Policymakers with decision-making power on the proposal.
Goal: Influence policymakers by demonstrating the immediate and long-term impacts and costs associated with this proposal.
Activity: Hold two workshops for policymakers throughout the assessment process.

Audience: Community members affected by the proposal.
Goal: Gain the support of community members to put pressure on decision-makers.
Activity: Publish a short, clear-language summary of the findings and develop a press release targeting local media and journalists.

EXPECTED OUTCOMES

Completing the framing stage will steer your application of the Framework through all phases. Before you move on to the next stage, make sure you have:

1. An outline of your interest;
2. A question or statement regarding the eco-agri-food system issue of interest;
3. A clear statement on the purpose of your assessment;
4. A comprehensive list of stakeholders and the formation of a group of engaged and diverse stakeholders who will function as your advisory committee; and
5. An outline of your action plan.

PHASE 2: DESCRIBE & SCOPE

PHASE 2: DESCRIBE & SCOPE

This phase involves **describing** the relevant eco-agri-food system and narrowing the **scope** of the study based on description and the assessment purpose. As you describe and scope, you may identify additional stakeholders or shift your objectives. The Framework does not require a linear approach, and frequently reflecting on the framing of your assessment is encouraged.

The process of describing is integrated with the process of scoping to ensure all connections and effects that are relevant to the assessment are identified before determining their relative importance. Taking an iterative and integrated approach that moves between describing and scoping allows you to investigate new pathways or relationships that are identified.

Completing this stage will help to ensure that the next stage (measure and value) accurately focuses on addressing your issue of interest and meeting your study purpose.

SYSTEM: A set of elements or components that work together and interact as a whole.

SYSTEMS THINKING: An approach that focuses on the identification of interrelationships between components of a system.

DESCRIBE

A core feature of the Guidance is a multiple capitals-based approach to systems thinking, which includes natural, human, social, and produced capital. This integrated approach enables you to articulate and explore the full range of visible and invisible connections that agricultural and food systems have with humans and the environment in eco-agri-food **systems.** Describing is fundamental to **systems thinking** and enables the systematic mapping of systemic connections and effects that may not be immediately apparent. A systems-based approach is an approach that analyzes the interrelations between capitals across temporal and spatial scales. It involves identifying the drivers of change as determined and impacted by feedback loops, delays, and non-linear relationships (based on TEEB, 2018a). It is important while describing to look as broadly as possible (within available time and resources) to ensure you have captured all relationships in the eco-agri-food system relevant to your assessment. The description may be informed by a literature review, discussions with key stakeholders, and any other methods available.

PHASE 2: DESCRIBE & SCOPE

EXPECTED OUTCOMES

During the describe section of this phase, you will:

1. Describe the system;
2. Describe the agri-food value chain and activities of interest;
3. Describe the eco-agri-food system; and
4. Create a summary table describing the capital stocks, flows, outcomes, and impacts.

DESCRIBE THE SYSTEM

The full range of visible and invisible connections that agricultural and food systems have with humans and the environment can be better identified by describing the system. Starting with a description will help you view the issue of interest as part of a system.

PHASE 2: DESCRIBE & SCOPE

STEP 6: DESCRIBE THE SYSTEM

The outline completed in Step 1 provides a basic description that can be improved by including information about the actors, agency, and relationships within the system and the historical, political, and institutional context of the system. For example, if livestock traders have a lot of power over farmers in determining price, this should be identified. Similarly, if the activities of farmers upriver disproportionately affect fishing villages downriver, these too should be brought into your analysis. There may be regulatory and policy frameworks and historical trends that are relevant to your assessment, such as subsidies on agricultural inputs or pricing control schemes (like the tariffs noted in the example description).

Other aspects of your issue of interest that are important to consider include the geographic and temporal scale. What is the geographic boundary of your issue? Is it local, regional, national, or global? Does it move between geographies? What time period is your assessment concerned with? Are the impacts immediate or deferred? While not all of these considerations can or will be quantified, they can offer entry points or pathways to evaluate potential actions, interventions, and policy recommendations. Advisory committee members will be instrumental in identifying relevant contextual information. Engaging them early on to complete this description will ensure that it is comprehensive.

ASSESSMENT EXAMPLE (STEP 6)

A region in Brazil contains both natural rainforest and agricultural land (two types of natural capital). The agricultural land was created by clearing natural rainforest 20 years ago. It is now used to raise cattle. The global demand for Brazilian beef is increasing, and the company wants to increase production. They have submitted a proposal to the agriculture ministry to clear a section of the rainforest and convert it to agricultural land so they can increase production of cattle.

The site that the proposal aims to deforest is used by locals for food, fuel, and enjoyment. It is also adjacent to a river and just 2 miles (3.2 km) upriver from a local village. The village depends on the river, as the fish it contains are a significant component of their diet.

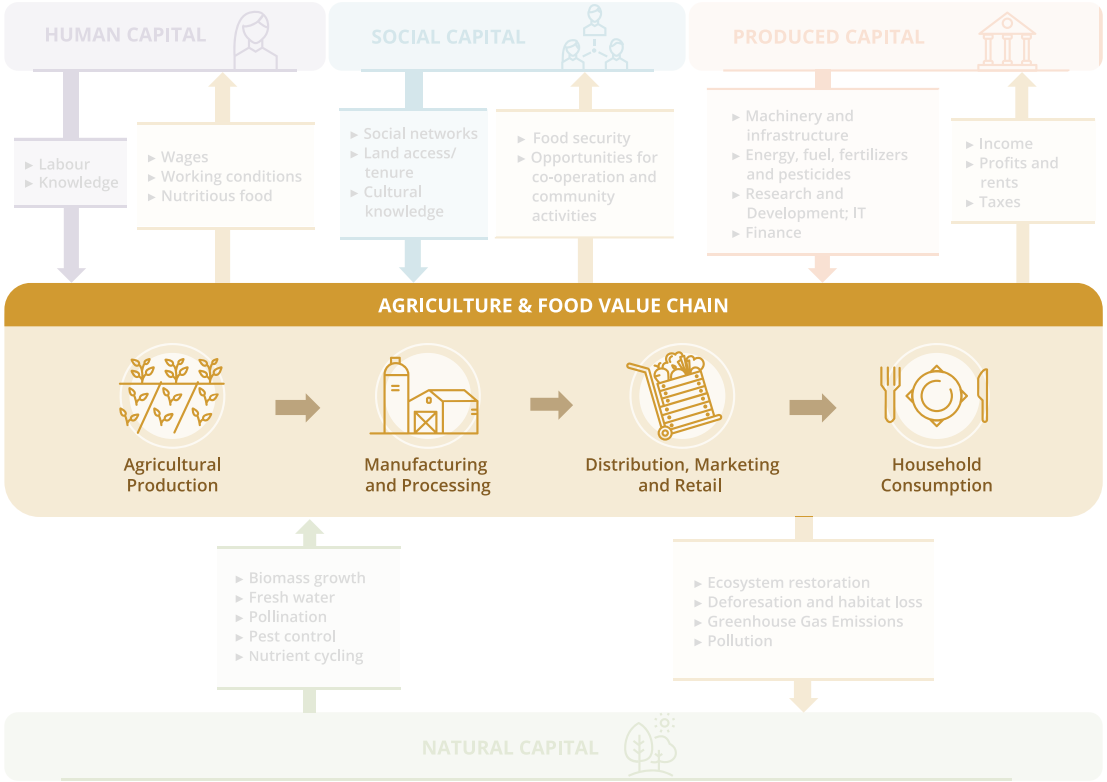
The proposal to increase cattle production in Brazil is in response to increasing demand for beef in China.

Significant external factors contribute to instability in the price that farmers receive for cattle, including international supply and demand, trade agreements, tariffs, and market speculation.

DESCRIBE THE AGRI-FOOD VALUE CHAIN

To develop a comprehensive description of an eco-agri-food system, it is helpful to start with the agri-food value chain. The agri-food value chain is the collection of activities that add value to agricultural products as they move through the value chain and include four stages: **agriculture production; manufacturing and processing; distribution, marketing, and retail; and household consumption** (see Figure 2). The application of the Framework rests on being able to categorize the multitude of processes and relationships occurring between and within the agri-food value chain.

FIGURE 2. AGRI-FOOD VALUE CHAIN



Source: Adapted from TEEB (2018a).

AGRICULTURE PRODUCTION: The first of four stages in the value chain, including activities and processes occurring within farm-gate boundaries (including the supply of ecosystem services, the supply of goods and services, and connections between producers).

MANUFACTURING AND PROCESSING: The second of four stages in the value chain, including the operations involved in converting raw materials into finished products.

DISTRIBUTION, MARKETING, AND RETAIL: The third of four stages in the value chain, including the activities associated with the transport and sale of goods, for example, to retailers or consumers.

HOUSEHOLD CONSUMPTION: The final of four stages in the value chain, including purchases of food for consumption within the household, purchases of food supplied by restaurants and the hospitality industry more generally, and consumption of food grown at home.

PHASE 2: DESCRIBE & SCOPE

STEP 7: DESCRIBE THE AGRI-FOOD VALUE CHAIN

Using your description of the system, describe the agri-food value chain and activities through the four stages. The possibility of food waste should be considered at all stages. Be sure to capture any product transformations through the value chain. For example, manufacturing burgers involves a step to transform cattle into ground beef.

There are often many linkages through and between value chains in complex eco-agri-food systems. Because of this, location is an important consideration, as it often has an impact on the type and quality of capitals that are available and how those capitals are used in the agri-food value chain and locally. For instance, a business may be using water from a local river, the amount of which seems low in comparison to its other operations in different locations, but in the local context the quantity may represent a high percentage of total river flow, thus potentially stressing local natural capital (the river).

ASSESSMENT EXAMPLE (STEP 7)

STAGE	AGRICULTURAL PRODUCTION	MANUFACTURING & PROCESSING	DISTRIBUTION, MARKETING, & RETAIL	HOUSEHOLD CONSUMPTION
ACTIVITY	Clearing the land and raising cattle	Processing cattle into cuts of beef for sale	Shipping and selling beef oil to consumer markets	Consumption of beef
INPUTS	Land, water, feed, labour, infrastructure	Cattle, labour, energy, infrastructure	Beef cuts	Beef cuts
OUTPUTS	Cattle	Beef cuts, waste	Beef cuts, waste	
LOCATION	A region in Brazil, adjacent to a river and just 2 miles (3.2 km) upriver from a local village	Manufacturing region in Brazil	Manufacturing region in China	Urban areas in China

STEP 8: DESCRIBE THE ACTIVITIES OF INTEREST

Using your description of the system and activities, identify the activity or activities that are related to the issue of interest and which agri-food value chain stage they are within. It may be helpful to first recall your issue of interest and the purpose of your assessment. While you may wish to focus on one stage of the agri-food value chain, it is important that links to other stages of the chain are acknowledged if they are not measured. This is particularly important if stages of the agri-food value chain influence the behaviour of other stages in the chain.

You will then describe the methods and practices that will be used to complete the activities of interest you identified. Keep in mind the actors, agency, and relationships within the system and the historical, political, and institutional context of the system.

ASSESSMENT EXAMPLE (STEP 8)

AGRI-FOOD VALUE CHAIN STAGE	Agricultural production
ACTIVITIES OF INTEREST	Clear a section of the rainforest and convert it to agricultural land to increase production of cattle.
METHODS AND PRACTICES USED TO COMPLETE THE ACTIVITIES	The land will be owned and operated by the company, and they will employ local people to clear the forest and raise the cattle. The rainforest will be removed in one go, known as “clear felling” or “clear cutting.” This method is the quickest and lowest-cost way to clear the land but causes topsoil loss. Any remaining brush will be removed by burning it. This will be done by local workers using heavy machinery. The cattle will be raised using intensive production methods, which will have negative impacts on the soil, reducing the water-holding capacity of the land, resulting in runoff rainwater and reliance on the water contained in the river that runs adjacent to the site. The beef will then be sold and exported to China.

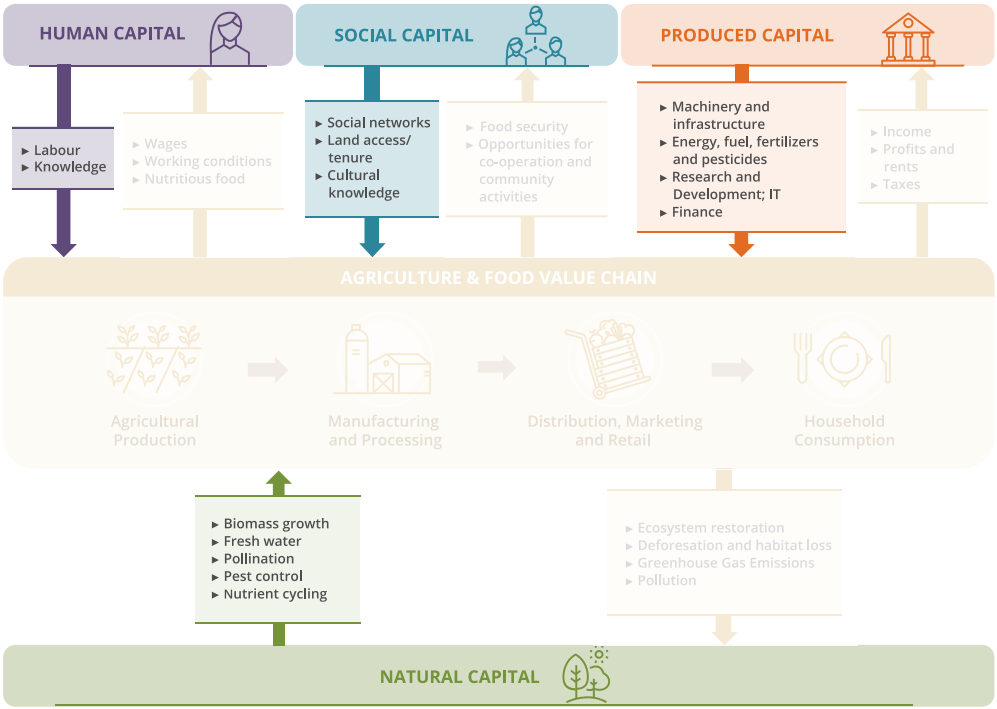
DESCRIBE THE ECO-AGRI-FOOD SYSTEM

This section will guide you through describing the eco-agri-food system related to the issue or question identified for assessment. Throughout this process you will use the key elements of the TEEBAgriFood Framework, including capital stocks, flows, outcomes, and impacts.

STEP 9: DESCRIBE THE CAPITAL STOCKS

The Framework approach considers four types of **capital** that contribute to human well-being: natural, human, social, and produced. **Stocks** are the quantity and/or quality of that capital that **flow** through the system. Capital stocks are any tangible or intangible asset that is used to create value (market or non-market). Figure 3 provides some examples.

FIGURE 3. CAPITAL STOCK EXAMPLES



Source: Adapted from TEEB (2018a).

CAPITAL: The economic framing of the various stocks in which each type of capital embodies future streams of benefits that contribute to human well-being.

STOCK: The quantities and qualities of (natural, human, social, produced) capital within a system at a point in time.

FLOW: A cost or benefit derived from the use of various capital stocks (categorized into agricultural and food outputs, purchased inputs, ecosystem services, and residuals).

NATURAL CAPITAL: The limited stocks of physical and biological resources found on Earth, and of the limited capacity of ecosystems to provide ecosystem services.

HUMAN CAPITAL: The knowledge, skills, competencies, and attributes embodied in individuals that facilitate the creation of personal, social, and economic well-being.

SOCIAL CAPITAL: Networks, including institutions, that share norms, values, and understandings that facilitate cooperation within or among groups.

PRODUCED CAPITAL: All manufactured capital, such as buildings, factories, machinery, physical infrastructure (roads, water systems), as well as all financial capital and intellectual capital (technology, software, patents, brands, etc.).

ASSESSMENT EXAMPLE (STEP 9)

Describe the natural, human, social, and produced capital stocks that are either being managed or used during each activity listed. Note that *managing* capital stocks involves maintaining, improving, or repurposing the stocks. *Using* (or employing) capital stocks produces outputs. If your listed activity is made up of multiple activities then it may be helpful to identify separate activities when filling in the worksheets.

ACTIVITY	Clear a section of the rainforest and convert it to agricultural land to increase production of cattle.	
CAPITAL TYPE	**CAPITAL MANAGED**	**CAPITAL USED**
NATURAL	Forested land cleared and repurposed Biodiversity of plants and animals	Land to raise the cattle Water contained in river that runs adjacent to the land
HUMAN		Workers to clear the land Farmers to raise the cattle
SOCIAL		Workers union to influence wages Political institutions to gain access to local land
PRODUCED		Finance borrowed from local lender Chainsaws, tractors, tools to clear the land Equipment to aid in raising the cattle

For additional information on capital stocks, refer to the *TEEBAgriFood Scientific and Economics Foundations report* (2018a; Section 6.3).

STEP 10: DESCRIBE THE FLOWS

Flows are a cost or benefit derived from the use of capital in the agri-food value chain and are categorized broadly as *inputs* and *outputs*.

Inputs that flow from stocks of capital *into* the agri-food value chain can be described as a **dependency** (goods and services required to produce outputs). In the Framework, these include **purchased inputs** and **ecosystem services**. In Figure 4, the arrows pointing toward the agri-food value chain indicate inputs.

Purchased inputs are the intermediate inputs that are used within the agri-food value chain, and the capital services received from employing a capital. They can include labour services, ecosystem services, energy, water, fertilizers, and pesticides.

Ecosystem services are the benefits to people from ecosystems. These include provisioning (e.g., food, clean water, timber), cultural (e.g., Indigenous knowledge, aesthetic appreciation of green space), supporting (e.g., supportive services for life, such as habitats and genetic diversity), and regulating (e.g., filtration, purification, carbon sequestration, pollination). Ecosystem services can be used as purchased inputs or can be an input into non-market consumption (e.g., public ecosystem services).

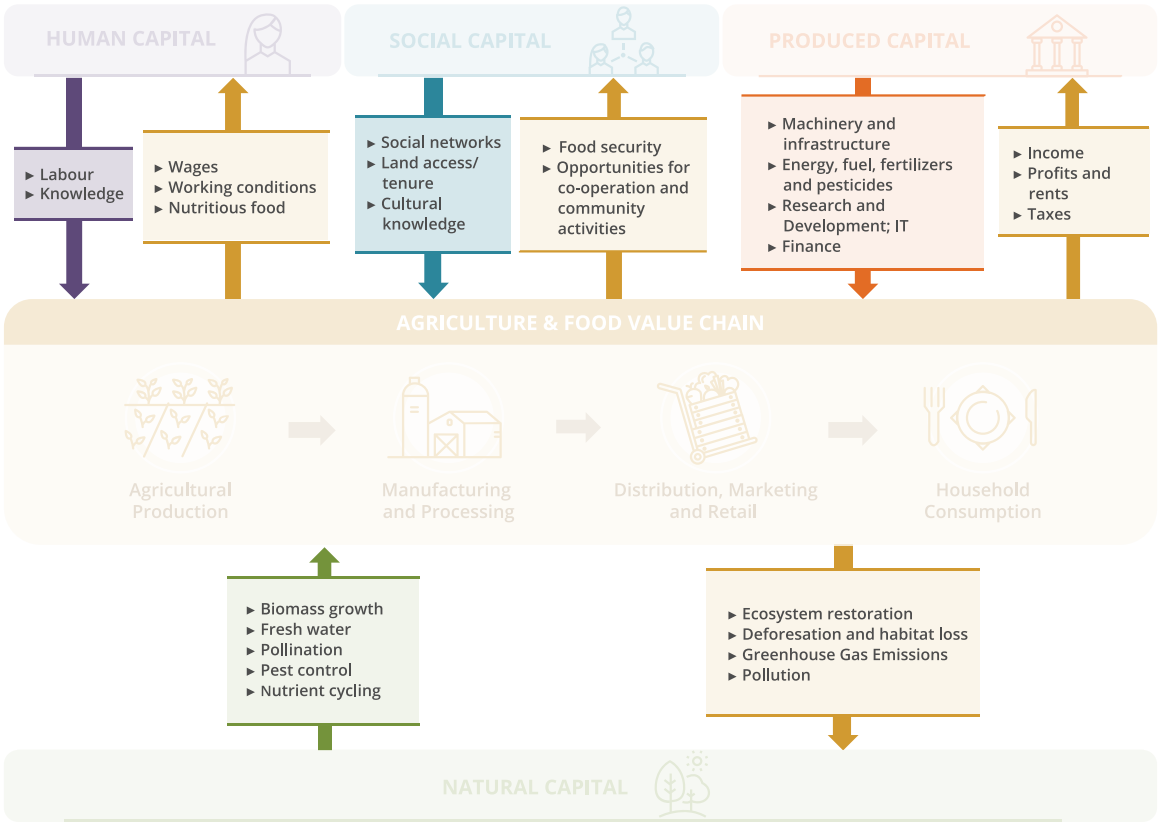
DEPENDENCY: Reliance on or use of a capital required to produce goods and services, or to provide basic human needs (e.g., air to breathe).

PURCHASED INPUTS: The intermediate inputs that are used within the agri-food value chain, and the capital services received from employing a capital.

ECOSYSTEM SERVICES: The benefits to people from ecosystems.

For additional information on ecosystem services, refer to the *TEEBAgriFood Scientific and Economics Foundations report* (2018a; Section 7.2) and the *Millennium Ecosystem Assessment* (2005).

FIGURE 4. CAPITAL FLOW EXAMPLES



Source: Adapted from TEEB (2018a).

For additional information on capital flows, refer to the *TEEBAgriFood Scientific and Economics Foundations report* (2018a; Section 6.3.2).

PHASE 2: DESCRIBE & SCOPE

Outputs are the products and by-products of the production processes in the agri-food value chain. In the Framework, these include **agricultural and food outputs** in the form of goods and services, and **residuals** that arise from their production. In Figure 4, arrows pointing toward capitals stocks chain indicate outputs.

Agricultural and food outputs are goods and services, including agricultural and food products, and financial outputs, such as income, taxes, and subsidies, that flow out of the agri-food value chain. They may be final goods and services or intermediate inputs to another agri-food value chain stage. For example, beef can be sold to households directly from the farm for consumption as a final good, or can be used as an intermediate input into the production of other products containing beef.

Residuals are by-products of the production processes that produce agricultural and food outputs. Examples include greenhouse gas (GHG) emissions, excess nitrogen, harvest losses, and food waste. It is important to distinguish between residuals and **externalities**, which are an economic construct. Externalities are recognized when the economic (financial) cost or impact of a residual flow is borne by a third party. If the cost to a third party of a residual flow is paid (compensated) for by the producer of the residual, then in economic terms the externality has been internalized. This does not imply the residual flow has stopped; it simply indicates there has been compensation.

AGRICULTURAL AND FOOD OUTPUTS: **Goods and services, including agricultural and food products and financial outputs.**

RESIDUALS: **By-products of the production processes that produce agricultural and food outputs.**

EXTERNALITY: **A positive or negative consequence of an economic activity or transaction that affects other parties without being reflected in the price of the goods or services transacted.**

ASSESSMENT EXAMPLE (STEP 10)

ACTIVITY	Clear a section of the rainforest and convert it to agricultural land to increase production of cattle.					
CAPITAL STOCKS			FLOWS: INPUTS		FLOWS: OUTPUTS	
CAPITAL TYPE	CAPITAL MANAGED	CAPITAL USED	PURCHASED INPUTS	ECOSYSTEM SERVICES	AGRI & FOOD OUTPUTS	RESIDUALS
NATURAL	Forested land cleared and repurposed Biodiversity of plants and animals	Land to raise the cattle Water contained in river that runs adjacent to the land	Water	Supporting: biodiversity, habitats Regulating: carbon sequestration, pollination, temperature, rain patterns, etc. Provisioning: food, clean water, timber, etc. Cultural: enjoyment, beauty, traditional knowledge, etc.		Emissions from use of fuel in machinery Carbon release and loss of carbon sequestration capacity from deforestation Habitat loss from deforestation and runoff into river
HUMAN		Workers to clear the land and farmers to raise the cattle	Labour		Wages	
SOCIAL	Political institutions	Workers union Land access		Cultural benefits from nature		
PRODUCED		Finance borrowed from local lender Chainsaws, tractors, tools to clear and plant the land	Machinery and tools to clear and cultivate the land Feed Fuel for machinery		Cattle Income	

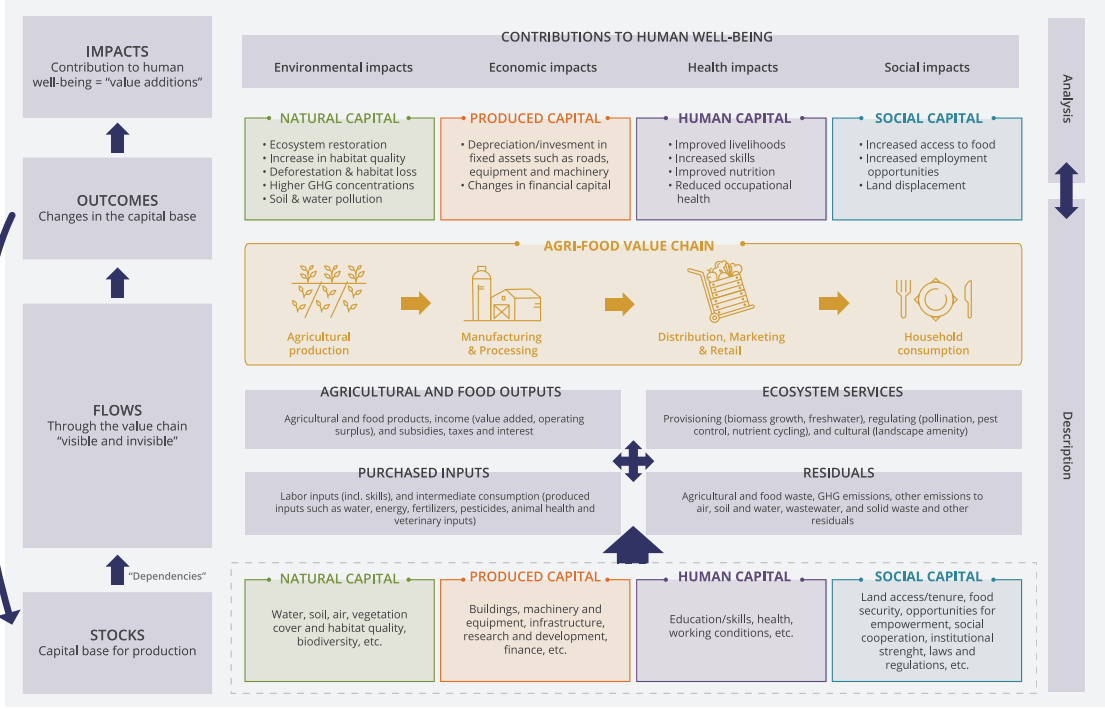
Note that ecosystem service inputs and residual flows outputs are typically recorded within natural capital. Purchased inputs and agricultural and food outputs are typically recorded within produced capital or human capital. Social capital may relate to any of the flows.

STEP 11: DESCRIBE THE OUTCOMES

The positive or negative changes in the extent (quantity) and/or condition (quality) of stocks of capital are **outcomes**. Changes in capital can result from the employment (use) of capital (depreciation) and the management of capital (e.g., investment in capital improvement, buying new capital, and repurposing capital). It is also possible for capital to be degraded as a result of residuals (e.g., the flow of agricultural runoff into a river — natural capital) or other shocks (e.g., fire, monsoon). Outcomes affect the owner of the capital and those who rely on capital. Outcomes are measured by recording the changes in stocks. Figure 5 expands on the capital stocks and value flows diagram, and presents the full TEEBAgriFood Evaluation Framework, which includes the outcomes and impacts.

OUTCOME: A change in the extent or condition of the stocks of capital (natural, produced, social, and human) due to value-chain activities.

FIGURE 5. OUTCOMES & IMPACTS



Source: TEEB (2018a).

PHASE 2: DESCRIBE & SCOPE

When describing outcomes it is important to distinguish between direct and indirect outcomes to understand if they are the direct result of the activities or the indirect result of a change in capital. For instance, an activity may lead to a change in capital (direct outcome), which may lead to a change in another capital (indirect outcome). This is an important distinction when determining the full range of outcomes, as they can offer entry points or pathways for change.

Table 1 shows how managing each of the capitals (or changing the activities associated with each capital) can lead to direct changes in the capital of interest and indirect changes in other capitals. For example, the degradation of soil due to production activities is a direct outcome, while the reduction in river health from increased runoff due to the degradation of soil is the indirect outcome. Investment activities to improve the human capital of farmers (direct outcome) may be linked to improved natural capital (indirect outcome) through better management practices. Similarly, activities aimed at improving public food distribution systems (direct outcomes) can lead to positive outcomes for social capital (indirect outcomes through greater food security) and human capital (improved nutrition). This table and the findings from the describe and scope phase are key to the application of systems thinking across the capitals.

Outcomes should be considered both spatially and temporally. For example, on-farm activities aimed at reducing soil erosion directly improves natural capital and indirectly (in another spatial location) improves river health and human health due to better water quality. Direct outcomes can contribute to indirect outcomes in different time periods. For example, forcing an employee to work long hours now and causing their health to deteriorate (direct outcome) might reduce the likelihood that their child reaches their maximum potential (indirect outcome) in the future due to reduced parenting time. Outcomes may also accrue over time, such as increases in diet-related diseases due to changes in crops that are produced locally and globally, and the resulting products that are produced and consumed.

TABLE 1: DIRECT & INDIRECT CAPITAL OUTCOMES FROM INVESTMENT ACTIVITIES

Direct outcomes from an investment are listed on the diagonal, with indirect outcomes on the off-diagonal.

	OUTCOME ON NATURAL CAPITAL	OUTCOME ON HUMAN CAPITAL	OUTCOME ON SOCIAL CAPITAL	OUTCOME ON PRODUCED CAPITAL
INVEST IN NATURAL CAPITAL	DIRECT – enhanced and protected natural capital	INDIRECT – better health and well-being for people	INDIRECT – better health and well-being that supports social cohesion	INDIRECT – reduced or increased produced capital inputs
INVEST IN HUMAN CAPITAL	INDIRECT – better management of natural capital	DIRECT – better education for people	INDIRECT – individual capacity/ capability contributes to social capital and networking	INDIRECT – produced capital is employed and used more effectively
INVEST IN SOCIAL CAPITAL	INDIRECT – knowledge is transferred between human capital faster, benefiting natural capital	INDIRECT – human capital gains knowledge via networking faster and more efficiently	DIRECT – better social networking	INDIRECT – produced capital is better utilized via shared know-how between human capital
INVEST IN PRODUCED CAPITAL	INDIRECT – the produced capital helps to conserve natural capital	INDIRECT – less time is required for people using the built capital	INDIRECT – networking (via computer) is easier to the social capital	DIRECT – better technology embedded in produced capital

Source: IDEEA Group (2019).

Remember that outcomes can be in-situ or beyond the fence (upriver or downriver in terms of natural capital) and can also have impacts on other capital stocks. The outcome can be due to an explicit activity to manage the quantity or quality of stock (e.g., land clearing) or could be the degradation or improvement of capital through use. There are both direct outcomes and indirect outcomes that may result from an activity. For example, the loss of forest and species (the direct outcome) may be linked to a reduction in the condition of human capital related to psychological stress due to poorer living conditions as a result of firewood shortages (indirect outcome).

ASSESSMENT EXAMPLE (STEP 11)

Describe the outcomes associated with the activity for each capital. Indicate whether it is a direct or indirect outcome of the activity. This table makes it possible to follow the activity from left to right, from capital stocks through to flows and outcomes (changes in capital). Note that the example provided is simplified and does not show or explain the full causal pathways. Iterating between outcomes and impacts will enhance this.

ACTIVITY	Clear a portion of rainforest and convert it to agricultural land to increase cattle production									
CAPITAL STOCKS			FLOWS: INPUTS		FLOWS: OUTPUTS		OUTCOMES			
CAPITAL TYPE	CAPITAL MANAGED	CAPITAL USED	PURCHASED INPUTS	ECOSYSTEM SERVICES	AGRI & FOOD OUTPUTS	RESIDUALS	HUMAN	NATURAL	PRODUCED	SOCIAL
NATURAL	Forested land cleared and repurposed Biodiversity of plants and animals Land and water to raise the cattle			Supporting: biodiversity, habitats, etc. Regulating: carbon sequestration, pollination, temperature, rain patterns, etc. Provisioning: food, clean water, timber, etc. Cultural: enjoyment, beauty, traditional knowledge, etc.		Emissions from use of fuel in machinery Carbon release and loss of carbon sequestration capacity from deforestation Habitat loss from deforestation and runoff into river	Reduced health/incomes from locals who used forest resources for personal fulfillment or to sell (indirect)	Carbon in atmosphere increases (direct) Damage to ecosystem and loss of species and biodiversity (direct) Increase in arable land (direct) Degradation of land and soil quality (direct) Degradation of river health (indirect)		Stress among locals increases without access to cultural resources provided by the rainforest (indirect) Community groups are displeased with locals who now farm what was a common resource (indirect)

Example continued

ACTIVITY	Clear a portion of rainforest and convert it to agricultural land to increase cattle production									
CAPITAL STOCKS			**FLOWS: INPUTS**		**FLOWS: OUTPUTS**		**OUTCOMES**			
CAPITAL TYPE	**CAPITAL MANAGED**	**CAPITAL USED**	**PURCHASED INPUTS**	**ECOSYSTEM SERVICES**	**AGRI & FOOD OUTPUTS**	**RESIDUALS**	**HUMAN**	**NATURAL**	**PRODUCED**	**SOCIAL**
HUMAN		Workers to clear the land and farmers to raise the cattle	Labour		Wages		Increased employment opportunities (direct)			
SOCIAL	Political institutions	Workers union Land access		Cultural benefits from nature						Current rules are scrutinised by locals and there is less trust in government (indirect)
PRODUCED		Finance borrowed from local lender Chainsaws, tractors, tools to clear and plant the land	Machinery and tools to clear and cultivate the land Feed Fuel for the machinery		Cattle Income				Machinery and tools are worn down during use (direct) Fuel and chemical inputs are used up (direct) Increased corn production (direct)	

STEP 12: DESCRIBE THE IMPACTS

Impacts are changes in well-being that are connected to outcomes (a change in capital). Impacts can be categorized into four types: environmental, economic, health, and social impacts (see Figure 5). Note that these categories do not align directly to the four types of capital and do not share a one-to-one relationship.

IMPACT: A positive or negative contribution to one or more dimensions (environmental, economic, health, or social) of human well-being.

Impacts can be described as increases in services (quantity effect), change in prices, increases in disservices, increase in costs, reduction in costs, changes in risk levels (which can be expressed in changes in costs or services in expectation), and changes in the distribution of these costs and services. For example, poor soil management may lead to desertification (an outcome). The impact linked to this outcome is a loss of income for a farmer, which in turn may lead to higher stress on public health and social welfare systems. Impacts are measured by valuing the changes (projected or observed) associated with an activity or intervention.

Other impacts, in particular social impacts, do not easily lend themselves to monetary analysis. For example, the impacts of social capital outcomes such as a change in food security may be very difficult to capture quantitatively, let alone in terms of "value addition." The complete evaluation of impacts therefore should accommodate qualitative assessments of some variables. This will involve presenting information on impacts relating to, for example, food security, access to nutritious food, gender equity in land holdings, etc., and utilizing the information reflected in other parts of the Framework.

When assessing impacts, it is also important to recognize the distributional (e.g., income groups, age classes, educational level, gender) effects of outcomes. For instance, the poor may be impacted more significantly from the loss of local forest resources than those who are financially well off and don't rely on food and fibre from the forest.

PHASE 2: DESCRIBE & SCOPE

The aim of the impact description is to list all potential impacts associated with the outcomes identified (both direct and indirect outcomes). It is important to involve your advisory committee and other relevant stakeholders in this process to ensure your assessment of the impacts is comprehensive. Do not limit your description to only those things you feel are most relevant to your assessment or what you think you can measure; this will be addressed in the scope section of this stage.

An important role of your application is to assess trade-offs, including trade-offs between ecosystem services as inputs to production and corresponding purchased inputs (e.g., fertilizer versus soil management) and the potential trade-offs in **value** between modifying ecosystems to support agriculture versus maintaining ecosystems to supply ecosystem services that are of broader public benefit, such as carbon storage and the provision of habitat to support maintenance of biodiversity.

VALUE: The importance, worth, or usefulness of a good or service (including all relevant market and non-market values) determined by people's preferences and the trade-offs they choose to make given their scarce resources, or the value the market places on an item.

Value can be measured in monetary terms. It can also be captured through non-monetary quantitative and qualitative measurement. See Phase 3: Measure and Value (page 50) for more information.

PHASE 2: DESCRIBE & SCOPE

ASSESSMENT EXAMPLE

ACTIVITY	Clear a portion of rainforest and convert it to agricultural land to increase cattle production													
CAPITAL STOCKS			**FLOWS: INPUTS**		**FLOWS: OUTPUTS**		**OUTCOMES**				**IMPACTS**			
CAPITAL TYPE	**CAPITAL MANAGED**	**CAPITAL USED**	**PURCHASED INPUTS**	**ECOSYSTEM SERVICES**	**AGRI & FOOD OUTPUTS**	**RESIDUALS**	**HUMAN**	**NATURAL**	**PRODUCED**	**SOCIAL**	**ENVIRONMENTAL**	**ECONOMIC**	**HEALTH**	**SOCIAL**
NATURAL	Forested land cleared and repurposed Biodiversity of plants and animals Land and water to raise the cattle			Supporting: biodiversity, habitats, etc. Regulating: carbon sequestration, pollination, temperature, rain patterns, etc. Provisioning: food, clean water, timber, etc. Cultural: enjoyment, beauty, traditional knowledge, etc.		Emissions from use of fuel in machinery Carbon release and loss of carbon sequestration capacity from deforestation Habitat loss from deforestation and runoff into river		Carbon in atmosphere increases (direct) Damage to ecosystem and loss of species and biodiversity (direct) Increase in arable land (direct) Degradation of land and soil quality (direct) Degradation of river health (indirect)		Stress among locals increases without access to cultural resources provided by the rainforest (indirect) Community groups are displeased with local who now farm what was a common resource (indirect)	Reduction in air quality Reduction in rainforest ecosystem services (provisioning, carbon sequestration, water filtration, etc.) Habitat services and related threatened species affected Increase in biomass provisioning services Reduction in fish provisioning services	Increase in costs of health conditions Loss of income from harvest of non-timber forest products Lower productivity of households whose human capital may have been affected by loss of forest ecosystems Loss of income for downstream farmers who use the water Reduction in income from fish catch Loss of income for tourism operators as tourists swim in the stream	Increase in respiratory health conditions Cost of illness through lower water quality	Loss of cultural belonging and subsequent displacement of local Indigenous group

Example continued

ACTIVITY	Clear a portion of rainforest and convert it to agricultural land to increase cattle production													
CAPITAL STOCKS			FLOWS: INPUTS		FLOWS: OUTPUTS		OUTCOMES				IMPACTS			
CAPITAL TYPE	CAPITAL MANAGED	CAPITAL USED	PURCHASED INPUTS	ECOSYSTEM SERVICES	AGRI & FOOD OUTPUTS	RESIDUALS	HUMAN	NATURAL	PRODUCED	SOCIAL	ENVIRONMENTAL	ECONOMIC	HEALTH	SOCIAL
HUMAN		Workers to clear the land and farmers to raise the cattle	Labour		Wages		Increased employment opportunities (direct) Reduced health/ incomes from locals who used forest resources for personal fulfillment or to sell (indirect)					Increase in available jobs Increase in living costs	Decrease in health due to reduction in natural food sources	
SOCIAL	Political institutions	Workers union Land access		Cultural benefits from nature						Current rules are scrutinized by locals and there is less trust in government (indirect)		Cost of illness through reduction in mental and physical health benefits associated with forest	Increases in negative health conditions	Breakdown of community networks
PRODUCED		Finance borrowed from local lender Chainsaws, tractors, tools to clear and plant the land	Machinery and tools to clear and cultivate the land Feed Fuel for the machinery		Cattle Income				Machinery and tools are worn down during use (direct) Fuel and chemical inputs are used up (direct) Increased corn production (direct)			Costs to repair or replace machinery and tools Increased profits and income for company owners		Political (institutional) unrest

PHASE 2: DESCRIBE & SCOPE

EXPECTED OUTCOMES

This table and the findings from the describe section are central to the application of systems thinking across the capitals. By the end of this section you will have a comprehensive and systemic understanding of the activities related to the issue of interest and their impacts on the four capitals.

Before you move on to scope make sure you have:

1. A description of the system;
2. A description of the agri-food value chain and activities of interest;
3. A description eco-agri-food system;
4. A summary table that describes the capital stocks, flows, outcomes, and impacts.

The sharing of descriptions of systems is encouraged to support future work and to help bring transparency to assessments and highlight potential exclusions and inclusions of material relationships.

PHASE 2: DESCRIBE & SCOPE

SCOPE

With your description of the eco-agri-food system complete, you can clearly see the capitals stocks being managed or used in the activities related to your issue of interest, the outcomes of those activities (the changes in the capitals as a result of the activities), and the impacts of those outcomes (direct and indirect).

Scoping helps refine or narrow the assessment based on the issue of interest determined while **framing** and is informed by any discoveries you made while **describing** the system. Remember that the process of describing is integrated with the process of scoping to ensure all connections and effects that are relevant to the assessment are identified before determining their relative importance. Because of this, you may move back to describing if new pathways or relationships are identified.

Before you start scoping, it is helpful to reflect again on the issue of interest and the purpose and audience of your assessment.

EXPECTED OUTCOMES

During the scope section of this phase you will:

1. Assess materiality using a method appropriate for your context;
2. Select the impacts you will include or exclude in your assessment and describe why; and
3. Identify opportunities for change.

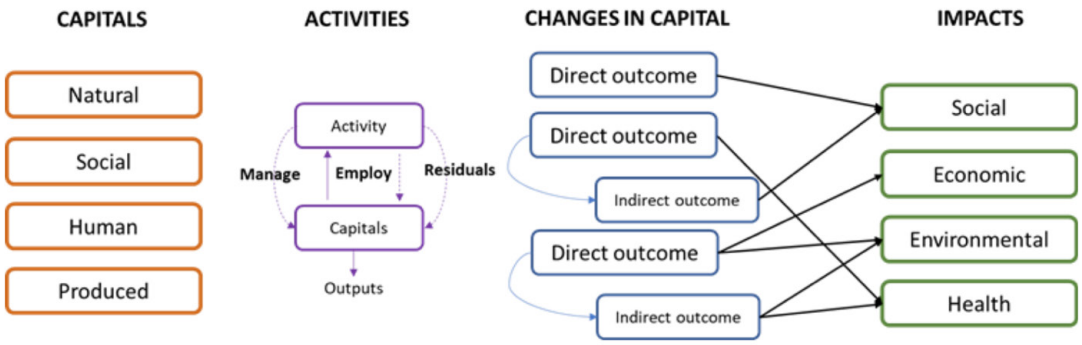
STEP 13: ASSESS MATERIALITY

The purpose of this section is to focus the scope of your assessment and describe the rationale behind these choices. This is done by assessing the **materiality** of the impacts identified while describing the eco-agri-food system. An impact may be considered material if measurement and communication of the impact has the potential to alter decision-making processes.

Materiality assessments are used to determine which impacts are the most important and significant in relation to the issue of interest and what you will go on to measure and value. Using a systematic and transparent process allows you to communicate to your audiences and others about how and why you have limited the scope of your assessment by providing the rationale behind your choices. It is critical to engage your advisory committee and other relevant stakeholders while conducting your materiality assessment.

The basis for the materiality assessment is built up through the process of describing and the information collected in the summary tables for Activities 11 and 12. Reviewing these tables allows you to follow the issue you are assessing from its capital stock inputs and the flows of capital through to the outcomes or changes in capital and the impacts that those changes have, and helps to establish the causal links (see Figure 6). Following these causal links reveals the **impact pathways** and **dependency pathways** that can be used to assess materiality.

FIGURE 6. CAUSAL LINKAGES BETWEEN CAPITALS, ACTIVITIES, & IMPACTS

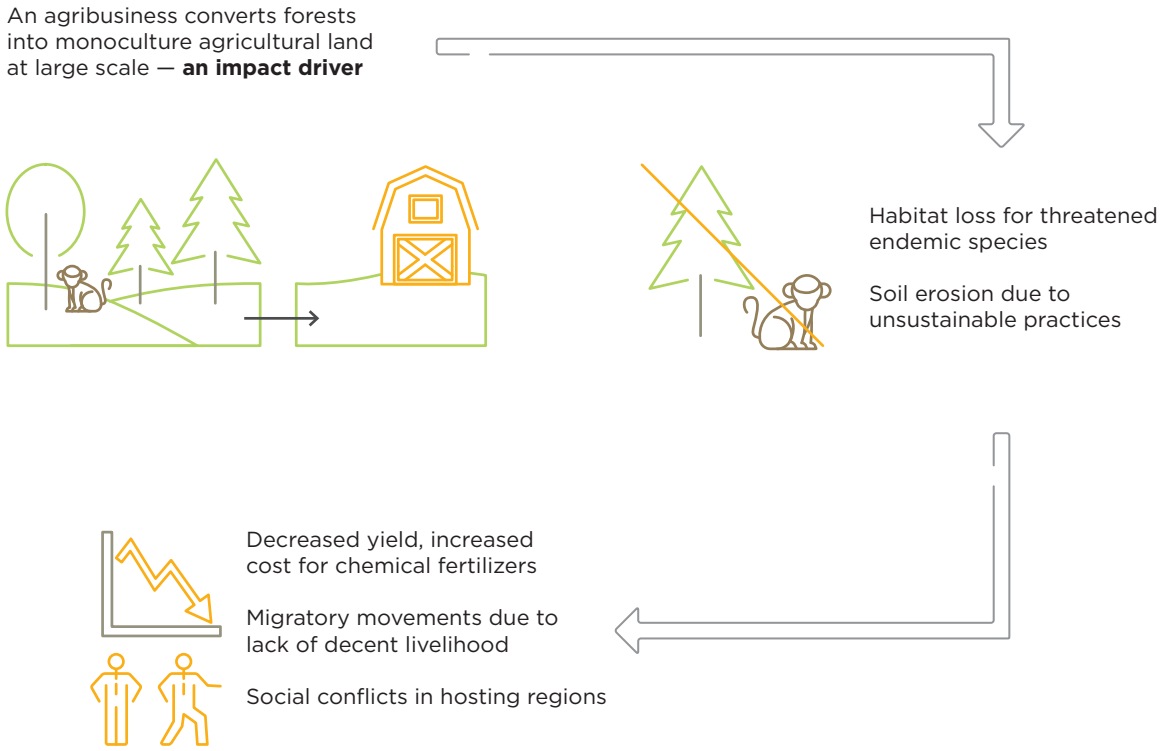


MATERIALITY: The importance, worth, or usefulness of something. It reflects significant economic, environmental, and social impacts that substantially influence the assessments and decisions of stakeholders (adapted from Global Reporting Initiative, 2020).

IMPACT PATHWAY: A series of consecutive, causal relationships, ultimately starting at a stock, describing how an activity results in changes in a capital (outcome), and what impact these changes have on different stakeholders. See Figure 7 for an example.

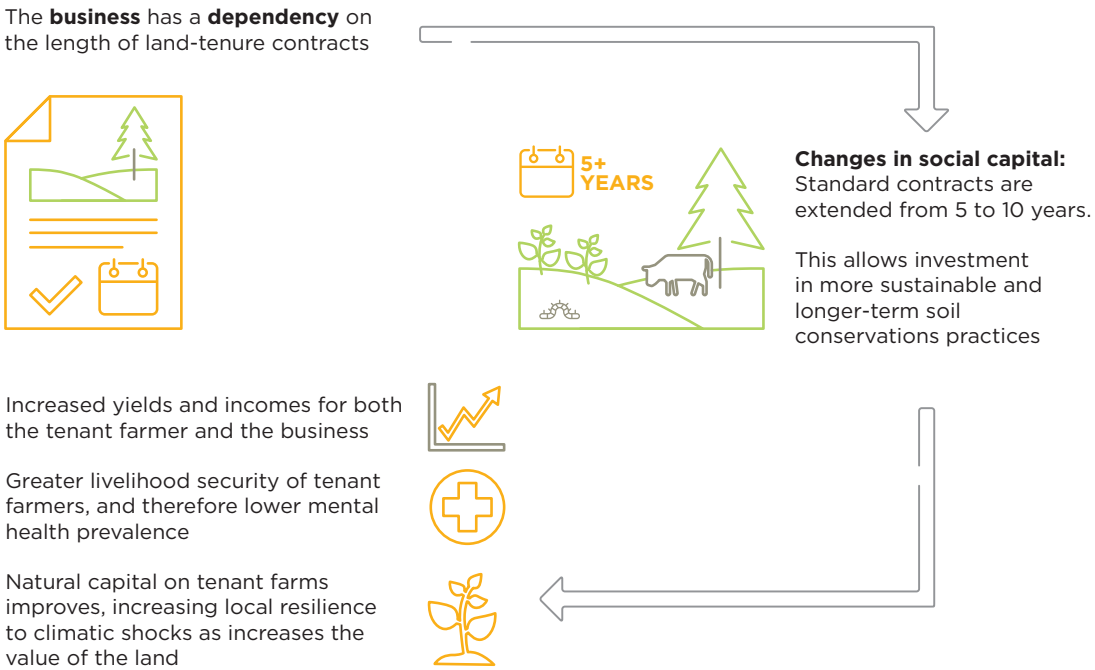
DEPENDENCY PATHWAY: How an activity depends on a capital stock, and how changes in the quantity or quality of that capital stock impacts different stakeholders. See Figure 8 for an example.

FIGURE 7. IMPACT PATHWAY EXAMPLE



Source: Capitals Coalition (2020b).

FIGURE 8. DEPENDENCY PATHWAY EXAMPLE



Source: Capitals Coalition (2020b)

Before assessing materiality, it is important to recall your issue of interest and your purpose or objective. Additionally, reflecting on the actors, agency, and relationships within the system and the historical, political, and institutional context of the system can help direct you to entry points or pathways for change.

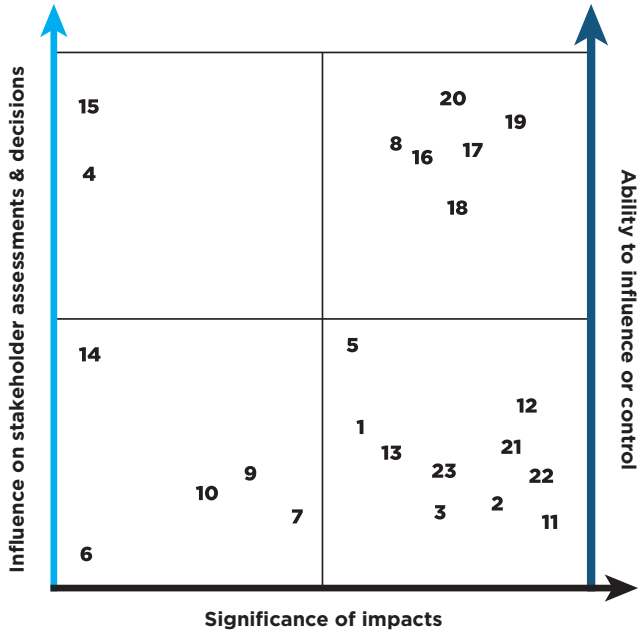
There are many different materiality assessment methods, and some may be more relevant to your assessment (especially in business or government contexts). You may want to seek expert advice, consult additional stakeholders, review literature (both grey and published), or collect new information to help you inform your materiality assessment.

For additional information on material assessment, refer to the *GSI Sustainability Reporting Standards* (Global Reporting Initiative, 2020) and to the *TEEBAgriFood Operational Guidelines for Business* (Capitals Coalition, 2020b; steps 5 to 7).

ASSESSMENT EXAMPLE (STEP 13)

List the impacts from Step 12 and assess materiality.

IMPACTS			
ENVIRONMENTAL	**ECONOMIC**	**HEALTH**	**SOCIAL**
1. Reduction in air quality	6. Increase in available jobs	17. Decrease in health due to reduction in natural food sources	21. Loss of cultural belonging and subsequent displacement of local Indigenous group
2. Reduction in rainforest ecosystem services (provisioning, carbon sequestration, water filtration, etc.)	7. Increase in living costs	18. Increase in respiratory health conditions	22. Breakdown of community networks
3. Habitat services and related threatened species affected	8. Increase in costs of health conditions	19. Cost of illness through lower water quality	23. Political (institutional) unrest
4. Increase in biomass provisioning services	9. Loss of income from harvest of non-timber forest products	20. Increases in negative health conditions	
5. Reduction in fish provisioning services	10. Lower productivity of households whose human capital may have been affected by loss of forest ecosystems		
	11. Loss of income for downstream farmers who use the water		
	12. Reduction in income from fish catch		
	13. Loss of income for tourism operators as tourists swim in the stream		
	14. Costs to repair or replace machinery and tools, fuel		
	15. Increased profits and income for company owners		
	16. Cost of illness through reduction in mental and physical health benefits associated with forest		



Source: Global Reporting Initiative (2020), adapted by Overall Strategies.

STEP 14: SELECT IMPACTS FOR ASSESSMENT

After conducting a materiality assessment you will have determined which impacts are the most important to focus on in the measure and value phase of the assessment. List all of the impacts and indicate if you have included or excluded them. It is important to articulate the reasons for including or excluding each of the impacts.

ASSESSMENT EXAMPLE

IMPACTS

ENVIRONMENTAL	ECONOMIC	HEALTH	SOCIAL
1. Reduction in air quality. INCLUDED. This impact is related to material health impacts.	6. ~~Increase in available jobs.~~ EXCLUDED. Quality of jobs are poor.	17. Decrease in health due to reduction in natural food sources. INCLUDED. Potential of significant impacts and important to decision-makers.	21. Loss of cultural belonging and subsequent displacement of local Indigenous group. INCLUDED. This impact is related to material health impacts.
2. Reduction in rainforest ecosystem services (provisioning, carbon sequestration, water filtration, etc.) INCLUDED. This impact is related to material health impacts.	7. ~~Increase in living costs.~~ EXCLUDED. Little influence as decision-makers cite job creation as a solution.	18. Increase in respiratory health conditions. INCLUDED. Potential of significant impacts and important to decision-makers.	22. ~~Breakdown of community networks.~~ EXCLUDED. Decision-makers have not expressed interest in this issue.
3. Habitat services and related threatened species affected. INCLUDED. This impact is related to material health impacts.	8. Increase in costs of health conditions. INCLUDED. Potential of significant impacts and important to decision-makers.	19. Cost of illness through lower water quality. INCLUDED. Potential of significant impacts and important to decision-makers.	23. ~~Political (institutional) unrest.~~ EXCLUDED. Decision-makers have not expressed interest in this issue.
4. ~~Increase in biomass provisioning services.~~ EXCLUDED. Not a part of the issue of interest.	9. ~~Loss of income from harvest of non-timber forest products.~~ EXCLUDED. Little influence as decision-makers cite job creation as a solution.	20. Increases in negative health conditions. INCLUDED. Potential of significant impacts and important to decision-makers.	
5. Reduction in fish provisioning services. INCLUDED. This impact is related to material health impacts.	10. ~~Lower productivity of households whose human capital may have been affected by loss of forest ecosystems.~~ EXCLUDED. Little influence as decision-makers cite job creation as a solution.		
	11. ~~Loss of income for downstream farmers who use the water.~~ EXCLUDED. Little influence as decision-makers cite job creation as a solution.		
	12. ~~Reduction in income from fish catch.~~ EXCLUDED. Little influence as decision-makers cite job creation as a solution.		
	13. ~~Loss of income for tourism operators as tourists swim in the stream.~~ EXCLUDED. Little influence as decision-makers cite job creation as a solution.		
	14. ~~Costs to repair or replace machinery and tools, fuel.~~ EXCLUDED. Not a part of the issue of interest.		
	15. ~~Increased profits and income for company owners.~~ EXCLUDED. Not a part of the issue of interest.		
	16. Cost of illness through reduction in mental and physical health benefits associated with forest. INCLUDED. Potential of significant impacts and important to decision-makers.		

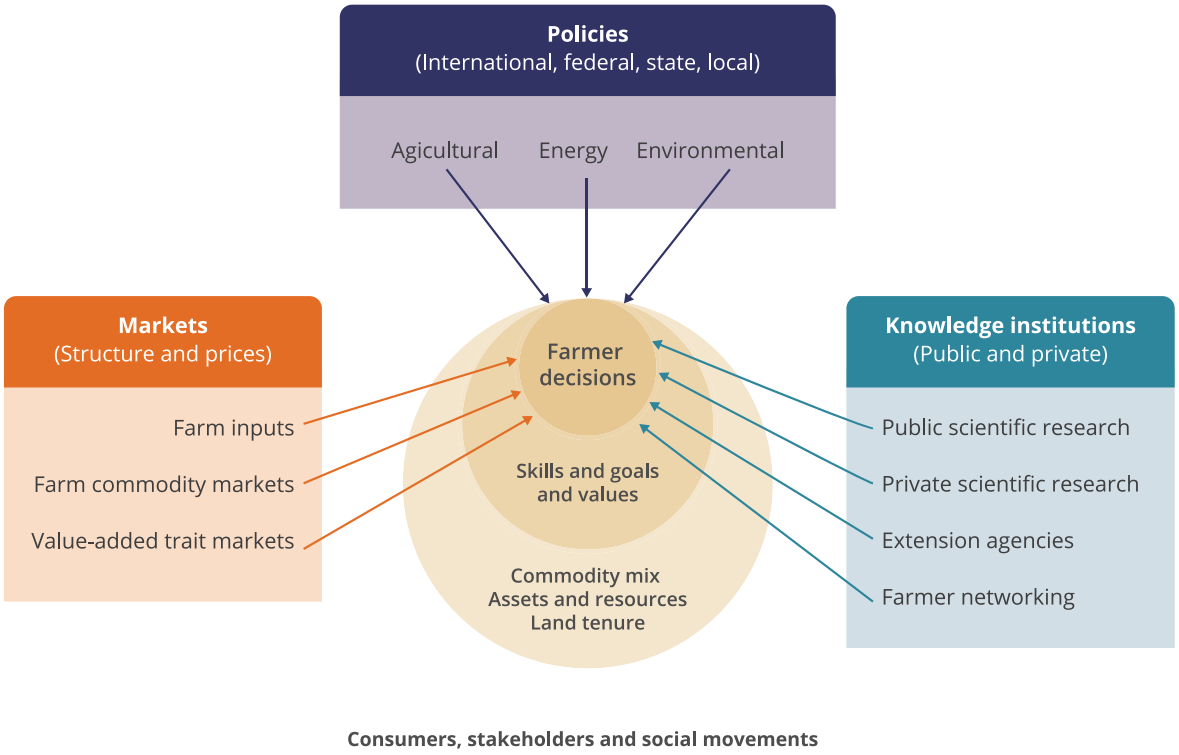
STEP 15: IDENTIFY OPPORTUNITIES FOR CHANGE

Once you have selected the impacts that you will assess, work backward using the information compiled in Step 12 to identify opportunities for change. Understanding the **drivers,** outcomes, and impact pathways will help you to identify opportunities for change. Review Table 1 to recall how managing each of the capitals (or changing the activities associated with each capital) can lead to direct changes in the capital of interest and indirect changes in other capitals. It may be cost effective to directly invest in one capital to generate positive outcomes in another capital (say, natural). This table and the findings from the describe and scope phase are critical to the application of systems thinking across the capitals.

To identify opportunities for change, you may determine that some drivers, outcomes, and impact pathways are easier to change or influence than others. Because the ability to influence people and decisions presents opportunities for change, this step may also inform your materiality assessment. You may want to move back and forth between these steps to help you scope and focus your assessment further, but it is important to maintain careful consideration of your issue of interest, stakeholders, and the purpose of your assessment and not to narrow your assessment for the sake of ease or favourable outcomes.

DRIVER: A flow (e.g., input or non-product output) that arises from the activities of agents (e.g., governments, corporations, individuals) in eco-agri-food value chains, resulting in significant outcomes and leading to material impacts.
See Figure 9 for an example of drivers and constraints that affect farmers' decisions.

FIGURE 9. DRIVERS & CONSTRAINTS THAT AFFECT FARMERS' DECISIONS



Source: TEEB (2018a), Figure 7.1.

ASSESSMENT EXAMPLE (STEP 15)

The materiality assessment example has determined that the most material impacts of the proposal to clear a section of the rainforest and convert it to agricultural land to increase production of cattle are related to a reduction of mental and physical health benefits and the associated costs of illness. Your engagement with stakeholders has revealed that the local healthcare system is already under stress and that government expenditure associated with the provision of health services are relatively low.

Using the information from the completed activities to work backward, you can see that the driver of the health impacts is changing forested land (natural capital) and repurposing it for agricultural production. Investing in natural capital (maintaining the forest) will have positive indirect impacts on human capital (maintaining health). By assessing the extent of the health impacts, you will be able to provide information on the indirect health costs of environmental and land use changes. This is a powerful approach to influencing decisions on the proposal.

EXPECTED OUTCOMES

By the end of the scope section and this phase you will have refined or narrowed your assessment so that the measure and valuation stage will adequately address the issue of interest and meet your study objectives. Before you move on to the next stage make sure you have:

1. Assessed materiality using a method appropriate for your context;
2. Selected the impacts you are including or excluding in your assessment and described why; and
3. Identified opportunities for change.

PHASE 3: MEASURE & VALUE

PHASE 3: MEASURE & VALUE

This phase provides an overview of the considerations that are relevant to measurement and valuation. There are a range of approaches to measurement and valuation that are dependent on the purpose of the assessment, the scope and type of questions that are being asked, and the context of the assessment. Rather than provide specific guidance for each of these scenarios, this section provides an overview of how to approach measurement and valuation. It is recommended that the measure and value stage is complemented with technical information (or expertise) specific to the approach selected.

EXPECTED OUTCOMES

During the measure and value phase you will:

1. Select an analytical approach appropriate for the assessment purpose and audience;
2. Select key variables to measure and appropriate indicators;
3. Collect data and complete measurement;
4. Apply value to your measurement (where possible); and
5. Document study reviews, key assumptions, and assess strengths and weaknesses.

PHASE 3: MEASURE & VALUE

STEP 16: SELECT AN ANALYTICAL APPROACH & METHOD

When considering approaches and methods, it is important to consider the issue, purpose, and intended audience of the assessment. You should also revisit the temporal scope of your assessment. The temporal dimension of the assessment will inform the type of approach or method chosen. All approaches have a reference point (see Table 2) to compare against, whether it be a different time period, a different product, or a different country. For instance, your assessment may be:

- evaluating historical information to evaluate past and inform future decisions;
- benchmarking current performance against other units (e.g., production methods, products, businesses, countries, cities, etc.); or
- projecting information into the future to inform current decisions.

TABLE 2: MEASURE & VALUE REFERENCE-POINT CONSIDERATIONS

DECISION POINT	REFERENCE POINT	DECISION MAKER	APPROACH
Historical	Historical	Internal	Impact evaluation
Current	Historical	Internal External	Indicator monitoring Reporting
Current	Current	Internal	Cross-sectional comparisons
Current	Future	Internal Internal Internal Internal	Scenario analysis Life-cycle assessments Risk assessment Options analysis

PHASE 3: MEASURE & VALUE

You may already know what approach to use and can proceed to apply this preferred approach and method. If you have not chosen your approach, you should research the range of approaches to determine what is appropriate for the assessment. Examples of measurement approaches and methods include cost-benefit analysis, scenario analysis, natural resource damage assessments, strategic target-setting and monitoring, impact assessment, risk assessment, and life-cycle assessments. The TCA Inventory contains an initial list.

You can apply different methods to underpin the approach you choose. This will depend on the type of assessment chosen. For example, to perform scenario analysis, the practitioner may apply input-output modelling or some form of financial modelling. You will need to research the approach and the different methods that underpin them to understand what best suits your assessment. You should consider the type of measurement (qualitative, quantitative, and monetary) when choosing an approach and method.

ASSESSMENT EXAMPLE (STEP 16)

The purpose of the example assessment is to assess the (current) impacts of deforestation for agriculture production to inform decisions on the proposal (future) made by the company to clear a portion of rainforest and convert it to agricultural land. In this case, a life-cycle assessment may be appropriate.

For additional information on evaluation methodologies, refer to the *TEEBAgriFood Scientific and Economics Foundations report* (2018a; Section 6.3) and the *TEEBAgriFood Operational Guidelines for Business* (Capitals Coalition, 2020b; Steps 5 to 7).

STEP 17: SELECT APPROPRIATE VARIABLES & INDICATORS

Selecting variables for the material impacts you've identified requires you to review the table you created in previous steps and determine which material impacts you will assess and which you will not. This allows you to identify appropriate variables along the related impact pathways, helping you assess and measure what is deemed important through the process. When assessing impact pathways, you may measure one or all variables. The variables you select depend on prior knowledge and the temporal aspect of the assessment. You should always measure activities, as this establishes the causal links between activity and outcomes and impacts.

For instance, the purpose of the assessment may be to monitor the results of the regulation and investment (enforcement and education) to reduce levels of land clearing. This may involve monitoring the activities of businesses, farmers, households, including how they manage and employ/use the capitals, and the level of forest. You may have already studied the loss of ecosystem services (impact) associated with land clearing, and so the measurement of these impacts is not required as it was prior knowledge.

The intended audiences of the assessment and their demand for information is an important consideration when selecting a measurement type. For example, measuring biodiversity loss by evaluating changes using sector-specific tools such as the Shannon's Index may be understood by an environmental agency, but it may not be familiar to a central government agency concerned with the return on investment across different investment options.

For additional information on measuring and valuing biodiversity, refer to the *Biodiversity Guidance* (Capitals Coalition, 2020a).

PHASE 3: MEASURE & VALUE

You should also consider the type of measurement suited to the different variables. Qualitative, quantitative, and monetary measurement are all options for measuring the different components. You may select a combination of measurement types. Qualitative techniques are used to inform the potential scale expressed through qualitative, non-numerical terms. Qualitative indicators may be based on professional judgement and can be informed by the opinions of stakeholders. Quantitative techniques focus on numerical data that are used as indicators. Quantitative indicators are typically in physical units, such as volume of water abstracted or tons of waste produced. Monetary techniques translate measures into a single common currency and can be based on market or non-market prices depending on what is being measured.

For each of the variables selected you will need to define an indicator. The practitioner should consider the requirements of the approach and method chosen. For example, input-output analysis might require water use to be measured in tons of water abstracted.

PHASE 3: MEASURE & VALUE

ASSESSMENT EXAMPLE (STEP 17)*

ACTIVITY	Clear a portion of rainforest and convert it to agricultural land to increase cattle production											
	CAPITAL STOCKS				FLOWS: INPUTS		FLOWS: OUTPUTS		OUTCOMES			
MEASUREMENT	NATURAL CAPITAL	HUMAN CAPITAL	SOCIAL CAPITAL	PRODUCED CAPITAL	PURCHASED INPUTS	ECOSYSTEM SERVICES	AGRI & FOOD OUTPUTS	RESIDUALS	NATURAL	HUMAN	SOCIAL	PRODUCED
VARIABLES	Land Water Air Living	~~Workers~~	~~Political institution~~ ~~Workers union~~ Land access	~~Financing~~ ~~Machines/ tools~~	~~Labour~~ ~~Machines/ tools~~ ~~Feed~~ ~~Fuel~~	~~Biodiversity~~ Carbon sequestration Food/fibre Water Cultural benefits	~~Wages~~ ~~Cattle~~ ~~Income~~	Emissions Carbon release Runoff	Atmospheric carbon increases (direct) Damage to ecosystem and biodiversity (direct) ~~Increase in arable land (direct)~~ Degradation of land and soil quality (direct) Degradation of river health (indirect)	~~Increased employment (direct)~~ Reduced health (indirect)	Increased stress without access to cultural resource (indirect) ~~Community groups are displeased (indirect)~~	~~Depreciation of machines/ tools (direct)~~ ~~Depletion of fuel and chemicals (direct)~~ ~~Increased corn production (direct)~~
INDICATORS	Land size, use Water turbidity Air quality index Number of species		Number of people using land and uses			Tons of carbon Tons of fish/ food/fibre Megalitres of water Qualitative happiness indicators		Tones of GHG PPM of nitrogen and phosphorus	Tons of carbon Species loss Soil carbon/ water retention Fish counts Water turbidity	Rates of illness or disease and costs	Qualitative stress indicators	

Strikethrough indicates variables that have been eliminated.

PHASE 3: MEASURE & VALUE

STEP 18: COLLECT DATA & MEASURE

Now you will need to collect data to compile the indicators defined in the previous step. You should gather data from several different sources and engage with relevant stakeholders. The data collected and the sources available will vary depending on the location of the assessment and the scope of the indicators across stocks and flows. There are different options to consider when collecting data to measure the indicators (see Table 3 for examples of measuring stocks). These include primary data collection, secondary data collection, and modelling data. Primary data collection often involves sampling or undertaking surveys to collect data. This may require training or specialist assistance to ensure the validity of data and the statistical significance of results. Secondary data collection involves the collection of already established datasets; the TCA Inventory may be a helpful starting point.

Primary and secondary data can both be used to create new data sets through modelling. Existing data can be used and analyzed to extend spatial and temporal coverage through various forms of estimation (e.g., interpolation, extrapolation, bottom-up aggregation, and top-down spatial redistribution). Working with secondary data requires consideration of underlying assumptions, conversion factors, and other procedures to ensure the data used is appropriate for your situation. Biophysical modelling or life-cycle-analysis (LCA) are practical options. For example, biophysical modelling can be used to estimate to what extent an upriver forest purifies or provides water. Similarly, understanding the emissions or water use through pathways such as tilling, harvesting, and processing could be achieved through LCA methods. External support may also be required when working with secondary data.

TABLE 3: DATA SOURCE EXAMPLES

	NATURAL CAPITAL	HUMAN CAPITAL	SOCIAL CAPITAL	PRODUCED CAPITAL
PRIMARY DATA	Sampling data (required where secondary data is not available)	Business surveys, population surveys	Household, government, workplace, community surveys	Business surveys
SECONDARY DATA	Land cover, land use, vegetation, species, stock, biodiversity, water data	Population statistics, labour force statistics, demographic data	Household, government, workplace, community surveys	National accounts and other national datasets compiled by statistic agencies
MODELLED DATA	Primary and secondary data can be used to model data. Bottom-up or top-down approaches can be used.			

ASSESSMENT EXAMPLE (STEP 18)

Collect the data and measure the indicators identified in the previous step.

	TYPE OF INDICATORS			
	NATURAL CAPITAL	**HUMAN CAPITAL**	**SOCIAL CAPITAL**	**PRODUCED CAPITAL**
INDICATORS	Land size, use Water turbidity Air quality index Number of species Tons of carbon Tons of fish/food/fibre Megalitres of water Tones of GHG PPM of nitrogen and phosphorus Species loss Soil carbon/water retention Fish counts	Rates of illness or disease and costs Qualitative happiness indicators Qualitative stress indicators	Number of people using land and uses	N/A
PRIMARY DATA	Sampling required where secondary data isn't available		Community surveys Household surveys	
SECONDARY DATA	Land (cover, use, vegetation, soil carbon, tree count data) Species (presence, absence, stocks, diversity data) Air (carbon, GHG) Water (volume, turbidity, nitrogen and phosphorus data)	Population statistics Demographic information (age, gender etc.) National accounts and other national datasets compiled by statistic agencies		
MODELLED DATA	Primary and secondary data can be used to model data. Bottom up or top down approaches can be used.			

PHASE 3: MEASURE & VALUE

STEP 19: APPLY VALUE TO YOUR MEASUREMENT

Valuation can allow comparison of impacts across systems in a common unit. Note that this stage is not required if your issue and assessment does not require valuation or is not appropriate for valuation. For example, the evaluation of a policy program does not always require valuation.

In the case that your assessment requires valuation, there are three different types: qualitative, quantitative, and monetary. Qualitative valuation techniques are used to inform the potential scale of costs and/or benefits expressed through qualitative, non-numerical terms. Quantitative valuation techniques focus on numerical data that are used as indicators for costs and/or benefits. Monetary valuation techniques translate quantitative estimates of costs and/or benefits into a single common currency. The choice of valuation technique depends on the issue you wish to address, the method you choose, and the constraints on your project. The TCA Inventory outlines a number of resources to support environmental and social valuations.

ASSESSMENT EXAMPLE (STEP 19)

Your assessment of the proposal to clear a section of the rainforest shows that disease and illness rates in local populations will increase. These changes can be monetized fairly easily. Estimated changes to the amount of fish stocks in the river and the food and fibre contained in the forest can be quantified through various methods. Changes to happiness and other personal experiences are most easily measured through qualitative valuations. Almost anything could be valued, but common and comparable valuations are not always possible.

Remember that this example is illustrative and theoretical. In your assessment it will be important to be as practical as possible in your valuation process.

PHASE 3: MEASURE & VALUE

STEP 20: VALIDATE YOUR STUDY & TEST KEY ASSUMPTIONS

To validate the process and the findings it will be necessary to conduct internal and external reviews. There will always be some level of estimation or approximation involved in your assessment. Ensure your results are robust and ready for application and communication by: undertaking a sensitivity analysis on your indicators, data collection methods, measurement, and valuation; presenting any numbers in a range or rounded; and documenting your decision to do this. When applying your chosen measurement approach/method you should refer to different guidance material. Document any strengths or weaknesses of your assessment.

ASSESSMENT EXAMPLE (STEP 20)

A review of the study found that impacts were typically generalized across the population. By including more detailed national datasets with robust demographic information, you may have been able to present a more nuanced assessment of the distributional impacts of clearing a section of the rainforest. The collection of primary data may have been improved through increased engagement of community members.

EXPECTED OUTCOMES

By the end of the measure and value stage you will have a comprehensive understanding of the magnitude of the impacts assessed and will be ready to interpret, apply, and act upon the results. Before you move on to the next stage, make sure you have:

1. Selected an analytical approach appropriate for the assessment purpose and audience;
2. Selected key variables to measure and appropriate indicators;
3. Collected data and completed measurement;
4. Applied value to your measurement (where possible); and
5. Documented study reviews, key assumptions, and assessment strengths and weaknesses.

PHASE 4: TAKE ACTION

PHASE 4: TAKE ACTION

You are now at the final stage of your assessment. Before this, **framing** your hypothesis or research question informed what you were going to investigate and why. **Describing** was the investigation. **Scoping** allowed you to focus on what was important to you from your findings during the investigation. Now you will react to what you found in your investigation by interpreting, applying, and **acting** upon your findings.

EXPECTED OUTCOMES

The expected outcomes of this phase will vary depending on your issue of interest, the purpose of your study, the stakeholders, your action plan, and the assessment findings. Taking action on your assessment should have an impact or influence on decisions, practices, and policies. The following activities are meant to guide you but are not meant to be comprehensive.

STEP 21: IDENTIFY WHO IS AFFECTED

Review your list of stakeholders and identify any new ones. Be sure to consider additional audiences and impacted groups that your assessment may have revealed. For each of the measurements undertaken, articulate distributional issues and how the outcomes may be distributed across various actors. For example, runoff from farms will affect downriver communities that may not have access to municipal water supplies so are disproportionately affected by the runoff. Furthermore, the impacts may be distributed differentially across time. For example, some impacts may only make themselves visible in future generations, such as the impacts of environmental contamination. Therefore, questions of both inter- and intragenerational equity should also be considered in this step.

ASSESSMENT EXAMPLE (STEP 21)

One clear distributional impact identified through your assessment was that the health of the people who live downstream on the river would be most impacted due to significant negative changes in water quality and depleted fish stocks. Understanding who is affected and how will help you apply and communicate results effectively.

PHASE 4: TAKE ACTION

STEP 22: APPLY & ACT ON YOUR RESULTS

Depending on your position, you may be able to take direct action to apply and act upon the results of your assessment. For instance, businesses may explore different or modified practices, and governments may change policies or regulations. It's important to remember that decisions are made based on information, relationships, and emotion. Ensuring your stakeholders were involved throughout the process will be helpful as steps are made to apply and act on your results.

ASSESSMENT EXAMPLE (STEP 22)

The assessment was conducted by a broad set of stakeholders, including some policymakers. Because of this, the results of your assessment can be directly input into the decision-making process that will determine whether the proposal is approved or rejected. If the proposal is approved, the information collected through the assessment may result in conditions, such as requiring the company to internalize the projected costs incurred on the health system by paying to improve the government's provision of health services.

STEP 23: COMMUNICATE YOUR RESULTS

If you are not in a position to take direct action on the results of your assessment, you can provide decision-makers with information to inform their decisions. This should include information to explain the assessment process and the results, including assumptions, uncertainties, or limitations that may apply. For assessment results to effectively inform decisions, you will need to provide information in a suitable format.

ASSESSMENT EXAMPLE (STEP 23)

Other stakeholders who participated in the assessment include community organizations. Although they do not have direct influence on the proposal decision, they are able to use the assessment findings to advocate for a specific action or decision. They also use the results to communicate impacts with community members by publishing a short, clear language summary of the findings and developing a press release targeting local media and journalists.

EXPECTED OUTCOMES

The outcomes from taking action will vary. It is important to identify what actions had an impact and to continue efforts to share your results with others.

CONCLUSION

This four-phase process completes the TEEBAgriFood Evaluation Framework application. Recognizing and accounting for the negative and positive environmental, social, and health externalities of food and agricultural systems is a significant contribution toward the creation of healthy and sustainable food systems. We hope you will share your work with governments, farmers, corporations, the finance and investment community, consumers, and other relevant stakeholders to foster action and food systems transformation.

Sharing your system description, study methodology, data, and results with partners and other groups that may benefit helps to inform future and similar studies and improves our collective understanding of eco-agri-food systems. We encourage you to submit your TEEBAgriFood application to the TCA Inventory collection of application case studies. Additionally, consider joining the True Cost Accounting Community of Practice, a vibrant community of stakeholders working collectively to strengthen and mainstream TCA for food systems.

For more information, visit www.futureoffood.org or contact tca@futureoffood.org.

GLOSSARY

(Agri-food) value chain: The full range of processes and activities that characterize the life cycle of a product from production to manufacturing and processing; to distribution, marketing, and retail; and finally to consumption (including waste and disposal across all stages).

Agricultural and food outputs: Goods and services including agricultural and food products and financial outputs such as income, taxes, and subsidies that flow out of the agri-food value chain.

Agriculture production: The first of four stages in the value chain, including activities and processes occurring within farm-gate boundaries (including the supply of ecosystem services, the supply of goods and services, and connections between producers).

Capital: The economic framing of the various stocks in which each type of capital embodies future streams of benefits that contribute to human well-being.

Dependency: Reliance on or use of a capital required to produce goods and services, or to provide basic human needs (e.g., air to breathe).

Dependency pathway: How an activity depends on a capital stock, and how changes in the quantity or quality of that capital stock impacts different stakeholders. See Figure 8 for an example.

Distribution, marketing, and retail: The third of four stages in the value chain, including the activities associated with the transport and sale of goods, for example, to retailers or consumers.

Driver: A flow (e.g., input or non-product output) that arises from the activities of agents (e.g., governments, corporations, individuals) in eco-agri-food value chains, resulting in significant outcomes and leading to material impacts. See Figure 9 for an example of drivers and constraints that affect farmers' decisions.

Eco-agri-food system: A descriptive term for the vast and interacting complex of ecosystems, agricultural lands, pastures, inland fisheries, labour, infrastructure, technology, policies, culture, traditions, and institutions (including markets) that are variously involved in growing, processing, distributing, and consuming food.

Ecosystem services: The benefits to people from ecosystems. These include provisioning (e.g., food, clean water, timber), cultural (e.g., Indigenous knowledge, aesthetic appreciation of green space), supporting (e.g., supportive services for life, such as habitats and genetic diversity), and regulating (e.g., filtration, purification, carbon sequestration, pollination).

Externality: A positive or negative consequence of an economic activity or transaction that affects other parties without being reflected in the price of the goods or services transacted.

Flow: A cost or benefit derived from the use of various capital stocks (categorized into agricultural and food outputs, purchased inputs, ecosystem services, and residuals).

Household consumption: The final of four stages in the value chain, including purchases of food for consumption within the household, purchases of food supplied by restaurants and the hospitality industry more generally, and consumption of food grown at home.

Human capital: The knowledge, skills, competencies, and attributes embodied in individuals that facilitate the creation of personal, social, and economic well-being.

Impact: A positive or negative contribution to one or more dimensions (environmental, economic, health, or social) of human well-being.

Impact pathway: A series of consecutive, causal relationships, ultimately starting at a stock, describing how an activity results in changes in a capital (outcome), and what impact these changes have on different stakeholders. See Figure 7 for an example.

Manufacturing and processing: The second of four stages in the value chain, including the operations involved in converting raw materials into finished products.

Materiality: The importance, worth, or usefulness of something. It reflects significant economic, environmental, and social impacts that substantially influence the assessments and decisions of stakeholders (adapted from Global Reporting Initiative, 2020).

Natural capital: The limited stocks of physical and biological resources found on Earth, and the limited capacity of ecosystems to provide ecosystem services.

Outcome: A change in the extent or condition of the stocks of capital (natural, produced, social, and human) due to value-chain activities.

Produced capital: All manufactured capital, such as buildings, factories, machinery, and physical infrastructure (roads, water systems), as well as all financial capital and intellectual capital (technology, software, patents, brands, etc.).

Purchased inputs: Intermediate inputs that are used within the agri-food value chain, and the capital services received from employing a capital. They can include labour services, ecosystem services, energy, water, fertilizers, and pesticides.

Residuals: By-products of the production processes that produce agricultural and food outputs.

Social capital: Networks, including institutions, that share norms, values, and understandings that facilitate cooperation within or among groups.

Stock: The quantities and qualities of (natural, human, social, produced) capital within a system at a point in time.

System: A set of elements or components that work together and interact as a whole.

Systems thinking: An approach that focuses on the identification of interrelationships between components of a system.

Value: The importance, worth, or usefulness of a good or service (including all relevant market and non-market values) determined by people's preferences and the trade-offs they choose to make given their scarce resources, or the value the market places on an item.

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DISCLAIMER

This research was commissioned by the Global Alliance for the Future of Food to stimulate an understanding of critical issues related to food systems reform, inform individual member foundations, and guide Global Alliance collective action. The Global Alliance has chosen to make it available to the broader community to contribute to thinking and discussion about sustainable food systems reform. This report and associated products constitute the work of independent authors. Any views expressed in this report do not necessarily represent the views of the Global Alliance or of any of our members.

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