Guidance for Demonstrating Ecosystem Services Impacts

FSC-GUI-30-006a V2-0 EN



GUIDELINE

FORESTS FOR ALL FOREVER

ACKNOWLEDGEMENTS

This document was researched and written by Petra Westerlaan (Ecosystem Services Expert for the Forest Stewardship Council International) and Ondrej Tarabus (FSC International).

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Initial version.

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Minor revisions made: clarifying how the high carbon stock approach can be applied, changing the order of the modules to highlight the importance of how to obtain a payment or benefit from demonstrated positive impacts on ecosystem services, and updating the graphics in accordance with the revised Ecosystem Services Procedure.

V2-0 approval date: 15 July 2025
Major revisions made to align with the revised FSC Ecosystem Services Procedure (V2-0).

Contents

INTRODUCTION

Who is this guidance for?

This guidance aims to support forest managers and project developers with implementing the Forest Stewardship Council® (FSC®) Ecosystem Services (ES) Procedure (FSC-PRO-30-006), specifically with demonstrating an ES impact in the forest. It may also be useful for certification bodies undertaking ecosystem services evaluations, and for FSC Network Partners providing support to forest managers.

What does it cover?

Using explanations in simple terms and relevant examples, this guidance showcases how the requirements in the Ecosystem Services Procedure (ES Procedure) can be conformed with in a variety of forest management contexts. Specific guidance for small and low-intensity managed forests (SLIMF) and community forests is presented in teal green boxes. Tips for forest management groups applying the ES Procedure are provided in peach orange-coloured boxes.

What about guidance on other ES aspects?

While this guidance (FSC-GUI-30-006a) focuses on demonstrating ES impacts in forests, separate but related guidance (FSC-GUI-30-006b) focuses on the application of verified (and/or validated) ES impacts, concluding mutually rewarding sponsorships, conforming with requirements for sponsors, outlining alignment with key external frameworks, and making ecosystem services claims (ES claims).

Terms and definitions

The terms and definitions as included in <FSC-PRO-30-006 Ecosystem Services Procedure: Impact Demonstration and Market Tools> (V2-1) and <FSC-STD-01-002 Glossary of Terms> apply.

How to navigate this guidance document?

After Module 1 'Getting started', this guidance is divided into three sections:

- Part I focuses on demonstrating an ES impact (Modules 2–4).
- Part II is dedicated to ES project safeguards (Modules 5–7).
- Part III contains ES-specific guidance for each of the seven ES categories (Modules 8–14).

This modular approach helps users navigate to the topic for which they need guidance. There is no need to read the whole document in chronological order.

Throughout this document, the following icons are used:

- Links to specific steps or clauses in the ES Procedure:

  Link ES PRO

- A worked example, drawn from either a real FSC ES project or a hypothetical case:

  Example

- Measurement (of outcome indicator):
- Suitable for SLIMF and community forests:

- The seven ES categories **are depicted using the following icons:**

Biodiversity conservation

Water services

Recreational services

Air quality

Carbon sequestration and storage

Soil conservation

Cultural practices and values

MODULE 1: GETTING STARTED

There are several key aspects to think about before and at the start of using the FSC ES Procedure to demonstrate ES impacts.

1.1 FSC CERTIFICATION AS A SOLID FOUNDATION

The ES Procedure builds on the basis of FSC Forest Management (FSC-FM) certification for validating or verifying ES impacts. FSC-FM certification often requires forest managers to go beyond business as usual. This means the management activities implemented to conform with the FSC-FM standard can lead to a positive impact on ecosystem services. Typically, national FSC standards provide the FM certification foundation, in some cases alongside the continuous improvement procedure (eligible for use by SLIMF and community forests) and/or the group certification standard. Management Units (MUs) holding Controlled Forest Management (CFM) certification are eligible to validate ES impacts.

For resource efficiency reasons, it is recommended to plan the evaluation of ES impacts concurrently with the FSC-FM main or surveillance evaluation. ES impacts can be evaluated at the same time as the initial FSC-FM or CFM evaluation.

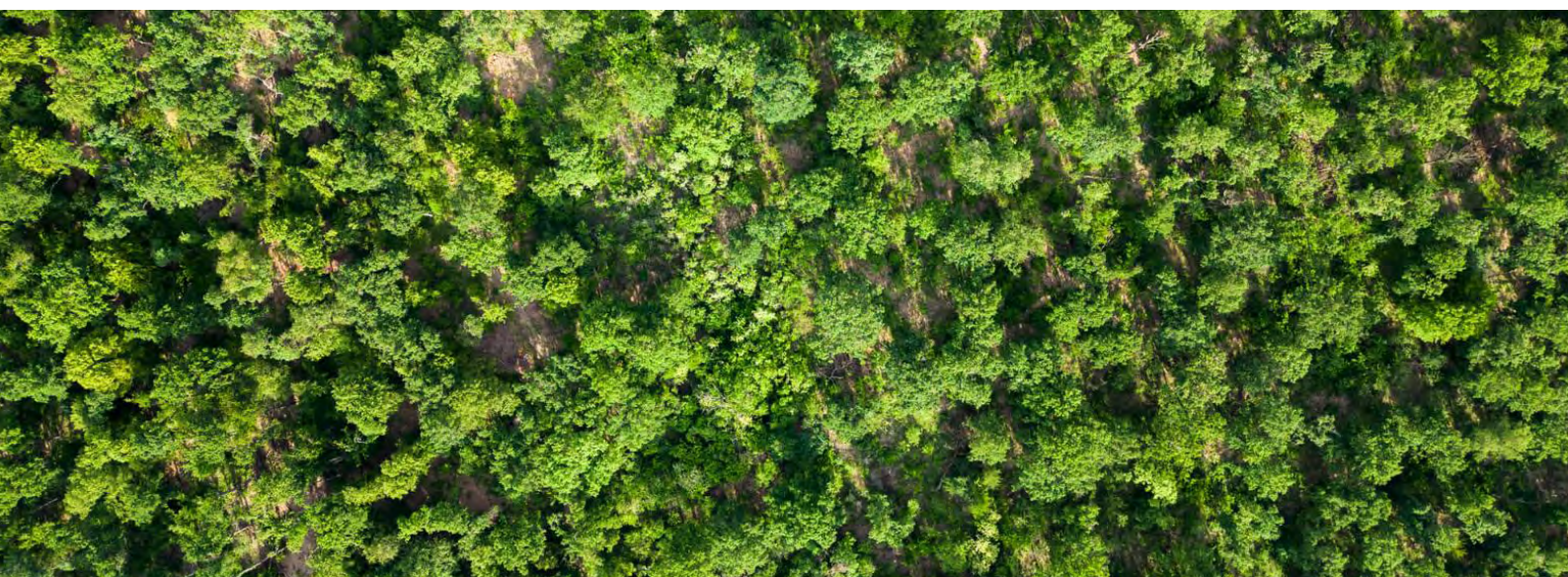
1.2 SELECTING THE TYPE(S) OF ES IMPACT(S)

As a forest manager, you can consider the following aspects when selecting the type of ES impact to demonstrate: the unique features of your forest(s); which of the seven types of ecosystem services are being provided by the forest(s) under your management; the foreseen use (Section 1.3); and the legal framework (Section 1.4), which may further direct you away from some, and towards other, ES categories.

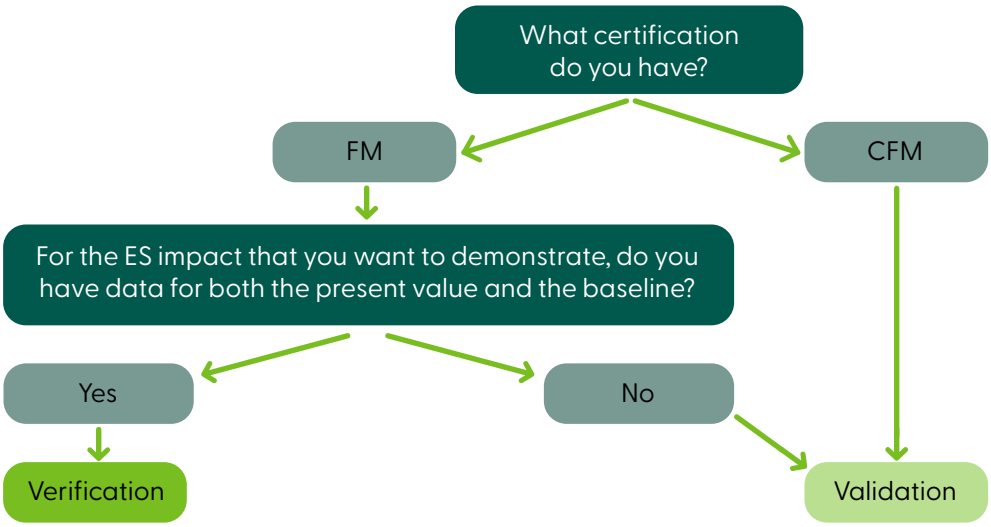
For the ES categories that stand out based on these first four checkpoints, it is recommended to go through the list of ES impacts as well as the questions to identify potential ES impacts that can be demonstrated (see Modules 8–14). You can decide to demonstrate one or multiple ES impacts at the same time. If you have or plan to undertake any other ES projects in the MU, it is important to avoid double counting and double claiming (see Section 1.5).

You may know what type of monitoring data are already available that can be used to demonstrate an ES impact. These data could be collected as part of your forest monitoring activities, for example under Principle 8 or 9 (or, in the future, the outcome-oriented indicators) that are part of the FSC-FM standard applicable to your MU. You may also be aware of research that has previously been undertaken in your MU. For the list of potential ES impacts to demonstrate, go to Annex B of the ES Procedure and check the outcome indicators that are required to be measured or quantified, as well as the type of baseline that is needed.

Link ES PRO: Step 1, Clause 2.1 on the selection of the ES impact



Validation or verification?



Some impacts, particularly biodiversity impacts, may take time to materialize. As a result, it will be difficult to show real benefits over a five-year time frame. Note that you can revalidate once.

Link ES PRO: Clause 1.12

This means that after 10 years, you need to be able to demonstrate that a positive impact has happened (i.e. have data for both the present value and baseline value) and move from validating to verifying the ES impact.

While validation has the potential advantage of bringing a sponsor into the ES project at an early stage, allowing for co-creation on the ES project, it is important to note that validated ES impacts have fewer uses (see introduction of ES Procedure).

1.3 HOW WILL THE ES IMPACT BE USED?

First and foremost, it is important to determine the foreseen use of the ES impact that you aim to generate. What is your objective? Are you looking to improve your marketing and communication through data-driven storytelling? Do you want to use it in your company's sustainability reporting – using CDP/Greenhouse Gas (GHG) Protocol or your own sustainability report structure? Are your customers asking for specific data about ES? Are you seeking sponsorship to finance forest management activities that ensure the continued provision of ecosystem services? What is the sponsor's interest and how would the sponsor want to use and communicate about their support for forest ecosystem services? Note that there are strict requirements preventing ES claims from being used for beyond value chain compensation or offsetting.

The more detailed your answer, the easier it will be to select the ES category, ES impact, outcome indicators, and methodology that fit with the intended use.

While the introduction of the FSC ES Procedure lists the potential uses, the Guidance on market use and communication of ES impacts (FSC-GUI-30-006b) provides more context and examples for each of these uses. If you wish to obtain sponsorship, it is recommended to also go through that guidance and consider whether a sponsor can be involved at an early stage in the project development. In such a co-creation model, the sponsor could have influence over ES project details, for example which ES impact is being demonstrated, how data are being collected, etc.

1.4 WHAT IS THE LEGAL FRAMEWORK AROUND ECOSYSTEM SERVICES?

Legal requirements may prevent you from obtaining payments for ecosystem services or from making ES claims, because the forest manager does not have ownership of these ecosystem services. In your country, state, and/or region, are there any policies and legislation around ownership and management of ecosystem services, and – if your objective is to obtain a sponsorship – around receiving payments for ecosystem services? Does legislation differ between types of forest manager and/or land tenure situations (e.g. landowner versus land lease/forest concession)? It may also differ according to ES category (e.g. there may be rules around carbon, but not [yet] around other ES categories).

It is useful to be aware of current legislation, as well as discussions taking place or developments that may impact you in the near future. Contact your national or regional FSC office to find out whether they have relevant information for you on this.

Link ES PRO: Step 1, Clause 2.3 on the legal or customary right to receive payments for ecosystem services

1.5 AVOIDING DOUBLE COUNTING AND DOUBLE CLAIMING

Do you already have a project in your MU that is generating ES assets or claims under an external framework or standard, such as carbon credits or biodiversity credits? Or do you plan to set up an ES project under an external framework or standard?

There are several limitations when engaging in multiple ES project types in the same MU, around avoiding double counting and double claiming, and maintaining additionality.

Link ES PRO: Step 1, Clauses 2.4–2.8 on avoiding double counting and double claiming, and annulling additionality

Avoiding double counting

To ensure integrity and credibility of use and claims about ES impacts, it is important to avoid multiple parties taking credit for realizing the same positive impact on ecosystem services. Therefore, it is not possible to use the FSC ES Procedure to demonstrate the same ES impact that has already been registered, issued, certified, and/or quantified under another scheme (e.g. Verra, Gold Standard, or a national scheme).

More specifically, the ES Procedure requires you to explain how the ES impact you want to demonstrate is different from ES assets or claims obtained under any external framework or standard. This distinction can be on one or more of the following aspects:

- different geographical area within the same MU;
- different ES category (e.g. a carbon project and a recreational services project);
- different aspect of the same ES category (e.g. enhancing natural forest structure and maintaining a specific wildlife species population);
- different project period(s) (e.g. ES impact verified 2017–2022, biodiversity credits generated from 2023).

Maintaining additionality

Most ES assets or claims generated under external frameworks or standards require additionality to be demonstrated. Additionality usually includes financial additionality, which means the payment for the ES asset or claim is needed to make the ES project viable (see also Module 5 on additionality).

It is possible that some management activities lead to positive impacts on multiple ecosystem services. For example, project activities leading to the generation of carbon credits may also result in positive impacts on biodiversity. While the carbon credits would be issued under an external programme, the biodiversity impact could be verified using the FSC ES Procedure. To avoid reversing the additionality of existing ES projects in the MU, you cannot receive sponsorships for ES impacts if there is an overlap with projects or activities registered under an external ES programme, unless you can demonstrate that funding from both sources is needed to implement the project and/or activity.

1.6 INDIGENOUS PEOPLES, TRADITIONAL PEOPLES, AND LOCAL COMMUNITIES

Free, Prior, and Informed Consent

- ☐ Have you identified Indigenous Peoples and/or traditional peoples within or around your MU?
- ☐ Are there Indigenous Peoples and/or traditional peoples with rights to the forest land and/or the ES on the MU?
- ☐ And does implementing management activities related to the ES project require Indigenous Peoples and/or traditional peoples to delegate control over such management activities to you?

If all of the above apply, you will need to obtain a binding agreement with the Indigenous Peoples and/or traditional peoples through Free, Prior, and Informed Consent (FPIC).

If you already have a binding agreement obtained through an FPIC process as part of your FSC-FM Certification, check whether this includes the aspects related to the ecosystem services for which you want to demonstrate a positive impact.

Link ES PRO: Step 1, Clauses 2.9 and 2.10 on FPIC

Culturally appropriate engagement

In Step 1 of the ES Procedure (Clause 3.2), you are asked to provide a summary of culturally appropriate engagement with Indigenous Peoples, traditional peoples, and local communities related to the selected ecosystem service(s). Such engagement includes:

- awareness of ES project plans and execution;
- any new management activities that may impact them;
- their access and use of the ecosystem services, and potential limitations;
- eventual compensation for negative impacts;
- benefit sharing when they are among the parties identified to participate in the revenue-sharing agreement (if sponsorship is being received).

ES-related engagement can be integrated into stakeholder engagement being held as part of FSC-FM. The guidance for stakeholder engagement (FSC-GUI-30-011) can be followed.

Note that for ES6 'Cultural practices and values', you are required to involve – in a culturally appropriate manner – Indigenous Peoples, and/or traditional peoples at the following stages of the ES project:

- in identifying cultural practices and values;
- in designing and implementing activities;
- in measuring the outcome indicators to demonstrate that their cultural practices and values are maintained or enhanced over time.

Link ES PRO: Clause 21.1

1.7 DEVELOPING THE ECOSYSTEM SERVICES REPORT (ESR)

The Ecosystem Services Report (ESR) is the core document in which the information related to demonstrating the ES impact is recorded. You need to create the ESR through the FSC ES Registry available at FSC Connect. Once you finalize the ESR, it is automatically submitted to the certification body. When the certification body approves the validated and/or verified ES impact(s) included in the ESR, the information submitted will become publicly available in the ES Registry (except information considered confidential – for further information, see Annex A of the ES Procedure).

Link ES PRO: Annex A on content of the ESR

A stable internet connection is required to fill in the ESR. Your work can be saved, edited, and finalized at a later stage. The FSC ES Registry is designed to facilitate forest managers in completing all details in full. Where possible, it offers prepopulated information and a list of options to select from, and provides guidance for open fields. If you do not have access to a stable internet connection, you can record the information elsewhere (e.g. in a Word document), then copy and paste it into the ESR online tool once a stable internet connection is available.

Process

1. The forest manager can access the ESR application through FSC Connect, after signing a Trademark License Agreement (TLA).
2. The forest manager (group manager, or project developer/consultant on behalf of the forest manager) fills in ESR part I 'Project description', documenting the information related to the seven steps to demonstrate an ES impact, and ESR part II 'Additional information on The Organization and the ES project'. Once the forest manager has obtained a sponsorship, parts III and IV must also be completed.
3. To make sure the forest manager does not overlook anything, the ESR application will flag any information that has not yet been completed.
4. Once completed, the forest manager submits the ESR to their certification body. This submission must be done at least 30 days prior to the start of the ES evaluation.

Note that certain information is not recorded in the ESR and instead must be provided to the auditor(s) separately, such as a binding agreement through FPIC (Step 1, Clauses 2.9 and 2.10) or conformance with ES-specific safeguards (Clauses 18.1, 19.1, 20.2, 20.3, and 21.1 in Annex B).

1.8 FOREST MANAGEMENT GROUPS

Within forest management groups, some members may decide to use the ES Procedure and demonstrate ES impacts (in some or all of their MUs), while others may decide not to. Among members using the ES Procedure, they can all demonstrate the same ES impact or different ES impacts; either are permitted.

While all information can be organized in a single ESR, it is important to make explicit which MUs participate in which ES impacts, theories of change, and methodologies. Further, certain information can be useful for the entire group or for a cluster of MUs that share the same characteristics (e.g. same ecology and forest management). The table below offers the suggested level at which to provide certain information for key aspects of the ES Procedure, where 'X' is the first option and (X) the second option.

Table 1.1 Suggested level at which to provide certain information for forest management groups

Aspect of ES PRO	Group level	Cluster of MUs	MU level
ESR	X	(X)	
Selecting ES impact			X
Description of ES		X	
Theory of change		X	Specify MUs that participate
Methodology		X	Specify MUs that have used methodology
Values for present value, baseline value	X (aggregate number can be included in the ESR)		X (need to be available for certification body)
Additionality test		X	
Risk management plan		X	

PART I

ES impact demonstration

MODULE 2: BUILDING A THEORY OF CHANGE

A theory of change is a chain of results over time that shows how your management activities contribute or could contribute to an ES impact.

Link ES PRO: Step 3

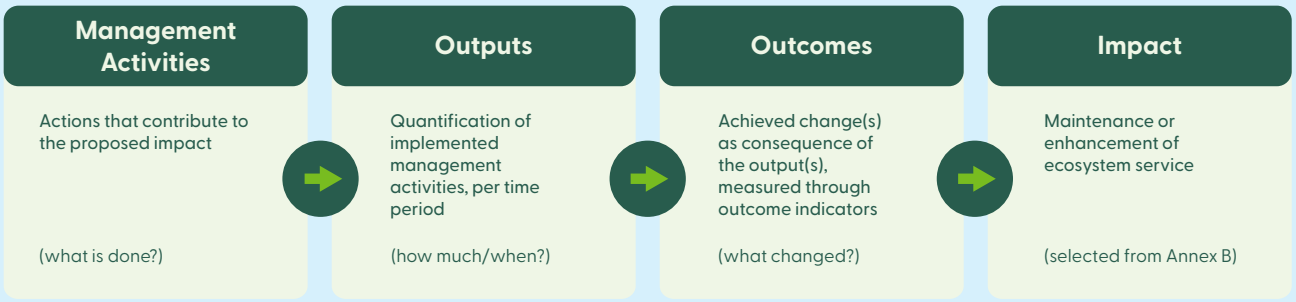
Part III of this guidance includes examples of completed theories of change for each of the seven ES categories.

Creating a theory of change can be done as a group exercise (e.g. in a workshop) or alternatively by an individual with sufficient knowledge of your management activities and the effects on the specific ecosystem service.

2.1 BUILDING BLOCKS

The building blocks of a theory of change are an impact, management activities, outputs, and outcomes (see Box 2.1 for a definition of each of these terms).

Box 2.1 Building blocks of a theory of change
A basic structure of a theory change consists of four main building blocks – see the figure below.



- **Management activities:** actions that contribute to the proposed impact. These include all actions you take, whether passive or active, that aim to or contribute to achieving the ES impact.
- **Outputs:** the immediate, direct, and quantified consequences from management activities implemented in the MU. It is recommended to indicate the time period in which the outputs were realized. It is usually possible to quantify or state the amount of output.
- **Outcomes:** the ecological or social condition on the ground that has changed as a consequence of the outputs. Outcomes represent results towards achieving the selected ES impact and are best expressed as changes in condition, rather than measurements.
- **Impact:** maintenance or enhancement of a specific ecosystem service. The impact is selected from Annex B of the ES Procedure.

Closely related to the theory of change are the outcome indicators. These are the elements that are being measured, or for which values need to be obtained, to indicate that the ES impact has taken place in the MU. For each ES impact, Annex B of the ES Procedure specifies the type of outcome indicator(s) that need to be measured and provides examples of specific outcome indicators.

2.2 FLOW OF THE EXERCISE

Regardless of the starting point, you will likely find yourself moving up and down the four levels (management activities–outputs–outcomes–impact) while constructing the theory of change.

When starting to build a theory of change, ask yourself the following questions:

- What positive impact(s) on ecosystem services are being created by the management activities in the MU (starting point: ES category/ES impact)?
- What new management activities, relevant for ecosystem services, have recently been introduced or could be included in an updated forest management plan, forest conservation plan, or operational plan (starting point: management activities)?
- What has changed (verification) or what is going to change (validation) in my forest (starting point: outcome)?
- What monitoring activities are carried out (as part FSC-FM, i.e. Principles 8 and 9) that are related to ecosystem services (starting point: existing monitoring data)

The flow of the exercise is described below, using the ES impact as the starting point. Note that this is only one way to develop a theory of change – you may decide to take a different route. Two alternative pathways are demonstrated in Figure 2.1.

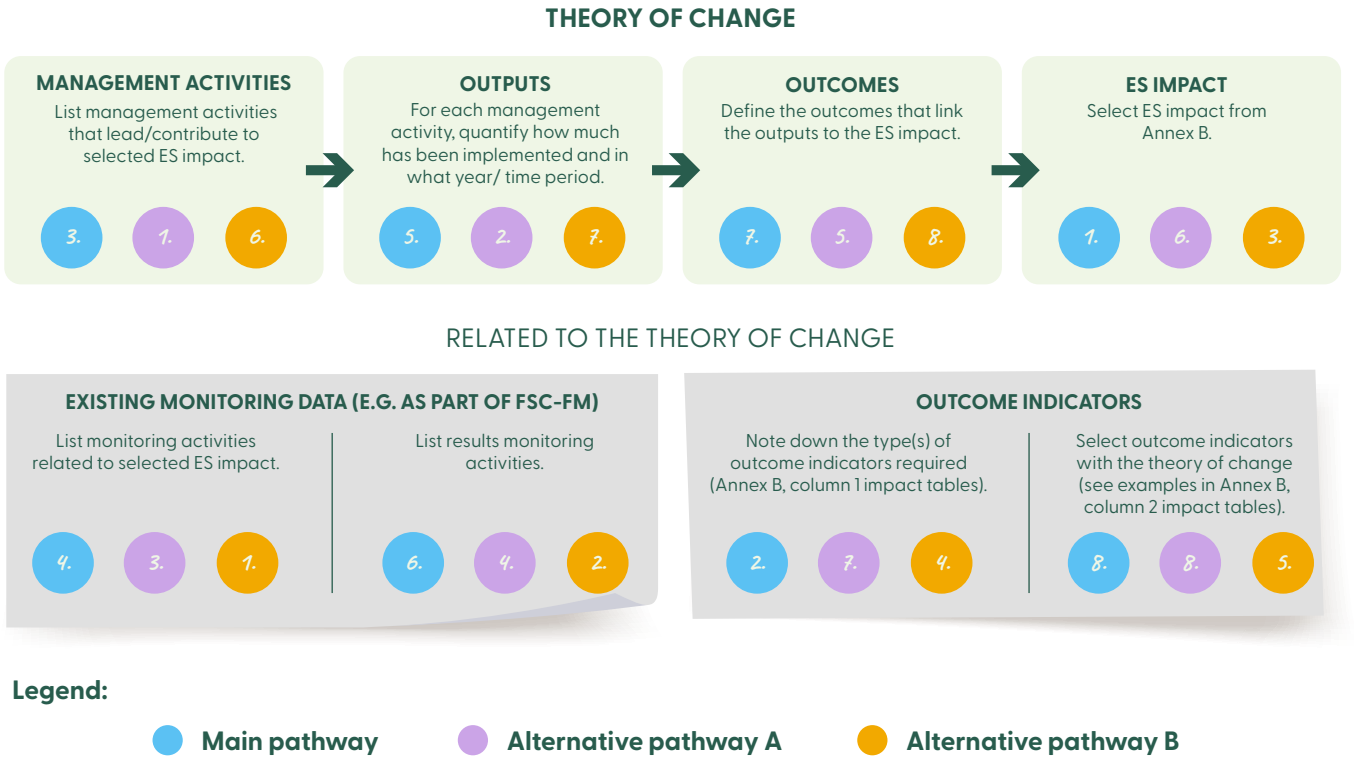


Figure 2.1. Flow of the exercise using the ES impact as a starting point (main pathway), using management activities as a starting point (Alternative pathway A) and/or using existing monitoring data as a starting point (Alternative pathway B)

1. The first step is to select the ES impact(s) from Annex B of the Ecosystem Services Procedure.
2. Take note of the type of outcome indicator(s) that need to be measured for the selected ES impact.
3. List all management activities that lead to, or positively contribute to, the selected ES impact.
4. Note that monitoring activities do not maintain or enhance ecosystem services, so are recommended not be included in the theory of change. However, they could be helpful in indicating the results of implementing management activities.
5. For every management activity, write down the concrete output that has been realized, quantifying it where appropriate and including the year of realization. In other words: how much has been implemented and in what time period (e.g. two training activities provided to 18 and 13 employees in 2017; 50 m of fence constructed in 2016)?
6. For the monitoring activities, list any relevant results for the selected ES impact.
7. Define the outcomes that link the outputs to the ES impact. In most theories of change, multiple outcomes lead to the ES impact and multiple outputs lead to a certain outcome. The type(s) of outcome indicators to be measured should provide you with the minimum number of outcomes to be defined, as well as give you an idea of the formulation of the outcome. Make sure to formulate the outcomes as medium-term results that have been completed (e.g. area of forest protected, knowledge of something has increased).

To finish the theory of change, use arrows to connect the various building blocks.

8. Selecting outcome indicators

Finally, define the outcome indicators you are going to measure, or obtain a value for, to indicate that the ES impact is being achieved. A list of examples is provided for each type of required outcome indicator in Annex B of the ES Procedure (see column 2 of the impact tables). If none of the outcome indicator examples included in Annex B are a good fit with the outcome and theory of change of your forest ES project, you may propose a different outcome indicator of the same type.

Link ES PRO: Step 4

Consider whether you already have available monitoring data that fit with some of the outcome indicators, either from your own monitoring activities or from others undertaking research activities in your forest.

2.3 QUALITY CHECK

Once the theory of change has been completed, it is recommended that you perform a quality check.
If the theory of change has been created by one individual, we recommend that you validate it with interested stakeholders and/or experts.

Theory of change quality checklist

- ☐ The theory of change provides a logical narrative based on the expected results of implementing management activities.
- ☐ The theory of change truthfully presents the management activities undertaken (for verified ES impacts, management activities are thus formulated in the past and/or the present tense, not the future tense) or the management activities to be undertaken (for validated ES impacts).
- ☐ All outputs are quantified to the extent possible, and the year of realization is included where possible.
- ☐ Outcomes are formulated as medium-term results (not as activities or measurable outcome indicators) – something that has been achieved (e.g. decreased water turbidity, reduced hunting pressure).
- ☐ All key outcomes that are necessary to achieve the ES impact are included in the theory of change.

MODULE 3: DATA COLLECTION

While developing the theory of change (Module 2), you selected the outcome indicators that need to be measured for the ES impact(s) as well as the available monitoring data (e.g. collected to conform with Principles 8 and 9 of the FSC-FM standard) linked to the activities, outputs, and outcomes leading to the ES impact.

For every outcome indicator, you are required to have a value for: the present value (validation and verification) and the baseline value (verification), in conformity with the impact tables in Annex B of the ES Procedure. For the present value, primary data must be used, unless you manage a forest classified as SLIMF or community forests. In those cases, secondary data may be used instead.

To measure the baseline value of an outcome indicator, both primary and secondary data can be used.

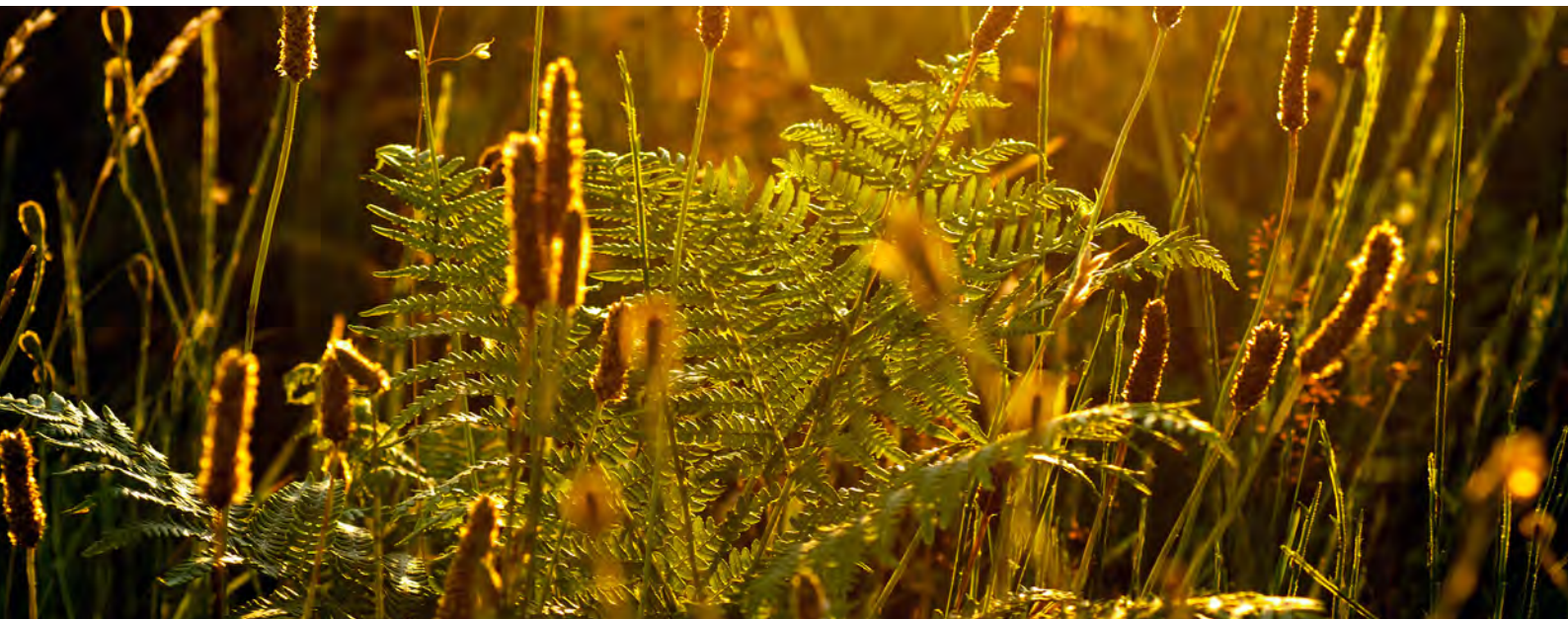
Link ES PRO: Step 6, Clauses 7.3 and 7.4

Box 3.1. Primary data and secondary data

	Primary data	Secondary data
Definition	Direct measurements or first-hand, original data from the forest	Data that are not directly collected from the MU or ES project area but provide a suitable proxy
Examples	Forest inventories, field assessments, direct questionnaires, sensor-based counts of visitors, model-based approaches derived from direct measurements, or remote sensing-based approaches calibrated (i.e. ground-truthed) using direct measurements	Regional average data, data obtained from literature, or data collected in a forest that shares the same characteristics in relation to the outcome indicator for which a value is being sought
Use	Required to measure the present value (unless you manage SLIMF or community forests) Can be used to measure the baseline value (see 3.1.1. 'A value from the past')	SLIMF and community forests may use it to measure the present value Can be used to measure the baseline value

Data representing the present value need to be as recent as possible and not older than five years (unless justified in line with Clause 7.2.2) at the time of the ES evaluation. The baseline value can be 10 years old or older upon justification.

Link ES PRO: Clause 7.7b



3.1 BASELINE VALUE

The ES Procedure requires the use of different types of baselines, depending on the selected ES impact. Consult the table below to direct you to the correct piece of guidance in this section.

Note that for a validated ES impact (Section 9 of the ES Procedure), no baseline is required.

Table 3.1. Baseline requirements included in Annex B of the ES PRO and associated guidance.

Baseline requirement(s) (see impact table in Annex B of the ES PRO)	Follow baseline guidance
At least one previous value of the outcome indicator measurement	3.1.1 'A value from the past'
The value on 1 January 2017 or earlier	
A relevant standard	3.1.2 'A reference value'
A description of a natural forest condition	
A minimum viable population size	
A value from a (natural) reference area	
Long-term average of the value of the outcome indicator before the ES project activity	3.1.3 'A calculated counterfactual'
Projected carbon stocks in the MU over the entire logging cycle	
Zero activity	

3.1.1 A value from the past

For many impacts, the ES Procedure requires you to compare the present value with at least one previous value of the outcome indicator. In this comparison, you must include all previous measurements for which data are available.

Link ES PRO: Clause 7.7

Refer to the use of existing data (Section 3.2) and new data collection (Section 3.3) on how to obtain this type of baseline value.

3.1.2 A reference value

To enable a valid and clear comparison with your forest, the following factors must be taken into consideration when selecting a reference value:

Link ES PRO: Clause 7.8, Step 6

- same country or region (geographic location, legal and political situation)
- similar land cover, climate, topography, and forest type (forest ecology, land characteristics)
- similar forest management and harvesting activities (land use and management history)
- other factors relevant to the ecosystem service

For certain outcome indicators, global, regional, or national standards or reference levels may be established for the desired value of the outcome indicator, such as the World Health Organization water quality guidelines for drinking water (WHO, nd-a) or for recreational use of surface waters (WHO, nd-b). Similarly, soil or water testing kits or laboratories that analyse samples may provide information about the desired values of the tested parameters within your local context (climate, soil type, etc.).

You are advised to select appropriate standards for the geography of the site and the use of the service. For example, some water quality standards are appropriate for drinking water, while others are used for irrigation.

For several impacts, the required comparison is a description or estimate based on best available information. This information may come from various sources but must be the most credible, accurate, up-to-date, complete, and/or pertinent information that can be obtained through reasonable effort and cost.

For some outcome indicators, measurements may have been taken by others in natural reference areas or areas within the same watershed, or a regional reference level may have been established. Refer to Section 3.2 on the use of existing data. If no existing data can be used as a baseline, the outcome indicator value can be measured in the field, in a forest outside of the MU where the ES project is located. In this case, follow the guidance on data collection provided in Section 3.3.

3.1.3 A calculated counterfactual

A counterfactual is a baseline that represents the without-project scenario. In other words: What would have been the outcome indicator value if the ES project had not been implemented? The without-project scenario could be what was originally included in the forest management plan before implementing the ES project (continuation of forest management prior to implementing ES project), or a common forest in the same geo-ecological context and jurisdiction. In any case, the without-project scenario needs to comply with current laws and legislation. It is important to consider different without-project scenarios and select the credible and conservative one(s) for use as the baseline. Values for the outcome indicator can be calculated using reference data (e.g. mean annual increment of main tree species) and/or models (e.g. forest biomass and carbon stock increment over time).

For forests where harvesting takes place, especially clearcuts, forest carbon stocks vary. Recently harvested areas count lower carbon stocks, whereas forest areas ready for harvesting have higher carbon stocks. To account for the effect of management interventions as part of the ES project, it is important to calculate the average carbon stocks over the entire logging cycle (see the right-hand graph of Figure 3.1).

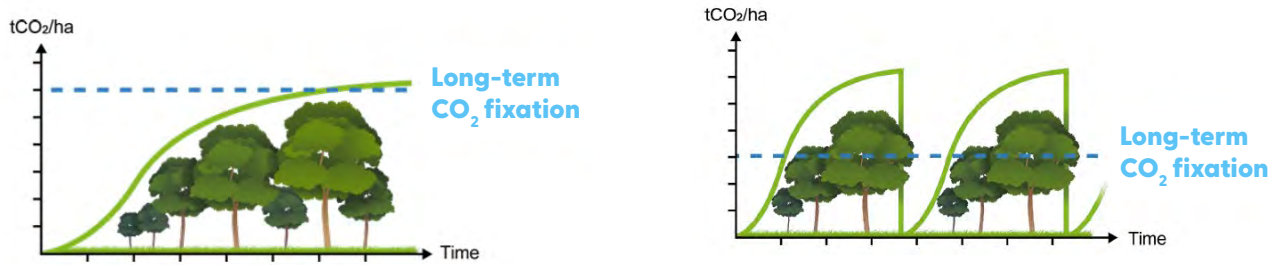


Figure 3.1. Long-term carbon stocks: conservation forests and selectively logged forests (left) and rotation forestry over an entire logging cycle (right)
Source: Gold Standard, 2024.

Then, following the implementation of the ES project, a difference in long-term carbon stocks can be observed (see Figure 3.2).

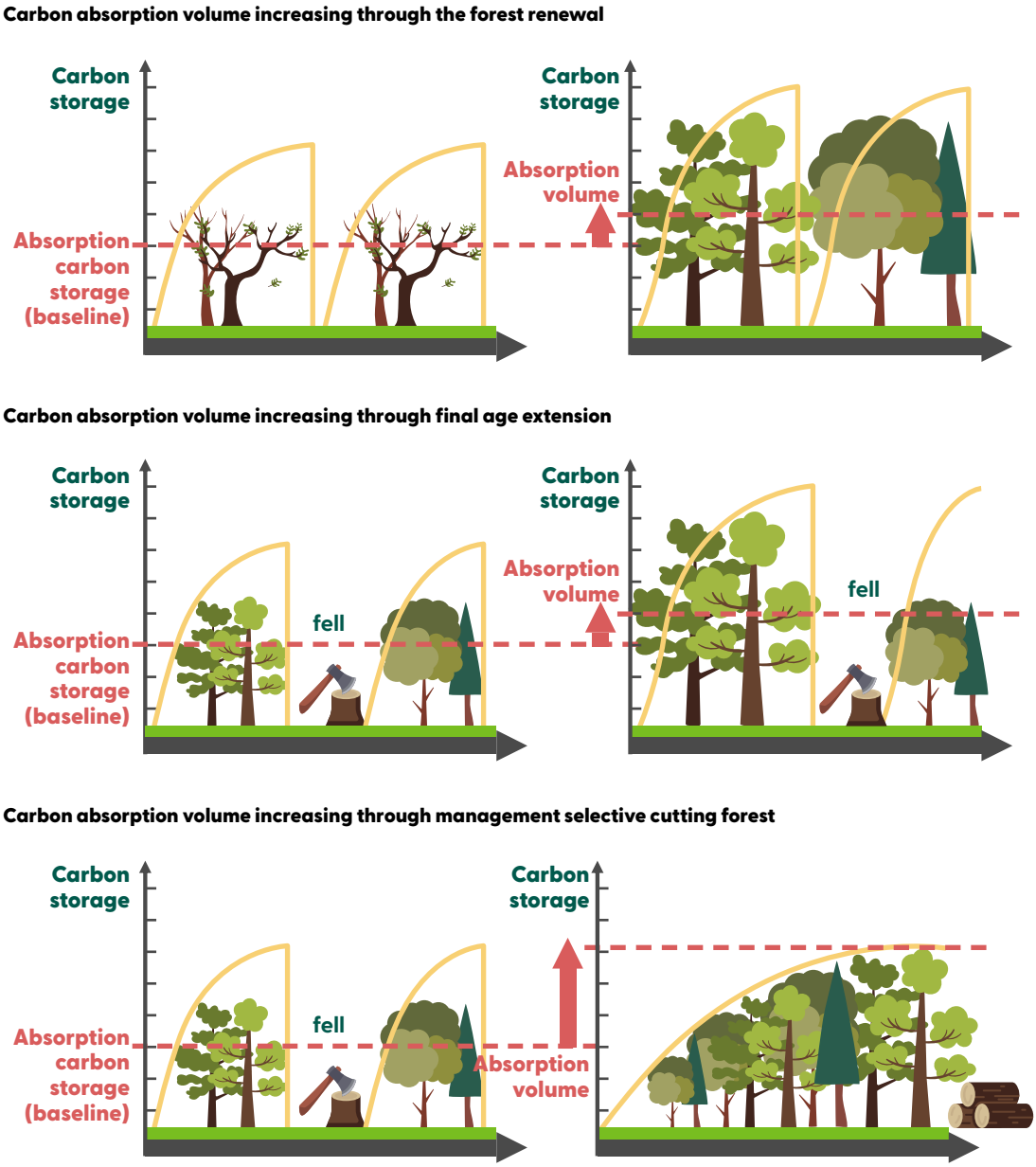


Figure 3.2. Forest carbon stock increase following different types of ES project interventions
Source: Korea Forest Service (nd).

3.2 USE OF EXISTING DATA

As a manager of an FSC-certified forest, you may already possess monitoring data on certain parameters that help demonstrate the positive impact of forest stewardship on ecosystem services– for example, data collected as part of the development of a forest management plan, assessments, and monitoring to conform with the FSC-FM standard (see Box 3.2 for a list of data that may be useful). With FSC's forest management standards moving to outcome orientation, your future national Forest Stewardship Standard may include a requirement around measuring outcomes that can be directly plugged into the demonstration of ES impacts.

Box 3.2. Examples of existing data that may be relevant

- forest inventory data
- data on water courses, topography, and slopes
- records of soil condition, water quality, and water quantity
- land-cover and/or land-use maps, forest classification maps, or other vegetation indices
- data collected from biodiversity and wildlife studies and monitoring
- data from socio-economic studies and/or stakeholder meetings
- environmental and social impact assessment
- scientific or non-governmental organization (NGO) studies undertaken in the (direct vicinity of the) MU
- government-led monitoring (e.g. of water or air quality parameters)
- High Conservation Value (HCV) assessment and monitoring
- results of regeneration activities
- evidence of illegal or unauthorized activities
- protection of sites of special cultural, ecological, economic, religious, or spiritual significance to Indigenous Peoples and local communities
- existence of Indigenous cultural landscapes and associated values of significance to Indigenous Peoples
- monitoring data related to:
  - carbon sequestration and storage (e.g. from permanent sample plots)
  - rare and threatened species
  - naturally occurring native species and biological diversity
  - water courses, water bodies, water quantity, and water quality
  - landscape values.

When using existing monitoring data – your own or from others – it is highly recommended that you obtain (and check) the following information:

- Do the data correspond to an outcome indicator suitable for the ES impact you want to demonstrate?
- Are the data recent enough to be used as a present value (i.e. as recent as possible, and maximum 5 years old at the time of the ES evaluation, unless justified in accordance with Step 6, Clause 7.2.2 of the ES Procedure) and/or baseline value (i.e. maximum 10 years old, unless justified in accordance with Step 6, Clause 7.7 of the ES Procedure)?

- Who collected and analysed the data and for what purpose? Consider getting in touch with the team leader (or a team member) to discuss the details of the data collection and find out if you need to consider any other factors when using the data. Also, the original collector may still be collecting data or have unpublished data that could be useful.
- What methodology was used? Is there a data collection plan available alongside (examples of) raw data? This may provide a basis for data collection to measure the current value of the outcome indicator.
- Are the data complete? Do you have the raw data, not just the final result representing the outcome indicator value?
- Are the data of good quality? Does the methodology conform with Clause 6.1 (and 6.2) of the ES Procedure, and is there available information about data collection and analysis (per Step 5, Clause 6.5 of the ES Procedure)?
- If relevant, how many samples were taken and what was the variation in data? The greater the variation in data, the greater the number of samples that need to be taken during future measurements.
- What data treatment and analyses were carried out? This helps you to interpret the results and, if the data are going to be used as a baseline, the same data treatment and analyses should be done for the current measurement of the outcome indicator.

3.3 NEW DATA COLLECTION

3.3.1 Collaborate

To minimize costs and make use of specialized expertise, explore collaborating with universities, research institutes, or NGOs. They might be interested in collecting field data, help you set up your data collection strategy, or support with data analysis. You can also look for ways to engage affected and interested stakeholders in monitoring (e.g. through participatory research methods or citizen science).

Box 3.3. Method versus methodology

When collecting data, it is important to distinguish between two related but distinct concepts: method and methodology. While a **method** can be seen as an ingredient, a **methodology** can be considered as the entire recipe for a dish. Methodology includes the methods for data collection, sampling strategy, data processing, analysis, and how to come to the final result. You need the whole 'recipe' to be able to measure the outcome indicator(s) and demonstrate an ES impact.

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3.3.2 Methodology

For each ES impact and most outcome indicators, suggested methodologies are provided in Modules 8–14. Note that forest managers are free to propose another methodology, as long as it is suitable for the local context, is based on best available information, and yields similar results when applied by different observers in the same site under similar conditions.

Link ES PRO: Clause 6.2

Broadly speaking, the suggested methodologies in Modules 8–14 include different methods: direct measurement and direct observation in the forest, remote sensing and Geographic Information System (GIS), census, questionnaire surveys, and in-depth interviews. For some methodologies, a complete field protocol is detailed with many practical tips, while others remain more high level. If your methodology does not include sampling, please consult the guidance provided below. Remember that in the ESR, you will need to describe the collection and analysis of data, including methodology used, sampling methods adopted, and data analyses performed.

Link ES PRO: Clause 6.5

At this stage, you may want to seek input from a monitoring and evaluation specialist or forest research expert on your methodology (combination of methods for data collection, sampling strategy, and data analysis). Furthermore, it is important to emphasize that this guidance includes methodologies suitable for different international forest contexts and that more adequate methodologies may be available at your national and/or regional or local level.

3.3.3 Sampling

Data collection is usually based on sampling of a representative target population rather than a 100% inventory – be it number of people to include in a survey, number and size of plots to measure trees, or length of transects to include in a wildlife population study.

Sample size

As a general rule, the more samples collected, the more confidence we can have in the results; and the more variety in the measured values, the larger the sample size needs to be to detect change. Some methodologies included in the annexes provide guidance on how many samples should be taken. For methodologies that do not specify a number of samples, you are encouraged to follow the below guidance.

Depending on the item of study and the comparison to be made, different formulas can be used to calculate the required sample size. Mousaei Sanjerehei (2021) provides 13 different formulas for calculating sample sizes for vegetation studies, including examples. For some of the more simple formulas, online calculator tools can help determine sample size (calculator for quantitative variables; calculator for proportion) if you enter certain statistical parameters.

Table 3.2. Recommended statistical parameter values in determining sample size
Source: Adapted from Mousaei Sanjerehei, 2021.

Statistical parameter	Aim for
Statistical power	>80%
Confidence level	90–95%
Margin of error	5% (max. 10%)

Allowing for some measurement errors to occur during data collection, it is recommended to round the calculated number up (e.g. 26.4 to 30; 386 to 400). Advice from a statistician may be helpful in determining the sample size based on calculating the statistical power and the ability to observe significance in results.

Example calculation of sample size

Shanghang Baisha recreation service area in China covers almost 700 ha and is divided in two scenic areas: 617 ha in Maanshan Scenic Area and 73 ha in Xiputuo Scenic Area. The area consists of subtropical evergreen broadleaved forest, subtropical mixed coniferous forest, and coniferous forest. Shanghang Baisha recreation service area receives an average of 3,000 visitors annually, and the number of tourists increased every year between 2018 and 2022.

Many tourists come to the recreation service area to escape a fast-paced city life and enjoy a 'forest bath': bathing in sunlight, breathing fresh air, relaxing, and playing, thereby improving their health. Shanghang Baisha recreation service area offers guided tours of the area and has improved the tourism service function by expanding the length of the trail, restoring and improving the ecological landscape, installing a resource display centre, and building different facilities for the safety and comfort of visitors.

To measure visitor satisfaction, the forest manager wants to use questionnaires asking visitors to indicate their level of satisfaction with the services offered and their visit experience.

How many questionnaires would the forest manager need to conduct?

Remember that, on average, Shanghang Baisha recreation service area receives 3,000 visitors per year. Following the recommended statistical parameter values in Table 3.2, the sample size calculator tool gives this result: 341 questionnaires (for a 95% confidence level) or 249 questionnaires (for a 90% confidence level).

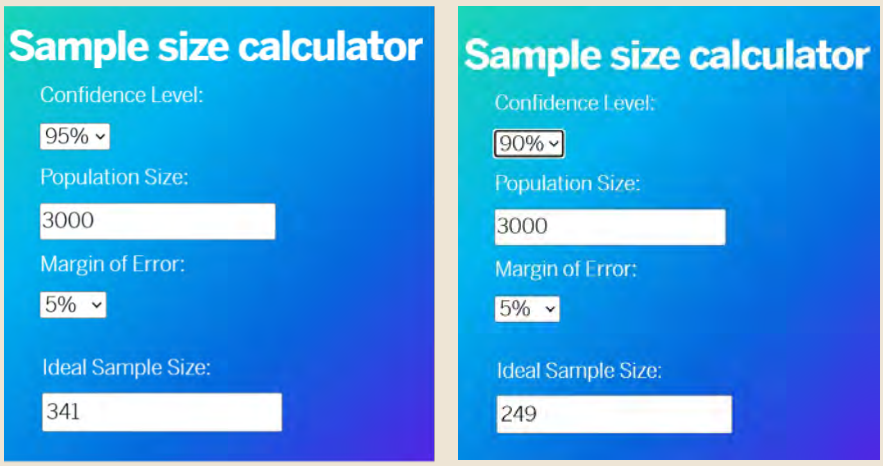


Figure 3.3. Using the sample size calculator tool to determine ideal sample size based on 95% confidence level (left) and 90% confidence level (right)

Allowing for some errors to occur, correcting up leads to ideal sample sizes of 350 questionnaires for a 95% confidence level or 255 questionnaires for a 90% confidence level.

Based on Ecosystem Services Certification Document (ESCD) by Fujian Province Shanghang Baisha national forest farm, approved in February 2023.

Sampling approach

The sample included in the data collection must be representative of the target population/area and item of study. There are different ways to decide which site or person will be part of the sample (i.e. different sampling approaches can be used).

You are advised to consider the following points when determining your sampling approach:

- Is your study area/population homogeneous or heterogeneous?
- If there are clear subgroups, you are advised to start by stratifying the study area or population (i.e. dividing them into more homogeneous groups).
- Include randomness in your sampling approach.
- To make sure that each potential site/person has an equal opportunity to be part of the study, random sampling or systematic sampling are the most recommended, or stratified random sampling if you applied stratification (see Table 3.3 for guidance on how to use each of these approaches).
- Practical considerations (e.g. accessibility of terrain).

For example, if a data collection plan has been finalized and the field team encounters difficulty accessing a certain sample site, they can select an alternative site within a 100 m radius.

Table 3.3. Overview of key sampling approaches

Sampling approach	What is it?	When to use?	How to use?
Random sampling	Randomly choosing a subset of sites from a larger set of potential sites, where each site has an equal probability of being selected	Homogeneous target population/area	Give a unique number to every potential sample site, determine the sample size, use an online random number generator tool (e.g. this one) to randomly select the numbers that are part of the sample.
Stratified random sampling	Dividing the ES project area into relatively homogeneous subgroups or sub-areas (i.e. strata) based on relevant characteristics (e.g. habitat type, management regime), then applying weighted random sampling within each stratum	Heterogenous target population/area with known strata	Create strata and determine the sample size per strata. For every stratum, give a unique number to every potential sample site and use an online random number generator tool (e.g. this one) to randomly select the numbers that are part of the sample per stratum.
Systematic sampling	Applying a consistent spatial sampling interval from a randomly selected starting point (e.g. overlaying the ES project area with a 500 m × 500 m sampling grid, including every eighth household in the survey)	Homogeneous target population/area or heterogenous target population/area with unknown strata, no risk of a pattern (e.g. edge effects such as all samples are at the same distance from a road)	Determine the sample size, determine the interval between samples, and randomly select a starting point (e.g. if the interval is 8, write numbers 1–8 on a paper, put them in a hat, and blindly select one). The interval will determine other sites/persons to be included in the sample.

Natural variability

It is recommended that you consider whether there is natural variation in the outcome indicator and how to take that into account in the sampling strategy. There could be variability from one measurement point to another within the same data collection period (spatial variability). If so, stratifying the sampling area (e.g. conservation/protected forest versus productive forest) or population (e.g. gender, age) is recommended.

There could also be seasonal, annual, or periodic (e.g. El Niño, La Niña) variability between outcome indicator values (temporal variability). For example, fauna populations typically follow cyclic patterns based on factors including food availability, climate, predator - prey dynamics, and disease. Water quantity and quality fluctuate with seasons and weather conditions. Aim to adapt the sampling frequency and timing to account for this temporal variability.

MODULE 4: DATA ANALYSIS AND RESULTS

This module continues from the data collection in the previous module.

Link ES PRO: Clauses 7.9–8.2 (Steps 6–7)

4.1 DATA PROCESSING AND ANALYSIS

After data collection, the next step is to clean and organize the data to ensure their integrity and usability for data analysis. This step involves performing data quality checks (e.g. filtering out errors due to double registering of measurement values, completing information about samples, or eliminating samples when missing information cannot be completed) and may involve data entry into software (e.g. Excel, SPSS, GIS) and coding data.

Subsequently, you can start performing analyses of the data set to check if the data support the logic of the theory of change of your ES project by discovering patterns, correlations, and insights, and translating your data into knowledge. Think about what results you would like to present as well as how you want to present them (see Section 4.4), and how to extrapolate results of the samples to the entire ES project. This includes, at minimum: an outcome indicator value that represents the present value, the baseline value, and the comparison between the two. Data processing may also comprise calculating the statistical significance of results of comparison between present value and baseline value (see Section 4.3 on conservativeness).

4.2 UNCERTAINTY MITIGATION

For every outcome indicator, it is important to identify any factors that may have influenced or created a bias in the results of the data collection and analyses, for both the present and baseline values. Table 4.1 provides examples of sources of uncertainty and mitigation measures to reduce uncertainty.

Table 4.1. Examples of sources of uncertainty and proposed mitigation measures

Outcome indicator		
Source of uncertainty	**Outcome indicator value(s) to which it is applicable**	**Mitigation measures**
Large natural variation of outcome indicator	Present value and baseline value*	• Stratification • Sampling at multiple or specific seasons/ times of the year • Removing outliers during data processing
Different teams collecting data in MUs A, B, C and MUs X, Y, Z	Present value	• Training on data collection protocol • Team leads have calibration meetings to align on decisions made during data collection • Same team analysing the data
Data collection errors	Present value	• Test data collection protocol • Quality control
Weather conditions	Present value	• Data collection on days with similar weather conditions
Default value	Baseline value	• Look at different sources • Choose the most recent one

**Only include them in the same row if the mitigation measure is the same for both – otherwise create separate rows (duplicating source of uncertainty).*

4.3 CONSERVATIVENESS

While you can try to mitigate uncertainty as much as possible, there will always be some left in your results. To avoid over-claiming, it is best practice to report results conservatively and be transparent about the level of uncertainty.

There are two ways to do this (see ES Procedure Clauses 7.10–7.12, Step 7):

1. quantitatively by:
   a. calculating the confidence interval
   b. then applying a deduction factor
2. qualitatively by describing conservativeness.

For SLIMF and community forests, go straight to 2) Describing conservativeness.

Box 4.1. Terms used for expressing uncertainty of results

Uncertainty range: the span of possible values within which the true value of a measurement is expected to lie. It represents the variability in estimates and expresses the degree of uncertainty associated with a result. Uncertainty ranges are often expressed as confidence intervals in statistics.

Confidence interval: a range of values, derived from sampling data, that is likely to contain the true value of the indicator. This range has an upper bound and a lower bound, the position of which is related to the confidence level applied. A lower confidence level leads to narrower confidence intervals, a higher confidence level to broader confidence intervals.

Confidence level: expressed as a percentage, such as 90%, 95%, or 99%.

Margin of error: the margin of error is half the width of the confidence interval.

1a) Calculating the confidence interval

Several parameters are needed to be able to calculate the confidence interval:

- sample size
- mean
- standard deviation
- confidence level (see Table 3.2 Recommended statistical parameter values in determining sample size).

If not yet available from your data analysis, this online calculator can help you to calculate the sample mean and standard deviation.

Subsequently, various online calculators are available that can be used to calculate the confidence interval. Note that there is a difference between calculating the confidence interval for a mean and for a proportion. Some calculators allow for the use of raw data as well. All online calculators listed below provide explanations on the formula used.

Calculators for the confidence interval for a mean:

https://www.mathsisfun.com/data/confidence-interval-calculator.html

https://www.calculator.net/confidence-interval-calculator.html

https://www.omnicalculator.com/statistics/confidence-interval#how-to-calculate-confidence-interval

Calculator for the confidence interval for a proportion:

https://sample-size.net/confidence-interval-proportion/

Subsequently, the uncertainty range (%) is calculated through the following formula:

Uncertainty range (%) = (upper bound confidence interval – lower bound confidence interval/ 2*mean or proportion) * 100%

For example, if the 95% confidence interval is 68 ± 6.39 (61.61 to 74.39), then the uncertainty range is: (74.39-61.61/2*68) * 100% = 9.40%.

1b) Applying a deduction factor

A deduction factor is also referred to as a conservativeness factor or conservativeness deduction. Based on the calculated uncertainty range, apply a deduction factor to the outcome indicator values that aims to correct the result downwards in accordance with the degree of uncertainty to prevent over-claiming. The table below provides guidance on the deduction factor to apply to the result of the comparison.

Table 4.2. Uncertainty range and deduction factors to apply
Source: adapted from CDM, 2008.

Estimated uncertainty range at 95% confidence level	Deduction factor (multiply your result, i.e. comparison between baseline value and present value, with this)
< +/- 15%	1
> +/- 15%, ≤ +/- 30%	0.943
> +/- 30%, ≤ +/-50%	0.893
> +/- 50%, ≤ +/- 100%	0.836

If you have the uncertainty range for both the present value and the baseline value, you can:

1. add up the uncertainty range of the present value and the uncertainty range of the baseline value. Then, the sum of the two uncertainty ranges determines the deduction factor to apply. For example, the baseline value has a 10% uncertainty range and the present value has a 6% uncertainty range, then together the uncertainty range is 16%.
2. correct the result of the comparison between present value and baseline value downwards by using the upper limit of the confidence interval for the baseline value and the lower limit of the confidence interval for the present value.

If you only have the uncertainty range for the present value, then apply the associated deduction factor to the result of the comparison, after choosing a conservative baseline value.

2) Describing conservativeness

When a methodology does not provide quantitative data or when you are managing SLIMF or community forests, instead of calculating the uncertainty range and applying a deduction factor, you may describe how the outcome indicator values are presented conservatively.

Link ES PRO: Clauses 7.11 and 7.12

Take into consideration the sources of uncertainty and how residual uncertainty (the part that cannot be mitigated) may affect the results. If you are in doubt about the level of confidence in the results, it is advisable to take a cautious approach to avoid over-claiming. For example, if you detect a minor positive change, a precautionary approach would be to make a maintenance claim rather than an enhancement claim.

Example of mitigating uncertainty and describing conservativeness: Ejido la Selva

Ejido la Selva is a community-managed natural forest in Mexico. To demonstrate the positive impacts of sustainable forest management on water services, Ejido la Selva uses the Stream Visual Assessment Protocol (SVAP, ES3-D). Out of the 16 elements included in the SVAP, 14 elements are included and scored between 1 and 10 (two elements are considered not applicable). Each of the elements receives a score (see the figure below).

No.	Elemento	Puntaje
1	Condición de la corriente	9
2	Alteración hidrológica	9
3	Condición del margen de la corriente	8
4	Cantidad de la zona riparia	8
5	Calidad de la zona riparia	9
6	Cobertura del dosel	8
7	Aspecto del agua	9.5
8	Acumulación de nutrientes	9
9	Presencia de estiércol y residuos de origen humano	NA
10	Pozas	9.0
11	Barreras al movimiento de especies acuáticas	9
12	Complejidad del hábitat para los peces	8
13	Hábitat de invertebrados acuáticos	8
14	Comunidad de invertebrados acuáticos	7
15	Presencia de rabiones	9
16	Salinidad	NA
A	**Suma de todos los elementos**	**119.5**
B	**Número de elementos calificados**	**14**

Figure 4.1. Scoring of a stream in Ejido la Selva, Mexico, using the Stream Visual Assessment Protocol

As you can see in Figure 4.1, the score per element varies between 7 and 9.5. The average score is 8.56 (119.5/14) which translates into a good water quality, see Table 4.3.

Table 4.3. Scoring ranges and their interpretation of water quality

Scoring range	Water quality
1–2.9	Severely degraded
3–4.9	Poor
5–6.9	Normal
7–8.9	Good
9–10	Excellent

Uncertainty mitigation

Although guidance is provided in the SVAP, the scoring of the elements carries a level of subjectiveness in it. This means that different assessors may each come to a slightly different score.

Imagine that this assessment is repeated every year to show a trend over time. Uncertainty and subjectivity can be minimized by:

1. having multiple assessors in a team, instead of just one person;
2. making sure to keep the composition of the assessment team the same, or at least including members of the previous assessment team to ensure comparability of results;
3. taking photographs of the forest stream and keeping them with the scores as a reference for future assessments.

Describing conservativeness

Imagine the assessment team is made up of José, Ana, and Pablo. If José scores the quality of the riparian zone as 8.5, Ana as 8.5, and Pablo as 8, it would be conservative to use Pablo's score because it is the lowest.

Inspired by ESCD by Ejido la Selva, Mexico, approved in November 2023.

4.4 PRESENTING YOUR RESULTS

For every outcome indicator value that is derived from multiple measurement values, at minimum – the following information is recommended to be presented:

- the value of the outcome indicator, such as the mean or proportion (e.g. 2.1, 35%);
- the confidence interval (e.g. 1.8–2.4, 32–38%) OR the margin of error (e.g. ±3%);
- the confidence level (e.g. 95%).

The outcome indicator values for the baseline value and the present value need to be comparable; in other words, the values need to be in the same units of measurement and at the same level of precision (e.g. for units, kg and kg rather than kg and tonnes; for precision, 3.48 and 4.85 instead of 3.4778 and 5).

Whenever data are available over a longer period of time that allows for comparison, it is better to include multiple values and show a trend over time rather than comparing data from just two points in time. Where possible, use a graph or table. Maps and/or photos can also powerfully convey useful information and can be part of the evidence to demonstrate a positive impact on ecosystem services. It is recommended that you describe and explain the results.

The natural variation of an outcome indicator (as well as measurement errors) brings a risk of being falsely interpreted as a positive or negative change caused by the management activities. For an enhancement ES impact, it is important to ensure that the positive change detected in the outcome indicator value is not within its range of natural variation. For a maintenance ES impact, a stable trend may mean that a minor negative change can be accepted if this can be explained by the natural variation (in other words, the interpretation of 'stable' includes both minor positive changes and minor negative changes, because of natural variability). Applying conservativeness to the comparison between the present value and the baseline value is helpful to avoid over-claiming.

Finally, you need to formulate a conclusion about the observed results for each of the outcome indicators separately, as well as an overall conclusion regarding the selected ES impact based on the combination of results.

Example of presenting results: biodiversity conservation by Industrie Forestiere de Ouesso

Industrie Forestière de Ouesso manages a natural tropical forest in the Republic of Congo. It is implementing a set of management activities to protect and maintain critically endangered forest elephants and gorillas as well as endangered chimpanzees living in their forests. Using a systematic sampling approach (overlaying a grid on their MU), data were collected during transect walks, with elephant droppings and primate nests being counted to estimate species abundance (cf. ES1-F). The results are presented in the table below.

Table 4.4. Results flagship species monitoring in a natural tropical forest in the Republic of Congo

	No. of animals (2014) (95% confidence level)	No. of animals (2021) (95% confidence level)	Difference (2014–2021) (P-value*)	Result (significance 0.05)
Gorillas	54,751 (33,119–90,515)	67,196 (51,810–87,152)	Increase: +12,445 (P=0.22)	P>0.05 → Maintenance
Chimpanzees	6,590 (3,818–11,374)	7,312 (4,767–11,215)	Increase: +722 (P=0.38)	P>0.05 → Maintenance
Forest elephants	3,299 (1,882–5,780)	2,956 (1,951–4,479)	Decrease: -343 (P=0.24)	P>0.05 → Maintenance

* the P-value expresses the level of statistical significance

The table above shows that there is a large confidence interval around the mean number of animals in the MU. This means that for gorillas, an increase of 12,445 animals is a difference that is not significant (P>0.05). Therefore, the conclusion is that the gorilla population has been maintained (not increased). Similarly, for elephants, the population decrease observed between 2014 and 2021 is not significant, thus the result shows maintenance.

Inspired by ESCD by Industrie Forestier de Ouesso, Republic of Congo, approved in December 2022.

PART II

ES project safeguards

MODULE 5: ADDITIONALITY

In many cases, there is no need to demonstrate additionality. The ES Procedure requires the demonstration of additionality in the following cases:

Link ES PRO: Clause 2.8 and Clause 4.3, Step 3

1. when a sponsor wants to attribute the verified ES impact to its financial contribution (i.e. thanks to <sponsor>'s support, this positive impact has been realized);
2. when the Organization wants to get sponsorships for multiple ES impacts based on the same set of management activities from different sponsors (i.e. stacking, see Figure 5.1);
3. when the Organization wants to receive sponsorships for ES impacts where there is an overlap with projects or activities registered under an external ES programme.

Of course, in addition to the above, a forest manager may voluntarily decide to demonstrate the additionality of the ES project.

5.1 WHAT IS ADDITIONALITY?

Additionality is interpreted in different ways. What they have in common is the understanding that something 'additional' has happened [in the forest] because of the ES project that would not have happened without the expected benefit from the ES project.

Additionality in the ES Procedure focuses on developing a theory of change of the ES project and subsequently identifying those management activities and outputs included in the theory of change that represent legal additionality, or regulatory surplus, which would not have been implemented without the (expected) financial support by a sponsor or benefit from the ES project (financial additionality). It is good to keep in mind that the ES Procedure cannot be used for beyond value chain compensation and neutralization.

5.2 WHY UNDERTAKE AN ADDITIONALITY TEST?

Demonstrating the additionality of an ES project is often closely related to obtaining sponsorship or payments for the ecosystem services being provided by the forest. An additionality test provides proof that the positive impact on ecosystem services generated by the ES project would not have happened otherwise – that is, without implementing the best management practices (that go beyond legal requirements) and without (expected) financial support from a sponsor for the ES project. An additionality test also functions as a justification for a sponsor of why its contribution is needed and impactful.

Even if not required, you may still see value in undertaking an additionality test voluntarily, especially when looking for sponsorship. Having clarity on the additionality is helpful for determining the price of the ES impact(s) as well as for marketing and sales.

5.3 HOW TO UNDERTAKE AN ADDITIONALITY TEST

Link ES PRO: Clause 4.4, Step 3

An additionality test is typically carried out per ES project, that is, from the implementation of a set of management activities. As mentioned, the ES Procedure focuses on identifying legal additionality, or regulatory surplus, and financial additionality.

If multiple ES impacts and/or projects or activities are registered under an external ES programme resulting from a single ES project (i.e. one or more management activities lead to multiple ES impacts) and you want to sell them separately (i.e. stacking with unbundling, see Figure 5.1), you will need to justify the need for multiple sources of funding for the same ES project.

For forest management groups:
Where possible, you are advised to group in a cluster the MUs that share the same legislative environment and financial context (e.g. ES project costs, subsidies received, carbon credit project income, etc.)

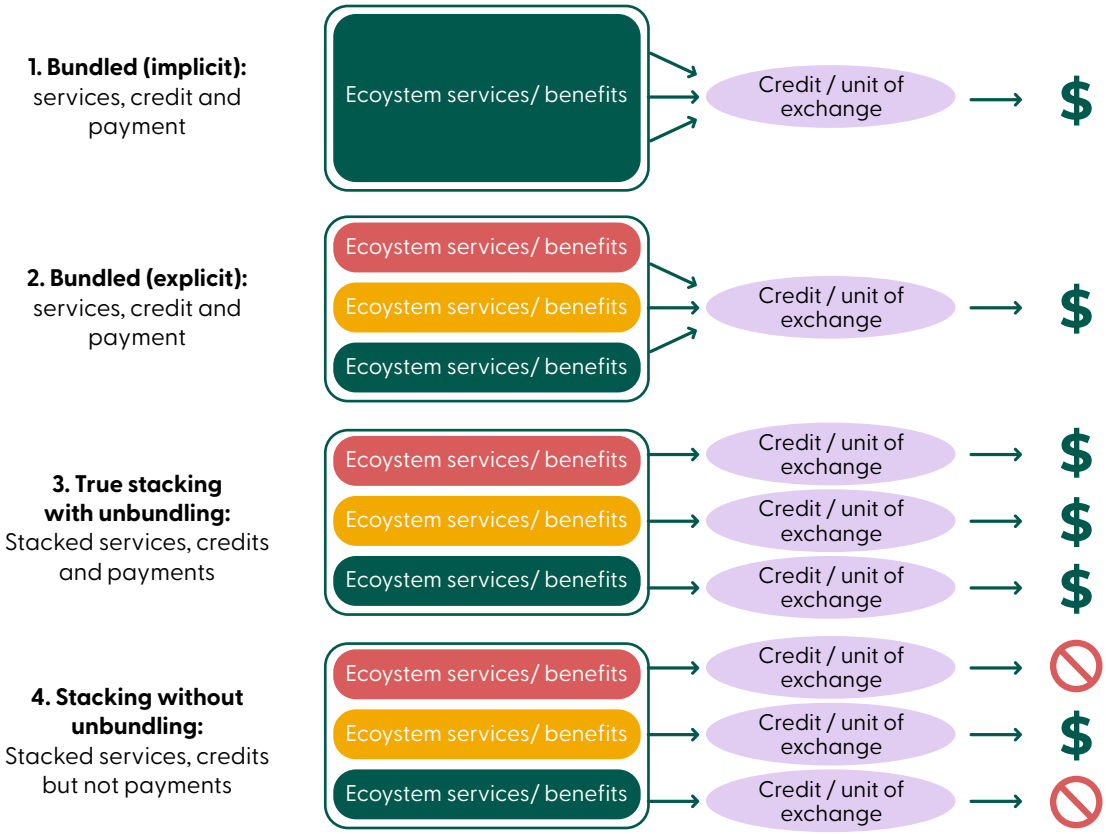


Figure 5.1. Bundling and stacking
Source: BBOP (2018). See also module in FSC-GUI-30-006b on pricing and sales of ES impacts.

Identify legal additionality

Look at the management activities and outputs included in the theory of change of the ES impact. Identify those that go beyond the legal requirements applicable in your country and jurisdiction (region, state, province). It may be that certain management activities are legally required to be undertaken but the degree of implementation is different from the best management practices you have implemented (e.g. buffer zone around water bodies, where legal requirement is 15 m and you adopt 30 m). In such case, specify the legal surplus (in this example, 15 m).

The legal additionality test leads to a 'yes/no' result; it is either there or not. With time, new laws and legislation may be introduced that affect the legal additionality of your ES project. It is good practice to monitor developments in the legal framework applicable to your ES project and adjust the additionality test if needed.

Demonstrate financial additionality

1. Present a financial overview of the ES project costs, considering the implementation of management activities included in the theory of change that represent a legal surplus, such as foregone revenue (e.g. from harvesting less), monitoring costs, staff time investment in preparing the ESR, and ES evaluation costs. For verified ES impacts, this should cover the time period from the start of the ES project (e.g. year of baseline values of outcome indicators) until the year of impact verification. For validated ES impacts, this should cover the time period from the start of the ES project until the year when the ES impact is expected to be verified (e.g. five years from the year of validation).

2. Identify any income derived from the ES project (e.g. subsidies, sales of carbon credits, or other payments for ecosystem services issued based on the same management activities).
3. Justify the financial contribution for the ES impact needed to make the ES project viable.

Table 5.1. Example template to create a financial overview of ES project costs

Cost item/year	Y1	Y2	Y3	Y4	Y5	Total (legal surplus)
Implementation management activity 1	Costs output 1 in Y1 (legal surplus)	Costs output 1 in Y2 (legal surplus)	Costs output 1 in Y3 (legal surplus)	Costs output 1 in Y4 (legal surplus)	Costs output 1 in Y5 (legal surplus)	
Implementation management activity 2						
Implementation management activity 3						
Monitoring						
Staff time/ consultant hire ES project development						
ES evaluation (certification body)				Audit costs		
Other						
Grand total						
Total (legal surplus)						

Example: demonstrating additionality

To promote biodiversity in a temperate forest in Europe, a forest manager leaves deadwood in the forest and keeps large trees standing, thereby creating microhabitats to attract a variety of bird and other fauna species in 5 ha of forest.

Legal additionality: There is no legal obligation to leave deadwood or protect large, old-growth trees. Therefore, the ES project passes the legal additionality test.

Financial additionality:

1. Annually, the foregone revenue of these management activities is 20 m^3/ha of wood, with an average worth of €40/m^3 (timber market price minus harvesting costs), resulting in a cost price of €800/ha. For the total forest area this comes to 5 ha*€800/ha = €4,000. The monitoring and ES audit costs are €1,250 per five years, resulting in an annual amount of €250. The total annual costs are €4,250.
2. There are no public subsidies to promote biodiversity or any other income derived from the ES project.
3. The financial contribution for the ES impact is needed to make this biodiversity project viable for the forest manager. Therefore, the ES project passes the financial additionality test.

As with legal additionality, the financial situation may change with time and affect the outcome of the financial additionality test – for example, if new subsidies become available or if the foregone revenue increases based on high timber market prices. In such cases, a new additionality test needs to be carried out.

MODULE 6: RISK MITIGATION PLAN

Even if you make all the necessary efforts to maintain or enhance an ES impact, some events are outside of your control. For example, a wildfire may come to your region and affect (part of) your MU and ES project area. The purpose of the risk mitigation plan is to avoid the positive impact on ES being negatively affected or undone by a threat that manifests during the period when the verified/validated ES impact is valid and ES claims can be made. It works to ensure that any communications promoting the positive impact on ecosystem services still correspond to the reality in the forest. If an unavoidable threat does manifest and negatively affects the ES project, the risk mitigation plan aims to minimize and restore the damage done to the ES project. The risk mitigation plan is a key integrity piece, safeguarding against positive impacts being reversed and ensuring credibility of the ES claims.

The risk mitigation plan consists of the following elements:

- threats, both of human and natural origin
- likelihood that the threat will manifest
- mitigation action(s)
- monitoring of threats.

Link ES PRO: Clause 4.6, Step 3

It is recommended to develop the risk mitigation plan after building the theory of change. If developing the theory of change was a group exercise, the same group could also support in developing the risk mitigation plan during a workshop, brainstorming session, or by reviewing a draft risk management plan for the ES impact.

6.1 IDENTIFYING THREATS

Threats can come from within or outside the MU. They can come from a natural origin (e.g. extreme weather event, disease) or be caused by human action (e.g. development of infrastructure, introduction of new law, etc.). Table 6.1 below provides more examples of threats.

By implementing Criterion 10.9 of the FSC-FM standard, you have already identified risks originating from natural hazards that may also be relevant for the ES project. While developing the theory of change, you may have already thought about which specific threats could negatively affect the ES impact and/or you may have identified mitigation actions against key threats and included them as management activities in the theory of change.

6.2 DETERMINING LIKELIHOOD

The likelihood that a threat will materialize is classified as low, medium, or high, in accordance with the duration of the risk management plan (at minimum five years into the future). You can classify threats by looking both at past experience and into the future, keeping in mind that climate change can affect the likelihood of threats (e.g. extreme weather events) manifesting.

6.3 MITIGATION ACTIONS

You are advised to give priority to effective mitigation actions against threats with a high likelihood of materializing and threats with a medium likelihood of manifesting but a significant (medium-high) negative impact if they do.

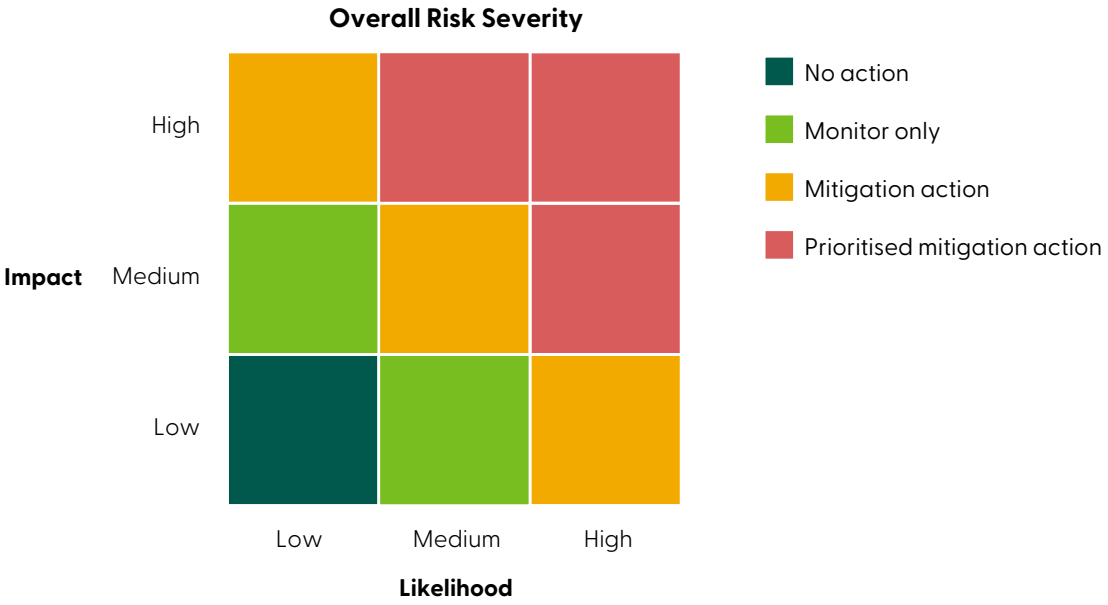


Figure 6.1. Prioritizing mitigation actions based on likelihood of the threat manifesting and severity of negative impact if it does manifest

Mitigation actions can be positioned on a continuum, starting with preventive actions (avoiding the threat negatively affects the ES impact), to minimizing negative effects on the ES impact, and finally, if the ES impact has been negatively affected or undone, actions to restore the ecosystem services. For threats that come from outside of the MU, it is recommended to collaborate with other stakeholders.

Table 6.1 below provides more examples of mitigation actions. It is important to make these actions specific to the ES impact you are looking to demonstrate and to your unique forest context. Moreover, the principles of scale, intensity, and risk play a key role here. SLIMF and community forests with fewer resources are not expected to implement as many mitigation actions as large companies with more resources.

6.4 MONITORING THREATS

Methods to monitor threats include: following local news; talking to neighbours; subscribing to, checking, or creating threat alert systems (e.g. a specific phone number to contact if smoke/fire is detected by local communities); remote sensing; and threat-specific patrolling or monitoring in the forest. See Table 6.1.

Table 6.1. Examples of threats, likelihood, mitigation actions, and monitoring (threats will need to be specifically identified at the forest/country level)

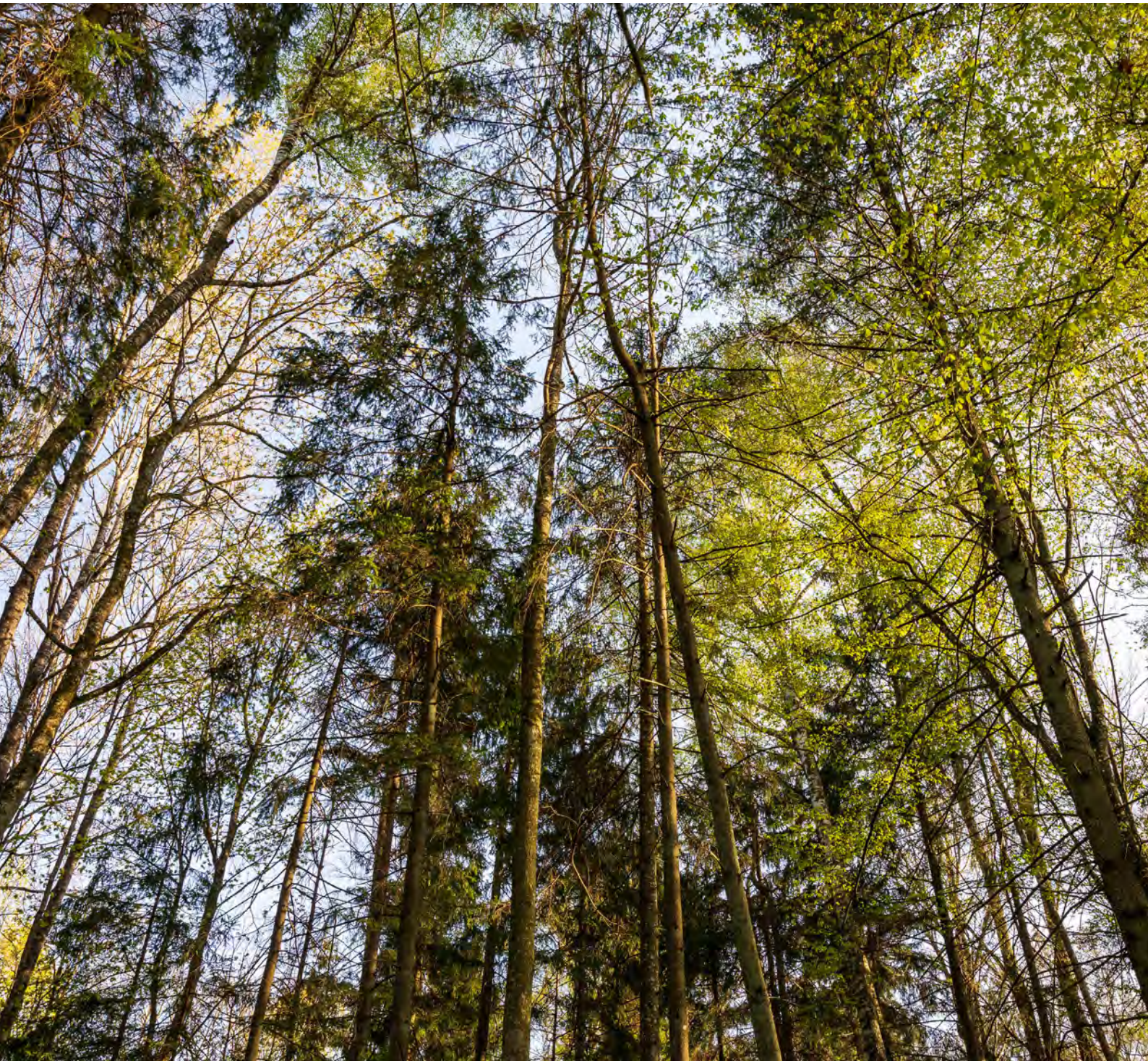
Threat	Likelihood	Mitigation actions	Monitoring
Wildfire	High in dry season	• Create fire breaks • Collaborate with authorities, neighbours, and/or local communities in awareness raising, detection, and response • No forestry work during high-risk season (avoid tinder from machinery, avoid accidents from crew smoking) • Rapid response team to extinguish fire • Select fire-resistant tree species • Restore burnt area using assisted natural regeneration	• Subscribe to local fire alert system • Remote sensing for burnt vegetation within MU • Map area burnt/affected by wildfire
Drought		• Select drought-resistant tree species/use native species that are well adapted to local conditions	• Measure precipitation on site
Storm, flooding, hurricane		• Limit clear cut sizes • Diverse tree species composition • Selective/no logging on slopes	• Weather forecast, subscribe to weather alarm
Earthquake, landslide		• Reduce clear cut area	
Pest/disease		• Diversify species and genetic variety • Timely action to remove infested trees • Pest traps • Barriers to prevent spreading of pest/disease	• Forest health and sanitary monitoring
Invasive species		• Timely action to remove invasive species • Adequate forest regeneration practices	• Forest health and sanitary monitoring
Illegal logging		• Patrolling • Dialogue stakeholders	• Patrolling
Road construction/ maintenance		• Timing outside of nesting season • Fauna passage (ecoduct) • Limit road width	
Poaching/hunting		• Patrolling • Dialogue with stakeholders	• Patrolling
Pollution incident upstream		• Engage stakeholders in watershed in awareness raising, education	• Follow local news • Subscribe to upstream water quality monitoring executed by local government or water authority • Monitor a point representing water quality upstream from your MU
Changed law		• Engagement with authorities	• Follow developments and publication of new laws and changes in laws
Local human population growth		• Dialogue with stakeholders	• Follow news on local population census

6.5 THREAT RESPONSE

In case a threat has manifested and negatively impacted the ES project, you need to restore the forest and the ES project features. In case the damage is severe and it is no longer credible to make ES claims about the original demonstrated ES impact (as it is no longer there), you are advised to get validation of the restoration of the ES project through choosing to pursue the enhancement impact type of the original demonstrated ES impact or another enhancement impact that seems fitting.

For example, if a wildfire burns down 50% of the forest in the ES project area and it is no longer credible to make ES claims based on ES1.7 'Maintenance of native species diversity', based on the implementation of restoration activities you can pursue the validation of ES1.8 'Enhancement of native species diversity'. In the project description section in the ESR, you can include details about the event that has happened (under 'past condition').

Link ES PRO: Annex A, Clause 6c



MODULE 7: REVENUE-SHARING AGREEMENT

Link ES PRO: Section 10

If you are receiving revenue, you are required to establish a revenue-sharing agreement.

Box 7.1 Definition of revenue

Revenue is defined as any payment received from a sponsor for the validated or verified ES impact(s) on ecosystem services, less any charges, taxes or similar fees levied by the host country government and applicable governmental agencies.

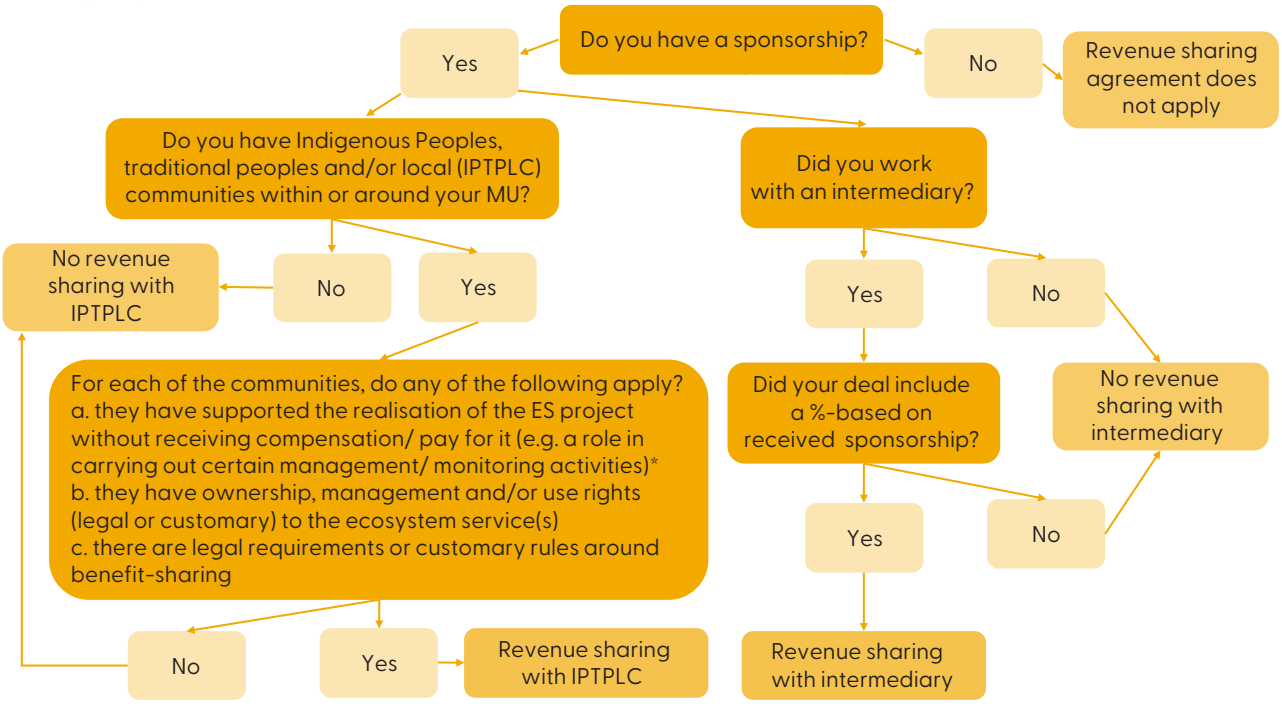
Source: 'Terms & Definitions' section of the ES Procedure.

Also referred to as benefit-sharing mechanisms, revenue-sharing agreements are considered a key integrity piece in today's climate and ecosystem services markets. For example, Plan Vivo includes a cap of revenue for project developers in its Plan Vivo Standard (Plan Vivo, 2022), and the International Advisory Panel on Biodiversity Credits includes benefit sharing among its high-level principles (IAPB, 2024).

The purpose of the revenue-sharing agreement is to ensure that the majority of the sponsors' investments reach the forest and ES project and that those responsible for the stewardship of ecosystem services actually receive the benefits and support, rather than large sums of money being captured by intermediaries or consultants.

7.1 PARTIES IN A REVENUE-SHARING AGREEMENT

A variety of actors can be involved in an ES project. While there may be a single revenue-sharing agreement, it is most likely that as a forest manager you will set up multiple revenue-sharing agreements – one with each identified party.



**Note that compensation from using Indigenous and traditional knowledge is already covered under FSC-FM standard as well as compensation form any negative impact resulting from the ES project.*

Figure 7.1 Decision-tree to help identify parties in the revenue-sharing agreement

Subsequently, you register in the ESR the share that each party (or category of parties) received of the total sum that the sponsor paid. Note that this may be different from the total amount you receive, if the intermediary is the direct recipient of the sponsor investment and transfers you the amount after deducting its share to cover the effort of obtaining the sponsorship for you (see Figure 7.1).

7.2 REVENUE-SHARING AGREEMENT WITH INTERMEDIARY

It is likely that the intermediary will propose you an offer stipulating how much you will get paid for the ES impact(s), once a sponsor has been found. There may be a flat rate to cover your costs (implementing the management activities, eventual subcontractor, collecting and analysing data, filling in the ESR, eventual help of a consultant, evaluation by a certification body) and a flexible add-on rate that depends on the market demand, prices, and total amount of sponsorship acquired.

In some cases, the intermediary may simultaneously play the role of project developer. In general, the higher the (time) investment and risk taken by the intermediary for the ES project, the more they will need to recover this from the sponsorship, thus the higher their share of the total revenue may amount to. Their share of revenue needs to be recorded in the ESR, and therefore the intermediary or project developer must disclose this information to the forest manager.

7.3 REVENUE-SHARING AGREEMENT WITH INDIGENOUS PEOPLES, TRADITIONAL PEOPLES, AND LOCAL COMMUNITIES

How can you determine what is fair and equitable?

When Indigenous Peoples, traditional peoples, and/or local communities are identified as a party in a revenue-sharing agreement (see paragraph 7.1 above), several points must be taken into consideration when determining what would be a fair share of revenue:

- their rights to the forest land and/or ecosystem service;
- their role and contributions towards creating the ES impact (e.g. implementing management activities; monitoring, expertise in creating theory of change and/or risk mitigation plan);
- any legal requirements around benefit sharing the ecosystem service;
- existing revenue-sharing agreements based on forest-based products and services (such as timber or non-timber forest products).

Fair, transparent, and inclusive revenue sharing within the community

While communities are sovereign in their governance structures and rules for decision-making, certain practices can prevent elite capture and promote inclusivity so that all community members benefit from a shared revenue. The following good governance practices are recommended to ensure a fair and transparent sharing of revenue within the community:

- The revenue-sharing agreement itself is signed in front of the entire community, so everyone in the community knows about it.
- If payments are made in cash, do this in front of the community and show the amount – this promotes accountability of community leaders.
- Fair distribution, inclusive of vulnerable members of the community, can also be arranged through a social development fund set up to finance community projects that have been collectively identified and prioritized (e.g. at community meetings).

PART III

ES-specific guidance

This section contains, for each of the seven ES categories:

- support in selecting a specific ES impact
- for some ES categories: guidance on meeting ES-specific requirements
- questions to help in identifying beneficiaries
- for some ES categories: suggested management activities
- example(s) of a theory of change and associated outcome indicators
- suggested methodologies for each outcome indicator or impact.

Specific recommendations are made regarding SLIMF and community forests.

MODULE 8: BIODIVERSITY CONSERVATION

Forests are home to many tree and plant species and provide habitats for numerous species, some of which may be of particular interest (i.e. a focal species) because they are endemic to the area, are rare, threatened, or endangered, or are collected for traditional or medicinal purposes. Further, some species or ecosystems play a functional role, for example by providing pollination services to the forest and nearby agricultural areas.

Biodiversity is not an ecosystem service, but it is essential for ecosystem functioning and **underpins all other ecosystem services** (Millennium Ecosystem Assessment, 2005). Forest ecosystems with high biodiversity store more carbon (Gamfeldt et al., 2013) and are often more attractive for recreational activities than less-rich ecosystems (Tyrväinen, 2014). Given the importance of biodiversity for ecosystem services, FSC has adopted it as an ES category for which impacts can be demonstrated.

8.1 SELECTING BIODIVERSITY CONSERVATION IMPACT(S)

Question	If answer is 'yes', consider ES impact:
Are there any focal species (endemic to the area; rare, threatened, or endangered; or collected for traditional or medicinal purposes) within the MU, and/or have high conservation value (HCV) 1 (species diversity) areas been identified within the management unit (MU)?	ES1.7/ES1.8
Does (part of) the MU contain endemic and/or rare, threatened, or endangered ecosystems, habitats, or refugia, and/or have HCV 3 (ecosystems and habitats) areas been identified within the MU?	ES1.11/ES1.12 ES1.3/ES1.4
Does the MU contain or is it part of an intact forest landscape (IFL), and/or have HCV 2 (landscape-level ecosystems and mosaics) areas been identified within the MU?	ES1.2
Have you created a conservation area network in your MU, conforming to Criterion 6.5 (FSC-FM Principles and Criteria)?	ES1.3/ES1.4
Is the MU part of a larger conservation areas network that sustains viable populations of focal species?	ES1.3/ES1.4 ES1.7/ES1.8
Is the forest in the MU in a near-natural condition?	ES1.5 ES1.7
Does the MU stand out for its maintenance of forest cover, in contrast to adjacent areas?	ES1.5 ES1.7
Does the MU serve focal species as a place of refuge from significant poaching pressures?	ES1.7/ES1.8
Are you aiming to restore natural forest cover and/or biodiversity?	ES1.1 ES1.6 ES1.8
Do certain populations of species in the MU deliver specific services, such as pollination or pest control?	ES1.9/ES1.10

Functional biodiversity

Functional biodiversity refers to the variety of biological functions or ecological roles that different species within an ecosystem fulfil. Ecological roles can be seen as specific **'jobs' in the ecosystem** to make the ecosystem function well.

Pollination is one type of job in an ecosystem. It is carried out by pollinators, which may include bees, butterflies, moths, beetles, bats, flies, wasps, and certain birds (e.g. hummingbirds, sunbirds). Some species also play a role in **seed dispersal**: frugivores, which include monkeys and certain birds (hornbills, pigeons), eat fruits and disperse the seeds in their faeces; squirrels, which hide nuts for winter and forget the hiding place of some; and animals with furry coats that seeds stick to. In terms of **pest control**, insectivores (e.g. birds like flycatchers, woodpeckers, and bats) play a role, as well as certain beetles and other species that feed or parasitize upon forest pests. Plant species are responsible for creating biomass through photosynthesis – in other words, they have the job of **primary productivity**. Herbivores eat plants and are preyed upon by carnivores. Finally, some species have the

job of **cleaning up**: This includes scavengers like vultures, hyenas, crows, and ants. Different trophic levels in the ecosystem (i.e. plants, herbivores, primary carnivores, secondary carnivores, and scavengers) keep the species population dynamics balanced.

The more different species occupy the same job (i.e. the higher the diversity), the higher the resilience of the ecosystem: If one species is affected by a disease or heavily preyed upon in a given year, then other species can still perform the job. If no species in the ecosystem can fulfil a certain job, this vacancy may need to be filled by human intervention – for example, chemical pest control.

8.2 IDENTIFYING BENEFICIARIES

Besides the benefits provided to the global community and the intrinsic value of biodiversity, when identifying other beneficiaries, you can consider the following questions:

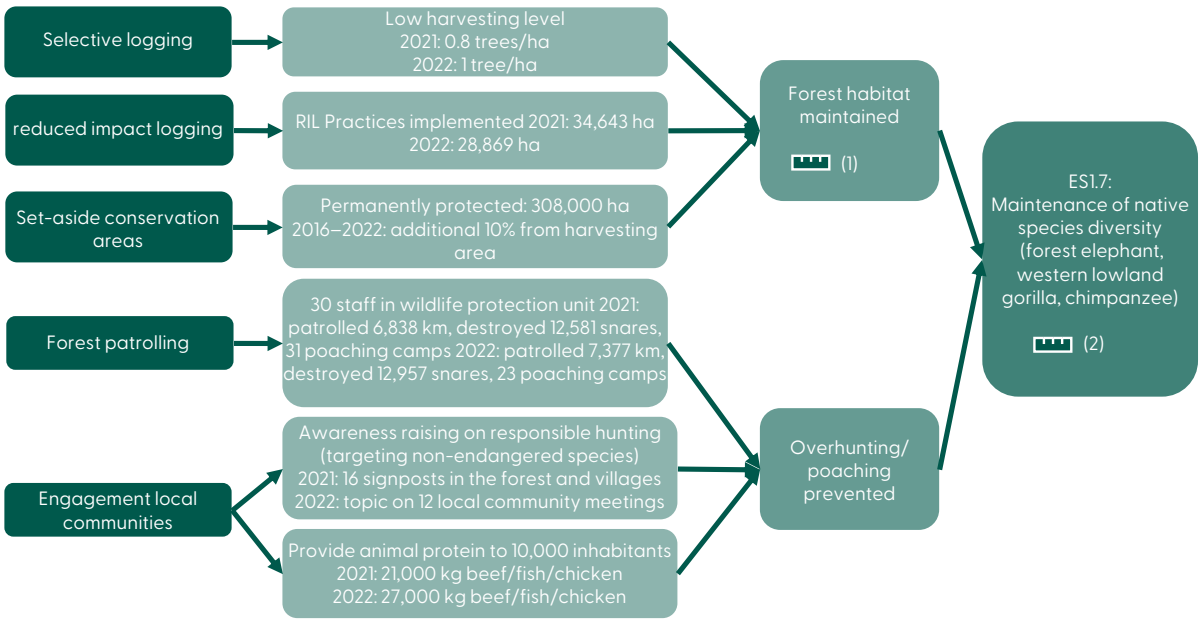
- Do farmers or nearby communities benefit from pollination services provided by forest bees or other pollinators?
- Are there traditional hunters in nearby areas who hunt species for which the forest provides a refuge?
- Do Indigenous Peoples and/or local communities inside or nearby the MU collect medicinal plants?
- Are there any forests connected to the MU that (potentially) help animals move through the wider landscape, permanently or seasonally (e.g. migratory species), which would be of interest to managers of nearby national parks or NGOs active in these connected forests?
- Are there any universities or research institutes undertaking biodiversity-related research or education activities?

→ See also identifying beneficiaries under recreational services

8.3 EXAMPLES: THEORY OF CHANGE AND OUTCOME INDICATORS

See Module 2 for guidance on how to develop a theory of change.

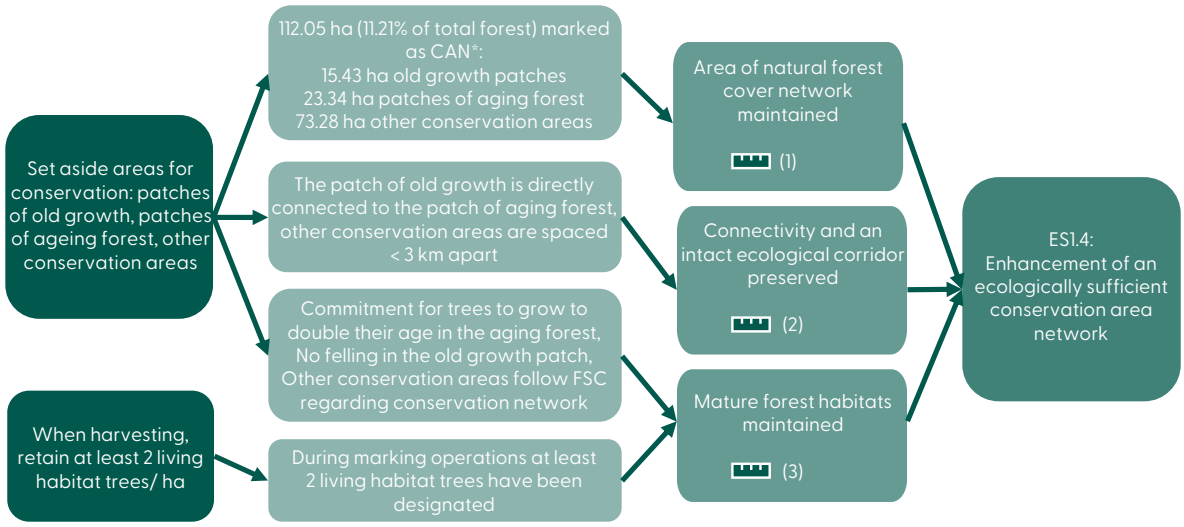
Example 1: natural tropical forest in Africa



1): Outcome indicator = Area of available habitat (ha)
2): Outcome indicator = Abundance of selected species (forest elephant, western lowland gorilla, chimpanzee)

Example based on ESCD by Industrie Forestier de Ouesso, Republic of Congo, approved in December 2022.

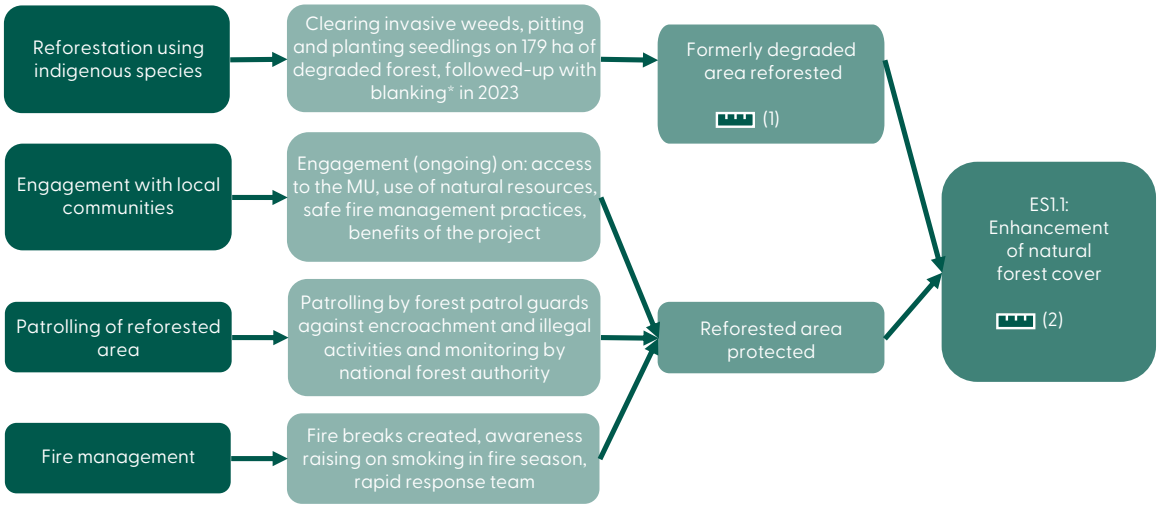
Example 2: temperate forest in Europe



1): Outcome indicator = area of conservation area network (ha)
2): Outcome indicator = connectivity of conservation area network
3): Outcome indicator = presence of natural environmental values and habitat suitability * Conservation area network

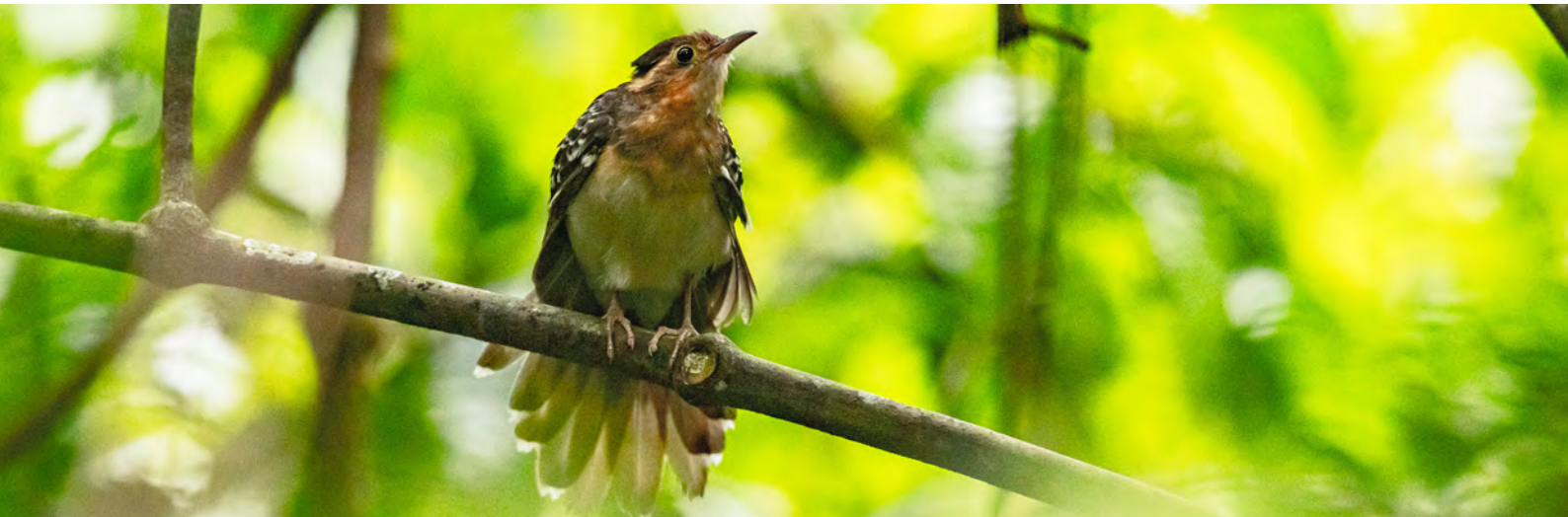
Example based on ESCD by Cabinet Bechon, France, approved in January 2023.

Example 3: reforestation by SLIMF (low impact) in Africa



1): Outcome indicator = Degraded forest area (ha) as a proportion of total land area (MU) (%) * replacing seedlings that died
2): Outcome indicator = Degraded/deforested area with successfully established native tree seedlings

Example based on ESCD by Uganda Timber Growers Association, approved in June 2023.



8.4 METHODOLOGIES

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
ES1.1	**Enhancement of natural forest cover**	
Extent of natural forest cover from restoration activities	Area of natural forest cover resulting from reforestation	ES1-A Satellite imagery and GIS
	Restored forest area as a proportion of total forest area	*Simple measurement or calculation*
Quality of natural forest cover from reforestation/ restoration activities	Forest density	ES1-B LiDAR ES1-J Index for Biodiversity Potential ✓
	Survival rate of planted native species	*Simple measurement or calculation*
	Variety of plant species composition	
	Diversity of forest structure	ES1-K Forest Integrity Assessment Tool ✓ ES1-B LiDAR
ES1.2	**Maintenance of Intact Forest Landscapes**	
Extent of Intact Forest Landscapes in the MU	Area of Intact Forest Landscapes	ES1-C Assessment of the Area of Intact Forest Landscapes ✓
	Area of Intact Forest Landscape core areas	*Simple measurement or calculation*
	Area of protected Intact Forest Landscapesa	*Simple measurement or calculation*
ES1.3	**Maintenance of an ecologically sufficient conservation area network**	
ES1.4	**Enhancement of an ecologically sufficient conservation area network**	
Connectivity of the conservation areas network	Connectivity of the conservation areas network	ES1-D Calculating Habitat Connectivity ES1-A Satellite imagery and GIS
	Connectivity to conservation areas outside the management unit	ES1-D Calculating Habitat Connectivity ES1-A Satellite imagery and GIS
	Connectivity to natural habitats outside the conservation areas network	ES1-D Calculating Habitat Connectivity ES1-A Satellite imagery and GIS
	Size of ecological corridor	ES1-A Satellite imagery and GIS
Habitat quality of the conservation areas network	Area of the conservation area network within and outside the management unit (including representative sample areas, conservation zones, protection areas, connectivity areas, and high conservation value areas)	Area: *Measured as part of FSC-FM* Habitat quality: ES1-J ✓, ES1-K ✓
	Area with High Conservation Value (HCV)	Area: *Measured as part of FSC-FM* Habitat quality: ES1-J ✓, ES1-K ✓
	Proportion of HCV area within the conservation area network	Percentage of area: *Measured as part of FSC-FM* Habitat quality: ES1-J ✓, ES1-K ✓
	Area of habitats of conservation importance	Area: *Measured as part of FSC-FM* Habitat quality: ES1-J ✓, ES1-K ✓

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
	Area of suitable habitats for species with conservation value	Area: *Measured as part of FSC-FM* Habitat quality: ES1-J ✓, ES1-K ✓
	Area of large landscape level ecosystems and mosaics (HCV2)	Area: *Measured as part of FSC-FM* Habitat quality: ES1-L
	NOTE: in addition to measuring the area, you can measure the habitat quality of that area using suggested methodologies	
ES1.5	**Maintenance of natural forest structure**	
ES1.6	**Enhancement of natural forest structure**	
Forest structure	Forest age class	
	Forest ecosystem structure	ES1-K Forest Integrity Assessment Tool ✓ ES1-B LiDAR
	Forest structural condition index	
	Forest vertical and/or horizontal structure	ES1-K Forest Integrity Assessment Tool ✓ ES1-B LiDAR ES1-J Index for Biodiversity Potential ✓
	Amount of standing and fallen deadwood and/or other important natural microhabitats	ES1-K Forest Integrity Assessment Tool ✓ ES1-B LiDAR ES1-J Index for Biodiversity Potential ✓
ES1.7	**Maintenance of native species diversity**	
ES1.8	**Enhancement of native species diversity**	
Native species diversity	Indices of native species assemblage or composition (e.g. Shannon diversity index)	ES1-E Environmental DNA ES1-F Fauna Species Survey Techniques ES1-G Camera trap surveys ES1-H Acoustic monitoring ES1-L Forest Intactness Index
	Proportion of native species classified as at risk	
Abundance or viability of focal, endemic, or rare, threatened, and endangered species	Abundance of selected species	ES1-F Fauna Species Survey Techniques ES1-G Camera trap surveys ES1-H Acoustic monitoring
	Availability of selected species for sustainable traditional use (e.g. medicinal plants)	
Habitat availability within the management unit for focal, endemic, or rare, threatened, and endangered species	Area of available habitat	*Simple measurement or calculation*
	Suitability of habitat	ES1-K Forest Integrity Assessment Tool ✓ ES1-L Forest Intactness Index
	Habitat connectivity	ES1-D Calculating Habitat Connectivity
	Area protected from illegal hunting	ES1-H Acoustic monitoring
ES1.9	**Maintenance of functional biodiversity**	
ES1.10	**Enhancement of functional biodiversity**	

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
Ecological function	Pollination rates	ES1-I TESSA Pollination method 5: Flower visitation rate as a proxy
	Seed dispersal	
	Pest control	
	Gross or net primary production	
	Population dynamics	
Functional biodiversity	Species richness of native pollinators	ES1-E Environmental DNA
	Abundance of natural enemies (e.g. bats) that limit pests	ES1-F Fauna Species Survey Techniques ES1-G Camera trap surveys ES1-H Acoustic monitoring
	Variety of functional species groups	ES1-E Environmental DNA
	Diversity of morphological species traits	
	Diversity of soil microbiome	ES1-E Environmental DNA
Habitat availability within the management unit for functional biodiversity	Evidence of roosts and shelters in use by functional species	ES1-K Forest Integrity Assessment Tool ✓
	Area of available habitat for functional biodiversity species	*Simple measurement or calculation*
	Suitability of habitat for functional biodiversity	ES1-K Forest Integrity Assessment Tool ✓
	Availability of standing and fallen deadwood and/or other important natural microhabitats	ES1-K Forest Integrity Assessment Tool ✓ ES1-B LiDAR ES1-J Index for Biodiversity Potential ✓
ES1.11	**Maintenance of rare, endemic, threatened or endangered habitats or ecosystems**	
ES1.12	**Enhancement of rare, endemic, threatened or endangered habitats or ecosystems**	
Extent of rare, endemic, threatened or endangered habitats or ecosystems	Area of endemic habitats or ecosystems	*Simple measurement or calculation*
	Area of ecosystems that are threatened or endangered	*Simple measurement or calculation*
	Area of ecosystems or habitats that are classified as threatened in national or international systems	*Simple measurement or calculation*
	Area of priority habitats and ecosystems for conservation at the global, regional, national, and/or local levels	*Simple measurement or calculation*
Condition of rare, endemic, threatened or endangered habitats or ecosystem	Ecological Integrity Index	
	Proportion of forest intactness areas	ES1-L Forest Intactness Index
	Disturbance level	ES1-K Forest Integrity Assessment Tool ✓
	Presence of indicator species for good habitat/ ecosystem quality	ES1-E Environmental DNA
	Proportion of degraded habitats in relation to total	ES1-L Forest Intactness Index

MODULE 9: CARBON SEQUESTRATION AND STORAGE

Forests play an important role in climate change mitigation because of their ability to store carbon and act as a carbon sink. Trees sequester and store carbon as they grow.

Forest carbon is stored in five pools:

- above-ground biomass
- below-ground biomass
- soil (soil organic carbon)
- deadwood
- litter.

The amount of carbon stored in forests, and in the various carbon pools, varies across different forest types. For example, in boreal forests, most of the carbon is stored in the soil (soil organic carbon); in tropical forests, on the other hand, over half of the carbon is stored in living biomass (above-ground and below-ground biomass) (Merger and Seebauer, 2014).

Tree planting and management activities, such as protected areas, silvicultural treatments, and fire management, result in carbon sequestration, while deforestation, logging, fire, and other human-induced and natural disturbances (e.g. wind, pests, and disease) release carbon emissions into the atmosphere.

Carbon is also stored outside of the forest in wood products. The positive effect on emissions of using wood rather than other materials is not part of the scope of the ES Procedure.

9.1 SELECTING CARBON IMPACT(S)

Question	If answer is 'yes', consider ES impact:
Are there any forest areas that you protect for their high stocks of forest carbon?	ES2.1
Have you converted any forest areas from production forest to conservation forest?	ES2.1
Have any HCV 4 (critical ecosystem services) areas been identified in the management unit (MU) based on forest carbon stocks?	ES2.2
Are you specifically aiming to increase forest carbon stocks by extending rotation age?	ES2.4
Are you adopting reduced-impact logging practices (reduced road width, directional felling, etc.)?	ES2.5
Can you modify management activities to reduce losses of forest carbon?	ES2.5
Are you restoring the forest, either through assisted natural regeneration or planting trees in the MU?	ES2.3
Are you implementing forest management techniques to improve resilience against pests, diseases, or fires?	ES2.5

9.2 MEETING CARBON-SPECIFIC REQUIREMENTS

The table below shows which additional requirements need to be met for each of the carbon impacts.

Table 9.1 Overview of additional requirements for carbon impacts

	Specify carbon pools, ensure credible comparison	Justify no leakage within MU*	Implement actions that promote carbon removals/ GHG reductions*	Calculate long-term average**	Demonstrate biodiversity impact
ES2.1	X	X			
ES2.2	X	X			X (ES1.5/ES1.6)
ES2.3	X	X			X (ES1.1)
ES2.4	X	X	X	X	
ES2.5	X	X	X	X	

* Guidance is provided in the NOTES in the ES PRO.
** See Section 3.1.3. 'A calculated counterfactual for guidance'.

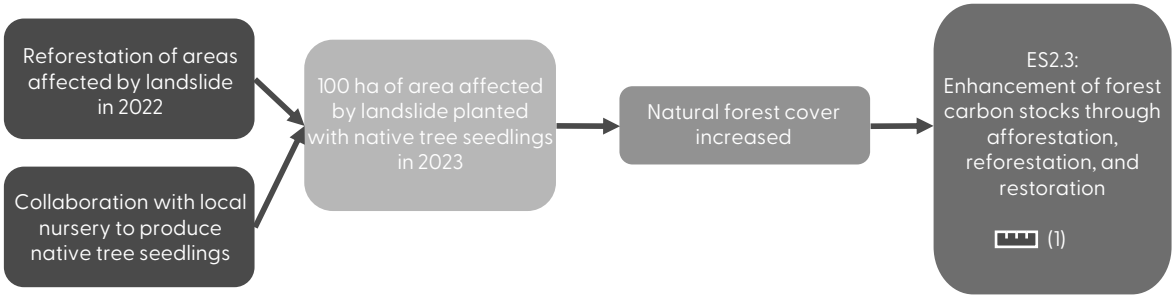
9.3 IDENTIFYING BENEFICIARIES

The ecosystem service related to carbon is important to the global community. These are assumed and do not need to be listed in the ESR.

9.4 EXAMPLE: THEORY OF CHANGE AND OUTCOME INDICATORS

See Module 2 for guidance on how to develop a theory of change.

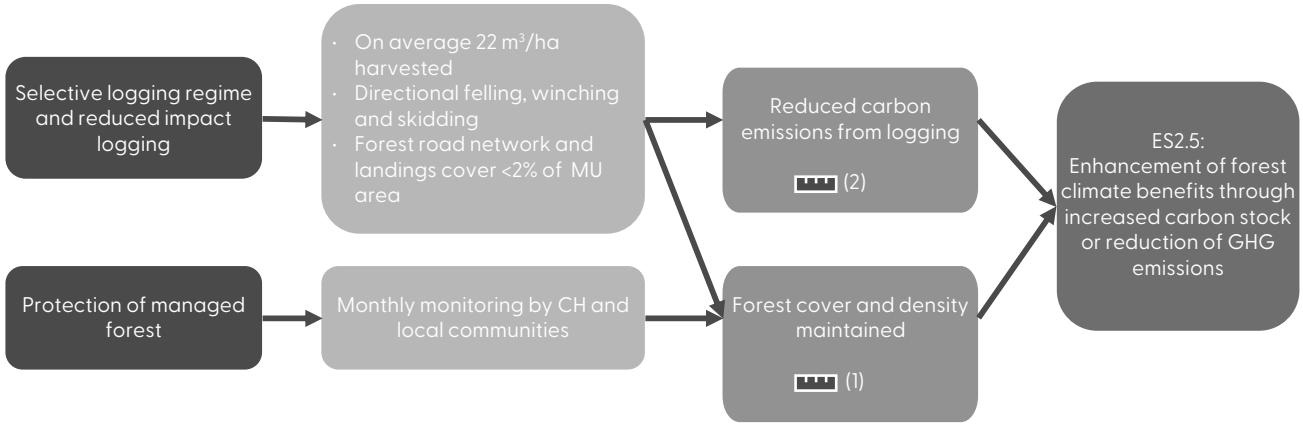
Example 1: restoration of natural forest by SLIMF (smallholders) in Viet Nam



1): Outcome indicator 1 = carbon stocks in the ES project area (tC/ha)

Example based on ESCD by Association of Quang Tri Smallholder Forest Certification Groups, Viet Nam, approved in January 2023.

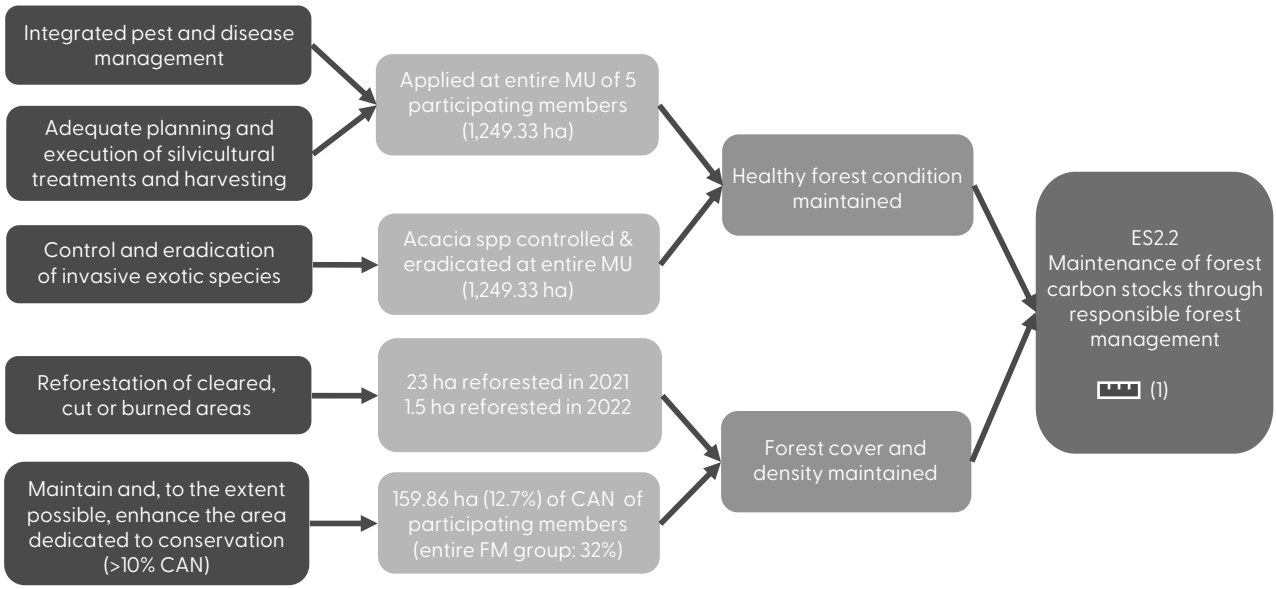
Example 2: reduced-impact logging in a natural tropical forest in Brazil



(1): Outcome indicator 1 = forest carbon stocks of managed forest (tC)
(2): Outcome indicator 2 = GHG emissions related to logging operations in managed forest

Example based on ESCD by Mil Madeiras, Brazil, approved in February 2022.

Example 3: sustainable forest management (group certificate) in Spain



(1): Outcome indicator 1 = Carbon stocks across the entire management unit (tC)

Example based on ESCD by Xunta de Galicia, Spain, approved in April 2023.

9.5 SUGGESTED MANAGEMENT ACTIVITIES

The table below gives an overview of suggested management activities to promote carbon storage in a forest.

Table 9.2 Management activities to maintain, enhance, or restore carbon storage in a forest

Reduced-impact logging	Suggested practices
Improved harvesting and forest management practices can reduce avoidable logging damage to residual forest, soil, and critical ecosystem processes. Compared with conventional logging, fewer trees are damaged or die and more carbon remains in the living forest. Furthermore, regeneration capacity remains and opened canopies accumulate carbon at a relatively quick rate (Tyrrell et al., 2009). This practice is applicable to selective logging only.	• Planning and constructing infrastructure, road networks, skid trails, and drainage structures to reduce impacts on carbon stocks and carbon footprint • Pre-felling vine cutting • Using appropriate felling and bucking techniques (including directional felling, cutting stumps low to the ground to avoid waste, and optimal crosscutting of tree stems into logs to maximize the recovery of useful wood) • Retaining hollow trees • Increased utilization of felled trees • Winching logs to planned skid trails and logs not transported outside skid trails • Suspending logs above ground or minimizing impact on soil • Postharvest treatments
Conservation and restoration	**Suggested practices**
Conserving existing forests and restoring degraded forest are other examples of key activities to maintain and enhance forest carbon.	• Establishing some areas as protected forests • Restoring degraded forests
Change of rotational length	**Suggested practices**
Extending rotation age provides carbon benefits in the MU by increasing carbon density per hectare.	• Extending prescribed logging cycles or rotation length
Silvicultural treatments	**Suggested practices**
Various silvicultural treatments can be implemented and applied before and after logging operations to promote increased carbon storage. This class of treatments is particularly broad and should be adapted to local conditions.	• Selecting and managing species to increase and optimize carbon sequestration and storage • Maintaining or restoring the vertical diversity and age structure of stands, including the presence of large old trees • Implementing reproduction methods that increase forest structure, habitat diversity, and overall forest resilience (e.g. shelter wood and variations around structural classes and ages) • Thinning • Increasing carbon storage through afforestation/reforestation • Preventing the reduction of dead–live wood ratios in all size classes and species types (coniferous versus deciduous) or restoring the dead–live wood ratio of forest stands relative to natural condition • Keeping individual trees, patches of trees, and snags well distributed throughout harvest areas • Retaining individual trees and patches through several rotations
Drainage management	**Suggested practices**
To increase forest production, especially in peatlands and forest wetland areas, water levels in certain parts of the world have been artificially managed by creating ditches. This has led to changes in the hydrology and water quality of downstream waterways (Hasselquist et al., 2018). Peatlands are also important for carbon storage. Draining peatlands greatly increases the risk of fire with associated GHG emissions, and the previously wet soil generates emissions as it dries and decomposes (Page et al., 2002).	• Avoiding drainage in peatlands • Restoring/rewetting peatlands

Fertilizer management	Suggested practices
In many forest ecosystems, nitrogen is the limiting factor for tree growth. Thus, fertilization is a common practice to increase forest growth, and consequently forest carbon storage and sequestration rates. However, trade-offs exist with the production of fertilizers that create GHG emissions due to fossil fuel use.	• Avoiding use of fertilizers as main means of enhancing, restoring, and maintaining carbon
Fire management	**Suggested practices**
Reducing the risk of fire is a good strategy to reduce overall carbon loss in the long term.	• Developing a fire management plan, including a fire detection and communication plan • Developing a fire awareness, preparedness, and education programme for workers and other relevant stakeholders that may be affected by fires • Implementing pre-fire season activities to reduce the risk of fire (e.g. infrastructure planning, fuel load removal, planned fires) • Restoring burnt areas

9.6 METHODOLOGIES

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
ES2.1	**Maintenance of forest carbon stocks through forest protection or conservation**	
Forest carbon stocks	Carbon stocks in the ES project area	ES2-A FSC Carbon Monitoring Tool ✓ ES2-B Participatory carbon monitoring ✓ ES2-C Verra's Verified Carbon Standard methodologies ES2-F Optical remote sensing for carbon
ES2.2	**Maintenance of forest carbon stocks through responsible forest management**	
Forest carbon stocks	Carbon stocks across the entire management unit	ES2-A FSC Carbon Monitoring Tool ✓ ES2-B B Participatory carbon monitoring ✓ ES2-F Optical remote sensing for carbon
ES2.3	**Enhancement of forest carbon stocks through afforestation, reforestation and restoration**	
Forest carbon stocks	Carbon stocks in the ES project area	ES2-A FSC Carbon Monitoring Tool ✓ ES2-B Participatory carbon monitoring ✓ ES2-C Verra's Verified Carbon Standard methodologies ES2-D Gold Standard's Afforestation and Reforestation methodology ES2-E Plan Vivo Carbon Standard methodologies ✓ ES2-F Optical remote sensing for carbon
ES2.4	**Enhancement of forest carbon removals through responsible forest management**	
Forest carbon stocks	Carbon stocks in the ES project area	ES2-C Verra's Verified Carbon Standard methodologies ES2-D Gold Standard's Afforestation and Reforestation methodology ES2-E Plan Vivo Carbon Standard methodologies ✓ ES2-F Optical remote sensing for carbon
GHG emissions	GHG emissions related to forestry operations	
ES2.5	**Enhancement of forest climate benefits through increased carbon stock or reduction of GHG emissions**	
Forest carbon stocks	Carbon stocks in the ES project area	ES2-C Verra's Verified Carbon Standard methodologies ES2-D Gold Standard's Afforestation and Reforestation methodology ES2-E Plan Vivo Carbon Standard methodologies ✓ ES2-F Optical remote sensing for carbon
GHG emissions	GHG emissions related to forestry operations in the ES project area	

MODULE 10: WATER SERVICES

Forests influence the hydrological (water) cycle in a variety of ways, so the linkages between forest management and water ecosystem services are myriad. Forest root networks affect soil structure, **increasing water uptake, storage, and filtration**, and preventing (or reducing) surface water run-off. Forests also stabilize soil, **reducing erosion and run-off** into water bodies, especially on steep slopes, which often benefits downstream water users. Forests 'consume' more water than most other vegetation types (through higher evapotranspiration). Consequently, some forests may reduce run-off via rivers and/or groundwater (or aquifer) recharge. However, in cloud forests, trees also capture water by intercepting mist, clouds, and condensation. The **'thirstiness' of a forest varies** considerably across forest types, depending on elements including the dominant tree species (coniferous or broadleaved), forest age, and climatic conditions. Finally, forests **influence the microclimate** by affecting local rainfall patterns, and probably also the climate on a larger scale in regions such as the Amazon and the Congo Basin (Wunder and Thorsen, 2014).

On balance, forests have a positive impact on water quality (reduced soil erosion leads to clearer water, and water filtration through forest soil reduces pollutants and nutrients) and water quantity variability (by reducing surface run-off and lessening the frequency and effects of floods and avalanches).

Water services may be closely linked to soil conservation (erosion), biodiversity (wetlands and other water bodies are rich habitats and vital drinking sources), and recreational services (e.g. scenic beauty, swimming, and fishing).

10.1 WATER ASSESSMENT

When demonstrating a water impact, you are required to undertake an assessment to identify areas of water stress, water scarcity, and flooding within your MU.

Link ES PRO: Clauses 18.1

To identify these areas, you could use World Resources Institute's aqueduct water risk atlas. Under the category of 'physical risks quantity', you can select:

- 'water stress'
- 'riverine flood risk'
- 'coastal flood risk'.

Another tool you could use is WWF's water risk filter.

While water impacts can be demonstrated for any area in the MU, it would be most impactful to develop an ES project in areas of water stress. It is **best practice** to take the results of the water assessment into consideration when developing the ES project and selecting the outcome indicators.

10.2 SELECTING WATER SERVICES IMPACT(S)

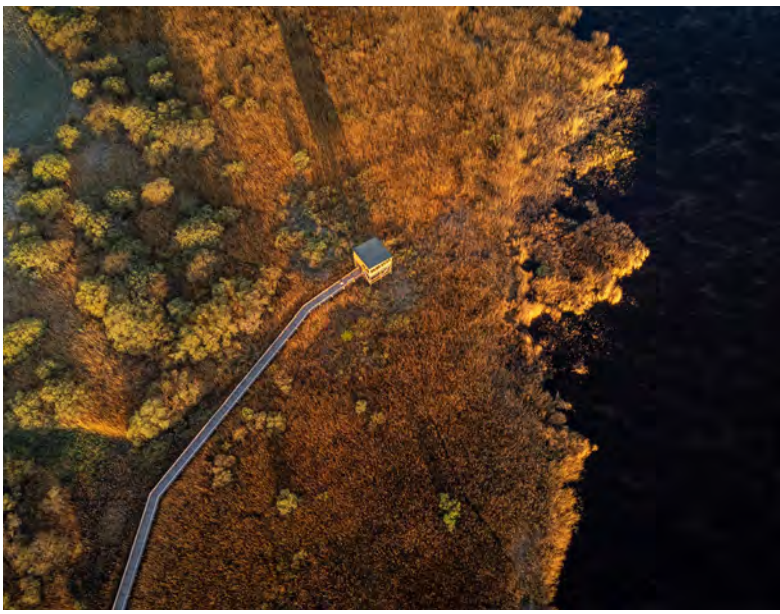
Question	If answer is 'yes', consider ES impact:
Is the forest located in an area of high water risk?	ES3.3/ES3.4
Does the management unit (MU) have an important role in providing water services in the watershed?	ES3.1/ES3.2 ES3.3/ES3.4
Are there any wetlands and/or peatlands present in the MU?	ES3.3/ES3.4
Have HCV 4 (critical ecosystem services) areas been identified in the MU based on critical water services provided by the forest?	ES3.1/ES3.2
Are any water bodies present within or adjacent to the MU?	ES3.1/ES3.2
Do local/regional people or cities downstream use the water bodies for drinking water, household purposes, recreation, and/or irrigation of crops?	ES3.1/ES3.2
Is groundwater used in the MU area?	ES3.1/ES3.2 ES3.3/ES3.4
Are there steep slopes in the MU and/or areas prone to surface water run-off and erosion?	ES3.3/ES3.4
Has there ever been any flooding? Are there recurrent (or seasonal) flooding events that can be attributed to poor land management?	ES3.3/ES3.4
Is the watershed in a relatively intact and good forest condition relative to adjacent areas?	ES3.3/ES3.4
Are you specifically aiming for and implementing management activities to maintain and/or enhance water services (e.g. retaining canopy cover, thereby regulating evaporation and sustaining water retention; removing species consuming large amounts of water; forest thinning in overgrown areas to improve water availability; designing forest roads to prevent water channelling and erosion)?	ES3.1/ES3.2 ES3.3/ES3.4
Can you restore degraded areas of the MU that have a direct impact on the regulation of water quality or flow?	ES3.2 ES3.4

Although the impact of a large forest area is more prominent at the watershed level, water impacts can be demonstrated for MUs of any size.

10.3 IDENTIFYING BENEFICIARIES

To identify beneficiaries, you can consider the following questions:

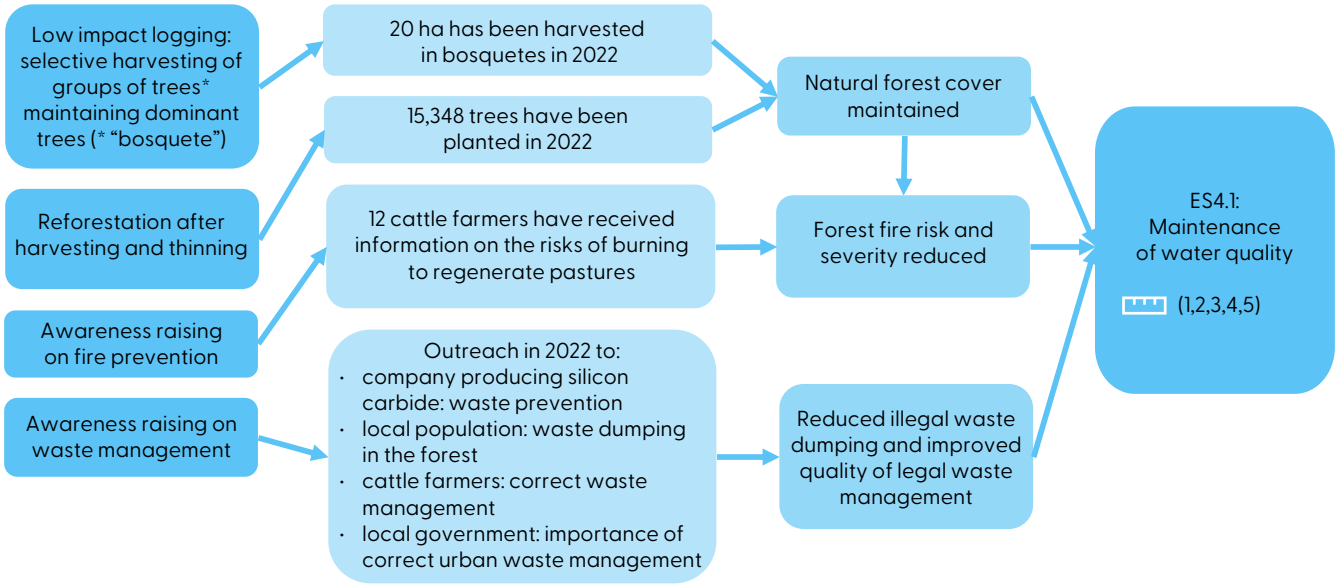
- Are there nearby and/or downstream communities that use the water supplied by water bodies within the forest?
- Does wildlife or livestock use water bodies within the forest as an important source of drinking water, either all year round or in specific seasons?
- Are there farmers downstream who use the water to irrigate agricultural fields?
- Is there a downstream hydropower plant, beer brewery, canoe rental, or other company that uses the water as a main input in its production process or services?
- Are there any houses, villages, towns, or cities that would be at an increased risk of flooding (or avalanches) without the forest, or if the forest was not managed specifically to reduce risk?



10.4 EXAMPLE: THEORY OF CHANGE AND OUTCOME INDICATORS

See Module 2 for guidance on how to develop a theory of change.

Example 1



(1): Outcome indicator 1 = pH
(2): Outcome indicator 2 = turbidity
(3): Outcome indicator 3 = silica
(4): Outcome indicator 4 = nitrogen and phosphorous concentration
(5): Outcome indicator 5 = pathogen levels (*E.coli*)

Example based on ESCD by Mancomunidad de Montes Particulares de Cañizares, Spain, approved in June 2023.

10.5 METHODOLOGIES

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
ES3.1	**Maintenance of water quality**	
ES3.2	**Enhancement of water quality**	
Water quality	Water turbidity	ES3-A TESSA Water method 5A: measuring the contribution of a wetland site to water quality ✓ ES3-B Remote sensing for water quality
	Water temperature	ES3-A TESSA Water method 5A: measuring the contribution of a wetland site to water quality ✓ ES3-B Remote sensing for water quality
	Dissolved oxygen	ES3-A TESSA Water method 5A: measuring the contribution of a wetland site to water quality ✓
	Water pH	ES3-A TESSA Water method 5A: measuring the contribution of a wetland site to water quality ✓
	Bio-indicators of stream health (macro-invertebrates, fish)	ES3-D Stream Visual Assessment Protocol ✓
	Pathogens (bacteria, e.g. E. coli; viruses) in water	ES3-A TESSA Water method 5A: measuring the contribution of a wetland site to water quality ✓

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
	Nutrients (phosphorous, nitrogen) in water	ES3-A TESSA Water method 5A: measuring the contribution of a wetland site to water quality ✓
	Total suspended solids	ES3-B Remote sensing for water quality
	Level of sedimentation/ water sediment load (grams per litre)	ES3-A TESSA Water method 5A: measuring the contribution of a wetland site to water quality ✓ ES3-B Remote sensing for water quality
	Organic pollution: biochemical oxygen demand (BOD) and/or chemical oxygen demand (COD)	ES3-A TESSA Water method 5A: measuring the contribution of a wetland site to water quality ✓
	Level of metal contamination	ES3-A TESSA Water method 5A: measuring the contribution of a wetland site to water quality ✓
ES3.3	**Maintenance of water volume regulation**	
ES3.4	**Enhancement of water volume regulation**	
Native forest cover and density	Natural forest cover for the management unit overlapping with the relevant watershed	ES1-A Satellite imagery and GIS
	Native forest density	ES1-J Index for Biodiversity Potential ✓
	Proportion of forest that is degraded over total forest area	ES1-A Satellite imagery and GIS
Watershed condition	Percentage of natural wetlands remaining	ES1-A Satellite imagery and GIS
	Percentage of forest cover in the relevant watershed in undisturbed condition	ES1-A Satellite imagery and GIS
	Percentage of forest that is degraded over total forest area	ES1-A Satellite imagery and GIS
	Percentage of waterbody shoreline with forest cover	ES3-D Stream Visual Assessment Protocol ✓
	Percentage of undisturbed water sources	ES1-A Satellite imagery and GIS
Volume of water regulated	Volume of infiltration and groundwater recharge	ES3-C Soil and Water Assessment Tool
	Volume of runoff avoided or reduced	ES3-C Soil and Water Assessment Protocol
	Peak discharge reduction	
	Water flow	
	Level of flood protection	

MODULE 11: SOIL CONSERVATION

Healthy soil is vital for plant growth and thus forms the basis for terrestrial life on Earth. A forest's root network keeps the soil in place and therefore protects and conserves it by **preventing erosion**. The forest vegetation intercepts rain, reducing the physical impact on the forest floor and conserving the topsoil. Decomposing dead leaves, litter, and deadwood **increase soil organic matter**, which is essential material for soil formation. Meanwhile, certain **forestry activities**, especially constructing roads and using heavy machinery, adversely affect the soil.

There is a close link between soil conservation and water services, as described above. Soil is also a (potentially) biodiverse habitat. As outlined in Module 9, soil may store significant amounts of carbon. Finally, recreational activities and developing infrastructure can adversely affect soil health through the effects of soil sealing, soil compaction, and soil erosion.

11.1 SOIL ASSESSMENT

When demonstrating any soil impact, you are required to identify vulnerable or high-risk soil within the MU, including thin soil; soil with poor drainage and subject to waterlogging; and soil prone to compaction, erosion, instability, and run-off.

Link ES PRO: Clauses 19.1

To do this, you can use existing information on soil that is available for your MU, such as soil maps or assessments (e.g. by local authorities or soil institutes). Additionally, you could use the Visual Soil Assessment methodology (ES4-F).

While soil impacts can be demonstrated for any area in the MU, it would be most impactful to do it in areas of vulnerable or high-risk soil within the MU. It is best practice to take the results of the soil assessment into consideration when developing the ES project and selecting the outcome indicators.

11.2 SELECTING SOIL IMPACT(S)

Question	If answer is 'yes', consider ES impact:
Have HCV 4 (critical ecosystem services) areas been identified in the management unit (MU) based on soil services provided by the forest?	ES4.3/ES4.4
Are there steep slopes in the MU and/or areas prone to soil erosion and/or landslides?	ES4.3/ES4.4
Is there any vulnerable soil present within the MU?	ES4.3/ES4.4
Are reduced-impact logging techniques practised in the planning and construction of roads and/or in harvesting techniques?	ES4.1/ES4.2
Are there any no-logging zones in the MU established to protect soil?	ES4.3/ES4.4
Is there a risk of soil compaction and are there measures in place to prevent this?	ES4.1/ES4.2
Do you specifically aim to conserve and/or restore soil?	ES4.1/ES4.2 ES4.3/ES4.4
Can you restore degraded soil in the MU?	ES4.3/ES4.4

11.3 IDENTIFYING BENEFICIARIES

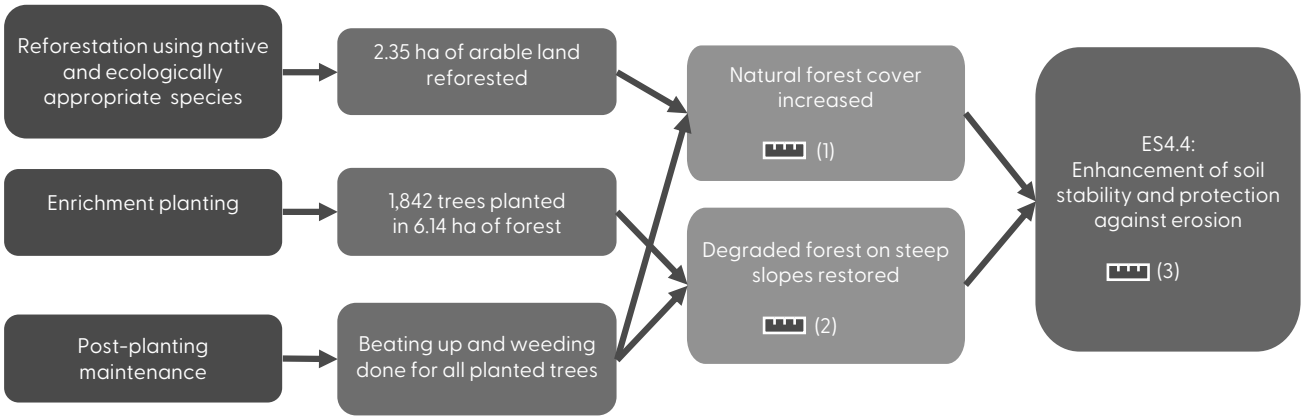
To identify beneficiaries, you can consider the following questions:

- Are there any farmers adjacent to the forest area?
- Are there any sites where sediment deposition occurs after soil erosion incidents, resulting in cleaning efforts and/or costs for companies and/or individuals, for example to downstream hydropower plants?
- Are there any houses, villages, towns, or cities that would be at an increased risk of landslides or mudflows without the forest, or if it was not managed specifically to reduce risk?

11.4 EXAMPLE: THEORY OF CHANGE AND OUTCOME INDICATORS

See Module 2 for guidance on how to develop a theory of change.

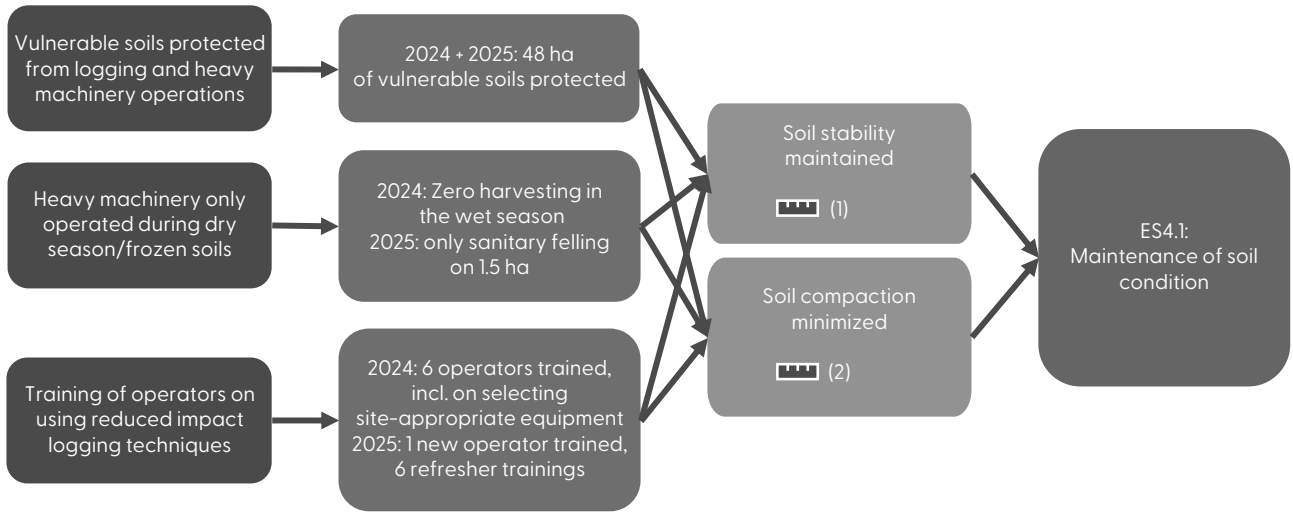
Example 1



(1): Outcome indicator 1 = Area of natural forest cover resulting from afforestation/ reforestation (ha)
(2): Outcome indicator 2 = Area of protective forest cover on steep slopes (ha)
(3): Outcome indicator 3 = Erosion rate (tons/ha/year)

Example adapted from ESCD by Etifor forest management group, FMU Bosco Limite, Italy approved in January 2023.

Example 2



(1): Outcome indicator 1 = Soil stability
(2): Outcome indicator 2 = Degree of soil compaction in operated areas (roads and harvest areas)

11.5 METHODOLOGIES

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
ES4.1	**Maintenance of soil condition**	
ES4.2	**Enhancement of soil condition**	
Soil properties and quality	Soil depth	ES4-F Visual Soil Assessment ✓
	Soil (aggregate) stability	
	Thickness of layer of soil organic matter	
	Organic matter content (%)	
	Soil pH	ES4-B Soil testing kits ✓
	Nutrient (e.g. nitrogen, phosphorous, potassium) content of soil	ES4-B Soil testing kits ✓
	Salt concentration in the soil	ES4-B Soil testing kits ✓
	Soil humidity/ moisture	ES4-C Soil sensors and tools
	Soil macro-fauna abundance	ES4-F Visual Soil Assessment ✓
Soil condition	Extent of land with forest canopy or ground vegetation	ES4-A Line-point transect forest cover and erosion assessment method ✓
	Percentage of forest cover in undisturbed condition	ES1-A Satellite imagery and GIS
	Proportion of forest that is degraded over total forest area	ES4-D United Nations Convention to Combat Desertification's (UNCCD's) computation of Land Degradation Neutrality
	Percentage of damaged soil	

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
ES4.1	**Maintenance of soil condition**	
ES4.2	**Enhancement of soil condition**	
Soil condition	Degree of soil compaction in operated areas	ES4-E Soil penetrometer
	(roads and harvest areas)	ES4-C Soil sensors and tools
	Water infiltration rate	ES3-C Soil and Water Assessment Tool
	Incidence of landslides	ES5-E Key informant interview
	Productivity (forest and agricultural) per unit area	ES4-D UNCCD's computation of Land Degradation Neutrality
ES4.3	**Maintenance of soil stability and protection against soil erosion**	
ES4.4	**Enhancement of soil stability and protection against soil erosion**	
Forest cover on vulnerable or high- risk areas	Protective forest cover on steep slopes	ES1-A Satellite imagery and GIS
	Protective forest cover for wetlands and/ or coastal areas	ES1-A Satellite imagery and GIS
	Natural forest cover on vulnerable areas	ES1-A Satellite imagery and GIS
	Degraded forest area as a proportion of total forest area	ES4-D UNCCD's computation of Land Degradation Neutrality
Soil erosion	Area affected by wind and/or water erosion	ES4-A Line-point transect forest cover and erosion assessment method ✓ ES4-F Visual Soil Assessment ✓
	Amount of erosion (cubic meters, area affected)	
	Soil erosion and sedimentation levels	
	Time spent on removal of sediment	ES5-E Key informant interview ✓
	Costs of removal of sediment	ES5-E Key informant interview ✓
	Impacts of sediment deposited by wind and/or water erosion on nearby land or water bodies	ES5-E Key informant interview ✓
	Percentage of households within local communities affected by landslide	ES5-E Key informant interview ✓ ES5-C Household questionnaires ✓
Successful reforestation/ restoration activities	Area of natural forest cover resulting from afforestation/ reforestation	ES1-A Satellite imagery and GIS
	Restored forest area as a proportion of total forest area	*Simple measurement or calculation*

MODULE 12: RECREATIONAL SERVICES

Forests are popular for recreational activities and tourism (e.g. dog walking, sports, trekking, and watching wildlife). Forest-based recreation reduces stress and enhances psychological and physiological **health and well-being**. The availability and quality of forest infrastructure (e.g. trails, campgrounds), how natural the forest is, and how intensively it is managed affect a forest's attractiveness for recreation (Tyrväinen, 2014).

12.1 MEETING RECREATION REQUIREMENTS

Link ES PRO: Clause 20.1

When demonstrating any recreational services impacts, you need to implement practices to protect the health and safety of visitors – for example, ensuring trails are safe by regularly monitoring and repairing rails/platforms, etc. if needed, felling trees at risk of falling in visitor accessible areas, keeping a first aid kit on site, monitoring water quality for recreational use, etc.

You also need to implement practices to protect wildlife from being disturbed by recreational or tourist activities – for example, seasonal closing off of nesting/breeding areas, requiring dogs to be on a leash, ensuring proper waste management, etc.

Link ES PRO: Clause 20.2

12.2 SELECTING RECREATIONAL SERVICES IMPACT(S)

Question	If answer is 'yes', consider ES impact:
Is there any infrastructure for tourism/recreation in the management unit (MU) (e.g. walking trails, benches, litter bins, watchtowers, signposts)?	ES5.1
Can you restore degraded attractions, trails, or other recreational infrastructure?	ES5.2
Does the forest attract visitors engaging in activities like kayaking, trekking, cycling, horseback riding, or forest bathing?	ES5.1/ES5.2
Does the forest have sites or offer tours for birdwatching, observing mammals (e.g. safari) or insects (e.g. butterflies), recreational fishing, or enjoying specific plants, flowers, or tree species?	ES5.3/ES5.4

12.3 IDENTIFYING BENEFICIARIES

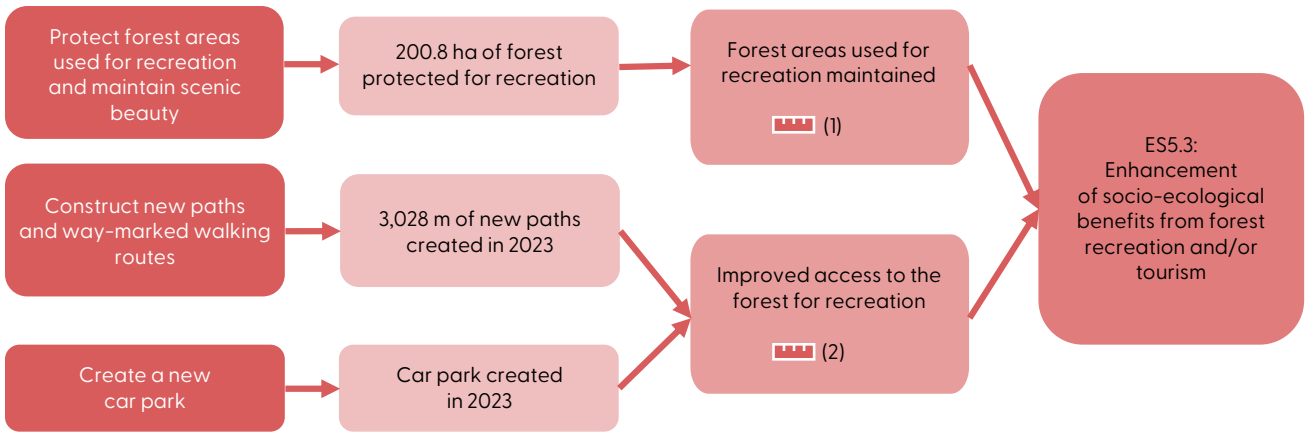
To identify beneficiaries, you can consider the following questions:

- Who are the users of the recreational services?
- Are there any companies offering goods and services to visitors (e.g. tour operators, cafés/ restaurants, visitor centres and shop, bike/canoe rentals)?
- Are there any individuals/villagers or communities offering lodging, meals, or other services to visitors?

12.4 EXAMPLE: THEORY OF CHANGE AND OUTCOME INDICATORS

See Module 2 for guidance on how to develop a theory of change.

Example 1



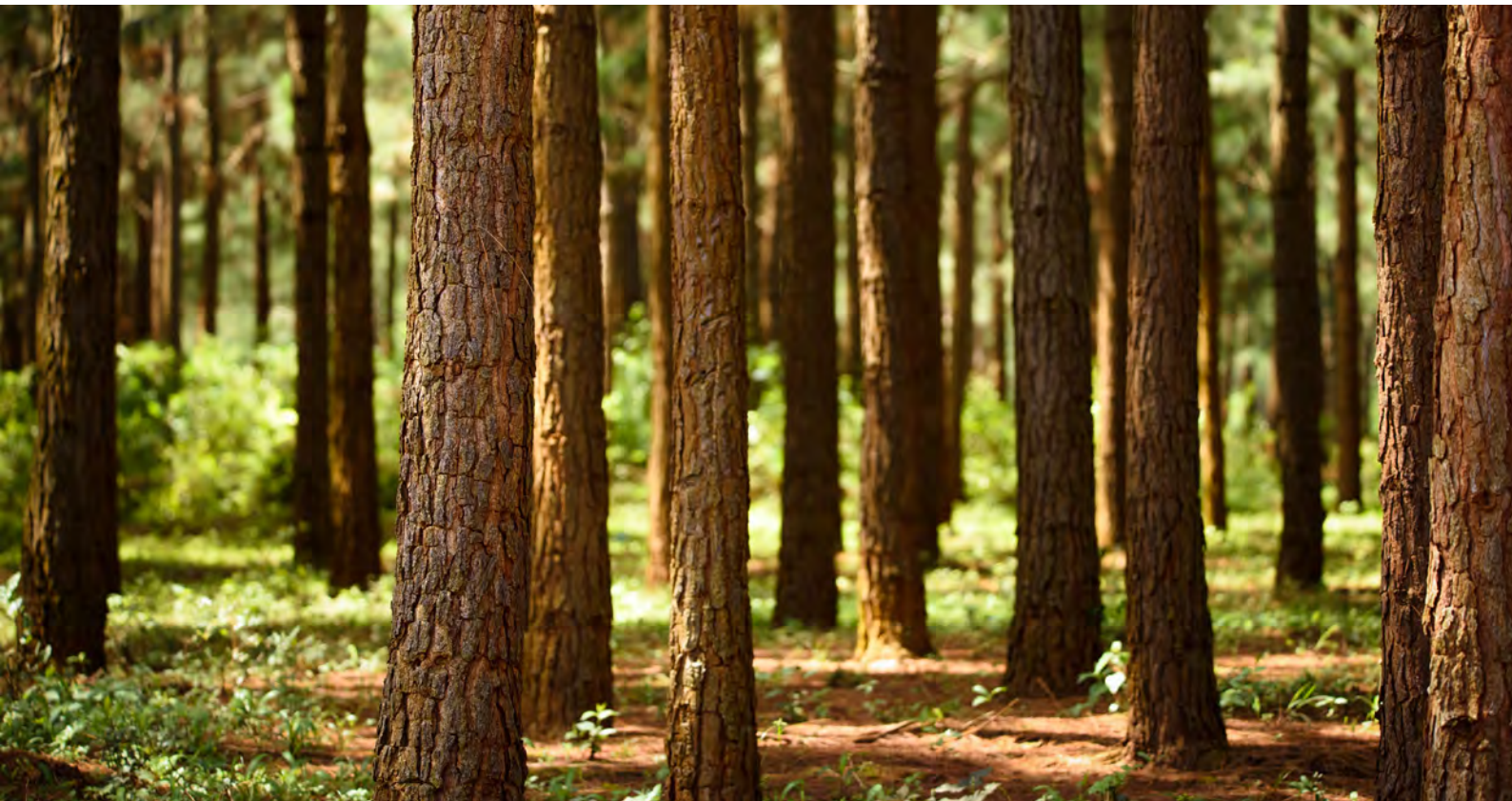
(1): Outcome indicator 1 = Area protected and used for nature-based recreation (ha)
(2): Outcome indicator 2 = Km of hiking trails with adequate accessibility

Example based on ESCD by Ardura Community Forest, Scotland, approved in July 2023.

12.5 METHODOLOGIES

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
ES5.1	**Maintenance of social-ecological benefits from forest recreation and/or tourism**	
ES5.2	**Enhancement of social-ecological benefits from forest recreation and/or tourism**	
Extent of areas protected and used for nature-based recreation	Area protected and used for nature- based recreation (e.g. forest bathing)	*Simple measurement or calculation*
	Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas and used as recreational, by ecosystem type	*Simple measurement or calculation*
	Coverage by protected areas of important sites for biodiversity conservation used for tourism visitation	*Simple measurement or calculation*
Facilities and services for visitors	Km of hiking trails with adequate accessibility	*Simple measurement or calculation*
	Coverage of interpretation panels	*Simple measurement or calculation*
	Sheltering/resting facilities for visitors	*Simple measurement or calculation*
	Adequacy of waste management processes	*Simple measurement or calculation*
	Trail signage and surface markings	*Simple measurement or calculation*
Visitor experience	Level of visitor satisfaction, feedback or reactions	ES5-A TESSA Recreation method 1: Census for estimating number of sites visits ✓ ES5-B Visitor questionnaires ✓
	Number of recurring visits per recreational experience	ES5-B Visitor questionnaires ✓

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
Benefits for local communities, Indigenous Peoples and/or traditional peoples from nature-based tourism	Level of wellbeing of local communities, Indigenous Peoples and/or traditional peoples (considering factors like health, education, income, housing infrastructure, etc.)	ES5-C Household survey ✓ ES5-D Focus group discussion ✓
	Number of new employments generated by recreational activities	ES5-D Focus group discussion ✓ ES5-E Key informant interview ✓
	Number of people/households involved in recreational activities	ES5-D Focus group discussion ✓ ES5-E Key informant interview ✓
	Level of income generated by recreational activities	ES5-C Household survey ✓
	Improvement of social needs (e.g. healthcare, education, food security) generated by recreational activities	ES5-D Focus group discussion ✓
ES5.3	**Maintenance of populations of species of interest for nature-based tourism**	
ES5.4	**Enhancement of populations of species of interest for nature-based tourism**	
For selected species of interest, indicators of population abundance	Abundance of selected species of recreational interest	ES1-G Fauna species survey techniques ES1-H Camera trap surveys ES1-I Acoustic monitoring
	Number of charismatic species sightings (e.g. when birdwatching)	ES5-B Visitor questionnaires ✓
Evidence that the habitat is in suitable condition	Area of habitat of selected species protected	*Simple measurement or calculation*
	Suitability of habitat for selected species	ES1-K Forest Integrity Assessment Tool ✓
	Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type	*Simple measurement or calculation*



MODULE 13: CULTURAL PRACTICES AND VALUES

Indigenous Peoples and traditional peoples often feel a strong connection between the forest and/or landscape of their territory and their culture and identity. The **cultural and spiritual significance of nature** is deeply embedded in the practices and beliefs of Indigenous Peoples and traditional peoples. Characterized by a **holistic view of interconnectedness** of species and elements in an ecosystem, the cultural practices and values of Indigenous Peoples and traditional peoples guide how they **steward and conserve their territories**, while the ecosystem (forest) itself provides the socio-environmental space for maintaining and enhancing these cultural practices and values. The mutual benefits of Indigenous and traditional communities living in harmony with nature also encompass the communities' self-determination, health, and well-being.

Indigenous Peoples and traditional peoples believe that preserving their language and cultural practices is vital for maintaining their communities, conserving forests, and ensuring younger generations **stay connected to their cultural values**. It is important to emphasize that while their positive impact on forests can be demonstrated, Indigenous Peoples, traditional peoples, and their cultures have an intrinsic value that goes beyond how their cultural practices and values relate to forest conservation (Matta, 2024).

When demonstrating the positive impact on (and of) cultural practices and values, Indigenous Peoples and/or traditional peoples must have a **(co-)leading role** in recognizing and identifying cultural knowledge and practices related to the forest (cf. Clause 21.1 ES Procedure), to be respectful and ensure their self-determination and decision-making power. For ES impacts on cultural practices and values, it is particularly important to implement FPIC processes as referred to in Principles 3 and 4 of <FSC-STD-01-001 FSC Principles and Criteria for Forest Stewardship>. ES projects on cultural practices and values must be conducted with **deep respect and trust among project partners**, ensuring an open-minded approach to Indigenous and traditional culture. Finally, these projects require an ethical approach to monitoring and communication in relation to the ES project, including by recognizing any intellectual property rights that belong to Indigenous Peoples and traditional peoples.

13.1 SELECTING CULTURAL PRACTICES AND VALUES IMPACT(S)

Question	If answer is 'yes', consider ES impact:
Do you have HCV 6 areas in your management unit (MU)?	ES6.1/ES6.2
Does your MU contain or is it part of an Indigenous Cultural Landscape?	ES6.1/ES6.2
Are there plant or animal species in your MU that have a particular meaning to Indigenous Peoples or traditional peoples?	ES6.3/ES6.4
Do you have HCV 5 areas in your MU, related to plant or animal species?	ES6.3/ES6.4

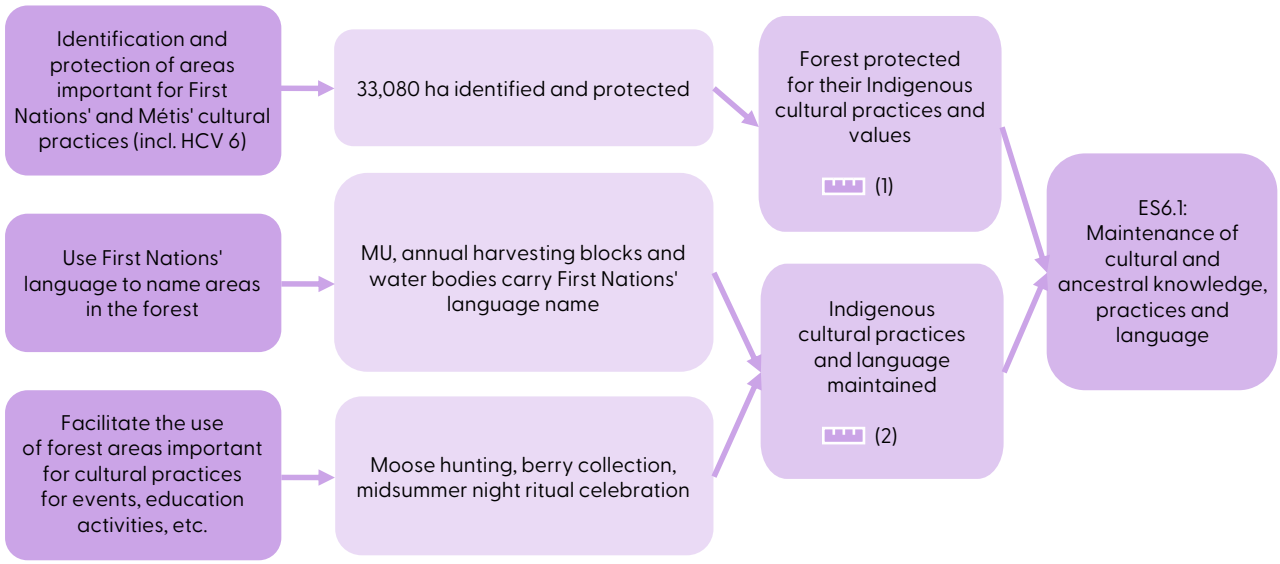
13.2 IDENTIFYING BENEFICIARIES

Besides the benefit to the Indigenous Peoples and/or traditional peoples, whose cultural value and practices are at the core of the demonstrated impact, maintaining and enhancing cultural practices and values holds intrinsic value for society as a whole.

13.3 EXAMPLES: THEORY OF CHANGE AND OUTCOME INDICATORS

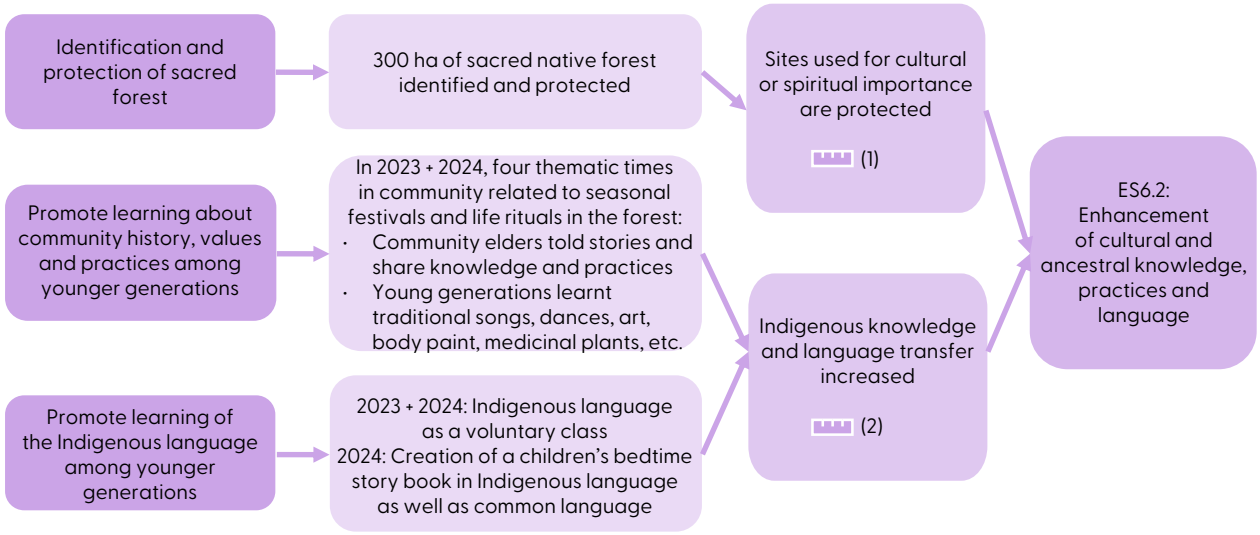
See Module 2 for guidance on how to develop a theory of change.

Example 1



(1): Outcome indicator 1 = carbon stocks in the ES project area (tC/ha)
(2): Outcome indicator 2 = Sense/Level of connection to the forest across generations.

Example 2



(1): Outcome indicator 1 = Sites used for cultural awareness, cultural exchange or cultural or spiritual importance that are protected
(2): Outcome indicator 2 = Transference of Indigenous or traditional knowledge and language intergenerationally.

13.4 METHODOLOGIES

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
ES6.1	**Maintenance of cultural and ancestral knowledge, practices and language**	
ES6.2	**Enhancement of cultural and ancestral knowledge, practices and language**	
Extent of protected areas or sites in the forest that are of importance for cultural practices	Indigenous land protected or area protected based on evidence as a result of cultural activities, cultural heritage, identity or sense-of-belonging	*Simple measurement or calculation*
	Sacred sites or sites nationally designated or recognized to possess high cultural value.	*Simple measurement or calculation*
	Area covered by Indigenous Cultural Landscape	*Simple measurement or calculation*
	Extent of sites of special intellectual, scientific, archaeological interest or used for educational activities	*Simple measurement or calculation*
	Sites used for cultural awareness, cultural exchange, or of cultural and spiritual importance that are protected	*Simple measurement or calculation*
Socio-cultural and environmental benefits resulting from their connection to the forest	Educational, training, capacity building or learning activities and materials developed to reveal cultural and historic significance of protected areas, and people engaged	ES5-C Household survey ✓ ES5-D Focus group discussion ✓ ES5-E Key informant interview ✓
	Events used for high spiritual, intergenerational, traditional or bequest significance conducted in the areas (e.g. storytelling, folklore, dance, songs or art ceremonies and initiatives)	ES6-A Questionnaire ✓
	Transference of Indigenous or traditional knowledge and languages intergenerationally (e.g. by recognising and using Indigenous terms for sites and practices)	ES6-A Questionnaire ✓ ES5-D Focus group discussion ✓
	Activities that recognize and enhance the contribution of Indigenous, traditional, cultural knowledge and practices to wellbeing and environmental conservation	ES6-A Questionnaire ✓
ES6.3	**Maintenance of culturally valued populations or species**	
ES6.4	**Enhancement of culturally valued populations or species**	
Culturally valued species or populations	Diversity of cultural, historical or iconic species or populations which are used as emblems or cultural signifiers of some kind	ES1-E Environmental DNA ES1-F Fauna species survey techniques ES1-G Camera trap surveys ES1-H Acoustic monitoring
	Richness of species deemed to have cultural, sacred or spiritual significance for people, including for Indigenous or traditional peoples' values and sense of belonging	ES1-E Environmental DNA ES1-F Fauna species survey techniques ES1-G Camera trap surveys ES1-H Acoustic monitoring
	Existence of endangered species which preservation is required for heritage or identity values or future generations	ES1-F Environmental DNA ES1-F Fauna species survey techniques ES1-G Camera trap surveys ES1-H Acoustic monitoring

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
ES6.3	**Maintenance of culturally valued populations or species**	
ES6.4	**Enhancement of culturally valued populations or species**	
Culturally valued species or populations	Species associated to spiritual, traditional or culturally relevant food, knowledge, therapeutic and medicinal activities	ES1-E Environmental DNA ES1-F Fauna species survey techniques ES1-G Camera trap surveys ES1-H Acoustic monitoring
	Species important to sustain livelihoods, subsistence and food sovereignty	ES1-E Environmental DNA ES1-F Fauna species survey techniques ES1-G Camera trap surveys ES1-H Acoustic monitoring
Habitats protected by traditional, Indigenous practices	Area of selected species protected by Indigenous and traditional cultural practices	*Simple measurement or calculation*
	Proportion of important sites for terrestrial and freshwater biodiversity that are under Indigenous or traditional sustainable management	*Simple measurement or calculation*
	Habitat protected from external pressures, using Indigenous and traditional knowledge (e.g. control of wildfires)	*Simple measurement or calculation*

MODULE 14: AIR QUALITY

Forests reduce air pollution, with trees' leaves absorbing gaseous pollutants and tree surfaces (e.g. waxy leaves) capturing particulate matter. These air quality services are particularly useful for **urban forests**.

The positive impact of a forest on air quality depends on factors like forest size, tree density, wind patterns, pollution levels, and local geography. Towns located within or very close to a forest (0–10 km) experience the most significant benefits, including higher oxygen levels, reduced particulate matter, and lower carbon dioxide concentrations. If a town is downwind of a large forest, it may experience cleaner air, even at greater distances. Conversely, urban emissions and industrial pollution can counteract the benefits if they are more dominant in the area.

Finally, forest fires result in poor air quality, with particulate matter ($PM_{2.5}$) specifically considered a public health concern (WHO, 2024). This means that **active management to prevent forest fires** maintains air quality (by preventing poor air quality).

14.1 SELECTING AIR QUALITY IMPACT(S)

Question	If answer is 'yes', consider ES impact:
Is the area known for forest fires occurring in unmanaged forests and are you implementing management activities to prevent forest fires?	ES7.1
Are you changing species composition, forest structure, or implementing other management activities in your forest to enhance the air quality?	ES7.2
Do you have bioindicator species of good air quality in your forest?	ES7.1/ES7.2

14.2 IDENTIFYING BENEFICIARIES

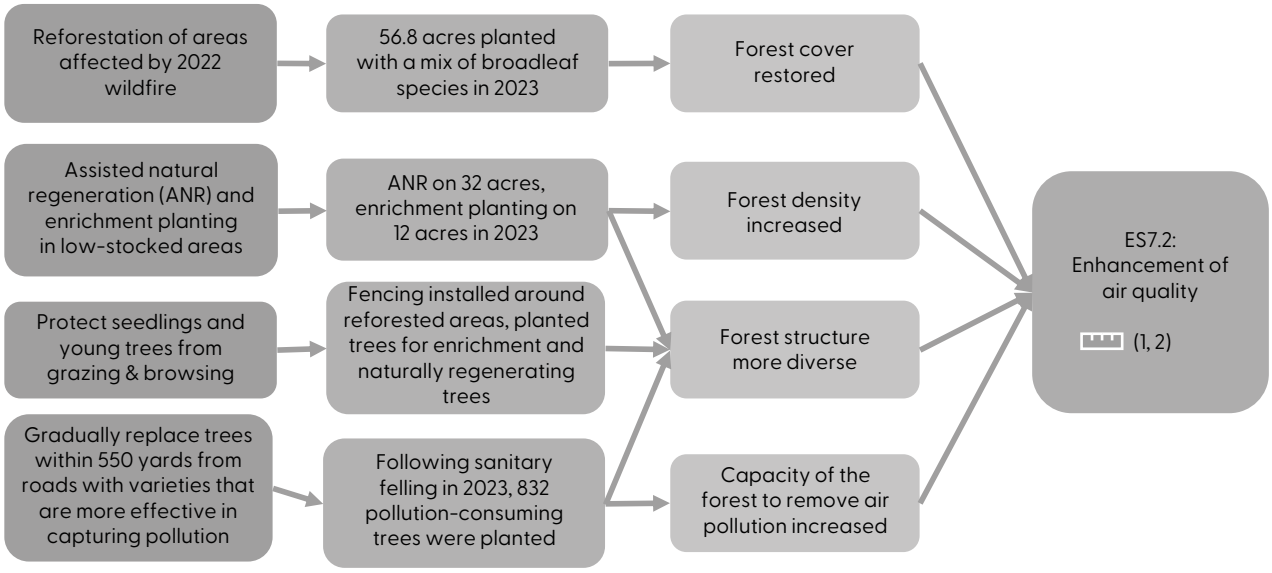
To identify beneficiaries, you can consider the following questions:

- Does a local town/city benefit from the air quality services your forest provides?
- Are there industries in the area negatively impacting air quality that rely on your forest to improve the local air quality?

14.3 EXAMPLE: THEORY OF CHANGE AND OUTCOME INDICATORS

See Module 2 for guidance on how to develop a theory of change.

Example 1



(1): Outcome indicator 1 = Critical loads of atmospheric deposition of nitrogen and sulphite
(2): Outcome indicator 2 = Leaf area index (LAI)

14.4 METHODOLOGIES

ES impact		
Outcome indicator type	**Example outcome indicator**	**Suggested methodologies**
ES7.1	**Maintenance of air quality**	
ES7.2	**Enhancement of air quality**	
Air quality	Critical loads of atmospheric deposition of nitrogen and/or sulphite	ES7-C i-Tree tools ES7-B Deploying sensors in the forest
	Concentration of NO_2 and/or O_3	ES7-A Remote sensing for air quality ES7-B Deploying sensors in the forest
	$PM_{2.5}$ or PM_{10}	ES7-C i-Tree tools ES7-A Remote sensing for air quality
	Bio-indicators of air quality such as lichens, mosses	ES7-D Surveying bioindicators
Forest structure	Leaf area index (LAI)	ES1-A Satellite imagery and GIS ES1-B LiDAR
	Forest vertical and/or horizontal structure	ES1-B LiDAR
	Forest structural condition index	

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LIST OF ABBREVIATIONS

CFM	Controlled Forest Management
ES	ecosystem service(s)
ESCD	Ecosystem Services Certification Document
ESR	Ecosystem Services Report
FM	forest management
FPIC	Free, Prior, and Informed Consent
FSC	Forest Stewardship Council
GHG	greenhouse gas
GIS	Geographic Information System
ha	hectare
HCV	High Conservation Value
IFL	intact forest landscape
MU	management unit
NGO	non-governmental organization
PM	particulate matter
SLIMF	small and low-intensity managed forest(s)
SVAP	Stream Visual Assessment Protocol
UNCCD	United Nations Convention to Combat Desertification

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