ICAT | INITIATIVE FOR Climate Action Transparency

# FOREST METHODOLOGY

*Assessing the greenhouse gas impacts of forest policies*

ICAT SERIES OF
**ASSESSMENT GUIDES**

ghg management institute

VERRA Standards for a Sustainable Future

UNOPS



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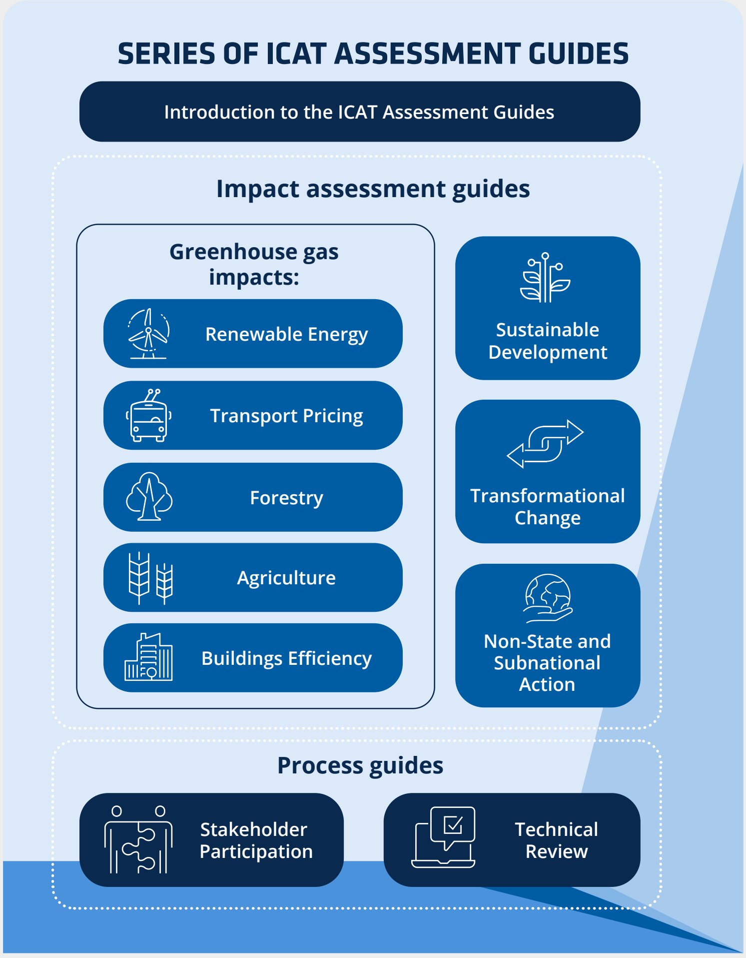
## How to use the Assessment Guides

This guide is part of a series developed by the Initiative for Climate Action Transparency (ICAT) to help countries assess the impacts of policies and actions. It is intended to be used in combination with other ICAT assessment guides and can be used in conjunction with other guidance.



# Contents

# PART I

## Introduction, objectives, key steps and overview of forest policies

# 1 Introduction

*Agriculture, forestry and other land use account for approximately 25% of global greenhouse gas (GHG) emissions. Forestry sector emissions predominantly come from deforestation. A fundamental transformation is needed if the sector is to play its part in the transition to net zero global GHG emissions in the second half of the 21st century. Activities such as afforestation, sustainable forest management and reducing deforestation are often low-cost mitigation options, and can play an important role in reducing GHG emissions and enhancing carbon stocks. They can also be considered win–win activities because of the multitude of environmental, social and economic benefits they bring, including supporting a country or region in its adaptation efforts.*

*In this context, there is an increasing need to assess and communicate the impacts of forest policies to ensure that they are effective in mitigating GHG emissions, and helping countries meet their sectoral targets and national commitments. The Initiative for Climate Action Transparency (ICAT)* Forest Methodology *helps policymakers assess the impacts of forest policies and improve the effectiveness of policies. It can play a critical role in providing the information needed for preparing reports under the Paris Agreement's enhanced transparency framework and for the United Nations Sustainable Development Goals (SDGs).*

## 1.1 Purpose of the methodology

This document provides methodological guidance for assessing the GHG impacts of forest policies that increase carbon sequestration and reduce GHG emissions by enabling or incentivizing:

- afforestation and reforestation
- sustainable forest management
- reduced deforestation and/or degradation activities.

This methodology is part of the series of ICAT guides for assessing the impacts of policies and actions. It is intended to be used in combination with any other ICAT documents that users choose to apply. The series of assessment guides is intended to enable users who choose to assess GHG impacts, sustainable development impacts and transformational impacts of a policy to do so in an integrated and consistent way within a single impact assessment process. Refer to the *Introduction to the ICAT Assessment Guides*[1] for more information about the ICAT assessment guides and how to apply them in combination.[2]

## 1.2 Relationship to other guidance and resources

This methodology uses and builds on existing resources mentioned throughout the document. These include volume 4 of the Intergovernmental Panel on Climate Change (IPPC) *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC 2006 GL) – *Agriculture, Forestry and Other Land Use*.[3]

The methodology builds upon the Greenhouse Gas Protocol *Policy and Action Standard* (© WRI 2014; all rights reserved) (which provides guidance on estimating the GHG impacts of policies and actions, and discusses many of the accounting concepts in this document, such as baseline and policy scenarios), to provide a detailed method for forest policies.[4] The methodology adapts the structure, and some of the tables, figures and text from the *Policy and Action Standard*, where relevant. Chapters 1, 2, 4, 5, 6, 10 and 11, and the glossary include elements drawn from the *Policy and Action Standard*. Figures and tables adapted from the *Policy and Action Standard* are cited, but for readability not all text taken directly or adapted from the standard is cited.

A full list of references is provided at the end of this document.

[1] https://climateactiontransparency.org/wp-content/uploads/2020/01/Introduction-to-the-ICAT-Assessment-Guides.pdf

[2] https://climateactiontransparency.org/wp-content/uploads/2020/01/Forest-Methodology-Executive-summary.pdf

[3] Available at: www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html.

[4] Available at: www.ghgprotocol.org/policy-and-action-standard.

## 1.3 Intended users

This methodology is intended for use by policymakers and practitioners seeking to estimate GHG mitigation impacts in the context of development and implementation of nationally determined contributions (NDCs), national low-carbon strategies, nationally appropriate mitigation actions (NAMAs) and other mechanisms. The primary intended users are developing country governments and their partners who are implementing and assessing forest policies. Throughout the document, the term "user" refers to the entity implementing the methodology.

The main emphasis of the methodology is on the assessment of GHG impacts. Impact assessment can also inform and improve the design and implementation of policies. Thus, intended users include any stakeholders involved in the design and implementation of forest policies, strategies, NDCs or NAMAs, including research institutions, businesses and non-governmental organizations (NGOs).

## 1.4 Scope and applicability of the methodology

This document provides general principles, concepts and procedures for estimating GHG impacts of forest policies[5] that increase carbon sequestration and/or reduce GHG emissions from the following activities (which are further described in Chapter 3):

- **afforestation and/or reforestation (A/R)** – increase carbon sequestration and/or reduce emissions by establishing, increasing or restoring vegetative cover through the planting, sowing or human-assisted natural regeneration of trees
- **sustainable forest management (SFM)** – increase carbon sequestration and/or reduce emissions on forest lands managed for wood products such as sawtimber, pulpwood and fuelwood by increasing biomass carbon stocks through improving forest management practices
- **reduced deforestation and/or degradation** – reduce net GHG emissions by reducing the conversion of forest lands with high carbon stocks to forest or non-forest lands with lower carbon stocks.

This document is organized into four parts (see Figure 1.1). It details a process for users to follow when conducting a GHG assessment of forest policies. It provides guidance on defining the assessment, an approach to GHG assessment including ex-ante (forward-looking) assessments and ex-post (backward-looking) assessments, and monitoring and reporting. Throughout the document, examples and case studies are provided to illustrate how to apply the methodology.

This methodology is applicable to users who have defined the individual policy instruments, and mitigation practices and/or technologies that could be implemented to reduce GHG emissions. Examples of relevant policy instruments, and mitigation practices and/or technologies are described in Chapter 3. Policies that are not well defined or have not undergone a policy development process can be difficult to assess, because the level of detail needed to estimate GHG impacts may not be available without further policy development.

The steps for estimating emissions reductions and removals are based on the IPCC 2006 GL.[6] Countries that have a GHG inventory for the forestry sector can use data used to compile the inventory to estimate emissions reductions.

The methodology is applicable to policies:

- at any level of government (national, subnational, municipal) in all countries and regions
- that are planned, adopted or implemented
- that are new policies; or extensions, modifications or eliminations of existing policies.

Appendix C lists the full criteria used to choose the scope of the methodology.

[5] Throughout this document, where the word "policy" is used without "action", it is used as shorthand to refer to policies and actions, and policies and measures. See Glossary for definition of "policy or action".

[6] Available at: www.ipcc-nggip.iges.or.jp/public/2006gl/index.html. As the IPCC guidelines are updated or refined, users may refer to subsequent versions to improve impact assessment estimation. Note that the enhanced transparency framework states that "Each Party shall use the 2006 IPCC Guidelines and any subsequent version or refinement of the IPCC Guidelines agreed upon by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA)".

FIGURE **1.1**

**Overview of the methodology**

**Part I: Introduction, objectives, key concepts and overview of forest policies**

Understand the purpose and applicability of the methodology (Chapter 1)
Determine the objectives of the assessment (Chapter 2)
Understand forest policies (Chapter 3)
Understand assessment steps and principles (Chapter 4)

↓

**Part II: Defining the assessment**

Clearly describe the policy to be assessed (Chapter 5)
Indentify the GHG impacts to assess (Chapter 6)

↓

**Part III: Assessing impacts**

Estimate the baseline scenario and emissions (Chapter 7)
Estimate the implementation potential of the policy and quantify the emissions ex-ante (Chapter 8)
Estimate the impact of the policy ex-post (Chapter 9)

↓

**Part IV: Monitoring and reporting**

Clearly describe the policy to be assessed (Chapter 10)
Indentify the GHG impacts to assess (Chapter 11)

## 1.5 When to use the methodology

The methodology can be used at multiple points throughout a policy design and implementation process, including:

- **before policy implementation** – to assess the expected future impacts of a policy (through ex-ante assessment)
- **during policy implementation** – to assess the impacts achieved to date, ongoing performance of key performance indicators, and expected future impacts of a policy
- **after policy implementation** – to assess what impacts have occurred as a result of a policy (through ex-post assessment).

Depending on individual objectives and when the methodology is applied, users can implement the steps related to ex-ante assessment, ex-post assessment or both. The most comprehensive approach is to apply the methodology before implementation, regularly during policy implementation and again after implementation.

## 1.6 Key recommendations

The methodology includes key recommendations that are recommended steps to follow when assessing and reporting impacts. These recommendations are intended to help users to produce credible and high-quality impact assessments that are based on the principles of relevance, completeness, consistency, transparency and accuracy.

Key recommendations are indicated in subsequent chapters by the phrase “It is a *key recommendation* to …”. All key recommendations are also compiled in a checklist at the beginning of each chapter.

Users who want to follow a more flexible approach can use the methodology without adhering to the key recommendations. The *Introduction to the ICAT Assessment Guides* provides more information on how and why key recommendations are used within the ICAT assessment guides, and on following either the “flexible approach” or the “key recommendations approach” when using the documents. Refer to the *Introduction to the ICAT Assessment Guides* before deciding which approach to follow.

## 1.7 Alignment with the enhanced transparency framework of the Paris Agreement

This methodology can help countries to fulfil their accounting and reporting requirements under the enhanced transparency framework of the Paris Agreement. Specifically, the methodology can help countries understand the impacts of forest policies, estimate baseline emissions and GHG impacts, conduct projections, and monitor progress over time using indicators and parameters. This enables countries to account for their contributions and track progress towards implementation and achievement of their NDCs. Alignment of indicators and parameters (i.e. using the same indicators and parameters to assess the impacts of a forest policy and to meet reporting requirements of the transparency framework) is recommended for the following:

- Estimating baseline emissions and GHG impacts. Align input parameters used to estimate baseline emissions and GHG impacts of forest policies with the input parameters used for GHG accounting of NDCs (Chapter 7 and 8).
- Projections. Align the parameters and time frame used to develop projections for forest policies with the parameters and time frame used to meet reporting requirements of the transparency framework (Chapter 7).
- Monitoring and tracking progress towards NDCs. Indicators and parameters used in this methodology to monitor forest policy implementation can also be used to track progress towards implementation and achievement of an NDC. Some indicators suggested in this methodology can be used to track sustainable development impacts (Chapter 11).

## 1.8 Process for developing the methodology

This methodology has been developed through an inclusive, multi-stakeholder process convened by ICAT. The development is led by the Greenhouse Gas Management Institute (technical lead) and Verra (co-lead), who serve as the secretariat and guide the development process. The first draft was developed by drafting teams, consisting of a subset of a broader Technical Working Group (TWG) and the secretariat. The TWG consists of experts and stakeholders from a range of countries identified through a public call for expressions of interest. The TWG contributed to the development of the technical content of the methodology through participation in regular meetings and written comments. A Review Group provided written feedback on the first draft of the methodology. ICAT’s Advisory Committee, which provides strategic advice to ICAT, reviewed the second draft.

The second draft was applied by ICAT participating countries and other non-state actors to ensure that it can be practically implemented. The current version of the methodology was informed by the feedback gathered from that experience and includes case studies from those applications.

More information about the methodology development process, including governance of the initiative and the participating countries, is available on the ICAT website.[7]

All contributors are listed in the Contributors section.

[7] https://climateactiontransparency.org

# 2 Objectives of assessing GHG impacts of forest policies

*This chapter provides an overview of objectives users may have in assessing the GHG impacts of forest policies. Determining the assessment objectives is an important first step, since decisions made in later chapters should be guided by the stated objectives.*

**Checklist of key recommendations**

- Determine the objectives of the assessment at the beginning of the impact assessment process

Assessing the GHG impacts of policies is a key step towards identifying opportunities and gaps in effective GHG mitigation strategies. Impact assessment supports evidence-based decision-making by enabling policymakers and stakeholders to understand the relationship between policies and expected or achieved GHG impacts. It is a *key recommendation* to determine the objectives of the assessment at the beginning of the impact assessment process.

Examples of objectives for assessing the GHG impacts of a policy are listed below. The ICAT *Sustainable Development Methodology* and *Transformational Change Methodology* can be used to assess the broader sustainable development and transformational impacts of forest policies, and users should refer to these methodologies for objectives for assessing such impacts.

## 2.1 Objectives of assessing impacts before policy implementation

- **Inform policy selection** by comparing policy options based on their expected future impacts.
- **Improve policy design and implementation** by understanding the impacts of different design and implementation choices.
- **Inform goal setting** by assessing the potential contribution of policy options to national goals, such as NDCs and NAMAs.
- **Report** on the expected future impacts of policies, domestically and/or internationally.
- **Access financing** for policies under consideration by demonstrating expected future results.

## 2.2 Objectives of assessing impacts during or after policy implementation

- **Assess policy effectiveness** by determining whether policies are delivering the intended results.
- **Improve policy implementation** by determining whether policies are being implemented as planned.
- **Learn from experience** and share best practices about the impacts of policies.
- **Track progress towards national goals** such as NDCs, the SDGs of the 2030 Agenda for Sustainable Development and national REDD+ (reduced emissions from deforestation and forest degradation, and foster conservation, sustainable management of forests and enhancement of forest carbon stocks) strategies/action plans, and understand the contribution of policies towards achieving them.
- **Inform future policy design**, including reformulation of NDCs towards enhanced ambition, and decide whether to continue current actions, enhance current actions or implement additional actions.
- **Report**, domestically or internationally, including under the Paris Agreement's

enhanced transparency framework, on the impacts of policies achieved to date.

- **Meet funder requirements** to report on impacts of policies, if relevant.

Users should identify the intended audience of the assessment report. Possible audiences include policymakers, the general public, NGOs, companies, funders, financial institutions, analysts, research institutions, or other stakeholders affected by (or who can influence) the policy. For more information on identifying stakeholders, refer to the ICAT *Stakeholder Participation Guide* (Chapter 5).

Subsequent chapters provide flexibility to enable users to choose how best to assess the impacts of policies in the context of their objectives, including which impacts to include in the GHG assessment boundary, and which methods and data sources to use. The appropriate level of accuracy and completeness is likely to vary by objective. Users should assess the impacts of their policies with a sufficient level of accuracy and completeness to meet the stated objectives of the assessment.

# 3 Overview of forest policies

*This chapter provides an overview of the types of forest policy instruments, and mitigation practices and technologies, to which this methodology can be applied. The forestry and agriculture sectors present a large opportunity for countries to meet their commitments to the Paris Agreement, and to reduce GHG emissions from the atmosphere and enhance carbon stocks. This methodology is primarily designed to assess specific policy instruments and associated mitigation practices and/or technologies in the forestry sector. In this document, policies are instruments that enable or incentivize the implementation of GHG mitigation measures. Measures are the practices and technologies that reduce emissions.*

## 3.1 Forest policy instruments

This methodology can be used to assess the GHG impacts of a range of policy instruments that enable or incentivize reducing or removing emissions in the forestry sector. Table 3.1 presents examples of common policy instruments to which this methodology can be applied. This list is not exhaustive, and some users may have policy instruments of other types. Further information about types of policies and actions is provided in the *Introduction to the ICAT Assessment Guides*.

TABLE **3.1**

**Common policy instruments applicable to the forestry sector**

| Type of policy or action | Description | Examples |
|---|---|---|
| Regulations and standards | Rules or standards that specify abatement technologies (technology regulation or standard), or increasing the minimum diameter limit of cutting thresholds or other management activities (performance regulation or standard). They typically include legal penalties for non-compliance. | • Standards for timber management practices<br>• Standards for implementing agroforestry or silvopastoral systems<br>• Conservation mandate requiring landowners to reforest an area equivalent to 10% of cultivated lands into conservation reserve<br>• Laws that promote connectivity between natural ecosystems<br>• Moratorium on new land concessions<br>• Moratorium on exporting forest risk commodities from deforestation risk regions (e.g. Brazil municipality black list)<br>• New systems to effectively enforce existing or new environmental regulation (e.g. improve coordination of observation, enforcement and prosecution agencies against illegal logging and land grabbing) |
| Subsidies and incentives | Direct payments, tax reductions, price supports or the equivalent provided by a government to an entity for implementing a practice or performing a specified action | • Payments for setting aside agricultural land<br>• Payments for ecosystem services |

TABLE **3.1,** continued

**Common policy instruments applicable to the forestry sector**

| Type of policy or action | Description | Examples |
|---|---|---|
| Voluntary agreements or actions | Agreements, commitments or actions undertaken voluntarily by public or private sector actors, either unilaterally or jointly in a negotiated agreement. Some voluntary agreements include rewards or penalties associated with participating in the agreement or achieving the commitments. | • Zero net-deforestation commitments<br>• Ecosystem restoration commitments (e.g. Bonn Challenge)<br>• Agroforestry agreements with landowners<br>• National programmes to reduce emissions in a sector (e.g. NAMA)<br>• Low-carbon development projects |
| Information instruments | Requirements for public disclosure of information. These include labelling programmes, emissions reporting programmes, rating and certification systems, benchmarking, and information or education campaigns aimed at changing behaviour by increasing awareness. | • Programmes requiring standardized labelling on environmental attributes of agricultural and forest products |
| Trading programmes | Programmes that establish a limit on aggregate emissions or pollutants from specified sources; require sources to hold permits, allowances or other units equal to their actual emissions or pollution; and allow permits to be traded among sources | • Nutrient trading programmes<br>• Cap-and-trade programmes |
| Research, development and deployment policies | Policies aimed at supporting technological advances, through direct government funding or investment, or facilitation of investment, in technology research, development, demonstration and deployment activities | • Efforts to strengthen formal education of land managers, provide training, and introduce technologies or practices provided by extension services or other programmes supported by the government to encourage improved practices, technology adoption and even monitoring of activities<br>• Training modules about sustainable production and climate change disseminated through extension agents<br>• Regional workshops for land managers |
| Financing and investment | Public or private sector grants or loans (e.g. those supporting low-carbon development strategies or policies) | • Low–interest rate loans for forest land managers who implement sustainable timber management practices |

## 3.2 Mitigation practices or technologies

This methodology can be used to assess a range of mitigation practices or technologies that reduce emissions and/or enhance removals in the forestry sector. Box 3.1 lists common mitigation practices through A/R, SFM and reduced deforestation/degradation, and to which this methodology is applicable. These mitigation practices are enabled or incentivized by the policy instruments described above.

BOX **3.1**

### Common mitigation practices in the forestry sector

**Common mitigation practices that reduce emissions or enhance removals through A/R**

- Planting trees/woody biomass (including agroforestry and silvopasture)
- Removing vegetation that competes with trees
- Making sites suitable for natural regeneration (e.g. protecting mother trees and seedlings)
- Removing ongoing disturbances that prevent reforestation or natural regeneration

**Common mitigation practices that reduce emissions or enhance removals through SFM**

- Improving forest management practices (e.g. increasing the minimum age or the minimum diameter of cutting thresholds, extending the re-entry period for selective harvesting, improving the selection of trees for harvesting, implementing sustainable harvest modelling, implementing stocking retention requirements)
- Enhancing productivity (e.g. supplemental planting and thinning, introducing tree species with higher growing rates)
- Improving harvest efficiency (e.g. reducing damage or felling of other trees, reducing the size of logging roads)
- Improving mill efficiency and utilization of wood products

**Common mitigation practices that reduce emissions through reduced deforestation/degradation**

- Conserving forests on public or private land
- Providing alternative sources for fuelwood (e.g. woodlots for fuel, gas or kerosene for cooking)
- Converting logged forests to protected forests
- Increasing sustainable agricultural intensification to reduce conversion of forest lands

# 4 Using the methodology

*This chapter provides an overview of the steps involved in assessing the GHG impacts of forest policies, and outlines assessment principles to help guide the assessment.*

**Checklist of key recommendations**

- Base the assessment on the principles of relevance, completeness, consistency, transparency and accuracy

## 4.1 Overview of steps

This document is organized according to the steps a user follows in assessing the GHG impacts of a policy (see Figure 1.1). Depending on when the methodology is applied and the approach chosen, users can skip certain chapters. For example, users assessing impacts ex-ante but not ex-post can skip Chapter 9.

## 4.2 Planning for the assessment

Users should review this methodology, and plan the steps, responsibilities and resources needed to meet their objectives for assessing GHG impacts of forest policies in advance. The time and human resources required to implement the methodology and carry out an impact assessment depend on a variety of factors, such as the complexity of the policy being assessed, the extent of data collection needed and whether relevant data have already been collected, and the desired level of accuracy and completeness needed to meet the objectives of the assessment.

### 4.2.1 Choosing a desired level of accuracy based on objectives

A range of options exist for assessing GHG impacts that allow users to manage trade-offs between the accuracy of the results, and the resources, time and data needed to complete the assessment, based on objectives. Some objectives require more detailed assessments that yield more accurate results (to demonstrate that a specific reduction in GHG emissions is attributable to a specific policy, with a higher level of certainty), whereas other objectives may be achieved with simplified assessments that yield less accurate results (to show that a policy contributes to reducing GHG impacts, but with less certainty around the magnitude of the impact).

Users should choose approaches and methods that are sufficient to accurately meet the stated objectives of the assessment and ensure that the resulting claims are appropriate – for example, whether a policy contributes to achieving GHG emissions reductions or whether emissions reductions can be attributed to the policy. Users should also consider the resources required to obtain the data needed to meet the stated objectives of the assessment.

### 4.2.2 Approaches for assessing the GHG impacts of forest policies

This methodology provides two approaches for estimating the GHG impacts of forest policies ex-ante:

- **Emissions approach.** This compares GHG emissions and removals between the policy scenario and the baseline scenario. The difference between policy and baseline scenario emissions and removals is the GHG impact resulting from the policy.

- **Activity data approach.** This focuses on estimating the effect of the policy on activity data by estimating the expected increase or decrease in the area of land in a land category, or the extent of adoption of a mitigation practice that is triggered by the policy. The emissions associated with the increase or decrease in activity data are estimated to give the expected GHG impact resulting from the policy.

**Emissions approach**

In this method, users determine the most likely baseline scenario for land use, land-use change and/or timber management practices, and estimate baseline emissions and removals (Chapter 7). Users then develop the most likely policy scenario by determining the likely implementation potential of the policy (Sections 8.2–8.5). Policy scenario emissions and removals are quantified by using the same method that was used to estimate the baseline emissions and removals, with parameter values that are adjusted for the policy scenario. The net change in GHG emissions and removals is the difference between policy and baseline emissions and removals.

### Activity data approach

In this approach, users estimate the maximum implementation potential of the policy (following the approach in Chapter 8), based on the causal chain that is developed in Chapter 6. The maximum implementation potential is estimated in terms of activity data. "Activity data" are parameters that are expected to change in value as a result of the policy. This approach is best for policies that target changes in activity data (e.g. hectares [ha] of forest land remaining as forest land).

Users then evaluate how barriers to implementation and other factors may limit the policy's overall effectiveness, and determine the policy's likely implementation potential. The likely implementation potential represents the effects that are expected to occur as a result of the policy (the most likely policy scenario). The implementation potential is the area of land in a land category that will be impacted by the policy (e.g. the hectares of degraded land that are planted with trees) or the expected extent of adoption of a mitigation practice (e.g. the percentage of timber land managers who increase the diameter cutting threshold). Implicitly, these effects are relative to the baseline scenario.

GHG emissions and removals are estimated based on the increase or decrease in activity data (Section 8.6), with emission factors that are updated to represent the policy scenario. Estimating baseline emissions is optional when using this approach; the GHG impacts of the policy can be calculated directly, without explicitly determining separate baseline and policy scenarios. In such cases, users can skip Chapter 7.

Table 4.1 sets out the advantages and disadvantages of the two approaches, and Box 4.1 provides further information on deciding between them.

TABLE **4.1**

**Advantages and disadvantages of different approaches**

| Approach | Advantage | Disadvantage |
|---|---|---|
| Emissions | • Enables more robust and accurate understanding of the GHG impacts of forestry policies<br>• Meets a wider set of objectives (related to understanding policy impact)<br>• Meets the widest set of stakeholder needs | • Increased time, cost, data and capacity needs, depending on approach taken (simpler to more complex) |
| Activity data | • Gives an understanding of expected GHG impacts<br>• Easier; simpler; and requires less time, resources and capacity | • Provides a more informative estimate of the GHG impacts of the policy, which may limit the range of reporting objectives the assessment can meet<br>• Risk of oversimplification or limited understanding of relevant impact drivers |

BOX **4.1**

**Choosing an approach based on objectives**

The approach to follow should be guided by the user's objectives, capacity and resources. If the objective is to understand the impact of a policy and use that information to meet other objectives – such as informing policy design, improving policy implementation, evaluating policy effectiveness, reporting on policy impacts, and attracting finance based on policy impacts – the user should use a more robust approach for assessing impacts, and obtaining and estimating data.

Some objectives may be achieved with an activity data approach, such as gaining an understanding of impacts in a short time to guide decision-making. Other objectives may require a more rigorous emissions approach, such as attracting public or private financing to implement an intervention and achieve specific results. The emissions approach to assessing GHG impacts better supports several objectives, but generally requires more time and resources, whereas the activity data approach is less resource-intensive but may not fully meet all of a user's objectives. In general, users should quantify significant impacts of the policy, where feasible.

### 4.2.3 Methods for obtaining or estimating data

This methodology provides simplified (Tier 1) methods for estimating spatial data and carbon stock change (e.g. emission factors). It does not provide more robust measurement, modelling or estimation methods (e.g. higher Tier 3 methods). The use of tiers and approaches is consistent with the IPCC 2006 GL. It is helpful to become familiar with basic best practices and tables in the IPCC 2006 GL.[8]

Users may decide on their method of assessment based on both their assessment objectives and their capacity, resources and time available to carry out the assessment (Figure 4.1). For planning purposes, it is helpful for users to identify the desired estimation method before beginning an impact assessment. Users may rely on a combination of methods within a policy estimation. For example, if a policy affects multiple carbon pools, each carbon pool estimate could use a different methodological tier. Similarly, data availability may vary across policy locations, requiring the use of different approaches. Users using a combination of methods and approaches should heed the consistency and comparability assessment principles described in the next section.

[8] For information on tiers, see IPCC 2006 GL, Chapter 1, Section 1.3.2, Box 1.1, and Figures 1.2 and 1.3 (www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_01_Ch1_Introduction.pdf). For information on approaches, see IPCC 2006 GL, Chapter 3, Section 3.3.1 and Figure 3.1 (www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_03_Ch3_Representation.pdf).

### 4.2.4 Expert judgment

It is likely that expert judgment and assumptions will be needed to complete an assessment where information is not available or requires interpretation. Expert judgment is defined by the IPCC as a "carefully considered, well-documented qualitative or quantitative judgment made in the absence of unequivocal observational evidence by a person or persons who have a demonstrable expertise in the given field".[9] The goal is to be as representative as possible to reduce bias and increase accuracy. Users can apply their own expert judgment or consult experts.

When relying on expert judgment, information can be obtained through methods that help to avoid bias – known as "expert elicitation". The IPCC 2006 GL provides a procedure for expert elicitation, including a process for helping experts understand the elicitation process, avoiding biases, and producing independent and reliable judgments.

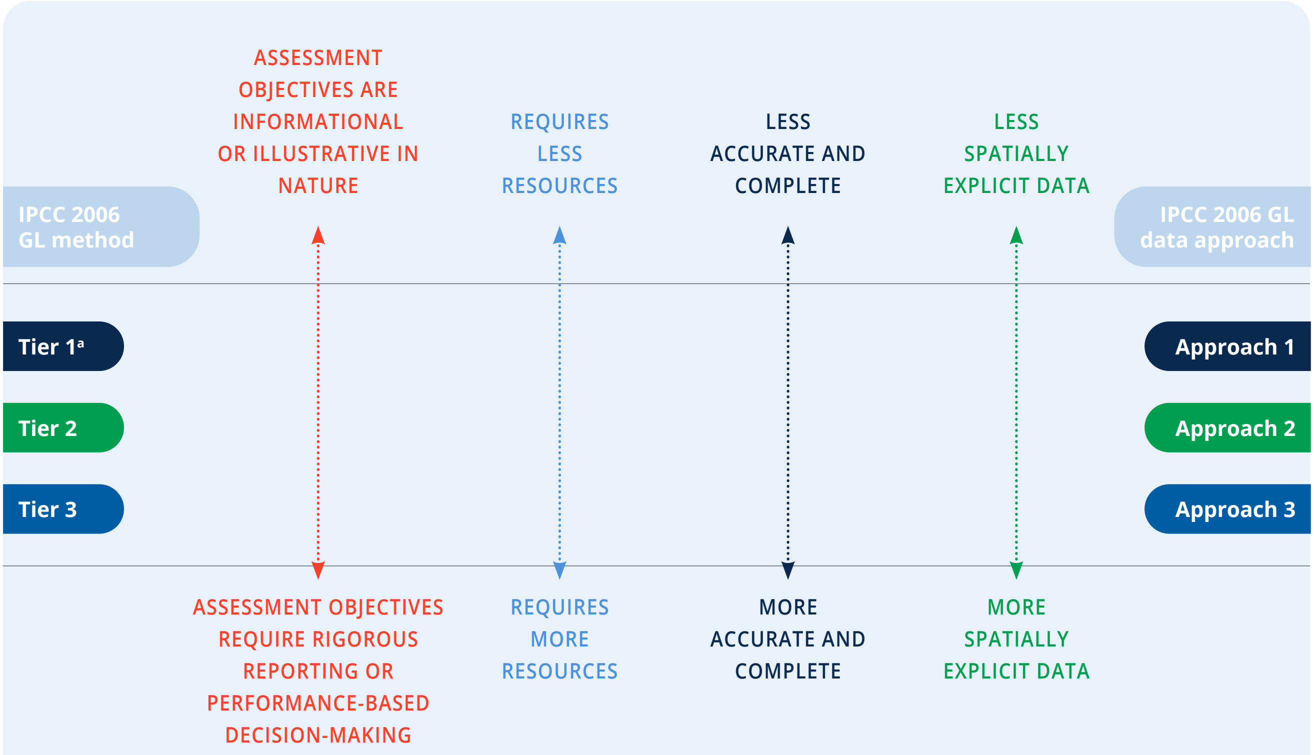
Expert judgment can be associated with a high level of uncertainty. As such, experts can be consulted to provide a range of possible values and the related uncertainty range, or to help select suitable values from a range of values. Expert judgment can be informed or supported by broader consultations with stakeholders.

It is important to document the reason that no data sources are available and the rationale for the value chosen.

[9] IPCC (2000).

FIGURE **4.1**

**Methods and approaches for estimating GHG emissions based on data availability**




[a] It is not appropriate to use a Tier 1 method for a stock-difference calculation.

### 4.2.5 Planning stakeholder participation

Stakeholder participation is recommended at many steps throughout the methodology. It can strengthen the impact assessment and the contribution of policies to GHG mitigation goals in many ways, including by:

- establishing a mechanism through which people who may be affected by, or can influence, a policy have an opportunity to raise issues and have these issues considered before, during and after policy implementation
- raising awareness and enabling better understanding of complex issues for all parties involved, building their capacity to contribute effectively
- building trust, collaboration, shared ownership and support for policies among stakeholder groups, leading to less conflict and easier implementation
- addressing stakeholder perceptions of risks and impacts, and helping to develop measures to reduce negative impacts and increase benefits for all stakeholder groups, including the most vulnerable
- increasing the credibility, accuracy and comprehensiveness of the assessment by drawing on diverse expert, local and traditional knowledge and practices – for example, to provide inputs on data sources, methods and assumptions
- increasing transparency, accountability, legitimacy and respect for stakeholders' rights
- enabling enhanced ambition and financing by strengthening the effectiveness of policies and credibility of reporting.

Various sections throughout this methodology explain where stakeholder participation is recommended – for example, in identifying the impacts of the policy (Chapter 6), estimating the baseline scenario and emissions (Chapter 7), estimating GHG impacts ex-ante (Chapter 8), monitoring performance over time (Chapter 10) and reporting (Chapter 11).

Before beginning the assessment process, users should consider how stakeholder participation can support the objectives, and include relevant activities and associated resources in assessment plans. It may be helpful to combine stakeholder participation for GHG impacts assessment with other participatory processes involving similar stakeholders for the same or related policies, such as those being conducted for assessment of sustainable development and transformational impacts, and for technical review.

It is important to conform with national legal requirements and norms for stakeholder participation in public policies. Requirements of specific donors, and of international treaties, conventions and other instruments to which the country is party should also be met. These are likely to include requirements for disclosure, impact assessments and consultations. They may include specific requirements for certain stakeholder groups (e.g. United Nations Declaration on the Rights of Indigenous Peoples, International Labour Organization Convention 169) or specific types of policies (e.g. United Nations Framework Convention on Climate Change [UNFCCC] guidance on safeguards for activities that reduce emissions from deforestation and degradation in developing countries).

During the planning phase, it is recommended that users identify stakeholder groups that may be affected by, or may influence, the policy. Appropriate approaches should be identified to engage with stakeholder groups, including through their legitimate representatives. Effective stakeholder participation could be facilitated by establishing a multi-stakeholder working group or advisory body consisting of stakeholders and experts with relevant and diverse knowledge and experience. Such a group may provide advice and potentially contribute to decision-making; this will ensure that stakeholder interests are reflected in design, implementation and assessment of policies, including on stakeholder participation in the assessment of GHG impacts of a particular policy. It is also important to ensure that stakeholders have access to a grievance redress mechanism to protect their rights related to the impacts of the policy.

Refer to the ICAT *Stakeholder Participation Guide* for more information, such as how to plan effective stakeholder participation (Chapter 4), identify and analyse different stakeholder groups (Chapter 5), establish multi-stakeholder bodies (Chapter 6), provide information (Chapter 7), design and conduct consultations (Chapter 8), and establish grievance redress mechanisms (Chapter 9). Appendix A of this document summarizes the steps in this methodology where stakeholder participation is recommended and provides specific references to relevant guidance in the ICAT *Stakeholder Participation Guide*.

### 4.2.6 Planning technical review (if relevant)

Before beginning the assessment process, user should consider whether the assessment report will be subject to technical review. The technical review process emphasizes learning and continual improvement, and can help users identify areas for improving future impact assessments. Technical review can also provide confidence that the impacts of policies have been estimated and reported according to ICAT key recommendations. Refer to the ICAT *Technical Review Guide* for more information on the technical review process.

## 4.3 Assessment principles

Assessment principles underpin and guide the impact assessment process, especially where the methodology provides flexibility. It is a *key recommendation* to base the assessment on the principles of relevance, completeness, consistency, transparency and accuracy, as follows:[10]

- **Relevance.** Ensure that the assessment appropriately reflects the GHG impacts of the policy and serves the decision-making needs of users and stakeholders – both internal and external to the reporting entity. Applying the principle of relevance depends on the objectives of the assessment, broader policy objectives, national circumstances and stakeholder priorities.

- **Completeness.** Include all significant impacts – both positive and negative – in the GHG assessment boundary. Disclose and justify any specific exclusions.

- **Consistency.** Use consistent assessment approaches, data-collection methods and calculation methods to allow meaningful

[10] Adapted from WRI (2014).

performance tracking over time. Document any changes to the data sources, GHG assessment boundary, methods or any other relevant factors in the time series.

- **Transparency.** Provide clear and complete information for stakeholders to assess the credibility and reliability of the results. Disclose and document all relevant methods, data sources, calculations, assumptions and uncertainties. Disclose the processes, procedures and limitations of the assessment in a clear, factual, neutral and understandable manner through an audit trail with clear documentation. The information should be sufficient to enable a party external to the assessment process to derive the same results if provided with the same source data. Chapter 11 provides a list of recommended information to report to ensure transparency.

- **Accuracy.** Ensure that the estimated impacts are systematically neither over nor under actual values, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users and stakeholders to make appropriate and informed decisions with reasonable confidence about the integrity of the reported information. If accurate data for a given impact category are not currently available, strive to improve accuracy over time as better data become available. Accuracy should be pursued as far as possible, but, once uncertainty can no longer be practically reduced, conservative estimates should be used. Box 4.2 provides guidance on conservativeness.

In addition to the principles above, users should follow the principle of comparability if it is relevant to the assessment objectives – for example, if the objective is to compare multiple policies based on their GHG impacts, or to aggregate the results of multiple impact assessments and compare the collective impacts with national goals (described further in Box 4.3).

- **Comparability.** Ensure common methods, data sources, assumptions and reporting formats, such that the estimated impacts of multiple policies can be compared.

In practice, users may encounter trade-offs between principles when developing an assessment. For example, a user may find that achieving the most complete assessment requires using less accurate data for a portion of the assessment, which could compromise overall accuracy. Users should balance trade-offs between principles depending on their objectives. Over time, as the accuracy and completeness of data increase, the trade-off between these principles will likely diminish.

BOX **4.2**

### Conservativeness

Conservative values and assumptions are more likely to overestimate negative impacts or underestimate positive impacts resulting from a policy. Users should consider conservativeness in addition to accuracy when uncertainty can no longer be practically reduced, when a range of possible values or probabilities exists (e.g. when developing baseline scenarios), or when uncertainty is high.

Whether to use conservative estimates and how conservative to be depends on the objectives and the intended use of the results. For some objectives, accuracy should be prioritized over conservativeness, to obtain unbiased results. The principle of relevance can help guide what approach to use and how conservative to be.

BOX **4.3**

### Applying the principle of comparability when comparing or aggregating results

Users may want to compare the estimated impacts of multiple policies – for example, to determine which policy has the greatest positive impacts. Valid comparisons require that assessments have followed a consistent methodology – for example, regarding the assessment period, the types of impact categories, impacts, and indicators included in the GHG assessment boundary; baseline assumptions; calculation methods; and data sources. Users should exercise caution when comparing the results of multiple assessments, since differences in reported impacts may be a result of differences in methodology rather than real-world differences. To understand whether comparisons are valid, all methods, assumptions and data sources used should be transparently reported. Comparability can be more easily achieved if a single person or organization assesses and compares multiple policies using the same methodology.

Users may also want to aggregate the impacts of multiple policies – for example, to compare the collective impact of several policies in relation to a national goal. Users should likewise exercise caution when aggregating the results if different methods have been used and if there are potential overlaps or interactions between the policies being aggregated. In such a case, the sum would either overestimate or underestimate the impacts resulting from the combination of policies. For example, the combined impact of a local energy efficiency policy and a national energy efficiency policy in the same country will probably be less than the sum of the impacts had they been implemented separately, since they affect the same activities. Chapter 5 provides more information on policy interactions.

# PART II

## Defining the assessment

# 5 Describing the policy

*This chapter provides guidance on describing the policy. To assess the GHG impacts of a policy, users need to describe the policy that will be assessed, decide whether to assess an individual policy or a package of related policies, and choose whether to carry out an ex-ante and/or ex-post assessment.*

**Checklist of key recommendations**

- Clearly describe the policy (or package of policies) that is being assessed

## 5.1 Describe the policy to be assessed

To effectively carry out an impact assessment (in subsequent chapters), a detailed understanding and description of the policy being assessed are needed. It is a *key recommendation* to clearly describe the policy (or package of policies) that is being assessed. Table 5.1 provides a checklist of recommended information that should be included in a description to enable an effective assessment. Table 5.2 outlines additional information that may be relevant, depending on the context.

If assessing a package of policies, these tables can be used to document either the package as a whole or each policy in the package separately. The first two steps in this chapter (Sections 5.1 and 5.2) can be done together or iteratively.

Users who are assessing the sustainable development and/or transformational impacts of the policy (using the ICAT *Sustainable Development Methodology* and/or *Transformational Change Methodology*) should describe the policy in the same way to ensure a consistent and integrated assessment.

## 5.2 Decide whether to assess an individual policy or a package of policies

If multiple policies are being developed or implemented in the same time frame, users can assess them either individually or as a package. When making this decision, users should consider the assessment objectives, the feasibility of assessing impacts individually or as a package, and the degree of interaction between the policies.

In subsequent chapters, users follow the same general steps, whether they choose to assess an individual policy or a package of related policies. Depending on the choice, the impacts estimated in later chapters will apply either to the individual policy assessed or to the package of policies assessed.

FIGURE **5.1**

**Overview of steps in the chapter**

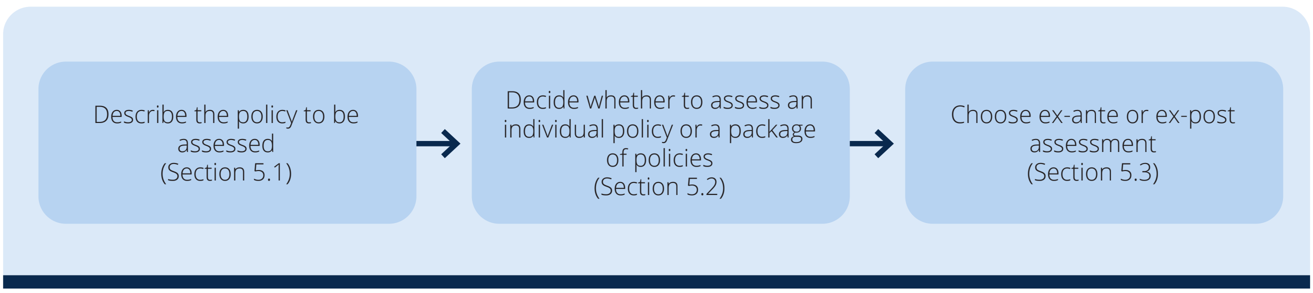


TABLE **5.1**

**Checklist of recommended information to describe the policy being assessed**

| Information | Description | Example |
|---|---|---|
| Title of the policy | Policy name | PES system and tax for ecosystem service users |
| Type of policy | The type of policy, such as those presented in Table 3.1, or other categories of policies that may be more relevant | Subsidies and incentives<br>Taxes and charges |
| Description of specific interventions | The specific mitigation practice and/or technology carried out as part of the policy or action, such as those presented in Box 3.1 | Reducing emissions and enhancing removals, through (a) SFM and/or (b) A/R<br>(a) SFM strategies: increasing the minimum age or tree diameter of cutting thresholds, extending the re-entry period for selective harvesting and improving the selection of trees for harvesting<br>(b) A/R strategies: planting trees/woody biomass, planting endangered tree species, removing vegetation that competes with trees, removing ongoing disturbances that prevent natural regeneration<br>Under the new PES system, the Ministry of Environment will engage stakeholders in voluntary contracts to provide ecosystem services on a total of 60% of private forest lands and 25% of low-productivity cropland over 10 years.<br>The specific aim of the policy is SFM on private forest land and A/R activities on cropland. Voluntary contracts aim to promote sustainable harvest regimes, general tree planting, tree planting with endangered species, and natural regeneration, with landowner payments for each practice of $500/ha, $1,000/ha, $1,500/ha, and $500/ha, respectively.<br>A new tax system will be enacted to fund the ecosystem service payments. Under this system, a national legislative body will enact a new tax for all users of ecosystem services (primarily for water and hydroelectric utilities, but other sectors may be included, such as tourism companies). The national taxing agency will collect the tax, which will fund the new PES programme (estimated to be about 1–2% of annual revenue) to provide programme incentives, as well as administrative and operational expenses. |
| Status of the policy | Whether the policy is planned, adopted or implemented | The national government is evaluating whether to implement this policy. |
| Date of implementation | The date the policy comes into effect (not the date that any supporting legislation is enacted) | Expected 2021 |
| Date of completion (if relevant) | If relevant, the date the policy ceases, such as the date a tax is no longer levied or the end date of an incentive scheme with a limited duration (not the date that the policy no longer has an impact) | Expected 2030 |

TABLE **5.1,** continued

**Checklist of recommended information to describe the policy being assessed**

| Information | Description | Example |
|---|---|---|
| Implementing entity or entities | The entity or entities that implement(s) the policy, including the role of various local, subnational, national, international or any other entities | National legislative body and Ministry of Environment |
| Objectives and intended impacts or benefits of the policy | The intended impact(s) or benefit(s) of the policy (e.g. the purpose stated in the legislation or regulation) | The goals of the PES programme are to expand SFM activities, and promote A/R through tree planting or natural regeneration. Specifically, the goals are to:<br>• increase forest carbon stocks on private forest land<br>• increase forest carbon stocks on low-productivity cropland<br>• decrease soil erosion<br>• increase economic output for ecosystem services, including water retention/run-off and biodiversity<br>• reduce degradation pressure on private forest lands<br>• accelerate adoption of improved SFM on a widespread basis by demonstrating ecosystem service benefits of improving forest carbon stocks. |
| Level of the policy | The level of implementation, such as national level, subnational level, city level, sector level or project level | National |
| Geographic coverage | The jurisdiction or geographic area where the policy is implemented or enforced, which may be more limited than all the jurisdictions where the policy has an impact | Based on data from the latest national forest census, the total area of privately owned forest land in the country is 250,000 ha; 60% of this area is 150,000 ha. From national agriculture statistics, it is known that the total area of low-productivity cropland is 240,000 ha; 25% of this is 60,000 ha. |
| Sectors targeted | The sectors or subsectors that are targeted | Forest and agriculture – interventions will target private forest and cropland owners. |
| Greenhouse gases targeted | Which GHG the policy aims to control, which may be more limited than the set of GHG that the policy affects | Increase $CO_2$ sequestration in forests. |
| Other related policies or actions | Other policies or actions that may interact with the policy being assessed | The regional Non-Industrial Private Forest programme, funded by a non-profit organization, aims to encourage sustainable harvest practices through capacity-building in a region containing 10,000 ha of private forest land.<br>The Forest Protection Act (FPA) of 2010 improves enforcement of laws preventing illegal logging. Monitoring and evaluation of the FPA indicates it has reduced illegal logging by approximately 5%. The FPA has the potential to discourage forest degradation on private forest land. |

*Source:* Adapted from WRI (2014).
*Abbreviation:* PES, payment for ecosystem services

TABLE **5.2**

**Checklist of additional information that may be relevant to describe the policy being assessed**

| Information | Description | Example |
|---|---|---|
| Intended level of mitigation to be achieved and/or target level of other indicators | If relevant and available, the total emissions and removals from the sources and sinks targeted; the target amount of emissions to be reduced or removals to be enhanced as a result of the policy, both annually and cumulatively over the life of the policy (or by a stated date); and/or the target level of key indicators (such as hectares of land to conserve) | The goal of the policy is for 150,000 more hectares of forest land to be brought into SFM, and 60,000 more hectares of cropland to be converted to forest land as a result of the policy:<br>• SFM – 150,000 ha<br>• tree planting – 15,000 ha<br>• natural regeneration – 40,000 ha<br>• tree planting with endangered species – 5,000 ha. |
| Title of establishing legislation, regulations or other founding documents | The name(s) of legislation or regulations authorizing or establishing the policy (or other founding documents, if there is no legislative basis) | Pending legislation<br>Ministry of Environment draft PES contract template |
| Monitoring, reporting and verification procedures | References to any monitoring, reporting and verification procedures associated with implementing the policy | Annual forest land and cropland visits conducted by forest and extension specialists to all landowners receiving payment. Specialists to verify implementation of practices according to annual reports submitted by participants. See "Enforcement mechanisms" for more information on reporting. |
| Enforcement mechanisms | Any enforcement or compliance procedures, such as penalties for non-compliance or requirements for reporting | Participation in the programme is voluntary. However, to receive payments, landowners must submit a year 1 and year 10 forest inventory report. Landowners must also submit annual harvesting records. Reports are submitted to the Ministry of Environment. They can be filled out and submitted with assistance from extension specialists. |
| Reference to relevant documents | Information to allow practitioners and other interested parties to access any guidance documents related to the policy (e.g. through websites) | Ministry of Environment private landowner forest inventory report template |
| Broader context or significance of the policy | The broader context for understanding the policy | The policy is part of the package of actions that is being considered to fulfil the aspirational goal (as described in the NDC submitted to UNFCCC) to reduce total national GHG emissions in 2035 from 35% to 17.5% above 2010 levels. It is anticipated that the policy will account for a minimum of 20% of the total GHG reductions required to achieve the NDC goal. |
| Outline of sustainable development impacts of the policy | Any anticipated sustainable development benefits other than GHG mitigation | Land-use change, water quality, endangered species and biodiversity improvement |

TABLE **5.2,** continued

**Checklist of additional information that may be relevant to describe the policy being assessed**

| Information | Description | Example |
|---|---|---|
| Key stakeholders | Key stakeholder groups affected by the policy | Private forest landowners, farmers, users of ecosystem services (primarily water and hydroelectric utilities) |
| Other relevant information | Any other relevant information (e.g. costs, non-GHG mitigation benefits) | If this policy is successful, there may be a decrease in supply of agricultural products from a decrease in available cropland. A decrease in cropland or a decrease in harvest timber may result in forest degradation on non-participating lands. |

*Source:* Adapted from WRI (2014).
*Abbreviation:* PES, payment for ecosystem services

### 5.2.1 Types of policy interactions

Policies can either be independent of each other or interact with each other. Policies interact if their total impact, when implemented together, differs from the sum of their individual impacts had they been implemented separately. They interact if they affect the same GHG source or carbon pool. For example, national and subnational policies in the same sector are likely to interact since they likely affect the same GHG sources and carbon pools. Two policies implemented at the same level may also interact.

Policies do not interact if they do not affect the same GHG sources and carbon pools, either directly or indirectly.

Policies can be independent, overlapping, reinforcing, or both overlapping and reinforcing. Table 5.3 and Figure 5.2 provide an overview of four possible relationships between policies. Further information is available in the *Policy and Action Standard*.

### 5.2.2 Determining whether to assess an individual policy or package of policies

To assess the extent of policy interactions and decide whether to assess an individual policy or a package of policies, users should follow these steps:

- step 1 – characterize the type and degree of interaction between the policies under consideration
- step 2 – apply criteria to determine whether to assess an individual policy or a package of policies.

**Step 1: Characterize the type and degree of interaction between the policies under consideration**
Potentially interacting policies can be identified by identifying activities targeted by the policy, then identifying other policies that target the same activities. From this, assess the relationship between the policies (independent, overlapping or reinforcing) and the degree of interaction (minor, moderate or major). The assessment of interaction can be based on expert judgment, published studies of similar combinations of policies or consultations with relevant experts. The assessment should be limited to a preliminary qualitative assessment at this stage.

**Step 2: Apply criteria to determine whether to assess an individual policy or a package of policies**
Where policies interact, there can be advantages and disadvantages to assessing the interacting policies individually or as a package (see Table 5.4). To help decide, apply the criteria in Table 5.5. In some cases, certain criteria may suggest assessing an individual policy, while other criteria suggest assessing a package. Users should exercise judgment, based on the specific circumstances of the assessment. For example, related policies may have significant interactions (suggesting a package), but it may not be feasible to model the whole package (suggesting an individual assessment). In this case, a user can assess an individual policy, but acknowledge in a disclaimer

TABLE **5.3**

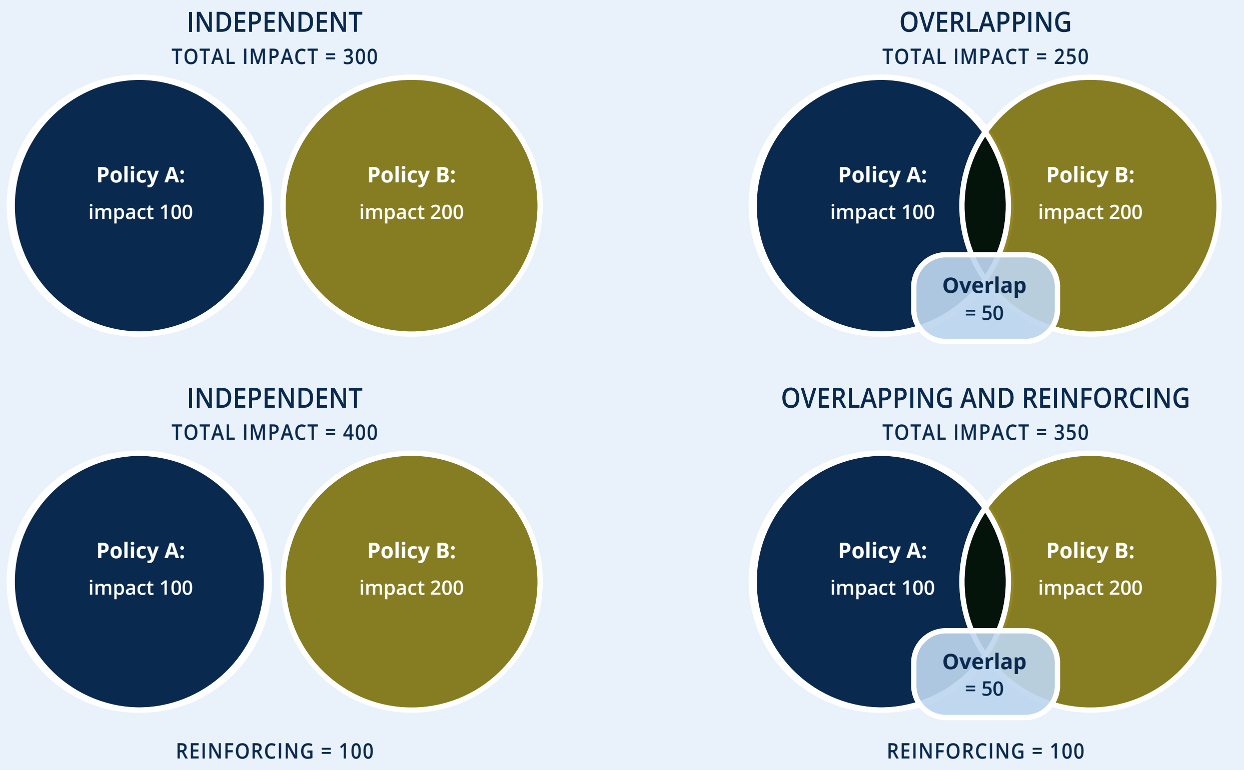
### Types of relationships between policies

| Type | Description |
|---|---|
| Independent | Multiple policies do not interact with each other. The combined effect of implementing the policies together is equal to the sum of the individual effects of implementing them separately. |
| Overlapping | Multiple policies interact, and their combined effect is less than the sum of their individual effects if implemented separately. This category includes policies that have the same or complementary goals (such as national and subnational energy efficiency standards), as well as counteracting policies that have different or opposing goals (such as increasing food production and reducing emissions from agriculture). |
| Reinforcing | Multiple policies interact, and their combined effect is greater than the sum of their individual effects if implemented separately. |
| Overlapping and reinforcing | Multiple policies interact, and have both overlapping and reinforcing interactions. Their combined effect may be greater or less than the sum of their individual effects if implemented separately. |

*Source:* WRI (2014).

FIGURE **5.2**

### Types of relationships between policies




*Source:* Adapted from WRI (2014).

that any subsequent aggregation of the results from individual assessments would be inaccurate given the interactions between the policies.

Users can also assess both individual policies and packages of policies. Doing so will yield more information than choosing only one option. Undertaking both individual assessments and assessments for combinations of policies should be considered where the end user requires information on both, resources are available to undertake multiple analyses and undertaking both is feasible.

Where users choose to assess both an individual policy and a package of policies that includes the individual policy assessed, they should define each assessment separately and treat each as a discrete application of this methodology, to avoid confusion of the results.

TABLE **5.4**

**Advantages and disadvantages of assessing policies individually or as a package**

| Approach | Advantages | Disadvantages |
|---|---|---|
| Assessing policies individually | Shows the effectiveness of individual policies, which decision makers may require to make decisions about which individual policies to support.<br>May be simpler than assessing a package in some cases, since the causal chain and range of impacts for a package may be significantly more complex. | The estimated impacts from assessments of individual policies cannot be straightforwardly summed to determine total impacts, if interactions are not accounted for. |
| Assessing policies as a package | Captures the interactions between policies in the package and better reflects the total impacts of the package.<br>May be simpler than undertaking individual assessments in some cases, since it avoids the need to disaggregate the effects of individual policies. | Does not show the effectiveness of individual policies.<br>May be difficult to quantify. |

*Source:* Adapted from WRI (2014).

TABLE **5.5**

**Criteria for determining whether to assess policies individually or as a package**

| Criterion | Questions | Recommendation |
|---|---|---|
| Objectives and use of results | Do the end users of the assessment results want to know the impact of individual policies (e.g. to inform choices on which individual policies to implement or continue supporting)? | If "Yes", undertake an individual assessment. |
| Significant interactions | Are there significant (major or moderate) interactions between the identified policies, either overlapping or reinforcing, that will be difficult to estimate if policies are assessed individually?<br>For example, policies that target other sectors can coexist and reinforce forest policies that focus on reducing drivers of deforestation and/or degradation. These include policies that:<br>• promote agricultural intensification<br>• support the use of alternative fuels<br>• reform transportation networks. | If "Yes", consider assessing a package of policies. |
| Feasibility | Is it possible (e.g. are data available) to assess a package of policies? | If "No", undertake an individual assessment. |
| | For ex-post assessments, is it possible to disaggregate the observed impacts of interacting policies? | If "No", consider assessing a package of policies. |

*Source:* Adapted from WRI (2014).

## 5.3 Choose ex-ante or ex-post assessment

Choose whether to carry out an ex-ante assessment, an ex-post assessment, or a combined ex-ante and ex-post assessment. Choosing between ex-ante and ex-post assessment depends on the status of the policy. Where the policy is planned or adopted, but not yet implemented, the assessment will be ex-ante by definition. Alternatively, where the policy has been implemented, the assessment can be ex-ante, ex-post, or a combination of ex-ante and ex-post. The assessment is ex-post assessment if the objective is to estimate the impacts of the policy to date, an ex-ante assessment if the objective is to estimate the expected impacts in the future, and a combined ex-ante and ex-post assessment if the objective is to estimate both the past and future impacts. An ex-ante assessment can include historical data if the policy is already implemented, but it is still ex-ante (rather than ex-post) if the objective is to estimate future effects of the policy.

# 6 Identifying impacts: how forest policies reduce emissions or enhance removals

*To estimate the GHG impacts of a policy, it is important to understand how the policy is intended to be implemented and how it will achieve the desired GHG mitigation outcome. A causal chain is a conceptual diagram representing the sequence of changes that are expected to occur as a result of the policy. Implicitly, these changes are relative to a baseline scenario.*

*This chapter provides a method to develop a causal chain by considering how the policy will be implemented, who it will affect, its potential intermediate effects and how these effects cause GHG impacts. The intermediate effects are mapped in a causal chain to show how the policy leads to the intended GHG impacts. The causal chain serves as the basis for defining the GHG assessment boundary. This chapter also provides a method for defining the assessment period.*

**Checklist of key recommendations**

- Identify all stakeholders affected by, or with influence on, the policy
- Identify the inputs and activities for implementing the policy
- Identify all intermediate effects of the policy
- Identify all potential GHG impacts of the policy
- Develop a causal chain
- Include all significant GHG impacts in the GHG assessment boundary
- Define the assessment period

## 6.1 Identify GHG impacts

To identify the GHG impacts of the policy, it is useful to first identify the stakeholders affected by, or with influence on, the policy, and the inputs and activities associated with implementing the policy. Inputs are resources that go into implementing the policy, while activities are administrative activities involved in implementing the policy. These inputs and activities lead to intermediate effects, which are changes in behaviour, technology, processes or practices that result from the policy. The intermediate effects then lead to the policy's GHG impacts.

A causal chain approach is used to understand how the policy, and its corresponding inputs and activities, cause intermediate effects and ultimately result in GHG impacts. A causal chain is a conceptual diagram tracing the process by which the policy leads to GHG impacts through a series of interlinked logical and sequential stages of cause-and-effect relationships. It allows users to visually understand how policies lead to changes in emissions. An example causal chain is provided in Figure 6.2.

The sections below provide a method for identifying intermediate effects (through identifying stakeholders, and inputs and activities), identifying potential GHG impacts and developing a causal chain. The causal chain provides the basis for defining the GHG assessment boundary (Section 6.2).

FIGURE **6.1**

**Overview of steps in the chapter**

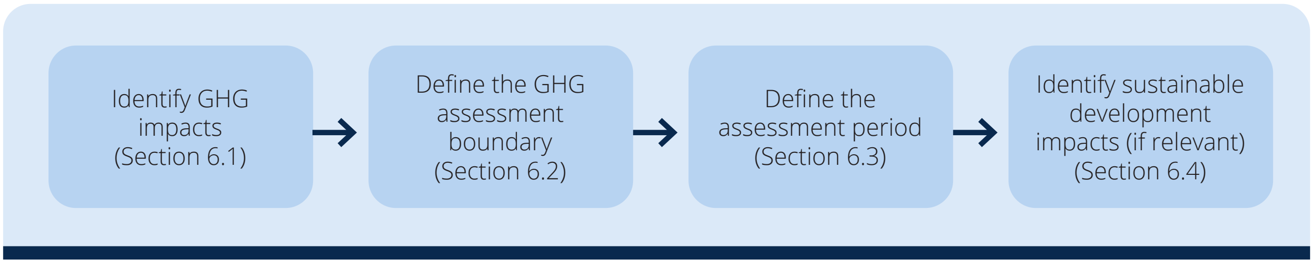


FIGURE **6.2**

**Example of a causal chain**


*Abbreviation:* PES, payment for ecosystem services

The causal chain is also used to estimate the GHG impacts of the policy ex-ante using the method in Chapter 8. Monitoring the intermediate effects can allow users to evaluate the performance of the policy and to attribute GHG impacts to policy implementation.

### 6.1.1 Identify intermediate effects

To identify intermediate effects, first identify the stakeholders of the policy, then the inputs and administrative activities associated with implementing the policy. Following this, identify and describe the intermediate effects of the policy. These three steps are described below.

**Step 1: Identify stakeholders**
It is a *key recommendation* to identify all stakeholders affected by, or with influence on, the policy. Stakeholders can be people, organizations, communities or individuals. They include different agencies and levels of government, as well as civil society and private sector organizations. Stakeholders may be affected by the policy or may influence the policy. Some typical stakeholders for the forestry sector include:

- communities, indigenous peoples or marginalized groups that are involved in, or affected by, forest resources
- producer associations
- NGOs or civil society organizations
- farmers and ranchers
- education and research institutions
- suppliers of equipment and inputs
- commercial forest companies
- other companies
- informal forest businesses
- national and subnational government agencies
- government entities responsible for forest management, and/or agriculture and livestock management
- financial institutions
- consumers.

Identifying stakeholders is necessary for estimating the likely implementation potential of the policy in Chapter 8, where barriers to implementation and economic implications of a policy from the perspective of stakeholders are evaluated.

A participatory process is helpful to identify the full range of stakeholders and understand how they may be affected by, or influence, the policy. The ICAT *Stakeholder Participation Guide* provides information on how to identify stakeholders (Chapter 5), including marginalized people or groups. Users may also identify affected stakeholders from existing stakeholder mapping exercises.

**Step 2: Identify inputs and administrative activities**
It is a *key recommendation* to identify the inputs and activities for implementing the policy. Table 6.1 provides definitions and examples of inputs and administrative activities.

Where feasible, when describing inputs, specify the amount of money that goes into implementing the policy and is paid out as part of the administrative activities. Identifying inputs and administrative activities is necessary for determining the economic feasibility of the policy in Chapter 8.

**Step 3: Identify and describe intermediate effects**
It is a *key recommendation* to identify all intermediate effects of the policy. Intermediate effects can be characterized by how stakeholders are expected to respond to the inputs or administrative activities, or to other intermediate effects of the policy. Intermediate effects can also include the measures that are enabled or incentivized by the policy. The following are examples of how stakeholders may respond to inputs, administrative activities or other effects:

- Comply with regulations.
- Access subsidies or incentives.
- Sign up or commit to programmes.
- Purchase new equipment in order to comply with a policy.
- Plant trees with payments received.

TABLE **6.1**

**Summary of inputs and activities**

| | Definition | Examples |
|---|---|---|
| Inputs | Resources that go into implementing a policy | • Money allocated to training and education programmes<br>• Money allocated to research programmes<br>• A new programme authorized out of the national budget<br>• Private financing secured to co-fund a government programme |
| Administrative activities | Administrative activities involved in implementing the policy (undertaken by the authority or entity that implements the policy) | • Payments from a government agency for tree planting<br>• Establishment of tree nurseries by a government agency<br>• Payment from a government agency to communities to develop grazing management plans and for fences for implementation of the plans<br>• Grants offered to extend training in new cultivation methods<br>• Additional staff hired to work with farmers on technology transfer<br>• Prohibitions placed on tree cutting for a given size class<br>• Improvement in enforcement of forestry standards<br>• Easing of credit access by a government agency for technology adoption by farmers and ranchers |

*Source:* Adapted from WRI (2014).

- Sign up for training and increase knowledge of technologies or practices.
- Change forest management strategies (e.g. increase rotation age or increase harvest efficiency by reducing damage to unfelled trees).

Intermediate effects can also be characterized as land based or market based:

- **Land-based effects** occur when a land use shifts from one land category to another – for example, when agriculture expands into forest land.
- **Market-based effects** occur when the policy reduces the production of a commodity, causing a change in the supply and market demand equilibrium that results in a shift of production elsewhere to make up for the supply. For example, when timber production decreases as a result of a restriction on the minimum age of trees on public lands, timber production may increase on private lands to compensate for the loss of supply.

Intermediate effects can be characterized as intended or unintended. Unintended intermediate effects occur as a result of compensating actions (i.e. rebound effects). Unintended effects can impact other sectors and members of society not targeted by the policy. In particular, forest policies can have unintended effects on the agriculture sector. Users should consider both intended and unintended intermediate effects.

When identifying intermediate effects, it may help to consider this general framing question: If effect X happens, what do we expect the reactionary effect to be? For completeness, confirm that all types of mitigation practices, and technology or land-use changes enabled or incentivized by the policy are included as activities or intermediate effects.

Consultations with stakeholder groups can help to identify a full range of intermediate effects, and to identify and address possible unintended or negative impacts early on. Refer to the ICAT *Stakeholder Participation Guide* (Chapter 8) for information on designing and conducting consultations.

Users should describe each intermediate effect according to the following characteristics:

- affected land category
- affected activities

- direction and amount of effect
- geographic location of effect
- timing of effect.

It is useful to create a table of effects to describe these characteristics. Example tables (Tables 6.2 and 6.3) for describing intermediate effects are provided at the end of this section.

*Affected land category*
Intermediate effects can be a change in how land is used or managed. When this occurs, describe the affected land area by its size and using the land categories found in the IPCC 2006 GL, volume 4, Chapter 2.[11] Using the IPCC land categories will help with estimating GHG emissions in Chapters 7 and 8. Use the following IPCC land categories to describe land upon which the intermediate effect occurs:

- forest land
- cropland
- grassland
- wetlands
- settlements
- other land.

When intermediate effects are a change in how land is used, describe the change in terms of a land category being converted from one type to another – for example:

- land converted to cropland; more specifically, forest land converted to cropland, and grassland converted to cropland
- land converted to grassland; more specifically, forest land converted to grassland
- land converted to forest land; more specifically, cropland converted to forest land, and grassland converted to forest land
- land converted to settlements
- land converted to other land (category).

When intermediate effects are a change in how land is managed, describe the change as a conversion from one type of management to another within a land category (the land category does not change) – for example:

- forest land remaining forest land; more specifically, reducing the impact of logging on land managed for timber.

*Affected activities*
Intermediate effects can also be a change in activity, practice or technology, such as a reduction in the amount of timber harvested. These effects should be described by the activity data categories that are used to prepare national GHG inventories according to IPCC guidelines. The activity data categories are used to estimate GHG emissions following the method in Chapters 7 and 8.

*Direction and amount of effect*
When labelling intermediate effects, identify the direction of the effect. For example, label the activity as "increase" if the policy leads to an increase in an identified activity, such as an increase in area of forest land.

Where known, include the intended amount of the effect in the description of the intermediate effect. The intended amount of the effect may have been determined as part of the policy design process. For example, if a policy aims to incentivize reforestation of 10,000 ha of cropland, the intermediate effect can be described as "increase the amount of cropland converted to forest land by 10,000 ha". The direction of the effect is to increase. With this example, note the use of IPCC land categories in the description "cropland converted to forest land".

*Geographic location*
Describe the geographic location where the intended intermediate effects are likely to occur. The geographic location of intended effects is likely to be within the jurisdiction of the policy. For example, for a policy that aims to reforest degraded land, if a specific geographic location is targeted by the policy, the effect can be described as "increase the amount of degraded land converted to forest land in the tropical dry forest in the north coast region of the jurisdiction by 10,000 ha".

Information on geographic location will be relevant for collecting activity data and selecting emission factors when estimating GHG emissions, and for monitoring impacts ex-post.

[11] Available at: www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html.

Unintended intermediate effects can occur outside the intended jurisdiction of the policy. Where the policy causes a shift in activity to outside the jurisdiction, the effect can be described as out-of-jurisdiction.

*Timing of the effect*

Effects can occur in both the short term and the long term. Describe effects as short term or long term. The distinction between short term and long term can be defined based on the policy being assessed. Some effects may also be temporary, whereas others are permanent. If known, identify when the effect is likely to occur using specific years or with reference to the start date of a policy. For example, a policy may seek to affect a certain group of stakeholders or actions during the first five years and then a different group during the last five years. This information will be used for estimating GHG emissions and monitoring implementation ex-post.

To continue with the policy example above, if a specific time frame is targeted by the policy, that characteristic can be added to the description as "increase the amount of cropland converted to forest land in the southern tropical region of the jurisdiction by 10,000 ha by 2030".

*Example of describing intermediate effects*

Table 6.2 provides an example of how to describe inputs and administrative activities, and Table 6.3 provides an example of how to describe intermediate effects.

### 6.1.2 Identify potential GHG impacts

Intermediate effects can lead to GHG impacts. For example, increasing the area of cropland that is reforested is an intermediate effect that leads to an increase in the amount of carbon sequestered by an area of land.

A/R activities can increase carbon sequestration and/or reduce carbon dioxide ($CO_2$) emissions by establishing, increasing or restoring above-ground biomass. SFM activities increase carbon sequestration and/or reduce $CO_2$ emissions on forest lands managed for wood products (e.g. timber, pulpwood, fuelwood) by increasing biomass carbon stocks through improving forest management practices. Reduced deforestation/degradation activities reduce net $CO_2$ emissions by avoiding the conversion of forest land to another land-use category with lower carbon stock.

It is a *key recommendation* to identify all potential GHG impacts of the policy. To ensure a complete assessment, users should consider all identified intermediate effects and associate them with specific GHG impacts.

All potential GHG impacts should be identified at this stage so that they can be used to develop the causal chain following the method in Section 6.1.3. A subset of GHG impacts will be identified and included in the GHG assessment boundary following the method in Section 6.2.

### 6.1.3 Develop a causal chain

It is a *key recommendation* to develop a causal chain. Users should start by drawing links from the policy to the inputs and activities. Links are also drawn from inputs and activities to affected stakeholders and intermediate effects. There may be a series of intermediate effects in the causal chain until it leads to a GHG impact. All the detailed information about affected stakeholders, inputs, activities and intermediate effects, from the steps in Sections 6.1.1 and 6.1.2, should be included in the causal chain. Figure 6.2 provides an example causal chain to illustrate the process.

A causal chain represents the sequence of intermediate effects expected to occur as a result of the policy. Implicitly, these changes are relative to a baseline scenario. For example, if an intermediate effect is that 10,000 ha of cropland will be converted to forest land, this means that 10,000 more hectares of cropland will be converted to forest land than in the scenario without the policy intervention (i.e. in the baseline scenario).

Consultations with stakeholders can help with developing and validating the causal chain by integrating stakeholder insights on cause–effect relationships between the policy, behaviour change and expected impacts. Refer to the ICAT *Stakeholder Participation Guide* (Chapter 8) for information on designing and conducting consultations.

TABLE **6.2**

**Example of how to describe inputs and administrative activities**

| | Detail/explanation | Geographic location of effect | Timing of effect |
|---|---|---|---|
| **Inputs** | | | |
| Legislation is passed to allow taxation of ecosystem service users. | Legislative body enacts a tax for users of ecosystem services (water and hydroelectric utilities, tourism companies and others). | National scale | 2021 |
| Tax revenue is allocated to Ministry of Environment to pay PES contracts. | National government allocates tax revenue to Ministry of Environment, to make payments to landowners who have executed and complied with PES contract terms. | National scale | Annually, 2022–2030 |
| **Administrative activities** | | | |
| Annual tax revenue from ecosystem service users is generated. | Ecosystem users pay taxes. | National scale | Annually, 2021–2030 |
| Landowners execute PES contracts. | Landowners voluntarily sign contracts to participate in the programme. | Privately owned forest land or low-productivity cropland | Rolling enrolment, 2021–2030 |
| Extension service provides training and support to landowners under contract. | Extension service provides SFM and A/R training, and monitoring and reporting support to landowners who are under contract. | Privately owned forest land or low-productivity cropland | Ongoing, based on landowner needs, 2021–2030 |
| Landowners under contract submit required reporting. | Landowners submit year 1 and year 10 forest inventory reports, and annual harvest data. | Regions where payments have been dispersed | Annually, 2022–2030 |
| Extension service conducts site visits to land under contract. | Extension service specialists conduct routine site visits to verify forest inventory and harvest reports submitted by landowners. | Regions where payments have been dispersed | Ongoing, 2022–2030 |
| Payments are administered to landowners who comply with the terms of PES contracts. | Ministry of Environment pays contractual rates for SFM and A/R activities.<br>Rates are based on number of hectares where sustainable harvest regimes, general tree planting, tree planting with endangered species, and/or natural regeneration occur. | Privately owned forest land or low-productivity cropland | 2022–2030 |

*Abbreviation:* PES, payment for ecosystem services

TABLE **6.3**

**Example of how to describe intermediate effects**

| Intermediate effect | Details | Affected parameter | Direction of effect | Amount of effect | Geographic location of effect | Timing of effect |
|---|---|---|---|---|---|---|
| Forests have sustainable yields | Management changes such as increasing the minimum age or tree diameter at cutting result in increases in merchantable volumes and higher average growth rates. | Forest land remaining forest land under SFM | Increase | 150,000 ha | Contracted land | At least one harvest cycle |
| Forests are healthy | Management changes such as extending the re-entry period for selective harvesting and improving the selection of trees for harvesting decrease the chances of degradation from selective harvesting. | Forest land remaining forest land under SFM | Increase | 150,000 ha | Contracted land | At least one harvest cycle |
| Change in supply of wood products | SFM leads to decreased harvest rates in the near term, reducing the supply of wood products. | Wood removals | Decrease | Unknown | Contracted land | Contract period |
| Change in area of timber harvest | Market forces from the decrease in supply of harvested wood products drive increased timber harvesting elsewhere. | Wood removals, and forest land converted to another land category | Increase | Unknown | Unknown, outside areas enrolled in programme | Contract period |
| Low-productivity cropland owners implement A/R | Low-productivity cropland owners implement A/R activities on low-productivity cropland converted to forest land. | Cropland converted to forest land | Increase | 60,000 ha | Contracted land | Contract period |
| Survival and growth of trees | Tree planting, removing competing species and removing ongoing disturbances that prevent natural regeneration result in viable forests that accumulate carbon in forest carbon pools. | Cropland converted to forest land | Increase | 60,000 ha | Contracted land | Contract period |
| Change in agricultural product supply | Conversion of cropland to forest land results in a near-term decrease in supply of agricultural products. | Crop and other product output | Decrease | Unknown | Contracted land | Contract period |
| Land conversion for agriculture | Market forces from the decrease in supply of agricultural products drive increased land conversion for agriculture elsewhere. | Land converted to cropland | Increase | Unknown | Unknown, outside areas enrolled in programme | During and after contract period |
| Agricultural intensification | Market forces from the decrease in supply of agricultural products drive agricultural intensification on existing cropland. | Cropland remaining cropland | Increase | Unknown | Unknown, outside areas enrolled in programme | During and after contract period |

## 6.2 Define the GHG assessment boundary

It is a *key recommendation* to include all significant GHG impacts in the GHG assessment boundary. The GHG assessment boundary defines the range of GHG impacts that are included in the policy assessment. Not all GHG sources or carbon pools associated with GHG impacts in the causal chain will need to be included in the GHG assessment boundary. In this step, users determine which GHG sources and/or carbon pools[12] are significant and should be included in the analysis. This is done by evaluating the likelihood and relative magnitudes of each of the GHG impacts identified in Section 6.1, using the following steps:

- Step 1. Assess the likelihood that each GHG impact will occur.
- Step 2. Assess the expected magnitude of each GHG impact.
- Step 3. Determine the significance of each GHG impact.

### Step 1: Assess the likelihood that each GHG impact will occur

For each GHG impact identified in Section 6.1, assess the likelihood that it will occur by classifying each impact according to the options in Table 6.4. For ex-ante assessments, this involves predicting the likelihood of each impact occurring in the future as a result of the policy. For ex-post assessments, it involves assessing the likelihood that the impact occurred in the past as a result of the policy – impacts may have occurred during the assessment period for reasons unrelated to the policy being assessed. If a given impact is unlikely to occur, the subsequent impacts that follow from that impact can also be considered unlikely to occur. Where the likelihood is unknown or cannot be estimated, the impact should be classified as “possible”.

As far as possible, the likelihood classification should be based on evidence, such as published literature, prior experience, modelling results, risk management methods, consultation with stakeholders, expert judgment or other methods.

TABLE **6.4**

**Assessing likelihood of GHG impacts**

| Likelihood | Description | Approximate likelihood (rule of thumb) |
|---|---|---|
| Very likely | Reason to believe the impact will happen (or did happen) as a result of the policy. | ≥90% |
| Likely | Reason to believe the impact will probably happen (or probably happened) as a result of the policy. | 66–89% |
| Possible | Reason to believe the impact may or may not happen (or may or may not have happened) as a result of the policy. About as likely as not. Cases where the likelihood is unknown or cannot be determined should be considered possible. | 33–65% |
| Unlikely | Reason to believe the impact probably will not happen (or probably did not happen) as a result of the policy. | 10–32% |
| Very unlikely | Reason to believe the impact will not happen (or did not happen) as a result of the policy. | <10% |

*Source:* Adapted from WRI (2014).

[12] The term “carbon pools” is used here instead of “sinks” because the quantification methods for sinks are based on specific carbon pools and the GHG boundary needs to be identified at the level of the carbon pool.

Users should consult stakeholders when assessing the likelihood of impacts. Refer to the ICAT *Stakeholder Participation Guide* (Chapter 8) for more information on how to consult with stakeholders.

**Step 2: Assess the magnitude of each GHG impact**

Next, classify the magnitude of each GHG impact as major, moderate or minor according to Table 6.5. This involves approximating the change in GHG emissions and removals resulting from each GHG impact. GHG emissions and removals do not need to be accurately calculated in this step, but the relative magnitude should be categorized.

The relative magnitude of each GHG impact depends on the size of the GHG source or carbon pool affected and the magnitude of the change expected. The size of the GHG source or carbon pool can be estimated based on GHG inventories or other sources. The relative magnitude of each GHG impact should be estimated based on the absolute value of total change in GHG emissions and removals, taking into account both increases and decreases.

This determination requires some level of expert judgment and should be done in consultation with stakeholders. If it is not possible to classify the magnitude of an impact as major, moderate or minor (e.g. due to lack of data or capacity), users can classify a given impact as “uncertain” or “cannot be determined”, as appropriate. Users can also estimate changes in activity data rather than changes in emissions to assess the magnitude of the GHG impact, where relevant.

**Step 3: Determine the significance of each GHG impact**

Once the likelihood and magnitude of each impact have been determined, review the classifications for likelihood and magnitude to determine whether each impact is significant. In general, users should consider impacts to be significant unless they are either minor in size or unlikely or very unlikely to occur (see Figure 6.3). Impacts that were considered to be minor in size or unlikely or very unlikely to occur at the time of an ex-ante assessment should be re-evaluated for significance during an ex-poste assessment.

Table 6.6 provides additional considerations for evaluating which GHG sources and carbon pools to include in the GHG assessment boundary.

The ICAT *Agriculture Methodology* lists considerations for which GHG sources and carbon pools to include in a GHG assessment boundary for mitigation activities that lead to enhanced $CO_2$ sequestration and reduced $CO_2$ emissions in the soil carbon pool in pasture, grazing lands and croplands.

TABLE **6.5**

**Estimating relative magnitude of GHG impacts**

| Relative magnitude | Description | Approximate relative magnitude (Rule of thumb) |
|---|---|---|
| Major | The change in the GHG source or carbon pool is (or is expected to be) substantial in size (either positive or negative). The impact significantly influences the effectiveness of the policy. | >10% |
| Moderate | The change in the GHG source or carbon pool is (or is expected to be) moderate in size (either positive or negative). The impact somewhat influences the effectiveness of the policy. | 1–10% |
| Minor | The change in the GHG source or carbon pool is (or is expected to be) insignificant in size (either positive or negative). The impact is inconsequential to the effectiveness of the policy. | <1% |

*Source:* Adapted from WRI (2014).

TABLE **6.6**

## Considerations for evaluating significance of GHG sources and carbon pools

| Source or carbon pool | GHG | Considerations |
|---|---|---|
| Biomass carbon | $CO_2$ | This source should be considered significant for all policies with interventions that target forest carbon. |
| Soil carbon | $CO_2$ | Generally, soil carbon stocks will not decline significantly as a result of a forest policy. Consider including this source for forest policies that affect land-use change (reduced deforestation and A/R) because, in some cases, gains in soil carbon stocks can occur. For example, soil carbon stocks can increase significantly in reduced deforestation projects when (a) initial forest soil carbon stock is moderately large and (b) the policy helps to avoid a shift to conventional tillage agriculture. However, it is conservative to exclude this pool from the policy assessment. |
| Dead organic matter | $CO_2$ | In most cases, this pool is expected to have a relatively minor effect and can be excluded. Consider including this pool if the policy interventions impact peatland or wetland ecosystems. |
| Harvested wood products – intended and within geographic area of the policy | $CO_2$ | Consider including this source when forest management policies aim to promote more production of long-term HWP than a baseline of dominant short-term HWP, and when A/R results in an increased supply of long-term HWP that would not occur in the baseline. In most other forest policy scenarios, it is likely that the relative magnitude of the effect will be small. |
| Harvested wood products – unintended and outside geographic area of the policy | $CO_2$ | Consider including this source if changes in forest management inside the geographic area of the policy will significantly reduce timber supply and lead to increases in timber harvesting outside the geographic area of the policy. |
| Biomass burning | $CO_2$, $CH_4$, $N_2O$ | Forest policies are not likely to intentionally increase biomass burning compared with baseline. They may intentionally reduce biomass burning compared with baseline; however, it is conservative to exclude this source in that situation.<br>If unintended land conversions are likely (see below), consider including biomass burning because it may increase as a result of the unintended land-use change. |
| Fuel combustion | $CO_2$ | There may be some emissions related to site preparation and planting for A/R projects. However, these are likely to be relatively minor in magnitude and can be excluded. |
| Unintended land conversions to cropland or grassland | $CO_2$ | This may be significant for forest polices that are intended to affect land-use change (i.e. reduced deforestation and A/R). If food supply is decreased as a result of the policy, unintended land-use change is possible. This may occur when the policy intervention reduces crop outputs compared with baseline. As part of its Jurisdictional and Nested REDD+ programme, the Verified Carbon Standard Program provides guidance for quantifying the effective area needed to maintain production, in the Verra *Global Commodity Leakage Module: Effective Area Approach*;[a] and guidance for evaluating the volume of foregone commodity production, in the *Global Commodity Leakage Module: Production Approach*.[b] Both these resources can be adapted to assess the significance of a forest policy on food supply or demand.<br>If unintended land conversion is considered to be significant, it is recommended to include the estimation of converted land area within the policy land stratification of affected land categories. |

*Abbreviations:* $CH_4$, methane; HWP, harvested wood products; $N_2O$, nitrous oxide

[a] Verra (2014a).

[b] Verra (2014b).

FIGURE **6.3**

**Recommended approach for determining significance based on likelihood and magnitude**

| Relative magnitude | Magnitude: Minor | Magnitude: Moderate | Magnitude: Major |
|---|---|---|---|
| **Very likely** | Insignificant | Significant | Significant |
| **Likely** | Insignificant | Significant | Significant |
| **Possible** | Insignificant | Significant | Significant |
| **Unlikely** | Insignificant | Insignificant | Insignificant |
| **Very unlikely** | Insignificant | Insignificant | Insignificant |

*Source:* Adapted from WRI (2014).

## 6.3 Define the assessment period

It is a *key recommendation* to define the assessment period. The assessment period is the time period over which impacts resulting from the policy are assessed. The starting date and the duration of the assessment period may vary depending on whether an ex-ante or ex-post assessment will be conducted.

Where possible, users should align the assessment period with other assessments being conducted using ICAT methodologies. For example, where users are assessing the forest policy's sustainable development impacts using the ICAT *Sustainable Development Methodology* in addition to assessing GHG impacts, the assessment period should be the same for both the sustainable development and GHG impact assessments.

### 6.3.1 Ex-ante assessment

For ex-ante assessment, users should consider the assessment objectives and stakeholders' needs when determining the assessment period. Where the objective is to understand the expected contribution of the policy towards achieving a country's NDC, it may be most appropriate to align the assessment period with the NDC implementation period (e.g. ending in 2030). To align with longer-term trends and planning, users should select an end date such as 2040 or 2050.

The ex-ante assessment period is usually determined by the longest-term impact included in the GHG assessment boundary. The assessment period can continue until the policy implementation period ends or for longer, as some significant GHG impacts can occur after the policy implementation period ends. The assessment period should be defined to include all significant GHG impacts included in the GHG assessment boundary, based on when they are expected to occur (as described in Section 6.1.1, step 3).

To determine the end of the assessment period, users can choose from the following approaches, among others:

- a time frame or date that is directly specified in the policy goal or target (e.g. reduce emissions by 50% by 2020)
- the length of time for which the policy is funded or expected to be funded
- a period that has otherwise been identified as the policy implementation end date
- 20-year assessment period (based on the rationale below).

When determining the assessment period, GHG emission and removal dynamics should be considered for GHG impacts that involve carbon sequestration in soils and/or biomass. For example, changes in land use or land management can change soil carbon sequestration rates until a new equilibrium is reached. The IPCC suggests a default 20-year transition period for soil carbon dynamics to reach a new equilibrium.[13] Generally, when establishing new forests or when forests regrow after harvest and disturbance, the initial rate of carbon gain in the biomass pool is higher than later, when the forest reaches maturity. Also, forest biomass is removed or lost as a result of multiple factors. Forest harvesting, which occurs in close to 20-year cycles, results in removal of biomass from forest stands, and the end use of the harvested wood determines the amount of carbon loss over time.

Policies that impact carbon sequestration should be evaluated over a sufficiently long assessment period to capture, as far as possible, the net impact of gains and losses in carbon pools. If practicable, given the IPCC 20-year transition period for soils and an approximate 20-year harvest cycle for forests, it is recommended that users set the assessment period to a minimum of 20 years, even if this extends the assessment period beyond the policy implementation period.

Assumptions about baseline and policy scenarios become more uncertain the further forward in time the assumptions are projected. Therefore, it is also recommended that the assessment period is not extended much further than 20 years. Rather, users can define multiple discrete assessment periods that cover the length of the policy implementation period, with each assessment period not exceeding 20 years. For example, where the policy implementation period is 2020–2060, there can be two assessment periods: 2020–2040 and 2041–2060.

### 6.3.2 Ex-post assessment

For an ex-post assessment, the assessment period can be the period between the date the policy is implemented and the date of the assessment, or a shorter period between these two dates. The assessment period for a combined ex-ante and ex-post assessment should consist of both an ex-ante assessment period and an ex-post assessment period.

In addition, users can separately estimate and report impacts over any other time periods that are relevant. For example, if the assessment period is 2020–2040, a user can separately estimate and report impacts over the periods 2020–2030, 2031–2040 and 2020–2040.

[13] IPCC (2006).

## 6.4 Identify sustainable development impacts (if relevant)

Forest policies have broader sustainable development impacts, in addition to their GHG impacts. Sustainable development impacts are changes in environmental, social or economic conditions that result from a policy, such as changes in air quality, water quality, health, quality of life, employment or income.

Refer to the ICAT *Sustainable Development Methodology* for the method for conducting an assessment of sustainable development impacts. Table 6.7 lists examples of sustainable development impacts that may be associated with forest policies, categorized according to the ICAT *Sustainable Development Methodology*. The SDGs most directly relevant to each impact category are indicated in parentheses.

TABLE **6.7**

**Examples of sustainable development impacts and indicators relevant to forest policies**

| Impact categories | Indicators |
|---|---|
| **Environmental impacts** | |
| Biodiversity of terrestrial ecosystems (SDG 15) | • Species diversity (number of species or species richness)<br>• Change in threat status of species (abundance of selected key species, invasive alien species or endangered species)<br>• Proportion of terrestrial area protected<br>• Damage to ecosystem (potential affected fraction of species)<br>• Extinction rate<br>• Biodiversity intactness index<br>• Quality of ecosystem services |
| Land-use change, including deforestation, forest degradation and desertification (SDG 15) | • Annual change in degraded or desertified arable land (% or hectares)<br>• Area of forested land as a percentage of original or potential forest cover<br>• Proportion of land area covered by forests<br>• Area of forest under sustainable forest management<br>• Arable and permanent cropland area<br>• Area under organic farming |
| Soil quality (SDG 2) | • Net emissions of sulfur dioxide, ammonia and nitrogen oxides ($NO_x$) (tonnes/year)<br>• Soil organic matter<br>• Acidity (pH)<br>• Extent of soil erosion |
| **Social impacts** | |
| Access to land (SDG 2) | • Percentage of population with access to land |
| Indigenous rights (SDG 2, SDG 4, SDG 10) | • Extent of recognition of ancestral land titles<br>• Extent of free, prior and informed consent<br>• Extent of protection of Indigenous traditional knowledge |
| Resilience to dangerous climate change and extreme weather events (SDG 13) | • Reduction of natural disaster risks |
| Economic productivity (SDG 8, SDG 2) | • Agricultural productivity (harvested crop yields per hectare) |

*Source:* Adapted from ICAT *Sustainable Development Methodology*.

# PART III

## Assessing impacts

# 7 Estimating the baseline scenario and emissions

*When using the emissions approach, estimating the GHG impacts of a policy requires a reference case, or baseline scenario, against which impacts are estimated. The baseline scenario represents what would have happened in the absence of the policy intervention. Baseline emissions and removals are estimated according to the most likely baseline scenario that includes credible assumptions on land use, land-use changes and timber management practices, and the associated emissions and removals that would have occurred without the implementation of the policy.*

*The method in this chapter can be used to determine the baseline scenario and estimate emissions ex-ante or ex-post. Estimating baseline emissions is optional; users can calculate the GHG impacts of the policy directly, without explicitly determining separate baseline and policy scenarios, using the activity data approach. In such cases, users can skip to* *Chapter 8*.

**Checklist of key recommendations**

- Identify the intended policy outcomes and target drivers
- Stratify land by land-use category
- Estimate the area of land in each stratum
- Estimate the carbon stock change (i.e. emission factor) for each carbon pool in each land stratum
- Calculate the cumulative GHG emissions and removals for the baseline scenario over the assessment period

## 7.1 Determine the baseline scenario

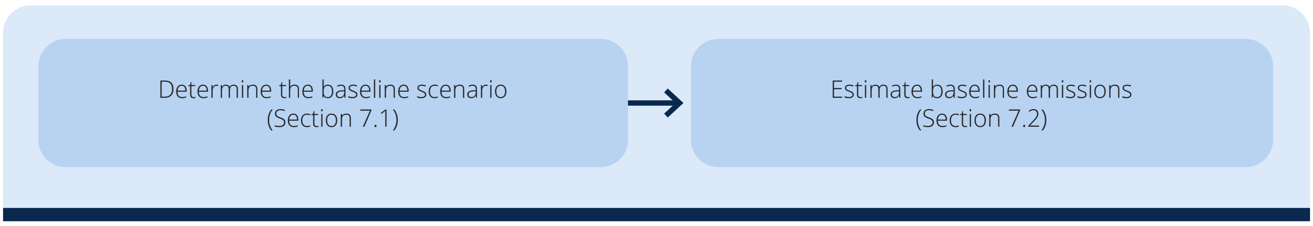
The most likely baseline scenario is determined by drivers that affect GHG emissions and carbon stocks. This step requires identifying parameters for these drivers and making reasonable assumptions about their most likely values in the absence of the policy.

When determining the baseline scenario, consider how the sector would have developed without the policy. For example:

- What mitigation practices or technologies would be implemented in the absence of the policy?
- Are there existing or planned policies, other than the policy being assessed, that are likely to have an impact on GHG emissions for the forestry sector?
- Are there non-policy drivers (e.g. market trends or non-anthropogenic processes) or other sectoral trends that should be reflected in the baseline scenario? For example
    - » changes in the demand for harvested wood products
    - » improvements in timber and forest management practices
    - » land-use change (e.g. natural regeneration)
    - » trends in the agriculture sector
    - » trends in biofuel production
    - » trends in development (e.g. settlements and infrastructure).

FIGURE **7.1**

**Overview of steps in the chapter**



To the extent possible, users should identify a single baseline scenario that is considered to be the most likely. In certain cases, multiple baseline options may seem equally plausible. Users can develop multiple baselines, each based on different sets of assumptions, rather than just one set. This approach produces a range of possible emissions reduction scenarios. Users can then conduct a sensitivity analysis to see how the results vary depending on the selected baseline scenario. More guidance about conducting a sensitivity analysis is provided in Chapter 12 of the *Policy and Action Standard*.

Users who are assessing the sustainable development, transformational or other GHG impacts of the policy should use the same underlying assumptions about macroeconomic conditions, demographics and other non-policy drivers. For example, if gross domestic product (GDP) is a macroeconomic condition needed for assessing both the job impacts and economic development impacts of an agriculture policy, users should use the same assumed value for GDP over time for both assessments.

### 7.1.1 Approaches to determining the baseline scenario

This section describes approaches to determining the most likely baseline scenario. There are multiple ways to project the baseline scenario, ranging from simple to complex. Depending on the availability and quality of forecasting data, any of the following approaches can be used for determining the baseline scenario. Figure 7.2 illustrates the different approaches.

**Constant baseline**
The constant baseline approach assumes that there will be no change in land use, land cover or forest management practices during the baseline period. It is the simplest approach because only historical data are required. Either the most recent available data or an average of the data from at least three years before the start of the policy implementation can be used to quantify the baseline parameters. This approach then assumes that the parameters are held constant for the assessment period, and the baseline is the continuation of the current or historical situation. For example, land will remain degraded under the baseline scenario. Although this baseline approach is the easiest, assessments based on a constant baseline may be less accurate.

**Simple trend baseline**
The simple trend baseline approach assumes that land use, land cover and forest management practices will evolve in the same way as in the past. This approach typically uses a linear or exponential extrapolation of the historical trend for each baseline parameter. Users can employ a statistical regression analysis to estimate trends. This approach can be easy to implement, but it does not include any assumptions about future policy measures or future mitigation actions. This approach should use historical data from 5–10 years before the implementation of the policy. More data points will strengthen the regression analysis. For example, land-use change in the future can be estimated by assuming that the same rate of change before policy implementation continues in the baseline.

**Advanced trend baseline**
The advanced trend baseline approach models the future evolution of the key drivers of emissions and factors, taking into account many interacting elements, including trends in macroeconomic conditions, demographics and other non-policy drivers.

A modelled baseline can be top-down or bottom-up:

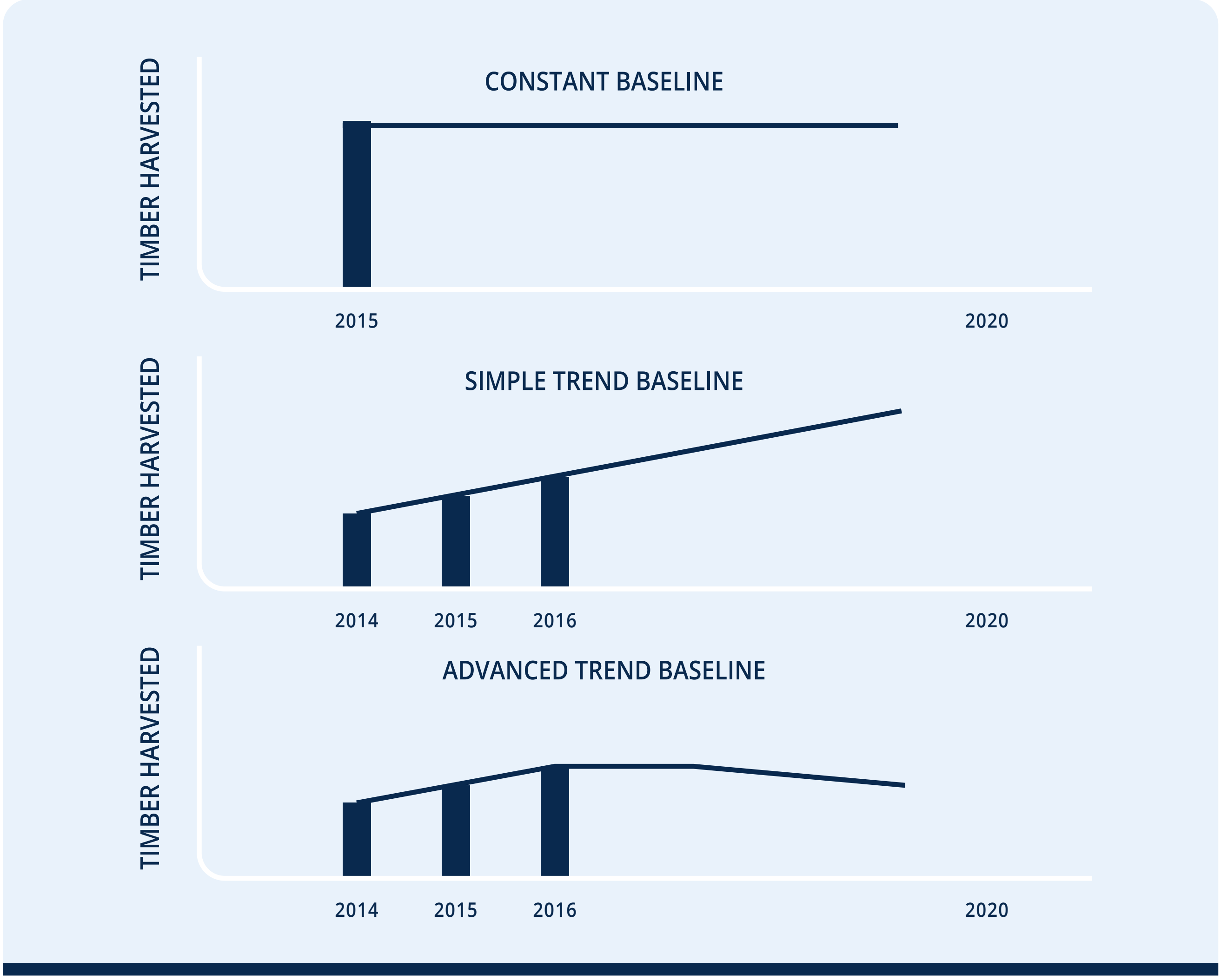
- **Top-down model.** This models how the economy or other exogenous factors (e.g. macroeconomic and demographic conditions) will impact the forestry sector. For example, the approach may model how population growth will impact land use, and then uses population forecasts to predict baseline land-use change.

- **Bottom-up model.** This approach models the interaction of key drivers on specific land use, land-use change and forest management practices. It can offer a more detailed projection of specific GHG sources and carbon pools. This approach is likely to require detailed data, such as forest inventory data, and data on drivers of land-use change, or specific timber or forest management practices. It is suitable in countries where emissions from this sector are small or their economic output is modest, because the expected trends in macroeconomic and demographic conditions may not be a good indicator of land use or land-use change.

A land use, land-use change and forestry (LULUCF) model projects the land use and land-use changes that are expected to occur in the baseline. A

FIGURE **7.2**

**Examples of constant, simple trend and advanced trend baselines**




comprehensive LULUCF model covers the following dimensions:

- **Sectoral.** There is sufficient detail to identify targeted economic opportunities within and across the sectors (e.g. land-use change, forest management, agricultural management, biofuel production). The model could include a market-clearing price and resource competition to capture the impact of mitigating emissions where forest and agriculture products are affected.
- **Spatial.** The model accounts for the heterogeneity of biophysical and economic conditions within and across regions as they relate to the production of food, fibre and fuel. For example, carbon sequestration rates can vary regionally. A spatial model could also model competition for region-specific resources, such as land and water, which affects economic responsiveness in forestry and agriculture.
- **Temporal.** The model can capture dynamic biophysical processes (e.g. soil and biomass carbon accumulation, fate of harvested wood products). It could also capture dynamic economic processes (e.g. investment, technological progress, demand trends, traditional commodity developments).

LULUCF models can be categorized according to their functional and methodological aspects, as follows:

- statistical or econometric models
- spatial interaction models
- optimization models (which include linear, dynamic, hierarchical and non-linear programmes, such as utility maximization models and multi-criteria decision-making models)
- integrated models (gravity, simulation and entry–exit models)
- models based on natural sciences
- models based on GIS
- models based on the Markov chain.[14]

A number of existing models can be used to project an advanced trend baseline. For example, the Global Biosphere Management Model (GLOBIOM) is an economic partial equilibrium model of the competition for global land use. In GLOBIOM, the demand for land is modelled based on exogenously specified regional drivers (including GDP growth, population growth, evolution of food diets and global bioenergy demand), and local characteristics of the land. Brazil has considered a model that includes the dynamics of land use that will be affected by competition and scale. The model provides the results of land allocation to different regions and biomasses in the country, thereby projecting the type of natural vegetation that is converted (deforested) into agricultural land. The projections are based on country-level plans up to 2030.[15]

### 7.1.2 Data sources

Multiple types of data can be used to develop baseline scenarios, including top-down and bottom-up:

- **Top-down data** – macro-level data or statistics collected at the jurisdictional or sectoral level. Examples are economic data on milk or meat consumption, land-use maps, population and GDP. In some cases, top-down data are aggregated from bottom-up data sources.
- **Bottom-up data** – data that are measured, monitored or collected at the facility, entity or project level. Examples are agricultural or livestock census data on current and/or historical livestock population, species and feed intake; and land-use categories classified by climate region, soil type and management.

The key parameters for estimating baseline emissions and removals in forests are:

- **activity data** – hectares of forest land remaining forest land, non-forest land converted to forest land, and forest land converted to non-forest land
- **carbon stock change factor** – the net change in carbon stocks per hectare of land, which can also be expressed as $CO_2$ emissions and removals per hectare of land. The carbon stock change represents the emission factor for a land use or land management.

Existing data that have been collected for other assessments (including from national GHG inventories, national communications, biennial update reports and biennial transparency reports[16]), which are prepared following IPCC guidelines, can be used for determining the baseline scenario, and estimating baseline emissions and removals. Where relevant, it may be important to use data that are consistent with national- or subnational-level sectoral baselines. Sources of data for the key parameters include:

- forest cover maps and regionally specific data
- country-level data from NAMA and low-carbon development programmes
- country-level REDD+ reporting or studies (e.g. national or subnational REDD+ forest reference emissions levels [FRELs] or forest reference levels [FRLs])
- Global Forest Watch data,[17] United States Geological Survey datasets,[18] or databases of the Food and Agriculture Organization of the United Nations.[19]

[14] MAPA (2015).

[15] MAPA (2015)

[16] Biennial transparency reports will supersede the biennial update report requirements from December 2024.

[17] Available at: www.globalforestwatch.org.

[18] Available at: https://archive.usgs.gov/archive/sites/landcover.usgs.gov/globallandcover.html.

[19] Available at: www.fao.org/faostat/es.

### 7.1.3 Choosing the approach to determine the baseline scenario

The choice of approach to determine the baseline scenario depends on users' resources, capacity, access to data, and availability of models and methodologies, and the parameters that are expected to change. A constant baseline is the simplest option and may be appropriate when parameters are considered likely to remain stable over time. A simple trend baseline is most appropriate if the change in baseline parameter values is expected to remain stable over time. Advanced trend baseline approaches may yield more accurate results than other approaches, since they take into account various drivers that affect conditions over time. However, more complex baselines will only be more accurate if the underlying data and methods used to model the impacts of drivers are robust. Users should use methods and data that yield the most accurate results within a given context, based on the resources and data available.

## 7.2 Estimate baseline emissions

This section provides a method for estimating baseline emissions. It provides suggestions for identifying data sources and methods for projecting key baseline scenario parameters. Figure 7.3 outlines the steps in this section.

The method can also be used to estimate policy scenario emissions for forest policies. To estimate policy scenario emissions, the same method should be used that was used to estimate baseline emissions, with new parameter values derived following the method in Sections 8.2–8.5 and, if relevant, new emission factors that represent conditions under the policy scenario. The policy scenario can be estimated ex-ante or ex-post using these methods.

Changes in land use can lead to an increase or decrease in forest carbon. For example, conversion of cropland to forest land results in a net increase in forest carbon. Conversely, conversion of cropland to forest land (deforestation) results in net losses of forest carbon. Where land use remains the same over time (e.g. forest land remaining forest land), changes in management (e.g. increasing the minimum age of tree cutting thresholds) can result in net increases or decreases in forest carbon. Policy impacts on forest carbon are estimated in terms of how the policy changes land use and management.

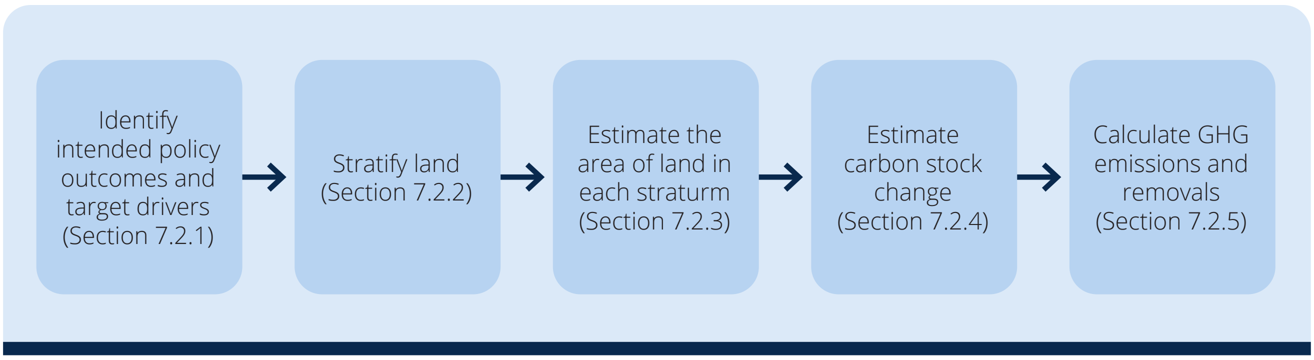
### 7.2.1 Identify intended policy outcomes and target drivers

It is a *key recommendation* to identify the intended policy outcomes and target drivers. There are generally four types of policy outcomes in the forestry sector:

- Increase forest carbon stocks by converting land to forests (A/R).
- Increase forest carbon stocks in existing forests.
- Reduce emissions from deforestation.
- Reduce emissions from degradation.

FIGURE **7.3**

**Steps for estimating baseline emissions**



Drivers are a categorical description of agents and processes that lead to GHG emissions in the forestry sector in the baseline scenario. Policies enable or incentivize measures that are designed to affect target drivers. Table 7.1 provides examples of target drivers as they relate to intended policy outcomes. The target drivers need to be identified in the baseline scenario because assumptions about them are modified to develop the policy scenario.

Drivers that are not affected by the policy do not need to be analysed, because they are assumed to remain constant between the baseline and policy scenarios. For example, if the policy focuses on afforestation on degraded lands, it can be assumed that logging practices on lands managed for timber will remain the same.

The data for key parameters will vary depending on the intended policy outcome. Table 7.2 provides general descriptions of the key parameters associated with each type of policy outcome.

### 7.2.2 Stratify land

It is a *key recommendation* to stratify land by land-use category. Following the method in Section 6.1.1, step 3, users should identify the affected land categories where changes in land use and forest management are expected to occur under the policy scenario. At a high level, the possible affected land categories are:

- forest land converted to non-forest land
- forest land remaining forest land
- non-forest land converted to forest land.

For each of the land categories in the GHG assessment boundary, users should further divide them into subcategories by climate information, forest types and forest management. Where available, country-level stratification of forest type and biomass values from the country's national GHG inventory should be used.

TABLE **7.1**

**Example relationships between intended policy outcomes, target drives and policy measures**

| Intended policy outcome | Example drivers and barriers | Example policy measures |
|---|---|---|
| Enhance forest carbon stocks by converting land to forests | Barriers to natural regeneration | Plant trees<br>Remove barriers to natural regeneration<br>Make sites suitable for natural regeneration |
| Enhance forest carbon stocks with existing forests | Poor forest management | Encourage implementation of sustainable forest management<br>Reduce the size of logging roads<br>Reduce damage of other trees when logging |
| Reduce emissions from deforestation | Illegal logging<br>Economic pressure for more agricultural production that requires agricultural land expansion | Introduce and improve systems to effectively enforce existing or new regulation for forest protection<br>Intensify agriculture |
| Reduce emissions from degradation | Unsustainable biomass removals from selective logging and fuelwood gathering<br>Overfrequent burning | Introduce and improve systems to effectively enforce existing or new regulation of fuelwood collection |

TABLE **7.2**

**Key parameters by policy outcome**

| Intended policy outcome | Activity data | Carbon stock change |
|---|---|---|
| Increase forest carbon stocks within existing forests | Area of forest land remaining forest land where management can be improved | $CO_2$ removals per hectare from enhancements |
| Increase forest carbon stocks by converting land to forests | Area of land converted to forest land | $CO_2$ removals per hectare from biomass and soil, from land conversion |
| Reduce emissions from deforestation | Area of forest land converted to non-forest land | $CO_2$ emissions per hectare from deforestation |
| Reduce emissions from degradation | Area of forest land remaining forest land where degradation occurs | $CO_2$ emissions per hectare from degradation |

The IPCC 2006 GL provides a land categorization for forests that is compatible with Tier 1 estimation methods. To use the IPCC categorization, users should identify the ecological zones and forest management types that correspond to the forest land in that category. Ecological zones are areas with relatively homogeneous vegetation. The IPCC defines ecological zones based on climate domain and climate region, where climate domain is an area of relatively homogeneous temperature, and climate region is an area with a relatively similar climate in terms of both moisture and temperature. Examples of ecological zones are tropical rainforest, subtropical humid forest, temperate oceanic forest and boreal coniferous forest. IPCC definitions of ecological zones according to climate domain and climate region are provided in Table 4.1 of the IPCC 2006 GL, volume 4, Chapter 4.

Within each ecological zone, users should further define subcategories of forest land in terms of how the forests are managed. The IPCC provides two categories for this: natural and plantation forest. Natural forests are generally naturally regrowing stands with reduced or minimum human intervention. Plantation forests are intensively managed (including planted, managed, harvested and replanted). The IPCC provides Tier 1 estimated biomass values for natural and plantation forests for all ecological zones (Table 4.12 of the IPCC 2006 GL, volume 4, Chapter 4). The IPCC biomass values and information about forest management and forest biomass in the user's country should be used to develop criteria for classifying forests into natural and plantation. The criteria used need to be documented.

The subcategories outlined above (i.e. ecological zone and management type) are recommended because they are compatible with using IPCC Tier 1 emission factors for estimating the carbon in forest biomass. The land categorization can be done differently where Tier 2 emission factors are available or a derived Tier 2 estimate of $CO_2$ emissions and removals for each land category can be calculated. Where the policy aims to reduce forest degradation, higher approaches and tiers should be used to capture changes. Such methods require more data, but can yield a more accurate GHG impact assessment. Users should consider the objectives of the policy when selecting which method to use.

### 7.2.3 Estimate the area of land in each stratum

It is a *key recommendation* to estimate the area of land in each stratum. Land area can be derived from national data sources that are widely accepted among policymakers and endorsed by the government. Potential data sources include remotely sensed and aerial imagery, ministry of agriculture or forests, national agricultural or forest research institutes, and international agencies (e.g. Food and Agriculture Organization of the United Nations). Data on land area compiled for the national GHG inventory are also a relevant data source. These data sources will typically provide information on historical and current land area.

Several resources detail how to develop land area estimates for forest carbon monitoring:

- IPCC 2003 *Good Practice Guidelines for Land Use, Land-Use Change and Forestry*[20]
- IPCC 2006 GL, volume 4, *Agriculture, Forestry and Other Land Use*[21]
- *Global Observation of Forest Cover and Land Dynamics (GOFC GOLD) Sourcebook*[22]
- Winrock *Standard Operating Procedures for Terrestrial Carbon Measurement*, 2014[23]
- Global Forest Observation Initiative methods and guidance documentation.[24]

These resources can be used to estimate a time series of land area for the baseline assessment. The time series is the number of hectares of land in each land stratum each year of the assessment period. Any of the approaches discussed in Section 7.1 can be used to project the hectares of land over time based on current and historical data.

### 7.2.4 Estimate carbon stock change

It is a *key recommendation* to estimate the carbon stock change (i.e. emission factor) for each carbon pool in each land stratum. At a minimum, the carbon stock change for the living above-ground and below-ground biomass (living biomass) pool should be estimated. For A/R and reduced deforestation activities, carbon stock change for dead organic matter and soil carbon pools can also be estimated, where these pools are included in the GHG assessment boundary.

When deciding which pools to estimate the carbon stock change for, users may encounter trade-offs between the principle of accuracy and the cost of collecting data. Conservativeness can moderate accuracy, to balance costs while maintaining the credibility of the GHG estimate. Users can rely on existing data and methods for estimating carbon stock change, including:

- national forest inventories
- subnational or regional forest inventory data sets
- relevant independent or regional scientific studies or data sets
- values published in scientific literature
- values provided in the IPCC 2006 GL.

The method below is for estimating carbon stock change based on the living biomass carbon pool only.

**Land-use change**
For A/R or reduced deforestation where land use changes (e.g. non-forest land converted to forest land and vice versa), the carbon stock change is the average change in forest carbon stocks per unit area as a result of land being afforested/reforested or deforested. In general, this can be estimated as the difference between the forest carbon stocks per unit area before and after the land conversion, as shown in equation 7.1 (based on equation 2.16 in the IPCC 2006 GL). Equation 7.1 includes the area term representing activity data. Executing the equation with the area term yields total emissions and removals in terms of tonnes of carbon per year for all land conversions. Executing the equation without the area term will yield a per area carbon stock change for each type of land conversion.

As noted above, Tier 1 estimated biomass values for natural and plantation forests for all ecological zones are provided in Table 4.12 of the IPCC 2006 GL, volume 4, Chapter 4. These values can be used to develop Tier 1 carbon stock change factors for A/R and reduced deforestation, using the equation above. Values for biomass stocks in the non-forest land pre- or post-conversion categories can be found in Table 5.9 (croplands) or Table 6.4 (grasslands) of the IPCC 2006 GL.

For a rough estimate of a deforestation carbon stock change, use zero for the value of $B_{after,i}$. This will overestimate emissions from deforestation because the biomass gains that occur in the post-conversion land category are not counted (i.e. the loss in biomass as a result of conversion is overestimated). However, this is likely to be a proportionally small overestimation because post-conversion biomass

[20] Available at: www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html.

[21] Available at: www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html.

[22] Available at: www.gofcgold.wur.nl/redd.

[23] Available at: www.leafasia.org/tools/winrock-standard-operating-procedures-terrestrial-carbon-measurementfield-sop-manual.

[24] Available at: www.fao.org/gfoi.

### Equation 7.1: Carbon stock change from land conversion

$$\Delta C_{\text{conversion}} = \sum_i \{(B_{\text{after},i} - B_{\text{before},i}) \times A_{To\_NF,i}\} \times CF$$

where

$\Delta C_{\text{conversion}}$ = carbon stock change on land type *i* (tonnes of carbon per year)

$B_{\text{after},i}$ = biomass stocks[25] on land type *i* after the conversion (tonnes of dry matter per hectare)

$B_{\text{before},i}$ = biomass stocks[23] on land type *i* before the conversion (tonnes of dry matter per hectare)

$A_{To\_NF,i}$ = area of land use *i* converted to non-forest land (*NF*) in a certain year (hectares per year)

$CF$ = carbon fraction of dry matter (tonnes of carbon per tonne of dry matter)

$i$ = type of land converted to non-forest land

stocks are relatively small compared with pre-conversion forest carbon stocks.

For a rough estimate of an A/R carbon stock change, use zero for the value of $B_{\text{before},i}$. This will overestimate removals from A/R because it does not count the biomass stocks that existed before conversion (i.e. the gain in biomass as a result of conversion is overestimated). This is also likely to be a proportionally small overestimation because pre-conversion biomass stocks are relatively small compared with post-conversion forest carbon stocks.

### Forest land remaining forest land

For forest land remaining forest land, the carbon stock change is the average annual change in forest carbon stocks per unit area. This can be estimated in one of two ways according to the IPCC 2006 GL:

- **Stock-difference method.** The average annual change in forest carbon stocks is calculated as the difference in average forest carbon stocks between two points in time, divided by the time period, as shown in equations 7.2a and 7.2b (adapted from the first part of equation 2.8 in the IPCC 2006 GL). The stock-difference method is most suitable when the availability of information and/or resources is good (e.g. Tier 2, approach 2 or 3) – for example, national forest inventories or data sets that allow estimates of carbon stocks by forest type, specific to local or regional conditions, over time. In most cases, it is not appropriate to use a Tier 1 method for a stock-difference calculation.[26]

- **Gain–loss method.** The average annual change in forest carbon stocks is calculated as a process of gains and losses. Gains result from annual forest growth, and losses result from processes such as wood harvesting, fuelwood extraction and disturbance, as shown in equation 7.3. The gain–loss method is most suitable when countries do not have time series information on activity data and emission factors to assess using the stock-difference method.

Both the stock-difference and gain–loss methods are executed with the area term (activity data) in the equations, which yields total change in carbon stocks for all land strata in forest land remaining forest land.

Therefore, the carbon stock change is embedded in the quantification of total emissions and removals.

[25] Note: Biomass stocks × *CF* = carbon stocks. The carbon fraction converts units of dry matter (a common measure in forestry) to units of carbon with a basic conversion factor that varies by climate region. The IPCC 2006 GL provides default carbon fraction values in Table 4.3.

[26] See IPCC GL, Section 2.3.1.1. Available at: www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_02_Ch2_Generic.pdf.

### Stock-difference method

Equation 7.2a: Part 1 of stock-difference method for estimating carbon stock change

$$\Delta C = \frac{(C_{t_2} - C_{t_1})}{(t_2 - t_1)}$$

where

$\Delta C$ = annual forest carbon stock change (tonnes per year)

$C_{t_1}$ = forest carbon stock at time $t_1$ (tonnes of carbon)

$C_{t_2}$ = forest carbon stock at time $t_2$ (tonnes of carbon)

The terms $C_{t_1}$ and $C_{t_2}$ can be estimated with equation 7.2b (adapted from the second part of equation 2.8 in the IPCC 2006 GL). Like equation 7.1, equation 7.2b includes the area term representing activity data. Executing equation 7.2b without the area term will yield a per area carbon stock value for a given land stratum defined by ecological zone and climate domain.

Equation 7.2b: Part 2 of stock-difference method for estimating carbon stock change

$$C = \sum_{ij} \{A_{i,j} \times V_{i,j} \times BCEF_{S_{i,j}} \times (1 + R_{i,j}) \times CF_{i,j}\}$$

where

$C$ = total carbon stock in living biomass in all forest land remaining forest land at a given point in time

$A_{i,j}$ = area of forest land remaining forest land (hectares), in ecological zone *i* and climate domain *j*

$V_{i,j}$ = merchantable growing stock volume (cubic metres per hectare) for forests in ecological zone *i* and climate domain *j*

$BCEF_{S_{i,j}}$ = biomass conversion and expansion factor for expansion of merchantable growing stock volume to above-ground biomass (tonnes of above-ground biomass growth per cubic metre of growing stock volume), for forests in ecological zone *i* and climate domain *j*

$R_{i,j}$ = ratio of below-ground to above-ground biomass (tonnes of dry matter below-ground biomass per tonne of dry matter above-ground biomass), for forests in ecological zone *i* and climate domain *j*

$CF_{i,j}$ = carbon fraction of dry matter (tonnes of carbon per tonne of dry matter)

### Gain–loss method

Equation 7.3: Gain–loss method for estimating carbon stock change

$$\Delta C_B = \sum_{ij} [G_{W_{i,j}} \times (1 + R_{i,j}) \times A_{i,j} \times CF_{i,j}] + L_{\text{wood-removals}} + L_{\text{fuelwood}} + L_{\text{disturbance}}$$

where

| | | |
|---|---|---|
| $\Delta C_B$ | = | annual net change in carbon stocks in living biomass in all forest land remaining forest land (tonnes of carbon per year) |
| $i$ | = | ecological zone ($i$ = 1 to $n$) |
| $j$ | = | climate domain ($j$ = 1 to $m$) |
| $G_{W_{i,j}}$ | = | average annual above-ground biomass growth rate for a specific forest type (tonnes of dry matter per hectare per year) |
| $R_{i,j}$ | = | ratio of below-ground biomass to above-ground biomass of the specific forest type; for Tier 1, $R_{i,j}$ can be set to zero |
| $A_{i,j}$ | = | area of forest (hectares) |
| $CF_{i,j}$ | = | carbon fraction of dry matter (tonnes of carbon per tonne of dry matter) |
| $L_{\text{wood-removals}}$ | = | annual above-ground biomass carbon loss due to wood removals (tonnes of carbon per year) |
| $L_{\text{fuelwood}}$ | = | annual above-ground biomass carbon loss due to fuelwood removals (tonnes of carbon per year) |
| $L_{\text{disturbance}}$ | = | annual above-ground biomass carbon losses due to disturbances (tonnes of carbon per year) |

Guidance and equations for estimating $L_{\text{wood-removals}}$, $L_{\text{fuelwood}}$ and $L_{\text{disturbance}}$ are provided in the IPCC 2006 GL, volume 4, Chapter 4.

With the gain–loss method, there are two options for estimating $G_{W_{i,j}}$ (average annual above-ground biomass growth rate):

- **IPCC default values.** Default values for net biomass growth are available in Table 4.12 of the IPCC 2006 GL, volume 4, Chapter 4.

- **Mean annual growth.** Mean annual growth is also called mean annual increment (MAI). MAI describes the typical growth rates of trees in forests of a given type and age class. It is a fairly common measure collected by forestry agencies or forest managers. Consult the IPCC 2006 GL for further information on how to use MAI to estimate $G_{W_{i,j}}$.[27]

**Further resources**
Comprehensive guidance on estimating forest carbon stock changes in all carbon pools can be found in numerous resources:

- IPCC 2003 *Good Practice Guidelines for Land Use, Land-Use Change and Forestry*

- IPCC 2006 GL, volume 4, *Agriculture, Forestry and Other Land Use*

- Global Observation of Forest Cover and Land Dynamics (GOFC–GOLD) sourcebook

[27] See IPCC 2006 GL, Section 2.3.1.1, Subsection A.1. Available at: www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_02_Ch2_Generic.pdf.

- Winrock *Standard Operating Procedures for Terrestrial Carbon Measurement* 2014
- Global Forest Observation Initiative (GFOI) methods and guidance documentation.

The GOFC–GOLD sourcebook, and GFOI methods and guidance documentation are particularly relevant resources for estimating carbon stock change for multiple carbon pools for enhancing carbon stocks through A/R, enhancing carbon stocks through management, deforestation, and degradation. Where higher-tier data are available (including emission factors, biomass values or land stratification), such data can be used to increase accuracy and completeness of the estimate.

### 7.2.5 Calculate GHG emissions and removals

It is a *key recommendation* to calculate the cumulative GHG emissions and removals for the baseline scenario over the assessment period. Estimate annual carbon stock change for each land stratum each year in the baseline scenario using area data and carbon stock change equations provided above for land-use change (A/R and reduced deforestation) and forest land remaining forest land. Sum annual carbon stock changes by stratum across all land strata to yield net annual carbon stock change on lands in the GHG assessment boundary.

Finally, sum the annual carbon stock changes for all years in the assessment period to yield cumulative carbon stock change in the baseline scenario. Convert the cumulative carbon stock change to GHG emissions (expressed as tonnes of carbon dioxide equivalent [$CO_2e$]) by multiplying the cumulative carbon stock change by 44/12 and by –1. This yields total cumulative $CO_2e$ emissions (positive) or removals (negative) for the baseline.

# 8 Estimating GHG impacts of the policy ex-ante

*This chapter describes how to estimate the expected future GHG impacts of the policy (ex-ante assessment). Users estimate the maximum implementation potential of the policy based on the causal chain that was developed in Chapter 6. Users then evaluate how barriers to implementation and other factors may limit the policy's overall effectiveness, and determine the likely implementation potential of the policy. The likely implementation potential represents the effects that are expected to occur as a result of the policy (most likely policy scenario). Implicitly, these effects are relative to the baseline scenario.*

*There are two ways that users can estimate the GHG impacts of the policy scenario based on the implementation potential of the policy. Using the emissions approach, the GHG impacts are estimated by subtracting the baseline emissions (as determined in Chapter 7) from policy scenario emissions (as determined in this chapter). Alternatively, users can estimate the relative change in GHG emissions based on the likely implementation potential of the policy, using the activity data approach.*

**Checklist of key recommendations**

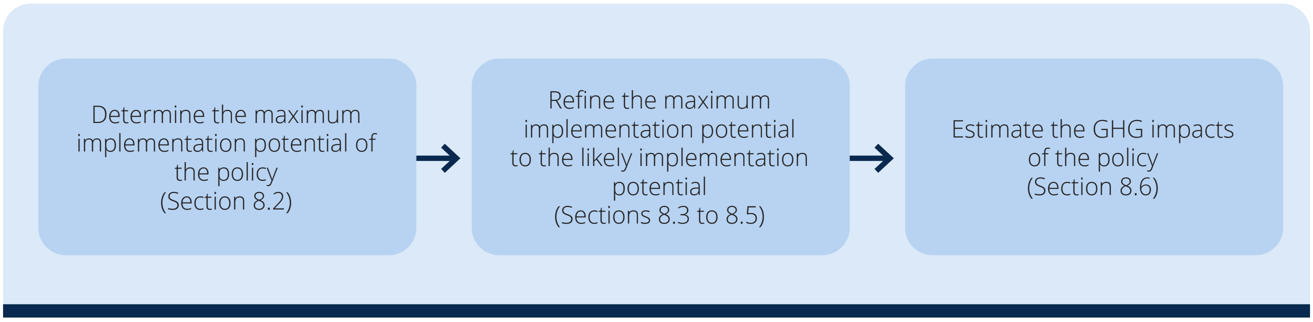
- Determine the maximum implementation potential of the policy
- Analyse policy design characteristics and national circumstances that may reduce the effectiveness of the policy, and account for their effect on the maximum implementation potential
- Analyse the financial feasibility of the policy for each stakeholder group and account for the effect on the implementation potential of the policy
- Analyse other barriers that could reduce the effectiveness of the policy and account for their effect on the implementation potential of the policy
- Estimate the GHG impacts of the policy

## 8.1 Introduction to estimating the implementation potential

The policy scenario represents the events or conditions that are most likely to occur in the presence of the policy being assessed. The method focuses first on estimating the "maximum implementation potential" of the policy. The maximum implementation potential of the policy assumes that all inputs, activities and intermediate effects in the causal chain are highly likely to occur

FIGURE **8.1**

**Overview of steps in the chapter**



as planned and at the implementation level intended by the policy. It represents the intended policy outcome or policy effectiveness. The maximum implementation potential is then refined to the likely implementation potential (e.g. most plausible policy scenario) by taking into account factors that could reduce the effectiveness of the policy.

Subsequent sections of this chapter provide methods for estimating the implementation potential of the policy based on policy design characteristics and national circumstances (Section 8.3), financial feasibility (Section 8.4) and other barriers (Section 8.5). Figure 8.2 outlines the steps in this process. Most of the analysis in Sections 8.2–8.5 will be qualitative and require expert judgment, expert elicitation and/or stakeholder input. Guidance on expert judgment is provided in Section 4.2.4.

Figure 8.3 illustrates how the maximum implementation potential of the policy is refined at each step to achieve a more realistic estimate of the implementation potential. When determining the likelihood and magnitude of each refinement step, implicitly, any additional assumptions should be applied to the implementation potential quantified in the previous refinement step, so that the total reduction from maximum implementation potential to likely implementation potential is calculated in an accurate and stepwise manner. It is possible that the policy's likely implementation potential could exceed the estimated maximum implementation potential. This could occur where policies have a reinforcing effect (as discussed in Section 5.2.1).

These steps focus on estimating the implementation potential of the policy in terms of activity data rather

FIGURE **8.2**

**Overview of steps for estimating the likely implementation potential of the policy**

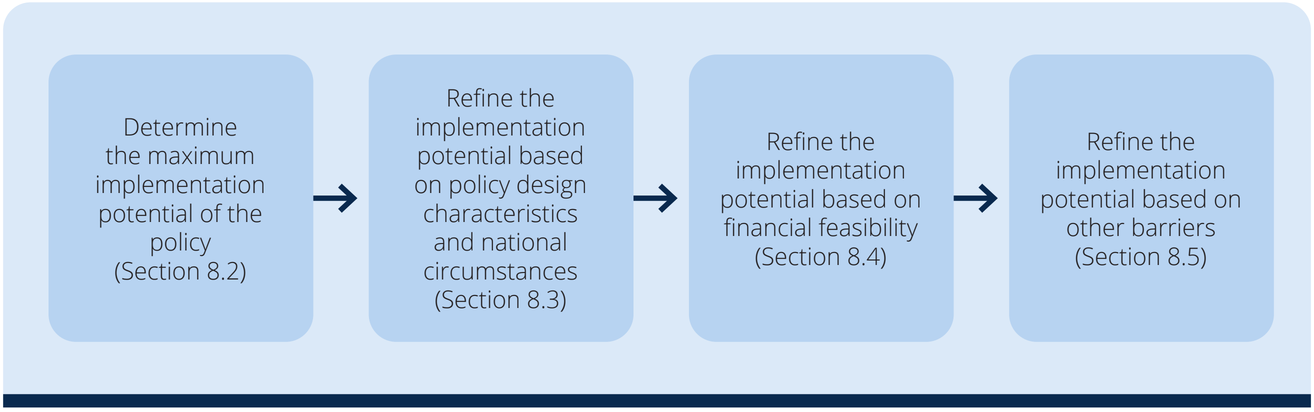
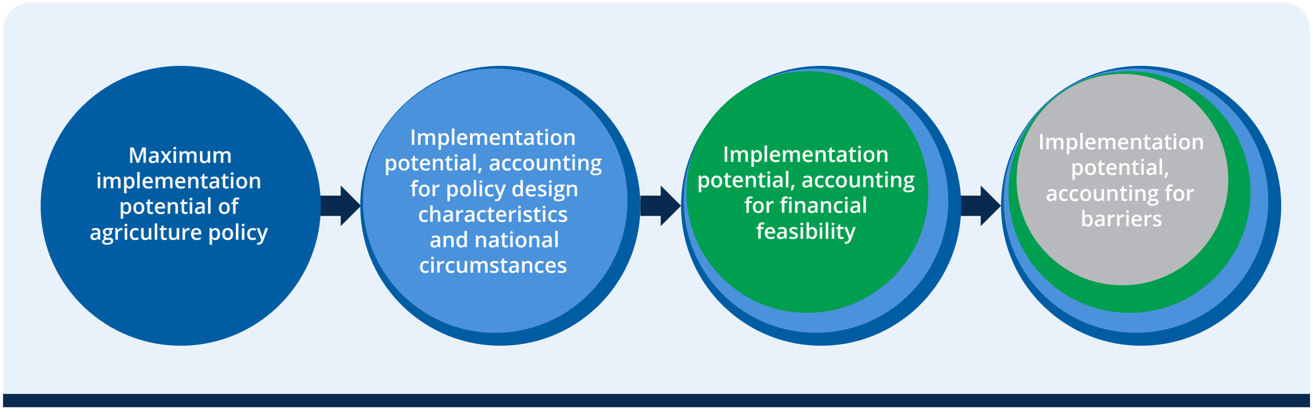



FIGURE **8.3**

**Refining the maximum implementation potential to the implementation potential**



than GHG emissions. Examples of such activity data are discussed in Section 8.2. The GHG impacts for each GHG source or carbon pool in the GHG assessment boundary will be determined using the final refined estimates of the activity data after completion of the four steps, following the method in Section 8.6.

Where quantitative information about how a factor is likely to impact the implementation potential of the policy is available, it can be used to estimate the effect of the policy. For example, an analysis may indicate that a barrier reduces the effectiveness of the policy intervention by 5%. Reduction in effectiveness can apply at two different levels:

- **General level.** The barrier affects the entire policy (e.g. a barrier that hinders deployment across all components of the policy). In this case, the 5% reduction applies to the overall policy effect.
- **Component level.** The barrier affects only one specific aspect of the policy (e.g. a barrier that hinders policy implementation for only a segment of the total population, one of the land-use categories considered, some regions of the country or the adoption rate of one agricultural practice). In this case, the 5% reduction applies only to the specific aspect of the policy affected by the barrier.

To the extent possible, users should identify a single policy scenario that is considered to be the most likely. In certain cases, multiple policy scenario options may seem equally plausible. Users can develop multiple policy scenarios, each based on different sets of assumptions, rather than just one set. This approach produces a range of possible emissions reduction scenarios. Users can then conduct a sensitivity analysis to see how the results vary depending on the selection of policy scenario options. More guidance about conducting a sensitivity analysis is provided in Chapter 12 of the *Policy and Action Standard*.

Box 8.1 gives an example of how to estimate the implementation potential of a policy. The implementation potential of the example policy is assessed on the basis of the estimated number of hectares of land on which the policy will be implemented.

## 8.2 Determine the maximum implementation potential

It is a *key recommendation* to determine the maximum implementation potential of the policy. For each GHG source or carbon pool in the GHG assessment boundary, users should choose a type of activity data to assess the implementation potential of the policy. The type of activity data chosen should be a parameter that is expected to change as a result of the policy (e.g. hectares of forest land prevented from being converted to cropland) and can be used to estimate GHG impacts. That is, the activity data serve as a proxy for the policy outcome. The maximum implementation potential is expressed in terms of activity data. Table 8.1 provides examples of types of activity data to consider.

BOX **8.1**

### Example of forest policy for national- or subnational-level GHG mitigation

The government is considering the option of promoting SFM and A/R through the introduction of a payment for ecosystem services (PES) programme, combined with a new tax legislated for users of ecosystem services. Government officials are in the initial phase of the policy development process, and need to consider all aspects relating to legislating, designing and implementing the policy intervention. It is expected that the national legislative body will enact a new tax for all users of ecosystem services (primarily for water and hydroelectric utilities, but other sectors may be included, such as tourism companies). The national taxing agency will collect the tax, which will fund a new PES programme (estimated to be about 1–2% of annual revenue) to provide programme incentives, as well as administrative and operational expenses.

The goals for the PES programme are to (1) expand SFM activities and (2) promote A/R through tree planting or natural regeneration.

Further details on the policy can be found in Section 5.1.

TABLE **8.1**

**Examples of types of activity data for analysing implementation potential of a policy**

| GHG source or carbon pool | Policy | Activity data |
|---|---|---|
| Biomass and soil carbon | • Incentives for SFM<br>• Payments for A/R<br>• Technical assistance to improve management<br>• Introduction and improvement of systems to effectively enforce existing or new environmental regulation | • Hectares of forest land prevented from being converted to non-forest land<br>• Hectares of forest land remaining forest land where management is improved<br>• Hectares of forest land remaining forest land where sustainable forest management is implemented<br>• Hectares of cropland converted to forest land<br>• Hectares of grassland converted to forest land |

The maximum implementation potential can be estimated based on a number of elements. The options include using a mitigation goal, expected adoption of practices or technologies, financial considerations, land area and other resource potential, and expert judgment. Each element is explained below. The maximum implementation potential is the theoretical intent of the policy effect without "friction" created by barriers that limit the policy's efficacy. The maximum implementation potential can be estimated using a single element or a combination of elements. A combination is likely to yield a better estimate.

### 8.2.1 Mitigation goal

When there is an intended level of mitigation and/or an explicit goal for the policy, the goal and other details of the policy can be used to estimate the maximum implementation potential. A mitigation goal may include, among other things, the target amount of emissions reductions or enhancement of carbon stocks as a result of the policy, the targeted amount of land area or adoption rate, or the total expected emissions reductions and removals from a specific GHG source or carbon pool. The mitigation goal may be in different units from the activity data, and additional information from surveys and national statistics may be needed to estimate how the goal will translate into actions or land areas. For example, an explicit goal for a forest policy could be to increase the minimum diameter cutting threshold on all publicly managed timber forests by 2020.

Where the results of the assessment will be used to meet the reporting requirements of the transparency framework, users should consider aligning the parameters used for the emissions projections of forest policies with those used to develop sectoral projections. It is recommended to align the time frame used for the emissions projections of forest policies with the time frame used for sectoral projections developed to meet the reporting requirements of the transparency framework (e.g. the starting and final year of the assessment period developed for a forest policy should be the same as the starting and final year of the forest sector projections).

Using a stated goal as the main indication of intended policy outcomes or policy effectiveness can be highly uncertain. At a minimum, the mitigation goal needs to be specific enough to reflect an intended level of mitigation.

### 8.2.2 Adoption of practices or technologies

The expected level of adoption of the practice or technology that is targeted by the policy can be used to estimate the maximum implementation potential. The main assumption would be that targeted stakeholders will fully engage voluntarily, or fully comply where the policy is mandatory.

Information about stakeholders can be obtained from the causal chain, the policy description and other sources. It can be used to infer the amount of land area or number of livestock affected by the policy, such as:

- the stakeholders targeted by the policy
- the average size of parcels of land owned or used by a stakeholder group
- the typical amount of forest products extracted or crops produced per person
- the number of cattle or other animals managed by stakeholders in a specific region.

### 8.2.3 Financial considerations

The cost of implementing mitigation practices or using technology (e.g. $/head to provide a feed supplement to livestock) can be compared with the total financing available for the policy to estimate the maximum implementation potential. Information on the unit cost of implementing technologies or practices might be available from studies that have been commissioned and funded by the government, an international organization or academia. Where unit cost information is not available, other sources can be used as a first approximation, including:

- consultations with stakeholders on costs in different parts of the country and for different activities (such information could also be derived from scientific journals)
- figures obtained from other marginal abatement cost-curve models, or from studies published in scientific journals.

Where unit cost figures are derived from global data, journals or studies relating to other countries, users should ensure that the information is suitable for their country or representative of national circumstances.

Users also need an indication of the financial resources that will be allocated to a specific policy from the national budget and other funding sources (e.g. private sector, national or international donors, international or regional funds) to estimate implementation potential from financial data. This information may be available from the description of inputs developed in Section 6.1.1, step 2.

The unit cost combined with the total investment level can be used to estimate maximum implementation potentials. For example, if a policy includes plans to invest $1 million in reforestation and it costs $100/ha to implement, the maximum implementation level of the policy can be estimated as 10,000 ha of reforestation. Ideally, this value would be reconciled with an estimate of maximum available area of land for reforestation using land area data to ensure that it is realistic to assume that at least 10,000 ha could be reforested.

Note that this analysis focuses on policy-level financing (e.g. national and sectoral level). A method is provided in Section 8.3 for assessing the financial feasibility of a policy from the perspective of landowners.

### 8.2.4 Land area and other resource potential

Analysing the availability of land is another way to estimate maximum implementation potential – that is, identifying the total area of land upon which there is technical potential for a specific mitigation practice or land-use change to occur. The assumption would be that all available land is affected by the change in management or land use as a result of the policy. For example, if a policy aims to convert highly degraded pasture to productive silvopastoral systems, and there is 50,000 ha of highly degraded pasture within the policy jurisdiction, the assumption would be that the policy will result in 50,000 ha of pasture used for silvopasture.

To use this approach for estimating maximum implementation potential, information on current land management and land uses is needed. Such data can be found in, or derived from:

- national land cadastre
- national agricultural census data
- land-use titles
- local or regional land registration offices
- farmer or logger associations
- logging permits
- timber harvesting statistics.

The technical potential of resources other than land area can be analysed to estimate adoption rates for new practices or technologies. For policies that reduce emissions from enteric fermentation, the total number of livestock in the country or the total number of ranchers could be used to analyse the maximum implementation potential. For example, if a policy seeks to increase use of feed supplements in dairy cattle, it can be assumed that all dairy cattle within the policy jurisdiction will receive the feed supplements as a result of the policy.

### 8.2.5 Expert judgment

Expert judgment can be paired with any of the approaches above to derive an informed estimate of the maximum implementation potential. Sector specialists (e.g. farmers, ranchers, foresters, scientists who study the technologies or practices promoted by a policy, statisticians, government staff who are familiar with the policy) can help to fill gaps in available data or provide a range for the maximum implementation potential. Experts can also help users identify suitable values of the policy outcome or policy effectiveness from estimated ranges. When consulting experts, information can be obtained through an expert elicitation process (described in Section 4.2.4).

### 8.2.6 Example of determining maximum implementation potential

Using the example scenario in Box 8.1, the PES policy has the goal to engage stakeholders in voluntary contracts with the Ministry of Environment to provide ecosystem services on a total of 60% of private forest lands and 25% of low-productivity cropland over 10 years. The specific aim is to implement SFM on private forest land and A/R activities on cropland. The maximum implementation potential is determined for the policy activities on each land category.

Based on data from the latest national forest census, the total area of privately owned forest land in the country is 250,000 ha; 60% of this area is 150,000 ha. From national agriculture statistics, it is known that the total area of low-productivity cropland is 240,000 ha; 25% of this is 60,000 ha. Therefore, over 10 years, the goal of the policy is for 150,000 more hectares of forest land remaining forest land to be brought into SFM and 60,000 more hectares of cropland to be converted to forest land as a result of the policy. The values can be annualized evenly over 10 years (e.g. 15,000 ha/year for 10 years), annualized following a non-linear trend based on estimated timing of implementation, or considered cumulatively (i.e. 150,000 ha total over 10 years). The land areas (150,000 and 60,000 ha, respectively) are considered as the maximum possible land areas for policy intervention.

Additional information in the policy design indicates that, to meet the goal of converting cropland to forest land, the policy aims to promote three types of practices: general tree planting, tree planting with endangered species and natural regeneration, with landowner payments for each practice of $1,000/ha, $1,500 /ha and $500/ha, respectively. Programme managers in the Ministry of Environment believe that most of the budget should go to funding natural regeneration because of its relatively low cost and comparable benefits to the other practices, and only a small share should fund tree planting with endangered species, with the remaining funding going to general tree planting. Based on these priorities, the total amount of land where each practice will be adopted as a result of the policy was estimated. Table 8.2 provides the maximum potential estimated land areas affected by the policy, by practice, cumulatively for the 20-year assessment period.

TABLE **8.2**

**Example of maximum implementation potential**

| Policy activity | Maximum implementation potential (ha) |
|---|---|
| SFM | 150,000 |
| Tree planting general | 15,000 |
| Natural regeneration | 40,000 |
| Tree planting with endangered species | 5,000 |

## 8.3 Account for policy design characteristics and national circumstances

It is a *key recommendation* to analyse policy design characteristics and national circumstances that may reduce the effectiveness of the policy, and account for their effect on the maximum implementation potential of the policy.

Section 8.3.1 provides a method for analysing policy design characteristics and national circumstances (step 1), and estimating their effect on maximum implementation potential (step 2). Section 8.3.2 provides some further considerations to help with this analysis. Section 8.3.3 provides a worked example to illustrate the steps.

### 8.3.1 Method for accounting for policy design characteristics and national circumstances

**Step 1: Analyse policy design characteristics and national circumstances**
Compile information on the policy design characteristics and national circumstances using the questions in Table 8.3. The questions relate to the effect of policy design characteristics and national circumstances on policy effectiveness. The questions can be revised, or further questions can be added, as needed, to ensure that the analysis is relevant to the policy and national circumstances.

Information can be gathered through expert elicitations with administration and government experts who are directly or indirectly involved in the policy under consideration, desk reviews and stakeholder consultations. Refer to the ICAT *Stakeholder Participation Guide* (Chapter 8) for further information on designing and conducting consultations with stakeholders.

Answer each question and score each response based on its potential to have a positive or negative effect on the effectiveness of the policy, on a scale of 1 to 4, as follows:

1 = Likely to have a positive (reinforcing) effect

2 = Likely to have no effect (no discernible positive or negative effect)

3 = Likely to have a negative effect

4 = Unknown.

**Step 2: Evaluate the overall distribution of scores and estimate the effect on maximum implementation potential**
Once policy design characteristics and national circumstances have been analysed and scored, evaluate the overall distribution of scores:

- A distribution with many scores of 1 or 2 indicates less need to refine the estimated maximum implementation potential of the policy.
- A distribution with many scores of 3 or 4 could suggest a downward adjustment of the maximum implementation potential, or a need to gather more information and reassess the impact, especially for scores of 4.

Carefully review each score of 3. Consider and, if possible, estimate to what extent the factor will decrease policy effectiveness. Describe and justify the reduction. In addition, look for crucial problems that have the potential to render the policy ineffective. If even one crucial problem is identified, it is recommended to reconsider the policy design. If possible, identify potential corrective action to minimize the negative impacts. For example, after following the method in this section, the user may reduce the geographic scope of impact, reduce the expected adoption rates or delay the timing of the implementation of a policy.

For scores of 4, attempt to gather enough information to assess the effect of the factor. If this is not possible, it is conservative to assume that the factor will have a negative effect.

A positive impact may reinforce the implementation of the policy through, for example, synergistic effects between policies. Where a situation may increase policy effectiveness, it is conservative to not estimate any potential positive impact or make any positive adjustments to the expected policy outcomes.

### 8.3.2 Considerations for accounting for policy design characteristics and national circumstances

This section describes a number of considerations to bear in mind when following the steps in Section 8.3.1.

TABLE **8.3**

**Questions for identifying policy design characteristics and national circumstances**

| | |
|---|---|
| **1. Institutional arrangements and national circumstances** | |
| a. | Can the policy be implemented with existing governance structures, institutional arrangements and legal mechanisms? |
| b. | Is there corruption in the areas or regions under consideration? If so, how extensive? |
| c. | Do stakeholders receiving the benefits offered by the policy have clear title and rights? |
| d. | How well can the levels of governance that influence land use coordinate to achieve the intended outcome? |
| e. | How well can coordination (e.g. resources, enforcement, data sharing) be carried out at subnational levels (e.g. between local municipalities), if necessary, according to the policy? |
| **2. Participation requirements** | |
| a. | Is participation in, or compliance with, the policy voluntary or mandatory? |
| **3. Compliance monitoring and enforcement** | |
| a. | Is a monitoring programme planned or in place to assess policy implementation? |
| b. | Is an enforcement measure part of the policy? If so, to what degree are similar standards, rules and regulations enforced, and how? |
| **4. Complementarity and synergies** | |
| a. | To what extent will supporting or complementary policies and actions in effect during the policy implementation period improve policy effectiveness? |
| b. | To what extent is the policy part of an interdisciplinary approach linking food security, ecosystem services and/or sustainable development? |
| c. | Are supportive measures in place to build the capacity and technical skills of affected stakeholders who will be implementing the policy? |
| **5. Policy implementation risks** | |
| a. | To what extent are the intended policy outcomes vulnerable to risks (including natural events and disasters) that could jeopardize or reverse the policy outcomes? |
| b. | Have research and pilot studies been conducted in the areas where the policy will be implemented, and do they demonstrate that the expected outcomes of the policy are feasible? |

### Institutional arrangements and national circumstances

Institutional arrangements are formal or informal legal and procedural agreements between agencies executing a policy. They can include arrangements between government agencies, or between government and non-governmental or private sector agencies. National circumstances are the conditions present in the country. They include the government structure, population profile, cultural context, geographic profile, climate profile and structure of the economy.

Lack of a governance structure, lack of coordination between national and subnational levels, or lack of a legal basis for providing incentives to stakeholders are critical considerations that can inhibit the successful implementation of the policy if not addressed appropriately. Policies are likely to be limited in their effectiveness if countries do not have established institutional arrangements, or an effective legal framework to secure cooperation between different government levels and with key stakeholders (including private, public and non-governmental stakeholders).

Many ministries and other government agencies have difficulties in hiring and retaining staff, primarily because of budgetary and administrative constraints. Where staff and infrastructure (e.g. offices, equipment, vehicles, fuel) necessary for policy implementation are not in place before policy implementation, policy implementation may not move forward as expected, reducing the effectiveness of the policy.

Corruption in national or subnational government structures can also play a detrimental role in the implementation of the policy. Corrupt practices may involve politicians, local leaders, and government or non-governmental actors. They can result in implementation problems relating to land concessions, the allocation of contracts (e.g. favouring friends or relatives), allowing illegal practices (e.g. logging without permits), and misuse of funds intended for the policy.

**Participation requirements**

Participation in the policy, by people or organizations, can be voluntary or mandatory. Voluntary participation relies on the willingness of stakeholders to respond to a policy, offers flexibility in terms of who participates and how, and can involve less oversight and enforcement. In the absence of strong incentives, voluntary participation is unlikely to result in high participation and is more likely to result in a policy whose impacts are indistinguishable from the baseline scenario. Other factors that can help or hamper participation include effective communications and training for target stakeholder groups.

Mandatory participation can be accompanied by specific obligations and can be enforced through strict procedures, including penalties for non-compliance. Mandatory participation works better in cases where the progress of policy implementation can be effectively monitored and enforced. However, bribery and corruption could reduce the potential impact of the policy.

**Compliance monitoring and enforcement**

Monitoring and enforcement are mechanisms to compel stakeholders to comply with a policy. Monitoring is the process of inspecting that the policy is being implemented, and enforcement is an action taken against those who are not in conformance with the policy. The policy may include measures to monitor and/or enforce policy implementation.

When stakeholders understand that policy implementation will be monitored, it is more likely that implementation will occur. If monitoring procedures are already in place or are planned (e.g. because similar policies or projects already exist in a region), this should be taken into account, as it can help ensure that the policy is implemented effectively. In the absence of monitoring procedures, the policy may not be implemented as effectively as expected.

Local enforcement agencies and other stakeholders should be consulted to determine the likelihood that standards, rules or laws will be enforced. The likelihood of enforcement (e.g. 90% chance of enforcement) should be used to refine the implementation potential of the policy (e.g. reduce the impact by 10%). If penalties for non-conformance with the policy are minor, enforcement may not be as effective in ensuring compliance.

**Complementarity and synergies**

GHG mitigation policies that contribute to local sustainable development and promote better local conditions are far more acceptable to local communities, and usually have a far better chance of uptake and success. Examples of this type of policy are policies that have health benefits due to reduction of local air pollution, reduce loss of biodiversity, address desertification issues, protect water resources or improve food security for poor communities.

The implementation of GHG mitigation policies can be positively or negatively affected by other complementary policies. For example, a policy to reduce water pollution from agricultural run-off may drive changes in land management that reduce fertilizer use and increase use of cover crops, which are practices that can reduce nitrous oxide emissions from soils and increase soil carbon sequestration.

Interventions that provide education and technical assistance do not reduce GHG emissions directly. However, they may be pivotal in developing the capacity of land managers to implement technologies and practices that reduce GHG emissions. Therefore, the presence of such interventions can be synergistic with GHG mitigation policies.

**Policy implementation risks**
Agriculture and forest productivity are greatly impacted by weather conditions, climate and water. Food, forests and wood production are often impacted by natural events and disasters. For example, forest fires, floods, droughts, extreme weather events (e.g. hurricanes, tornadoes), diseases and pests can have negative consequences.

The assessment should consider the effect of natural events and disasters. If areas that are known to be prone to extreme conditions are included in the geographic scope of the policy, the expected implementation potential of the policy should be reduced because the policy may be ineffective in these areas. However, even if there is no previous history of disaster risk, users may still consider reducing the implementation potential of the policy to account for unanticipated disasters.

The evaluation should also consider the risk that the policy will not be as successful as anticipated in reducing GHG emissions as a result of limited data and research. For example, where research and pilot studies have not been conducted in the areas where the policy will be implemented, there is a risk that implementation and/or impacts of the policy will be hampered by lack of experience and proof of concept, and this could reduce policy effectiveness.

### 8.3.3 Example of accounting for policy design characteristics and national circumstances

The screening questions from Table 8.3 were reviewed, and policy design characteristics and national circumstances were analysed (step 1). The participation requirements category is evaluated from the perspective of voluntary participants in SFM and A/R, as well as from users of ecosystem services. An additional question was added to reflect this. Extensive consultation with experts resulted in the responses and scores shown in Table 8.4.

TABLE **8.4**

**Example of accounting for policy design characteristics and national circumstances**

| | 1. Institutional arrangements and national circumstances | Score |
|---|---|---|
| a. | *Can the policy be implemented with existing governance structures, institutional arrangements and legal mechanisms?* Sufficient governance structures are in place to oversee the policy implementation. | 2 |
| b. | *Is there corruption in the areas or regions under consideration? If so, how extensive?* Corruption is confined to small communities where local leaders are known to receive bribes for favourable treatment of industry. Most of these communities are located in areas that are not easily accessible. After consulting with experts, it is assumed that participation in the most remote communities will not result in the expected policy outcomes. These communities comprise an estimated 2% of the SFM area and 1.5% of the A/R area considered. | 3 |
| c. | *Do stakeholders receiving the benefits offered by the policy have clear title and rights?* There is no legal basis for participation of the private sector in the PES programme. To address this, the policy defines a legal framework for the participation of private landowners. | 2 |
| d. | *How well can the levels of governance that influence land use coordinate to achieve the intended outcome?* With the exception of two regions, the government and local authorities have a good working relationship. | 2 |
| e. | *How well can coordination (e.g. resources, enforcement, data sharing) be carried out at subnational levels (e.g. between local municipalities), if necessary, according to the policy?* There are no subnational technical assistance or incentive programmes that conflict with the national policy. | 2 |

TABLE **8.4,** continued

**Example of accounting for policy design characteristics and national circumstances**

| 2. Participation requirements | | Score |
|---|---|---|
| a. | *Is participation or compliance with the SFM and A/R activities voluntary or mandatory?*<br>Because of voluntary participation, experts believe that 85% of the landowners originally considered will participate. These landowners account for 77% of the SFM area and 96.5% of the A/R area considered, without taking into consideration the area reduction due to aspect 1d above. | 3 |
| b. | *Is participation in, or compliance with, the policy voluntary or mandatory?*<br>One out of the two hydroelectric utilities will not participate in policy implementation because operations will be suspended as a result of the 5-year drought that has reduced the river flows that power the hydropower station. That utility was expected to contribute to about 15% of the total revenue that was to be raised. | 3 |
| **3. Compliance monitoring and enforcement** | | |
| a. | *Is a monitoring programme planned or in place to assess policy implementation?*<br>There is sufficient local enforcement capacity in the regions considered. | 2 |
| b. | *Is an enforcement measure part of the policy? If so, to what degree are similar standards, rules and regulations enforced, and how?*<br>The Ministry of Environment will conduct annual audits on a random basis to monitor implementation of, and compliance with, best-practice standards for SFM, tree planting and natural regeneration. | 2 |
| **4. Complementarity and synergies** | | |
| a. | *To what extent will supporting or complementary policies and actions in effect during the policy implementation period improve policy effectiveness?*<br>There are complementary activities to regulate water and reduce loss of biodiversity in the areas considered. | 1 |
| b. | *To what extent is the policy part of an interdisciplinary approach linking food security, ecosystem services and/or sustainable development?*<br>There is a direct link to ecosystem services (PES scheme) and sustainable development, because the policy will provide resources to local communities and will contribute to stopping the degradation of the local environment. | 1 |
| c. | *Are supportive measures in place to build the capacity and technical skills of affected stakeholders who will be implementing the policy?*<br>The policy incorporates educational programmes to raise awareness and build technical skills of local foresters. | 1 |
| **5. Policy implementation risks** | | |
| a. | *To what extent are the intended policy outcomes vulnerable to risks (including natural events and disasters) that could jeopardize or reverse the policy outcomes?*<br>About 35% of the areas considered have experienced extreme weather events in the past five years. | 3 |
| b. | *Have research and pilot studies been conducted in the areas where the policy will be implemented, and do they demonstrate that the expected outcomes of the policy are feasible?*<br>Scientific research in the National Study on Decarbonisation Strategies provides evidence that SFM and tree planting increase carbon sequestration. | 1 |

The distribution of scores was evaluated (step 2). Of the 14 factors above, 10 received a score of 1 or 2, indicating that most factors considered are expected to have either a positive impact or no impact on the implementation potential of the policy. Four factors are likely to have a negative impact and received a score of 3. These related to corruption (1b), participation (2a and 2b) and policy implementation risks (5a). No factors had a score of 4.

The extent to which policy effectiveness may be reduced as a result of each factor was evaluated (step 2). None of the factors receiving a 3 appear to be crucial problems that could completely hamper policy effectiveness. The impact on policy effectiveness was adjusted quantitatively.[28]

The exclusion of communities with corruption problems (1b), the expectation of lower than planned voluntary participation of landowners (2a) and the potential risk of disasters (5a) will all result in an overall reduction in the area of land where the policy is effectively implemented. Table 8.5 summarizes the estimated extent to which these aspects will reduce policy outcomes.

The withdrawal of one hydroelectric utility (factor 2b) will reduce the expected tax revenue by 15% over 10 years. This reduction, however, is not expected to create a measurable impact because the overall SFM and A/R areas enrolled are also likely to be smaller than expected (based on the score for 2a). In any case, it would be desirable that other sources of revenue are identified to ensure that there will be no shortage of funding for the PES programme in the long term.

Complementarity and synergy factors 4a, 4b and 4c could create interest and possibly increase support from stakeholders and participation from landowners who see the benefits of the policy. However, the potential positive impact is not quantified.

At the end of the analysis, the maximum area affected by the policy has been adjusted to reflect the quantifiable impacts of lower than originally designed participation and expected policy outcomes. The results are shown in Table 8.6.

TABLE **8.5**

**Example description and justification for reducing expected policy effectiveness**

| Description and justification | Reduction in policy effectiveness (%) | |
|---|---|---|
| | SFM | A/R |
| Participation in remote communities where corruption exists will not yield expected policy outcomes. These comprise 2% and 1.5% of the land areas for SFM and A/R targeted by the policy, respectively. | 2 | 1.5 |
| Experts estimate that only 85% of landowners offered the opportunity will participate because it is voluntary (77% of SFM; 96.5% of A/R). | 23 | 0.5 |
| 35% of the area target by the policy has experienced extreme weather events in the past five years. Using information on the impacts of these past events, experts estimate that about 5% of land enrolled in the programme will experience catastrophic weather during the assessment period that could prevent achievement of the expected policy outcomes in those areas. | 5 | 5 |
| Total potential adjustment (percentage reduction in policy effectiveness) | 30 | 7 |

[28] Where quantifiable information is not available, estimates of the impact on policy effectiveness may be made using expert judgment based on the best available information. Although it may be subjective, this is more conservative than not making an adjustment where the aspect considered is likely to have a negative impact.

TABLE **8.6**

**Example of refined implementation potential**

| Policy activity | Maximum implementation potential (ha) | Refined implementation potential based on policy design and national circumstances (ha) |
|---|---|---|
| SFM | 150,000 | 105,000 |
| Tree planting, general | 15,000 | 13,950 |
| Natural regeneration | 40,000 | 37,200 |
| Tree planting with endangered species | 5,000 | 4,650 |
| **Total** | **210,000** | **160,800** |

## 8.4 Account for financial feasibility

It is a *key recommendation* to analyse the financial feasibility of the policy for each stakeholder group and account for the effect on the implementation potential of the policy.

Financial feasibility analysis determines whether enough money is being invested in the policy to ensure that stakeholders will participate or otherwise respond to the policy. The effectiveness of a policy can be reduced if its implementation costs outweigh its benefits for a given stakeholder critical to the implementation of the policy.

There is no single way to perform a financial feasibility analysis. It may take the form of a complex and rigorous assessment (e.g. a detailed financial return-on-investment model) or a simple analysis (e.g. a checklist of financial costs and benefits). Users should determine the specific type of analysis based on the data available.

Sources of information for conducting financial feasibility are, in order of preference:

- existing calculations of the costs and benefits of policies for an individual stakeholder that were done during the policy design phase (as long as these are deemed reliable)
- implementation cost analyses
- exiting national cost studies
- global cost studies
- expert judgment based on assessments or desk review.

In the absence of other available resources, the sections below provide a method for performing a basic cost analysis. Section 8.4.1 provides a method for analysing financial feasibility. Section 8.4.2 provides some further considerations to help with this analysis. Section 8.4.3 provides a worked example to illustrate the steps.

Before starting the cost analysis, some questions should be considered:

- Do some stakeholders bear significant new net costs under the proposed policy? If so, which stakeholders and what are the costs?
- Do some stakeholders realize significant new net financial gains under the proposed policy? If so, which stakeholders and what are the gains?
- What goods and services are produced commercially from lands that are the target of the policy, both before and after policy implementation? Is production likely to increase or decrease as a result of the policy?

- Is the policy potentially in conflict with economic development?
- Will the policy strengthen important supply chains?

### 8.4.1 Method for accounting for financial feasibility

**Step 1: Identify stakeholder groups to analyse**
In Section 6.1.1, users identified the stakeholders of the policy. These stakeholders are the focus of this analysis, particularly stakeholders who implement changes in practices, technologies or land use in response to the policy. Each stakeholder group should be included in the financial feasibility analysis, and the net costs and benefits for each group should be considered separately. Where insufficient data and information are available to analyse all stakeholder groups separately, at least include the following groups in the analysis:

- stakeholders with official land tenure rights or de facto control of land addressed by the policy
- stakeholders who use the land addressed by the policy but have limited actual control over the land.

It can be difficult to distinguish between stakeholders with official tenure to land and stakeholders who use the land affected by the policy without tenure. In such cases, focus on the main stakeholder group that is expected to implement the mitigation measures.

**Step 2: Calculate net cash flows for each stakeholder group**
In a basic implementation cost analysis, net cash flows are estimated for a typical stakeholder in each stakeholder group under baseline and policy scenarios. It is best if the financial feasibility analysis is done in the local currency. If foreign investment is required or if loans are denominated in a foreign currency, it is still best to do the analysis in the local currency and then convert the results to the foreign currency. Often some factors will be in foreign currency. In this case, the exchange rate should be entered in only one location in the analysis calculations, so that the entire analysis can be updated by changing the exchange rate at that location if the exchange rate changes. If the analysis is done in a foreign currency, there is a risk of currency fluctuations altering the conclusions of the analysis.

Where inflation is likely (e.g. over longer periods of time), apply a discount rate and calculate a net present value for the cash flows to take into account the future value of money. Non-discounted values can be used if inflation is not likely during the analysis period (e.g. five years or less). Table 8.7 provides more information on metrics for financial analysis.

Different stakeholders should have different discount rates. For example, the discount rate for a government is generally much lower than the discount rate for a corporation, and the discount rate for a corporation that has access to capital is often much lower than the discount rate of a smallholder farmer. Appendix B provides additional information on discount rates. To enable comparison between stakeholder groups, the costs should be normalized (e.g. per hectare, per operation, per head of livestock, per person).

The following process is used to estimate net cash flows:

1. Estimate baseline scenario costs and revenues using present-day data for a typical stakeholder who will take part in the policy, and repeat this for each stakeholder group. Take into account how the land area under consideration would be used without the policy (e.g. what is produced on the land and how much, considering, for example, animal farming, croplands, set-asides or logging).

   Average cost and revenue figures can be used for groups of land categories. For example, use average expense and income from all cropland areas (irrespective of the type of the crop); group together fallow land and set-asides, and derive average values for those lands; or use national statistics and prices on average timber harvest.

   Include costs of inputs and costs of production, in addition to revenues from sale of goods. Key input costs include raw materials, equipment, labour, permits to operate, and other costs entailed in producing and selling the goods. For example, costs in agriculture include fertilizer and seed for crops, fencing for cattle, feed, feed additives and medications. Input costs may include taxes on operations or land that must be paid from revenues from the sale of goods.[29]

[29] The European Commission *Guide to Cost Benefit Analysis of Investment Projects* (EC, 2008) can be a useful resource for how to identify costs and revenues, calculate discounted cash flows, and implement other aspects of financial and economic feasibility analysis.

TABLE **8.7**

**Definitions of common terms used in financial analysis**

| Term | Definition |
|---|---|
| Cash flow | The net amount of cash and cash equivalents moving into and out of a business. Positive cash flow indicates that a company's liquid assets are increasing, enabling it to settle debts, reinvest in its business, return money to shareholders, pay expenses and provide a buffer against future financial challenges. Negative cash flow indicates that a company's liquid assets are decreasing. Some stakeholders will not implement an action that has a negative net cash flow at any time. |
| Discount rate | The interest rate that needs to be earned on a given amount of money today to end up with a given amount of money in the future. The discount rate accounts for the time value of money, which is the idea that a dollar today is worth more than a dollar tomorrow, given that the dollar today has the capacity to earn interest. |
| Present value | The current worth of a future sum of money or stream of cash flows given a specified discount rate. Future cash flows are discounted at the discount rate. The higher the discount rate, the lower the present value of the future cash flows. |
| Rate of return | The gain or loss on an investment over a specified time period, expressed as a percentage of the investment's cost. Gains on investments are defined as income received plus any capital gains realized on the sale of the investment. The general equation for the rate of return is: (gain of investment – cost of investment) / cost of investment |

*Source:* Adapted from Investopedia (2017).

2. Estimate the baseline scenario net cash flow (i.e. revenues minus costs) over the assessment period, separately for each stakeholder group.

3. Estimate the policy scenario costs and revenues over the assessment period, separately for each stakeholder group. This includes determining

   » the amount and type of government or private funding committed to implementing the policy
   » the cost to the stakeholder to implement the policy
   » the revenues that the stakeholder will gain from the policy.

4. Estimate the net cash flow for a typical stakeholder in the policy scenario, separately for each stakeholder group.

**Step 3: Assess financial feasibility**
Compare the net cash flow for the baseline scenario with that for the policy scenario to assess financial feasibility, as follows:

1. Determine whether the total net cash flow for the policy scenario exceeds the net cash flow for the baseline scenario. This must be the case for the policy to be financially feasible.

2. Determine whether the total net cash flow for the policy scenario is positive. This must be the case for the policy to be financially feasible.

3. When the net cash flow for the policy scenario is positive, compare the discounted cash flow (net present value) and rate of return (for the general formula, see Table 8.7) in the baseline and policy cases. For the policy to be financially feasible, the rate of return on the policy case must be higher than the baseline rate of return by more than 3 percentage points.

Repeat this analysis for each stakeholder group identified and all activities covered by the policy.

**Step 4: Estimate the extent to which financial aspects will limit policy outcomes**
Based on the results of the financial feasibility assessment, decide how the implementation potential of the policy will be affected, as follows:

- Where the policy does not appear to provide sufficient incentive for stakeholders to participate or otherwise respond to the policy, either reconsider the design of the policy (or the relevant component of the policy) or refine the implementation potential of the policy.

- Where the policy appears to provide sufficient incentive for stakeholders to participate or otherwise respond to the policy, continue to the next step without revising the implementation potential of the policy.

### 8.4.2 Considerations for accounting for financial feasibility

Below are additional considerations when deciding how the implementation potential of the policy will be affected:

- In addition to discounted costs and revenues, the financial analysis should consider the relative timing of costs and revenues, and the capital needed to achieve these cash flows. If costs occur before revenues, stakeholders must have access to funds to pay the costs or they may not behave as expected.

  Shifts in timing of returns can be large for A/R. There are considerable costs in establishing stands of trees, but there may be negligible revenues for years while the trees grow to have commercial value. As a result, many forestry projects are only financially feasible with low discount rates. For entities with high discount rates, such as most smallholder farmers, even modest seasonal delays in revenue relative to expenditures can create a significant barrier to implementation. Delaying the harvest season can be a barrier to food-insecure households that do not have other crops to eat during the delay.

- In general, unless the policy increases net revenue to stakeholders, or reduces their risks, the policy is unlikely to be adopted voluntarily.

  Policies that provide a net financial benefit may have little incentive for adoption if the net gain is small relative to overall cash flows.

- Investors, farmers, landowners and other stakeholders are often risk averse. Some policies offer stakeholders a positive financial return, yet still fail to be adopted, because stakeholders view returns as too uncertain or risky. For example, they may not be confident that payments in the future will be made, contracts will be honoured, or the policy will have ongoing political and budgetary support. As a result, assessing simple return on investment alone may not give a reliable indication of the likelihood of policy adoption. Financial risk can be quantitatively incorporated into the analysis by increasing stakeholders' discount rate, or qualitatively considered by consulting stakeholders on their likely response to specific real-world policy incentives.

- Some changes may have costs that are not obvious. For example, a change may involve significant management labour costs to revise organizational processes or train new workers who are needed to provide different skills in the organization.

- It may be important to identify other financial considerations, and sectoral policies and trends that may affect the financial feasibility of the policy, and to consider whether these reinforce or counteract the intended implementation (e.g. through price signals and consumer behaviour).

When a government is considering what policies to adopt, it may also want to consider the financial effects on society as a whole. Such an evaluation is beyond the scope of this methodology.[30]

### 8.4.3 Example of accounting for financial feasibility

To estimate net cash flows, data on a per-hectare basis are used for annual costs and benefits for land areas affected by the policy, from the perspective of stakeholders managing the land. For this example, a cost analysis is conducted for tree planting activities on cropland. The example considers the first 10 years

[30] A variety of sources are available that provide guidance on estimating net economic effects on society, including EC (2008).

of policy implementation after the conversion of agricultural land into forest land, representing enough time to complete a harvest cycle and realize the value of timber from the planted trees.

The costs and revenues for the baseline scenario are estimated in Table 8.8. The baseline scenario assumes that there will be a continuation of current agricultural production for the next 10 years (constant baseline). The table presents annual data for year 1, years 2–9 and year 10 of the policy. Negative numbers represent costs (expenses), and positive numbers represent revenues (income).

Table 8.8 provides average present-day estimates for costs and revenues per hectare under the baseline scenario. The costs identified were farming labour; crop inputs (seed, fertilizer, equipment, fuel); and land cost, taxes and concession fees. The revenues identified include all income from selling the crops. The costs and revenues were kept constant for all 10 years. Based on these assumptions, a typical farmer has net annual revenues (or cash flow) of $50/ha. Applying a discount rate of 15% reduces the annual revenue from $50/ha in year 1 to $14/ha by year 10.

Next, the costs and revenues for the policy scenario are estimated (Table 8.9). Under the policy scenario, the same cropland area is converted to forest land through general tree planting.

Table 8.9 provides average present-day estimates for costs and revenues per hectare under the policy scenario. The costs identified are planting cost for trees; land costs, taxes and concession fees; and stand management and harvest costs. It is anticipated that the farmer would have planting costs for year 1 ($1,000/ha), stand management costs for years 2–9 ($10/ha) and harvest costs for year 10 ($12,000/ha, assuming a harvest of 50 $m^3$/ha, a harvest cost of $100/$m^3$, a processing cost of $50/$m^3$, and transport and tax cost of $100/$m^3$).

The revenues identified include government support for the planting of all trees in year 1 ($1,000/ha) and income from selling the harvested timber in year 10 (assuming a harvest of 50 $m^3$/ha, and a price of $300/$m^3$).

Comparison of discounted net revenues in the baseline ($289/ha) and policy ($665/ha) scenarios indicates that general tree planting activities may be profitable for farmers (Tables 8.8 and 8.9). The

TABLE **8.8**

**Example calculation of baseline costs and revenues for continuation of agricultural production**

| Costs and revenues | Annual costs and revenues ($/ha) for year | | | Total |
|---|---|---|---|---|
| | 1 | 2–9[a] | 10 | |
| **Costs** | | | | |
| Farming labour | –100 | –100 | –100 | |
| Crop inputs (seed, fertilizer, equipment, fuel) | –100 | –100 | –100 | |
| Land cost, taxes and concession fees | 0 | 0 | 0 | |
| **Total cost** | **–200** | **–200** | **–200** | |
| **Revenues** | | | | |
| Crop revenues | 250 | 250 | 250 | |
| **Net farming revenue, undiscounted** | **50** | **50** | **50** | **500** |
| **Net farming revenue, present value** | **50** | **[43–16]** | **14** | **289** |

[a] For simplicity, individual values for each year are not shown. Square brackets indicate the range of values during that time period. That is, [43–16] means that values range from $43/ha in year 2 to $16/ha in year 9.

TABLE **8.9**

**Example calculation of policy scenario costs and revenues for general tree planting**

| Costs and revenues | Annual costs and revenues ($/ha) for year 1 | 2–9[a] | 10 | Total |
|---|---|---|---|---|
| **Costs** | | | | |
| Planting cost | –1,000 | 0 | 0 | |
| Land costs, taxes and concession fees | 0 | 0 | 0 | |
| Stand management and harvest cost | 0 | –10 | –12,500 | |
| **Total cost** | **–1,000** | **–10** | **–12,500** | |
| **Revenues** | | | | |
| Timber | 0 | 0 | 15,000 | |
| Government payments for planting | 1,000 | 0 | 0 | |
| Government livelihood support | 0 | 0 | 0 | |
| **Total revenue** | **1,000** | **0** | **15,000** | |
| | | | | |
| **Net tree planting revenue, undiscounted** | **0** | **–10** | **2,500** | **2,420** |
| **Net tree planting revenue, present value** | **0** | **[–9 to –3]** | **711** | **665** |

[a] For simplicity, individual values for each year are not shown. Square brackets indicate the range of values during that time period.

net cash flow in the policy scenario is positive and exceeds the net cash flow in the baseline scenario. In both cases, the net revenue after 10 years of tree planting would be significantly higher than the net farming revenue.

However, yearly cash flow trends in the policy scenario show a net loss of income for 9 out of the 10 years of policy implementation. Because of this, some farmers may decide not to participate. Other farmers may be able to wait until year 10 for the revenue from selling the harvested timber and would be more likely to participate. Without more information or refining of the policy design, participation is likely to be highly situational and difficult to predict.

Given this uncertainty, the policy design is reconsidered, and an alternative scenario explored. The alternative scenario is for the government to provide a low–interest rate (e.g. 4%) annual loan payment to compensate for the lost revenue ($50/ha/year) (see Table 8.10). The loan provides the farmer with annual income (although less than the baseline case), and the total loan value can be repaid from timber sale revenues in year 10. If the policy is modified this way, broad participation in the programme is more likely. Table 8.10 demonstrates the costs and revenues of the redesigned policy for general tree planting with a low–interest rate loan.

Net cash flow estimates were made for natural regeneration and tree planting with endangered species for the A/R policy scenario (not shown), using the same constant baseline scenario as in Table 8.8 (continuation of current agricultural production for the next 10 years). Net cash flow estimates were also made for implementing SFM on privately owned forest land, where the constant baseline is the continuation of current forest management practices (not shown).

TABLE **8.10**

**Calculation of policy scenario costs and revenues for general tree planting with a low-interest rate loan**

| Costs and revenues | Annual costs and revenues ($/ha) for year | | | Total |
|---|---|---|---|---|
| | 1 | 2–9[a] | 10 | |
| **Costs** | | | | |
| Planting cost | –1,000 | 0 | 0 | |
| Land costs, taxes and concession fees | 0 | 0 | 0 | |
| Stand management and harvest cost | 0 | –10 | –12,500 | |
| **Total cost** | **–1,000** | **–10** | **–12,500** | |
| **Revenues** | | | | |
| Timber | 0 | 0 | 15,000 | |
| Government payments for planting | 1,000 | 0 | 0 | |
| Government livelihood support | 50 | 50 | –1,300 | |
| **Total revenue** | **1,050** | **50** | **13,700** | |
| | | | | |
| **Net tree planting revenue, undiscounted** | **50** | **40** | **1,200** | **1,570** |
| **Net tree planting revenue, present value** | **50** | **[35–13]** | **341** | **571** |

[a] For simplicity, individual values for each year are not shown. Square brackets indicate the range of values during that time period.

After considering all proposed activities, and adjusting some policy design aspects as described above, the policy was determined to be financially feasible for general tree planting and tree planting with endangered species. For SFM and natural regeneration, the policy scenario does not generate more revenue for landowners. Therefore, the policy design was modified further to increase payments for SFM and natural regeneration, maintaining the overall budget level. To achieve this, the area of land targeted for SFM and natural regeneration will be reduced by 10%. This will result in the total land areas shown in Table 8.11.

TABLE **8.11**

**Refined implementation potential after financial feasibility analysis**

| Policy activity | Maximum implementation potential (ha) | Refined implementation potential based on policy design and national circumstances (ha) | Refined implementation potential based on financial feasibility (ha) |
|---|---|---|---|
| SFM | 150,000 | 105,000 | 94,500 |
| Tree planting, general | 15,000 | 13,950 | 14,250 |
| Natural regeneration | 40,000 | 37,200 | 33,480 |
| Tree planting with endangered species | 5,000 | 4,650 | 4,750 |
| **Total** | **210,000** | **160,800** | **146,580** |

## 8.5 Account for other barriers

It is a *key recommendation* to analyse other barriers that could reduce the effectiveness of the policy and account for their effect on the implementation potential of the policy. This analysis is similar to that in Section 8.3 but focuses on institutional, cultural and physical barriers that may limit effectiveness of the policy.

Section 8.5.1 provides a method for analysing these other barriers and estimating their effect on the implementation potential of the policy. Section 8.5.2 provides some further considerations to help with this analysis. Section 8.5.3 provides a worked example to illustrate the steps.

### 8.5.1 Method for accounting for other barriers

**Step 1: Analyse institutional, cultural and physical barriers**
Compile information on the barriers identified in Table 8.12 and consider how these barriers may affect the implementation potential using the questions provided. The questions can be adapted, or further barriers and questions can be added, as needed, to ensure that the analysis is relevant to national circumstances.

Information can be gathered through expert elicitations with administration and government experts who are directly or indirectly involved in the policy under consideration, as well as through desk reviews and additional stakeholder consultations. Refer to the ICAT *Stakeholder Participation Guide* (Chapter 8) for further information on designing and conducting consultations.

Answer each question and score each response based on its potential to limit the effectiveness of the policy, on a scale of 1 to 4, as follows:

1 = Likely to have no effect

2 = Likely to limit effectiveness

3 = Likely to prevent implementation

4 = Unknown.

**Step 2: Evaluate the overall distribution of scores and estimate the effect on implementation potential**
Once each barrier has been analysed and scored, evaluate the overall distribution of scores:

- A distribution with many scores of 1 indicates less of a need to refine the implementation potential of the policy.

TABLE **8.12**

### Other barriers to policy implementation

| | |
|---|---|
| **1. Institutional barriers** | |
| a. | Are there any conflicting goals or jurisdictions between ministries or other agencies with respect to implementation of the policy? |
| b. | Is there the potential for institutional racism, gender bias or age discrimination that could limit the effectiveness of the policy – for example, by limiting participation of certain stakeholders based on their race, religion, gender or age? |
| **2. Cultural barriers** | |
| a. | Are different languages used in the region where the policy will be implemented? |
| b. | Is the policy congruent with cultural norms and values? |
| c. | Are there gender issues in accessing resources or communication? |
| d. | Are there generational differences in work ethics and work approaches that could result in conflicts or disputes among stakeholders that might limit the ability to effectively implement the policy? |
| e. | Are there any areas or landmarks with religious significance in the region under consideration? |
| f. | Is there a group that has very strong opposition to the policy? |
| **3. Physical barriers** | |
| a. | Are land areas proposed for intervention easily accessible? |
| b. | Is the necessary physical infrastructure in place for the proposed policy? |
| c. | Are there any war conflicts in the country that would limit access to certain land areas? |

- A distribution with many scores of 2, 3 or 4 could suggest a downward adjustment of the implementation potential, or a need to gather more information and reassess the impact, especially for scores of 4.

Carefully review each score of 2 and 3. For a score of 2, consider and, if possible, estimate to what extent the barrier will decrease policy effectiveness. Describe and justify the reduction. For a score of 3, the barrier is considered crucial and has the potential to render the policy ineffective. If even one crucial barrier is identified, it is recommended to reconsider the policy design and discontinue the impact assessment. For scores of 4, attempt to gather enough information to assess the effect of the barrier. If this is not possible, it is conservative to assume that the factor will limit effectiveness of the policy.

Consider and determine to what extent the effects of barriers overlap. An overlapping effect occurs where one barrier limits implementation in one area and another barrier limits implementation in the same area. These overlapping effects should be appropriately accounted for when calculating the potential effect of all barriers. The combined effect of the barriers may be greater than or less than the sum of the individual barriers. If information is available, uncertainty ranges should also be incorporated in the final results.

During the data-gathering phase, it is recommended that information also be collected on any other relevant policies in the country that might help overcome specific barriers. Where such policies exist, the scoring of the barrier effect should be changed accordingly (most likely to a score of 1).

### 8.5.2 Considerations for accounting for other barriers

**Institutional barriers**

Conflicting goals between different ministries and other government agencies could result in overlapping regulation, and ambiguous roles and responsibilities of the stakeholders involved. For example, proposed areas for the policy may overlap with other existing types of area protection (e.g. based on national policies or international conventions), which could lead to confusing regulations for specific sites.

Institutional barriers involving discrimination often include selection approaches that are not based on the actual performance of individual workers but are affected by racism, gender bias, age discrimination, favouritism and other factors. Where discrimination is present, certain stakeholders may not have equal access to the opportunities afforded by a policy (e.g. incentive payments, technical assistance, education), and this can limit overall effectiveness of the policy. Often such barriers are linked to corrupt practices (addressed in Section 8.3). Safeguards to prevent discrimination can be built into policies. For example, it can be required that enrolment in programmes such as education opportunities must be diverse in terms of race and gender. If safeguards against discrimination do not exist, either as part of the policy being analysed or in institutions involved in implementing the policy, it is possible that discrimination will be a barrier to policy implementation.

**Cultural barriers**

The use of language and terminology that is not widely understood by the target stakeholders could be a crucial cultural barrier because it could result in communication problems that lead to misunderstandings, mistrust, and non-participation or non-compliance among the local population. Where language barriers exist and there is no mechanism in place to overcome them, the effectiveness of the policy is likely to be reduced.

In many countries, successful implementation of GHG mitigation policies may require consideration of gender or social class sensitivities to reduce resistance of local communities to the proposed intervention. Cultural preferences may have more potential for change than physical limits, but change may take time and almost certainly will benefit from considering existing mechanisms of social influence. There may also be generational differences in work ethics and work approaches that have the potential to result in conflicts between older and younger workers. If the policy is sensitive to such factors, including potential language barriers, age distribution and cultural norms of stakeholders, they may not present a barrier to implementation.

In some countries, gender considerations can have a very important effect on the success or failure of implementation of the policy. It is important to consider who makes decisions about land-use actions, and who has access to information and money. For a policy to be implemented effectively, the person who is responsible for managing land will also need to have access to information and financing to implement management changes. If they do not, this will likely limit policy effectiveness.

Certain land areas or landmarks have important religious significance for local communities. Policies that may affect ancestral homes or sacred grounds are more likely to face resistance from indigenous peoples and local communities.

Strong opposition to a policy – for example, from a particular stakeholder group or political party – could hamper efforts to secure financing, gain trust and otherwise implement policy interventions, especially if that group is influential.

Failure to identify and address cultural barriers will more than likely have detrimental impacts on policy implementation. Effective stakeholder participation from early in policy design is important to identify and address cultural barriers. Refer to the ICAT *Stakeholder Participation Guide* for further information about all elements of effective stakeholder participation for policy design, implementation and evaluation.

**Physical barriers**

In mountainous countries or countries with inaccessible regions, policies relating to agriculture and forests should take into account whether certain land areas are remote or difficult to access. Minimal existing road networks or insufficient transportation infrastructure would be expected to limit the implementation potential of the policy.

Conflicts in a country (such as civil war or territorial disputes with a neighbouring country) could limit access to areas that could be considered for policy intervention. Depending on the severity of the conflict, and to safeguard the welfare of the people involved, certain parts of the country may be excluded until the conflict is resolved. This would reduce the impact of the policy, at least while conflicts remain active, and possibly longer.

### 8.5.3 Example of accounting for other barriers

The screening questions from Table 8.12 were reviewed (step 1). Not all of the screening questions were relevant, and a few of the questions were modified to suit national circumstances. The barriers under the cultural barriers category that related to cultural norms and values (2b), gender issues (2c), generational differences (2d) and areas of religious significance (2e) were considered collectively. The barriers under the physical barriers category that related to accessibility of land area (3a) and availability of infrastructure (3b) were also considered jointly. With these modifications, a total of seven barriers were considered. In consultation with experts, responses were tabulated and scored in Table 8.13.

TABLE **8.13**

**Example of accounting for other barriers**

| | 1. Institutional barriers | Score |
|---|---|---|
| a. | *Are there any conflicting goals or jurisdictions between ministries or other agencies?*<br>The Ministry of Natural Resources has recently initiated a project, as a result of national legislation, in a land area covering about 25,000 hectares to address loss of biodiversity concerns. The same area is also considered for this project. | 4 |
| b. | *Is there the potential for institutional racism, gender bias or age discrimination that could limit the policy effectiveness – for example, by limiting participation of certain stakeholders based on their race, religion, gender or age?*<br>The policy is in accordance with recent national legislation that has been put in place to eliminate discrimination in the workplace. | 1 |
| | **2. Cultural barriers** | |
| a. | *Are different languages used in the region where the policy will be implemented?*<br>French and English are the two most widely spoken languages. However, several local isolated communities use their own dialects. Most local offices have sufficient capacity to communicate in these dialects. | 1 |
| b. | *Is the policy congruent with cultural norms and values?*<br>Several local communities rely on hierarchical authority to make decisions on the use of their forest land. This is made possible in part by the age distribution of the communities. In most rural areas, the population is rather aged (average age of farmers: 45 years). Most young people move to urban areas in search of work because of a lack of job opportunities in the countryside. As a result, there is very little conflict about how to manage natural resources, with decisions made by elders largely carried out by the community leaders without question. Therefore, there are no cultural barriers related to generational differences. | 1 |
| c. | *Are there gender issues in accessing resources or communication?*<br>See b above. | – |
| d. | *Are there generational differences in work ethics and work approaches that could result in conflicts or disputes among stakeholders that might limit the ability to effectively implement the policy?*<br>See b above. | – |
| e. | *Are there any areas or landmarks with religious significance of the region under consideration?*<br>See b above. | – |
| f. | *Is there a group that has very strong opposition to the policy?*<br>No indications of groups that oppose the policy; however, information is very limited. | 4 |

TABLE **8.13,** continued

**Example of accounting for other barriers**

| | 3. Physical barriers | Score |
|---|---|---|
| a. | *Are land areas proposed for intervention easily accessible?*<br>About 96% of the land area targeted by the policy is accessible. However, as a result of recent floods and soil erosion in the northern part of the country (accounting for about 35% of the land area under consideration), some roads will need to be inspected and repaired. According to expert judgment, it is too expensive, and there is currently no budget, to build roads. Therefore, about 6,400 ha of land originally targeted by the policy will not be accessible. Based on current land use in the impacted areas, it is estimated that half would have been used for natural regeneration and the other half for SFM under the PES programme. | 2 |
| b. | *Is the necessary physical infrastructure in place for the proposed policy?*<br>See a above. | – |
| c. | *Are there any war conflicts in the country that would limit access to certain land areas?*<br>There are no conflicts in the country. | 1 |

*Abbreviation:* –, not applicable

The distribution of scores was evaluated (step 2). Four barriers received a score of 1. One barrier received a score of 2. Two barriers received a score of 4. None of the barriers received a score of 3.

The extent to which policy effectiveness may be reduced as a result of each barrier was evaluated. Five of the barriers are not expected to limit policy effectiveness. None of the barriers received a 3 (i.e. appear to be crucial problems that could completely hamper policy effectiveness). Physical barrier 3a will reduce the area of land available for SFM and natural regeneration by 3,200 ha. Any potential conflicts with the biodiversity project are unknown at this point because no details are yet available on how the project will be implemented, and what sort of criteria it will have for management and land use.

Based on the above assessment, the land area of the policy will be adjusted as shown in Table 8.14.

The table illustrates how land area was refined after each step. The refined values in the last column are considered the likely implementation potential of the policy, which are the values that should be used to estimate the GHG impacts of the policy.

## 8.6 Estimate GHG impacts

It is a *key recommendation* to estimate the GHG impacts of the policy. There are two ways to estimate GHG impacts: the emissions approach and the activity data approach. Where baseline emissions were estimated, users can calculate the change in emissions between the baseline and policy scenarios (emissions approach). Where baseline emissions were not estimated, the GHG impacts can be estimated by calculating the net GHG emissions reductions and removals directly from the likely implementation potential of the policy (activity data approach). A method for estimating the GHG impacts for each approach is given below.

### 8.6.1 Emissions approach

Users should use the likely implementation potential of the policy (derived following the method in Sections 8.2–8.5) to determine the most likely policy scenario. This involves deriving new parameter values and, if relevant, new emission factors that reflect conditions under the policy scenario. Box 8.2 provides an example of how emission factors were selected in the impact assessment of a NAMA.

The adjusted values and emission factors are used to estimate GHG emissions of the policy scenario. This involves subtracting the policy scenario emissions and removals from the baseline emissions and removals to estimate net change in GHG emissions and removals resulting from the policy.

TABLE **8.14**

### Example of refined implementation potential

| Policy activity | Maximum implementation potential (ha) | Refined implementation potential based on policy design and national circumstances (ha) | Refined implementation potential based on financial feasibility (ha) | Refined implementation potential based on barriers (ha) |
|---|---|---|---|---|
| SFM | 150,000 | 105,000 | 94,500 | 91,300 |
| Tree planting, general | 15,000 | 13,950 | 14,250 | 13,950 |
| Natural regeneration | 40,000 | 37,200 | 33,480 | 30,280 |
| Tree planting with endangered species | 5,000 | 4,650 | 4,750 | 4,750 |
| **Total** | **210,000** | **160,800** | **146,580** | **140,280** |

BOX **8.2**

### Example of selecting emission factors for estimating GHG impacts

The Grupo Ecológico Sierra Gorda, a national NGO in Mexico, is coordinating the implementation of the NAMA – Subnational Mitigation Actions for the Regeneration of Landscapes. The NAMA includes state-led policies and actions for the regeneration of forests and the implementation of planned grazing in 12 states.

One of the subnational actions for the regeneration of forests is to provide payments for ecosystem services to forest owners in exchange for the removal of cattle and other degradation factors from their forests. To assess the GHG impacts of pilot activities using the activity data approach described in the ICAT *Forest Methodology*, the Grupo Ecológico initiated local studies in conjunction with the Postgraduate College in Agricultural Science, with the support of the United States Forest Service and the State Secretariat of Sustainable Development. The studies include sampling of forest parcels that are regenerating following the removal of cattle, and of control sites that are still subject to cattle grazing. The studies seek to develop local emission factors for forest carbon capture resulting from natural regeneration. Initial results from these studies were used to assess GHG impacts in the forest understorey. It is expected that the studies will provide emission factors for other strata in the future.

To be consistent with national reports, data from the local study were complemented by the use of emission factors from Mexico's most recent national communication and biennial update report submitted to UNFCCC. In some cases, emission factors were also extrapolated from annual growth increments reported in state forest inventories or by state forestry departments.

### 8.6.2 Activity data approach

The likely implementation potential of the policy represents the effects that are expected to occur as a result of the policy. Implicitly, these effects are relative to the baseline scenario. The method below should be used to calculate the impact of the policy on each GHG source and carbon pool in the GHG assessment boundary. The GHG impacts for all GHG sources and carbon pools are summed to yield total policy impact on GHGs.

**Estimate carbon stock change**

Using the estimates of how much the policy will increase or decrease the area of land (hectares) in land categories affected by the policy (determined following the method in Sections 8.2–8.5), subdivide the land categories into strata according to the method in Section 7.2.2. These are the policy scenario strata.

Determine the policy impact on each GHG source and carbon pool included in the GHG assessment boundary for each policy scenario stratum. Methods for estimating the GHG impacts of the living biomass carbon pool are provided in the relevant sections below. Repeat the steps for each policy scenario stratum.

*Forest land remaining forest land*

- Step 1: Estimate the hectares of land in the policy scenario stratum for each year of the assessment period. Unless the policy design indicates otherwise, assume that the area of land changes following a linear trend. For example, in the forest policy example, the implementation potential for SFM is estimated as 97,400 ha over 15 years. A linear trend assumes that 6,300 ha of forest is affected by the policy each year for 15 years (i.e. management changes to sustainable forestry on 6,300 ha/year for 15 years). The assessment period is 20 years; therefore, for the last five years of the time series, no further hectares of forest are affected by the policy. Table 8.15 provides an example land area time series.

- Step 2: Calculate the annual carbon stock change for living biomass for the policy scenario stratum based on the land area time series estimated in step 1 and the method in Section 7.2.4 for forest land remaining forest land. Call this term $\Delta C_{\text{biomass with policy}}$ (units are tonnes C/year).

- Step 3: Determine the baseline scenario stratum, which is the most likely stratum if the policy were not enacted ("without policy"). The ecological zone in the baseline stratum should be the same as in the policy scenario stratum. The baseline management category should be different from the policy scenario stratum. To use this equation for the activity data approach, assume that the baseline land area time series is identical to the policy scenario land area time series developed in step 1 because it represents the same land as the policy scenario under an alternative scenario. Calculate the annual carbon stock change in living biomass for the baseline stratum based on the land area time series estimated in step 1 and following the method in Section 7.2.4 for forest land remaining forest land. Call this term $\Delta C_{\text{biomass without policy}}$ (units are tonnes C/year).

- Step 4: Calculate the cumulative carbon stock change over all years of the assessment period, separately for the baseline and policy strata.

- Step 5: Subtract the baseline cumulative carbon stock change from the policy cumulative carbon stock change to yield the policy impact on the living biomass carbon pool for the land strata.

TABLE **8.15**

**Example land area time series**

| Year | 1 | 2 | 3 | 4–13[a] | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area (ha)** | 6,300 | 12,600 | 18,900 | [25,200–81,900] | 88,200 | 94,500 | 94,500 | 94,500 | 94,500 | 94,500 | 94,500 |

[a] For simplicity, individual values for each year are not shown. Square brackets indicate the range of values during that time period.

*Non-forest land converted to forest land*

- Step 1: Estimate the cumulative hectares of land in the policy scenario stratum for the assessment period. For example, in the forest policy example, it is estimated that 14,250 ha of cropland will be converted to forest land through general tree planting as a result of the policy. Therefore, the cumulative hectares of land in the policy scenario stratum for non-forest land converted to forest land is 14,250 ha.

- Step 2: Calculate the change in forest carbon stocks from land conversion using equation 7.1 in Section 7.2.4. Set the area term in equation 7.1 equal to the hectares of land from step 1. This yields the policy impact on the living biomass carbon pool for the land stratum.

*Reduced forest land conversion to non-forest land*

- Step 1: Estimate the cumulative hectares of land in the policy scenario stratum for the assessment period. For reduced deforestation, this will be the estimated amount of forest land not converted to non-forest land as a result of the policy.

- Step 2: Calculate the change in forest carbon stocks from land conversion using equation 7.1 in Section 7.2.4. Set the area term in equation 7.1 equal to the hectares of land from step 1.

  The result of equation 7.1 will be the estimated carbon stock loss that would have occurred if those hectares were deforested. Multiply the result of equation 7.1 by –1 to convert the outcome to carbon stock gain because the policy reduced this amount of forest carbon stock loss. This yields the policy impact on the living biomass carbon pool for the land stratum.

### 8.6.3 Calculate GHG impacts

Calculate the total policy impact on the living biomass carbon pool by summing the results for all policy scenario strata. Convert the net carbon stock change to GHG emissions reductions or removals, expressed as tonnes of $CO_2$e, by multiplying by 44/12 and –1. This generates the cumulative policy impact in terms of tonnes of $CO_2$e emissions (positive) or removals (negative). Divide the cumulative policy impact by the number of years in the assessment period for the annual GHG impacts of the policy.

Where other GHG sources and carbon pools are included in the GHG assessment boundary, calculate their impact in terms of $CO_2$e emissions and add this to the policy impact on the living biomass carbon pool.

# 9 Estimating GHG impacts of the policy ex-post

*Ex-post impact assessment is a backward-looking assessment of the GHG impacts achieved by a policy to date. The GHG impacts can be assessed during the policy implementation period or in the years after implementation. Ex-post assessment involves evaluating the performance of the policy, and estimating its impact by comparing observed policy scenario values (based on monitored data) with ex-post baseline values. In contrast to ex-ante assessment, which is based on forecasted values, ex-post assessment involves monitored or observed data collected during the policy implementation period. The impact of the policy (ex-post) is estimated by subtracting baseline estimates from policy scenario estimates. Users who are estimating GHG impacts ex-ante only can skip this chapter.*

**Checklist of key recommendations**

- Estimate or update baseline emissions using observed values for parameters that are not affected by the policy and estimated values for parameters that are affected by the policy
- Ascertain whether the inputs, activities and intermediate effects that were expected to occur according to the causal chain actually occurred (if relevant)
- Estimate the GHG impacts of the policy over the assessment period for each GHG source and carbon pool included in the GHG assessment boundary

## 9.1 Estimate or update baseline emissions

It is a *key recommendation* to estimate or update baseline emissions using observed values for parameters that are not affected by the policy and estimated values for parameters that are affected by the policy. The baseline emissions can be estimated following the method in Section 7.2. Further guidance on monitoring parameters is provided in Chapter 10. The baseline and policy scenarios have the same GHG assessment boundary.

Where the baseline scenario was determined and baseline emissions were estimated in a previous ex-ante impact assessment, this should be updated by replacing estimated values with observed data for non-policy drivers.

FIGURE **9.1**

**Overview of steps in the chapter**

Estimate or update baseline emissions (Section 9.1) → Estimate GHG impacts (Section 9.2)

Where the results of the assessment will be used to inform GHG accounting and reporting of progress made towards implementation and achievement of NDCs, and meet the reporting requirements of the transparency framework, users should consider aligning the input parameters (e.g. activity data, emission factors, socioeconomic data) used for estimating the GHG impact of forest policies with similar parameters used for GHG accounting and reporting under the Paris Agreement. Some parameters used for the projection of GHG impacts of forest policies can also be used as key parameters for projections developed to meet reporting requirements of the transparency framework.

## 9.2 Estimate GHG impacts

### 9.2.1 Evaluate performance of the policy (if relevant)

The performance of the policy should be evaluated to ensure that the GHG impacts calculated ex-post can be attributed to the policy. To do this, it is a *key recommendation* to ascertain whether the inputs, activities and intermediate effects that were expected to occur according to the causal chain actually occurred. This step can be skipped for ex-post impact assessments where no previous ex-ante assessment has been conducted.

Chapter 10 provides examples of the inputs and activities that should be monitored to evaluate the performance of the policy. If users cannot ascertain that the inputs or activities occurred, it is not possible to attribute GHG impacts to policy implementation.

Users should also examine whether the intermediate effects in the causal chain occurred. It may not be feasible to monitor all intermediate effects. At a minimum, each of the intermediate effects linked to GHG sources and carbon pools included in the GHG assessment boundary should be monitored with at least one parameter. Tables 6.2 and 6.3 in Chapter 6 provide examples of intermediate effects that should be monitored. If users cannot confirm that these intermediate effects occurred, it is not possible to attribute GHG impacts to policy implementation.

Note that inputs, activities and/or intermediate effects may be smaller or larger than expected, but this does not mean that GHG impacts cannot be attributed to the policy.

### 9.2.2 Estimate the GHG impacts of the policy

It is a *key recommendation* to estimate the GHG impacts of the policy over the assessment period for each GHG source and carbon pool included in the GHG assessment boundary. The same methods used to estimate baseline emissions should be used to estimate policy scenario emissions to allow meaningful tracking of performance over time.

Users should calculate policy scenario emissions using the estimation methods in Section 7.2. Observed, measured or recently collected activity data, and measured or re-estimated emission factors should be used. Further guidance on monitoring parameters is provided in Chapter 10.

If using the emissions approach, the GHG impacts of the policy are calculated by subtracting baseline emissions (estimated in Section 9.1) from the ex-post policy scenario emissions for each GHG source and carbon pool included in the GHG assessment boundary.

If using the activity data approach, the GHG impact of the policy is calculated directly, by determining the actual implementation level using observed, measured or recently collected data, and measured or re-estimated emission factors. It is not necessary to estimate the GHG emissions of the baseline scenario when using this approach. Rather, users should follow the method in Section 8.6.2 using ex-post activity data and emission factors. Under this approach, users should carefully consider the policy's inputs and activities, and intermediate effects that occurred ex-post as a result of the policy. Users should report and justify that the actual implementation level (e.g. the observed change in activity data) is the result of the policy.

# PART IV

## Monitoring and reporting

# 10 Monitoring performance over time

*Monitoring during the policy implementation period serves two objectives. It allows users to evaluate the performance of a policy by monitoring trends in performance to understand whether the policy is on track and being implemented as planned. It also allows users to collect the information needed to quantify the GHG impacts during or after policy implementation. This chapter identifies data and parameters to monitor over time, and provides a method to develop a monitoring plan.*

**Checklist of key recommendations**

- Identify the key performance indicators that will be used to track performance of the policy over time and define the parameters necessary to estimate GHG emissions ex-post
- Create a plan for monitoring key performance indicators and parameters
- Monitor each of the indicators and parameters over time, in accordance with the monitoring plan

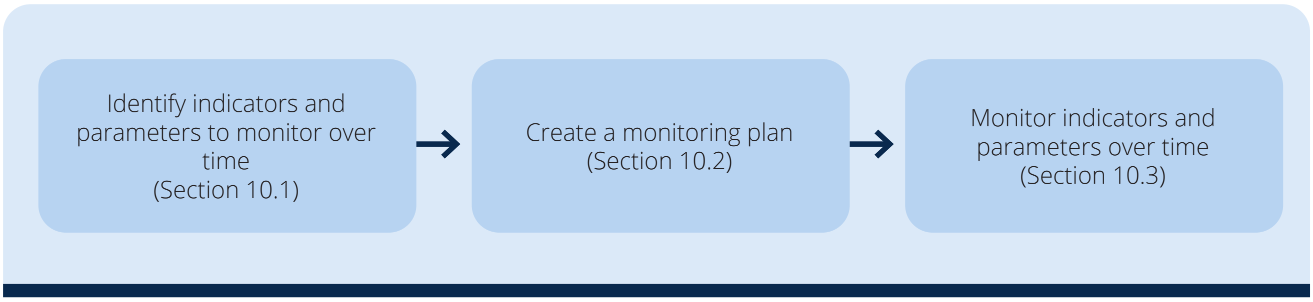
## 10.1 Identify indicators and parameters to monitor over time

This section describes the key performance indicators and parameters to monitor. A key performance indicator is a metric that indicates the performance of a policy (such as tracking changes in targeted outcomes). A parameter is a variable such as activity data or an emission factor that is needed to estimate emissions. Data are collected for indicators and parameters during or after the monitoring period. It is a *key recommendation* to identify the key performance indicators that will be used to track performance of the policy over time and define the parameters necessary to estimate GHG emissions ex-post.

Where the results of the assessment will be used to inform GHG accounting and reporting of progress made towards implementation and achievement of NDCs, and meet the reporting requirements of the transparency framework, the indicators and parameters listed in Tables 10.1–10.3 to monitor progress towards achieving GHG emissions reductions from the implementation of forest policies can also serve as inputs to monitor progress towards achieving national GHG reduction targets, such as NDCs.

FIGURE **10.1**

**Overview of steps in the chapter**



### 10.1.1 Key performance indicators

Table 10.1 defines, and provides examples of, the types of key performance indicators: inputs, administrative activities, intermediate effects, barriers, GHG impacts and sustainable development impacts.

### 10.1.2 Parameters

Table 10.2 defines and describes the three types of parameters: assumptions, activity data and carbon stock change factors.

TABLE **10.1**

**Key performance indicators to monitor**

| Key performance indicator | Definition | Example |
| --- | --- | --- |
| Inputs | Resources that go into implementing the policy | Taxation of ecosystem service users |
| Administrative activities | Administrative activities involved in implementing the policy | Number of contracts executed with landowners |
| Intermediate effects | Changes in behaviour, technology, processes or practices | Survival and growth of trees |
| Barriers | Activities that may limit the effectiveness of the policy | Degree to which corruption rules and regulations were enforced |
| GHG impacts | Changes in GHG emissions by sources or removals by sinks that result from the intermediate effects of the policy | Increased sequestration from biomass accumulation |
| Sustainable development impacts | Changes in relevant environmental, social or economic conditions that result from the policy | Number of endangered species planted |

*Source:* Adapted from WRI (2014).

TABLE **10.2**

**Parameters to monitor**

| Parameter | Definition | Example |
| --- | --- | --- |
| Assumptions | Data that influence estimation of parameters | GDP |
| Activity data | A quantitative measure of a level of activity that results in GHG emissions. Activity data are multiplied by an emission factor to derive the GHG emissions associated with a process or an operation. | Non-forest land converted to forest land |
| Carbon stock change factors | The average emissions rate of a given GHG for a given source, relative to units of activity and the data needed to choose or derive emission factors. | $CO_2$ removals per hectare |

Table 10.3 further elaborates specific parameters for A/R, SFM and reduced deforestation. In some cases, parameters may also be used as key performance indicators, as noted in the table. Parameters are organized by those needed for estimating GHG impacts of land-use change or of land management change. Those that are relevant to land management change on forest land remaining forest land are organized by the stock-difference method or the gain–loss method. Parameters that are needed regardless of land-use change or land management change are listed under "All". Parameters needed to estimate GHG impacts that can also be used to monitor policy performance are also designated as key performance indicators. The data needed to monitor these parameters may be measured, modelled or estimated. A suggested monitoring frequency is also provided. For parameters that are suggested to be monitored periodically, users can monitor annually, every 5 years or every 10 years, depending on data availability and the desired level of certainty.

TABLE **10.3**

**Monitoring parameters**

| Parameter and unit | Potential sources of data | Parameter type | Suggested monitoring frequency |
|---|---|---|---|
| **All** | | | |
| Land-use classification (by ecological domain and climate zone)<br>(unitless) | Remotely sensed and aerial imagery<br>Land-cover maps<br>National forest inventory<br>GHG inventory reports<br>IPCC 2006 GL,[a] Table 4.1 | Assumption | Once<br>Can be updated in conjunction with collecting data on the area of land in each stratum |
| Carbon fraction of dry matter<br>$CF_{i,j}$<br>(tonnes C per tonne dry matter) | IPCC 2006 GL,[a] Table 4.3<br>Published data | Carbon stock change calculation | Once per type |
| **Land-use change** | | | |
| Area of forest land converted to non-forest land<br>(ha) | Remotely sensed and aerial imagery<br>Land-cover maps<br>National forest inventory<br>GHG inventory reports | Activity data<br>Key performance indicator | At least twice (at beginning and end of policy implementation period) or periodically during policy implementation period |
| Area of land converted to forest land<br>(ha) | Remotely sensed and aerial imagery<br>Land-cover maps<br>National forest inventory<br>GHG inventory reports | Activity data<br>Key performance indicator | At least twice (at beginning and end of policy implementation period) or periodically during policy implementation period |

TABLE **10.3**, continued

## Monitoring parameters

| Parameter and unit | Potential sources of data | Parameter type | Suggested monitoring frequency |
|---|---|---|---|
| Biomass carbon stocks on land type *i*, after the conversion<br>$B_{after,i}$<br>(tonnes dry matter per ha) | Measured samples for tree attributes, such as diameters and heights, and applying species-specific allometric equations or biomass tables, from national forest inventory or country-specific research studies<br>GHG inventory reports<br>IPCC 2006 GL,[a] Tables 4.7, 4.8 and 4.12, for above-ground biomass carbon stocks in forests<br>IPCC 2006 GL,[a] Table 5.9, for default biomass carbon stocks on cropland (tonnes C per ha)<br>IPCC 2006 GL,[a] Table 6.4, for default biomass stocks on grassland | Carbon stock change calculation<br>Key performance indicator | Once |
| Biomass carbon stocks on land type *i*, before the conversion<br>$B_{before,i}$<br>(tonnes dry matter per ha) | Measured samples for tree attributes, such as diameters and heights, and applying species-specific allometric equations or biomass tables, from national forest inventory or country-specific research studies<br>GHG inventory reports<br>IPCC 2006 GL,[a] Tables 4.7, 4.8 and 4.12, for above-ground biomass carbon stocks in forests<br>IPCC 2006 GL,[a] Table 5.9, for default biomass carbon stocks on cropland (tonnes C per ha)<br>IPCC 2006 GL,[a] Table 6.4, for default biomass stocks on grassland | Carbon stock change calculation | Once |
| **Forest land remaining forest land: all** | | | |
| Area of forest land remaining forest land<br>(ha) | Remotely sensed and aerial imagery<br>Land-cover maps<br>National forest inventory<br>GHG inventory reports | Activity data<br>Key performance indicator | At least twice (at beginning and end of policy implementation period) or periodically during policy implementation period |
| Ratio of below-ground to above-ground biomass<br>$R_{i,j}$<br>(tonnes dry matter below-ground biomass per tonne dry matter above-ground biomass) | IPCC 2006 GL,[a] Table 4.4 | Carbon stock change calculation | Once per type |

TABLE **10.3,** continued

## Monitoring parameters

| Parameter and unit | Potential sources of data | Parameter type | Suggested monitoring frequency |
|---|---|---|---|
| **Forest land remaining forest land: stock-difference method** | | | |
| Forest carbon stock at time $t_1$<br>$C_{t_1}$<br>(tonnes C) | Measured samples for tree attributes, such as diameters and heights, and applying species-specific allometric equations or biomass tables, from national forest inventory or country-specific research studies<br>Estimated using IPCC 2006 GL,[a] equation 2.8 | Carbon stock change calculation<br>Key performance indicator | Once at the beginning of a time interval<br>The time interval may correspond to the policy implementation period or a shorter interval within the policy implementation period. |
| Forest carbon stock at time $t_2$<br>$C_{t_2}$<br>(tonnes C) | Measured samples for tree attributes, such as diameters and heights, and applying species-specific allometric equations or biomass tables, from national forest inventory or country-specific research studies<br>Estimated using IPCC 2006 GL[a] equation 2.8 | Carbon stock change calculation<br>Key performance indicator | Once at the end of a time interval<br>The time interval may correspond to the policy implementation period or a shorter interval within the policy implementation period. |
| Merchantable growing stock volume<br>$V_{i,j}$<br>($m^3$ per hectare) | National forest inventory<br>GHG inventory reports<br>Harvest or timber sale records | Carbon stock change calculation (parameter in IPCC 2006 GL,[a] equation 2.8)<br>Key performance indicator | Twice, in conjunction with estimating $C_{t_1}$ and $C_{t_2}$<br>One or more time intervals may be monitored within the policy implementation period. |
| Biomass conversion and expansion factor $BCEF_{S_{i,j}}$<br>(tonnes above-ground biomass grown per $m^3$ of growing stock volume) | IPCC 2006 GL,[a] Table 4.5 | Carbon stock change calculation (parameter in IPCC 2006 GL,[a] equation 2.8) | Once per type |
| **Forest land remaining forest land: gain–loss method** | | | |
| Above-ground biomass growth rate<br>$G_{W_{i,j}}$<br>(tonnes dry matter per ha) | Measured samples for tree attributes, such as diameters and heights, and applying species-specific allometric equations or biomass tables, from national forest inventory or country-specific research studies<br>GHG inventory reports<br>IPCC 2006 GL,[a] Table 4.12<br>Derived from mean annual increment (default values available in IPCC 2006 GL,[a] Tables 4.11A and 4.11B) and IPCC 2006 GL,[a] equation 2.10 | Carbon stock change calculation<br>Key performance indicator | Periodically |

TABLE **10.3**, continued

**Monitoring parameters**

| Parameter and unit | Potential sources of data | Parameter type | Suggested monitoring frequency |
|---|---|---|---|
| Annual above-ground biomass C loss due to wood removals<br>$L_{wood\text{-}removals}$<br>(tonnes C per year) | Estimated using IPCC 2006 GL,[a] equation 2.12<br>National forest inventory<br>Harvest or timber sale records | Carbon stock change calculation<br>Key performance indicator | Periodically |
| Annual above-ground biomass C loss due to fuelwood removals<br>$L_{fuelwood}$<br>(tonnes C per year) | Estimated using IPCC 2006 GL,[a] equation 2.13<br>National forest inventory | Carbon stock change calculation<br>Key performance indicator | Periodically |
| Annual above-ground biomass carbon losses due to disturbances<br>$L_{disturbance}$<br>(tonnes C per year) | Estimated using IPCC 2006 GL,[a] equation 2.14<br>National forest inventory | Carbon stock change calculation<br>Key performance indicator | Periodically |

[a] IPCC 2006 GL, volume 4, *Agriculture, Forestry and Other Land Use*

## 10.2 Create a monitoring plan

A monitoring plan is important to ensure that the necessary data are collected and analysed. It is a *key recommendation* to create a plan for monitoring key performance indicators and parameters. A monitoring plan is the system for obtaining, recording, compiling and analysing data and information important for tracking performance and estimating GHG impacts. Where possible, a monitoring plan should be developed before policy implementation. Doing so can ensure that the data needed to assess the effectiveness of the policy are collected.

In some reporting or decision-making cases, assessment objectives may require an estimate or description of assessment uncertainty. This could include documentation of the method or approach used to assess uncertainty and/or sensitivity of the results as a function of parameters, scenarios or models used. Qualifying or quantifying uncertainty can help users to choose assessment methods, prioritize data-collection efforts, interpret or compare estimation results, and/or identify estimation improvement efforts over time. Chapter 12 of the *Policy and Action Standard* provides methodological guidance for qualifying or quantifying uncertainty associated with an estimate of a policy's GHG impact.

The elements below should be described in the monitoring plan.

### 10.2.1 Monitoring period

The policy implementation period is the time for which the policy is in effect. The assessment period is the time for which the GHG impacts resulting from the policy are assessed. The monitoring period is the time for which the policy is monitored.

At a minimum, the monitoring period should include the policy implementation period. Users can have multiple monitoring periods for separate assessment periods. A monitoring period can also include monitoring of relevant activities before implementation of the policy and after the policy implementation period.

Users should strive to align the monitoring period with those of other assessments being conducted using other ICAT methodologies. For example, if assessing sustainable development impacts using the ICAT *Sustainable Development Guide* in addition to assessing GHG impacts, the monitoring periods should be the same.

### 10.2.2 Institutional arrangements for coordinated monitoring

Information on key performance indicators and parameters can be dispersed among different institutions. Given the wide variety of data needed for impact assessment and the range of stakeholders involved, strong institutional arrangements serve an important function. They play a central role in coordinating monitoring. A technical coordinator, coordinating team or body is often assigned to lead monitoring, reporting and verification (MRV) processes in which responsibilities have been delegated to different institutions. The coordinating body oversees the procedures for data collection, management and reporting.

Countries may already have institutions in place as part of a national MRV system. In this case, users can consider expanding the national MRV system to also monitor the impact of the policy. Where strong institutional arrangements do not yet exist, users can determine the governmental body with the adequate capacity and authority to be responsible for the MRV system and to establish the necessary legal arrangements. Institutional mandates help to strengthen the procedures and the system, and may also help secure funding from the government to ensure the continuity of the process.

Users can refer to the UNFCCC *Toolkit for Non-Annex I Parties on Establishing Institutional Arrangements for National Communications and Biennial Update Reports*,[31] as well as other sources, for support on establishing or improving the institutional arrangements for a robust MRV system.

### 10.2.3 Considerations for a robust monitoring plan

To ensure that the monitoring plan is robust, consider including the following elements in the plan:

- **Roles and responsibilities.** Identify the entity or person that is responsible for monitoring key performance indicators and parameters, and clarify the roles and responsibilities of the personnel conducting the monitoring.
- **Competencies.** Include information about any required competencies and any training needed to ensure that personnel have necessary skills.
- **Methods.** Explain the methods for generating, storing, collating and reporting data on monitored parameters.
- **Frequency.** Key performance indicators and parameters can be monitored at various frequencies, such as monthly, quarterly or annually. Determine the appropriate frequency of monitoring based on the needs of decision makers and stakeholders, cost, and data availability. In general, the more frequently data are collected, the more robust the assessment will be. Frequency of monitoring can be consistent with measurement conducted under the national MRV system.
- **Collecting and managing data.** Identify the databases, tools or software systems that are used for collecting and managing data and information.
- **Quality assurance and quality control (QA/QC).** Define the methods for QA/QC to ensure that the quality of data leads to confidence in the assessment results. QA is a planned review process conducted by personnel who are not directly involved in data collection and processing. QC is a procedure or routine set of steps performed by the personnel compiling the data to ensure the quality of the data.
- **Record keeping and internal documentation.** Define procedures for clearly documenting the procedures and approaches for data collection, as well as the data and information collected. This information is beneficial for improving the availability of information for subsequent monitoring events, documenting improvements over time and creating a robust historical record for archiving.
- **Continual improvement.** Include a process for improving the methods for collecting data, taking measurements, running surveys, monitoring impacts, and modelling or analysing data. Continual improvement of

31 Available at: http://unfccc.int/files/national_reports/non-annex_i_natcom/training_material/methodological_documents/application/pdf/unfccc_mda-toolkit_131108_ly.pdf.

monitoring can help reduce uncertainty in GHG estimates over time.

- **Financial resources.** Identify the cost of monitoring and sources of funds.

## 10.3 Monitor indicators and parameters over time

It is a *key recommendation* to monitor each of the indicators and parameters over time, in accordance with the monitoring plan. The frequency of monitoring is dependent on stakeholder resources, data availability, feasibility, and the uncertainty requirement of reporting or estimation needs. The monitoring plan should include an iterative process for balancing these dependencies.

# 11 Reporting

*Reporting the results, methodology and assumptions used is important to ensure that the GHG impact assessment is transparent, and gives decision makers and stakeholders the information they need to properly interpret the results. This chapter presents a list of information that is recommended for inclusion in an assessment report.*

### Checklist of key recommendations

- Report information about the assessment process and the GHG impacts resulting from the policy (including the information listed in Section 11.1)

## 11.1 Recommended information to report

It is a *key recommendation* to report information about the assessment process and the GHG impacts resulting from the policy (including the information listed below[32]). Where two or more assessment guides are applied to the policy, the general information and policy description only need to be reported once. For guidance on providing information to stakeholders, refer to the ICAT *Stakeholder Participation Guide* (Chapter 7).

### General information

- The name of the policy assessed
- The person(s) or organization(s) that did the assessment
- The date of the assessment
- Whether the assessment is an update of a previous assessment, and, if so, links to any previous assessments

[32] The list does not cover all chapters in this document because some chapters provide information or guidance that is not relevant to reporting.

### Chapter 2: Objectives of estimating GHG impacts

- The objective(s) and intended audience(s) of the assessment

### Chapter 4: Steps and assessment principles

- Opportunities for stakeholders to participate in the assessment

### Chapter 5: Describing the policy

- A description of the policy, including the recommended information in Table 5.1 and the additional information in Table 5.2
- Whether the assessment applies to an individual policy or a package of related policies; if a package is assessed, which policies are included in the package
- Whether the assessment is ex-ante, ex-post, or a combination of ex-ante and ex-post

### Chapter 6: Identifying impacts: how forest policies reduce emissions or enhance removals

- A causal chain, including a table describing all intermediate effects
- A list of all GHG sources and carbon pools that are included in the GHG assessment boundary
- A list of potential GHG sources and carbon pools that are excluded from the GHG assessment boundary, with justification for their exclusion
- The assessment period

### Chapter 7: Estimating the baseline scenario and emissions

- The method chosen (emissions approach or activity data approach) for estimating the policy's expected GHG impacts
- A description of the baseline scenario and justification for why it is considered the most likely scenario
- A list of the intended policy outcomes and associated target drivers

- Total annual and cumulative baseline emissions and removals over the GHG assessment period
- The methodology and assumptions used to estimate baseline emissions, including the emissions estimation methods (including any models) used
- Justification for the choice of whether to develop new baseline assumptions and data or to use published baseline assumptions and data
- A list of policies, actions and projects included in the baseline scenario
- A list of implemented or adopted policies, actions or projects that are expected to affect the GHG sources or carbon pools included in the GHG assessment boundary but are excluded from the baseline scenario, with justification for their exclusion
- Whether the baseline scenario includes any planned policies and, if so, which planned policies are included
- A list of non-policy drivers included in the baseline scenario
- A list of non-policy drivers that were considered for inclusion but are excluded from the baseline scenario, with justification for their exclusion
- The baseline values for key parameters (such as activity data, emission factors and global warming potential [GWP] values) in the baseline emissions estimation method(s)
- The methodology and assumptions used to estimate baseline values for key parameters, including whether each parameter is assumed to be static or dynamic, and assumptions regarding other policies/actions and non-policy drivers that are included in the baseline and affect each parameter
- All sources of data used to estimate key parameters, including activity data, emission factors, GWP values and assumptions
- The method or approach used to assess uncertainty
- An estimate or description of the uncertainty and/or sensitivity of the results, to help users of the information properly interpret the results

**Chapter 8: Estimating GHG impacts ex-ante**

- An estimate of the maximum implementation potential of the policy and a description of how it was estimated
- A description and justification for how policy design and national circumstances affect the maximum implementation potential of the policy, and a refined estimate of the implementation potential after accounting for policy design and national circumstances
- A description and justification for how financial feasibility affects the implementation potential of the policy, and a refined estimate of the implementation potential after accounting for the financial feasibility of the policy
- A description and justification for how other barriers affect the implementation potential of the policy, and a refined estimate of the implementation potential after accounting for other barriers
- Total annual and cumulative policy scenario emissions and removals over the GHG assessment period, if feasible based on the method used
- Year of expected fully realized GHG impact, if the policy implementation period or assessment period is shorter than the policy impact period
- An ex-ante estimate of the total net GHG impacts of the policy over the assessment period, and an estimate disaggregated by each GHG source and carbon pool included in the GHG assessment boundary
- Any methodologies and assumptions used to estimate policy scenario emissions, including the emissions estimation methods (including any models) used
- The policy scenario values for key parameters (e.g. activity data, emission factors, GWP values) in the emissions estimation method(s)
- The methodology and assumptions used to estimate policy scenario values for

key parameters, including whether each parameter is assumed to be static or dynamic

- All sources of data used to estimate key parameters, including activity data, emission factors, GWP values and assumptions
- The method or approach used to assess uncertainty
- An estimate or description of the uncertainty and/or sensitivity of the results, to help users of the information properly interpret the results

**Chapter 9: Estimating GHG impacts ex-post**

- The performance of the policy, including whether the inputs, activities and intermediate effects that were expected to occur, according to the causal chain, actually occurred
- Total annual and cumulative policy scenario emissions and removals over the GHG assessment period
- Year of expected fully realized GHG impact, if the policy implementation period or assessment period is shorter than the policy impact period.
- The methodology and assumptions used to estimate policy scenario emissions, including the emissions estimation methods (including any models) used
- All sources of data to estimate key parameters, including activity data, emission factors, GWP values and assumptions
- An estimate of the total cumulative GHG impacts of the policy over the assessment period, and disaggregated by each GHG source and carbon pool included in the GHG assessment boundary
- The method or approach used to assess uncertainty
- An estimate or description of the uncertainty and/or sensitivity of the results, to help users of the information properly interpret the results

**Chapter 10: Monitoring performance over time**

- A list of the key performance indicators used to track performance over time and the rationale for their selection
- Sources of key performance indicator data and monitoring frequency
- Additional information to report (if relevant)
- How the policy is modifying longer-term trends in GHG emissions and removals
- The economic, social and environmental (sustainable development) impacts of the policy
- The type of technical review undertaken (first, second or third party), the qualifications of the reviewers and the review conclusions. More guidance on reporting information related to technical review is provided in Chapter 9 of the ICAT *Technical Review Guide*

# APPENDICES

# Appendix A: Stakeholder participation during the assessment process

This appendix provides an overview of the ways that stakeholder participation can enhance the process of assessment of GHG impacts of forest policies. Table A.1 provides a summary of the steps in the assessment process where stakeholder participation is recommended and why it is important, explaining where relevant guidance can be found in the ICAT *Stakeholder Participation Guide*.

TABLE **A.1**

**Steps where stakeholder participation is recommended in the impact assessment**

| Chapter/step in this document | Why stakeholder participation is important at this step | Relevant chapters in *Stakeholder Participation Guide* |
|---|---|---|
| Chapter 2 – Objectives of estimating GHG impacts of forest policies | • Ensure that the objectives of the assessment respond to the needs and interests of stakeholders | Chapter 5 – Identifying and understanding stakeholders |
| Chapter 4 – Using the methodology<br>• Section 4.2.5 – Planning stakeholder participation | • Build understanding, participation and support for the policy among stakeholders<br>• Ensure conformity with national and international laws and norms, as well as donor requirements related to stakeholder participation<br>• Identify and plan how to engage stakeholder groups who may be affected or may influence the policy<br>• Coordinate participation at multiple steps of this assessment with participation in other stages of the policy design and implementation cycle, and other assessments | Chapter 4 – Planning effective stakeholder participation<br>Chapter 5 – Identifying and understanding stakeholders<br>Chapter 6 – Establishing multi-stakeholder bodies<br>Chapter 9 – Establishing grievance redress mechanisms |
| Chapter 6 – Identifying impacts: how forest policies reduce emissions or enhance removals | • Identify the full range of stakeholder groups affected by, or with influence on, the policy<br>• Enhance completeness by identifying expected intermediate effects and impacts for all stakeholder groups<br>• Identify and address possible unintended or negative impacts early on<br>• Improve and validate causal chain with stakeholder insights on cause–effect relationships between the policy, behaviour change and expected impacts | Chapter 8 – Designing and conducting consultations |
| Chapter 7 – Estimating the baseline scenario and emissions | • Inform assumptions on existing and planned policies | Chapter 8 – Designing and conducting consultations |

TABLE **A.1**, continued

**Steps where stakeholder participation is recommended in the impact assessment**

| Chapter/step in this document | Why stakeholder participation is important at this step | Relevant chapters in *Stakeholder Participation Guide* |
|---|---|---|
| Chapter 8 – Estimating GHG impacts of the policy ex-ante | • Inform estimates of the policy's implementation potential<br>• Gain insights into a policy's specific local context and impacts<br>• Identify and address potential cultural and other barriers to policy implementation | Chapter 8 – Designing and conducting consultations |
| Chapter 10 – Monitoring performance over time | • Ensure that monitoring frequency addresses the needs of decision makers and other stakeholders | Chapter 8 – Designing and conducting consultations |
| Chapter 11 – Reporting | • Raise awareness of the GHG benefits and build support for the policy<br>• Inform decision makers and other stakeholders about impacts to facilitate adaptive management<br>• Increase accountability and transparency, and thereby credibility and acceptance of the assessment | Chapter 7 – Providing information to stakeholders |

# Appendix B: Guidance on discount rates

Different kinds of entities have different discount rates. To understand the likely implementation potential of a proposed policy, it is useful to analyse the policy from the perspective of the stakeholders who use and manage land:

- Where the policy requires investments that are not provided by the government, it is useful to analyse the policy from the perspective of the investors.
- Where a private land manager will use its own capital for the investment, it is useful to analyse the policy from the perspective of the land manger.
- Where land managers need to borrow capital from others, it is useful to analyse the policy from the perspective of potential investors.

The discount rate used to analyse private investments, from the perspective of private firms (e.g. timber companies), will be different from the discount rate used to analyse government spending. The best discount rate to use is the rate a bank would charge to provide a loan to the typical actor for the activity being analysed. For private, multi-year investments in developing countries, discount rates may be greater than 15% per year.

For government investments and costs, the best discount rate for the analysis is the rate that the government pays to borrow money, with the term of the borrowing roughly matching the timespan of the financial analysis. For example, if one is analysing an investment in equipment for improving logging practices where the equipment has a five-year payback period, the rate the government pays for bonds that mature five years after issuance might be the appropriate discount rate for the analysis. That said, a 10-year rate is often more appropriate than a 5-year rate. Whereas discount rates for stable governments may be 3%, rates for less stable governments may be 5–10%, or even more.

Imputing a discount rate for smallholders who do not have access to credit can be difficult. Rates provided by informal lenders may be the best option for estimating rates for smallholders. These rates can be extremely high: 30–100% per year. Subsidized rates are not appropriate. For example, if an NGO provides subsidized loans for development or other social reasons, the loan rates may be quite different from the smallholders' discount rates.

To understand the likely behaviour of smallholders, the analysis should use observed interest rates, or discount rates imputed from observing what activities a smallholder will or will not participate in. For example, if a smallholder does not buy available, reliable, high-yielding seed that would grow a crop that is harvested and sold one year after seed purchase, even when the net returns from farming would be 30% higher, the smallholder has an imputed discount rate of 30%. However, this discount rate may be high because of barriers such as seasonal food insecurity or lack of access to capital. If the policy can address these barriers, the appropriate discount rate for the analysis may be much lower.

Discount rates of investors include the risk that the investor will not be repaid, repayments will be delayed or repayments will be partial. Typically, an analysis of a policy will not include a financial risk analysis, but instead will look at rates required by banks for similar policies. Hurdle rates of return required by private entities investing in similar policies can be used as the discount rate for private investors. However, private investors may not be willing to reveal their internal rates for analysis, and it can be hard to tell whether risk factors of the proposed policy would be similar to the risk factors of investments proposed as comparisons.

# Appendix C: Selecting the scope of the methodology

The forestry activities included in the scope of this methodology (i.e. A/R, sustainable forest management and reduced deforestation/ degradation) were selected using a set of criteria developed with the Technical Working Group:

- role of the activity in countries’ NDCs
- role of the activity in proposed NAMAs
- gaps in available guidance
- contribution of the activity to staying under a 1.5–2 °C temperature goal
- contribution of the activity to a large percentage of countries’ emissions.

# Abbreviations and acronyms

| | |
|---|---|
| **A/R** | afforestation/reforestation |
| **C** | carbon |
| **$CO_2$** | carbon dioxide |
| **$CO_2e$** | carbon dioxide equivalent |
| **GDP** | gross domestic product |
| **GHG** | greenhouse gas |
| **GWP** | global warming potential |
| **ha** | hectare |
| **ICAT** | Initiative for Climate Action Transparency |
| **IPCC** | Intergovernmental Panel on Climate Change |
| **IPCC 2006 GL** | *2006 IPCC Guidelines for National Greenhouse Gas Inventories* |
| **$m^3$** | cubic metre |
| **NAMA** | nationally appropriate mitigation action |
| **NDC** | nationally determined contribution |
| **NGO** | non-governmental organization |
| **PES** | payment for ecosystem services |
| **REDD+** | countries' efforts to reduce emissions from deforestation and forest degradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks |
| **SDG** | Sustainable Development Goal |
| **SFM** | sustainable forest management |
| **UNFCCC** | United Nations Framework Convention on Climate Change |

# Glossary

| | |
|---|---|
| **Assessment period** | The time period over which GHG impacts resulting from a policy are assessed |
| **Assessment report** | A report, completed by the user, that documents the assessment process, and the GHG, sustainable development and/or transformational impacts of a policy |
| **Baseline scenario** | A reference case that represents the events or conditions most likely to occur in the absence of a policy (or package of policies) being assessed |
| **Causal chain** | A conceptual diagram tracing the process by which a policy leads to impacts through a series of interlinked logical and sequential stages of cause-and-effect relationships |
| **Emission factor** | A factor that converts activity data into GHG emissions data |
| **Ex-ante assessment** | The process of estimating expected future GHG impacts of a policy (i.e. a forward-looking assessment) |
| **Ex-post assessment** | The process of estimating historical GHG impacts of a policy (i.e. a backward-looking assessment) |
| **Expert judgment** | A carefully considered, well-documented qualitative or quantitative judgment made in the absence of unequivocal observational evidence by a person or persons who have a demonstrable expertise in the given field.[33] Users can apply their own expert judgment or consult experts. |
| **GHG assessment boundary** | The scope of the assessment in terms of the range of GHG impacts that is included in the assessment |
| **GHG impacts** | Changes in GHG emissions by GHG sources and carbon pools that result from a policy |
| **Impact assessment** | Estimation of changes in GHG emissions or removals resulting from a policy, either ex-ante or ex-post |
| **Independent policies** | Policies that do not interact with each other, such that the combined effect of implementing the policies together is equal to the sum of the individual effects of implementing them separately |
| **Inputs** | Resources that go into implementing a policy, such as financing |
| **Interacting policies** | Policies that produce total effects, when implemented together, that differ from the sum of the individual effects had they been implemented separately |
| **Intermediate effects** | Changes in behaviour, technology, processes or practices that result from a policy, which lead to GHG impacts |

[33] IPCC (2006).

| | |
|---|---|
| **Jurisdiction** | The geographic area within which an entity’s (such as a government’s) authority is exercised |
| **Key performance indicator** | A metric that indicates the performance of a policy |
| **Monitoring period** | The time over which a policy is monitored, which may include pre-policy monitoring and post-policy monitoring in addition to the policy implementation period |
| **Negative impacts** | Impacts that are perceived as unfavourable from the perspective of decision makers and stakeholders |
| **Overlapping policies** | Policies that interact with each other and that, when implemented together, have a combined effect less than the sum of their individual effects when implemented separately. They include both policies that have the same or complementary goals and counteracting or countervailing policies that have different or opposing goals. |
| **Parameter** | A variable such as activity data or emission factors that are needed to estimate GHG impacts |
| **Policy or action, or policy and measures** | An intervention taken or mandated by a government, institution or other entity, which may include laws, regulations and standards; taxes, charges, subsidies and incentives; information instruments; voluntary agreements; implementation of technologies, processes or practices; and public or private sector financing and investment |
| **Policy implementation period** | The time period during which a policy is in effect |
| **Policy scenario** | A scenario that represents the events or conditions most likely to occur in the presence of a policy (or package of policies) being assessed. The policy scenario is the same as the baseline scenario except that it includes the policy (or package of policies) being assessed. |
| **Positive impacts** | Impacts that are perceived as favourable from the perspectives of decision makers and stakeholders |
| **Rebound effect** | Increased consumption that results from actions that increase efficiency and reduce consumer costs |
| **Stakeholders** | People, organizations, communities or individuals who are affected by, and/or who have influence or power over, a policy |
| **Sustainable development impacts** | Changes in environmental, social or economic conditions that result from a policy, such as changes in economic activity, employment, public health, air quality and energy security |
| **Uncertainty** | (1) Quantitative definition: Measurement that characterizes the dispersion of values that could reasonably be attributed to a parameter. (2) Qualitative definition: A general term that refers to the lack of certainty in data and methodological choices, such as the application of non-representative factors or methods, incomplete data or lack of transparency. |

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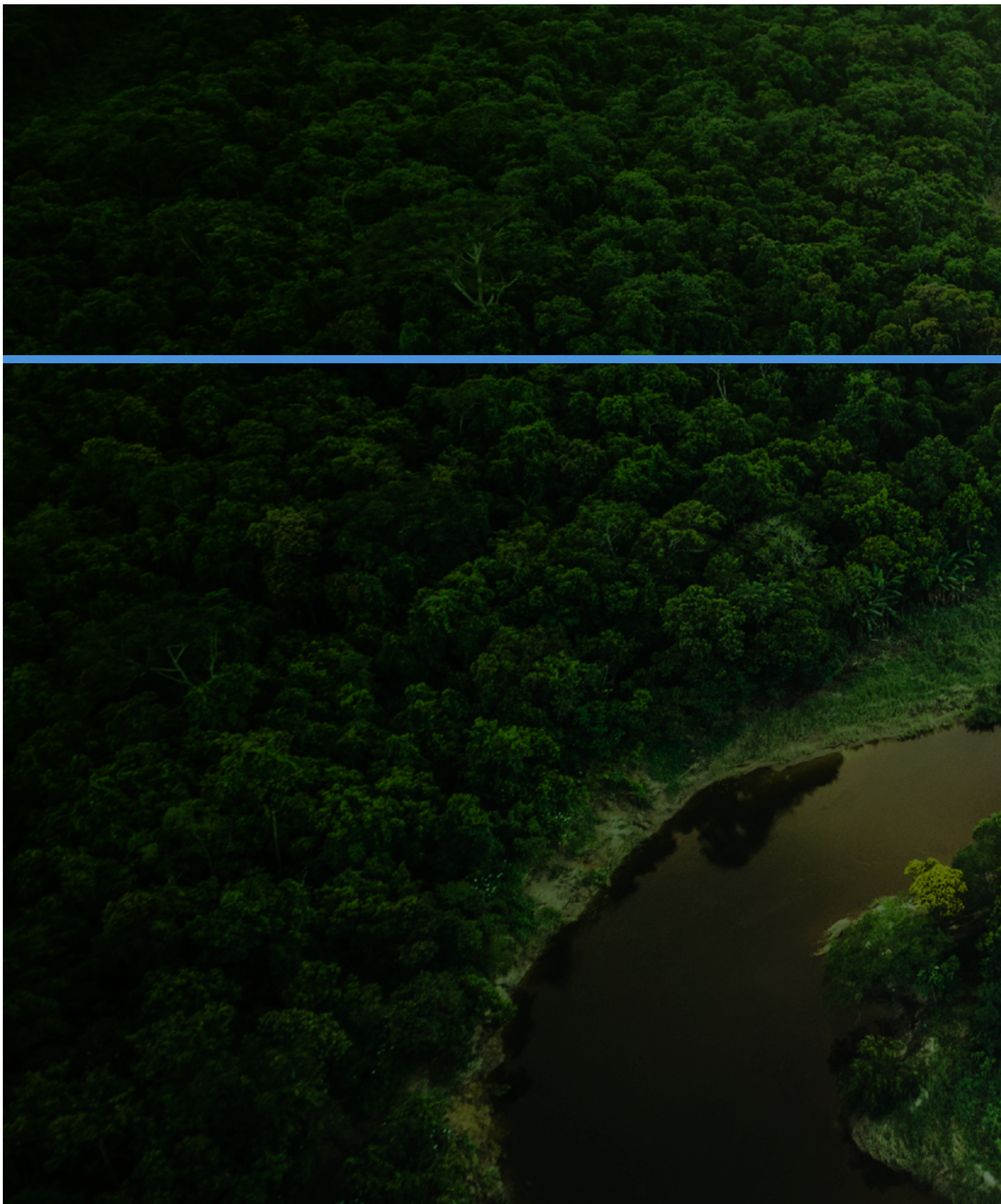

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