Greenhouse Gas Protocol

Mitigation Goals Accounting and Reporting Standard

First Draft for Review Group

November 2012

Introduction to this draft

This is the first draft of the *GHG Protocol Mitigation Goals Standard* for review by the Review Group. This draft was developed by the Technical Working Groups (TWGs) between June and October 2012, with strategic input from the Advisory Committee. A preliminary version of this draft was reviewed by the Advisory Committee and Technical Working Groups in October 2012 and revised based on their feedback. This draft will subsequently be revised multiple times based on stakeholder feedback and pilot testing. See the table below for the full standard development timeline. Events relevant to the Review Group are marked in bold. Our current place in the timeline is marked in red.

Standard development timeline

Month	Activity
June 2012	First Advisory Committee meeting (June 6-7) First Technical Working Group (TWG) conference calls
June - September	TWG conference calls every two weeks (of both TWG#1 and TWG#2)
October	Preliminary first draft (without sector detail) sent to Advisory Committee and TWGs for review (October 23 - November 5)
November	Preliminary first draft revised **First draft sent to Review Group (November 21 for review through January 11)**
December	**Stakeholder workshops to get feedback on first draft (in Doha/COP18 on December 2, Washington DC on December 13, and Beijing on December 19)**
January 2013	Stakeholder feedback compiled TWG call to discuss stakeholder feedback
February	Advisory Committee meeting #2 to discuss stakeholder feedback Preliminary second draft (with sector detail) compiled and sent to Advisory Committee and TWG
March	Preliminary second draft revised based on Advisory Committee and TWG feedback **Second draft (for pilot testing) completed**
April - August	Pilot testing in several countries/sectors (and pilot testing workshops)
September/ October	Technical Working Group meeting #2 to discuss pilot testing feedback Second draft revised based on pilot testing feedback (in consultation with Advisory Committee and TWGs)
November	**Final draft circulated for public comment**
Early 2014	Final draft revised **Standard published**

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Chapter 1: Introduction

Emissions of the anthropogenic greenhouse gases (GHG) that drive climate change and its impacts around the world are growing. According to climate scientists, global carbon dioxide emissions must be cut by as much as 85 percent below 2000 levels by 2050 to limit global mean temperature increase to 2 degrees Celsius above pre-industrial levels.[1] Temperature rise above this level will produce increasingly unpredictable and dangerous impacts for people and ecosystems. As a result, the need to accelerate efforts to reduce anthropogenic GHG emissions is increasingly urgent.

National and subnational jurisdictions are planning and implementing a variety of climate change mitigation goals in order to reduce their emissions. As they do so, they are facing new pressures to account for GHG reductions achieved by implementation of mitigation goals in order to track and report performance over time. Effective mitigation goals require robust monitoring and evaluation methodologies to ensure that they are effective in achieving their intended results.

1.1 The Greenhouse Gas Protocol

The Greenhouse Gas Protocol (GHG Protocol) is a multi-stakeholder partnership of businesses, nongovernmental organizations (NGOs), governments, and others convened by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). Launched in 1998, the mission of the GHG Protocol is to develop internationally accepted greenhouse gas (GHG) accounting and reporting standards and tools, and to promote their adoption in order to achieve a low emissions economy worldwide.

The GHG Protocol has produced the following separate but complementary standards, protocols, and guidelines:

- ***GHG Protocol Corporate Accounting and Reporting Standard* (2004):** A standardized methodology for companies to quantify and report their corporate GHG emissions. Also referred to as the *Corporate Standard*.
- ***GHG Protocol for Project Accounting* (2005):** A guide for quantifying reductions from GHG-mitigation projects. Also referred to as the *Project Protocol.*
- ***GHG Protocol Land Use, Land-Use Change, and Forestry Guidance for GHG Project Accounting* (2006):** A guide to quantify and report reductions from land use, land-use change, and forestry, to be used in conjunction with the *Project Protocol.*
- ***GHG Protocol Guidelines for Quantifying GHG Reductions from Grid-Connected Electricity Projects* (2007):** A guide for quantifying reductions in emissions that either generate or reduce the consumption of electricity transmitted over power grids, to be used in conjunction with the *Project Protocol.*
- ***Measuring to Manage: A Guide to Designing GHG Accounting and Reporting Programs* (2007):** A guide for program developers on designing and implementing effective GHG programs based on accepted standards and methodologies.
- ***GHG Protocol for the U.S. Public Sector* (2010):** A step-by-step approach to measuring and reporting emissions from public sector organizations, complementary to the *Corporate Standard.*
- ***GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard* (2011):** A standardized methodology for companies to quantify and report their corporate value chain (scope 3) GHG emissions, to be used in conjunction with the *Corporate Standard*. Also referred to as the *Scope 3 Standard*.

[1] IPCC, Summary for Policymakers (Table SPM.5: Characteristics of post-TAR stabilization scenarios), in Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, ed. B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, 2007).

- ***GHG Protocol Product Life Cycle Accounting and Reporting Standard* (2011):** A standardized methodology to quantify and report GHG emissions associated with individual products throughout their life cycle. Also referred to as the *Product Standard*.

1.2 Purpose of this standard

The *GHG Protocol Mitigation Goals Accounting and Reporting Standard* (also referred to as the *Mitigation Goals Standard*) provides requirements and guidance for jurisdictions to quantify, track, and report progress toward mitigation goals. This standard is designed to create more international consistency and transparency in the way national and sub-national jurisdictions quantify, track, and report progress toward mitigation goals.

This standard is intended to guide users in answering the following questions:

- For jurisdictions that do not have a mitigation goal: Which factors to consider when developing a mitigation goal
- For jurisdictions that have a mitigation goal: How to track and report progress toward meeting the goal
- Before the goal period: How to estimate the GHG reductions associated with meeting the goal
- During the goal period: How to track and report progress toward meeting the goal
- After the goal period: How to evaluate and report whether the goal has been achieved

The standard was developed with the following objectives in mind:

- To enable users to track and report progress toward mitigation goals in an accurate, consistent, transparent, complete, and relevant manner, through the use of standardized approaches and principles
- To help decision-makers develop effective strategies for managing and reducing GHG emissions through a better understanding of expected and achieved emissions impacts
- To support consistent and transparent public reporting of emissions impacts and mitigation goal effectiveness according to a standardized set of reporting requirements

1.3 Intended users

This standard is intended primarily for governments at all levels (e.g., national, state, provincial, municipal) who are seeking to either develop a mitigation goal and track and report progress toward achieving it or who are seeking to track and report progress toward a goal that they have already adopted.

Throughout this standard, the term “jurisdiction(s)” refers to the entity implementing the standard.

1.4 Scope of the standard

This standard is designed to enable jurisdictions to quantify, track, and report progress of mitigation goals over a defined goal period. It covers steps related to monitoring, reporting, and verification. The methodology is policy-neutral and its use is voluntary. Furthermore, the reporting requirements outlined in this standard describe the types of information that shall be publicly disclosed by jurisdictions in order for them to be in conformance with this standard.

This standard is applicable to:

- All geographies (i.e., it is internationally applicable)
- All levels of government (municipal, subnational, national)

- All types of mitigation goals (e.g., absolute reductions from a base year, reductions from a baseline, reductions in emissions intensity, reductions to an absolute level, and sectoral goals)
- Mitigation goals in any and all sectors and covering any and all greenhouse gases
- Both ex-ante estimation of GHG reductions associated with achieving the goal and ex-post evaluation of whether the goal was achieved

1.5 Relationship to GHG inventory accounting

National, subnational, and organizational GHG inventories are critical for enabling jurisdictions and organizations to track changes in overall GHG emissions at a national, subnational, or organizational level.

All jurisdictions and organizations should develop a GHG inventory as a first step to designing and setting a GHG mitigation goal. To develop an inventory, national jurisdictions should use IPCC *Guidelines for National Greenhouse Gas Inventories*. Subnational jurisdictions should use internationally accepted methods and guidelines, such as C40/ICLEI/WRI *Global Protocol for Community Emissions* (GPC) and IPCC *Guidelines for National Greenhouse Gas Inventories* to develop an inventory.

This standard uses the inventory as a starting point for quantifying emissions reductions associated with mitigation goals and tracking and reporting progress. While inventories should cover the full range of a jurisdiction's greenhouse gas emissions across all gases and sectors, mitigation goals accounting focuses on the greenhouse gases and sectors included within the goal boundary. Furthermore, mitigation goals accounting includes special treatment for emissions reductions from outside the goal boundary (e.g. offsets) and emissions and removals (sequestration) from the land-use sector, which may differ from the way they are treated under the inventory. In all cases, the quantification methods should be consistent between inventory and mitigation goals accounting.

Mitigation goals accounting is critical to achieving additional GHG management objectives relevant to jurisdictions, such as designing mitigation strategies and tracking GHG performance of mitigation goals, and should be carried out as a complement to developing and updating a GHG inventory on a regular basis.

1.6 Relationship to the GHG Protocol Policies and Actions Standard

The *GHG Protocol Policies and Actions Standard* and *GHG Protocol Mitigation Goals Standard* both apply to government jurisdictions and are intended to support tracking of progress toward meeting mitigation objectives. The two standards were developed simultaneously as part of the same standard development process in order to ensure harmonization of overlapping topics, where they exist.

The *Policies and Actions Standard* accounts for GHG effects of individual policies and actions undertaken by a jurisdiction or organization, while the *Mitigation Goals Standard* accounts for overall progress toward national or subnational GHG reduction goals (see Table 1.1). Together with guidelines for developing national, subnational, or organizational GHG inventories (see section 1.5), the two standards provide a comprehensive approach to jurisdictions' GHG measurement and management.

The user's objectives should drive the use of a particular GHG Protocol accounting standard. The *Policies and Actions Standard* enables a user to understand the future expected effects and past observed effects of individual policies and actions, as a means toward achieving GHG reduction goals, while the *Mitigation Goals Standard* enables users to track overall progress toward meeting those goals based on observed changes in emissions and removals relative to the goal level.

While each standard can be implemented independently, both standards are mutually supportive. For example, users can apply the *Mitigation Goals Standard* to understand the level of GHG reductions

needed to meet a given GHG mitigation goal, then use the *Policies and Actions Standard* to quantify the GHG effects of selected policies and actions to determine if they are collectively sufficient to meet the goal. Conversely, users can first apply the *Policies and Actions Standard* to quantify expected GHG reductions from various mitigation policies and actions to understand the range of possible GHG reductions, then use the *Mitigation Goals Standard* to set a mitigation goal and track and report progress.

The effects of mitigation policies and actions should be reflected in an annual GHG inventory and ultimately help jurisdictions meet their GHG mitigation goals. However, in practice their effect may not be seen, especially if mitigation policies and actions are avoiding emissions relative to a baseline scenario, but not leading to absolute reductions in emissions.

Table 1.1: Comparison of *GHG Protocol Mitigation Goals Standard* and *Policies and Actions Standard*

Standard	Description
Mitigation Goals Standard	Tracking and reporting overall progress toward national or sub-national GHG emission goals, and quantifying GHG reductions associated with goals. Examples: GHG reductions from a base year, GHG reductions from a baseline scenario, reductions in emissions intensity, or reductions to an absolute emissions level (e.g., zero in the case of carbon neutrality).
Policies and Actions Standard	Quantifying changes in GHG emissions caused by specific policies and actions, relative to a baseline scenario. Examples: the change in emission caused by increased energy efficiency, increased renewable energy, regulations and standards, trading programs, deployment of new product lines and technologies.

1.7 Relationship to GHG Protocol Corporate Accounting and Reporting Standard

The GHG Protocol Corporate Accounting and Reporting Standard provides guidance to companies for developing inventories and setting GHG reduction targets. This standard provides guidance to jurisdictions for setting mitigation goals and tracking and reporting progress toward their achievement.

The Corporate Standard is primarily an inventory methodology, whereas this standard focuses exclusively on mitigation goals accounting. Furthermore, the Corporate Standard describes and outlines mitigation goals framed as reductions from a base year and reductions in emissions intensity. This standard describes and outlines those goals in addition to goals framed as reductions from a baseline scenario and reductions to an absolute emissions level.

Companies may find some of the guidance provided in this standard useful when setting goals and tracking and reporting progress toward their achievement.

1.8 GHG calculation tools and guidance

To help jurisdictions implement the *Mitigation Goals Standard*, the GHG Protocol website provides a variety of useful GHG calculation tools and guidance, including several cross-sector and sector-specific calculation tools, which provide step-by-step guidance, together with electronic worksheets to help jurisdictions calculate GHG emissions from specific sources or sectors. All GHG calculation tools and guidance are available at www.ghgprotocol.org.

1.9 How this standard was developed

The GHG Protocol follows a broad and inclusive multi-stakeholder process to develop greenhouse gas accounting and reporting standards with participation from businesses, government agencies, NGOs, and academic institutions from around the world.

In June 2012, WRI launched a three-year process to develop the *GHG Protocol Mitigation Goals Standard*. A 30-member Advisory Committee of experts provides strategic direction throughout the process. The first draft of the *Mitigation Goals Standard* was developed in 2012 by a Technical Working Group consisting of over 25 members. In late 2012, a Review Group of over 100 members will review the draft standard and be invited to attend three stakeholder workshops (in Doha, Washington, and Beijing). In 2013, organizations from a variety of countries will pilot test the first draft and provide feedback on its practicality and usability. The standard will be published in early 2014 following additional opportunities for public comment.

1.10 Terminology: shall, should, and may

This standard uses precise language to indicate which provisions of the standard are requirements, which are recommendations, and which are permissible or allowable options that jurisdictions may choose to follow. The term **"shall"** is used throughout this standard to indicate what is required in order for a jurisdiction to be in conformance with the *GHG Protocol Mitigation Goals Standard*. The term **"should"** is used to indicate a recommendation, but not a requirement. The term **"may"** is used to indicate an option that is permissible or allowable. The term "required" is used in the guidance to refer to requirements in the standard. "Needs," "can," and "cannot" may be used to provide guidance on implementing a requirement or to indicate when an action is or is not possible.

1.11 Limitations

Jurisdictions should exercise caution in comparing the results of evaluations based on this standard for the same goal. Differences in reported emissions reductions may be a result of differences in quantification methodology rather than real world differences. Additional efforts are necessary to enable valid comparisons, such as consistency in quantification methodologies (e.g. inventory methodology and Global Warming Potential (GWP) values) and data sources. To understand whether comparisons are valid, all methodologies and data sources used must be transparently reported. In general, comparable results can best be achieved if GHG evaluations are undertaken using the same data and methodology, which ensures methodological consistency between assessments.

Regarding offsets and credits, this standard requires jurisdictions to ensure that all offset credits used to meet mitigation goals are real, additional, based on a realistic baseline, quantified and monitored, independently verified, unambiguously owned, address leakage, address permanence, do no net harm, and quantified using internationally accepted standards.[2] No guidance is provided in this standard on calculation methodologies for offsets or credits. In cases where jurisdictions do use offset credits to achieve their mitigation goals, they shall report the type of offset credit used, the calculation methodology, and the verifying body. For more information see Chapter 8.

A variety of inputs inform how jurisdictions decide on which type of mitigation goal they adopt and its corresponding level of ambition, in terms of GHG reductions. While this standard outlines considerations for choosing goal type and goal level, it does not provide comprehensive guidance on the types of analysis that should be undertaken to inform these decisions. For example, a detailed discussion of mitigation assessments, mitigation abatement cost (MAC) curves, and other similar tools and procedures is left out. However, this standard does include guidance on developing baseline scenarios, which are a

[2] Source: Offset Quality Initiative

critical element of mitigation assessments and can be used to understand likely emissions trajectories in the absence of a mitigation goal.

Emissions change for a variety of policy- and non-policy-related reasons. This standard enables jurisdictions to understand how emissions have changed within the goal boundary (i.e., whether they have increased or decreased and by how much) and whether a GHG mitigation goal has been met. However, it does not offer jurisdictions a comprehensive methodology for determining *why* emissions have changed within the goal boundary (e.g., whether a decrease in emissions was the result of mitigation strategies or an economic recession). Decomposition analysis and other analytical techniques can be used to determine the driving forces behind why emission changed over a certain time period.

Chapter 2: Objectives of mitigation goals accounting and reporting

Before tracking progress and quantifying GHG reductions associated with mitigation goals, jurisdictions should consider which objectives they intend to achieve.

Developing a GHG mitigation goal and tracking progress toward its achievement is an integral step toward effectively reducing emissions. This standard is intended to assist jurisdictions in fulfilling the following objectives:

- Designing and setting a GHG mitigation goal (before the goal period)
- Tracking progress toward achieving mitigation goal (during the goal period)
- Reporting on achievement of mitigation goal (after the goal period)
- Informing mitigation strategies by understanding GHG reductions needed to meet mitigation goal

[Placeholder for more guidance and case studies]

Chapter 3: Key concepts, overview of steps, and summary of requirements

This chapter provides an overview of key concepts used in this standard, a summary of the steps involved in goals accounting and reporting, as well as a list of the requirements that must be followed for a GHG evaluation to be in conformance with this standard.

3.1 Key concepts of mitigation goals accounting

This section outlines several key concepts of mitigation goals accounting, including:

- Designing and setting a GHG mitigation goal
- Ex-ante estimation of emissions reductions associated with meeting a goal
- Tracking progress during the goal period
- Ex-post evaluation of achieved reductions after the goal period
- Tracking progress of the goal itself as compared to overall emissions reductions in jurisdiction

Designing and setting a GHG mitigation goal

Mitigation goals can take a variety of forms depending on the circumstances and objectives of the jurisdiction. Goals can be reductions from a base year or from a baseline. They can also be a reduction in emissions intensity. Goals can be short-term or long-term and cover a variety of sectors and gases.

This standard provides guidance on how to design and set a mitigation goal.

Jurisdictions that already have designed and set a mitigation goal can skip Chapter 5, Chapter 6, and Chapter 7.

Ex-ante estimation of emissions reductions associated with meeting a goal

In order to design effective mitigation strategies to achieve a goal, jurisdictions must first understand the emissions reductions that will be needed.

This standard provides guidance on how to estimate emissions reductions associated with meeting a goal ex-ante, which can enable jurisdictions to understand the magnitude of emission reductions that will need to be achieved by the end of the goal period

Tracking progress during the goal period

Periodic assessments of progress and performance during the goal period offers jurisdictions information related to how well their mitigation strategies are working and how much further effort will be needed to meet their goal by the end of the goal period. This information can be used to strengthen high performing mitigation strategies and/or discontinue or revise underperforming ones.

This standard provides guidance on how to track performance during the goal period.

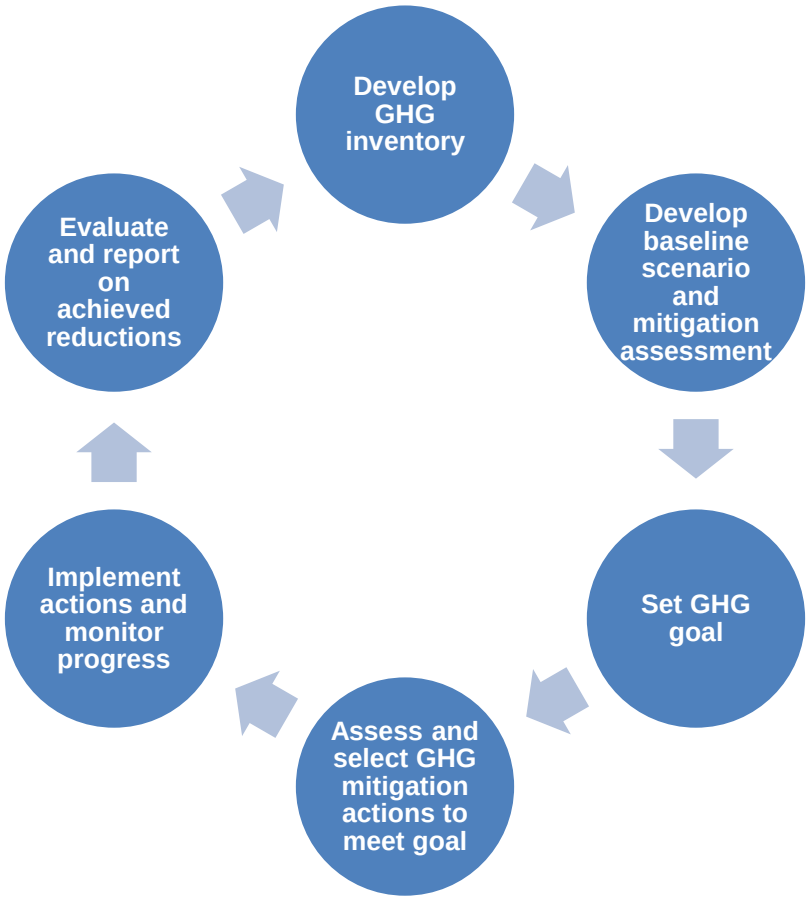
Ex-post evaluation of achieved reductions

At the end of the goal period, it is important for jurisdictions to know whether their goal has been met.

This standard provides guidance on evaluating, at the end of the goal period, whether the goal has been met.

Figure 3.1 outlines a sequence of steps that may be followed to set a GHG mitigation goal, design and select GHG mitigation actions, implement actions, and monitor, evaluate, and report progress. The cycle is an iterative process whereby goal setting is informed by previous experience with policies and actions that have already been implemented. Figure 3.1 is an example only. Not all steps in Figure 3.1 may be relevant to all users. Moreover, not all steps are covered by this standard.

Figure 3.1: Example of goal setting cycle and policy cycle



Tracking progress of the goal versus overall emissions in a jurisdiction

This standard uses the jurisdiction-level GHG inventory as the starting point for quantifying emissions reductions associated with a mitigation goal and tracking and reporting progress. However, accounting for mitigation goals is different than inventory accounting in a number of ways.

While inventories should cover the full range of a jurisdiction's greenhouse gas emissions across all gases and sectors, mitigation goals accounting focuses on the greenhouse gases and sectors included within the goal boundary. Furthermore, mitigation goals accounting includes special treatment for the emissions reductions generated outside the goal boundary (e.g. offsets) and emissions and removals (sequestration) from the land-use sector.

Emissions covered by goals that are narrower in scope (e.g. sectoral goals) could be decreasing while overall emissions in the inventory could be rising. In this case, using only the inventory to track progress

would obfuscate the goal's progress. Therefore, it is critical that mitigation goals accounting methods are used, in addition to inventories, to track progress toward goals.

This standard provides guidance on mitigation goals accounting.

3.2 Steps in mitigation goals accounting and reporting

This standard is organized according to the steps a user follows in accounting for and reporting emissions reductions resulting from a GHG mitigation goal. See Figure 3.2 for an outline of steps. See Table 3.2 for a description of steps. Steps in Chapter 5 and 6 can be skipped if the jurisdiction has already set a goal. Steps in Chapter 7 can be skipped if the user already has determined a baseline and/or base year.

Figure 3.2. Overview of steps in mitigation goals accounting

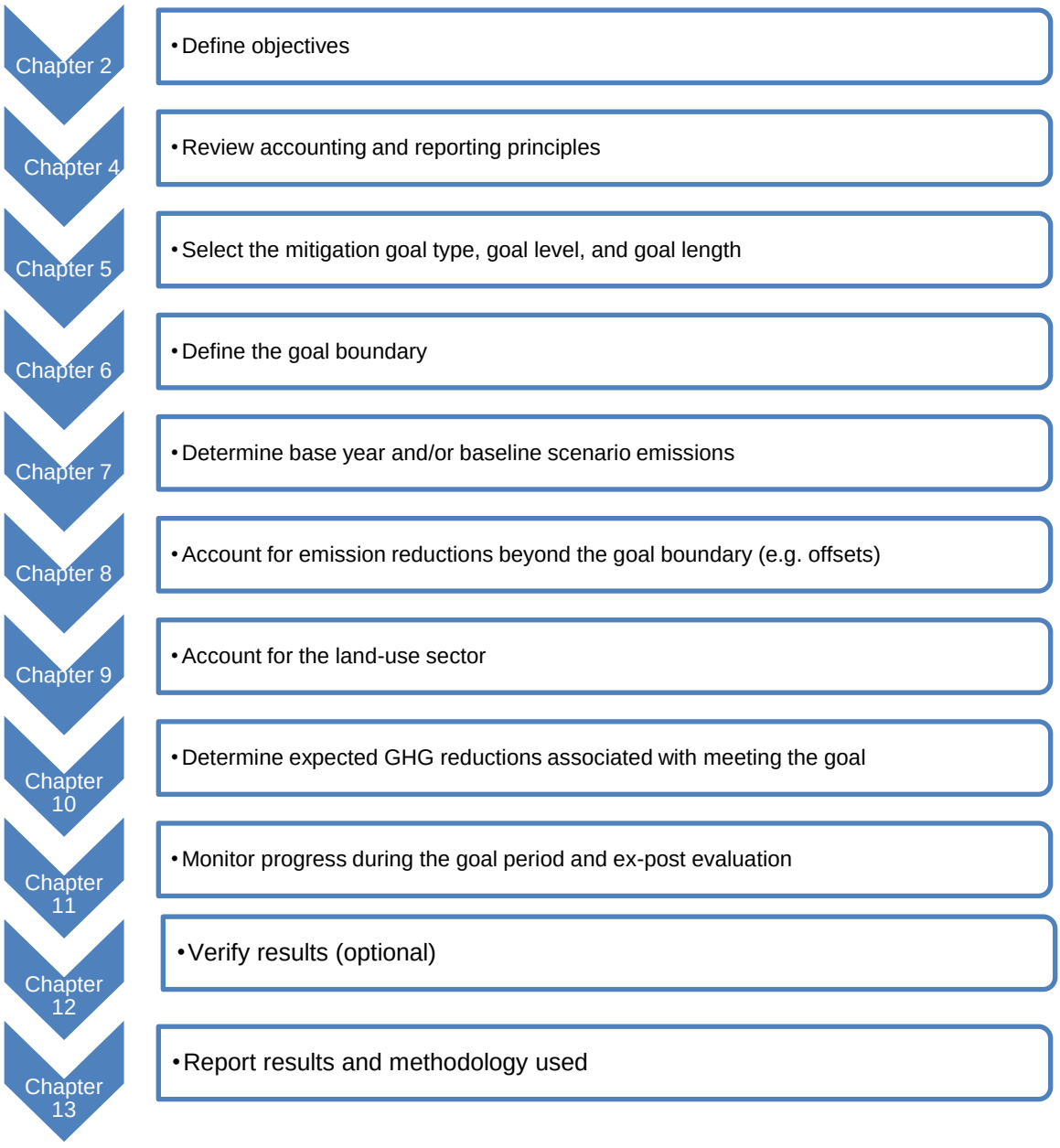


Table 3.2: Description and example of steps by chapter

Chapter	Step	Example of output from following the guidance in each chapter
Chapter 5: Determining the mitigation goal type, goal level, and goal length	Design a mitigation goal by choosing a goal type, goal level, and goal length.	"The mitigation goal is for a national jurisdiction to reduce GHG emissions by 20% from 1990 levels by 2020."
Chapter 6: Define the goal boundary	Define the GHGs, sectors, direct and indirect emissions, and geography covered by the goal, as well as the Global Warming Potential (GWP) values that will be used.	"The goal covers all seven Kyoto gases, all IPCC sectors, all direct (Scope 1) emissions, and the mainland geopolitical territory of the national jurisdiction. GWP values from the IPCC's *Fourth Assessment Report* will be used."
Chapter 7: Determine base year and/or baseline scenario emissions	Choose a base year and determine base year emissions, and/or develop a baseline and determine baseline scenario emissions, depending on the goal type and objectives of the jurisdiction.	"The base year is 1990 and base year emissions are 900 $MtCO_2e$."
Chapter 8: Account for emission reductions beyond the goal boundary (e.g. offsets)	Decide on the use of emissions reductions generated beyond the goal boundary (e.g. offsets) and how double counting will be avoided.	"The goal will be met in part by the use of emissions reductions generated outside the goal boundary. However, they will be no more than 10% of overall reductions. A registry will be used to prevent double counting between the selling and purchasing jurisdictions."
Chapter 9: Account for the land-use sector	Decide on how the land-use sector will be included in the mitigation goal.	"The entire land-use sector will be covered by the mitigation goal."
Chapter 10: Determine expected GHG reductions associated with meeting the goal	Determine expected GHG reductions (ex-ante) that will be achieved if the goal is successfully met.	"The emissions level within the goal boundary associated with meeting the goal is 720 $MtCO_2e$ in 2020. Emissions reductions from the 1990 base year associated with meeting the goal are 180 $MtCO_2e$ by 2020."
Chapter 11: Track progress during the goal period and ex-post evaluation	Track progress during the goal period and evaluate achieved reductions at the end of the goal period (ex-post).	"The emissions level within the goal boundary is 710 $MtCO_2e$ in 2020. The goal was achieved."

3.3 Checklist of requirements

This standard presents accounting and reporting requirements to help jurisdictions develop a GHG evaluation that represents a true and fair account of changes in GHG emissions resulting from a mitigation goal. Standardized approaches and principles are designed to increase the consistency and transparency of GHG evaluations. Table 3.3 provides a checklist of all the requirements included in this standard in order to help users keep track of requirements contained in subsequent chapters. Each subsequent chapter provides additional guidance and explanations of relevant terms and concepts. Requirements are also summarized in a box at the beginning of each chapter.

Table 3.3 Checklist of requirements

Chapter	Requirement
Chapter 4: Accounting and reporting principles	• GHG accounting and reporting shall be based on the following principles: relevance, completeness, consistency, transparency, and accuracy.
Chapter 5: Determining the mitigation goal type, goal level, and goal length	• Jurisdictions shall choose a mitigation goal type, goal level, and goal length.

Chapter 6: Define the goal boundary	• Jurisdictions shall:
	  ○ choose greenhouse gases to be included in the goal boundary
	  ○ use GWP values provided by the IPCC based on a 100-year time horizon
	  ○ choose sectors to be included in the goal boundary.
	  ○ choose definitions for included sectors
	  ○ choose the geographic boundary of the goal
	  ○ choose direct and indirect emissions sources to be included in the goal boundary
	• If jurisdictions update the GWP values during the goal period, then emissions from greenhouse gases included in the goal shall be recalculated for all years in the goal period and for base year and/or baseline scenario emissions

Chapter 7: Determine base year and/or baseline scenario emissions	*Base year* • A base year or base period shall be chosen for which representative, reliable, and verifiable emissions data are available • Base year emissions shall be calculated for all sectors and gases covered by the goal in accordance with the methodologies included in IPCC *Guidelines for National Greenhouse Gas Inventories* in conjunction with other internationally accepted methods • A base year recalculation policy shall be developed and a significance threshold shall be established • Jurisdictions shall recalculate base year emissions when significant changes in the goal boundary or inventory methodology occur • Recalculation policies shall be applied in a consistent manner *Baseline scenario* • The baseline scenario shall cover the same sectors and gases as the goal • (Million) Metric of tons of greenhouse gases – expressed as (M)tCO_2 or (M)tCO_2e, depending on which gases are included in the goal boundary – shall be used as the baseline metric • The timeframe for the baseline scenario shall match the goal period, at a minimum • Historical emissions data for the baseline scenario shall be collected from the jurisdiction's inventory for the selected historical reference year or period • A baseline scenario emissions recalculation policy shall be developed and a significance threshold shall be established • Jurisdictions shall recalculate baseline scenario emissions when significant changes in emissions drivers, goal boundary, and/or inventory methodology occur
Chapter 8: Account for emission reductions beyond the goal boundary (e.g. offsets)	• Jurisdictions shall not double count, double sell, or double claim GHG reductions. Credits sold by any jurisdiction shall be deducted ex-post from calculation of that jurisdiction's mitigation goal • Offset credits shall be: real; additional; based on a realistic baseline; quantified and monitored; independently verified; unambiguously owned; address leakage; address permanence; and do no net harm

Chapter 9: Account for the land-use sector	• Jurisdictions shall account for the land-use sector using one of the following approaches:
	  ○ include the land-use sector in the goal boundary
	  ○ account for the land-use sector as a separate sector-specific goal
	  ○ account for the land-use sector separately and use it as an offset for the goal
	  ○ do not account for the land-use sector
	• When the land-use sector is included in the goal boundary, it shall be accounted for using the same goal type method as used for other sectors under the mitigation goal (e.g. base year, baseline scenario, intensity, absolute level)
	• Activities-based or land-based accounting shall be used for the land-use sector
	• Within elected land-use categories or activities, emissions and removals arising from land use as well as land-use change shall be accounted for
	• All elected land-use categories/activities shall be accounted for using the same methodology
	• Within a land-use category or suite of activities, all significant pools, fluxes, and activities shall be accounted for
	• For land-use categories/activities included in accounting, jurisdictions shall account using one of four accounting methodologies:
	  ○ net-net accounting using a historical base year or period (base year)
	  ○ accounting against a forward-looking baseline scenario (baseline scenario)
	  ○ accounting against an emissions intensity goal (intensity)
	  ○ gross-net accounting (reduction to an absolute amount)
	• Jurisdictions shall choose whether they will remove the impacts of natural disturbances from accounting

Chapter 10: Determine expected GHG reductions associated with meeting the goal	• Jurisdictions shall calculate target year emissions level and emissions reductions associated with meeting their goal • Jurisdictions with goals framed as reduction in emissions intensity shall also calculate expected reductions in terms of absolute emissions • Jurisdictions that purchase emissions reductions from outside the goal boundary or sell emissions reductions to another entity shall subtract any emissions reduction credits purchased from the target year emissions level and add any emissions reduction credits sold onto that level

Chapter 11: Track progress during the goal period and ex-post evaluation	• The jurisdiction shall perform an analysis of whether it has achieved its goal at the end of the goal period. This evaluation shall be done as soon as possible (considering the availability of data) to produce a quality inventory for the target year • Jurisdiction shall use a consistent metric to track progress toward and evaluate achievement of the goal • Quality assurance (QA), quality control (QC), and uncertainty related to emissions inventory data shall be addressed in a manner that is consistent with the inventory methodology used • If jurisdictions update inventory methodologies, underlying assumptions (in the context of goals in relation to a baseline scenario), and/or GWP values during the goal period or at the end, then emissions included in the goal shall be recalculated for all years between the start of the goal period and the reporting year, including base year and/or baseline scenario emissions. In such cases, updated reports shall be published in a timely manner (at least with the next scheduled report) and clearly indicate where and why changes to inventory methods or GWP values have occurred. • The data used to determine whether the goal was achieved shall be the same as those used to evaluate progress during the goal period, unless the data was updated due to re-calculation. In which case, the updated data shall be used to evaluate progress. • Jurisdictions progress against the goal shall be assessed by comparing emissions (or emissions intensity) in the reporting year with emissions in the target year, the baseline scenario in the target year, or the goal itself (in the case of absolute reductions to a specified emissions level) • Base year and baseline scenario emissions shall be recalculated as outlined in Chapter 7 • Jurisdictions' performance tracking and final reports shall be publically available in a timely manner after completion including specifying when and where reports are published and how the public can obtain copies • Jurisdictions shall specify in the performance tracking and ex-post evaluation plan a schedule for evaluation of the plan itself. This shall include identification of needed revisions, controlling decisions on when and if updates will be made, and whether and under what circumstances improvements to the performance tracking plan will be allowed or required. • Jurisdictions shall note when any modifications to the monitoring plan or final report occur that materially affect the results of an inventory. In such circumstances the jurisdiction shall recalculate any information that can materially affect the determination of goal attainment. These updates shall include all reasonable efforts to improve data quality and ensure compliance with the five accounting principles of this protocol outlined in Chapter 4.
Chapter 13: Reporting	• See Chapter 13

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Chapter 4: Accounting and reporting principles

Generally accepted GHG accounting principles are intended to underpin and guide GHG accounting and reporting to ensure the reported GHG assessment represents a faithful, true, and fair account of changes in GHG emissions resulting from a mitigation goal. The five principles described below are intended to guide users in quantifying and reporting changes in GHG emissions, especially where the guidelines provide flexibility.

Requirements in this chapter

- GHG accounting and reporting shall be based on the following principles: relevance, completeness, consistency, transparency, and accuracy.

GHG accounting and reporting of a mitigation goal shall be based on the following principles:

Relevance: Ensure the GHG information appropriately reflects actual GHG emissions or reductions and serves the decision-making needs of users – both internal and external to the reporting entity.

Completeness: Account for and report on all GHG emission sources and activities within the goal boundary. Include all relevant information in the quantification of GHG reductions. Disclose and justify any specific exclusions.

Consistency: Use consistent methodologies to allow for meaningful performance tracking of emissions and reductions over time. Transparently document any changes to the data, boundary, methods, or any other relevant factors in the time series.

Transparency: Provide clear and sufficient information for reviewers to assess the credibility and reliability of GHG reduction claims. Disclose any relevant assumptions and make appropriate references to the methodologies and data sources used.

Accuracy: Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable confidence as to the integrity of the reported information. Accuracy should be pursued as far as possible, but once uncertainty can no longer be practically reduced, conservative estimates should be used. Users should apply conservative assumptions, values, and procedures when uncertainty is high and the cost of measures to reduce uncertainty is not worth the increase in accuracy. Conservative values and assumptions are those that are more likely to overstate GHG emissions or underestimate GHG reductions.

Guidance for applying the accounting and reporting principles

The primary function of these five principles is to guide the implementation of the *GHG Protocol Mitigation Goals Standard* and the assurance of the GHG evaluation, particularly when application of the standard in specific situations is ambiguous.

In practice, jurisdictions may encounter tradeoffs between principles when developing a GHG evaluation. For example, a user may find that achieving the most complete assessment requires using less accurate data, compromising overall accuracy. Conversely, achieving the most accurate assessment may require excluding activities with low accuracy, compromising overall completeness. Users should balance tradeoffs between principles depending on their objectives (see chapter 2 for more information). Over time, as the accuracy and completeness of data increases, the tradeoff between these accounting principles will likely diminish.

Relevance

A relevant GHG report contains the information that users – both internal and external to the reporting entity – need for their decision making. Jurisdictions should use the principle of relevance when determining whether to exclude any activities from the goal boundary (see description of "Completeness" below). Jurisdictions should also use the principle of relevance as a guide when selecting data sources. Users should collect data of sufficient quality to ensure that the assessment is relevant (i.e., that it appropriately reflects the GHG effects of the mitigation goal and serves the decision-making needs of users). Selection of data sources depends on individual objectives (see chapter 2).

Completeness

Organizations should ensure that the GHG assessment appropriately reflects the GHG effects of the mitigation goal, and serves the decision-making needs of users, both internal and external to the reporting entity. In some situations, users may be unable to estimate emissions due to a lack of data or other limiting factors. Organizations should not exclude any activities from the assessment that would compromise the relevance of the reported data. In the case of any exclusions, it is important that all exclusions be documented and justified. Assurance providers can determine the potential impact and relevance of the exclusion on the overall assessment. More information on completeness is provided in chapter 7.

Consistency

Users of GHG information typically track emissions information over time in order to identify trends and assess performance. The consistent application of accounting approaches, goal boundary, and calculation methodologies is essential to producing comparable GHG emissions data over time. If there are changes to the goal boundary (e.g., inclusion of previously excluded activities), methods, data, or other factors affecting emission estimates, they need to be transparently documented and justified, and may warrant recalculation of base year and/or baseline scenario emissions. Consistency should also be maintained between the GHG inventory calculation methodology and the methodology used to calculate emissions from sectors and gases covered by the mitigation goal.

Transparency

Transparency relates to the degree to which information on the processes, procedures, assumptions and limitations of the GHG assessment are disclosed in a clear, factual, neutral, and understandable manner based on clear documentation (i.e., an audit trail). Information should be recorded, compiled, and analyzed in a way that enables internal reviewers and external assurance providers to attest to its credibility.

Specific exclusions need to be clearly identified and justified, assumptions disclosed, and appropriate references provided for the methodologies applied and the data sources used. The information should be sufficient to enable a party external to the GHG assessment process to derive the same results if provided with the same source data. A transparent report will provide a clear understanding of the relevant issues and a meaningful assessment of emissions performance over time. More information on reporting is provided in chapter 13.

Accuracy

Data should be sufficiently accurate to enable intended users to make decisions with reasonable confidence that the reported information is credible. It is important that any estimated data be as accurate as possible to guide the decision-making needs of the user and ensure that the GHG information is relevant. GHG measurements, estimates, or calculations should be systemically neither over nor under

the actual emissions value, as far as can be judged. Jurisdictions should reduce uncertainties in the quantification process as far as practicable and ensure the data are sufficiently accurate to serve decision-making needs. Reporting on measures taken to ensure accuracy and improve accuracy over time can help promote credibility and enhance transparency.

Accuracy should be pursued as far as possible, but once uncertainty can no longer be practically reduced, conservative estimates should be used. Users should apply conservative assumptions, values, and procedures when uncertainty is high and the cost of measures to reduce uncertainty is not worth the increase in accuracy. Conservative values and assumptions are those that are more likely to overstate GHG emissions or underestimate GHG reductions.

[Placeholder for case studies]

Chapter 5: Determining the mitigation goal type, goal level, and goal length

The purpose of this chapter is to guide jurisdictions in choosing a mitigation goal type, goal level, and goal length. This chapter is intended for jurisdictions that do not already have a mitigation goal. However, all jurisdictions shall meet the reporting requirements of this chapter.

Requirements in this chapter

- Jurisdictions shall choose a mitigation goal type, goal level, and goal length.

5.1. Introduction

Determining a jurisdiction's goal requires the jurisdiction to specify three elements: the goal type, goal level, and goal length.

Many jurisdictions have already set goals that include these three elements; for such jurisdictions, this chapter provides a common terminology that the jurisdiction can use to frame its goal within the context of these guidelines.

For jurisdictions that have not already set a goal, this chapter will provide guidance on:

- *How to select a goal type.* Goal types vary, and the decision around the choice of goal type will depend on the priorities of the jurisdiction. This guidance does not prescribe which goal type should be selected. Goal types include goals that framed as being relative or absolute to a base year/baseline; goals that are compared to emissions from a historical point in time (either a single year or period of years) or from a baseline scenario; and goals that are based on the quantity of GHG emissions or on emissions intensity.
- *How to select a goal level.* The goal level represents the level of reduction in emissions or emissions intensity that is committed to by the jurisdiction. As discussed further below, the goal levels could be stated as a single value or a range of values.
- *How to select the goal length.* The length of the goal period represents the length of time between the start date of the goal l and the target year, or date when the emissions level associated with the goal level is met by the jurisdiction.

5.2. Mitigation assessment

Before setting a mitigation goal, jurisdictions may undertake a mitigation assessment in order to understand which mitigation options and opportunities exist, their cost, and the overall mitigation potential for their jurisdiction. Mitigation assessments are means of determining, selecting, and analyzing mitigation options and strategies based on the specific needs, conditions, and objectives of a jurisdiction. The basic analytical framework for mitigation assessments includes:[3]

- development of baseline scenario that represents likely growth in emissions that would occur in the absence of mitigation strategies
- identification and characterization of mitigation strategies, including policies, actions, and technologies, based on metrics such as mitigation potential, cost, and co-benefits
- development of alternative scenarios that represent likely emissions trajectories that would occur if mitigation strategies are implemented

[3] Based on Dennis Tirpak et. al, "Chapter 27: Methods for assessment of mitigation options," in *Climate Change 1995: The IPCC Second Assessment Report: Scientific-technical analyses of impacts, adaptations, and mitigation of climate change*, eds. Robert T. Watson, M.C. Zinyowera, and Richard H. Moss, Cambridge, UK: Cambridge University Press 1995, http://www.ipcc-wg2.gov/publications/SAR/SAR_Chapter%2027.pdf.

- estimation of incremental costs and benefits of mitigation strategies
- sensitivity analysis

Chapter 7 of this standard provides guidance on developing a baseline scenario, which is one critical element of mitigation assessments.

Detailed guidance on carrying out complete mitigation assessments can be obtained from the IPCC and the UNFCCC, among others.[4]

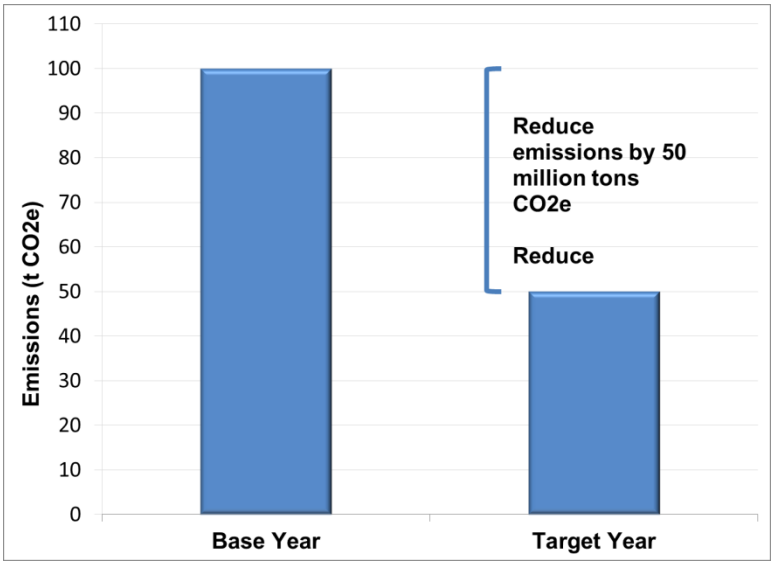
5.3. Choosing a goal type

The goal type defines the basis against which the emission reductions are measured. Goal types can be relative to another emissions value (e.g., relative to 2010 emissions) or independent of any stated emissions level (e.g., a goal to reach 100 tons CO_2e). Further, relative goal types can be expressed in terms of a percent reduction (e.g., 50% below base year emissions) or an absolute reduction (e.g., reduction of 10 tons CO_2e).

Four goal types include (presented in no particular order or ranking):

Reduction in emissions from a base year. This goal type represents a reduction from emissions relative to emissions in a chosen base year. A jurisdiction that selects this goal type will express the reduction goal in either (a) quantity of emissions reduced (e.g., metric tons of CO_2 equivalents reduced from base year) or (b) percent of emissions reduced relative to base year emissions (e.g., 25% below base year emissions).

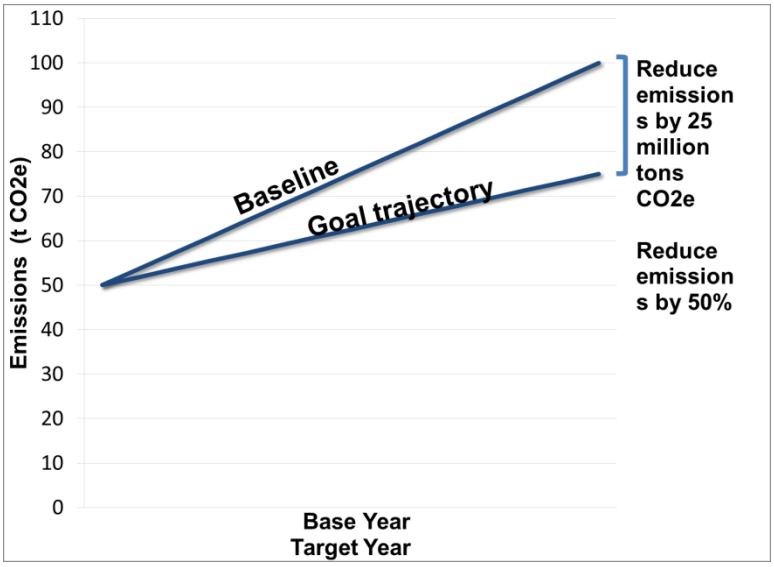
Figure 5.1. Reduction in emissions from a base year



[4] See Dennis Tirpak et. al, "Chapter 27: Methods for assessment of mitigation options," in *Climate Change 1995: The IPCC Second Assessment Report: Scientific-technical analyses of impacts, adaptations, and mitigation of climate change*, eds. Robert T. Watson, M.C. Zinyowera, and Richard H. Moss, Cambridge, UK: Cambridge University Press 1995, http://www.ipcc-wg2.gov/publications/SAR/SAR_Chapter%2027.pdf, Mitigation Assessments," UNFCCC, accessed November 12, 2012, http://unfccc.int/resource/cd_roms/na1/mitigation/index.htm, and Sathaye et. al., *Greenhouse Gas Mitigation Assessment: A guidebook*, prepared by Countries Studies Management Team and Lawrence Berkeley Laboratory, 1995, http://ies.lbl.gov/iespubs/ggma/ghgcontents.html.

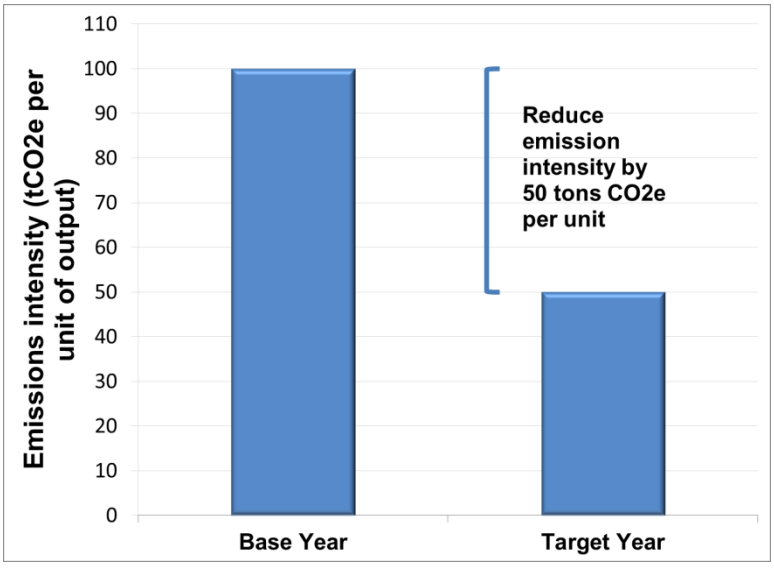
Reduction in emissions from a baseline scenario. This goal type represents a reduction from baseline scenario emissions for the jurisdiction. A jurisdiction that selects this goal type will express the goal a reduction in either (a) quantity of emissions reduced (e.g., metric tons of CO_2 equivalent reduced from a baseline scenario) or (b) percent of emissions reduced relative to baseline scenario emissions (e.g., 25% below baseline scenario emissions).

Figure 5.2. Reduction in emissions from a baseline scenario



***Reduction in emissions intensity from a base year*.** This goal type represents a reduction in emissions per unit of output relative to a base year, such as emissions per GDP or emissions per capita. A jurisdiction that selects this goal type will express the goal as a percent reduction in emissions intensity (e.g., 25% below base year emissions intensity).

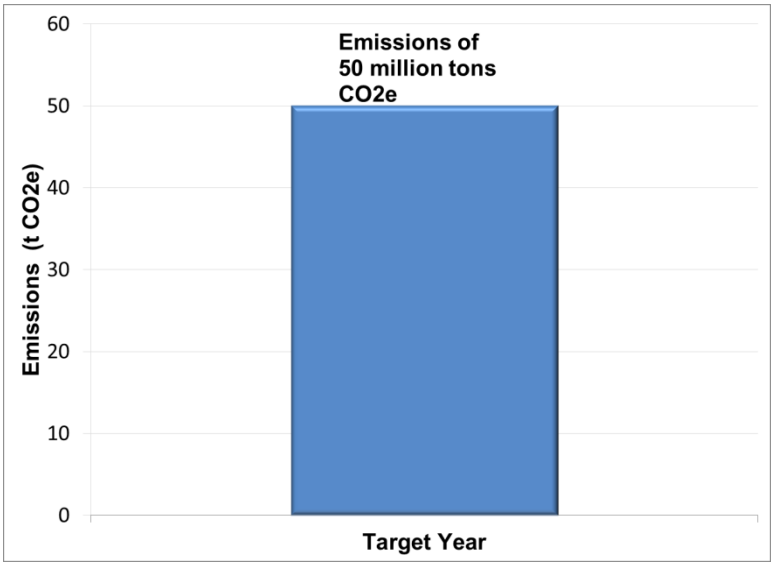
Figure 5.3. Reduction in emissions intensity from a base year



Reduction to an absolute emissions level. This goal type presents a reduction in emissions that is independent of any other emissions value. A jurisdiction that selects this goal type will express this goal

as the total emissions that will be emitted or that will not be exceeded (e.g., reduce emissions to 100 million metric tons of CO_2 equivalent). Carbon neutrality, where a jurisdiction commits that their goal is zero net emissions, usually through a combination of emission reductions and purchasing carbon offsets and a carbon cap, is an example of this goal type.

Figure 5.4. Reduction to an absolute emissions level



When choosing a goal type, jurisdictions should consider several factors, including:

- Global reductions needed to achieve atmospheric stabilization of GHG emissions that is consistent limiting warming to 2°C above pre-industrial levels, as outlined by climate science Desired ambition of emissions reductions
- Key emissions drivers for their jurisdiction and how they are projected to change over time
- Likely emissions trajectory based on a baseline scenario
- Results of mitigation assessment.
- Historical contribution to global emissions.
- Commitments by peer jurisdictions.

Goals that are designed to achieve an absolute reduction in GHGs emitted to the atmosphere are, in general, environmentally robust and can best address stakeholder concerns to mitigate absolute emissions.

Jurisdictions will growing economies may choose intensity based goals as they are able to accommodate growth in GDP while reducing emissions per unit of output.

From a GHG accounting perspective, baseline scenario-related goals pose a risk of low environmental integrity since the development of a baseline-scenario requires technical as well as political decisions regarding a range of inputs and future events, which may or may not be accurate. For example, which assumptions are chosen for emissions drivers like economic growth and how policies and measures are included in the baseline scenario will have a significant effect on resulting baseline scenario emissions. Furthermore, baseline scenarios attempt to predict future emissions, which by definition is extremely difficult and uncertain. Taken together, these issues threaten the accuracy of any baseline scenario and thus the environmental integrity of baseline scenario-related goals.

In some cases, jurisdiction may choose a goal type that combines two or more of the goal types listed above. In these instances, jurisdictions should follow the general guidance and reporting structure provided by this standard, as appropriate.

Jurisdictions shall report their goal type. If an intensity-based goal is chosen, jurisdictions shall report the unit of output.

5.4. Choosing a goal level

The goal level is the quantity of emissions or emissions reductions committed to by the jurisdiction and represents the level of ambition of the reduction target.

When choosing a goal level, jurisdictions should consider several factors, including:

- Global reductions needed to achieve atmospheric stabilization of GHG emissions that is consistent limiting warming to 2°C above pre-industrial levels, as outlined by climate science Desired level of ambition
- Historical contribution to global emissions.
- Per capita emissions relative to similar jurisdictions.
- Key emissions drivers for their jurisdiction and how they are projected to change over time
- Likely emissions trajectory based on a baseline scenario
- Results of mitigation assessment, including developing different reduction strategies based on the major reduction opportunities available and examining how emission projections change with different mitigation strategies
- Emissions by sector, and aggregating sectoral reduction opportunities to develop jurisdictional goal level
- Commitments by peer jurisdictions.

Goal levels may be stated either in terms of:

- ***Single numerical value*.** A jurisdiction that chooses a single numerical value for the goal level will select a single number of tons of greenhouse gases, a percent value, or an emission intensity value as the goal level. Examples include 10 $MtCO_2e$ below base year emissions and 20% reduction in GHG intensity.

- ***Range of numerical values*.** A jurisdiction that chooses a range of numerical values can specify an upper and lower estimate to bound the goal level, such that achieving an emission level/intensity within that range will indicate achievement of the goal. For example, achieving emission reductions of 5-10% below a baseline.

While a range of numerical values may offer more flexibility and better accommodate unpredictable political and/or economic events, a single numerical value provides increased certainty of the emissions level at the end of the goal period, assuming the goal is met.

Regardless of goal type, jurisdictions should set an ambitious goal level that reduces emissions significantly below the jurisdiction's business-as-usual emissions trajectory.

Jurisdictions shall report their goal level in terms of percent and absolute reduction. Jurisdictions shall also report the emissions level in the target year (at the end of the goal period) associated with meeting their goal.

5.5. Choosing the goal length

The goal length corresponds to the goal period, which is the period of time during which the jurisdiction commits to meet the goal level.

Jurisdictions may choose short-term goals, long-term goals, or a combination of both.

- **Short-term**. A short term goal is generally considered any goal with a timeframe of less than 10 years.

- **Long-term**. A long-term goal has a longer timeframe, e.g. greater than 10 years. Jurisdictions setting long-term goals often choose more aggressive goal levels than those associated with short-term goals because a longer time frame offers more flexibility to meeting ambitious goals.

When choosing a goal length, jurisdictions should consider several factors, including:

- Global reductions needed to achieve atmospheric stabilization of GHG emissions that is consistent limiting warming to 2°C above pre-industrial levels, as outlined by climate science
- Results of mitigation assessments, including estimated timeframes for implementation and scaling up of mitigation strategies
- Goal lengths of peer jurisdictions

In general, the longer goal periods facilitate long-term planning for large structural changes and capital investments with GHG benefits and provide more certainty for businesses and other stakeholders. Longer goal lengths can also be used to mitigate the risk of unpredictable events during any given year that may temporarily increase emissions.

Short-term goals can mobilize investment and planning for emission reductions more quickly and encourage quicker phase-out of inefficient practices and technologies.

Since both short-term and long-term goals offer significant advantages, jurisdictions should adopt and couple short- and long-term goals. For example, a jurisdictions could adopt a short-term goal until 2020 coupled with a long-term goal until 2050. Coupled short- and long-term goals can help ensure a decreasing emissions pathway that leads to significant cumulative reductions and the achievement of the goal.

Jurisdictions shall report the length of their goal period and the start year and target year of the goal period.

5.6. Revising the goal

During the goal period, jurisdictions may revise the goal type, goal level, and goal length. Jurisdictions shall disclose and justify any revisions made.

5.7. Reporting requirements

See Chapter 13 for reporting requirements for this chapter.

Chapter 6: Defining the goal boundary

The purpose of this chapter is to guide jurisdictions in defining the goal boundary in terms of GHG coverage and GWP values, sector coverage, geographic coverage, and coverage of direct and indirect emissions. This chapter is intended for jurisdictions that have not defined the boundary of their mitigation goal. However, all jurisdictions shall meet the reporting requirements of this chapter.

Requirements in this chapter

- Jurisdictions shall:
  - choose greenhouse gases to be included in the goal boundary
  - use GWP values provided by the IPCC based on a 100-year time horizon
  - choose sectors to be included in the goal boundary.
  - choose definitions for included sectors
  - choose the geographic boundary of the goal
  - choose direct and indirect emissions sources to be included in the goal boundary
- If jurisdictions update the GWP values during the goal period, then emissions from greenhouse gases included in the goal shall be recalculated for all years in the goal period and for base year and/or baseline scenario emissions

6.1. Introduction

What are goal boundaries and how are they relevant to the guidelines

Once a jurisdiction has decided on the goal type, level and time period, it will be important to clearly define the goal boundary.

The goal boundary defines which greenhouse gas(es) (GHGs), sector(s), geographic area(s), and direct and indirect emissions are covered by the goal.

It is important to distinguish between GHG accounting for a mitigation goal and for the inventory.. A GHG inventory boundary includes *all* emissions within the jurisdiction. The goal boundary on the other hand, may also include all emissions within the jurisdiction or only a subset of those emissions.

In general, the quality of the GHG inventory should be a key factor informing the choice of what to include in the goal boundary, as some emissions sources may not have sufficient data for inclusion in the goal.

Other factors may also be relevant when considering setting a goal boundary that differ from the GHG inventory, including the desire to focus on specific sectors of the economy or target a specific gas that contributes significantly to the jurisdiction's overall emissions.

In setting a goal boundary, a jurisdiction will need to consider the following parameters (discussed in more detail in this chapter):

- GHG coverage, which GHGs are included within the goal boundary and the global warming potential values used to aggregate those gases into a single metric
- sector coverage and definition, which sectors and included in the goal boundary and how are they defined
- geographic boundaries, which non-contiguous territories and protectorates (if any) are included in the goal boundary
- direct and indirect emissions, which direct and indirect emissions are included in the goal boundary

It should be noted that this chapter will not be relevant for jurisdictions who have already set the boundary for their mitigation goal. However, all jurisdictions shall meet the reporting requirements of this chapter.

Defining the goal boundary

When selecting the parameters that define the goal boundary, jurisdictions should include the most complete coverage as possible, including the fullest range of emissions that are reasonably measurable and fall within the jurisdiction's geopolitical boundary.

The sections below provide guidance for jurisdictions in setting the goal boundary.

6.2. Definitions of terms and concepts

- **Greenhouse (GHG) gas coverage** – The greenhouse gases included within the goal boundary and measured to assess progress toward the goal.
- **Global warming potential (GWP)** – A factor describing the radiative forcing impact (degree of harm to the atmosphere) of one unit of a given GHG relative to one unit of CO2
- **Sectoral boundaries** – A sectoral boundary is defined as those emissions associated with a particular grouping of related processes, sources and sinks.
- **Geographic boundaries** – The definition of the jurisdiction's geopolitical boundaries, including any non-contiguous or offshore territories, which is used to define the geographic area over which the mitigation goal will apply.
- **Coverage of direct and indirect emissions** – The extent to which the mitigation goal includes both direct emissions (those from sources that are within the jurisdiction's geopolitical boundary) and indirect emissions (those that are caused by activities taking place within the geopolitical boundary of the jurisdiction, but are released by sources outside of that boundary).

6.3. Greenhouse gas (GHGs) covered by goal

Mitigation goals may cover a range of different greenhouse gases. In order to track progress toward a particular goal, it is important to clearly define which gases are covered. This will also shape data collection needs and the amount of emissions covered by the goal.

The jurisdiction's GHG inventory should provide the basis for assessing which gases will be included within the goal boundary. In order to account for emissions within the goal boundary, jurisdictions should first ensure that they can accurately monitor and measure with reasonable confidence each gas emitted within geographic boundary.

Mitigation goals may include one or more of the seven major GHGs covered by the Kyoto Protocol,[5] which cover the majority of significant emissions for most jurisdictions. To the extent that a jurisdiction has a relatively accurate inventory for a wide range of gases, it should include all greenhouse gases, including but not limited to the seven gases covered by the Kyoto Protocol, within the goal boundary.

Jurisdictions may include a select limited range of gases within the goal boundary depending on the objectives of the jurisdiction and the capacity of the jurisdiction to accurately measure and monitor a wide range of greenhouse gases.

[5] The seven greenhouse gases covered by the Kyoto Protocol are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen triflouride ($NF_{3)}$.

For jurisdictions that do not use broad coverage of gases, reporting should include information about why certain gases were not selected and whether those gases contribute significantly to the jurisdiction's overall emissions, and any plans to incorporate additional gases in the future.

If additional gases are included in the goal boundary after the goal has been established, the jurisdiction will need to ensure that base year and/or baseline scenario emissions are recalculated accordingly, based on the recalculation policy. For more information see Chapter 7.

Jurisdictions shall disclose and justify all greenhouse gases included within the goal boundary.

6.4. Global warming potential of non-CO_2 greenhouse gases covered by goal

When a goal includes multiple GHGs, it is necessary to aggregate those gases in a way that they can be compared and converted into a single metric to measure against the single mitigation goal value. The most common single metric used is CO_2 equivalents (CO_2e).

The IPCC provides the international standard for converting non-CO2 gases into their CO_2 equivalents by using Global Warming Potential (GWP) values. Global Warming Potentials (GWP) are factors that describe the radiative forcing impact (degree of harm to the atmosphere) of one unit of a given greenhouse gas relative to one unit of CO_2.

Jurisdictions shall use GWP values provided by the IPCC based on a 100-year time horizon.

However, with every assessment report produced by the IPCC, the GWP values are updated based upon the most recent science. The most recent available IPCC Assessment Report is the *Fourth Assessment Report* (AR4), which was released in 2007. The IPCC is currently working on the *Fifth Assessment Report*, which is due to be released in 2014/15.

Jurisdictions should use the most recent IPCC GWP values for the GHGs included in the goal, since these values reflect the most recent scientific consensus.

Jurisdictions should use the same GWP values throughout the goal period in order to have a consistent time series and enable performance tracking overtime on a common basis.

If jurisdictions update the GWP values during the goal period, then emissions from greenhouse gases included in the goal shall be recalculated for all years in the goal period and for base year and/or baseline scenario emissions (see for example, IPCC *Guidelines for National Greenhouse Gas Inventories* for guidance on recalculating emissions based on updated GWP values).

Jurisdictions shall disclose and justify the source of GWP values used.

6.5. Sectors covered by the goal

IPCC *Guidelines for National Greenhouse Gas Inventories* organize emissions sources by sector. Greenhouse gas emissions and removals are divided into main sectors, which are groupings of related processes, emissions sources, and sinks (e.g. energy, industrial processes and product use, agriculture, forestry and other land use, waste, and other).

Each sector is further broken down into individual categories (e.g., transport) and sub-categories (e.g., passenger vehicles). Jurisdictions typically construct an inventory from sub-category level data, as suggested by IPCC methodologies, and then calculate total emissions for the jurisdiction by adding these up. The IPCC requires reporting at the sub-category level, at the sectoral level, as well as at the aggregate level for the entire jurisdiction.

Jurisdictions should include all IPCC sectors within the goal boundary.

However, some jurisdictions may choose goals that are specific to a single sector, sub-sector, or a selection of sectors. For example, a jurisdiction may set a goal of a 20% reduction in GHG emissions from the electricity sector. Therefore, jurisdictions may include a selection of sectors and/or sub-sectors within the goal boundary. However, this approach may leave out potentially significant emissions sources and not accurately reflect the jurisdiction's emissions impact or mitigation potential. For example, India's goal to reduce the GHG emissions intensity of its GDP does not cover the agricultural sector. In 2007, the agricultural sector accounted for 18% of India's emissions (inventory includes CO2, CH4, and N2O).[6]

If all IPCC sectors are not included within the goal boundary, jurisdictions should, at a minimum, include sector(s) with the most significant contribution to their overall emissions, according to the inventory.

Jurisdictions shall disclose and justify the sector(s) and/or subsector(s) included in and excluded from the goal boundary.

6.6. Defining sectors included in the goal boundary

As this standard is relevant to both "economy-wide" and sectoral goals, it will be important that sectors are clearly defined in order to include all relevant emissions sources and to understand what emissions and/or removals may be excluded from the goal boundary.

Generally speaking, the broader the coverage and more sectors included in the goal, the more complete the goal will be, reflecting most accurately the scope of emissions generated by the jurisdiction. However, if a jurisdiction chooses only to include a single sector, or a selection of sectors or sub-sectors, it will be important to understand how the boundaries of each of those sectors is defined, in order to gauge relevant emissions within those sectors and emissions that are excluded from those sectors.

As noted above, the IPCC guidelines provide a clear framework for sector definitions for use in compiling a GHG inventory. Jurisdictions should use sector definitions from the most recent IPCC *Guidelines for National Greenhouse Gas Inventories*. This approach ensures consistency between the GHG inventory and the mitigation goal.

See Chapter 9 for guidance on sector definitions related to land use activities.

In some instance, jurisdictions may choose deviate from IPCC sector definitions in order to target specific activities or use particular policy tools. For example, a city may discover that the majority of its emissions come from commercial and residential buildings and may want to establish a goal that applies to these end-use sectors, which do not correspond to IPCC sectors.

Examples of existing alternative sector definitions include: the North American Industrial Classification Standard (NAICS) and the International Standard Industrial Classification (ISIC).

Clear definitions emissions sources and sinks are included in sector definitions is critical in ensuring transparency and consistency in the definition of the mitigation goal boundary.

If sector definitions are used that deviate from the most recent IPCC guidelines, jurisdictions should provide an explanation as to why IPCC defined sectors were not used and information on the alternative

[6] See Planning Commissions, "Low Carbon Strategies for Inclusive Growth: An Interim Report," Government of India, 2011.

sector definitions. Jurisdictions should also provide an explanation of how non-IPCC sector definitions map onto the IPCC sectors.[7]

Jurisdictions shall disclose and justify sector definitions.

6.7. Geographic boundary of goal

In most instances, the geographic boundary of the goal will conform to the geopolitical boundary of the jurisdiction. However, in some cases jurisdictions may wish to include or exclude certain parts of its territory from the goal.

In determining the geographic boundary of the goal, jurisdictions should first take into account the coverage of their GHG inventory to ensure that there is adequate data for measuring progress toward the goal.

Jurisdictions may also assess the extent to which they able to influence the emissions of their various offshore or non-contiguous territories, to determine whether or not it is appropriate to include them within the goal's boundary.

The United Kingdom uses its GHG inventory as the basis to assess progress with its various mitigation goals, but has selected different geographical boundaries for each goal, outlined below.[8]

- The UK's domestic goal includes the UK and the Crown Dependencies of Jersey, Guernsey and the Isle of Man
- The UK's Kyoto Protocol commitment includes the Crown Dependencies of Jersey, Guernsey, and the Isle of Man, and the Overseas Territories of Cayman Islands, Falkland Islands, Bermuda, Monserrat and Gibraltar
- The UK's contribution to the EU emissions reduction goal includes only the UK and Gibraltar

Jurisdictions should include their mainland geopolitical territory and all non-contiguous territories, protectorates, dependencies, and departments under the authority of the jurisdiction within the goal boundary. This approach is common practice for compilation of GHG inventories by national jurisdictions, as outlined by IPCC guidelines, which require reporting of emissions and removals taking place within a country's national territory and any offshore areas over which the country has jurisdiction.[9]

Jurisdictions may choose to include only a subset of their non-contiguous territories within the goal boundary, depending on objectives, data availability, and significance of non-contiguous emissions sources. However, this approach should not be a way to exclude significant emissions from the goal boundary.

Jurisdictions shall disclose and justify the geographic boundary of their goal, including any protectorates, departments, overseas territories, dependencies or other non-contiguous territories that are included or excluded from the boundary.

Jurisdictions should provide a rationale for any territories that are excluded from the goal boundary and an indication of the magnitude of emissions associated with these excluded territories.

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[7] For example, see http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-Chapter-2-Trends.pdf, pages 2-16 and 2-17.

[8] For more information see: AEA, "Summary of difference between geographical coverages of reported GHG emissions," Report to UK Department of Energy and Climate Change, 2009, pg. 2, http://uk-air.defra.gov.uk/reports/cat07/0905261531_ED45322_GeographicalCoverage_GHG_Inventories_Final.pdf

[9] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_8_Ch8_Reporting_Guidance.pdf

6.8. Direct and indirect emissions covered by goal

Emissions can be caused by activities that occur within a jurisdiction's geopolitical boundaries, but be released outside of that boundary. For example, if waste generated inside a city is sent outside the city for disposal, emissions from the disposal of the waste would be caused by activities within the city, but be released outside the city's geopolitical boundary. These types of emissions are referred to as indirect emissions. Conversely, direct emissions are emissions that are caused by activities within the geopolitical boundary of a jurisdiction and released within that same boundary.

Direct emissions are accounted for using a production-based inventory approach, while a consumption-based approach is used to account for indirect emissions.

National jurisdictions should include all direct emissions within their goal boundary. They may also include significant indirect emissions within the goal boundary. Significant indirect emissions could result from a national jurisdiction's purchase of energy from outside its geopolitical boundary or its consumption of imported goods and services.

Subnational jurisdictions should include all direct and significant indirect emissions within the goal boundary. Examples of significant indirect emissions for subnational jurisdictions include emissions associated with imported energy, waste disposed of outside of jurisdiction, and transportation that originates or arrives within jurisdiction, or nearby the jurisdiction (e.g. emissions from airports that serve the jurisdiction, but that are located outside its geopolitical boundary).

Jurisdictions may consider issues such as "policy leverage", or the ability to manage emissions within and outside their jurisdiction, when choosing which direct and indirect emissions to include in the goal boundary. For example, many indirect emissions sources are not within political control of jurisdictions. Therefore, jurisdictions may want to consider emissions sources that they could meaningfully influence when deciding which indirect emissions to include with the goal boundary.

Leakage is an important issue that should be considered when deciding which direct and indirect emissions to include within the goal boundary. Leakage can occur in two ways:

1. when emissions reductions in one jurisdiction cause an increase in emissions in a different jurisdiction.
2. when emissions reductions in the sectors and gases covered by the goal cause an increase in emissions from uncovered sectors and gases

Jurisdictions should include significant sources of leakage within the goal boundary.

Jurisdictions shall disclose and justify direct and indirect emissions included within the goal boundary.

6.9. Reporting requirements

See Chapter 13 for reporting requirements for this chapter.

Chapter 7: Determining base year and baseline scenario emissions

The purpose of this chapter is to guide jurisdictions in choosing a base year and determining base year emissions and/or developing a baseline scenario and determining baseline scenario emissions. This chapter is intended for jurisdictions that have not already chosen a base year and/or determined base year and/or baseline scenario emissions. However, all jurisdictions shall meet the reporting requirements of this chapter.

Requirements in this chapter

Base year

- A base year or base period shall be chosen for which representative, reliable, and verifiable emissions data are available
- Base year emissions shall be calculated for all sectors and gases covered by the goal in accordance with the methodologies included in IPCC *Guidelines for National Greenhouse Gas Inventories* in conjunction with other internationally accepted methods
- A base year recalculation policy shall be developed and a significance threshold shall be established
- Jurisdictions shall recalculate base year emissions when significant changes in the goal boundary or inventory methodology occur
- Recalculation policies shall be applied in a consistent manner

Baseline scenario

- The baseline scenario shall cover the same sectors and gases as the goal
- (Million) Metric of tons of greenhouse gases – expressed as (M)tCO_2 or (M)tCO_2e, depending on which gases are included in the goal boundary – shall be used as the baseline metric
- The timeframe for the baseline scenario shall match the goal period, at a minimum
- Historical emissions data for the baseline scenario shall be collected from the jurisdiction's inventory for the selected historical reference year or period
- A baseline scenario emissions recalculation policy shall be developed and a significance threshold shall be established
- Jurisdictions shall recalculate baseline scenario emissions when significant changes in emissions drivers, goal boundary, and/or inventory methodology occur

7.1. Choosing a base year and determining base year emissions

For goals framed as reduction from a base year, a meaningful and consistent tracking of progress over time requires that jurisdictions establish a base year and determine base year emissions.

7.1.1.Base year terms and definitions

Base year: A specific year of historic datum against which jurisdictions emissions are tracked over time

Base period: An average of multiple years of historic datum against which jurisdictions emissions are tracked over time

7.1.2.Choosing a base year or base period

Throughout the standard, the term base year is used as shorthand to mean base year or base period.

Jurisdictions may either choose a single year or a range of years as their base period.

Option 1: Jurisdictions may choose a single year as their base year

In general, jurisdictions should choose as a base year the earliest relevant point in time for which they have reliable data. However, jurisdictions may wait until the second or third year of emissions reporting to set the base year, when the emissions inventory is sufficiently complete and reliable.

Jurisdictions should choose a base year that is representative of their average emissions in order to avoid cherry picking a year with uncharacteristically high or low emissions.

Jurisdictions may want to choose a base year that aligns with existing mitigation goals, such as the Kyoto Protocol for example.

Option 2: Jurisdictions may choose a range of years as their base period

Jurisdictions may choose an average for a range of years in order to elaborate a representative emissions level for the jurisdiction. This approach may be most relevant for jurisdictions whose emissions fluctuate significantly from year to year.

Under this approach, emissions for a range of years are averaged to determine base period emissions.

Considerations for choosing base year or base period:

- Data quality: emissions data for the base year or base period should be reliable and verifiable
- Nesting: the base year or base period could be aligned with other related jurisdictional goals in order to enable the nesting of goals (e.g. city goal within state or national goal)

Choosing different base years for different sectors and gases

Jurisdictions should establish a single base year or base period for all sectors and gases to enable comprehensive and consistent tracking of emissions over time. However, jurisdictions may choose a different base year or base period for different sectors and gases covered by the goal, based on their objectives, data availability, reliability, and verifiability for each sector and gas covered by the goal, and/or stakeholder demand.

Jurisdictions may want to choose a different base year for the land-use sector in particular, given the complexities of land-use accounting. For more information on choosing a base year for the land-use sector, see Chapter 9.

If different base years or base periods are chosen for different gases and sectors covered by the goal, jurisdictions shall provide a rationale.

Jurisdictions shall choose a base year or base period for which representative, reliable, and verifiable emissions data are available and specify their reasons for choosing that particular year.

7.1.3.Determining base year emissions

Calculation methodology

Once a base year is selected, jurisdictions shall determine base year emissions for all sectors and gases covered by the goal in accordance with IPCC *Guidelines for National Greenhouse Gas Inventories*.[10]

[10] IPCC, *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Prepared by the National

Subnational jurisdictions should use internationally accepted methods and guidelines, such as C40/ICLEI/WRI *Global Protocol for Community Emissions* (GPC) and IPCC *Guidelines for National Greenhouse Gas Inventories* to develop an inventory.

Jurisdictions shall report the methodology used to calculate base year emissions.

Data sources

In order to ensure consistency with the inventory, jurisdictions should use the same data for calculating base year emissions and calculating the inventory for that year.

If necessary, jurisdictions may use different data for calculating base year emissions and the inventory, as long as the data are representative, reliable and verifiable.

Jurisdictions shall disclose and justify all data sources.

7.1.4.Determining base year emissions intensity

To determine base year emissions intensity, base year emissions should be divided by the unit of output used to define the goal (as reported in Chapter 5, Section 5.3).

Data for the unit of output should be reliable, verifiable, and gathered from an official source.

Jurisdictions shall report the methodology used to calculate base year emissions intensity and the data sources used.

7.1.5.Base year emissions recalculations

To consistently track emissions over time, jurisdictions shall recalculate base year emissions when significant changes in jurisdictional structure or inventory methodology occur. In such cases, recalculating base year emissions is necessary to maintain consistency and enable meaningful comparisons of emissions (covered by the goal) over time.

Jurisdictions are required to recalculate base year emissions when the following changes occur and have a significant impact on the inventory:

- Structural changes in the jurisdiction that have a significant impact on its base year emissions, including, for example, changes in the jurisdiction's geopolitical boundary
- Changes in calculation methodologies, including;
    - updated inventory calculation method
    - improvements in the accuracy of emission factors or activity data
    - changes in GWP values
- Changes in goal boundary, including sectors, gases, or geographic area
- Discovery of significant error(s) in original calculations
- Any other changes in the jurisdiction that would otherwise compromise the consistency and relevance of the reported GHG emissions information

Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan, http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html.

Establishing base year emissions recalculation policy

When setting a base year, jurisdictions shall develop a base year emissions recalculation policy and clearly articulate the basis and context for any recalculations. Whether base year emissions are recalculated depends on the significance of changes. A significance threshold should be used to determine whether changes are significant.

A significance threshold is a quantitative/qualitative criterion used to define any significant changes to data, methods, boundaries, or any other relevant factors. For example, a significance threshold of 5% would mean that any change in improved data that results in a 5% change in the emissions inventory for the base year would trigger a recalculation of base year emissions.

As part of their recalculation policy, jurisdictions shall establish and disclose their significance threshold.

Jurisdictions shall apply their recalculation policy in a consistent manner.

7.2. Developing a baseline scenario and determining baseline scenario emissions

This section is most relevant for jurisdictions with goals that are framed as reductions from baseline scenario emissions. However, developing baseline scenarios can also be a useful decision making tool for all jurisdictions, even those with other goal types.

For goals framed as reduction from baseline scenario emissions, a meaningful and consistent tracking of progress over time requires that jurisdictions develop a representative and reliable baseline scenario and determine baseline scenario emissions.

7.2.1. Introduction

An emissions baseline scenario is a projection of an emission trajectory that can be used to set mitigation goals and track progress toward their attainment.

Baseline scenarios are critical for setting mitigation goals framed as reductions from a baseline or business-as-usual scenario and tracking progress toward their attainment. However, they can also be used by decision-makers to understand likely emissions paths. This information can inform the design of mitigation strategies by enabling the jurisdiction to understand the magnitude of likely emissions reductions that will be needed to meet their goal.

For baseline goals, the construction of the baseline scenario can have a significant impact on the ambition of the goal. An under- or over-estimated baseline could lead to a misallocation of resources or could allow a jurisdiction to meet its reduction while doing very little in the way of net emissions reductions. Therefore, in order to ensure the environmental integrity of a baseline goal, it is critical that the baseline scenario be developed in a careful, consistent, and transparent manner, and be representative of likely future emissions growth.

A baseline scenario could be the same as a business-as-usual (BAU) trajectory, but could also be set as an emissions level that incorporates policies and measures left out of a BAU.[11]

[11] For more information see Prag, Andrew and Christa Clapp (2011). "Setting National and Sectoral Baselines," Draft Discussion Document prepared for CCXG/Global Forum on Environment Seminar on MRV and Carbon Markets, 28-29 March 2011, Paris, http://www.oecd.org/dataoecd/37/41/47857020.pdf.

No standard guidelines exist for setting national, sub-national, or sectoral baseline scenarios. In part, the reason is that baseline scenarios are crafted in a diversity of ways to fit specific objectives and circumstances.

7.2.2.Baseline scenario terms

There are a variety of terms that are used to describe emissions projections. Baseline scenario, business-as-usual scenario, and reference case are three. This standard uses the terms baseline and baseline scenario as the generic terms for an emissions projection.

7.2.3.Purpose of baseline scenarios[12]

How a baseline scenario is designed depends on its purpose. Baseline scenarios can serve a number of purposes, including:

- **Set a goal** – a baseline scenario can be used as a reference point against which the ambition of a mitigation goal is set.
- **Track progress toward goal** – For all goal types, a baseline scenario can be used to track progress toward the goal's achievement by acting as a reference point against which mitigation strategies can be designed and assessed.
- **Reporting** – information regarding baseline scenarios are required by some reporting regimes in order to offer an estimation of an emissions trajectory for the jurisdiction. For example, under the UNFCCC, Annex I Parties are required to outline emissions projections for a number of different scenarios, including with and without policies and measures.
- **Mitigation assessment** - As described in Chapter 5, mitigation assessments are a means of determining, selecting, and analyzing mitigation options and strategies based on the specific needs, conditions, and objectives of a jurisdiction. One critical element of carrying out a mitigation assessment is the development of a baseline scenario. This standard does not provide detailed guidance on mitigation assessments; however such guidance can be obtained from the IPCC[13] and the UNFCCC[14], among others[15].

7.2.4.Developing a baseline scenario[16]

The process for developing a baseline scenario involves a large number of inputs. Some of the inputs are purely technical and relate to data availability and methodological approach. However, other inputs are influenced by political considerations, such as key drivers and underlying assumptions and the inclusion of policies and measures. How these inputs are defined and/or included may have a significant effect on baseline scenario emissions. Therefore, it is critical that baseline scenario inputs are accurate, relevant, consistent, and transparent.

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[12] Adapted from OECD, "Setting national and sectoral baseline," Draft discussion document 3, CCXG seminar breakout session 3a, March, 2011.

[13] Dennis Tirpak et. al, "Chapter 27: Methods for assessment of mitigation options," in *Climate Change 1995: The IPCC Second Assessment Report: Scientific-technical analyses of impacts, adaptations, and mitigation of climate change*, eds. Robert T. Watson, M.C. Zinyowera, and Richard H. Moss, Cambridge, UK: Cambridge University Press 1995, http://www.ipcc-wg2.gov/publications/SAR/SAR_Chapter%2027.pdf.

[14] "Mitigation Assessments," UNFCCC, accessed November 12, 2012, http://unfccc.int/resource/cd_roms/na1/mitigation/index.htm.

[15] For example, see Sathaye et. al., *Greenhouse Gas Mitigation Assessment: A guidebook*, prepared by Countries Studies Management Team and Lawrence Berkeley Laboratory, 1995, http://ies.lbl.gov/iespubs/ggma/ghgcontents.html.

[16] Adapted from OECD, "Setting national and sectoral baseline," Draft discussion document 3, CCXG seminar breakout session 3a, March, 2011 and Christa Clapp and Andrew Prag, "Emissions baselines for national climate policy: Options for improving transparency and consistency," CCXG Draft Discussion Document, (*forthcoming)*.

The construction of a baseline scenario depends on a number of key elements, including:

- **Scope** – Which gases and sectors are covered by the baseline scenario?
- **Metric** – Which metric will be used to calculate the baseline scenario?
- **Historical reference period and timeframe** – Which year(s) of GHG inventory are the historical reference for the baseline scenario?
- **Modelling framework** – Which model will be used to project emissions?
- **Key emissions drivers and underlying assumptions** – Which key emissions drivers and underlying assumption will be used?
- **Data** – What are the data needs and sources?
- **Policies and measures** – How will policies and measures be included in the baseline scenario?
- **Emissions reductions beyond the goal boundary** – How will emissions reductions beyond the goal boundary (e.g. offsets) be accounted for in the baseline scenario?
- **Baseline recalculation** – Under what conditions should the baseline scenario be recalculated?
- **Uncertainty and sensitivity analysis** – How will uncertainty and sensitivity analysis be addressed?

7.2.5.Scope

The scope of the baseline scenario refers to the sectors and gases that are covered by it.

In order to enable comprehensive and consistent tracking of progress toward the goal, the baseline scenario developed by the jurisdiction shall cover the same sectors and gases as the goal.

Jurisdictions shall disclose and justify the scope of the baseline scenario.

7.2.6.Metric

For the baseline scenario metric, the jurisdiction shall use (million) metric of tons of greenhouse gases – expressed as $MtCO_2$ or $MtCO_2e$, depending on which gases are included in the goal boundary.

Jurisdictions shall disclose the baseline scenario metric.

7.2.7. Baseline scenario: Historical reference period and timeframe

Historical reference period

Baseline scenarios can be based on a single historical reference year of GHG emissions inventory data or trends across a historical reference period, or series of years of inventory data.

If a single year is chosen as the basis for the baseline scenario, the choice of year can have a significant effect on baseline scenario emissions, especially if emissions were uncharacteristically high or low as a result of a variety of factors, including:[17]

- Short-term trends in GDP growth
- Energy prices and fuel supply
- Weather variations
- Natural disturbances such as forest fires, which can affect emissions and removals in the land-use sector

[17] Based on Christa Clapp and Andrew Prag, "Emissions baselines for national climate policy: Options for improving transparency and consistency," CCXG Draft Discussion Document, *(forthcoming).*

Given the variability of emissions year to year, jurisdictions should use a historical reference period, or series of years, as the basis for the baseline scenario. In this way, year to year fluctuations are smoothed to reveal an average trend in emissions.

Jurisdictions shall disclose and justify their choice of a historical reference year or period.

Timeframe

The timeframe for the baseline scenario refers to the period over which emissions are projected. At a minimum, jurisdictions with goals framed as reductions relative to a baseline scenario shall use a time frame for their baseline scenario that matches the goal period. For example, if a jurisdiction's goal period ends in 2020, the baseline scenario should be projected to at least the year 2020. For planning purposes, jurisdictions may project emissions farther into future, beyond the goal period.

7.2.8.Modelling framework

Since baseline scenario emissions by definition cannot be observed, models are used to develop baseline scenarios and associated baseline scenario emissions. These represent the emissions scenario that would likely develop based on assumed changes across a range of key emissions drivers.

The type of model used can have a significant impact on baseline scenario emissions. Moreover, the model used will depend on the objectives of the jurisdictions, data availability, and financial and technical resources.

Two major categories of models exist – top-down and bottom-up. Hybrid models are a third class, which combine elements from both the top-down and bottom-up approaches. See Table 7.1 for descriptions of each category of model.

Table 7.1. Comparison of top-down, bottom-up, and hybrid models (language from OECD)[18]

Model category	Definition
Bottom-up models	Typically assess distinct mitigation technologies or practices, including their costs and emission reduction capabilities, as well as their substitutability with other technologies. A combination of mitigation technologies is then used to meet energy demands under an environmental constraint. Bottom-up models tend to focus on the interactions within the energy system, rather than its relationship with the overall economy.
Top-down models	Usually view the economy as an integrated whole, reaching economic equilibrium under an environmental constraint through substituting capital, energy, and labour. Top-down models tend to focus on economic processes rather than technology detail or market products.
Hybrid models	Combine elements of both bottom-up technology detail, usually focused on the electricity sector, and top-down economic integration.

Choosing a model

To develop a baseline scenario, jurisdictions should use models that are specifically tailored to their jurisdiction. Examples include the National Energy Modeling System (NEMS) model for the USA and Canada's Energy-Economy-Environment Model for Canada (E3MC) model.

If a jurisdiction-specific model is not available, the jurisdiction should develop one.

[18] The language in this table is taken verbatim from Text Box 1 of Clapp et al, "National and sectoral GHG mitigation potential: A comparison across models," OECD, November 2009, pg. 15.

If the development of a jurisdiction-specific model is not possible, the jurisdiction should use generic/open source models. Examples include the Long range Energy Alternatives Planning System (LEAP) and MARKAL models.

If the use of an open source model is not a possibility, the jurisdiction may use an existing baseline scenario that has been developed for their jurisdiction by a third party. Examples include baseline scenarios that the International Energy Agency (IEA) has developed for a number of jurisdictions, including: USA, EU, Japan, Russia, China, India, and Brazil, as part of the annual *World Energy Outlook*. See Table 7.2 for more examples.

It is important that any third party baseline baselines used by a jurisdiction matches the scope of that jurisdiction's goal. For example, if a jurisdiction's goal includes the same sectors and gases included in the third party baseline scenario, the baseline would likely be a relevant projection of future emissions. However, if a jurisdiction's goal covers a different scope of sectors and gases than the third party baseline scenario, the baseline scenario would not be a relevant projection of future emissions. In which case, it shall not be used by the jurisdiction without the necessary modifications.

Jurisdictions shall report the model used for calculating the baseline scenario and associated baseline scenario emissions, and the rationale for choosing the model.

Table 7.2. Existing projections for energy and non-energy emissions

Institution	Methodology	Country/regional scope	Coverage	Time period
IEA World Energy Outlook 2011	World Energy Model	World; OECD; OECD Americas; USA; OECD Europe; EU; OECD Asia Oceana; Japan; Non-OECD; Eastern Europe/ Eurasia; Russia; non-OECD Asia; China; India; Middle East; Africa; Latin America; Brazil	Energy demand, gross electricity generation, electricity capacity, and CO2 emissions from fuel combustion	2009 - 2035
EIA International Energy Outlook 2011	WEPS+ Model	World; OECD; USA; Canada; Mexico and Chile; OECD Europe; Japan; South Korea; Australia/New Zealand; non-OECD; Russia; non-OECD Europe and Eurasia; China; India; non-OECD Asia; Middle East; Africa; Brazil; Other Central and South America	Energy consumption by end-use sector and fuel; Electricity capacity and generation by fuel; Population; GDP; Energy intensity; CO2 intensity	2008 - 2035
IPCC Fifth Assessment	Shared socioeconomic	Almost all countries	Combination of qualitative information related to country	2010 - 2100

Report (*forthcoming*)[19]	pathways (SSPs)		development and quantitative information on emissions and socioeconomic drivers such as population and per capita income	
EPA - Draft Global Non-CO_2 Emissions Projections Report: 1990-2030 (August, 2011)	In general, projections are based on NatComs	Data are available for virtually all countries[20]	Methane (CH4), nitrous oxide (N2O), and the high global warming potential (high GWP) gases. The high GWP gases include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).	1990 – 2030

Table 7.3. Examples of modelling frameworks used by select national jurisdictions

Country	Sector	Model/Method
Brazil[21]	Energy	Demand forecasting models based on population estimates, economic growth, and emissions intensity of energy sector
	Land use change	2020 emissions from deforestation equal the average rate of deforestation in a biome for a historical period multiplied by an emissions factor.
	Industrial processes, waste treatment and agriculture	GHG emissions for 2006-2020 are based on relationship between emissions and level of economic activity between 1990 and 2005.
Canada[22]	Energy	Energy, Emissions, and Economy Model for Canada (E3MC)
	LULUCF	Not forecasted
Chile[23]	Energy sector	Analytica software
	Forestry sector	Analytica software
Germany[24]	Energy demand in manufacturing sector	ISI-Industry model (Fraunhofer Institute)
	Energy demand in transport sector	FhG-ISI ASTRA model
	Energy demand in building sector	IKARUS space-heating model
	Commerce/trade/services/private households	Technology based individual models
	Electricity generation from renewable energies	Power-ACE model
	Electricity generation from fossil	ELIAS model

[19] For more information see Christa Clapp and Andrew Prag, "Emissions baselines for national climate policy: Options for improving transparency and consistency," CCXG Draft Discussion Document, Box 4, *(forthcoming)*, and Nigel Arnell et. al. "A framework for a new generation of socioeconomic scenarios for climate change impact, adaptation, vulnerability, and mitigation research," http://www.isp.ucar.edu/sites/default/files/Scenario_FrameworkPaper_15aug11_0.pdf

[20] http://www.epa.gov/climatechange/economics/downloads/Appendices_EPA_NonCO2_Projections_2011_draft.pdf

[21] http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Decreto/D7390.htm

[22] Canada, A Climate Change Plan for the Purposes of the Kyoto Protocol Implementation Act (2009)

[23] Luis Abdon Cifuentes Lira et. al. "Estudio: Co-Beneficios de la Mitigacion de GEI," GreenLab UC, commissioned by Chilean Ministry of Environment, 2011, http://greenlabuc.cl/wp-content/uploads/2012/04/CoBen-InformeFinal.pdf.

[24] Germany, 5th National Communication

	fuels	
	Primary energy consumption and determination of energy inputs in other transformation sectors	IKARUS-LP model
	GHG emissions from combustion processes	Oko-Institut's emissions model
	Industrial process emissions	Oko-Institut's emissions model (based on production estimates)
	HFC, PFC, SF_6	"existing projections have been updated and adapted as necessary"
	Agriculture	"the projections prepared by the Johann Heinrich von Thünen Institute (vTI; Federal Research Institute for Rural Areas, Forestry and Fisheries), for the NIR 2009, have been adopted"
	Waste	"Öko-Institut model used in preparation of the National Inventory has been expanded for the projection"
Israel[25]	Electric power, buildings, transport, chemicals, cement, petroleum and gas, other industries, waste, agriculture, forestry	McKinsey cost curve abatement
Mexico[26]	Energy sector	LEAP model
Norway[27]	CO_2 emissions	MSG (multi-sectoral growth) macroeconomic model
	All other GHGs	Norwegian Pollution Control Authority builds on modeled CO_2 projections to project emissions of all other non-CO_2 GHGs
	CO_2 sequestration from forests	Projections on productive forests are developed using the projection program Avvirk 2000, with modifications (see 5th NatComm – p110)
South Africa[28]	Energy sector	MARKAL
	Industrial processes, waste, agriculture, land use,	Bespoke spreadsheet model
UK[29]	CO_2	DECC Energy Model
	CO_2 from LULUCF	Produced by Centre for Ecology and Hydrology using methods consistent with inventory estimates.
	Non-CO_2 GHGs	Done by AEA (consultancy). Underlying assumptions broadly consistent with DECC CO_2 projections. Calculated using bespoke models.
USA[30]	Energy-related CO_2	NEMS model
	Non-energy CO_2 and non-CO_2 emissions	Global Anthropogenic Non-CO_2 GHG Emissions 1990-2020, from US Environmental Protection Agency
Vietnam[31]	Energy	LEAP model

[25] Israel, 2nd National Communication
[26] Programa Especial de Cambio Climatico 2009-2012, http://www.semarnat.gob.mx/programas/Documents/PECC_DOF.pdf
[27] Norway, 5th National Communication
[28] Energy Research Centre, "Long Term Mitigation Scenarios"
[29] UK, 5th National Communication
[30] USA, 5th National Communication

	Agriculture	GHG Mitigation Assessment Guidebook
	LULUCF	COMAP model

For further information on differences among models see:
http://www.oecd.org/environment/climatechange/44050733.pdf
http://www.oecd.org/environment/climatechange/49639001.pdf

7.2.9. Underlying assumptions and drivers

Identifying drivers

All baseline scenarios are based on assumptions about future changes in key emissions drivers. Determining emissions drivers varies by jurisdiction. Therefore, it is important that a jurisdiction identify for itself emissions drivers for each of the sectors and gases covered by the goal.

Examples of drivers include:

- economic activity
- energy prices by fuel type
- energy demand by fuel type
- energy supply by fuel type
- emissions intensity by fuel type
- population
- technological development
- land use practices

This list is not exhaustive. Additional drivers should be included based on a jurisdiction's circumstances.

Jurisdictions shall disclose and justify all emissions drivers included in the baseline scenario.

Assumptions

Once drivers have been identified, assumptions will have to be made about how those drivers will change over time, specifically between the base year or base period and the target year.

Some assumptions can be based on international projections. For example, future population numbers could come from UN population projections, while future energy use data can be borrowed from the projections of the International Energy Agency (for select countries). See Table 7.5 for further examples data sources that can be used as the basis for assumptions.

As the basis for their assumptions, jurisdictions should use official peer-reviewed data that is reliable, verifiable, and representative of their jurisdiction.

Jurisdictions should use conservative assumptions to define baseline values for each driver when uncertainty is high. Conservative values and assumptions are those that are more likely to underestimate GHG emissions in the baseline scenario.

Jurisdictions shall disclose and justify all assumptions used to develop the baseline scenario.

[31] OECD, "Outcomes of a workshop on setting national emissions baselines", Prag et al, September 2011

7.2.10. Data

Data needs will depend primarily on the methodological approach and model used. In all cases, historical emissions data will need to be used, which corresponds to a historical reference year or historical reference period (see Section 7.2.7). See Table 7.5 for common baseline scenario data types and sources.

Historical emissions data

Historical emissions data shall be collected from the jurisdictions' inventory for the base year or base period. A base year or base period cannot be established if inventory data is not available. The choice of the base year or base period should be directly related to the availability of reliable and verifiable emissions inventory data for that year or years.

See Table 7.4 for examples of emissions data used by select countries.

Jurisdictions shall disclose and justify the source of historical emissions data used to develop the baseline scenario.

Table 7.4. Examples of historical emissions data for baselines of select countries

Country	Type	Historical reference data
South Africa[32]	Average emissions over multiple base years	BAU timeframe is 2003-2050. Data taken from 1990 and 1994 UNFCCC GHG Inventory; LTMS estimate for emissions in 2003. Straight line extrapolation was done from 1990-1994 and 1994-2003.
Brazil[33]	Base period and base year	Land use change**:** Amazon deforestation: BAU based on average rate of observed deforestation between 1996 and 2005. Cerrado Biome: BAU based on average observed deforestation rate between 1999 and 2008. Atlantic forest biome, Caatinga, and Pantanal: BAU assumes that deforestation remains steady at 2005 levels. Industrial processes, waste treatment, and agriculture**:** BAU based on the relationship between volume of emissions and level of economic activity for each sector between 1990 and 2005.
Ethiopia[34]	Base year	All projections are from 2010 base year.
Mexico[35]	Base year	BAU builds on 2006 energy and non-energy data from UNFCCC inventory (4th National Communication) and Energy Sector Prospects 2008-2017.
Israel[36]	Base year	Based on 2005 base year (2nd National Communication has inventories for 1996, 2000, 2003, 2004, 2005, 2006, 2007)

[32] Government of South Africa, Dept of Environmental Affairs, "Defining South Africa's peak, plateau and decline GHG emission trajectory," p.2
[33] http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Decreto/D7390.htm
[34] Ethiopia's Climate-Resilient Green Economy Strategy
[35] Programa Especial de Cambio Climatico 2009-2012, p15 - http://www.semarnat.gob.mx/programas/Documents/PECC_DOF.pdf
[36] Israel, 2nd National Communication, p126

Norway[37]	Base period	Timeframe is 1990-2020. Data for 1990-2007 is based on inventory.
Sweden[38]	Base period	Timeframe is 1990-2020. Data for 1990-2007 is based on inventory.

Data related to emissions drivers

Data will need to be collected for emissions drivers (described in section 7.12.).

Data can be collected from a variety of sources depending on the jurisdiction's needs and objectives, including:

- National sources specific to the jurisdiction, such as national departments/ministries of energy, economics, transportation, and industry.
- International sources like the International Energy Agency (IEA), United Nations (UN), International Monetary Fund (IMF), and World Bank.
- Regional sources specific to the jurisdiction, such as regional energy, economics, transportation, and industrial agencies.
- State or provincial sources specific to the jurisdiction, such as regional energy, economics, transportation, and industrial agencies.
- City sources specific to the jurisdiction, such as regional energy, economics, transportation, and industrial agencies.
- Sector-specific data sources

Table 7.5 outlines common data needs and sources.

Jurisdictions should use official peer-reviewed data that is reliable, verifiable, and representative of their jurisdiction.

Jurisdictions shall disclose and justify data sources associated with emissions drivers.

[37] Norway, 5th National Communication
[38] Sweden, 5th National Communication

Table 7.5. Common baseline scenario data types and sources[39]

Category	Types of Data	Common Data Sources
Macroeconomic Variables		
Sectoral driving variables	GDP/value added, population, household size	National statistics and plans; macroeconomic studies; World Bank, GDP data, UN Population data, World Resources Institute.
More detailed driving variables	Physical production for energy intensive materials; transportation requirements (pass-km/year); agricultural production and irrigated area; commercial floor space, etc.	Macroeconomic studies; national sectoral studies, household surveys, UN FAO Agrostat database; etc.
Energy Demand		
Sector and subsector totals	Fuel use by sector/subsector	National energy statistics, national energy balance, energy sector yearbooks (oil, electricity, coal, etc.), International Energy Agency statistics.
End-use and technology characteristics	Energy consumption by end-use and device: e.g. new vs. existing building stock; vehicle stock; breakdown by type, vintage, and efficiencies; or simpler breakdowns.	Local energy studies; surveys and audits; studies in similar countries; general rules of thumb from end-use literature.
Response to price and income changes	Price and income elasticities	Econometric analyses of time-series or cross-sectional data.
Energy Supply		
Technical characteristics	Capital and O&M costs, performance, efficiencies, capacity factors, etc.	Local data, project engineering estimates, EPRI Technical Assessment Guide,
Energy prices		Local utility or Govt projections. IEA World Energy Outlook and fuel price projections.
Energy supply plans	New capacity on-line dates, costs, characteristics.	National or electric utility plans & projections; other energy sector industries.
Energy resources	Estimated recoverable reserves of fossil fuels; estimated costs and potential for renewable resources	Local energy studies; World Energy Council Survey of Energy Resources.
Technology Options		
Costs and performance	Capital and O&M costs, performance (efficiencies, unit intensities, capacity factors, etc.)	Local energy studies and project engineering estimates; technology suppliers; other mitigation studies,
Penetration rates	Percent of new or existing stock replaced per year; overall limits to achievable potential	Extrapolation of trends & expert judgment, optimizing or simulation models.
Administrative and program costs	For efficiency investment, often expressed in cost per unit energy saved.	Local and international studies.
Emission Factors	Kg GHG emitted per unit of energy consumed, produced, or transported.	National inventory assessments; IPCC Revised Inventory Guidelines (IPCC, 1996); CORINAIR; CO2DB, GEMIS, AIR CHIEF; IPCC Technology Characterization Inventory (US DOE, 1993); TED

[39] http://unfccc.int/resource/cd_roms/na1/mitigation/Module_5/Module_5_1/a_Mitigation_assessment_tools_energy/Module5_1.ppt

7.2.11. Policies and measures

Future GHG emissions within a jurisdiction will be affected by emissions-related policies and measures adopted and implemented by that jurisdiction. These will include a variety of policies, including those designed to reduce emissions, those designed to meet other goals, and those that have the effect of increasing emissions. The assumptions made about the likely impact of emissions-related policies and measures in the baseline scenario can have a significant effect on the resulting baseline scenario emissions. Therefore, it is critical that policies and measures are accounted for in the baseline scenario in a relevant, consistent, and transparent manner.

Table 7.8 describes three approaches for including policies and measures in the baseline scenario.

Table 7.9 gives examples of how a select number of countries have included policies and measures in their national baseline scenarios.

Jurisdictions should include mitigation policies and measures in the baseline scenario according to the 'with measures' approach.[40]

Jurisdictions should be transparent about the cut-off year after which no new policies are assumed to be implemented, and whether the effects of the included policies and measures are assumed to be static after the cut-off year or whether their effects will be extrapolated.[41]

If a jurisdiction deviates from this approach, they should disclose and justify their rationale.

Jurisdictions may develop additional baseline scenarios according to the other approaches as a means for comparing a variety of possible emissions trajectories.

Jurisdictions shall disclose and justify how policies and measures are included in the baseline scenario, including all policies and measures that are included in the baseline scenario, their associated GHG impacts, and the assumptions and methodologies used to estimate their impact.

Jurisdictions should disclose and justify any policies and measures with significant GHG impacts that are excluded from the baseline scenario.

Table 7.8. Approaches for including policies and measures in the baseline scenario[42]

Type of baseline	Description
Without measures	Baseline does not include impacts of mitigation policies and measures, including existing policies and measures.
With measures	Baseline includes mitigation policies and measures that are currently implemented (in the year the baseline is created).
With additional measures	Baseline includes all mitigation policies and measures that are currently implemented, in the legislative process, or planned (in the year the baseline is created).

[40] Based on Christa Clapp and Andrew Prag, "Emissions baselines for national climate policy: Options for improving transparency and consistency," CCXG Draft Discussion Document, 26 September 2012.
[41] See Christa Clapp and Andrew Prag, "Emissions baselines for national climate policy: Options for improving transparency and consistency," CCXG Draft Discussion Document, 26 September 2012.
[42] Adapted from Christa Clapp and Andrew Prag, "Emissions baselines for national climate policy: Options for improving transparency and consistency," CCXG Draft Discussion Document, 26 September 2012.

Table 7.9. Examples of inclusion of policies and measures from selected countries

Country	Inclusion of Policies and Measures
Brazil[43]	Energy: The Energy Development Plan (PDE) (EPE, 2010, in Portuguese) includes growth assumptions that lead to a 111% increase in total energy consumption from 2005-2020 with overall economic growth of 101% over the same period. The PDE emissions projection also assumes that a number of mitigation measures will be implemented during this period, resulting in only a 93% increase in overall emissions from energy over the same period. However, the PDE projection is not used as the BAU baseline for the energy sector because implementation of the mitigation measures assumed under PDE is not considered to occur under "business as usual". Rather, the BAU baseline for total emissions in the energy sector is calculated by taking the PDE projection and adding back into it the emissions expected to occur in the absence of the mitigation actions included in the PDE.[44] Land use change**:** No policies and measures included Industrial processes, waste treatment, and agriculture**:** No policies and measures included
Chile[45]	The baseline scenario will consider plans, actions, and measures that had entered into force by December 31, 2006.
Israel[46]	Based on existing programs and expected regulation, without implementation of new abatement programs. Takes into account government policy and regulation as of 2009.
Norway[47]	Measures and policies adopted after autumn 2008 are not included in the baseline scenario
South Africa[48]	Involves no change from current trends, not even implementing existing policy.
Sweden[49]	Based on policy instruments adopted by EU and Swedish parliament up to June 2008.

7.2.12. Accounting for emissions reductions from outside the goal boundary (e.g. offsets)

Jurisdictions may account for emissions reductions from outside the goal boundary in the baseline scenario instead of adding or subtracting them from the emissions level (reported or estimated).

For example, if a jurisdiction knows that it will buy a certain amount of offsets to reach its baseline scenario-related goal, it may choose to subtract the estimated number emissions credits that will be purchased in the target year from baseline scenario emissions in the target year. Doing so will shift the entire baseline scenario downwards. Alternatively, the same jurisdiction could subtract the estimated number of purchased credits from the emissions level in the target year associated with meeting goal, as described in Section 10.5.

[43] http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Decreto/D7390.htm
[44] OECD, "Crossing the Threshold: Ambitious Baselines for the UNFCCC New Market Mechanism," p26
[45] Chile's approach, Workshop on NAMAs submitted by developing country parties, 2011 UNFCCC meeting in Bonn
[46] Israel, 2nd National Communication, p126
[47] Norway, 5th National Communication
[48] Energy Research Centre, "Long Term Mitigation Scenarios", p49
[49] Sweden, 5th National Communication

If a jurisdiction chooses to account for emissions reductions from outside the goal boundary in the baseline scenario, the baseline scenario-related goal should be set against the adjusted baseline scenario.

Jurisdictions shall disclose and justify how emissions reductions from outside the goal boundary are accounted for in the baseline scenario, if applicable.

7.2.13. Baseline scenario recalculation

As the economic and political circumstances of a jurisdiction change over time, in addition to its ability to collect and monitor data, the original data, emissions drivers, assumptions, and/or included policies and measures may become less relevant or discovered to be erroneous.

If by monitoring baseline scenario parameters it becomes evident that a key parameter is no longer valid, then the baseline scenario and associated emissions estimates shall be reconsidered..

Jurisdictions shall recalculate baseline scenario emissions when significant and unexpected changes in emissions drivers, goals boundary, and/or inventory methodology occur. In such cases, recalculating baseline scenario emissions is necessary to maintain consistency and enable meaningful comparisons of emissions over time.

Examples of changes that would require recalculation include:

- Structural changes in the jurisdiction that have a significant impact on its baseline scenario emissions, including, for example, changes in the jurisdiction's geopolitical boundary
- Changes in emissions drivers that cause significant deviations from previous assumptions
- Changes in calculation methodologies, including;
    - updated inventory calculation method
    - improvements in the accuracy of emission factors or activity data
    - changes in GWP values
- Changes in goal boundary, including sectors, gases, or geographic area
- Discovery of significant error(s) in original calculations
- Any other significant changes in the jurisdiction that would otherwise compromise the consistency and relevance of the reported GHG emissions information

If a jurisdiction chooses to use a baseline scenario developed by a third party, recalculating baseline scenario emissions will be difficult without modifying the model. In this case, jurisdictions should develop their own baseline scenario. If this is not possible, it shall be disclosed and justified.

Establishing baseline scenario emissions recalculation policy

When developing a baseline scenario, jurisdictions shall develop a baseline scenario emissions recalculation policy and report the basis and context for any recalculations. Whether baseline scenario emissions are recalculated depends on the significance of changes. A significance threshold should be used to determine whether changes are significant.

A significance threshold is a quantitative/qualitative criterion used to define any significant changes to emissions drivers, data, methods, boundaries, or any other relevant factors. For example, a significance threshold of 5% would mean that any change in improved data that results in a 5% change in baseline scenario emissions in the target year would trigger a recalculation of baseline scenario emissions.

As part of their recalculation policy, jurisdictions should establish and disclose their significance threshold.

Jurisdictions should apply their recalculation policy in a consistent manner.

7.2.14. Uncertainty and sensitivity analysis

Understanding uncertainty can be crucial for properly developing and interpreting baseline scenario emissions. The term uncertainty assessment refers to a systematic procedure to quantify and/or qualify the sources of uncertainty in a GHG assessment. Identifying and documenting sources of uncertainty can assist users in understanding the steps required to help improve the assessment quality and increase the level of confidence users have in the results.

Guide to the uncertainty assessment process

Uncertainty assessment can be used within the baseline scenario development process as a tool for guiding data quality improvements, as well as a tool for reporting uncertainty results. Users should identify and track key uncertainty sources throughout the process and iteratively check whether the confidence level of the results is adequate for the stated objectives. Identifying, assessing, and managing uncertainty is most effective when done during the baseline scenario development process.

Users may choose a qualitative and/or quantitative approach to uncertainty assessment. Quantitative uncertainty assessment can provide more robust results than a qualitative assessment and better assist users in prioritizing data improvement efforts on the sources that contribute most to uncertainty. Including quantitative uncertainty results in the GHG assessment report also adds clarity and transparency to users of the report. Users should present both qualitative and quantitative (if completed) uncertainty information in the report. Users should also describe their efforts to reduce uncertainty in future revisions of the assessment (if applicable).

Types of uncertainty

Uncertainty is divided into three categories: parameter uncertainty, scenario uncertainty, and model uncertainty. The categories are not mutually exclusive, but they can be evaluated and reported in different ways. Table 12.1 illustrates these types of uncertainties and corresponding sources.

Table 7.10: Types of uncertainties and corresponding sources

Types of uncertainty	Sources
Parameter uncertainty	Activity data
	Emission factors
	Global warming potential (GWP) values
Scenario uncertainty	Methodological choices
Model uncertainty	Model limitations

For baseline scenario development, scenario and model uncertainty are the most relevant. They are each outline below.

Scenario uncertainty

While parameter uncertainty is a measure of how close the data used to calculate emissions are to the true (though unknown) actual data and emissions, scenario uncertainty refers to variation in calculated emissions due to methodological choices. When there are multiple methodological choices available in the standard (e.g., the selection of baseline assumptions), scenario uncertainty is created. The use of standards results in a reduction in scenario uncertainty by constraining choices the user may make in their methodology. For example, the boundary setting requirements standardize the boundary setting approach for all users.

To identify the influence of these selections on results, users should undertake a sensitivity analysis (see below).

Model uncertainty

Model uncertainty arises from limitations in the ability of the modeling approaches used to reflect the real world. Simplifying the real world into a numeric model always introduces some inaccuracies. In many cases, model uncertainties can be represented, at least in part, through the parameter or scenario approaches described above. However, some aspects of model uncertainty might not be captured by those classifications and are otherwise very difficult to quantify.

Sensitivity analysis

Sensitivity analysis should be used to understand differences in the GHG emissions results for the baseline scenario due to methodological choices and assumptions. A sensitivity analysis involves varying the parameters (or combinations of parameters) to understand the sensitivity of the overall results to changes in those parameters. These parameter adjustments may be plausible (e.g., changes are of a realistic magnitude) or implausible (e.g., interactions between the adjusted variables are ignored), but the main aim is to explore model sensitivity to inputs, and possibly uncertainty in outputs.[50]

When developing a baseline scenario, jurisdictions should identify those parameters that are most relevant for the determination of the result (in terms of GHG emissions) and conduct a sensitivity analysis by adjusting these to determine impact of such changes to the outcome, and specify whether the variation is conducted within a plausible or implausible range.

Two elements need to be considered separately in the sensitivity analysis:

- Sensitivity of results regarding identified emissions drivers (e.g., GDP, population, energy prices, policies and measures)
- Sensitivity of results regarding assumptions made for emissions drivers

Jurisdictions should report the sensitivity of their baseline scenario to changes in identified emissions drivers.

Reporting uncertainty

Uncertainty can be reported in many ways, including qualitative descriptions of uncertainty sources, and quantitative representations, such as error bars, histograms, probability density functions, etc. It is useful to provide as complete a disclosure of uncertainty information as is possible. Users of the information may then weigh the total set of information provided in judging their confidence in the information.

Jurisdictions should report uncertainty estimates for their baseline scenarios.

7.3. Reporting requirements

See Chapter 13 for reporting requirements for this chapter.

[50] Definition taken from IPCC, AR4, WGII, Box 2.1.

Chapter 8: Accounting for emissions reductions generated outside of the goal boundary and addressing double counting

The purpose of this chapter is to enable jurisdictions to account for emissions reductions outside of the goal boundary and put in place mechanisms to avoid double counting, double selling, and double claiming of emissions reductions between jurisdictions.

Requirements in this chapter

- Jurisdictions shall not double count, double sell, or double claim GHG reductions. Credits sold by any jurisdiction shall be deducted ex-post from calculation of that jurisdiction's mitigation goal
- Offset credits shall be: real; additional; based on a realistic baseline; quantified and monitored; independently verified; unambiguously owned; address leakage; address permanence; and do no net harm

8.1. Introduction

Many mitigation goals include flexible compliance mechanisms to enable entities to meet their reduction goals in the most cost-effective way.

Emissions reductions outside of the goal boundary may be used towards meeting a jurisdiction's goal. These units can be generated within the jurisdiction in uncovered sectors or within another jurisdiction (either within or beyond the national boundary depending on the scope of the goal). There are a number of different accounting-related considerations.

- First, the quantity of such units used will dictate ambition in both the jurisdiction and in certain sectors (in the case of domestic offset use).
- Second, the quality of such emissions reductions will have significant implications for the level of ambition and fungibility of units.
- Third, such emissions reductions could be claimed either by the jurisdiction that purchases the emissions reductions (i.e., the purchasing jurisdiction) or the jurisdiction that sells the emissions reductions (i.e., the host jurisdiction).

One associated danger with using emissions reductions outside of the goal boundary is double counting, which arises when the same emissions reduction unit is claimed toward the mitigation goal of more than one jurisdiction or the emissions reduction is sold multiple times.

The environmental integrity of the goal is also affected by how emissions reductions that will be sold to other jurisdictions are accounted for in a jurisdiction's baseline. See Chapter 7 for guidance on accounting for emissions reductions outside the goal boundary in the baseline.

8.2. Categories of emissions reductions generated outside of the goal boundary used towards achieving the goal

In what follows, the following definitions apply: credits encompass all types of greenhouse gas-related units that may be used for compliance; offsets include those credits that are generated through a baseline-and-credit system, issued ex post for emission reductions achieved; allowances include all instruments issued ex ante in a cap-and-trade scheme that allow a holder to emit a defined amount of greenhouse gases. Credits therefore refer to both offsets and allowances.

This standard makes the following relevant distinction with regard to credits:

- Credits from within the geographic/jurisdictional boundary (but not covered by the goal)
- Credits generated outside of the boundary:
  - from jurisdictions covered by a mitigation goal
  - from jurisdictions not covered by a mitigation goal

8.3. Percentage or quantity of emissions reductions generated outside of goal boundary used to achieve goal

Using emission reductions generated outside the goal boundary to achieve the proposed goal has both advantages and disadvantages, well-rehearsed in the literature on offsets. On the positive side, it may be expected that access to a wider pool of emission reduction opportunities may increase ambition on the part of the jurisdiction, which would not feel as constrained by a more ambitious goal on emissions. In addition, such emission reduction opportunities should lead potentially to more cost-effective mitigation overall. Finally, and as a corollary, allowing entities in the jurisdiction or the jurisdiction itself access to these other opportunities may provide a way to contain abatement costs within the jurisdiction, potentially diminishing the risk of over-ambitious policies engendering unexpected compliance costs.

On the negative side, relying on units generated outside of goal boundary to achieve mitigation goals may not necessarily drive domestic mitigation efforts (in the case of units purchased from another jurisdiction) or reductions in covered sectors (in the case of offsets generated in uncovered sectors within the jurisdiction's boundaries). If the units used toward the goal are of low quality, not reflecting additional emissions reductions, their use may well compromise the environmental integrity of the system, and lead to more emissions than would be the case otherwise. Finally, units purchased from a jurisdiction may focus on least-cost emission opportunities that may then lead that jurisdiction with a more difficult and costlier emission reduction opportunity set. However, this view takes a rather static view of the opportunity set and its abatement cost curve – as technology develops and diffuses, one would expect typically costs to decrease over time.

Based on such weighing of pros and cons, most jurisdictions to date have set some kind of quantitative and qualitative threshold of emission reductions generated outside the goal boundary (see Table 8.1 below for a description of quantitative limits on market-based units).

Table 8.1. Quantity of units from market-based mechanisms used to achieve goals: Existing practices

Jurisdiction	Quantity used to achieve goal[51]
Canada[52]	"No significant use assumed"
EU[53]	"For the use of units the EU ETS is capped at 50 per cent of the required reduction below 2005 levels; other sectors: annual use capped at 3–4 per cent of each member State's non-ETS GHG emissions in 2005"

[51] Please note that for Canada, EU, Iceland, Norway and Switzerland this assessment is for use of market-based mechanisms, which includes emissions trading.
[52] UNFCCC, "Quantified economy-wide emission reduction targets by developed country Parties to the Convention: assumptions, conditions, commonalities and differences in approaches and comparison of the level of emission reduction efforts," FCCC/TP/2012/2, 2012, http://unfccc.int/resource/docs/2012/tp/02.pdf.
[53] Ibid.

Iceland[54]	"No significant use assumed"
Norway[55]	"If Norway should move from a 30 per cent to a 40 per cent reduction target , this would entail considerable use of carbon credits"
Switzerland[56]	"The Swiss CO2 Law for the 2013–20 period defines the –20 per cent target as domestic, but carbon credits might be used in limited cases. Accordingly carbon credits could be used for up to 75 per cent of the additional emission reductions beyond the –20 per cent target by 2020 compared with 1990. Qualitative restrictions on the use of carbon credits are to be applied as of 2013 for the –20 per cent target"
California[57]	Offsets may be used to cover up to 8% of entity's compliance obligation

Jurisdictions are required to report on a threshold that is applied to the use of emission reductions beyond the goal boundary. The use or no use of the threshold must be explained with justification in relation to their policy priorities.

Jurisdictions are required to be transparent about the quantity of emissions reductions generated outside of goal boundary that are planned ex-ante and used ex-post towards meeting the goal.

Jurisdictions shall report ex-ante any threshold used to define the quantity of emissions reductions generated outside the goal boundary that are allowed to meet the goal, and the rationale used to establish the threshold. Jurisdictions shall also report ex-post how these decisions were implemented including actual quantity of external reductions used.

8.4. Guidance on quality and environmental integrity of purchases of credits beyond the boundaries of the mitigation goal

From the standpoint of environmental integrity, it is critical that emissions reductions generated outside of the goal boundary meet key quality criteria. Offset credits shall be: real; additional; based on a realistic baseline; quantified and monitored; independently verified; unambiguously owned; address leakage; address permanence; and do no net harm.[58] Credits that are additional, represent an emission reduction from a counterfactual scenario without the existence of the pricing induced by a particular carbon finance instrument, when they are used to meet the goal. In the absence of such additionality, a net increase of emissions will result from the use of any credits (allowances or offsets) towards their goal. This points to the critical role that the design of the counterfactual scenario – the baseline – has in ensuring environmental integrity of any crediting scheme. Internationally accepted baseline methodologies (e.g. *Project Protocol*) that underlie the generation of emissions reductions outside of the goal boundary are, therefore, critical.

For illustration and as a guide, Table 8.2 provides summary information on some of the most widely accepted crediting schemes (both cap-and-trade and offset). This table is not an endorsement and serves only to illustrate the variety of schemes in use.

[54] Ibid.
[55] Ibid.
[56] Ibid.
[57] http://globalclimate.epri.com/doc/EPRI_Offsets_W10_Background%20Paper_CA%20Offsets_040711_Final2.pdf
[58] Source: Offset Quality Initiative

Table 8.2. Overview table of selected existing crediting schemes

Crediting Scheme	Origin	Unit	Unit generation	Use/recognition in other schemes	More information
Clean Development Mechanism	Kyoto Protocol article 17	Certified Emission Reduction (CER)	Based on baseline methodologies approved by the CDM Executive Board.	Widely used across most official emission trading schemes to date.	cdm.unfcccc.int
Joint Implementation	Kyoto Protocol article 6	Emission Reduction Units (ERU)	Based on baseline methodologies approved by the JI Supervisory Committee. Follows closely the CDM model.	Widely used across most official emission trading schemes to date.	ji.unfccc.int
International Emission Trading	Kyoto Protocol article 17	AAU (Assigned Amount Unit)	Issuance to Kyoto Protocol Parties on the basis of their targets in the Protocol	Not used outside the Kyoto Protocol.	http://unfccc.int/kyoto_protocol/mechanisms/emissions_trading/items/2731.php
Verified Carbon Standard	Voluntary initiative	VER (Verified Emission Reduction)	Based on baseline methodologies approved by the VCS. Follows closely the CDM model.	Used mostly in the voluntary market. Recognition for some VCS standards in North American markets	www.v-c-s.org
American Carbon Registry	Voluntary initiative				americancarbonregistry.org
European Union Emission Trading System (ETS)	European Union law, Directive 2003/87, subsequently amended	European Union Allowance (EUA)		Linked to the CDM and to Australian CPM	http://ec.europa.eu/clima/policies/ets/index_en.htm
Australian Carbon Pricing Mechanism	Australian law				http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Pages/default.aspx
New Zealand ETS	New Zealand law	NZU (New Zealand Units)		Linked to CDM and to IET	http://www.climatechange.govt.nz/emissions-trading-scheme/
RGGI	Mandates from different Northeastern US states				http://www.rggi.org/

8.5. Double counting

Double counting of credits occurs when the same emissions reduction unit is counted toward the mitigation goal of two different jurisdictions.

Scenarios for double counting[59]

Double selling – occurs when credit from a single emission reduction is sold twice.

Double claiming – occurs when credit from an emissions reduction is claimed by two different parties:

- In the case of purchased units: Buyer claims units and credits them toward their goal. Double counting will occur if seller credits the same reduction units toward their goal.
- In the case of sold units: Seller sells units and claims credits toward their goal. Double counting will occur if purchaser credits the same reduction units toward their goal.
- In the case of shared units: Both buyer and seller claim a proportion of the emissions reduction units and credit them toward their goals. Double counting will occur if both the buyer and seller credit the same underlying reduction unit toward their goal.

Addressing double counting

Within any single or multiple systems of goals, double claiming of the same credits by both seller and buyer undermines the environmental integrity of the system(s), leading to a mismatch between what the accounting system(s) reflect and what the atmosphere observes.

Jurisdictions shall not double count, double sell, or double claim GHG reductions. Credits sold by any jurisdiction shall be deducted ex post from calculation of that jurisdiction's mitigation goal.

Jurisdictions should institute mechanisms to avoid double counting. To ensure that double counting does not occur, a variety of mechanisms may be used, including:[60]

- **Legal mandates** that disallow double counting
- **Registry** that lists the quantity of emissions reduction units held by a jurisdiction
- **Transaction log** that records the details of each transaction between registry accounts, including the issuance, holding, transfer, and acquisition of emissions reduction units
- **Agreements** between buyers and sellers that specify who claims emissions reductions associated with offsets and specifies what percentage, if any, are shared

Table 8.3 provides examples of existing mechanisms currently being used in different contexts, by way of example/illustration.

Table 8.3. Existing mechanisms to prevent double counting

Regime	Mandate language	Mechanism used to prevent double counting of offsets
Kyoto Protocol[61]	The CDM registry shall be in the form of a standardized electronic database which contains, *inter alia*, common data elements relevant to the issuance,	CDM registry and international transaction log, which: • contains data relevant to issuance, holding, transfer, and acquisition of CERs

[59] Based on Andrew Prag, "Overlap of carbon market mechanisms," Presentation given at CEPS Carbon Market Forum, 3rd meeting of the Task Force on New Market Mechanisms under the AWG-LCA, July 2012
[60] Please note that these are not mutually exclusive and a jurisdiction could employ a combination or all of them.
[61] Marrakesh Accords

	holding, transfer and acquisition of CERs. The structure and data formats of the CDM registry shall conform to technical standards to be adopted by the COP/MOP for the purpose of ensuring the accurate, transparent and efficient exchange of data between national registries, the CDM registry and the independent transaction log.
	
	Each CER shall be held in only one account in one registry at a given time.
		• has the following accounts:
		  ○ one for the Executive Board into which CERs are issued being transferred to other accounts
		  ○ at least one holding account for each non Annex I Party
		  ○ at least one account for cancelling CERs
		  ○ at least one account for holding and transferring CERS to cover administrative costs
		• Each account within the CDM registry shall have a unique identifying number
		• Each CER shall have a unique serial number

EU ETS[62]	In order to ensure the environmental integrity of the Community emissions trading scheme, Directive 2003/87/EC requires the Member States to ensure that when hosting project activities as established under the flexible mechanisms of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), no emission reduction units (ERUs) or certified emission reductions (CERs) are issued for reductions or limitations of greenhouse gas emissions that take place in installations that participate in the Community emissions trading scheme, as this would result in a double counting of emission reductions or limitations.	**Community Independent Transaction Log** "The CITL monitors, registers and validates all greenhouse gases emissions trading transactions between EU Member States. It implements the EC Directive and EU Regulation pertaining to greenhouse gas emissions reduction in Europe, on the basis of the Kyoto protocol agreements. The CITL was operational 3 years before the agreed timeframe for the Kyoto protocol (2008-2012), acting as a coordinator and facilitator of greenhouse gases emissions trading. The CITL successfully connected to the International Transaction Log in 2008 for the first phase of the Kyoto Protocol"[63]
California AB32	(a) An ARB offset credit issued under this article will remain valid unless invalidated pursuant to this section… (c) Grounds for initial determination of invalidation: (3) ARB determines that offset credits have been issued in any other voluntary or mandatory program within the same offset project boundary and for the same Reporting Period in which ARB offset credits were issued for GHG reductions and GHG removal enhancements.[64]	**Registry** – "ARB staff indicates that the registry system for cap-and-trade compliance instruments is designed to provide strong enforcement capabilities, including mechanisms to prevent double counting, public disclosure requirements, and methods to clearly define ownership." [65]

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[62] COMMISSION DECISION of 13 November 2006 on avoiding double counting of greenhouse gas emission reductions under the Community emissions trading scheme for project activities under the Kyoto Protocol pursuant to Directive 2003/87/EC of the European Parliament and of the Council
[63] http://www.epractice.eu/en/cases/emission
[64] Final Regulation Order, Article 5: California cap on greenhouse gas emissions and market-based compliance mechanisms, section § 95985
[65] Electric Power Research Institute, "Overview of California's greenhouse gas offsets program," April 2011.

8.6. Reporting

See Chapter 13 for reporting requirements for this chapter.

Chapter 9: Accounting for the land-use sector

The purpose of this chapter is to enable the jurisdiction to choose how to account for the land-use sector in the mitigation goal.

Requirements in this chapter

- Jurisdictions shall account for the land-use sector using one of the following approaches:
  - include the land-use sector in the goal boundary
  - account for the land-use sector as a separate sector-specific goal
  - account for the land-use sector separately and use it as an offset for the goal
  - do not account for the land-use sector
- When the land-use sector is included in the goal boundary, it shall be accounted for using the same goal type method as used for other sectors under the mitigation goal (e.g. base year, baseline scenario, intensity, absolute level)
- Activities-based or land-based accounting shall be used for the land-use sector
- Within elected land-use categories or activities, emissions and removals arising from land use as well as land-use change shall be accounted for
- All elected land-use categories/activities shall be accounted for using the same methodology
- Within a land-use category or suite of activities, all significant pools, fluxes, and activities shall be accounted for
- For land-use categories/activities included in accounting, jurisdictions shall account using one of four accounting methodologies:
  - net-net accounting using a historical base year or period (base year)
  - accounting against a forward-looking baseline scenario (baseline scenario)
  - accounting against an emissions intensity goal (intensity)
  - gross-net accounting (reduction to an absolute amount)
- Jurisdictions shall choose whether they will remove the impacts of natural disturbances from accounting

9.1. Introduction

How land-based emissions and removals are incorporated into a jurisdiction's GHG mitigation goal can have a significant impact on the overall reductions achieved. A jurisdiction's policy and methodological choices should therefore be carefully considered within the context of its unique goals, circumstances, and capacities.

Existing frameworks for the treatment of land-based emissions and removals generally provide guidance for accounting in either developing- or developed-country contexts. However, the guidance contained in this standard is applicable to all jurisdictions regardless of whether they currently account under another framework. The rules and recommendations contained herein are designed to work both in conjunction with existing accounting frameworks such as those under the United Nations Framework Convention on Climate Change, as well as national strategies and voluntary mechanisms.

The guidance for greenhouse gas accounting in the land-use sector established under the UNFCCC's Kyoto Protocol, and the good practice guidance developed by the Intergovernmental Panel on Climate Change for accounting under that process are the most immediately relevant example of land-use accounting.[66] However, accounting under the Kyoto Protocol is highly tailored to the specific

[66] The IPCC's guidance for accounting under the Kyoto Protocol is contained in the 2003 publication, *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, at http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html. The IPPC's guidelines on greenhouse gas inventories, including those for the land-use sector, are distinct from the Good Practice Guidance. The guidelines are cited extensively in this

circumstances of Annex I countries participating in a compliance regime. Therefore, while portions of this standard reflect the technical recommendations and practices contained in the Kyoto Protocol and its supporting documents, users of this standard should remain aware that the principles underlying the GHG Protocol differ from those of the Kyoto Protocol's accounting mechanism.

9.2. What is meant by the "land-use sector"?

Use of the term "land-use sector" in this guidance applies to accounting for land-based emissions and removals in both developing and developed country jurisdictions. The definition used here is based on the IPCC's land-use categories as contained in Volume 4 of the 2006 Guidelines for National Greenhouse Gas Inventories.[67] The land-use sector includes the following categories: forest land, cropland, grassland, wetland, and settlement. Accounting for the land-use sector under the this standard does not require a jurisdiction to account in all of these categories; further guidance and explanation is below.

9.3. How is accounting in the land-use sector different from that in other sectors?

In most sectors, tracking progress toward a mitigation goal can generally be accomplished by comparing the emissions contained in a greenhouse gas inventory for the accounting period with the emissions contained in the inventory for the base year, baseline, etc. However, this may not be the case for the land-use sector, where the greenhouse gas inventory may contain fluxes that should not be included in accounting.

What makes the land-use sector unique?

Unlike other sectors, the emissions included in a GHG inventory for the land-use sector includes fluxes of both anthropogenic and non-anthropogenic origin. The two dominant sources of non-anthropogenic fluxes in the land-use sector are (1) natural disturbances, which may include discrete events such as fires, windstorms, hurricanes, landslides, and tsunamis, or more continuous disturbances such as a pest outbreak or prolonged drought; and (b) age-class legacy.[68] While it is certainly arguable that, in certain instances, fluxes arising from either or both of these categories may have an anthropogenic component (e.g., the ignition of a forest fire may have been human-caused, or an aging forest was established through direct human intervention at some point in the past), determining the ultimate origin of these circumstances is beyond the scope of this guidance.[69] The treatment of anthropogenic versus non-anthropogenic fluxes in the land-use sector has fundamental implications for mitigation accounting and must be addressed through a combination of technical and policy mechanisms as discussed below.

*Why does it matter if accounting includes non-anthropogenic fluxes**?***

One of the purposes of this standard is to accurately track progress toward a jurisdiction's mitigation goal in a manner consistent with the principle of environmental integrity. In order to create an effective and equitable framework for measuring progress towards combating climate change, an accounting mechanism should reflect only those emissions reductions that are attributable to human intervention. There are two related reasons for this: 1) to uphold the environmental integrity of the mitigation mechanism by not accounting for emissions reductions that would have occurred even in the absence of a mitigation goal (non-additional emissions reductions), and 2) to create and maintain an incentive for

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section of the GHG Protocol and should be used by jurisdictions as appropriate for technical and methodological advice.

[67] IPCC 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan.

[68] Although the issue of age-class legacy is relevant specifically for forest land, the analogous issue of sink saturation may be relevant for the cropland, grassland, and wetland land uses.

[69] Reporting for the land-use sector should include information on the criteria used by jurisdictions to distinguish anthropogenic from non-anthropogenic fluxes.

jurisdictions to act affirmatively to mitigate emissions. The issue of non-additionality is of critical concern for jurisdictions participating in a compliance mechanism; however, it has implications for the accuracy and environmental integrity of mitigation accounting for all jurisdictions under this standard.

As explained above, the inclusion of non-anthropogenic fluxes may result in perverse accounting that erodes the environmental integrity of mitigation efforts. In order to accurately track a jurisdiction's progress toward its mitigation goal (the *additional* mitigation), it is often necessary to apply a layer of accounting rules and mechanisms on top of the greenhouse gas inventory in order to remove non-anthropogenic fluxes. The guidance contained herein addresses these rules.[70]

The following guidance for land-use sector accounting presupposes a jurisdiction has established an inventory consistent with the principles and guidance contained in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

9.4. Technical and policy considerations

This section addresses the main technical and policy considerations a jurisdiction must take into account when constructing an accounting framework for the land-use sector. Jurisdictions have a wide range of land-use types and characteristics, existing inventory structures, capacities, and goals, all of which will necessarily inform their decisions regarding the treatment of the sector.

Decision making for land-use sector accounting

1. Decide on how land-use sector will interact with mitigation goal (Section 9.4.1.)
    a. Included in mitigation goal boundary
    b. Sector-specific goal
    c. Sector used as an offset for mitigation goal
    d. Not accounted for (no interaction)

2. Decide on land-based or activity-based accounting approach (Section 9.4.2)

3. Decide on inclusion of land uses/activities (Section 9.4.3)

4. Decide on inclusion of carbon pools and fluxes (Section 9.4.4)

5. Decide on accounting methodology (Section 9.4.5)
    a. Net-Net based on Historical Year/Period
    b. Net-Net based on Forward-Looking Baseline
    c. Emissions Intensity
    d. Gross-Net

6. Determine whether land-use accounting approach is consistent with overall mitigation goal (Section 9.4.6)

7. Decide on treatment of natural disturbances (Section 9.4.7)

[70] Some jurisdictions, by virtue of the models and methodologies used to calculate their greenhouse gas inventories, may not need these additional accounting rules. However, many more will need to remove non-anthropogenic impacts.

9.4.1.How should land-use accounting interact with the mitigation goal?

Jurisdictions may choose to include the land-use sector in the mitigation goal in one of four ways. These approaches are listed as follows in the order from most- to least-strongly recommended.

- Land-use sector is included in the goal boundary
- Land-use sector is accounted for separately using a sector-specific goal
- Land-use sector is accounted for separately and used as an offset for the jurisdiction-wide goal
- Land-use sector is not accounted for

Considerations for which approach is chosen include the following:

- Environmental integrity of jurisdiction-wide mitigation accounting
- Provision of incentives to mitigate emissions in the land-use sector
- Consistency with the overall mitigation goal type/Avoidance of perversities in accounting framework
- Ease and cost of land-use accounting, including issues related to data availability
- Consistency with any existing land-use sector accounting mechanisms in which the jurisdiction is participating

See Table 9.1 for an explanation of each of the four approaches, including an overview of their strengths and weaknesses.

Table 9.1. Overview of possible interactions between land-use sector and mitigation goal

	Included in mitigation goal				Sectoral	Offset	None
	Base Year	**Baseline scenario**	**Emissions Intensity**	**Absolute amount**			
Description	Compares net emissions in accounting period to those represented in base year/period that is included in a jurisdictional goal	Compares net emissions in accounting period to those in a forward-looking baseline that is included in a jurisdictional goal	Net emissions measured and integrated into calculation of a jurisdictional goal	Net emissions from the sector tallied with other sectors and compared to the jurisdictional goal	Sector has a separate goal that does not interact with jurisdictional goal	Credits/debits from accounting added to/subtracted from jurisdictional accounting toward mitigation goal	Jurisdiction does not account for land-use sector
Pros	Consistent with mitigation goal; Strong signal to reduce emissions relative to historical	Consistent with mitigation goal; marginal incentive to improve land-use practices; Factors out fluxes from age-class legacy	Consistent with mitigation goal; Creates signal to increase the efficiency of land-based production	Consistent with mitigation goal; Closest to "what the atmosphere sees;" Relatively easy to account	Good when goal type creates perversities for land-use sector; Allows jurisdiction to tailor accounting approach	Brings land-use sector into mitigation framework; Allows jurisdiction to tailor accounting approach	Good for jurisdictions with insignificant land-use emissions or lack of capacity
Cons	May result in non-additional accounting; Requires historical data	Difficult to accurately project BAU emissions; Emissions can increase relative to historical with no penalty	Not intuitive way to measure fluxes or incentivize mitigation in the land-use sector; May result in non-additional accounting	May result in non-additional accounting	Depending on accounting methodology chosen, may not have strong mitigation signal	May not have strong mitigation signal; Perversities in land-use sector accounting may result in non-additional accounting	No mitigation signal
Accounting approach	"Net-Net" accounting using historical base year/period	"Net-Net" accounting using forward-looking baseline	Accounting using emissions intensity target	"Gross-Net" accounting	Can use any accounting methodology	Can use any accounting methodology	None

9.4.2.Land-based or activity-based accounting?

The second decision in the sequence focuses on whether land-use accounting tracks performance on the basis of land-use categories (land-based accounting) or land-use activities (activity-based accounting). The underlying purpose of both approaches is the same: to delineate the geographic areas, pools, and fluxes to be contained within the accounting framework. Jurisdictions should employ land-based accounting in order to minimize the potential for cherry-picking of emissions and removals included in accounting and for the relative transparency and simplicity of land-based accounting.

The land-based approach determines the scope of accounting based on the IPCC's five land-use categories: forest land, cropland, grassland, wetland, and settlement.[71] The areas included in accounting under this approach includes all lands within the category of interest; for example, net emissions from all lands classified in the greenhouse gas inventory as croplands are accounted for if the land-use category of cropland is elected (see section 9.4.3 for the election of land-use categories or land-use activities). Lands subject to land-use change should be accounted for under the land-use to which they are converted. If accounting for the converted-to land use is not elected, the net emissions should be accounted for under the converted-from land use.[72]

In some instances, a jurisdiction may wish to use the managed land proxy in conjunction with land-based accounting to mask out non-anthropogenic fluxes from accounting. Under the managed land proxy, areas of land that are "unmanaged" are excluded from accounting on the assumption that any fluxes occurring on those lands are not directly attributable to human influence.[73] While each jurisdiction will determine its own definition of managed lands for the purposes of the managed land proxy, jurisdictions should include all lands subject to direct human intervention, as well as lands on which an identifiable portion of emissions or removals result directly or indirectly from anthropogenic activity.

Land-based accounting categories

- Forest land
- Cropland
- Grassland
- Wetland
- Settlement

An activities-based framework defines the scope of accounting on the basis of where a pre-determined set of land-use practices occurs. For example, a jurisdiction may decide that the lands, pools and fluxes to be included in accounting for the activity "grazing land management" are those impacted by livestock ranching, fire prevention, and activities related to savannah restoration. The theory underlying activities-based accounting is similar to that of the managed land proxy—to limit accounting to those lands subject to direct human influence and thereby exclude non-anthropogenic fluxes from accounting.

Activity definitions are jurisdiction-specific. In order to uphold the environmental integrity of the accounting mechanism, jurisdictions using activities-based accounting should include all activities that result in significant changes in carbon pools and/or fluxes. Emissions resulting from land-use change activities must be accounted for. The lists of land-use activities and sub-categories are for illustrative purposes only, and do not represent the complete list of activities for which jurisdictions may account.

[71] "Other" is also a land-use category, but it is generally regarded as a balancing term rather than its own land use type.
[72] See 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 2, http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_02_Ch2_Generic.pdf
[73] Cite to relevant IPCC chapter, section

Activities-based accounting

- Forest Management
  - Afforestation/Reforestation, Deforestation, Community forestry, Sustainable forest management, Protected area management
- Cropland management
  - Soil carbon management, Fertilizer/Manure management, Agroforestry, Controlled burning, Vegetation management
- Grassland management
  - Soil carbon management, Controlled burning, Vegetation management, Protected area management
- Wetland management
  - Wetland drainage, Wetland rewetting, Vegetation management, Protected area management

To some extent, a jurisdiction's decision regarding whether to use land-based or activity-based accounting will be determined by the existing structure and scope of its inventory and its capacities, priorities, and goals.

Jurisdictions should use the land-based accounting approach.

Jurisdictions using the managed land proxy should include in the definition of "managed" all lands subject to direct human intervention, as well as lands on which an identifiable portion of emissions or removals result directly or indirectly from anthropogenic activity.

Jurisdictions using activities-based accounting should include all activities that result in significant changes in carbon pools and/or fluxes.

Within elected land-use categories or activities, jurisdictions shall account for emissions and removals arising from land use as well as land-use change.

9.4.3.What land uses/activities should be included?

A jurisdiction may choose the categories (if using land-based accounting) or suites of activities (activity-based accounting) it includes in its land-use accounting.

General guidance

- Guided by the objective of ensuring environmental integrity, all land-use categories or suites of activities encompassing significant fluxes should be included in land-use accounting.[74]
- Jurisdictions should strive for complete coverage of anthropogenic activities and fluxes within each elected land-use category or suite of activities.
- If necessary, jurisdictions may adopt a step-wise approach to accounting for additional land-use categories or activities based on data availability and capacity, contribution of additional categories to total emissions, and trends.
- Jurisdictions may elect to account for individual land-use categories or suites of activities, e.g., forest land, grassland, cropland management, grazing land management—accounting does not necessarily have to be all or nothing. However, as stated above, if a category/suite of activities has been elected, a jurisdiction should account for all significant fluxes within that category/suite.
- Land-use accounting should not include agricultural activities involving fossil fuel use or livestock.

[74] Significance may be defined in terms of contribution to sectoral or economy-wide emissions, short- or long-term trend, and/or mitigation potential.

9.4.4.What pools/fluxes should be included?

Jurisdictions should account for all significant land-based carbon pools and greenhouse gas fluxes within their chosen land-use categories or suites of activities. Volume 4 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories[75] provides technical and methodological guidance on the inclusion of carbon pools and fluxes in inventories; this guidance should inform the accounting decision made when using this standard.

9.4.5.What accounting methodology?

An accounting methodology is used to assess progress toward mitigation within each land-use category/activity. The methodology chosen has a potentially large impact on accounting not only within the elected land-use categories/activities, but also at the level of the jurisdiction's overall mitigation goal.

Accounting requirements and recommendations

- Jurisdictions including the land-use sector within the goal boundary shall use the same accounting methodology as the one used for the goal type, i.e., comparison to base year, comparison to baseline, emissions intensity, or reduction to an absolute amount.
- Jurisdictions shall account for all elected land-use categories/activities using the same methodology.
- Jurisdictions not including the land-use sector within the goal boundary shall report the rationale for doing so.
- Jurisdictions shall include in reporting the jurisdiction-wide goal level both with and without land-use sector accounting. This is especially relevant if the land-use sector is used as an offset.
- Net emissions from each elected land-use category/activity shall be assessed, reported, and accounted for as separate line items in a jurisdiction's accounts.
- Jurisdictions should include the land-use sector in the mitigation goal (see Table 9.1).

A brief overview of several types of accounting methodologies is contained in Table 9.1; a more thorough explanation of those methodologies is below.

Net-net

Relevant for: Included in goal boundary using base year/period, Sectoral accounting using base year/period, Offset accounting using base year/period

Net-net is so called because it compares the net emissions (emissions + removals) in the accounting period with net emissions from a historical base year or period. Net-net accounting may be against a historical base year or base period. However, because emissions and removals in the land-use sector can be highly variable due to both anthropogenic and non-anthropogenic factors, jurisdictions using a single base year risk adopting an unrepresentative value as a benchmark and thus creating an inaccurate and perverse accounting system. A base period of 5-10 years is generally sufficient to smooth the impacts of inter-annual variability and may also help to minimize the effect of long-term trends on net-net accounting, depending on the length and timing of the period chosen. For these reasons, jurisdictions should use a base period rather than a base year when accounting for land-use using the net-net methodology. When the jurisdiction-wide mitigation goal is framed in terms of base year emissions, the base period may be formulated to span an equal number of years on either side of the base year (e.g., the base period for a 1990 base year would be 1988-1992).

[75] http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html

Pros

- Creates a signal for mitigation relative to historical emissions
- Consistent with mitigation goals based on historical base years or periods

Cons

- Long-term trends in non-anthropogenic emissions may obscure impacts of anthropogenic mitigation and result in perversities in accounting
- Accountable emissions reductions may not be additional to what would have occurred in the absence of a mitigation goal
- Requires historical data

Forward-looking baseline

Relevant for: Included in goal boundary using baseline, Sectoral accounting using baseline, Offset accounting using baseline

A forward-looking baseline compares net emissions in the accounting period with an *ex ante* estimation of net business-as-usual emissions for the same period. Forward-looking baseline accounting (hereafter referred to as baseline accounting) is also a form of net-net, but is distinguished here on the basis of using a BAU projection as the benchmark, rather than a historical value of net emissions.

Pros

- Allows a jurisdiction to remove anticipated non-anthropogenic emissions and removals from accounting
- Creates a strong marginal signal for changes inland-use management that reduce emissions relative to BAU
- Maximizes the likelihood that accountable emissions reductions are additional to those that would have occurred without a mitigation goal

Cons

- Highly complex and data-intensive to calculate
- High uncertainty and variability in land-use sector emissions may lead to baselines that are not accurate representations of BAU, resulting in non-additional accounting
- Jurisdictions may claim credit for emissions reductions even when net emissions increase relative to historical levels

An important consideration for jurisdictions using the baseline accounting methodology for the land-use sector is how to determine which emissions are non-anthropogenic and thus eligible to be excluded from the BAU baseline. This is a policy decision that must be made by the jurisdiction. Jurisdictions should exclude anticipated net emissions that may reasonably be mitigated from the baseline scenario in order to create a robust incentive for their reduction.

Due to the high uncertainty inherent in projecting net emissions and the resulting potential for non-additional credits, jurisdictions employing the baseline accounting methodology when the land-use sector is included in the mitigation goal boundary or used as an offset should consider the use of a cap on credits. Such a cap could be constructed in a manner that would minimize the potential for non-additional credits to undermine the mitigation goal while still providing an incentive for robust mitigation.

Emissions intensity

Relevant for: Included in goal boundary using emissions intensity, Sectoral accounting using emissions intensity goal

Incorporation of the land sector into a jurisdictional emissions intensity goal is distinct from the two accounting methodologies previously discussed primarily in that it does not account against a benchmark of net emissions. Instead, net emissions per unit output from the sector are reduced to a predetermined level.

Emissions intensity goals for the land-use sector have the same strengths and weaknesses as for jurisdictional accounting more generally. Additionally, this goal type may be particularly ill-suited for the land-use sector due to the accounting of both emissions and removals, the cyclical or long-term nature of emissions profiles, and the many non-economic benefits for which land is managed. For these and other reasons, emissions intensity goals for the land-use sector may not properly incentivize mitigation or maintain environmental integrity. Therefore, emissions intensity goals for the land-use sector should be used only when the sector is incorporated in jurisdiction-wide accounting using such a goal.

Gross-net

Relevant for: Included in goal boundary using absolute amount, Sectoral accounting using absolute amount, Offset Accounting using absolute amount

Gross-net accounting is similar to net-net accounting in that it measures the net emissions (emissions + removals) in the accounting period. However, unlike net-net accounting, gross-net accounting does not compare accountable emissions to a benchmark, i.e., a base year/period or baseline. Instead, accounting encompasses the total value of net emissions in the accounting period.

Pros

- Accountable net emissions are “what the atmosphere sees”
- Relatively easy to calculate

Cons

- Jurisdictions may earn credits for non-additional mitigation that would have occurred in the absence of a mitigation goal
- Depending on the size of the sink, accounting in the land-use sector could overwhelm the mitigation goal

Due to the potential for relatively large quantities of non-additional credits in certain circumstances, jurisdictions using the gross-net methodology should consider using a cap on the quantity of accountable credits in order to limit perverse impacts on the jurisdiction-wide mitigation goal.

9.4.6.Consistent with mitigation goal?

One of the most important steps in accounting for the land-use sector is determining if the accounting methodology chosen is consistent with a jurisdiction’s accounting goal. As stated above, inclusion of the land-use sector in the jurisdictional mitigation goal is the recommended approach. However, there are circumstances in which doing so using the same accounting methodology as the goal will weaken a jurisdiction’s goal or distort the mitigation incentive. These circumstances will be addressed below.

Recommendations

- Jurisdictions treating the land-use sector as an offset should consider a cap that limits the potential for perverse impacts on the mitigation goal while preserving the incentive for robust mitigation of land-based emissions.
- Whether a cap on accounting is appropriate for a jurisdiction will depend on both the accounting structure and methodologies chosen and on its unique land-based emissions profile**.**

Base year and base period

Land-use sector accounting using a base year/period (net-net accounting) can result in non-additional credits or debits when non-anthropogenic emissions/removals cycles or trends, e.g., natural disturbances or age-class structure, obscure the impacts of mitigation. In this instance, there are two options to correct the potential perversity: 1) remove the land-use category/activity of interest from jurisdictional mitigation goal and account for it under a separate, category- or activity-specific goal, or 2) adjust the jurisdictional mitigation goal either up or down to compensate for the non-additional credits or debits arising from land-use accounting.

This same issue, of non-additional accounting when using a base year/period, can also affect mitigation accounting when the land-use sector is used as an offset. In this instance, the potential perversity can be minimized by 1) putting a cap on the quantity of credits and/or debits a jurisdiction can account toward its goal, or 2) adjusting the jurisdictional mitigation goal either up or down to compensate for the non-additional credits or debits.

Recommendations

- When the land-use sector is included in the goal boundary or used as an offset and the chosen accounting methodology would result in non-additional credits or debits, jurisdictions should adjust the overall mitigation goal up or down to compensate for those credits/debits in order to preserve the environmental integrity of the mitigation goal.

Baseline scenario

There are two potential weaknesses of using a baseline for accounting in the land-use sector: 1) difficulty in determining which emissions and removals should be excluded from accounting, and 2) difficulty in accurately predicting BAU emissions for the sector. Both can be partially ameliorated by using a conservative approach to calculating BAU scenarios.

There are two additional methodological means of mitigating the likelihood that inaccurate baselines will perversely impact accounting: *ex post* adjustments of the baseline scenario and use of a cap on credits to limit the impact that land-use sector accounting can have on the mitigation goal (relevant if land-use sector is included in the mitigation goal or used as an offset).

Recommendations

- Jurisdictions should use a conservative approach to calculating BAU scenarios for the land-use sector.
- Jurisdictions should consider using methodological approaches to limit the potential perverse impacts of inaccurate baseline calculation on mitigation accounting.

Gross-net

Due to the potential perversities associated with non-additional accounting using the gross-net methodology described above, jurisdictions should use a cap on the quantity of accountable credits resulting from land-use categories/activities that are a net sink when using gross-net accounting. This consideration is relevant when the land-use sector is included in the mitigation goal, when it is accounted for on a separate sectoral basis, or when it is used as an offset against the emissions contained in a jurisdiction's mitigation goal. If the land-use category/activity is included in the goal boundary, a jurisdiction may also consider adjusting the mitigation goal up or down to compensate for the impacts of non-additional credits/debits.

The issue of non-additional credits is especially relevant for forest land, as the age-class structure of a jurisdiction's forests and the resulting removals from the atmosphere may not represent mitigation that is additional to that which would have occurred in the absence of a mitigation goal.

Recommendations

- Jurisdictions accounting for land-use categories/activities that comprise a net sink should use a cap on accountable credits.
- Jurisdictions using gross-net accounting and including the land-use sector in its mitigation goal should consider adjusting the mitigation goal to compensate for the impacts of non-additional credits.

9.4.7.Factor out natural disturbances?

Natural disturbances are non-anthropogenic events or circumstances (e.g., severe drought) that cause significant land-based emissions and are beyond the control of, and not materially influenced by, a jurisdiction.[76] Where natural disturbances have the potential to significantly impact greenhouse gas accounting, jurisdictions may elect to establish mechanisms to factor the non-anthropogenic emissions out of their accounts. However, this is a highly complex and data-intensive undertaking.

There are four primary technical considerations associated with factoring out the impacts of natural disturbances.

1. How to determine when the emissions from a natural disturbance event or circumstance are a) truly non-anthropogenic, and b) significant enough to warrant factoring out.

2. How to separate the emissions resulting from the actual disturbance, which may be factored out, from emissions stemming from subsequent anthropogenic activities (e.g., salvage logging) or subsequent changes in land-use, which must be accounted for.

3. A natural disturbance mechanism must factor out not only the emissions, but also the subsequent removals resulting from the recovery of carbon stocks after the disturbance event or circumstance.[77] The land subject to the natural disturbance provision should remain out of accounting until the quantity of removals on that land has balanced the quantity of emissions that were factored out. The lands subjected to natural disturbances must be georeferenced and the fluxes tracked over time in order to determine when removals have balanced emissions.

4. A jurisdiction using base year/base period or baseline accounting that invokes a natural disturbance mechanism in the accounting period must ensure consistency with the treatment of natural disturbances in the base year/period or baseline.

The following methodological guidance for a natural disturbance mechanism has been adapted from the Annex to UNFCCC decision 2/CMP.7 on Land Use, Land-Use Change and Forestry.

- Any removals on the lands affected by a natural disturbance event/circumstance shall be excluded from the accounting until they have balanced the quantity of emissions removed from accounting.

- Jurisdictions shall account for emissions associated with salvage logging.

[76] Adapted from the definition of natural disturbance contained in UNFCCC Decision 2/CMP.7, http://unfccc.int/resource/docs/2011/cmp7/eng/10a01.pdf#page=11

[77] This is to prevent a jurisdiction from getting the benefit of a natural disturbance while avoiding the cost, and is as such necessary to upholding environmental integrity.

- Jurisdictions shall not exclude from accounting emissions from natural disturbances on those lands that are subject to land-use change following the disturbance.

- Jurisdictions shall provide transparent information:

    - Showing that all lands subject to the natural disturbance mechanism are identified, including their georeferenced location, year and types of disturbances;
    - Showing how annual emissions resulting from disturbances and the subsequent removals in those areas are estimated;
    - Showing that no land-use change has occurred on lands for which the mechanism is applied and explaining the methods and criteria for identifying any future land-use changes on those land areas during the commitment period;
    - That demonstrates that the occurrences were beyond the control of, and not materially influenced by, the Party in the commitment period, by demonstrating practicable efforts to prevent, manage or control the occurrences that led to the application of the mechanism;
    - That demonstrates efforts taken to rehabilitate, where practicable, the land for which the mechanism applied; and
    - Showing that emissions associated with salvage logging on forest land subject to natural disturbance were not excluded from accounting.

The additional burden associated with a natural disturbance mechanism will require jurisdictions to weigh the potential for large, highly emissive natural disturbances against the costs of establishing and implementing a mechanism to address those emissions. Although mechanisms to factor out emissions and removals from natural disturbances may be used in conjunction with any accounting framework or methodology, jurisdictions should consider the necessity of such a provision given their specific circumstances and the potential impacts of natural disturbances given their chosen accounting approaches. Due to the different characteristics of land-use categories/suites of activities, jurisdictions may elect to use a natural disturbance mechanism for individual categories/activities, rather than for the sector as whole.

9.4.8 Accounting Process

1. Determine accounting approach

    a. Choose land-based or activity-based accounting

2. Determine the land-use categories/activities and pools and fluxes to be included in accounting

3. Determine accounting methodology

    a. Include land-use sector in mitigation goal (recommended approaches based on each goal type)

        - If jurisdiction’s mitigation goal is reduction from base year, then use net-net accounting with historical base year/period
            - Calculate historical net land-use emissions in base year/period
            - Add to jurisdiction's base year/period emissions
            - Calculate target level emissions according to Equation 10.1
            - To account, add net land-use emissions in reporting year to jurisdiction's emissions
            - Calculate change in emissions according to Equation 11.1

        - If jurisdiction’s mitigation goal is reduction from baseline scenario, then use net-net accounting with forward-looking baseline

- Calculate projected net land-use emissions in baseline scenario
- Add to jurisdiction's baseline scenario emissions
- Calculate target level emissions according to Equation 10.1
- To account, add net land-use emissions in reporting year to jurisdiction's emissions
- Calculate change in emissions according to Equation 11.1

- If jurisdiction’s mitigation goal is reduction in emissions intensity
  - Calculate emissions intensity for applicable land-use categories/activities
  - Add to jurisdiction's base year emissions intensity
  - Calculate target level emissions intensity according to Equation 10.1
  - To account, add land-use emissions intensity in reporting year to jurisdiction's emissions intensity
  - Compare to emissions intensity goal

- If jurisdiction’s mitigation goal is reduction to absolute level, then use gross-net accounting
  - Calculate net land-use emissions in reporting year
  - Add to jurisdictions emissions in reporting year
  - Compare to mitigation goal

b. Include land-use sector as a sectoral goal

- If land-use goal is reduction from base year/period, then use net-net accounting with historical base year/period
  - Calculate historical net land-use emissions in base year/period
  - Multiply base year/period emissions by percent reduction to get target emissions
  - Calculate net land-use emissions in reporting year
  - Compare to reporting year emissions to target emissions

- If land-use goal is reduction from a baseline scenario, use net-net accounting with forward-looking baseline
  - Calculate projected net land-use emissions in baseline
  - Calculate net land-use emissions in reporting year
  - Compare reporting year emissions to target emissions

- If land-use goal is reduction to absolute amount, then use gross-net accounting
  - Calculate net land-use emissions in reporting year
  - Compare to goal

c. Include land-use sector as an offset

- Track progress in land-use sector using net-net accounting w/base year/period
  - Calculate historical net land-use emissions in base year/period
  - Calculate net land-use emissions in reporting year
  - Subtract reporting year emissions from base year/period emissions
  - Above quantity = offset

- Track progress in land-use sector using net-net accounting w/baseline scenario
  - Calculate projected net land-use emissions in land-use baseline scenario
  - Calculate net land-use emissions in reporting year
  - Subtract reporting year emissions from land-use baseline scenario emissions
  - Above quantity = offset

- Track progress in land-use sector using gross-net accounting
  - Calculate net emissions in reporting year
  - Above quantity = offset

d. Do not include land-use sector

4. Check for consistency with mitigation goal

5. Determine whether to use a natural disturbance mechanism

9.5 Reporting

See Chapter 13 for reporting requirements for this chapter.

Chapter 10: Estimating future emissions and emissions reductions associated with meeting the goal

The purpose of this chapter is to estimate the target year emissions level and emissions reductions associated with meeting the mitigation goal.

Requirements in this chapter

- Jurisdictions shall calculate target year emissions level and emissions reductions associated with meeting their goal
- Jurisdictions with goals framed as reduction in emissions intensity shall also calculate expected reductions in terms of absolute emissions
- Jurisdictions that purchase emissions reductions from outside the goal boundary or sell emissions reductions to another entity shall subtract any emissions reduction credits purchased from the target year emissions level and add any emissions reduction credits sold onto that level

10.1. Introduction

This chapter provides guidance for how to estimate expected emissions and emission reductions associated with meeting a jurisdiction's climate change mitigation goal. Jurisdictions shall report estimations of both the target year emissions level and emissions reductions associated with meeting their goal. The focus of this chapter is on outlining the calculations of these quantities, including simple equations. Chapter 13 provides additional detailed guidelines on how and what (e.g., which quantities) jurisdictions shall report.

As discussed in Chapter 5, goals can be framed in terms of reductions in emissions or emissions intensity from a base year, reductions from a baseline scenario, or reductions to an absolute emissions level (e.g., carbon neutrality).

In all cases, the calculations in this chapter assume that the necessary input data (e.g., goal level, base year emissions, and baseline scenario emissions) has already been calculated in previous chapters. As a result, the calculations presented here are largely arithmetic.

In particular, regardless of how a user's goal is framed, calculations are a variation of the following procedure:

Step 1: Start with base year emissions or emissions intensity or baseline scenario emissions in the target year (see Chapter 7)

Step 2: Calculate expected reduction in emissions or emissions intensity associated with meeting the goal

Step 3: Calculate emissions or emissions intensity level in the target year associated with meeting the goal

As stated in step 3, above, the end result of this simple process is a forecast of the emissions or emissions intensity level in the target year associated with meeting the mitigation goal. Jurisdictions should use this quantity (adjusted for the use of emissions reductions generated outside the goal boundary and the treatment of the land-use sector) for future evaluation of whether the goals have been met.[78] For more information see Chapter 11.

[78] The forecast here is a projection, and made using GHG inventory methods at the time the goal is set. In some cases, minor GHG inventory procedures (e.g., input factors) may change, suggesting that this forecast could also

The remainder of this chapter presents specifics of the above process, depending on whether the calculation is performed relative to a base year, baseline scenario, or for reductions to an absolute emissions level.

Jurisdictions shall use this chapter to calculate and report target year emissions and emissions reductions associated with meeting their goal.

10.2. Calculation details for reductions from base year and baseline scenario

For jurisdictions with goals framed as reduction from a base year or reduction from a baseline scenario, calculating expected emission reductions should be done by multiplying the expected percent reduction by either the base year or baseline scenario emissions level. The emissions level in the target year associated with meeting the goal is then base year emissions or baseline scenario emissions in the target year minus emissions reductions associated with meeting the goal in the target year.

Equation 10.1 specifies the details of the calculation in either case.

Equation 10.1. Calculation details for reductions from a base year or baseline scenario

Step	Calculation for reductions from a base year	Calculation for reductions from a baseline scenario
Step 1: Start with base year or baseline scenario emissions in target year	(base year emissions)	(baseline scenario emissions in target year)
Step 2: Calculate expected emissions reductions associated with meeting the goal	(emissions reductions) = (base year emissions) x (percent reduction)	(emissions reductions) = (baseline scenario emissions in target year) x (percent reduction)
Step 3: Calculate target year emissions level	(target year emissions level) = (base year emissions) – (emission reductions)	(target year emissions level) = (baseline scenario emissions in target year) – (emission reductions)

Note that:

- Step 2 is further simplified if a user's goal is framed as an absolute (rather than percent) reduction. In which case, the quantity needed for Step 2, emission reductions, is given directly by the goal.
- The same calculations apply for goals framed in terms of emissions intensity. Jurisdictions would simply substitute *emissions intensity* wherever the calculations above specify *emissions*.

Jurisdictions shall report

- Emissions level in the target year associated with meeting the goal
- Emissions reductions in the target year associated with meeting the goal

change. Accordingly, the exact target emissions level may in some cases change by a small amount. For further details, see Chapter 11.

10.3. Variation for reductions to an absolute emissions level

A goal framed in terms of a reduction to an absolute emissions level (e.g., carbon neutrality) specifies target level emissions (Step 3) directly. Therefore, the above procedure is not needed.

However, a variation of Step 2 can be used to calculate expected emissions reductions. Emissions reductions are the difference between the target year emissions level associated with meeting the goal and either base year or baseline scenario emissions in the target year, as in the revised Step 2, below.

Equation 10.2. Calculation Variant for Reductions to an Absolute Emissions Level

Step	Calculation for reductions from a base year	Calculation for reductions from baseline scenario emissions
Step 1: Start with base year or baseline scenario emissions	(base year emissions)	(baseline scenario emissions in target year)
Step 2: Calculate expected reduction in emissions associated with meeting the goal	(emissions reductions) = (base year emissions) – (target year emissions)	(emissions reductions) = (baseline scenario emissions in target year) – (target year emissions)
Step 3: Calculate target year emissions level	[No calculation needed]	[No calculation needed]

10.4. Additional details for reduction in emissions intensity

Jurisdictions with goals framed as reduction in emissions intensity shall also calculate expected reductions in terms of *emissions*. Likewise, jurisdictions with goals framed in terms of emissions may wish to calculate expected reductions in emissions *intensity*.

Converting between emissions and emissions intensity requires a projection of the intensity denominator, typically a unit of economic output (e.g., GDP). Projections of output metrics such as GDP should be gathered from international data sources like the IMF or UN, or from relevant government bodies. Modelling techniques may also be used to calculate projections for relevant output metrics.

Jurisdictions shall disclose and justify data sources for projecting output metrics and any projection methodology used.

Converting an emissions intensity level, or reduction of in emissions intensity, associated with meeting the goal in the target year, into an emissions level, or emissions reductions, requires multiplying emissions intensity, or reduction in emissions intensity, in the target year by the projected unit of output in the target year.

Converting an emissions level, or emissions reductions, associated with meeting the goal in the target year, into an emissions intensity level, or reduction in emissions intensity, requires dividing emissions by the projected unit of output in the target year.

10.5. Treatment of emissions reductions from outside the jurisdiction and the goal boundary (e.g., offsets)

The calculations above assume that: the jurisdiction's goal covers only emissions within the goal boundary, will be met by actions within the jurisdiction, and that other entities will not be claiming any of the emission reductions used to meet the jurisdiction's goal.

As described in Chapter 8, jurisdictions may in some cases choose to meet their goals by using emissions reductions generated outside the goal boundary (e.g., offsets). Furthermore, jurisdictions may generate emission reduction credits within the goal boundary that are sold and counted toward the goals of other jurisdictions.

For purposes of evaluating whether a goal has been met (see Chapter 11), jurisdictions that purchase emissions reductions from outside the goal boundary of the jurisdiction and the goal or sell emissions reductions to another entity shall make two adjustments to their target year emissions level associated with meeting their goal:

- subtract any emissions reductions purchased, and
- add any [target-year vintage] emissions reductions credits sold.

Likewise, jurisdictions may choose to make analogous adjustments to estimations of emission reductions associated with meeting their goal. For example, if a jurisdiction already knows that they plan to use or generate offset credits in the target year (and again, assuming that the user's goal covers only emissions within the goal boundary), then they may wish to make a correction to their expected emission reductions (in Step 2, above).

Specifically, to the estimation of emission reductions in Step 2 (Equation 10.1), jurisdictions should subtract any emissions reduction credits expected to be used to meet the goal, and add any [target-year vintage] emissions reduction credits expected to be sold to other entities in the target year.

If a jurisdiction is expected to be a net purchaser of emissions reduction credits, this adjustment would have the effect of raising the target year emissions level associated with meeting the goal. If a jurisdiction is expected to be a net seller of emissions reduction credits, this adjustment would have the effect of lowering the target year emissions level associated with meeting the goal.

One exception to this offset accounting practice is if a jurisdiction is setting a goal relative to a baseline scenario that already includes the effect of emissions reduction credits expected to be purchased or sold (i.e., the baseline scenario is reduced by the expected number of sold credits) (see Section 7.2.12). In such a case, jurisdictions should not also adjust the estimation of the target year emissions level associated with meeting the goal, as this would double count the purchased or sold credits.

If the land-use sector is not included within the goal boundary, jurisdictions may use GHG removals from the land-use sector to offset emissions from sectors and gases included within the goal boundary. If this approach is selected, jurisdictions should treat these GHG removals in the same manner as they treat emissions reductions purchased from outside their jurisdiction, by subtracting them from the target year emissions level associated with meeting the goal. For further details, see Chapter 9.

Jurisdictions shall report how emissions reductions from outside the goal boundary are accounted for, if applicable.

Jurisdictions shall report how emissions reductions generated within the goal boundary and sold to another jurisdiction are accounted for, if applicable.

10.6. Comparing emissions from covered and uncovered sectors and gases

In cases where a jurisdiction's mitigation goal does not cover all the sectors and gases in its GHG inventory, the jurisdiction may provide information that helps frame the expected reductions in this broader context.

Jurisdictions may provide a separate set of calculations performed with respect to the overall GHG inventory. For example, if a jurisdiction has a goal to reduce emissions in a particular subset (e.g., sector) of its entire emissions by X% from a base year, and uses the three-step process above to translate this goal into an equivalent of Y tons of emission reductions. The jurisdiction may also calculate the estimated effect (percent change) of this Y tons of emission reductions on the overall GHG inventory.

Similarly, jurisdictions forecasting a baseline scenario for the emissions covered by their goal may calculate a baseline scenario for all emissions in their inventory. Doing so may help identify potential areas of emissions leakage, e.g., if reductions in the emissions covered by the goal led to increases in emissions in other parts of the inventory not covered by the goal.[79]

10.7. Additional details on forecasts of cumulative emission reductions

The calculations above are specified for the target year. A similar procedure may be undertaken for intermediate years, in order to set particular milestones along a planned emissions trajectory, including calculating a complete forecast of cumulative emission reductions.

For calculating emissions and emissions reductions associated with the goal during the goal period, see Chapter 11.

10.8. Specifying an emissions pathway

After determining the emissions level in the target year associated with meeting the goal, jurisdictions may specify an emissions pathway for reaching that level.

10.9. Reporting

See Chapter 13 for reporting requirements for this chapter.

[79] This could happen, for example, if a goal was simply on direct CO2 emissions from transportation, but the goal was met by electrifying vehicles, leading to an increase in GHG emissions from electricity generation, an indirect emission that (in this example) would be outside the goal boundary.

Chapter 11: Tracking progress during the goal period and evaluating achievement at the end of the goal period

The purpose of this chapter is to enable jurisdictions to track progress toward the mitigation goal during the goal period as well as evaluate achievement of the goal after the goal period (ex-post).

Requirements in this chapter

- The jurisdiction shall perform an analysis of whether it has achieved its goal at the end of the goal period. This evaluation shall be done as soon as possible (considering the availability of data) to produce a quality inventory for the target year
- Jurisdiction shall use a consistent metric to track progress toward and evaluate achievement of the goal
- Quality assurance (QA), quality control (QC), and uncertainty related to emissions inventory data shall be addressed in a manner that is consistent with the inventory methodology used
- If jurisdictions update inventory methodologies, underlying assumptions (in the context of goals in relation to a baseline scenario), and/or GWP values during the goal period or at the end, then emissions included in the goal shall be recalculated for all years between the start of the goal period and the reporting year, including base year and/or baseline scenario emissions. In such cases, updated reports shall be published in a timely manner (at least with the next scheduled report) and clearly indicate where and why changes to inventory methods or GWP values have occurred.
- The data used to determine whether the goal was achieved shall be the same as those used to evaluate progress during the goal period, unless the data was updated due to re-calculation. In which case, the updated data shall be used to evaluate progress.
- Jurisdictions progress against the goal shall be assessed by comparing emissions (or emissions intensity) in the reporting year with emissions in the target year, the baseline scenario in the target year, or the goal itself (in the case of absolute reductions to a specified emissions level)
- Base year and baseline scenario emissions shall be recalculated as outlined in Chapter 7
- Jurisdictions' performance tracking and final reports shall be publically available in a timely manner after completion including specifying when and where reports are published and how the public can obtain copies
- Jurisdictions shall specify in the performance tracking and ex-post evaluation plan a schedule for evaluation of the plan itself. This shall include identification of needed revisions, controlling decisions on when and if updates will be made, and whether and under what circumstances improvements to the performance tracking plan will be allowed or required.
- Jurisdictions shall note when any modifications to the monitoring plan or final report occur that materially affect the results of an inventory. In such circumstances the jurisdiction shall recalculate any information that can materially affect the determination of goal attainment. These updates shall include all reasonable efforts to improve data quality and ensure compliance with the five accounting principles of this protocol outlined in Chapter 4.

11.1. Introduction

Once a mitigation goal has been set, jurisdictions should track progress during the goal period to understand how their emissions have changed. This information clarifies overall progress toward the goal and the likelihood of success in achieving the goal. Jurisdictions can use this information to modify their mitigation strategy to ensure that they meet their goal.

Evaluations performed at the end of the goal period can determine whether the jurisdiction has achieved its goal, provide information that may clarify which policies and measures helped the most, and aid in the design of new goals and mitigation programs.

The question of what policies and measures are most helpful in achieving emission reductions is more difficult to answer than the question of how emissions have changed. Assessment of *how* a jurisdiction achieved a goal (i.e. did it meet it or not and by how much) is the basis for determining *why* it achieved its goal – was it from policies and measures (PAMs), unplanned synergies, or exogenous events like economic decline?

11.2. Scope

Jurisdictions should report progress towards their goal during the goal period.

Jurisdictions shall evaluate and report whether they have achieved their goal at the end of the goal period.

At the end of the goal period, jurisdictions shall report:

- emissions level within the goal boundary and associated emissions reductions achieved in the target year
- emissions level of their complete inventory in the target year
- emissions reductions or reductions in emissions intensity achieved relative to the base year (for goals framed as reductions from base year emissions or emissions intensity). These jurisdictions should also report emissions reductions achieved relative to a baseline scenario.
- emissions reductions achieved relative to the baseline scenario (for goals framed as reductions from baseline scenario emissions).

Jurisdictions should report cumulative emissions reduced by the reporting year since the beginning of the goal period.

Jurisdictions should also assess the "*why* their emissions have changed" question through qualitative and quantitative analysis. Jurisdictions that wish for greater granularity on assessing the source of reductions that are reported should refer to the *GHG Protocol Policies and Actions Accounting and Reporting Standard*.

11.3. Tracking progress during the goal period

Jurisdictions should develop and make publically available a performance tracking plan that clearly outlines and describes all relevant methodological and reporting choices, including:

1. The metric that will be used to track progress
2. The frequency of evaluation, and rationale for choosing the frequency
3. The data that will be used to evaluate progress
4. Calculation method for evaluating progress against the goal
5. Recalculating base year or baseline scenario emissions
6. When and where performance tracking reports will be publically available
7. How often the plan and adherence to the plan will be evaluated, and corrections, updates and improvements to performance tracking will be implemented.

Requirements and recommendations for each of these plan elements are discussed in turn below.

11.3.1. Metrics that will be used to track progress

The metrics used for tracking progress will vary by goal.

Jurisdiction shall use a metric that is consistent with the units used in the definition of the goal (see chapter 5, *Selecting the goal, goal level, and goal length*).

For example, for a goal that aims to reduce GHG emissions by 20%, the metric would be GHG emissions reductions from a base year ($MMTCO_2e$). Similarly, for an intensity goal that aims to reduce the GHG intensity of GDP by 20%, the metric would be GHG intensity of GDP or $MMTCO_2e$ / GDP. See Table 11.1 for a list of relevant metrics by goal type.

Jurisdictions shall disclose and justify the metric they use to track progress.

Table 11.1. Relevant metric by goal type

Goal type	Metric
Absolute GHG reductions from a base year	$MMTCO_2e$
GHG reductions from a baseline scenario	$MMTCO_2e$
Reductions in GHG intensity	$MMTCO_2e$ / output indicator related to goal
GHG reduction to an absolute level	$MMTCO_2e$

11.3.2. The frequency of evaluation, and rationale for choosing the frequency

Jurisdictions should regularly track and report progress toward their goal. The frequency with which progress is reported may depend on a range of factors, including data availability, cost, capacity, and expectations of relevant stakeholders.

A number of jurisdictions, including the EU, UK and New York City, have released annual progress reports, while others have released progress reports less frequently or in a more *ad hoc* manner, including Mexico City and Chicago.

Biennial updates (as under the UNFCCC) represent one possible frequency to report progress for national jurisdictions with mitigation goals.

Jurisdictions should report progress annually. Once a reporting frequency is established by the jurisdiction, it should ensure consistent frequency throughout the goal period.

11.3.3. The data that will be used to evaluate progress

The primary data source for tracking progress is the inventory.

Other data sources may also be relevant. For example, for intensity goals, data is required on the denominator (e.g. GDP). Data related to offsets (purchased, sold, or shared), and data related to emissions and removals in the land-use sector (if not included in the inventory) shall be reported separately, if applicable.

Data sources

Emissions information (including information on the land-use sector) should come from official inventories that have been reviewed by third-parties and are publicly available. For national jurisdictions inventory information should come from national communications to the UNFCCC.

Gaps in past inventory data should be filled using estimations according to methodologies clearly specified in the performance tracking plan, the results of these exercises shall be clearly reported, and differentiated from actual reported data.

Missing data for current year(s) can be approximated from the most recently available published inventory report or any other method that is clearly specified in the performance tracking plan. The results shall be clearly reported, and differentiated from actual reported data

Data sources for units of output for emissions intensity goals should come from official, peer-reviewed sources that are publicly available.

Data sources for offsets should be collected from transaction logs and/or registries being used by the jurisdiction.

Updating GWP values and calculation methods are discussed in Chapter 6 (*Defining the goal boundary*). The source of all such updates and revisions shall be reported in a timely and transparent manner and be clearly noted in the next scheduled performance tracking report.

Jurisdictions shall disclose and justify all data sources.

Data quality – QA/QC

The GHG Protocol outlines five GHG accounting principles – relevance, completeness, consistency, transparency, and accuracy – that set a standard for the credible and unbiased representation of GHG emissions data.

Quality assurance (QA) and quality control (QC) of emissions inventory data shall be addressed in a manner that is consistent with the inventory methodology being used. For example, for national jurisdictions, QA/QC shall be addressed in the manner prescribed by the IPCC Guidelines for National Inventories. QA/QC of sub-national inventories shall be addressed at the same level of detail and rigor as provided in the IPCC Guidelines for National Inventories and the source(s) of such methods shall be clearly reported in the performance tracking plan.

Jurisdictions shall disclose data quality procedures.

Updates to inventory methodology and/or GWP values

The methodology for the development of the jurisdiction's inventory should be the IPCC in the case of national jurisdictions and the IPCC in conjunction with the internationally accepted guideline such as C40/ICLEI/WRI *Global Protocol for Community Emissions* (GPC) in the case of sub-national jurisdictions. In the event that a jurisdiction's goals are more specific or broader (e.g. more detailed dissection of sectors, or more gases) than can be calculated with these methodologies, the jurisdiction shall report where reporting methods deviate from these protocols and any alternative protocol that isused. Such methodologies should provide at least the same level of detail and rigor as IPCC methods.

Since inventory methodologies and GWP values are updated over time, an important consideration for jurisdictions is how and when inventory methodologies and/or GWP values used to track progress are updated.

Jurisdictions should use the same inventory methodologies and GWP values throughout the goal period in order to have a consistent time series and enable performance tracking over time on a common basis.

If jurisdictions update inventory methodologies and/or GWP values during the goal period, then emissions included in the goal shall be recalculated for all years between the start of the goal period and the

reporting year, including base year and/or baseline scenario emissions. In such cases, updated reports shall be published in a timely manner (at least with the next scheduled report) and clearly indicate where and why changes to inventory methods or GWP values have occurred.

Uncertainty

Uncertainty related to inventory data shall be addressed in a manner consistent with the inventory methodology used.

Jurisdictions shall use IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (and any updates) to address uncertainty.[80]

For the land-use sector, uncertainty shall be addressed using the IPCC *Good Practice Guidance for LULUCF* (and any updates).[81]

Uncertainty related to baseline drivers and assumptions is addressed in chapter 7.

Jurisdictions shall disclose and justify how data uncertainty is addressed.

11.3.4. Calculation method for evaluating progress against the goal

Jurisdictions shall report changes in emissions since the start of the goal period. A jurisdiction's progress against the goal shall be assessed by comparing emissions (or emissions intensity, depending on goal) in the reporting year with emissions in the target year, the baseline scenario in the target year, or the goal itself (in the case of absolute reductions to a specified emissions level).

Jurisdictions shall report changes in emissions between the base year and the reporting year according to Equation 11.1.

Equation 11.1: Quantifying the change in emissions between the reporting year and the base year

Change in emissions between reporting year and base year = (Reporting year emissions within goal boundary + emissions reductions sold to other jurisdictions – emissions reductions purchased from other jurisdictions) – (Base year emissions within goal boundary + emissions reductions sold to other jurisdictions in the base year – emissions reductions purchased from other jurisdictions in the base year)

Jurisdictions shall report the additional quantity of emissions reductions needed to meet the goal according to Equation 11.2.

Emission reductions needed to meet the goal should also be expressed in percentage terms.

[80] IPCC, *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, 2000, http://www.ipcc-nggip.iges.or.jp/public/gp/english/

[81] IPCC, *Good Practice Guidance for Land-use, Land-use Change and Forestry*, 2003, http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html.

Equation 11.2: Quantifying the additional quantity of emissions reductions needed to meet the goal

For goal types: reduction from a base year and reduction from a baseline

Additional emissions reductions needed to meet the goal = (Reporting year emissions within goal boundary + emissions reductions sold to other jurisdictions – emissions reductions purchased from other jurisdictions) - (Target year emissions level associated with meeting the goal)

"Reporting year emissions within goal boundary" should include net emissions from the land use sector if applicable. To determine "target year emissions level associated with meeting the goal," see Chapter 10.

For goal type: reduction in intensity

Additional emissions reductions needed to meet the goal = [(Reporting year emissions within goal boundary + emissions reductions sold to other jurisdictions – emissions reductions purchased from other jurisdictions) / quantity of output in the reporting year] – Target year emissions intensity associated with meeting the goal

"Reporting year emissions within goal boundary" should include net emissions from the land use sector if applicable.

For goal type: reduction to an absolute level

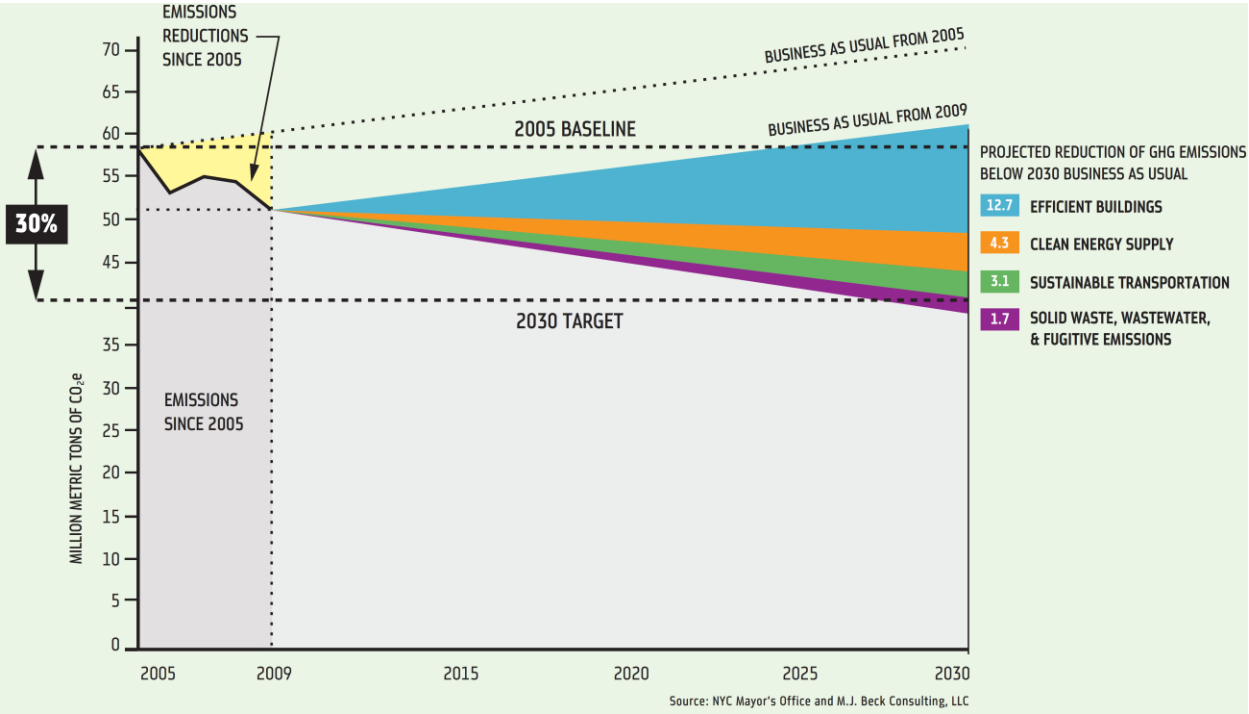
Additional emissions reductions needed to meet the goal = (Reporting year emissions within goal boundary + emissions reductions sold to other jurisdictions – emissions reductions purchased from other jurisdictions) - Absolute target emissions level

"Reporting year emissions within goal boundary" should include net emissions from the land use sector if applicable.

An example of monitoring progress is illustrated in Figure 11.1, which shows the actual emission reductions reported by NYC between the start of the goal period (2005) and the report date (2009). The figure also illustrates the emissions reductions still needed by the city to meet its 2030 target. NYC uses this information to inform the development of mitigation policies and measures, so as to meet their goal in 2030. As Figure 11.1 shows, NYC has recomputed a projection of the business as usual baseline from the new reporting period to give a more useful picture of how much reduction remains to meet the goal in light of pressures that tend to increase emissions despite mitigation policies and actions. The figure also shows how four different mitigation policies are expected to reduce emissions. In light of those policies, and the progress as of 2009, NYC projected that it would meet its 2030 goal of a 30% reduction from the 2005 base year emissions.

Figure 11.1 illustrates several important actions required or recommended by this protocol. Without this interim report, NYC policy makers would lack information on whether they are on track to reach their goal. The interim report can help evaluate whether existing policies and measures are having the desired effect.

Figure 11.1. New York's City's progress toward meeting its goal[82]



As in the NYC case illustrated in Figure 11.1, jurisdictions can use interim reports of emissions to understand the emissions reductions that have been achieved so far, as well as those that are needed in the rest of the goal period if the goal is to be achieved.

Based on the uncertainty related to the emissions estimation, jurisdictions may evaluate whether the emissions level for the reporting period is consistent with in reaching the goal or reductions planned for the reporting period within the margin of error of the data.

During the goal period, Jurisdictions should disclose interim progress made toward meeting their goals and the calculation methodologies used.

11.3.5. Recalculating base year or baseline scenario emissions

Base year and baseline scenario emissions shall be recalculated as outlined in Chapter 7.

Any revisions to base year or baseline scenario values should be reported in the next interim report with a statement whether these changes could materially affect the likelihood of achieving the emission goal.

Monitoring baseline drivers and assumptions

Jurisdictions shall monitor the key drivers of emissions used in the baseline scenario (which will have been defined in Chapter 7) and check whether assumptions considered in the baseline calculation are still valid. Examples of such drivers might include assumptions about the rate of economic growth, emission factors, assumptions about the GHG impacts of policies and measures, and/or assumptions about demographic trends.

[82] New York City, "PLANYC: Update April 2011," p.152, http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/planyc_2011_planyc_full_report.pdf.

The results of such monitoring should be included in each interim report with a statement whether changes are noticed that could materially affect the likelihood of achieving the emission goal.

If, by monitoring the assumptions that underlie emissions drivers in the baseline scenario, there is an indication that a key baseline assumption is no longer valid, then the baseline scenario shall be updated to reflect the observed changes in underlying drivers, according to the jurisdiction's recalculation policy.

Jurisdictions may wish to refer to current guidance from the UNFCCC concerning updates related to the Clean Development Mechanism (CDM). Under CDM entities have a choice of a single crediting period – 10 years – or three 7 years periods – updated every 7 years.[83]

As an example of a baseline update, imagine that GDP growth is a key driver in the baseline scenario of a jurisdiction with a baseline goal, and that during the construction of the baseline it was assumed that GDP would grow at an average rate of 5% between 2010 and 2020. However, during a performance evaluation carried out in 2015, it becomes known that for the period between 2010 and 2015, GDP grew at an average rate of 2.5%. Knowing this, the jurisdiction could recalculate its baseline from 2010 to 2015 using the observed GDP growth rate of 2.5% and recalculate the projection between 2015 and 2020 using an updated assumption, perhaps 3%. After this update, the baseline would most likely be revised downwards, since GDP growth tends to have a strong correlation with emissions growth. Chapter 7 presents more information about baseline recalculations.

Any updates to baseline values shall be reported in the next interim report with a statement whether these changes could materially affect the likelihood of achieving the emission goal.

11.3.6. When and where reports will be publically available

Jurisdictions' performance tracking reports shall be publically available in a timely manner after completion.

Jurisdictions shall specify when and where performance tracking reports are published and how the public can obtain copies.

11.3.7. How often the plan and adherence to the plan will be evaluated, and revisions, updates and improvements to tracking progress will be implemented.

Jurisdictions shall specify in the performance tracking plan a schedule for evaluation of the plan itself. This shall include identifications of needed revisions, controlling decisions on when and if updates will be made, and whether and under what circumstances improvements to the performance tracking plan will be allowed or required.

Jurisdictions shall note when any modifications to the plan that materially affect the results of an inventory. In such circumstances the jurisdiction shall recalculate any information that can materially affect the determination of goal attainment. These updates shall include all reasonable efforts to improve data quality and ensure compliance with the five accounting principles of this protocol outlined in Chapter 4.

11.4. Ex-post evaluation

Jurisdictions shall develop and make publically available a plan for ex-post evaluation that addresses the following points:

[83] Baseline Methodologies for Clean Development Mechanism Projects, A Guidebook, Risø Centre on Energy, Climate and Sustainable Development, November 2005, ISBN: 87-550-3483-7.

1. The metric that will be used to evaluate the goal
2. When the evaluation of meeting the goal will be performed
3. The data that will be used to evaluate whether the goal was achieved
4. How the jurisdiction will evaluate whether it has achieved the goal
5. Revisions and updates to base year (or baseline) emissions
6. When and where the final report will be publically available
7. If and how the ex post evaluation plan and adherence to the plan will be evaluated, and revisions, updates and improvements will be implemented.
8. Whether the mitigation goal was achieved

11.4.1. Indicators/metrics that will be used to determine whether the goal was achieved

The metrics used for tracking progress will vary by goal.

Jurisdiction shall use a metric that is consistent with the units used in the definition of the goal (see chapter 5, *Selecting the goal, goal level, and goal length*).

11.4.2. When the evaluation of meeting the goal will be performed

The jurisdiction shall perform an analysis of whether it has achieved its goal at the end of the goal period. This evaluation shall be done as soon as possible (considering the availability of data) to produce a quality inventory for the target year.

If the jurisdiction intends to enter another goal period and there is a review procedure between goal periods, the report should be produced as soon as possible so that it can inform plans for the next goal period.

11.4.3. The data that will be used to evaluate whether the goal was achieved

The data that used to determine whether the goal was achieved shall be the same as those used to evaluate progress during the goal period unless the data was updated due to re-calculation. In which case, the updated data shall be used to evaluate progress.

Jurisdictions shall disclose and justify all data sources.

Jurisdictions should use the same inventory methodologies and GWP values throughout the goal period in order to have a consistent time series and enable performance tracking over time on a common basis.

If jurisdictions update inventory methodologies and/or GWP values during the goal period, then emissions included in the goal shall be recalculated for the goal period, including base year and/or baseline scenario emissions. In such cases, the final report shall clearly indicate where and why changes to inventory methods or GWP values have occurred.

11.4.4. Determining whether the jurisdiction has achieved the goal

To evaluate whether the jurisdiction has achieved the goal, jurisdictions shall apply Equation 11.3.

Equation 11.3: Determining whether the goal has been achieved

For goal types: reduction from a base year and reduction from a baseline

(Target year emissions within goal boundary + emissions reductions sold to other jurisdictions – emissions reductions purchased from other jurisdictions) - (Target year emissions level associated with meeting the goal)

"Target year emissions within goal boundary" should include net emissions from the land use sector if applicable. To determine "target year emissions level associated with meeting the goal," see Chapter 10.

If the goal has been achieved, the result will be zero.

For goal type: reduction in intensity

[(Target year emissions within goal boundary + emissions reductions sold to other jurisdictions – emissions reductions purchased from other jurisdictions) / quantity of output in the target year] – Target year emissions intensity associated with meeting the goal

"Target year emissions within goal boundary" should include net emissions from the land use sector if applicable.

If the goal has been achieved, the result will be zero.

For goal type: reduction to an absolute level

(Target year emissions within goal boundary + emissions reductions sold to other jurisdictions – emissions reductions purchased from other jurisdictions) - Absolute target emissions level

"Target year emissions within goal boundary" should include net emissions from the land use sector if applicable.

If the goal has been achieved, the result will be zero.

Based on the uncertainty related to the emissions estimation, the jurisdiction may evaluate whether the emissions level at the end of the goal period is consistent with the goal level within the margin of error of the data.

Jurisdictions shall disclose whether their mitigation goals are achieved and the calculation methodologies used.

11.4.5. Recalculations to base year or baseline scenario emissions

At the end of the goal period, base year and baseline scenario emissions shall be recalculated as outlined in Chapter 7.

Jurisdictions should evaluate the drivers of emissions used in the baseline scenario (which will have been defined in Chapter 7) and check whether assumptions considered in the baseline calculation are still valid. Examples of such drivers might include assumptions about the rate of economic growth, emission factors, assumptions about the direction of policies, assumptions about the geographic distribution of growth, or assumptions about demographic trends.

The results of tracking progress should be included in each interim report with a statement whether changes are noticed that could materially affect the likelihood of achieving the emission goal.

If, by monitoring the assumptions that underlie emissions drivers in the baseline scenario, there is an indication that a key baseline assumption is no longer valid, then the baseline scenario shall be updated to reflect the observed changes in underlying drivers, according to the jurisdiction's recalculation policy.

If a jurisdiction chooses to recalculate base year or baseline scenario emissions, it shall provide a rationale for doing it and it shall report that update alongside the original baseline so that a comparison can be made.

11.4.6. When and where the final report will be publically available

The jurisdiction's final report (including a determination of whether it achieved its goal and any subsequent recalculations or revisions) shall be publically available in a timely manner following the end of the goal period or subsequent to revisions or updates.

Jurisdictions shall specify when and where reports are published and how the public can obtain copies.

A jurisdiction may consider publishing an interim report if it requires an early indication of whether it has achieved its goal but expects further information that could materially affect the answer. Such an interim report may be helpful when it is considering a subsequent mitigation goal period.

11.4.7. If and how the ex post evaluation plan and adherence to the plan will be evaluated, and revisions, updates and improvements will be implemented.

Jurisdictions shall specify in the ex-post evaluation plan a schedule for evaluation of the plan itself. This shall include identifications of needed revisions, controlling decisions on when and if updates will be made, and whether and under what circumstances improvements to the ex post evaluation plan will be allowed or required.

Jurisdictions shall note when any modifications to the plan could materially affect the likelihood of reaching the goal. These updates shall include all reasonable efforts to improve data quality and ensure compliance with the five accounting principles of this protocol outlined in Chapter 4.

11.5. Reporting

See Chapter 13 for reporting requirements for this chapter.

Chapter 12: Verification/assurance

This chapter has not yet been developed but is expected to include information on:

- Benefits of verification/assurance/quality assurance/quality control
- Types of verification/assurance/quality assurance/quality control
- Levels of verification/assurance/quality assurance/quality control
- Description of process and steps
- Timing of verification/assurance/quality assurance/quality control
- Materiality
- Challenges and considerations

Chapter 13: Reporting

This chapter outlines the reporting requirements for this standard.

A public GHG emissions report that is in conformance with the Mitigation Goals Accounting and Reporting Standard shall include the following information:

- GHG mitigation goal (including goal type, goal level, and goal length)
- Base year and base year emissions, if applicable
- Base year and base year emissions intensity, if applicable
- Baseline scenario emissions in target year, if applicable
- Emissions level within the goal boundary in the target year associated with meeting the goal and the calculation methodology used
- Emissions reductions within the goal boundary in the target year associated with meeting the goal and the calculation methodology used
- Emissions level within the goal boundary in the reporting year and the calculation methodology used
- Emissions reductions achieved within the goal boundary between the goal start date and the reporting year and the calculation methodology used
- Progress toward the goal or whether the mitigation goal was achieved

Jurisdictions shall report the following methodological information in order to be in compliance with this standard:

Chapter 5

- Goal type. If an intensity goal is chosen, jurisdictions shall report the unit of output
- Goal level in terms of:
    - Percent reduction in emissions by the target year (either single value or range)
    - Absolute reduction in emissions by the target year (either single value or range)
    - Emissions level in the target year associated with meeting the goal
- Length of their goal period and the start year and target year of the goal period

Chapter 6

- Greenhouse gases (GHGs) included in goal boundary
- GWP values used for non-CO2 gases included in goal boundary
- Sectors included in and excluded from the goal boundary, including justification for excluded sectors
- Definitions of sectors included in goal boundary, including a justification for the choice of definitions
- Geographic boundary of goal, including all protectorates, departments, overseas territories, dependencies or other non-contiguous territories that are included or excluded from the boundary
- Direct and indirect emissions included in goal boundary

Chapter 7

Base year

- Choice of base year or average period of years and specify the rationale for choosing that particular year or period of years. If different base years or base periods are chosen for different gases and sectors covered by the goal, jurisdictions shall provide a rationale.
- Base year emissions and base year emissions calculation methodology, if applicable
- Base year emissions intensity and calculation methodology, if applicable
- All data sources used

- Base year emissions and emissions intensity recalculation policy, including significance threshold
- Any and all base year emissions or emissions intensity recalculations and the rationale for the recalculation

Baseline scenario

- Sectors and gases included in the baseline scenario
- Metric used for calculating the baseline scenario
- Historical reference year or period used as the basis of the baseline scenario
- Timeframe of the baseline scenario
- Model used for calculating the baseline scenario, and the rationale for choosing the model
- Emissions drivers included in the baseline scenario
- Assumptions associated with each emissions driver, including a numerical value and the rationale for choosing that value
- Historical GHG inventory data for the historical reference year or period of the baseline scenario and its source
- Any historical energy and non-energy data used in the baseline scenario and its source
- Data used to develop assumptions for emissions drivers
- GWP values to calculate emissions in units of CO_2e
- Approach taken for including policies and measures in the baseline scenario - either without measures, with measures, or with additional measures
- Policies and measures included in the baseline scenario (if any) and their associated GHG impacts
- Assumptions and methodologies used to estimate the impact of the included policies and measures
- How emissions reductions from outside the goal boundary are accounted for in the baseline scenario, if applicable
- Baseline scenario recalculation policy, including significance threshold
- Any and all baseline scenario recalculations and the rationale for the recalculation
- Baseline scenario emissions in the target year

Chapter 8

- Jurisdictions shall report:
    - a threshold that is applied to the use of emission reductions beyond the goal boundary, if applicable. The threshold must be justified in relation to their policy priorities. If no threshold is applied, jurisdictions shall disclose and justify the reasons.
    - which credits purchased can be used towards their goal and any specific quality criteria (i.e. project type, origin of credit) required on purchased credits used. Jurisdictions should transparently describe the criteria and process for arriving at such decisions on credit quality.

Ex-ante

- Amount of emissions reductions generated outside the goal boundary that can be used to meet the goal, any limits on their use, and the rationale used to establish the limit including justification if no limit was established
- Qualitative information on the process for assessing eligibility of different credits, criteria to be used in determining eligibility, and types of credits allowed towards the mitigation goal

Ex-post

- How decisions related to threshold and eligibility of credits were implemented
- The actual quantity of external reductions used

- Methodologies used to estimate the emissions reductions associated with the use of emissions reductions generated beyond the goal boundary and the rationale for the choice of adopted methodology
- Proof that no double counting has occurred by describing the mechanisms that were used to prevent it, i.e. legal mandates, registry and/or transaction log, and identification numbers
- Whether offsets are being claimed by the buyer, the seller, or shared between both. If they are being shared, the user shall report which party is claiming which units in respect to which mitigation goal.
- Year of emissions reduction credits
- Seller and purchaser emissions reduction credits
- How and when emissions reduction credits were retired

Chapter 9

- GHG inventory data for relevant land-use categories/activities, including:
    - Data and data sources
    - Areas included and not included in each land-use category
    - Carbon pools and GHG fluxes included and not included in the GHG inventory
    - Explanation of the approaches, methodologies, and models, including assumptions, used to calculate GHG inventory
    - Uncertainties associated with emissions estimates
- How the land-use sector is incorporated in the mitigation goal and rationale for chosen approach.
- Jurisdiction-wide mitigation goal with and without accounting for land-use sector
- Choice of land-based or activity-based accounting and rationale for chosen approach
    - If land-based, areas included and excluded from accounting
    - If activity-based, definitions and sub-categories included and excluded from accounting
- Definitions and methodologies to distinguish between anthropogenic and non-anthropogenic emissions and removals, if applicable
- Land-use categories/activities elected for accounting and rationale for including/excluding categories/activities
- Carbon pools and GHG fluxes included in accounting and rationale for including/excluding pools and/or fluxes
- Land-use accounting methodology chosen and rationale for chosen approach
- Mitigation goal for the land-use sector
    - Quantification of goal
    - Explanation of the approaches, methodologies, and, if applicable, models and assumptions used to calculate the target emissions
    - Data and data sources used to calculate accountable net emissions
- Whether a cap was used in conjunction with accounting for any land-use categories/activities. If so, cap value and rationale for choosing that value.
- Whether the jurisdiction-wide mitigation goal was adjusted to address the impacts of non-additional emissions reductions. If so, explanation of how goal was adjusted.
- Whether a natural disturbance mechanism was adopted or is anticipated
    - Approaches used to factor out natural disturbances, including methodologies, models, and assumptions
    - Data and data sources used in the mechanism
    - Georeferenced areas subject to natural disturbance mechanism
- Net emissions from each elected land-use category/activity shall be assessed, reported, and accounted for as separate line items in a jurisdiction's accounts
- Greenhouse gas emissions from the land-use sector incorporated into mitigation goal

Chapter 10

- Emissions level in the target year associated with meeting the goal and the calculation methodology used
- Emissions reductions in the target year associated with meeting the goal and the calculation methodology used
- How emissions reductions from outside the goal boundary are accounted for, if applicable
- How emissions reductions generated within the goal boundary and sold to another jurisdiction are accounted for, if applicable
- Data sources for projecting output metrics (for intensity goals) and any projection methodology used, if applicable

Chapter 11

If jurisdictions choose to track progress during the goal period, they shall report:

- Reporting year
- Metric used to track progress
- How often performance against the goal will be evaluated, and the rationale for choosing this frequency
- The methodology for calculating progress toward goal
- The data used for evaluating performance, and the frequency with which these data were collected, including
    - a description of data source(s) used to carry out the monitoring
    - a description of QA/QC procedures
    - any updates to data and rationale for doing so
- Actual reported emissions data versus estimated emissions data for past and current year/s
- A description of relevant uncertainties in the data and how they were addressed
- Any updates and revisions to base year or baseline scenario emissions, if relevant, and how these changes could materially affect the likelihood of achieving the emission goal
- When and where reports are made publically available
- Any revisions to the performance tracking plan
- Emissions level within goal boundary in the reporting year by gas
- Emissions reductions achieved within the goal boundary in the reporting year by gas
- Complete inventory emissions for the jurisdiction in the reporting year by gas

For ex-post evaluation of whether the goal was achieved, jurisdictions shall report:

- Target year
- Metric used to evaluate whether goal was achieved
- The methodology for calculating progress toward goal
- The data used for evaluating whether goal was achieved, and the frequency with which these data were collected
    - A description of data source(s) used to carry out the monitoring
    - A description of QA/QC procedures
    - Any updates to data and rationale for doing so
- Any updates and revisions to base year or baseline scenario emissions, if relevant
- When and where reports are made publically available
- Any revisions to the ex-post evaluation plan
- Emissions level within goal boundary in the target year by gas
- Emissions reductions achieved within the goal boundary in the target year by gas
- Complete inventory emissions for the jurisdiction in the target year by gas
- Whether the mitigation goal was achieved

Glossary

Activity data: A quantitative measure of a level of activity that results in GHG emissions. Activity data is multiplied by an emissions factor to derive the GHG emissions associated with a process or an operation. Examples of activity data include kilowatt-hours of electricity used, quantity of fuel used, output of a process, hours equipment is operated, distance traveled, and floor area of a building.

Base year: A specific year of historic datum against which jurisdictions emissions are tracked over time.

Base year emissions: GHG emissions in the base year.

Base period: An average of multiple years of historic datum against which jurisdictions emissions are tracked over time.

Baseline scenario assumptions: Numerical values that describe how drivers in a baseline scenario will change over time.

Baseline scenario emissions: An estimate of GHG emissions, removals, or storage associated with a baseline scenario. Elements that are required to calculate the baseline scenario emissions include the baseline scenario emissions factors and baseline activity data.

Baseline scenario: A set of reasonable assumptions and data describing events or conditions that are likely to occur in the absence of activities taken to meet the mitigation goal. Elements that are required to define a baseline scenario include baseline scenario assumptions (e.g., related to emissions drivers like economic activity, energy prices, population growth, and policies and measures) and data sources, among others.

CO_2 equivalent (CO_2e): The universal unit of measurement to indicate the global warming potential (GWP) of each greenhouse gas, expressed in terms of the GWP of one unit of carbon dioxide. It is used to evaluate releasing (or avoiding releasing) different greenhouse gases against a common basis.

Direct emissions: Emissions from sources that are located within a jurisdiction's geopolitical boundary.

Driver: Something that creates or causes an emissions causing activity or change in the level of an emissions causing activity.

Dynamic: A descriptor for an element of a baseline scenario or baseline scenario emissions calculation (e.g., emission factor) that changes over time**.**

Emission factor: A factor that converts activity data into GHG emissions data (e.g., kg CO2e emitted per liter of fuel consumed).

Emissions: The release of greenhouse gases into the atmosphere.

Emissions level: The quantity of greenhouse emissions in a given year.

Emission source:. A point of origin for emissions, e.g. stationary fuel combustion is an emission source.

Ex-ante estimation: Estimating expected future GHG effects of a mitigation goal before implementation.

Ex-post evaluation: Evaluating historical GHG effects of a mitigation goal after implementation.

Geopolitical boundary: The geographic demarcation of a jurisdiction, within which political control and authority is exercised by that jurisdiction.

Global warming potential (GWP): A factor describing the radiative forcing impact (degree of harm to the atmosphere) of one unit of a given GHG relative to one unit of CO2.

Goal boundary: The greenhouse gases, sectors, geographic area, and direct and indirect emissions covered by the mitigation goal.

Goal length: The duration of the mitigation goal.

Goal level: Quantity of emissions or emissions reductions associated with the mitigation goal.

Goal period: The time between the start year and target year of the mitigation goal.

Greenhouse gas inventory: A quantified list of a jurisdiction's GHG emissions and sources.

Greenhouse gases (GHG): For the purposes of this standard, GHGs are the seven gases covered by the UNFCCC: carbon dioxide (CO2); methane (CH4); nitrous oxide (N2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); sulphur hexafluoride (SF6); and NF_3.

Indicator: Information or data which signifies conditions or a state of affairs beyond itself. E.g. the price of tradable permits is an indicator of over or under allocation of permits in a cap-and-trade scheme.

Indirect emissions: Emissions that are a consequence of the activities of the reporting jurisdiction, but occur at sources located outside that jurisdiction's geopolitical boundary.

Leakage: An increase in emissions outside of the goal boundary that is caused by mitigation activities within the goal boundary.

Mitigation goal: A commitment to reduce GHG emissions by a specified amount over a specified time period.

Materiality: Concept that individual or the aggregation of errors, omissions and misrepresentations could affect the GHG inventory and could influence the intended user's decisions.

Offset: An offset represents the reduction, removal, or avoidance of GHG emissions from a specific project that is used to compensate for GHG emissions occurring elsewhere. One offset credit represents one metric ton of CO2 equivalent.

Parameter: One of a set of variables used in a calculation. E.g. "emissions per kWh of electricity", and "quantity of electricity supplied" are both parameters in the calculation "0.5 $kgCO_2e$/kWh * 100 kWh of electricity = 50 $kgCO_2e$".

Parameter value: The value of a parameter. E.g. "0.5" is the parameter value for the parameter "emissions per kWh of electricity".

Peer-reviewed: Literature (e.g., articles, studies, evaluations) that has been subject to independent evaluation by experts in the same field prior to publication.

Reporting year: The year for which GHG emissions are reported.

Sensitivity analysis: Sensitivity analyses employ characterisations that involve arbitrary or graduated adjustments of one or several variables relative to a reference case. These adjustments may be plausible (e.g., changes are of a realistic magnitude) or implausible (e.g., interactions between the adjusted

variables are ignored), but the main aim is to explore model sensitivity to inputs, and possibly uncertainty in outputs. (IPCC, AR4, WGII, Box 2.1)

Static: A descriptor for an element of a baseline scenario or baseline scenario emissions calculation (e.g., emission factor) that does not change over time.

Target year: The end year of the goal period.

Timeframe: The period over which baseline scenario emissions are projected

Uncertainty: 1. Quantitative definition: Measurement that characterizes the dispersion of values that could reasonably be attributed to a parameter. 2. Qualitative definition: A general and imprecise term that refers to the lack of certainty in data and methodology choices, such as the application of non-representative factors or methods, incomplete data on sources and sinks, lack of transparency etc.

Uncertainty analysis: In uncertainty analysis, inputs relevant for the impact of policies are varied depending on the confidence in the made assumptions. The uncertainty levels are expressed by the confidence of a finding.

Abbreviations

BAU	Business-as-usual
C40	Cities Climate Leadership Group
CDM	Clean Development Mechanism
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COMAP	Comprehensive Mitigation Assessment Process Model
EIA	US Energy Information Agency
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GPC	Global Protocol for Community Emissions
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons
ICLEI	International Council for Local Environmental Initiatives
IEA	International Energy Agency
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
LEAP	Long-range Energy Alternatives Planning System
LULUCF	Land Use, Land Use Change, and Forestry
MARKAL	Market Allocation Model
$MTCO_2e$	Metric Tons of Carbon Dioxide Equivalent
NEMS	National Energy Modeling System
NF_3	Nitrogen Trifluoride
NGO	Non-Governmental Organization
N_2O	Nitrous Oxide
OECD	Organisation for Economic Co-operation Development
PFCs	Perfluorocarbons
QA	Quality Assurance
QC	Quality Control
SF_6	Sulphur Hexafluoride
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WRI	World Resources Institute
WEPS+	World Energy Projection System Plus

References

Contributors

Disclaimer

This draft standard is designed to promote best practice GHG accounting and reporting, and have been developed through a multi-stakeholder consultative process involving representatives of companies, governments, academic institutions, non-governmental organizations, and other individuals from around the world. The preparation and publication of reports based fully or partially on the draft standard is the full responsibility of those producing them. Neither WRI nor other individuals who contributed to this draft standard assume responsibility for any consequences or damages resulting directly or indirectly from its use in the preparation of reports or the use of reports based on the draft standard.