MITIGATION MONITORING AND EVALUATION GUIDELINES SERIES

of the

National Climate Change Response Monitoring and Evaluation System

Volume 1 **POLICIES, STRATEGIES & LAWS**

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THE SERIES CONSISTS OF THE FOLLOWING PUBLICATIONS:

- Volume 1: POLICIES, STRATEGIES AND LAWS
- Volume 2: ENERGY AND TRANSPORT SECTORS
- Volume 3: INDUSTRIAL PROCESSES AND PRODUCT USE SECTOR
- Volume 4: WASTE SECTOR
- Volume 5: AGRICULTURE, FORESTRY & OTHER LAND-USE SECTORS

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OVERVIEW

In 2011, the Department of Environmental Affairs (DEA) published the National Climate Change Response Policy (NCCRP) (DEA 2011a) presenting the country's vision for an effective climate change response and the long-term transition to a climate-resilient, equitable and internationally competitive lower-carbon economy and society. The 2011 NCCRP is South Africa's first policy focusing specifically on climate change (Boyd et. al. 2012), and has encouraged the development of sector-specific, provincial and local-level climate change response policies and strategies. This need for, and commitment to, a transition to a lower-carbon and climate-resilient society and economy is also echoed in various national policy documents, including the National Strategy for Sustainable Development and Action Plan 2011–2014 (DEA 2011b), the Integrated Resource Plan 2010 (DoE 2011), the Industrial Policy Action Plan for 2013/14–2014/15 (DTI 2013), the National Development Plan 2030: Our future – make it work (NDP) (NPC 2011), amongst other key climate-related policies and strategies.

Both the NDP and the NCCRP clearly highlight the importance of understanding South Africa's progress in moving towards this envisaged climate-resilient and lower-carbon economy and society, as well as the need for accountability through leadership, management, monitoring, reporting and verification of this transition. To this end, both policies (the NDP and the NCCRP) call for the setting up of a mandatory national monitoring, evaluation and reporting system for climate change information and a detailed analysis and implementation of mitigation policies and measures. Following this policy mandate the DEA has been working towards the development of a monitoring and evaluation (M&E) system since 2009. This started with the development of the National Climate Change Response Database (NCCRD) (DEA no date) in order to track current climate change response programmes and was developed into a fully-fledged climate change response M&E system (DEA 2015: 120–27). The design of the M&E system was finalised in 2015 culminating in The National Climate Change Response Monitoring and Evaluation System Framework document (DEA 2015). This M&E system, aimed at enhancing the country's ability to track emissions, emissions reductions and climate finance, would in turn assist with informing climate change policies, mitigation goals and support needs of the country. Figure 1 provides a high-level overview of South Africa's national climate change response M&E system.

It is within this national context and need that the Department of Environmental Affairs commissioned the development of a series of M&E guidelines in order to support effective tracking of South Africa's transition to this envisaged lower-carbon economy and climate-resilient society.

To support obligations in both domestic and international contexts a select set of implementation, impact and effectiveness indicators will be tracked and monitored over time and used to assess greenhouse gas (GHG) effects of policies and actions. The results of these policy/action assessments will support both domestic and international reporting obligations. The assessment outputs will be communicated mainly through three communication channels as indicated below:

- **The Annual Climate Change Reports:** Which showcase South Africa's climate change responses including both adaptation and mitigation responses and will also provide an overview of climate finance flows in the country. The reports are published annually targeting the South African climate change community (public, private, communities, academia and so on).
- **The National Communications Reports (NC):** Which serve the country's reporting obligations to the United Nations Framework Convention

on Climate Change (UNFCCC), these reports provide information on the national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol; a general description of steps taken or envisaged by the Party to implement the Convention and any other information that the non-Annex I Party considers relevant to the achievement of the objectives of the Convention and suitable for inclusion in its communication. These reports are published every four years.

- **The Biennial Update Reports (BUR):** provide an update of the information presented in National Communications reports, in particular on national circumstances, national GHG inventories, mitigation actions and their effects, constraints and gaps, including support needed and received. These reports are published every two years.

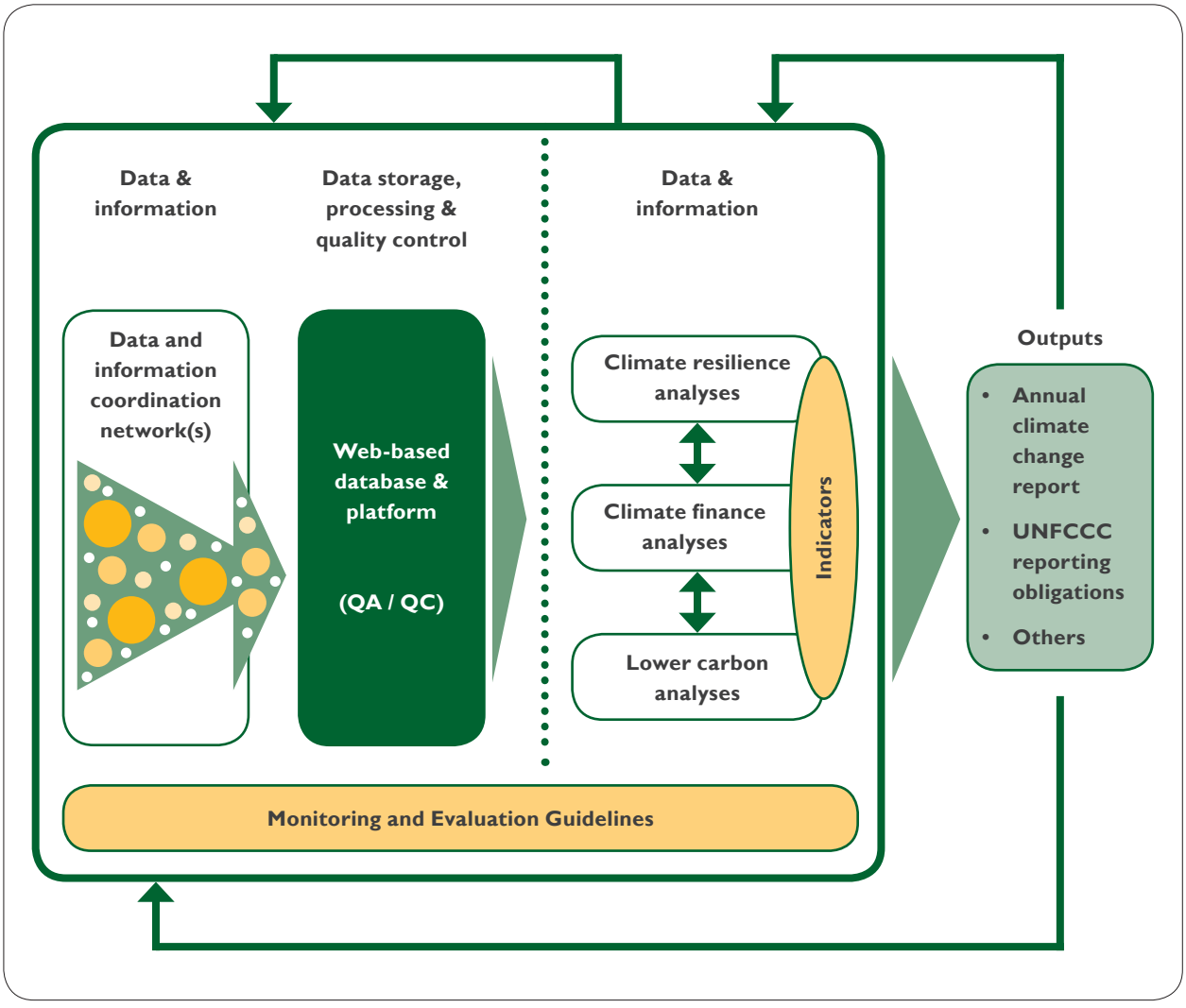

Figure 1: Climate Change Response M&E System overview.

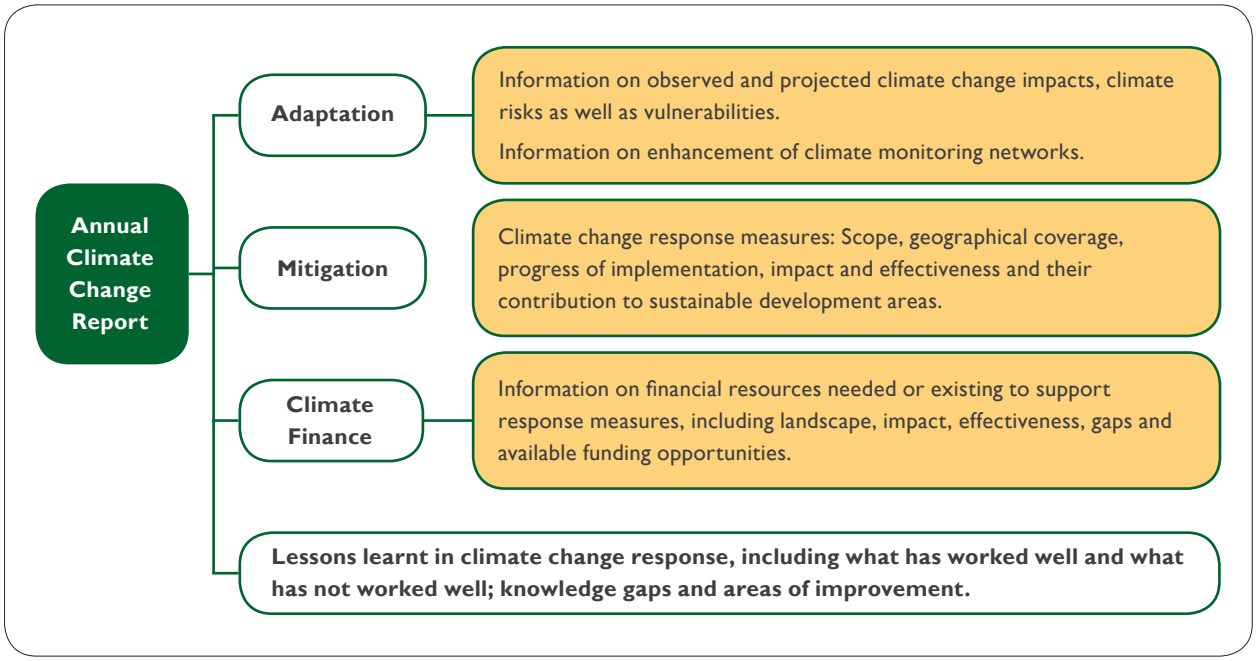

Figure 2: Key elements of the Climate Change Annual Report.

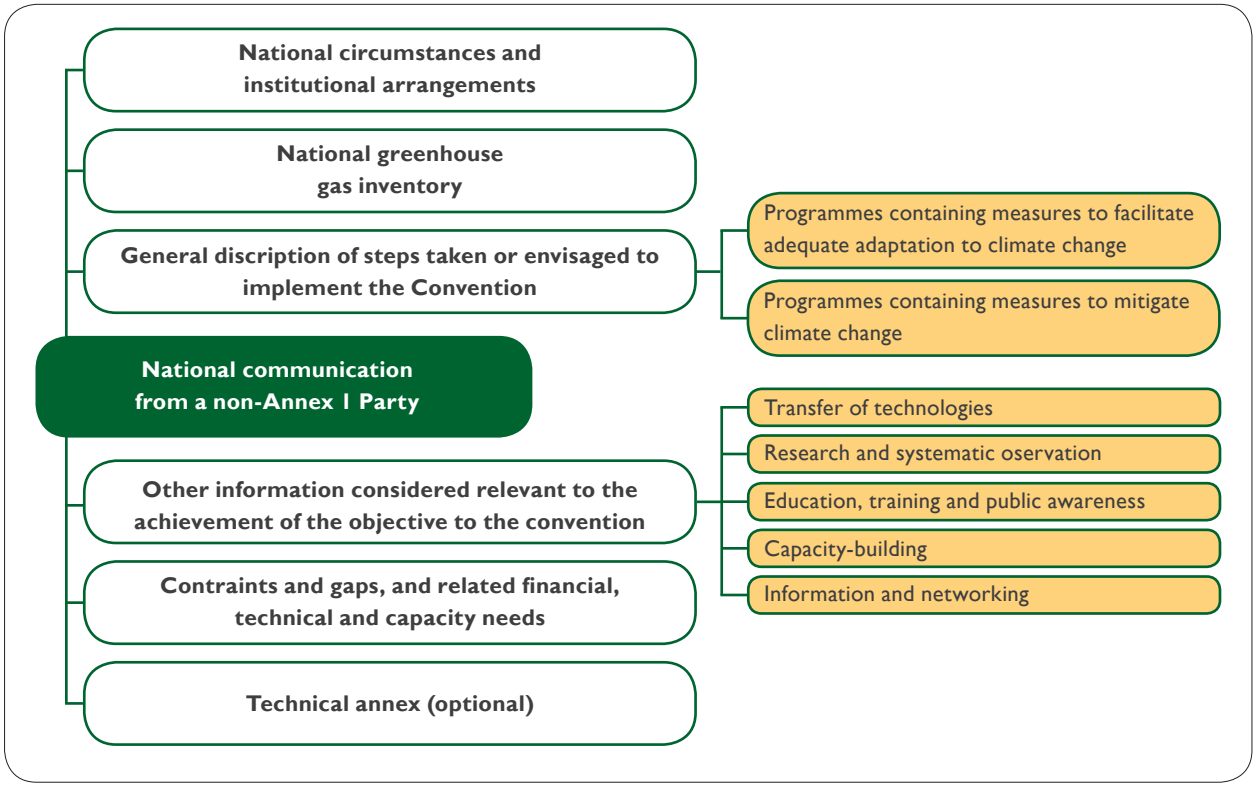

Figure 3: Key elements of National Communications. (Source: UNFCCC Handbook on MRV for Developing Countries)

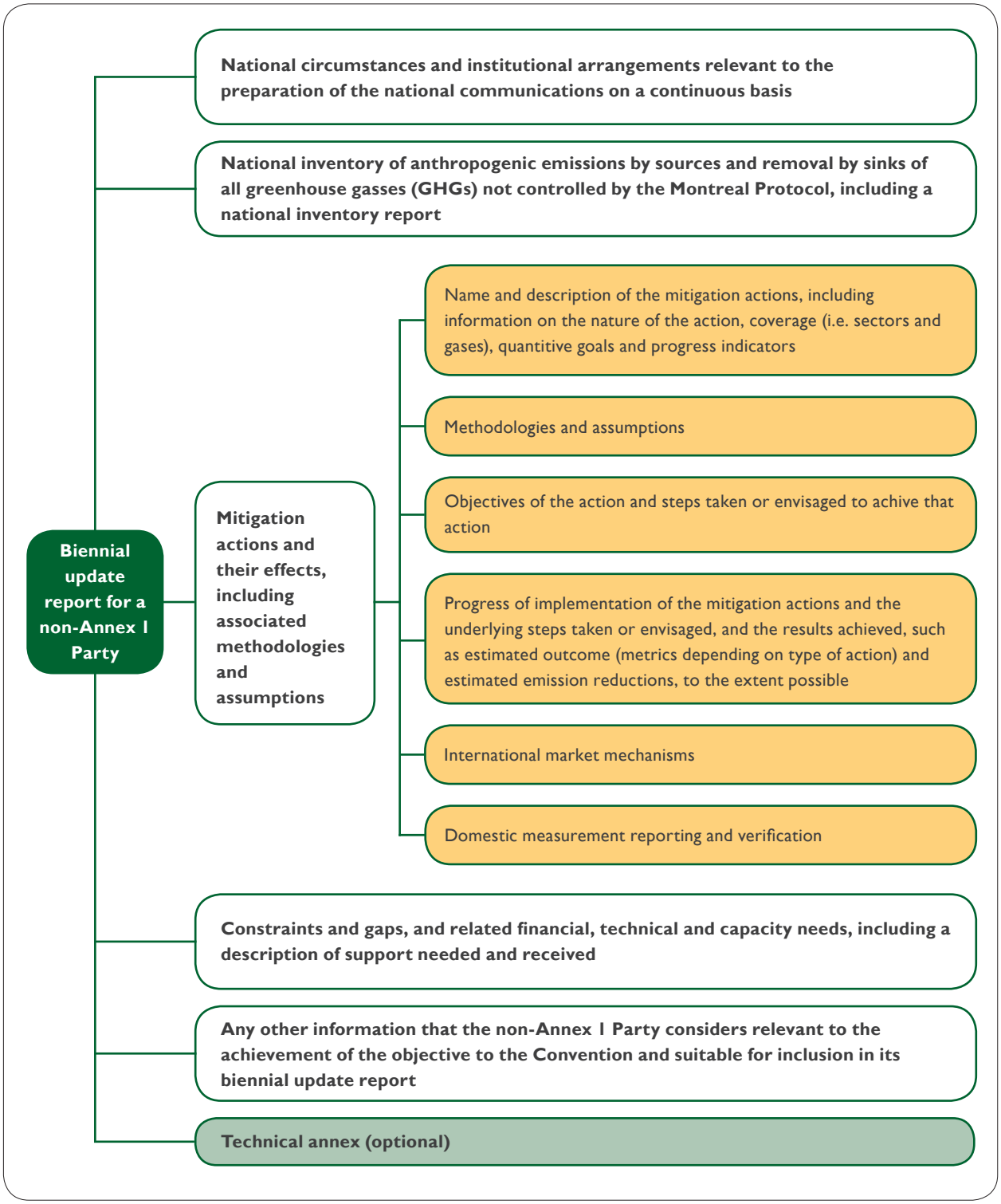

Figure 4: Key Elements of Biennial Update Reports. (Source: UNFCCC Handbook on MRV for Developing Countries)

1. INTRODUCTION

Assessing the GHG impacts of policies, strategies and laws is a key step towards developing effective GHG mitigation strategies to attain the aspirations of the National Climate Change Response Policy (2011) and the National Development Plan 2030. Impact assessment supports evidence-based decision making by enabling policymakers and stakeholders to understand the relationship between policies and expected GHG impacts. The South African Government (at national, provincial and local government level), the private sector, non-governmental organisations (NGOs), and academia are planning and implementing a wide range of policies, plans and actions that contribute towards reducing or increasing greenhouse gas (GHG) emissions However, there are still gaps in knowledge and understanding in South Africa on how these policies and strategies impact on GHG emissions and sustainable development benefits. In the context of South Africa therefore a strong need exists to assess and effectively communicate the effects these policies and actions have on GHG emissions and on sustainable development, both before adoption of policies (later in the guideline referred to as ex-ante or forward-looking assessment) to inform policy design processes and options; and after implementation (later in the guideline referred to as ex-post or backward-looking assessment) to understand whether the intended effects of the policy were achieved.

This document contains the monitoring & evaluation guidelines for climate related policies, strategies and laws that enable effective tracking and monitoring of mitigation effects of these policies, strategies and laws taking into account the South African national context and circumstances.

Relevance of these guidelines to the World Resources Institute (WRI) GHG Protocol Policy and Action Standard

These M&E guidelines for policies and actions draw from and were developed in accordance with the World Resources Institute (WRI) GHG Protocol Policy and Action Standard, which is an accounting and reporting standard for estimating the greenhouse gas effects of policies and actions. The GHG Protocol Policy and Action Standard provides a standardised approach for estimating and reporting the change in GHG emissions and removals resulting from policies and actions (WRI 2014).

The Standard helps answer the following questions

- What effect is a given policy or action likely to have on GHG emissions in the future?
- Is a given policy or action on track and delivering expected results?
- What effect has a given policy or action had on GHG emissions?

The Standard was developed with the following objectives in mind

- To help users assess the GHG effects of specific policies and actions in an accurate, consistent, transparent, complete and relevant way,
- To help policymakers and other decision makers develop effective strategies for managing and reducing GHG emissions through a better understanding of the emissions impacts of policies and actions.
- To support consistent and transparent public reporting of emissions impacts and policy effectiveness.
- To create more international consistency and transparency in the way GHG effects of policies and actions are estimated (WRI 2014: 5–6).

Unless otherwise cited, the approach, guidance and accounting methods provided in this guideline are based on this standard.

1.1 PURPOSE OF THESE GUIDELINES

This guidance provides general principles, concepts and procedures for estimating GHG and non-GHG impacts of policies, strategies and laws in the context of South Africa's Climate Change Monitoring and Evaluation Framework. These guidelines are intended to support tracking progress towards the country's transition to a lower-carbon economy by providing methodological guidance for quantification of GHG emissions and to support implementation of the country's mitigation action. The main objectives of the series of M&E guidelines (Volume 1 to Volume 5) is to support implementation of the climate change response M&E system. Volume 1 of these guidelines is intended to support implementation of the country's climate change response M&E system by giving guidance on the approach used to assess mitigation-relevant policies, strategies and laws and to ensure consistency in reporting the mitigation impact of climate related policies and actions in South Africa.

This guidance is applicable to users that have defined the individual policy instruments and mitigation practices and/or technologies that will be implemented to reduce GHG emissions. The steps for estimating emissions reductions and removals are based on the Intergovernmental Panel on Climate Change's IPCC 2006 Guidelines for National Greenhouse Gas Inventories (IPCC 2006). The guidelines are applicable for assessment of policies, strategies and laws in the context of South Africa's Monitoring and Evaluation Framework:

- at any level of government (national, provincial and municipal)
- private sector climate change mitigation actions and interventions
- that are planned, adopted or implemented
- whether they are new policies, extensions or modifications of policies, or a package of policies

Specifically, these guidelines are intended to:

- Provide guidance on how South Africa measures the mitigation impact of climate related policies in a *transparent*, *accurate*, *consistent* and *comparable* manner using an internationally standardised approach, based on the WRI Policy and Action Standard taking into

account South Africa's Monitoring and Evaluation Framework.

- Provide 'how-to' guidance on the overall approach that needs to be taken to assess implementation, GHG effects and non-GHG co-benefits of policies and their associated measures/actions by:
  - Providing an overall approach to guide the assessment through a step by step process.
  - Referring the user to sector-specific volumes (waste; transport; energy; agriculture, forestry and other land use (AFOLU); and so on) where users can get detailed methodologies, equations, data requirements and so on to calculate both the baseline and policy scenario GHG effects for specific response measures/programmes under the policy being assessed.
- Provide guidance on how to assess broader non-GHG effects or other sustainable development benefits of policies, strategies and laws.
- Provide an overview of the key institutions and data providers that will be providing the necessary information and data needed to assess the above-mentioned effects of policies.
- Provide quality assurance and quality control procedures to ensure that GHG assessments are scientifically robust.
- Provide details of how GHG assessments will be reported and verified.
- Provide a select set of indicators (that may be revised from time-to-time), the responsible entities to continuously monitor these, and how information on these indicators will be shared with the M&E system.
- Guidance is also provided on how to assess M&E system indicators.

1.2 LIMITATIONS OF THESE GUIDELINES

Users are encouraged to note the limitations of these guidelines. Depending on the methods used, the results of the assessment may not be sufficiently accurate for effective decision-making. Several inherent challenges are involved in estimating the GHG effects of policies and actions which may result in high uncertainty, such as the need to estimate effects relative to a counterfactual baseline scenario and estimating interactions between related policies. The degree to which these challenges are overcome may be limited by time, resources, and capacity needed to carry out an accurate and complete assessment. For this reason users should note the following limitations of this guideline:

- ***Results drawn from assessment based on these guidelines cannot support awarding of GHG credits in carbon markets:*** Users should note that these guidelines provide a general guidance and approaches to manage trade-offs between the accuracy of the assessment and the available time, resources and capacity in the context of individual objectives. Depending on the methods used, the results of the assessment may or may not be sufficiently accurate for effective decision-making. Users are encouraged to understand the uncertainty of results as provided in the assessment (uncertainty analysis). Given the uncertainties, the results of the assessment should be interpreted as *estimates* of the effects of policies, strategies and laws. Hence users should note that these guidelines do not support crediting of GHG reductions even in the case of the more detailed, sector-specific methods contained in the sectoral volumes 2 to 5. This is because (among other things) the guidelines do not prescribe provisions to ensure additionality, which is an aspect of the WRI's GHG Protocol for Project Accounting but not of its Policy and Action Standard.

- **Additionality:** The WRI Policy and Action Standard and the WRI Protocol for Project Accounting examine 'additionality' in the following context: whether a GHG mitigation project would have been implemented in the absence of financing or incentives generated by an offset crediting programme. The Policy and Action Standard states that 'A project is additional if it would have been implemented 'in the absence' of such incentives.' This guideline 'does not address additionality in this sense because the objective is not to determine whether a policy or action would have been implemented in the absence of a particular financing or support mechanism' (WRI 2014: 75).
  - The Policy and Action Standard examines whether a policy or action 'results in GHG effects that are additional to what would have happened in the absence of the policy or action since GHG effects are estimated relative to a baseline scenario that represents what would have most likely happened in the absence of the policy or action. For example, if emissions under the baseline scenario and the policy scenario are the same, the policy does not lead to GHG effects that are additional to what would have happened otherwise' (WRI 2014: 75).
  - The Policy and Action Standard examines 'whether a GHG mitigation project would have been implemented in the absence of financing or incentives generated by an offset crediting program. A project is additional if it would not have been implemented in the absence of such incentives' (WRI 2014: 75).
  - The Policy and Action Standard emphasises that programmes which offer credits for GHG reductions may not offer credits for reductions that policies or actions achieve unless specific additionality requirements are met (WRI 2014: 13).
- **Leakage:** The WRI Policy and Action Standard defines leakage as 'an increase in emissions outside the jurisdictional boundary that results from a policy or action implemented within that jurisdiction' (WRI 2014: 177) which should be understood to also signify 'effects in sectors other than the targeted sectors' (WRI 2014: 51). Depending on the objective of the assessment and the availability of resources users may account for leakage based on laid out guiding principles.
- **Life-cycle effects:** Defined in the Policy and Action Standard as 'Changes in upstream and downstream activities, such as extraction and production of energy and materials, or effects in sectors not targeted by the policy resulting from the policy or action' (WRI 2014: 52). These guidelines will not address this effect.
- **Permanence:** This concept typically applies to the AFOLU sector. Users should consider that sequestered carbon may be re-released, and hence this implies that to produce permanent GHG effects, a policy must restrict activities that would cause re-release, or require actions that would prevent it. The policy would also need to declare the minimum amount of time that the carbon would need to be sequestered in order for that GHG effect to be deemed a reduction or removal. Hence permanence is not required.

What these guidelines don't do

They don't prescribe specific equations (namely calculations, formulas and so on) but provide an overall accounting approach that must be taken to attribute changes in GHG trends to policies and measures. The specific equations can be found in sector specific volumes 2–5 of the M&E guidelines series.

1.3 GUIDING PRINCIPLES AND DEFINITIONS

Users are urged to adopt generally accepted principles to guide the impact assessment process, especially where the guidance provides flexibility. It is therefore recommended that users base their assessment as far as is practical on the principles of *relevance*, *completeness*, *consistency, simplicity*, *transparency* and *accuracy*, as defined below (this information draws on (WRI 2014: 31–2).

- **Relevance:** Ensure the assessment appropriately reflects the sustainable development indicators of the policy or action and serves the decision-making needs of users and stakeholders, both internal and external to the reporting entity. Applying the principle of relevance depends on the objectives of the assessment, the broader policy objectives, the sustainable development imperatives defined and stakeholder priorities. This principle should be applied, for example, when choosing which impact categories to assess in Chapter 5.2.
- **Completeness:** Include all significant impacts in the assessment boundary, including both the 24 positive and negative impacts. Document and justify any specific exclusions. This principle should be applied when identifying impact categories and specific impacts in Chapters 5 and 6.
- **Consistency:** Use consistent assessment approaches, data collection methods and calculation methods to allow for meaningful performance tracking over time. Transparently document any changes to the data sources, assessment boundary, methods, or any other relevant factors in the time series. The impacts of multiple mitigation actions will be measured. For the measurement to be 'consistent' the estimates in both cases must be based on the same assumptions and equations, this allows the evaluator to compare different actions and determine which were most effective. The key elements of consistency will entail; consistent data and methodology are used over time for a given source or sink category, sources and sinks are categorised in the same manner across different mitigation actions: for example, using IPCC nomenclature and documenting inconsistencies where appropriate.
- **Simplicity:** Ensure that processes followed are simple and user-friendly to allow for use by a wide range of stakeholders. Where appropriate use both simplified and comprehensive approaches and methods to allow for flexibility of use even under data and resource limitations. A straightforward structure should be used to facilitate following the guidelines and producing accurate results. Users should use decision tree guidance in figure 22 and in the sector guidance to decide whether to use the simplified methodology or a more complex one depending on objectives of the assessment, user needs, resources and data availability.
- **Transparency:** Provide clear and complete information for internal and external reviewers to assess the credibility and reliability of the results.

Document all relevant methods, data sources, calculations, assumptions and uncertainties, as well as the processes, procedures and limitations of the assessment in a clear, factual, neutral, and understandable manner. The information should be sufficient to enable a party external to the assessment process to derive the same results if provided with the same source data. Section 10 provides a list of recommended information to report on to ensure transparency.

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

In addition to the principles above, users should follow the principle of comparability if it is relevant to the assessment objectives. For example, if the objective is to compare multiple policies based on their sustainable development impacts or to aggregate the results of multiple impact assessments and compare the collective impacts to national goals

- **Comparability:** Ensure common methods, data sources, assumptions and reporting formats such that the estimated impacts of multiple policies or actions can be compared.
- **Conservativeness:** Conservative values and assumptions are those more likely to overestimate negative impacts or underestimate positive impacts resulting from a policy or action. Users should consider conservativeness in addition to accuracy when uncertainty can no longer be practically reduced, when a range of possible values or probabilities exists (for example, when developing baseline scenarios), or when uncertainty is high. Whether to use conservative estimates and how conservative to be depends on the objectives and the intended use of the results. For some objectives, accuracy should be prioritised over conservativeness in order to obtain unbiased results. The principle of relevance can help guide what approach to use and how conservative to be.

In practice, users may encounter trade-offs between principles when developing an assessment. For example, a user may find that achieving the most complete assessment requires using less accurate data (tier 1, see Table 22) for a portion of the assessment, which could compromise overall accuracy. Users should balance trade-offs between principles depending on their objectives. Over time, as the accuracy and completeness of data increases, the trade-off between these principles will likely diminish.

1.4 SCOPE OF THESE GUIDELINES

This guideline (Volume 1) provides a general framework (namely, overarching principles, concepts, and procedures) applicable to all sectors and types of policies, strategies and laws. Users are referred to the sector specific guidelines (Volume 2 to Volume 5 as detailed in Table 1 below) to obtain sectoral methodological approaches to conduct sector specific impact assessment.

As part of implementing South Africa's Climate Change Response Monitoring and Evaluation System, specific minimum data prerequisites are needed in order to assess the impact of policies on GHG emissions. These guidelines provide steps related to estimation of GHG effects, as well as specific steps on monitoring, reporting, verification and communication of minimum data requirements and outline how this data and information will be shared and by which stakeholders against the three indicator groups:

- **Implementation Indicators:** This includes guidance on how to track progress towards implementation and the various phases of implementation and this section refers to the Climate Policy Implementation Tracking Framework.
- **Impact Indicators:** Guidance here includes steps related to estimating GHG effects and non-GHG co-benefits.
- **Effectiveness indicators:** Guidance is provided on assessing cost effectiveness. As much as the focus is on the GHG effects of policies, GHG estimates may be combined with information on costs and used as part of a cost-benefit analysis.

The Climate Change Response M&E System Framework (DEA 2015) also provides a detailed overview of the various stakeholders that are key in implementing the M&E system and provides an overview of how data and information will be shared. In line with the WRI Policy and Action Standard these guidelines are premised on policy-neutrality, hence they do not provide guidance on what type of policy or action to implement and rather provide general guidance on how to estimate the emissions effects associated with its implementation. The guidelines cover both ex-ante assessment – the estimation of expected future GHG effects of a policy or action and ex-post assessment – the estimation of historical GHG effects of a policy or action.

1.5 SECTOR-SPECIFIC GUIDANCE

The guidelines provide guidance on an overall approach and procedures applicable to all sectors and types of policies and actions to assess the GHG effects of policies, strategies and laws but they do not prescribe specific calculation methodologies or tools that should be used. In order to complement these guidelines and to conduct sector specific assessments users are referred to sector specific guidelines (Volume 2 to Volume 5) as outlined in Table 1 below to get equations and data needed for quantifying emissions from the affected categories of sources and sinks relevant to specific sectors.

However, users can also use other methods (software, programs and so on) to calculate emissions. Table 1 aims to provide further clarity in this regard.

Table 1: Volume 1–5 of the M&E guidelines series.

Title	Purpose	Partners
Volume 1: POLICIES, STRATEGIES AND LAWS	Provides an overall accounting approach for estimating GHG and Non-GHG effects of policies and actions, without providing calculation formulas and data requirements.	WORLD RESOURCES INSTITUTE
Volume 2: ENERGY AND TRANSPORT SECTORS	Provides detailed equations and data requirements for assessing M&E system indicators in the Energy and Transport sectors, including GHG effects.	USAID | SOUTH AFRICA Low Emissions Development Program
Volume 3: INDUSTRIAL PROCESSES AND PRODUCT USE SECTOR (IPPU)	Provides detailed equations and data requirements for assessing M&E system indicators in the IPPU Sector, including GHG effects.	USAID | SOUTH AFRICA Low Emissions Development Program
Volume 4: WASTE SECTOR	Provides detailed equations and data requirements for assessing M&E system indicators in the Waste Sector, including GHG effects.	-
Volume 5: AGRICULTURE FORESTRY AND OTHER LAND-USE SECTOR (AFOLU)	Provides detailed equations and data requirements for assessing M&E system indicators in the AFOLU Sector, including GHG effects.	Australian Government

When to use these guidelines

- **Before policy implementation:** To estimate expected or anticipated emissions reductions or increases as a result of implementing a policy/group of policies (what is referred to as an **ex-ante** assessment).
- **During policy implementation:** To estimate achieved effects to date, ongoing performance of key performance indicators, and expected future effects of a policy.
- **After policy implementation:** To estimate what effects have occurred as a result of a policy (what is usually referred to as an **ex-post** assessment, also can be used to estimate GHG effects during implementation).

These guidelines may be used at multiple points in time throughout a policy design and implementation.

Depending on individual objectives and when these guidelines are applied, users may implement the steps related to ex-ante assessment, ex-post assessment, or both. Guidance on each of these is provided in Section 2 below.

1.6 TARGET GROUP AND INTENDED USERS

There is a wide range of stakeholders that have been identified to support the implementation of the climate change response M&E system and the use of this guideline for policies, strategies and laws. These stakeholders include national government departments, provincial and local governments, state-owned entities, private sector institutions, non-governmental organisations (NGOs) and other sector users who have an interest in assessing GHG and non-GHG effects of policies, strategies and laws. It must also be emphasised that as the policy landscape changes within the country due to political and other strategic restructuring processes, the intended users and role-players, and policy mandates are likely to change over time. Hence this is seen to be a dynamic environment with potential for ongoing changes regarding how these guidelines are used and by which stakeholders.

The primary intended users of these guidelines are the Climate Change and Air Quality Branch: Climate Change M&E team members within the Department of Environmental Affairs, who will be the team leading these policy assessments. However, other public-sector departments and private sector organisations can use these guidelines to track GHG and non-GHG effects of their policies in order to strengthen policy implementation and planning including in the development of new policies. For example, when new policies are being planned or adopted for implementation by public institutions. These public-sector institutions can conduct forward-looking assessments in order to get an understanding of the potential climate change mitigation contribution of their planned or adopted policies.

The following examples show how different types of users can use these guidelines

- **National and Provincial Government Departments:** Estimate the GHG effects of planned policies and actions to inform decision-making, monitor progress of implemented policies and actions, and retrospectively evaluate GHG effects to learn from experience.
- **Donor Agencies and Financial Institutions:** Estimate the GHG effects of finance provided, such as grants or loans to support GHG reductions and low emissions development strategies.
- **Businesses:** Estimate GHG effects of private sector actions larger than individual projects, such as company-wide energy efficiency programmes implemented by electric utilities; voluntary agreements; implementation of new technologies, processes or practices or private sector financing and investment.
- **Research Institutions and NGOs:** Estimate the GHG effects of any of the above types of policies or actions to assess performance or provide support to decision-makers (WRI 2014: 6).

1.7 PLANNING FOR THE ASSESSMENT

Users should review these guidelines to understand the processes involved in the quantification of policies and measures and also any specific M&E sector guidelines (Volumes 2–5) relevant to each individual assessment. Users should follow the guidance provided in these guidelines to plan the steps, responsibilities and resources needed to meet their objectives for assessing GHG and non-GHG impacts of policies and strategies in advance. Users should also prioritise some steps and processes involved in their assessment, based on the time and human resources required to implement this guidance, in order to carry out their impact assessment successfully. Users should note that each individual assessment depends on a variety of factors, such as the complexity of the policy being assessed, the intended audiences, the extent of data collection needed and whether relevant data has already been collected, and the desired level of accuracy and completeness needed to meet the objectives of the assessment. Hence these guidelines should inform users on how best to plan their assessment based on these factors and the special needs of each assessment.

ASSESSMENT STEPS

The content of these guidelines is organised according to the steps a user follows in accounting for and reporting changes in GHG emissions from any given policy or action. Depending on when the assessment is undertaken and applied, certain sections can be skipped.

Users can follow the guidance and steps below (Table 2) to undertake the assessment of any policy or strategy of interest. Detailed description of the tasks and activities under each step are provided in the sections below.

Table 2: Summary of steps in using the guidelines for policies, strategies and laws. (Source: Adapted from WRI Policy and Action Standard)

Overall Steps	Detailed steps	Section
 **Define policy/ strategy to be assessed**	Define objectives of assessing the effects of policies and identify target audience (Why is the assessment being conducted?)	2.1
	Select policy or group of policies to be assessed	2.2
	Define the policy or action to be assessed	2.3
	Apply criteria to determine whether to assess an individual policy/action or a package of policies/actions	2.4
	Choose ex-ante or ex-post assessment	2.5
 **Identify potential GHG Effects & indicators and map causal chain**	Identify all potential GHG effects of the policy or action	3.1
	Identify all non-GHG effects/sustainable development benefits	3.2
	Characterise all the types of effects	3.3
	Identify all source/sink categories and greenhouse gases associated with GHG effects	3.4
	Map the causal chain	3.5
 **Define the GHG assessment boundary**	Asses the significance of potential GHG effects	4.1
	Determine which GHG effects, source/sink categories & GHG to include in the assessment boundary	4.2
	Determine the GHG assessment period	4.3
 **Estimate Baseline and policy scenario emissions to estimate impact of policy or action**	Choose the type of baseline comparison method	5.1
	Estimate baseline and policy scenario emissions	5.2
	Deemed estimates method	5.2.1

	Scenario method - Determine most likely baseline scenario - Select desired level of accuracy - Define emissions estimation method(s) and determine parameters to calculate baseline emissions - Estimate baseline scenario emissions for each source/sink category - Estimate policy scenario emissions - Aggregate results across all source/ sink categories and calculate change in GHG emissions	5.2.2
	Comparison group method - Identify policy group and comparison group - Collect data from policy group and comparison group - Estimate emissions from both groups and estimate the GHG effect of the policy or action	5.2.3

 **Monitoring performance over time and tracking M&E indicators**	Define key performance indicators	6.1
	Define parameters needed for ex-post assessment	6.2
	Define the policy monitoring period	6.3
	Create a monitoring plan	6.4
	Monitor parameters over time	6.5

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	Quantitative uncertainty analysis	8.4

 **Verify results**	Verification, QA and QC procedures	9.0

 **Report results**	Methodology used	10.0

2. DEFINE THE ASSESSMENT

This chapter provides guidance on defining the policy or strategy to be assessed. Users need to define the objectives of the assessment and provide details of the target audience. This will assist in understanding the scope of the assessment in terms of required accuracy, the comprehensiveness of information to be collected and an estimate of the time needed to accomplish all the assessment tasks. Determining the target audience is crucial for understanding specific user needs that the assessment should address. Users first need to define and provide a detailed description of the policy or action that will be assessed, decide whether to assess an individual policy or action or a package of related policies or actions, and choose whether to carry out an ex-ante or ex-post assessment. Users can follow the simplified five step process as indicated in Figure 5 below. Sections 2.1 to 2.5 provide a detailed narrative of each task to be undertaken as illustrated in Figure 5.

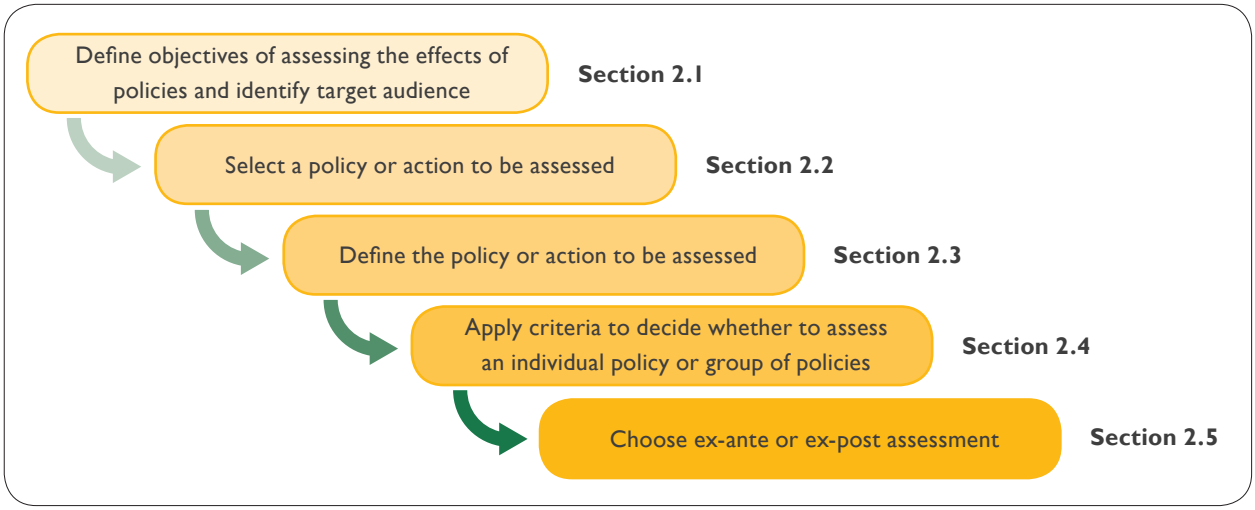


Figure 5: Overview of steps to define policy or action. (Source: WRI Policy and Action Standard)

Checklist of accounting requirements

Section	Accounting requirements
Define the assessment (Section 2)	Clearly define the policy or action (or package of policies/actions) that is to be assessed

2.1 DEFINE OBJECTIVES OF ASSESSING EFFECTS OF POLICIES AND IDENTIFY TARGET AUDIENCE (WHY IS THE ASSESSMENT BEING CONDUCTED?)

Users should start by defining why the impact assessment (GHG effects and non-GHG co-benefit effects) is done (what are the objectives). Defining the objectives will inform the design of the assessment and assist with setting boundaries and identifying data sources and indicators to monitor and so on. Users should also identify the target audience and understand their needs in terms of the assessment. Possible examples of objectives and intended audience are provided in Table 3 below. Users can select from these or define their own objectives for conducting the assessment.

Table 3: Defining objectives for a GHG assessment of policies, some possible examples. (Source: Adapted from WRI Policy and Action Standard)

Before Policy Implementation (Ex-Ante)	During or After Policy Implementation (Ex-Post) [This is the kind of assessment that the Climate Change Response M&E system undertakes]	Intended Audience
1. Choose among policy options based on their expected GHG effects 2. Improve the design of policies by understanding the GHG effects of different design choices 3. Understand potential GHG reductions from policy options to inform GHG reduction goals 4. Report on expected future GHG effects of policies and actions being considered or implemented (for domestic or international purposes) 5. Attract and facilitate financial support for mitigation actions by estimating potential GHG reductions.	1. Understand whether policies and actions are effective in delivering the intended results 2. Inform and improve policy implementation 3. Decide whether to continue with current activities or implement additional policies 4. Learn from experience and share best practices 5. Evaluate the contribution of policies and actions toward broader GHG reduction goals 6. Ensure that policies and actions are cost-effective and that limited resources are invested efficiently 7. Report on the GHG effects of policies and actions over time (for domestic or international purposes) 8. Meet funder requirements to report GHG reductions from mitigation actions	1. Public sector decision-makers 2. Decision-makers, policy design specialists, policy implementers etc. 3. Public sector institutions responsible for policy implementation and review, Policy M&E specialists etc. 4. Decisions-makers, civil society, International climate change community (UNFCCC), etc. 5. Climate finance houses, domestic and international climate change community, government policy implementers, M&E and decision-makers.

2.2 SELECT A POLICY OR ACTION TO BE ASSESSED

After the objectives of the assessment have been defined, the next step is to select a policy to be assessed. Table 4 below presents general types of policies that can be assessed using these guidelines. Additionally, users who wish to use these guidelines to assess other policy-types are encouraged to do so as the approach provided by these guidelines is applicable in wide ranging policy assessment.

Please note: If a modification/amendment of an existing policy is being assessed rather than a new one, it may be defined as either a modification of a part or the whole of the policy, depending on the objectives.

Table 4: Types of policies that can be assessed using this guideline. (Source: Adapted from WRI Policy and Action Standard)

Type of Policy	WRI/IPCC definitions	Examples
Regulations, laws and standards	Regulations or standards that specify reduction technologies (technology standard) or minimum requirements for energy consumption, pollution output, or other activities (performance standard). They typically include penalties for noncompliance.	• The Electricity Regulation Act, 2006 (Act No. 4 of 2006). • National Energy Act, 2008 (Act No. 34 of 2008) – Regulations on mandatory provision of energy data and mandatory development of energy management plans.
Taxes and charges	A levy imposed on each unit of activity by a source, such as a fuel tax, carbon tax, traffic congestion charge, or import or export tax.	• South African Draft Carbon Tax Bill (2016) • Electricity generation tax applied to non-renewable based electricity generation.
Subsidies and incentives	Direct payments, tax reductions, price supports or the equivalent thereof from a government to an entity for implementing a practice or performing a specified action.	• Low income housing subsidy to enable government to incorporate a number of energy efficiency measures contained in SANS 10400-XA in Low-income housing. • Section 12L of the Income Tax Act, 1962 (Act No. 58 of 1962 – Energy Efficiency tax rebate.

Type of Policy	WRI/IPCC definitions	Examples
Voluntary agreements or measures	An agreement, commitment, or measure undertaken voluntarily by public or private sector actors, either unilaterally or jointly in a negotiated agreement. Some voluntary agreements include rewards or penalties associated with participating in the agreement or achieving the commitments.	• Green Economy Accord 2011 • Energy Efficiency Accord 2005
Information instruments	Requirements for public disclosure of information. These include labelling programmes, emissions reporting programmes, rating and certification systems, benchmarking and information or education campaigns aimed at changing behaviour by increasing awareness.	• Department of Energy Efficiency Appliance Labelling Programme • Power Alert residential demand response system
Research, development, and deployment (RD&D) policies	Policies aimed at supporting technological advancement, through direct government funding or investment, or facilitation of investment, in technology research, development, demonstration, and deployment activities.	• Global Change Grand Challenge National Research Plan Department of Science and Technology (DST) • Australian Research Council (ARC) Centre of Excellence for Climate System Science
Public procurement policies	Policies requiring that specific attributes (such as GHG emissions) are considered as part of public procurement processes.	• Policies requiring specific attributes (such as GHG emissions) to be considered as part of public procurement processes. • Department of Public Works (DPW) National Framework for Green Building 2011 and the DPW Green Building Policy
Infrastructure programmes/ Policies	Provision of (or granting a government permit for) infrastructure, such as roads, water, urban services, and high-speed rail.	• Infrastructure Development Act, 2014 (Act No. 23 of 2014). In particular the Strategic Integrated Projects (SIP 8) on Renewable Energy.

Type of Policy	WRI/IPCC definitions	Examples
Climate-Related Policy support	Policy support instruments with explicit reference to climate change mitigation and adaptation.	• National Biofuels Industrial Strategy 2007 • Climate Change Policy Framework for State Owned Companies 2011 • National Biogas Strategy
Energy Policy	Policy support instruments with explicit reference to climate change mitigation and adaptation	• The White Paper on Renewable Energy (2003) • National Energy Efficiency Strategy 2005 (revised in 2013)
Other climate-relevant policies	Other policies not specifically directed at emissions reduction but which may have significant climate-related effects.	• Public Transport Strategy. Supporting the introduction of Mass Rapid Transit (BRT) systems and efficient transport systems, modal shift etc.
Policy Support and Strategic planning, Regulatory Instruments		• Integrated Energy Plan 2010 • Integrated Resource Electricity Plan 2010–2030 (multi-sectoral policy) • Industrial Policy and Action Plan 2015. Enabling and supporting Industry response through the Resource Efficiency programme and Manufacturing Competitive Enhancement Programme, supported by the National Cleaner Production Centre (NCPC).

2.3 DEFINE THE POLICY OR GROUP OF POLICIES TO BE ASSESSED

Once the objectives of conducting the GHG assessment have been defined and the target audience identified users need to clearly describe the policy to be assessed. In order to effectively carry out an impact assessment in subsequent steps, it is necessary to have a detailed understanding and description of the policy being assessed. Table 5 below provides a checklist of information that must be provided when defining the policy to be assessed, this information is contained in the first column of Table 5. Further to this, should users wish to understand how the policy has been implemented over time, namely to track key policy milestones, users may use the WRI Climate Policy Implementation Tracking Framework, which is a policy tool that allows users to track the adoption and implementation of climate change mitigation policies:

http://www.wri.org/publication/climate-policy-implementation-tracking-framework.

Table 5: Information requirements when describing the policy being assessed.

Information required	Explanation	Examples
The title of the policy or action	Policy Title/Name	The White Paper on Renewable Energy (Department of Minerals and Energy 2004)
Type of policy or action	The type of policy must be provided e.g. climate policy, energy policy, non-climate policy, implementation tool/plan etc.	Renewable Energy Policy
Description of specific interventions given rise to by the policy or group of policies.	The specific intervention(s) carried out as part of the policy or action	Introduce 10 000 GWh renewable energy contribution to final energy consumption by 2013 Achieving this target will result in: • Add about 1667 MW new renewable energy capacity, with a net impact on GDP as high as R1.071 billion a year • Create additional government revenue of R299 million • Stimulate additional income that will flow to low-income households by as much as R128 million, creating just over 20 000 new jobs; and • Contribute to water savings of 16.5 million kilolitres, which translates into a R26.6 million saving.

Information required	Explanation	Examples
The status of the policy or group of policies	Is the policy planned, adopted, or implemented	Implemented. One of the programmes implemented under the policy is the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). It has been designed to contribute 3 725 megawatts of energy from Renewable Energy sources and contribute towards socio-economic and environmentally sustainable growth, and to start and stimulate the renewable industry in South Africa.
Financing and costs (if applicable)	Which entity is funding the implementation of the policy and what are the costs of implementing the policy	
The date of implementation	(And completion date if available), if phased approach please indicate, for example, 2015–2020 piloting and testing, 2020–2050 implementation.	2004
Date of completion	If applicable, the date the policy or action ceases, such as the date a tax is no longer levied or the end date of an incentive scheme with a limited duration (not the date that the policy/ action no longer has an impact on GHG emissions)	2013
The implementing entity or entities	Which entity or entities implement(s) the policy or action, including the role of various local, subnational, national, international, or any other entities	Department of Energy (DoE)
The objective(s) of the policy	The intended effects(s) or benefit(s) the policy or action intends to achieve (for example, the purpose stated in the legislation or regulation)	10 000 GWh of energy to be produced from renewable energy sources (mainly from biomass, wind, solar and small-scale hydro) by 2013.

Information required	Explanation	Examples
The geographic coverage	The jurisdiction or geographic area where the policy or action is implemented or enforced, which may be more limited than all the jurisdictions where the policy or action has an impact	National
The primary sectors, sub-sectors, and emission source/sink categories targeted	Which sectors, subsectors, and source/sink categories are targeted, using sectors and subsectors from the most recent IPCC Guidelines for National Greenhouse Gas Inventories or other sector classifications	Energy Sector (IPCC category 1A1a – Main Activity Electricity & Heat Production)
Greenhouse gases targeted (if applicable)	If applicable, which greenhouse gases the policy or action aims to control, which may be more limited than the set of greenhouse gases that the policy or action affects	CO_2, CH_4, N_2O, NO_x
Other related policies (interacting with the policy assessed)	Other policies or actions that may interact with the policy or action assessed	• Integrated Resource Electricity Plan 2010 • National Energy Efficiency Strategy 2005 (revised in 2013) • Renewable energy depreciation allowance (Section 12B of the Income Tax Act, 1962 (Act No. 58 of 1962))
Other optional information	This is information that users may choose to include – which can be found in the reporting template.	

2.4 APPLY CRITERIA TO DECIDE WHETHER TO ASSESS AN INDIVIDUAL OR GROUP OF POLICIES

After selecting and defining the policy, the next step is to decide whether to assess an individual or a package of policies. This decision should be informed by a set of criteria which looks at the objectives, feasibility (of assessing one policy versus a group of policies) and scope of the assessment. In order to be able to apply the criteria for making this decision, users must first identify if there are any interactions between the policy being assessed and other policies and if so also categorise the degree of interaction between the policies being assessed. Users can follow the steps indicated in figure 6 below.

2.4.1 Policy interactions: Identify interaction between policies

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

Policies can either be independent of each other or they can interact with each other. Policies interact if their total impact, when implemented together, differs from the sum of their individual impacts had they been implemented separately. Policies also interact if they affect the same GHG source or carbon pool. For example, national and

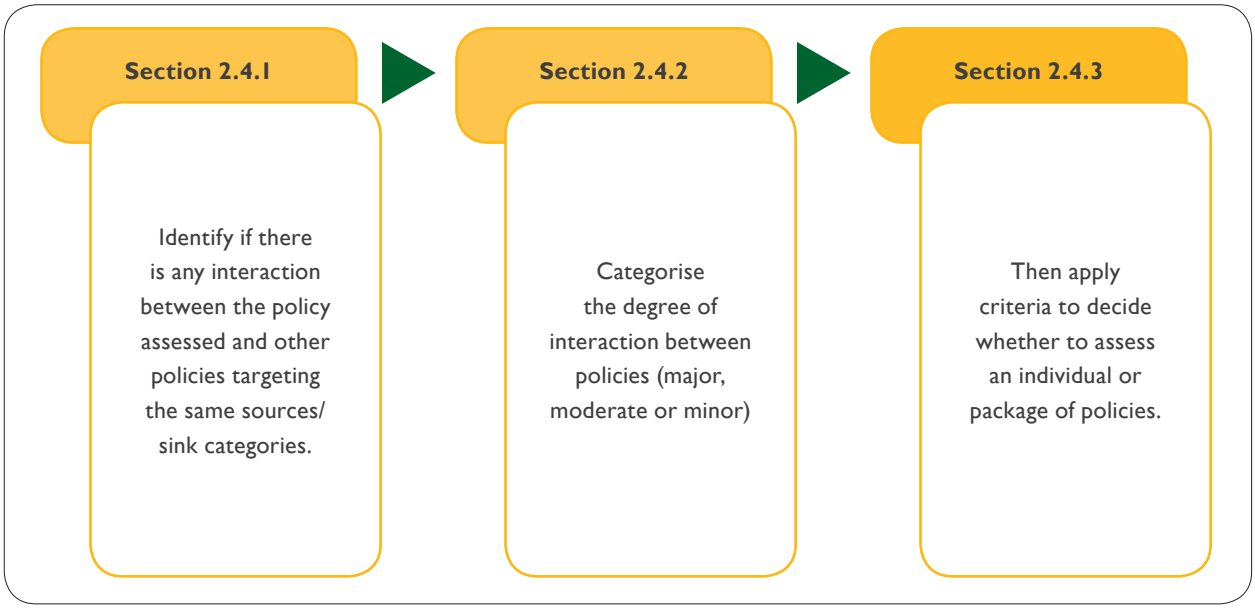


Figure 6: Guidance on process to decide whether to assess an individual policy or package of policies.

provincial policies in the same sector are likely to interact since they are likely to affect the same GHG sources and carbon pools. Two policies implemented at the same level may also interact. Policies do not interact if they do not affect the same GHG sources and carbon pools, either directly or indirectly.

This relationship (interaction) can either be *overlapping*, *reinforcing*, *independent* or *overlapping* and *reinforcing*. These are defined in table 6 below. Figure 7 illustrates how these interactions can take place between policies.

To assess policy interaction users should:

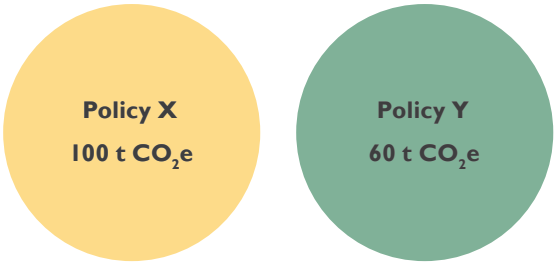
- Identify which sector(s) are affected/targeted by the policy selected for assessment.
- Identify which other policies affect/target the same sources directly or indirectly and how they affect the change in GHG emissions in those sectors.
- Then apply the criteria in table 8 to determine the level and type of interaction

Table 6: Types of relationships (interactions) that may exist between policies. (Source: WRI Policy and Action Standard)

Interaction	Nature of Relationship
Independent	Multiple policies do not interact with each other. The combined effect of implementing the policies together is equal to the sum of the individual effects of implementing them separately.
Overlapping	Multiple policies interact, and the combined effect of implementing the policies together is less than the sum of the individual effects of implementing them separately. This includes policies that have the same or complementary goals (such as national and subnational energy efficiency standards), as well as policies that have different or opposing goals (such as a fuel tax and a fuel subsidy). The latter are sometimes referred to as counteracting policies.
Reinforcing	Multiple policies interact, and the combined effect of implementing the policies together is greater than the sum of the individual effects of implementing them separately.
Overlapping and reinforcing	Multiple policies interact and have both overlapping and reinforcing interactions. The combined effect of implementing the policies together may be greater than or less than the sum of the individual effects of implementing them separately.

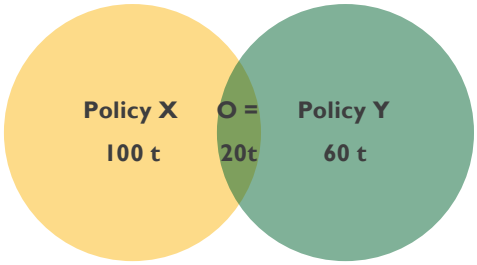
Users should identify if there are any interactions between the policy being assessed and other policies, then characterise this interaction according to Table 6 above. Potentially interacting policies can be identified by identifying activities targeted by the policy, then identifying other policies that target the same activities. Once these are identified, assess the relationship between the policies (independent, overlapping or reinforcing) and the degree of interaction (minor, moderate or major). The assessment of interaction can be based on expert judgment, published studies of similar combinations of policies, or consultations with relevant experts. The assessment should be limited to a preliminary qualitative assessment at this stage.

Independent



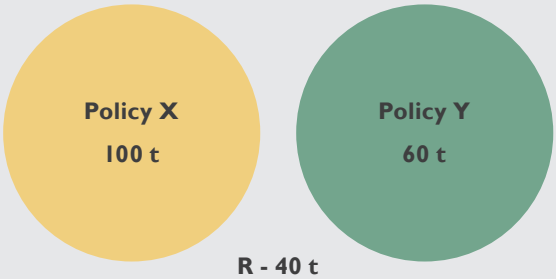
Combined effect - X + Y
Combined effect - 100 + 60 = 160 t CO_2e

Overlapping



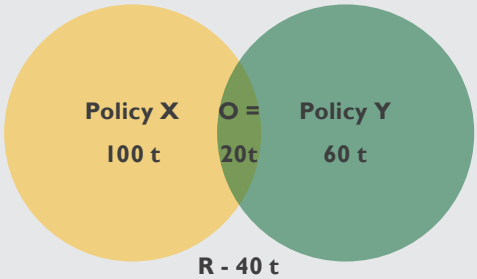
Combined effect < X + Y
Combined effect - 100 + 60 - 20 = 140 t CO_2e

Reinforcing



Combined effect > X + Y
Combined effect - 100 + 60 + 40 = 200 t CO_2e

Overlapping and reinforcing



Combined effect may be > or < X + Y
Combined effect - 100 + 60 - 20 + 40 = 180 t CO_2e

Note: *Effect O represents an overlapping effect. Efect R represents a reinforcing effect.*

Figure 7: Possible policy interactions that can exist between policies. (Source: WRI Policy and Action Standard)

Case Study Example of assessing policy interaction, read together with Figure 7.

A city government implements a subsidy programme for home insulation as well as an information campaign to educate residents on the financial benefits of installing insulation. Both policies are intended to reduce household energy use and emissions. If the subsidy were implemented on its own, 20000 households would install home insulation, reducing emissions by a total of 40000t CO_2e/year (see Scenario A). If the information campaign were implemented on its own, 10000 households would install home insulation, reducing emissions by a total of 20000t CO_2e/year (see Scenario B).

The two policies would be independent if one set of households responds to the subsidy, while a separate set of households responds to the information campaign. In this case, 30000 households would install home insulation and the total GHG reduction from both policies being implemented would be 60000t CO_2e/year (see Scenario C). However, the policies would overlap if some households would install insulation in either scenario (if either the subsidy were in place or if the information campaign were in place). Suppose that 5000 households would install insulation if either one of the policies were in place. In this case, only 25000 households would install home insulation, resulting in total GHG reductions of 50000t CO_2e/year, rather than 60000t CO_2e/year (see Scenario D).

Conversely, the combination of policies may reinforce each other if some households would only install insulation if both the subsidy and the information campaign were in place (rather than either on its own). Suppose an additional 20000 households would respond only to the presence of both policies. In this case, 50000 households would install home insulation (the 20000 households from Scenario A, the 10,000 households in Scenario B, plus an additional 20000 households that would only respond to the presence of both policies), resulting in total GHG reductions of 100000t CO_2e/year (see Scenario E). In practice, there may be both overlapping and reinforcing effects (see Scenario F).

Table 7: Case Study example of assessing policy interaction(s). (Source: WRI Policy and Action Standard)

Scenario	Number of households that install insulation	Total GHG reduction
A. Subsidy alone is introduced	20000	40000 t CO_2e/year
B. Information campaign alone is introduced	10000	20000 t CO_2e/year
C. Independent case: Both the subsidy and information campaign are introduced. Separate sets of households respond to each policy	30000	60000 t CO_2e/year
D. Overlapping case: Both the subsidy and information campaign are introduced. Some households would install insualtion if *either* policy were in place.	25000	50000 t CO_2e/year
E. Reinforcing case: Both the subsidy and information campaign are introduced. Some households would only install insulation if *both* policies were in place.	50000	100000 t CO_2e/year
F. Overlapping and reinforcing cases: Both the subsidy and information campaign are introduced. Some households would install insulation if either policy were in place, while other households would only install insulation if both policies were in place.	45000	90000 t CO_2e/year

2.4.2 Categorise the degree of interaction between policies (major, moderate or minor)

After identifying the type of interaction (namely, independent, overlapping or reinforcing) then:

- Characterise the degree of interaction between the policies being assessed, whether major, moderate or minor. This characterisation should preferably be based on expert judgment, published studies, or a combination of these. This characterisation may not necessarily be quantitative, but can also be qualitative in nature.
- Users can follow Table 8 below as guidance on how to characterise the type and degree of interaction. Users should start by placing the policy being assessed in the 1st column, then in the next column identify which emission sources/sink categories are affected by the policy, in the 3rd column identify what other policies target the same emission sources/sink categories, then characterise the interaction in the 4th column, then the degree of interaction in the 5th column. Table 8 below gives three examples.

Table 8: Examples of identifying policies/actions that target the same emission source and characterising the type and degree of interaction. (Source: Adapted from WRI Policy and Action Standard)

Policy or action assessed	Targeted emission source(s) or sink(s)	Other policies/actions targeting the same source(s) or sink(s)	Type of interaction	Degree of interaction
Example 1: Subsidy for home insulation	Household space heating	Energy tax	Overlapping	Moderate
		Information instruments for example, insulation awareness programme	Reinforcing	Moderate
Example 2: Appliance energy labels	Energy use in refrigerators	Energy efficiency standards	Overlapping	Moderate
		Subsidies for new appliances	Reinforcing	Moderate
Example 3: Fuel economy regulation	Emissions of new car fleet	Fuel taxes	Overlapping	Minor
		Biofuel subsidies	Overlapping	Minor
		Rebates for efficient cars	Overlapping	Minor

Users should note the advantages and disadvantages of assessing the policy individually or as a package. Table 9 below details the advantages and disadvantages of assessing the policy individually or as package.

Table 9: Advantages and disadvantages of assessing individually or as a package. (Source: Adapted from WRI Policy and Action Standard)

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

2.4.3 Apply criteria to determine whether to assess an individual policy/action or a package of policies/actions

Please Note: users should also exercise their own judgment to inform this decision based on the intended objective of the assessment, feasibility and capacity. For example, applying criteria may tell you to assess a package of policies, but it may not be feasible to do this because of lack of human capacity, complexity, timeframes, and issues around data availability. In such cases, users may assess policies individually and acknowledge that aggregation of results across all policies would compromise the accuracy, as significant interactions exist between the policies. Hence the criteria presented below provide some guidance on how users can arrive at such a decision.

Table 10 presents a set of criteria that should be used to inform the decision on whether to assess an individual policy or a package of policies. They include the objectives of the assessment, the significance of interactions between policies and the feasibility of assessing an individual policy or a package of policies. Assessing policy interaction will help users understand how other policies targeting the same sources/sink categories affect the change in GHG emissions and thus what is the total net effect of these other 'interacting' policies when combined.

Table 10: Criteria for determining whether to assess policies/actions individually or as a package. (Source: WRI Policy and Action Standard)

Criteria	Questions	Guidance
Objectives and use of results	Do the end-users of the assessment results want to know the impact of individual policies, for example, to inform choices on which individual policies to implement or continue supporting?	If 'Yes' then undertake an individual assessment
Significant interactions	Are there significant (major or moderate) interactions between the identified policies/actions, either overlapping or reinforcing, that will be difficult to estimate if policies/actions are assessed individually?	If 'Yes' then consider assessing a package of policies/actions
Feasibility	Will the assessment be manageable if a package of policies/actions is assessed? Is data available for the package of policies/actions?	If 'No' then undertake an individual assessment
	For ex-post assessments, is it possible to disaggregate the observed impacts of interacting policies/actions?	If 'No' then consider assessing a package of policies/actions

2.5 CHOOSE EX-ANTE OR EX-POST ASSESSMENT

After defining the policy or action to be assessed, the next sub-step is to choose whether to carry out an ex-ante assessment, an ex-post assessment, or a combined ex-ante and ex-post assessment. Choosing between ex-ante and ex-post assessments depends on the status of the policy or action. If the policy or action is planned or adopted, but not yet implemented, then the assessment will be ex-ante by definition. Alternatively, if the policy has been implemented, then the assessment can be ex-ante, ex- post, or a combination of ex-ante and ex-post. In this case, users would carry out an ex-post assessment if the objective is to estimate the impacts of the policy to date; an ex-ante assessment if the objective is to estimate the expected impacts in the future; or a combined ex-ante and ex-post assessment to estimate both the past and future impacts. An ex-ante assessment can include historical data if the policy is already implemented, but it is still an ex-ante rather than an ex-post assessment if the objective is to estimate future effects of the policy. Figures 8 and 9 provide a schematic presentation of ex-post and ex-ante assessments respectively.

Ex-Ante Assement

Defined as the process of estimating expected future GHG effects of a policy or action.

Ex-post Assessment

Defined as the process of estimating historical GHG effects of a policy or action. This is the type of assessment that is carried out in the national climate change response M&E system.

Combination of Ex-Ante and Ex-post

Looking at what has been achieved and what can be expected in future.

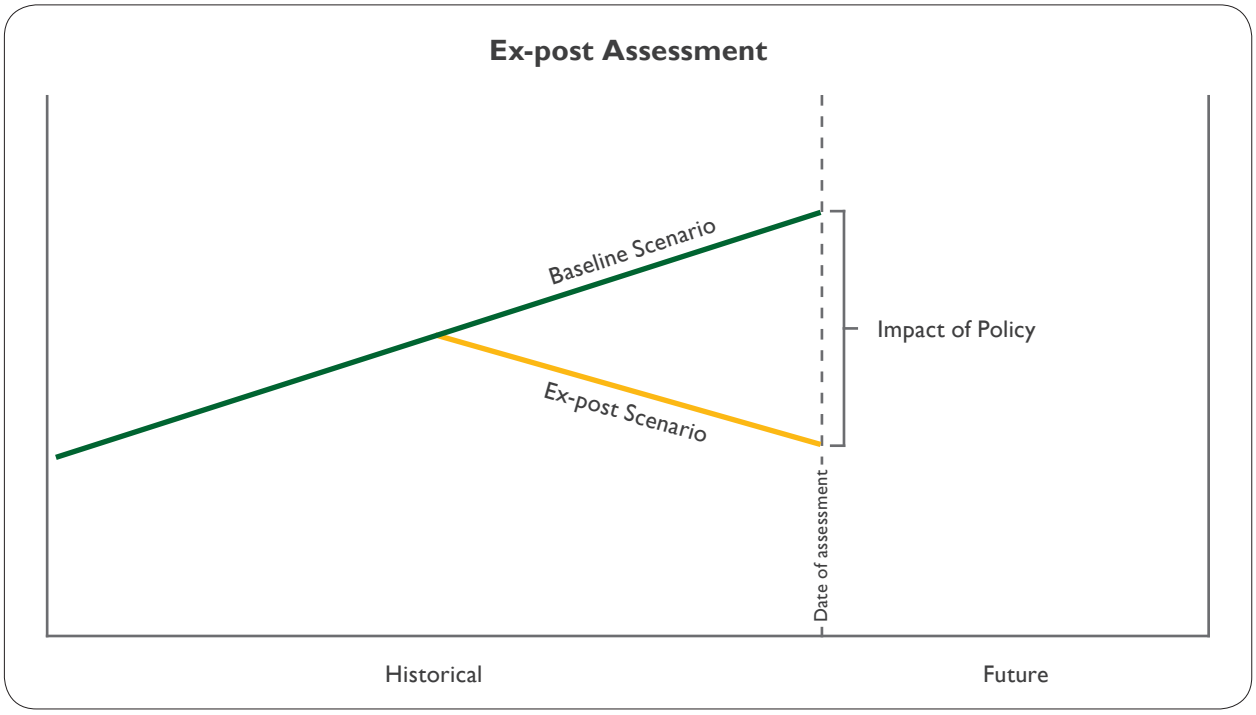


Figure 8: Example of ex-post assessment.

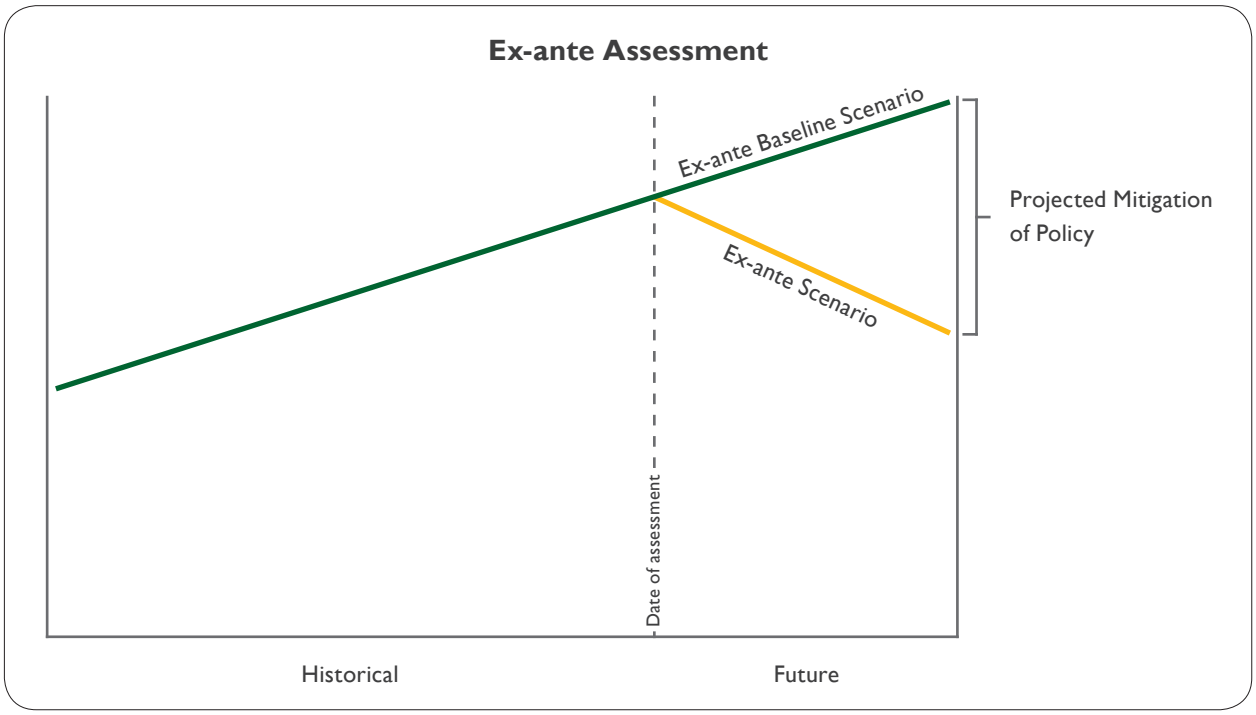


Figure 9: Example of ex-ante assessment.

3. IDENTIFY EFFECTS AND MAP THE CAUSAL CHAIN

In order to estimate the GHG and non-GHG impacts and co-benefits of a policy, it is important to understand how the policy is intended to be implemented and how it will achieve the desired GHG mitigation outcome. Section 3 provides guidance on how to develop a causal chain by considering how the policy will be implemented, what the potential intermediate effects of the policy will be, and how these effects cause GHG impacts. Implicitly, these changes are relative to a baseline scenario. The intermediate effects are mapped in a causal chain to illustrate the logical model for how the policy leads to the intended GHG impacts. The causal chain serves as the basis for defining the GHG assessment boundary.

Figure 10 below provides a five step process for identifying GHG effects and non-GHG effects as well as mapping the causal chain.

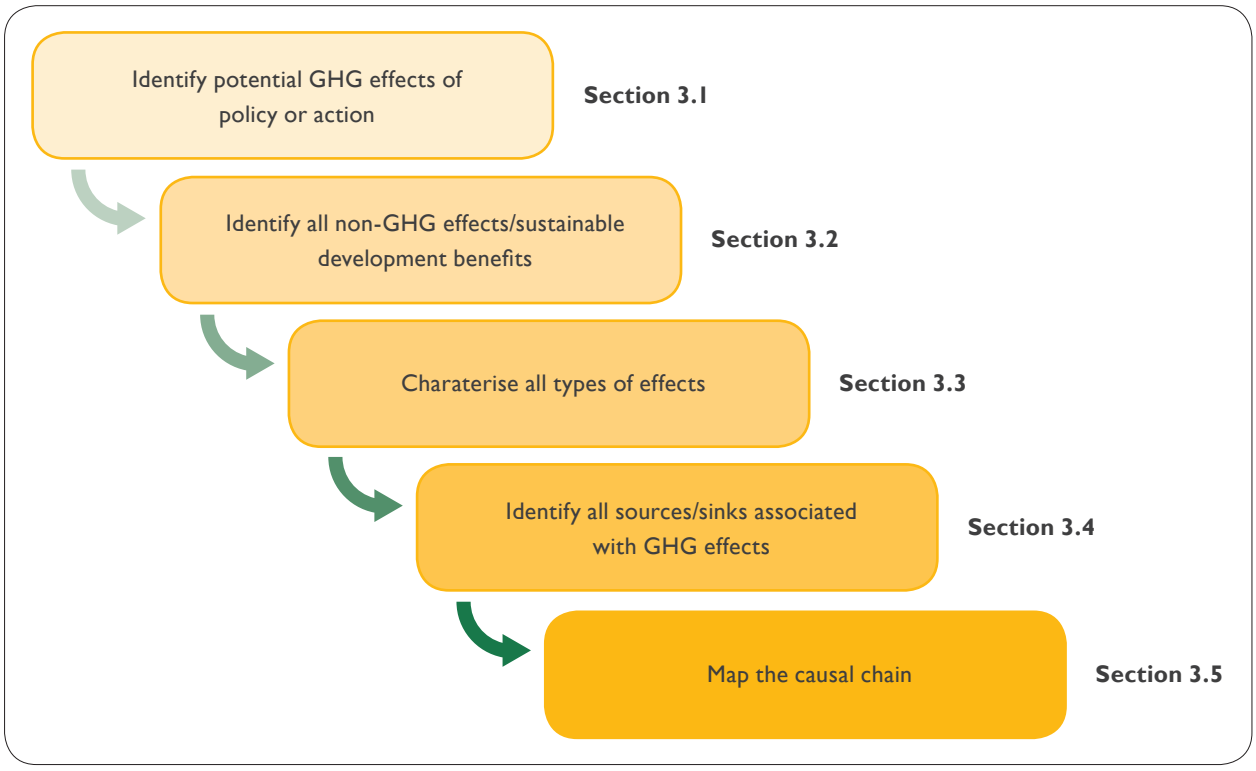


Figure 10: Overview of steps in identifying GHG effects and mapping the causal chain. (Source: WRI Policy and Action Standard)

Checklist of accounting requirements

Section	Accounting requirements
Identify potential GHG effects of policy or action (Section 3.1)	Identify all potential GHG effects of the policy or action
Identify all non-GHG effects/ sustainable development benefits (Section 3.2)	Identify all non-GHG effects/sustainable development benefits
Characterise all types of effects (Section 3.3)	Separately categorize in-jurisdiction effects and out-of-jurisdiction effects, if relevant and feasible
Identify all sources/sinks categories and greenhouse gases associated with the GHG effects (Section 3.4)	Identify all source/sink categories and greenhouse gases associated with GHG effects of the policy or action
Map the causal chain (Section 3.5)	Develop a map of the causal chain

3.1 IDENTIFY POTENTIAL GHG EFFECTS OF THE POLICY OR ACTION

Once you have chosen between an ex-ante or ex-post assessment, the next step is to identify all potential GHG and Non-GHG effects of that policy or group of policies. GHG effects include both increases and decreases in GHG emissions as well as increases and decreases in GHG removals that result from the policy or action. Greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide N_2O), hydrocarbons (HFCs), perfluorinated compounds (PFCs), sulphur hexafluoride (SF_6) and nitrogen difluoride (NF_3). Users shall separately identify and categorise in-jurisdiction effects and out-of-jurisdiction effects, if relevant and feasible.

In order to identify the GHG effects of the policy or action, it is useful to first consider how the policy or action is implemented by identifying the relevant *inputs and activities* associated with implementing the policy or action. Understanding inputs and activities is a means to understanding which effects are expected to occur, since inputs are necessary for activities to occur, and activities are necessary for GHG effects to occur. Users should then identify all intermediate effects of the policy or action that may lead to GHG effects. Users should ensure that less obvious effects, which may be potentially significant, are not omitted from the assessment. Users may also identify relevant non-GHG effects of the policy or action.

Figure 11 aims to show the relationship between inputs, activities, intermediate effects and GHG effects, it aims to capture that inputs such as financial resources and human capital result in activities being implemented, these activities then lead to intermediate effects which ultimately result in GHG and non-GHG effects. Also see table 11 below for definitions and South African policy example to better understand this relationship.

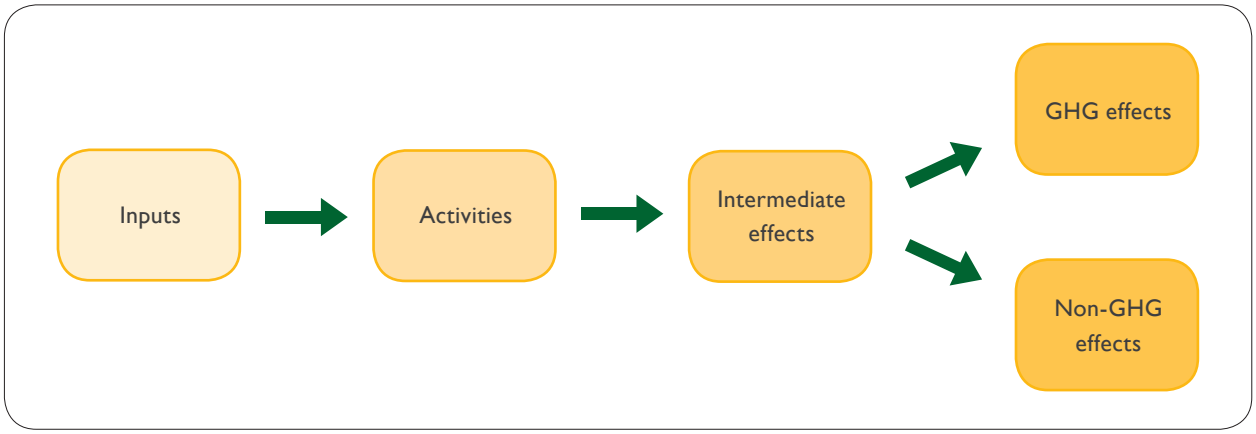


Figure 11: Relationship between inputs, activities, intermediate effects, GHG effects and non-GHG effects. (Source: WRI Policy and Action Standard)

Table 11: Summary of inputs, activities and effects. (Source: Adapted from WRI Policy and Action Standard)

Indicator Types	Definitions	Examples for the Industrial Policy and Action Plan Manufacturing Competitiveness Enhancement Programme (IPAP MCEP)
Inputs	Resources that go into implementing a policy or action, such as financing.	• Financial resources and human capital that went into the development and implementation of the policy and its actions.
Activities	Administrative activities involved in implementing the policy or action (undertaken by the authority or entity that implements the policy or action), such as permitting, licensing, procurement, or compliance and enforcement.	• Energy and resource efficiency audits, baseline determination etc.
Intermediate effects	Changes in behavior, technology, processes, or practices that result from the policy or action.	• Companies taking part in the programme reduce energy and water use, reduce waste production through use of Green Technology and Resource Efficiency Improvement Grant, change behavior by adopting green procurement policies and supply chain processes etc.

Indicator Types	Definitions	Examples for the Industrial Policy and Action Plan Manufacturing Competitiveness Enhancement Programme (IPAP MCEP)
GHG effects	Changes in greenhouse gas emissions by sources or removals by sinks that result from the intermediate effects of the policy or action.	• Reduced, avoided and/or sequestered CO_2, CH_4, and N_2O emissions from reduced electricity and water use. • Reduced, avoided and/or sequestered CH_4 from reduced waste landfill.
Non-GHG effects	Changes in relevant environmental, social, or economic conditions other than GHG emissions or climate change mitigation that result from the policy or action.	• Improved financial sustainability (from cost-saving efficiencies) • Improved air quality. • Protection of water resources (from, for example, reduced effluent discharge). • Jobs (lost/created).

3.1.1 Types of effects

To ensure a complete GHG assessment, it is important to identify as many potential GHG effects as possible. Many effects of the policy may not be immediately apparent, and many GHG effects (whether GHG increasing or GHG decreasing) may be far removed from the direct or immediate effects of the policy or action. Policies and actions can lead to effects beyond the sector or country where they are implemented, to a variety of unexpected or unintended consequences, and to long-lasting impacts. For example, the climate change policy framework for state owned enterprises may have indirect effects such as influencing procurement processes of its service providers and industry partners in manners that support mitigation goals; research, development and deployment (RD&D) policies may result in continued technological development over a long time period. Hence below are a list of guiding examples that allow a user to consider both direct and some of the more indirect effects of policies. When conducting an assessment the following types of effects should be considered

- **In- jurisdiction and out- of- jurisdiction effects:** These are effects that occur inside the geopolitical boundary where the implementing entity has authority such as a city, provincial or national boundary as well as effects that occur outside a geopolitical boundary (out of jurisdiction effects are sometimes referred to as spill-over effects or multiplier effects if they reduce emissions outside the jurisdiction boundary and leakage if they increase emissions outside the jurisdiction boundary or targeted sectors).
- **Short-, medium- and long-term effects:** these are planning horizons and include short- medium- and longer-term effects based on the amount of time between implementation of the policy and when the effects are realised. Short-term is five years from date of publication of policy/implementation; medium-term is twenty years and longer-term extends to 2050.
- **Intended and unintended effects:** based on the original objectives of a policy or group of policies, intended effects will be those that are aligned and

achieve the original objectives. Unintended effects may include a variety of effects including:

- The rebound effect: these effects are associated with marginal increases in energy-using activities or behaviour resulting from energy efficiency improvements. For example the Manufacturing Competitiveness Enhancement Programme, through resource efficiency improvements, may lead to more financial resources for participating companies which could in turn lead to companies increasing their energy intensive operations or activities that are energy intensive (namely, more production/manufacturing of goods) which can increase GHG emissions.

- **Likely, possible, and unlikely effects:** All potential effects regardless of how likely they are to occur.
- **GHG increasing and decreasing effects:** Effects that both increase and decrease GHG emissions from sources and removals of GHGs by sinks.

It should be noted that unintended effects could lead to increases or decreases in emissions and these need to be properly accounted for.

Table 12: Illustrative example of various effects for a low income housing subsidy.

(The subsidy has been increased from R75 000 to R110 000 which is enabling government to incorporate a number of energy efficiency measures contained in the South African National Standard (SANS) 10400-XA energy usage in buildings regulations in low-income housing (SABS 2011))

Indicator Types	Definitions
Intended effect	Reduction in residential energy use from thermal insulation, solar water heating, energy efficient lighting etc.
Unintended effects	Consumers have increased disposable income due to energy saving (from use of energy efficient technologies) and this may lead to consumers purchasing other energy intensive technologies.
In-jurisdiction effects	Energy usage in the residential sector for heating, cooling and lighting is reduced. Manufacturers in the country produce and sell more energy efficient technologies and components, which might increase emissions in the manufacturing sector.
Out-of-Jurisdiction effects	Due to South Africa implementing the subsidy, other SADC countries may choose to adopt and implement a similar subsidy programme, leading to reduced, avoided and/or sequestered emissions in these countries (*spillover*). South African manufacturers of energy intensive technologies, might sell these 'old' technologies to Lesotho and Swaziland and other neighbouring countries which may increase emissions in these countries (*leakage*)
Short-term effect	Reduced energy consumption in existing and newly built low-cost/affordable housing.
Long-term effect	Reduced, avoided and/or sequestered emissions from coal mining.
Non-GHG effects	Improved health, creation of green jobs in the manufacturing and production of components, increased disposable income, health benefits etc.

3.1.2 Methods for identifying GHG effects

Various approaches may be used to identify potential policy effects such as the following:

1. Expert judgment
2. Sector- specific guidance or methodologies
3. Literature review of prior assessments of similar policies and circumstances
4. Consultations, surveys, or panels with relevant experts and stakeholders
5. Review of regulations, statutory authorities, development plans, regulatory impact analyses, environmental impact assessments, or economic studies

3.2 IDENTIFY NON-GHG EFFECTS OR SUSTAINABLE DEVELOPMENT IMPACTS

Amongst other key priorities, one of the key imperatives of the country both within the public and private sectors, is to stimulate economic growth and thus create jobs, improve access to basic services and so on, within the limits of the enabling environment. Implementation of climate change policies and other policy instruments targeted to reduce GHG effects, often (in most cases) results in multiple co-benefits or broader sustainable development benefits that are achieved along the policy implementation continuum or process. However, there may be lack of clarity and methodology to account for these broader impacts, particularly climate change adaptation benefits. Users can follow the guidance provided in section 3.2 and the subsequent steps to determine and account for broader sustainable development impacts of policies and actions.

There are a range of sustainable development indicators that include non-GHG co-benefits of a policy other than changes in GHG emissions and include a wide range of social, environmental and economic impacts. This includes a list of other sustainable development impacts that may be relevant depending on the objectives of each individual assessment. In order for users to comprehensively account for these indicators it is recommended to estimate non-GHG effects per action taken as a result of the policy or group of policies. Then to aggregate these at policy-level to determine overall non-GHG co-benefits of the policy. Refer to section 3.2.1 for detailed guidance on how to account for and aggregate these effects. Users need to follow the guidance provided in section 2.2 to identify all non-GHG effects resulting from implementing the policy or group of policies under assessment. Users can follow the process as shown in Figure 12 to identify, characterise, draw up a map of a causal chain and estimate non-GHG effects.

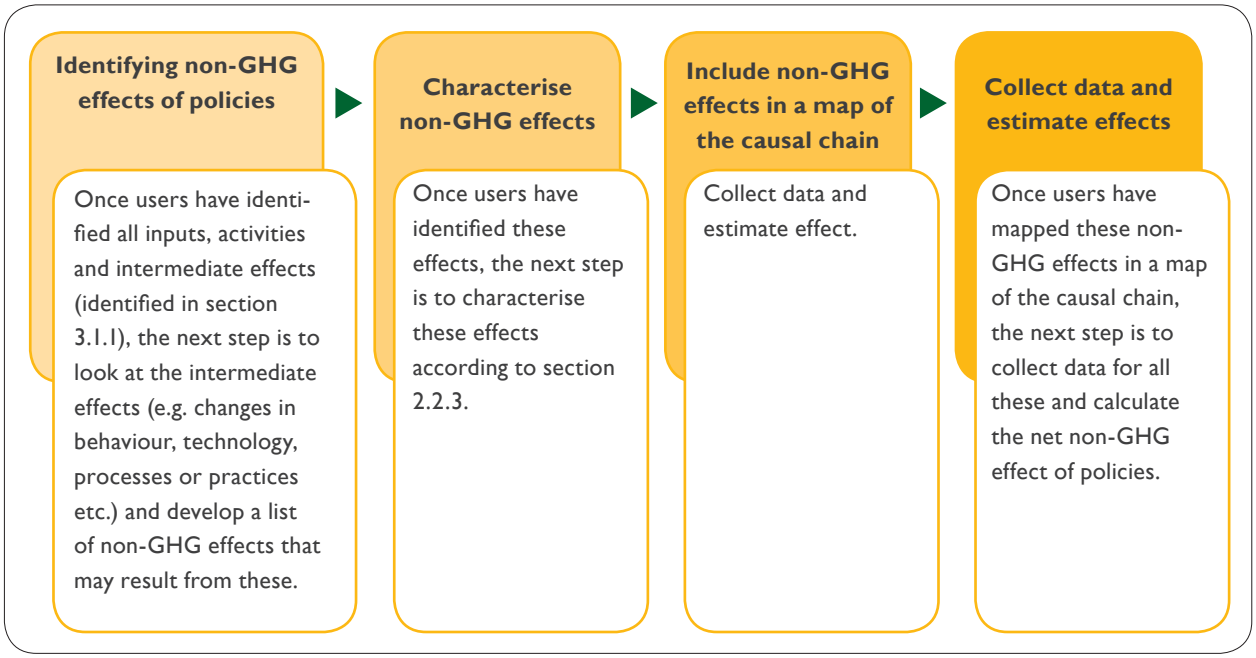


Figure 12: Overview of steps to identify, characterise, map causal chain and estimate non GHG effects.

In order to estimate the non-GHG effects users should draw up a list of all non-GHG effects of the policy or action that are relevant to the assessment, which may include the following sustainable development indicators:

- **Social:**
  - Number of jobs created as a result of implementing the policy or group of policies.
  - The type of jobs created (technical, permanent, labour-intensive, supervisory and so on).
  - Creation of green jobs.
  - Electricity savings (for example, if policy is targeting energy efficiency translating to increased disposable income).
  - Skills developed through training programmes (accredited or non-accredited).
  - Improved health.
  - Climate adaptation benefits.
- **Economic:**
  - Annual cost savings achieved from implementing the policy or group of policies.
  - Increased employment, income or GDP growth.
  - Number of small to medium enterprises developed as part of implementing the policy.
- **Environmental:**
  - Broader environmental benefits relating to improved air or water quality, waste management, biodiversity, ecosystem services and so on.

Users are referred to volumes 2–5 of the M&E guideline series for detailed guidance on data requirements and accounting methods that can be used to estimate these non-GHG effects.

N.B. Boundaries for non-GHG effects: Data collection and accounting of non-GHG effects should be accounted for per response measure/programme under the policy being assessed. In other words, these must be directly linked to the individual projects and programmes under the policy being assessed.

For further guidance on identifying and estimating sustainable development impacts, refer to the *Sustainable Development Guidance* developed by the World Resources Institute and UNEP DTU Partnership under the Initiative for Climate Action Transparency, available at:

http://www.climateactiontransparency.org/wp-content/uploads/2018/05/ICAT-Sustainable-Development-Guidance-May-2018.pdf.

Table 13: Examples of Non-GHG effects that may be considered and included in the assessment. (Source WRI Policy and Action Standard)

Category	Examples of non-GHG effects	
Environmental effects	• Air quality and air pollution (such as particulate matter, ozone, carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen oxides (NO_x), lead, and mercury) • Water quality. water pollution and water scarcity • Ozone depletion • Waste	• Toxic chemical / pollutants • Biodiversity / wildlife loss • Loss or degradation of ecosystem services • Deforestation and forest degradation • Loss of top soil • Loss or degradation of natural resources • Energy use
Social effects	• Public health • Quality of life • Gender equality • Traffic congestion • Road safety • Walkability • Access to energy, thermal comfort, fuel poverty	• Stakeholder participation in policy-making processes
Economic effects	• Employment and job creation • Productivity (such as agricultural yield) • Prices of goods and services (such as decreased energy prices) • Cost savings (such as decreased fuel costs) • Overall economic activity (such as GDP) • Household income • Poverty redution	• New business / investment opportunities • Energy security / independence • Imports and exports • Inflation • Budget surplus / deficit

3.3 IDENTIFY SOURCE/SINK CATEGORIES AND GASES ASSOCIATED WITH GHG EFFECTS

Once users have identified all the potential effects of a policy (namely, inputs, activities, intermediate, GHG and non-GHG effects), the next step is to identify all source/sink categories associated with these effects.

- **Source category:** Sources are processes or activities that release GHGs into the atmosphere.
- **Sink category:** Sinks are processes or activities that increase storage or removals of GHGs from the atmosphere.

Table 14 below provides examples of source and sink categories, their descriptions and types of emitting equipment or entities.

This step is necessary since estimation/accounting of baseline emissions and policy scenario emissions (in Section 3) occurs at the level of individual source/sink categories and greenhouse gases. The IPCC Guidelines for National Greenhouse Gas Inventories provides definitions of source/sink categories that may be used.

Table 14: Examples of Source/Sink categories and Greenhouse gases which may be included in the assessment boundary. (Source: WRI Policy and Action Standard)

Source category	Description	Examples of emitting equipment or entity	Relevant greenhouse gases
Stationary fossil fuel combustion	Combustion of fuels to generate energy	Power plants, industrial facilities, boilers, furnaces, turbines	CO_2, CH_4, N_2O
Mobile fossil fuel combustion	Combustion of fuels	Trucks, trains, airplanes, ships, cars, buses	CO_2, CH_4, N_2O
Cement manufacture	Chemical or physical processes	Industrial facilities	CO_2
Aluminum production	Chemical or physical processes	Industrial facilities	CO_2, PFCs
Natural gas systems	Fugitive emissions from natural gas transmission and distribution systems	Pipelines	CH_4, CO_2
Landfills	Degradation or decomposition of waste	Landfills	CH_4
Electrical transmission and distribution	Fugitive emissions	Electricity T&D systems	SF_6

Source category	Description	Examples of emitting equipment or entity	Relevant greenhouse gases
Refrigeration and air conditioning equipment	Fugitive emissions from equipment	Refrigeration and air conditioning equipment	HFCs
Agricultural soil management	Biological processes, emissions from fertiliser use	Agricultural soils	CO_2, N_2O
Forests and other land use	Forest degradation, deforestation	Forests, vegetation, soils	CO_2, CH_4, N_2O

Sink Category	Description	Examples of emitting equipment or entity	Relevant greenhouse gases
Biological Processes	Removal and storage of CO_2 through photosynthesis	Forests, vegetation, soils, peatlands etc.	CO_2
Carbon capture and storage	Removal and storage of CO_2	Industrial facilities, power plants, geological formations	CO_2

3.4 MAP THE CAUSAL CHAIN

A map of the causal chain forms an integral part of conducting a GHG assessment of policies. A causal chain is a conceptual diagram tracing the process by which the policy or action leads to various cascading effects through a series of interlinked logical and sequential stages of cause and effect relationships. Developing a causal chain is a useful tool to identify, organise, and communicate all potential effects of the policy or actions. Users should develop a causal chain that includes all potential impacts of the policy or action within each impact category included in the assessment.

Users shall develop and report a causal chain for the policy or action assessed, based on the effects identified in and the sources/sinks and greenhouse gases identified in sub-step 3.3. Users assessing a package of policies and actions may either:

- Develop a single causal chain for the package as a whole; or
- Develop separate causal chains for each policy or action included in the package.

Figure 13 below provides a generic example of a causal chain that includes intermediate effects and GHG effects

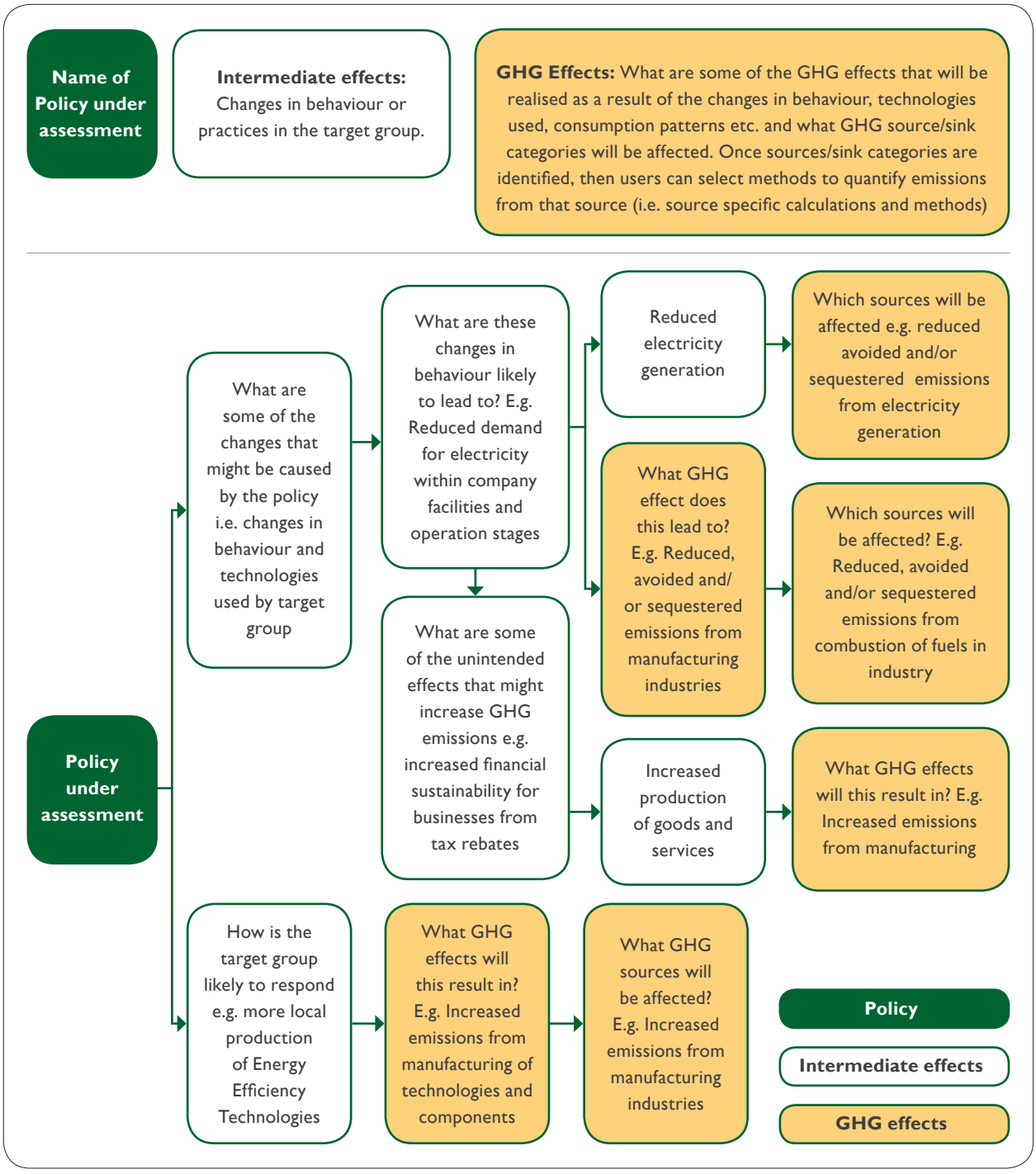


Figure 13: Generic example of mapping GHG effects by stage. (Source: Adapted from WRI Policy and Action Standard)

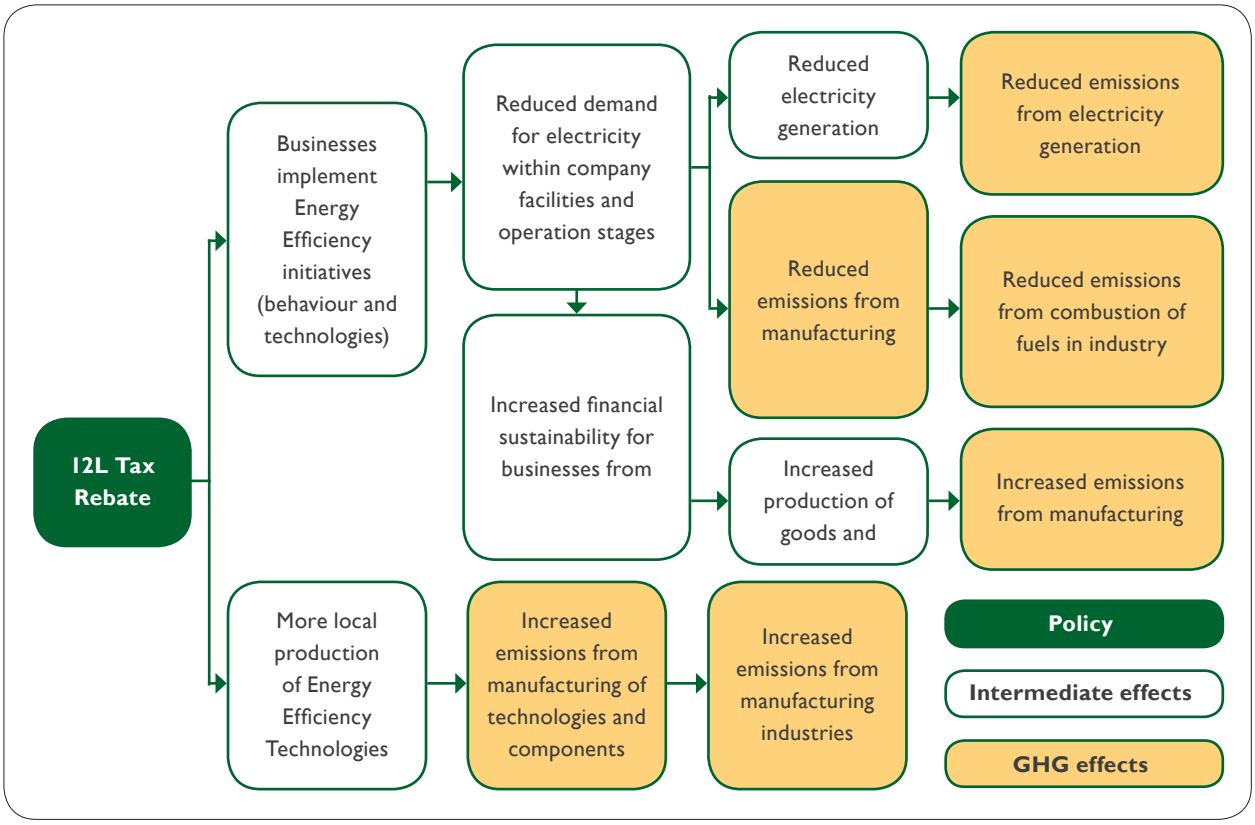


Figure 14: Map of the causal chain for 12L Energy Efficiency Tax incentive.

Users may include inputs and activities in the causal chain as steps toward identification of effects. See Figure 13 for a generic example that includes activities along with intermediate effects and GHG effects. Implicitly, these changes are relative to a baseline scenario that represents the conditions most likely to occur in the absence of the policy or action.

Users may refine the causal chain after clearly defining the baseline scenario. Users may also choose to develop two separate causal chains – one representing the baseline scenario and one representing the policy scenario – rather than a single causal chain representing the policy scenario. The causal chain should be as comprehensive as possible, rather than limited by geographic or temporal boundaries. To make the mapping step more practical, users should only include those branches of the causal chain that are reasonably expected to lead to changes in GHG emissions or removals. See Figure 14 for an illustrative causal chain for the 12L Energy Efficiency tax rebate (Income Tax Act, 1962 (Act No. 58 of 1962)).

After developing a map of the causal chain, the next step is to take all the GHG effects (the green boxes in figure 13) and populate these in a table and identify the following per potential GHG effect identified in the map of the causal chain:

- Affected sources (such as combustion of fuels to generate grid-connected electricity for use in homes)
- Affected sinks (mostly applicable to carbon capture and storage and AFOLU policies)
- Affected gases (namely, CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3)

Table 15 provides an example of this for a hypothetical policy 'a home insulation subsidy policy'. This process helps users to identify the GHG assessment boundary.

Table 15: Example of developing a list of potential GHG effects, affected sources and sinks, and affected greenhouse gases for a home insulation subsidy policy. (Source: WRI Policy and Action Standard)

Potential GHG effect	Affected sources	Affected sinks	Affected greenhouse gases
Reduced, avoided and/or sequestered emissions from electricity generation	Combustion of fuels to generate grid-connected electricity for use in homes	N/A	CO_2, CH_4, N_2O
Reduced , avoided and/or sequestered emissions from coal mining	Coal mines	N/A	CH_4
Reduced, avoided and/or sequestered emissions from natural gas systems (from reduced electricity use)	Natural gas systems	N/A	CO_2, CH_4
Reduced, avoided and/or sequestered emissions from home natural gas use (space heating)	Residential natural gas combustion (space heating)	N/A	CO_2, CH_4, N_2O
Reduced, avoided and/or sequestered emissions from natural gas systems (from reduced natural gas use)	Natural gas systems	N/A	CO_2, CH_4
Increased emissions from manufacturing	Manufacturing processes	N/A	CO_2, CH_4, N_2O
Increased emissions from insulation manufacturing	Insulation manufacturing processes	N/A	CO_2, CH_4, N_2O, HFCs

Summary

In step 3.4 the key output is a list of all the inputs, activities, intermediate effects, potential GHG effects and non-GHG effects.

4. DEFINE THE GHG ASSESSMENT BOUNDARY

Section 4.1 **Assess the significance of potential GHG effects**

Section 4.2 **Determine which GHG effects, source/sink categories and GHGs are included in the GHG assessment boundary**

Section 4.3 **Define the GHG assessment period**

In this section, users define the GHG assessment boundary by determining which potential GHG effects identified in section 3.1 are significant. The GHG assessment boundary defines the scope of the assessment in terms of the range of GHG effects, sources and sinks, and greenhouse gases included in the assessment. This section also defines the GHG assessment period – the time period over which GHG effects resulting from the policy or action are assessed. Figure 15 below provides an overview of steps to be followed for defining the GHG assessment boundary. A comprehensive narrative of the steps follows.

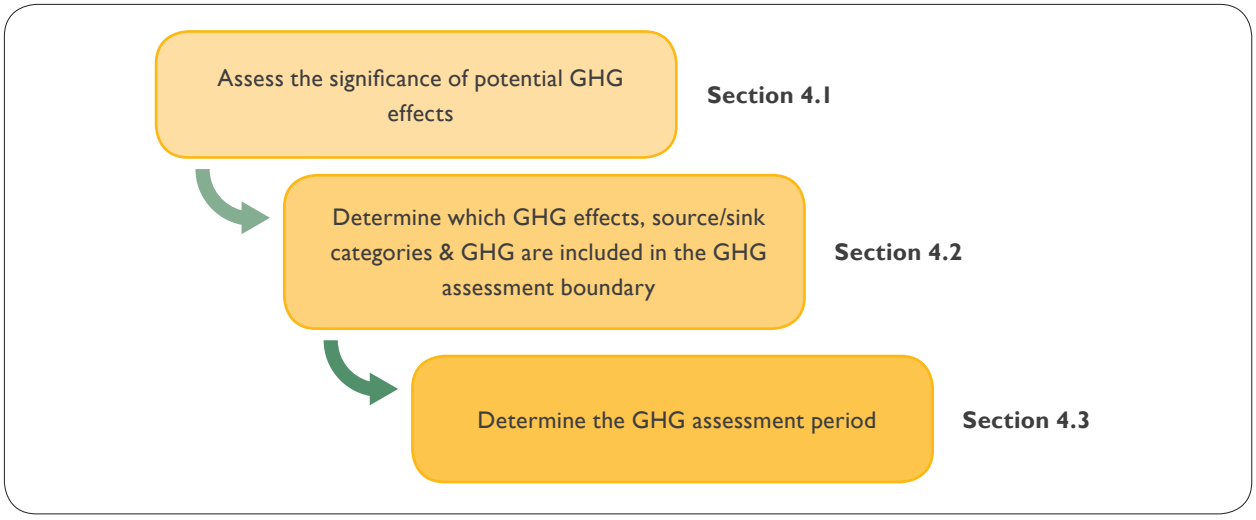


Figure 15: Overview of steps in identifying GHG effects and mapping the causal chain. (Source: WRI Policy and Action Standard)

Checklist of accounting requirements

Section	Accounting requirements
Determine which GHG effects, source/sink categories and greenhouse gases to include in the GHG assessment boundary (Section 4 .1)	Include all significant GHG effects, source/sink categories, and greenhouse gases in the GHG assessment boundary
Define the GHG assessment period (Section 4.3)	Define the GHG assessment period based on the GHG effects included in the GHG assessment boundary

4.1 ASSESS THE SIGNIFICANCE OF GHG EFFECTS

The primary step in defining the GHG assessment boundary is to assess each of the potential GHG effects identified in the causal chain to determine which of these are significant and should be included in the GHG assessment boundary. Any type of effect may be significant, including in-jurisdiction and out-of-jurisdiction effects and short-term and long-term effects. Users should assess the significance of effects based on two elements; the likelihood that each effect will occur (section 4.1.1) and the relative magnitude of each GHG effect (section 4.1.2) as shown on figure 16 below.

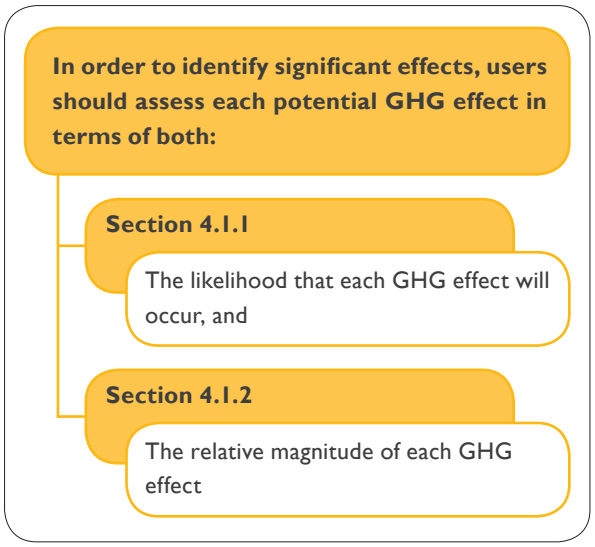


Figure 16: Elements that determine significance of effects for inclusion in the assessment. (Source: WRI Policy and Action Standard)

4.1.1 Estimate the likelihood that each GHG effect will occur

For each potential GHG effect identified and included in the map of the causal chain, users should estimate the likelihood that it will occur by classifying each effect according to the probability provided in Table 16. For ex-

Table 16: Assessing the likelihood of GHG effects. (Source: WRI Policy and Action Standard)

Likelihood	Description
Very likely	Reason to believe the effect will happen (or did happen) as a result of the policy. *(For example, a probability in the range of 90–100%.)*
Likely	Reason to believe the effect will probably happen (or probably happened) as a result of the policy. *(For example, a probability in the range of 66–90%.)*
Possible	Reason to believe the effect may or may not happen (or may or may not have happened) as a result of the policy. About as likely as not. *(For example, a probability in the range of 33–66%.)* Cases where the likelihood is unknown or cannot be determined should be considered possible.
Unlikely	Reason to believe the effect probably will not happen (or probably did not happen) as a result of the policy. *(For example, a probability in the range of 10–33%.)*
Very unlikely	Reason to believe the effect will not happen (or did not happen) as a result of the policy. *(For example, a probability in the range of 0–10%.)*

ante assessments, this involves predicting the likelihood of the effect occurring in the future as a result of the policy or action. For ex-post assessments, this involves assessing the likelihood that the effect occurred in the past as a result of the policy or action. (Certain effects may have occurred during the GHG assessment period for reasons unrelated to the policy or action being assessed.) In cases where the likelihood is unknown or cannot be estimated, the effect should be classified as possible. The likelihood should be based on evidence to the extent possible, such as published literature, prior experience, modelling results, risk management methods, consultation with experts and stakeholders, or other methods. If relevant evidence does not exist, expert judgment should be used.

4.1.2 Estimate the relative magnitude of each GHG effect

Next, users should categorise the relative magnitude of each GHG effect as major, moderate, or minor. This involves approximating the change in GHG emissions and removals resulting from each GHG effect. The relative magnitude of each effect depends on the size of the source/sink category affected and the magnitude of change expected to result from each source/sink category. The size of the source/sink category affected may be estimated based on the GHG inventory of the country. Relative magnitude can also be estimated separately by gas instead of looking at the entire GHG effect.

The relative magnitude of each GHG effect should be estimated based on the absolute value of the total change in GHG emissions and removals associated with the various effects, taking into account both increases and decreases in GHG emissions and removals. Table 17 provides percentage figures as a rule of thumb to help identify whether an effect is major, moderate, or minor. The percentage figures represent the estimated relative magnitude of the GHG effect being considered (in absolute value terms), relative to the estimated total change in GHG emissions and removals resulting from the policy or action (in absolute value terms). Users may choose to use different percentage thresholds than those presented in Table 17.

Table 17: Assessing relative magnitude of GHG effects based on percentage rule of thumb. (Source: WRI Policy and Action Standard)

Relative Magnitude	Description	Approximate relative magnitude (rule of thumb)
Major	The change in GHG emissions or removals is likely to be significant in size.	*More than 10%*
Moderate	The change in GHG emissions or removals could be significant in size.	*1–10%*
Minor	The effect is inconsequential to the effectiveness of the policy or action and the change in GHG emissions or removals is insignificant in size.	*Less than 1%*

4.2 DETERMINE WHICH GHG EFFECTS, SOURCE/ SINK CATEGORIES AND GREENHOUSE GASES TO INCLUDE IN THE GHG ASSESSMENT BOUNDARY

Users shall include all significant GHG effects, source/ sink categories, and greenhouse gases in the GHG assessment boundary. Users may define significance based on the context and objectives of the assessment. In general, users should consider all GHG effects to be significant (and therefore included in the GHG assessment boundary) unless they are estimated to be either minor in size or expected to be unlikely or very unlikely to occur (see table 18 below for guidance). In the diagram below, all GHG effects that fall in the green-shaded area shall be included in the assessment.

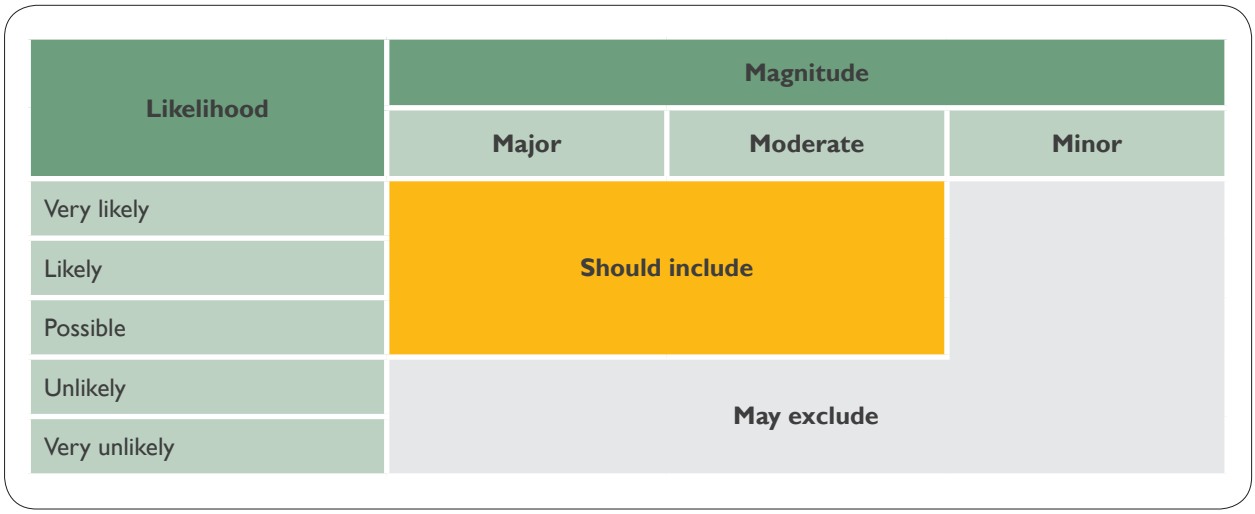


Figure 17: Recommended approach for determining significance based on likelihood and magnitude. If GHG effects, source/sink categories or greenhouse gases fall within the yellow shaded area (this represents significant GHG effects) they should be included in the assessment. (Source: Adapted from WRI Policy and Action Standard)

Table 18: Example of assessing likelihood and relative magnitude separately by gas. (Source: WRI Policy and Action Standard)

GHG effect	Likelihood	Relative Magnitude	Inclusion
Reduced, avoided and/or sequestered emissions from electricity generation			
CO_2	Likely	Major	Included
CH_4	Likely	Major	Included
N_2O	Likely	Minor	Excluded
Reduced, avoided and/or sequestered emissions from coal mining			
CH_4	Possible	Minor	Excluded

GHG effect	Likelihood	Relative Magnitude	Inclusion
Reduced, avoided and/or sequestered emissions from natural gas systems (from reduced electricity use)			
CO_2	Possible	Minor	Excluded
CH_4	Possible	Minor	Excluded
Reduced, avoided and/or sequestered emissions from home natural gas use (space heating)			
CO_2	Very likely	Major	Included
CH_4	Very likely	Minor	Excluded
N_2O	Very likely	Minor	Excluded
Increased emissions from insulation manufacturing			
CO_2	Possible	Moderate	Included
CH_4	Possible	Minor	Excluded
N_2O	Possible	Minor	Excluded
HFCs	Possible	Moderate	Included

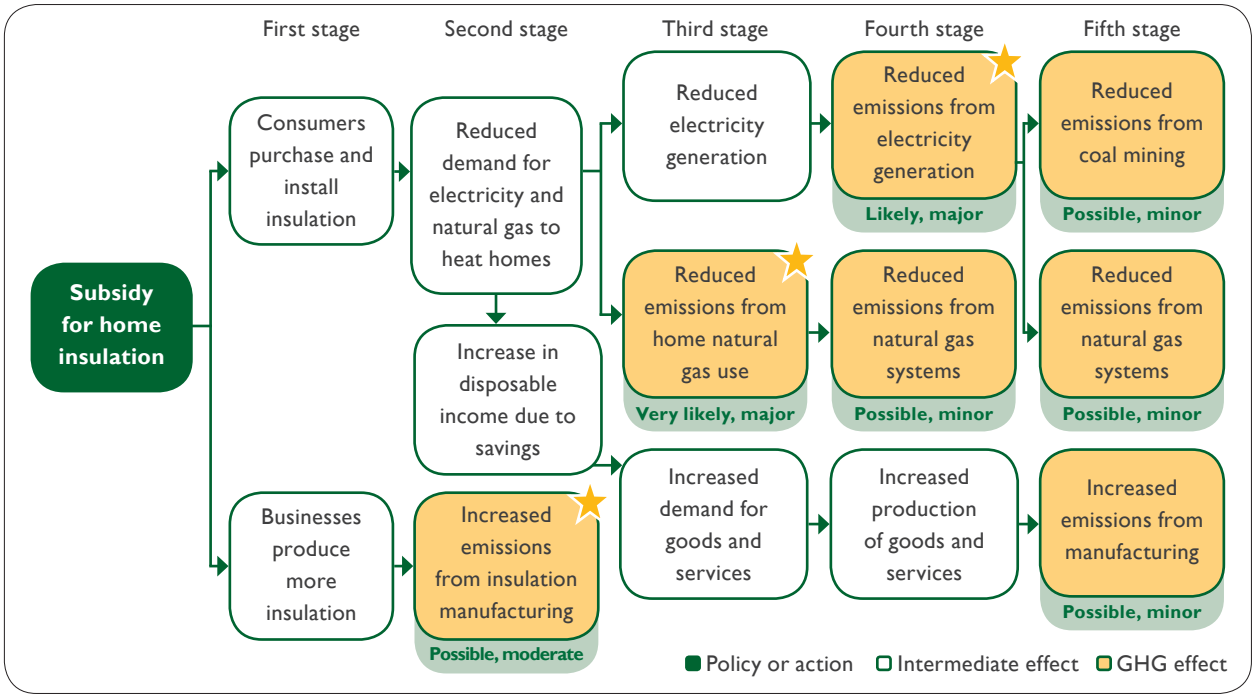


Figure 18: Example of assessing each GHG effect to determine which effects to include in the GHG assessment boundary. The stars indicate those GHG effects included in the GHG assessment boundary based on relative magnitude and likelihood. (Source: WRI Policy and Action Standard)

Table 19: Example of developing a list of GHG effects, source/sink categories, and greenhouse gases included in the GHG assessment boundary. (Source: WRI Policy and Action Standard)

GHG effect included	Sources	Sinks	Greenhouse gases
Reduced, avoided and/or sequestered emissions from electricity generation	Fossil fuel combustion in grid-connected power plants	N/A	CO_2
Reduced, avoided and/or sequestered emissions from home natural gas use (space heating)	Residential natural gas combustion (space heating)	N/A	CO_2
Increased emissions from insulation manufacturing	Insulation manufacturing processes	N/A	CO_2, HFCs

Summary

After all the GHG effects and/or gases (depending on how the rating was done, namely per GHG effect or Gas) have been identified and prioritised based on relative magnitude and likelihood of occurrence, users need to develop a table similar to that presented in table 19 in order to show:

- Which GHG effects are included in the assessment
- Which sources/sink categories are affected by these GHG effects
- And which gases are included in the assessment.

It is recommended that users categorise and indicate the source and sink categories according to the IPCC source codes for ease of reference. These can be found in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006). This will also assist in ensuring that the correct accounting methods are used in the baseline and policy scenario emissions calculations. This can also allow users to identify the relevant baseline data (for example) in the country's GHG inventory.

4.3 DEFINE THE GHG ASSESSMENT PERIOD

The assessment period is the time period over which GHG impacts resulting from the policy are assessed. In the steps outlined above, both short-term and long-term effects are included in the GHG assessment boundary if determined to be significant. Users shall define and report the GHG assessment period based on the time horizon of the GHG effects included in the GHG assessment boundary.

The ex-ante GHG assessment period *(forward- looking)* is determined by the longest-term effect included in the GHG assessment boundary. The GHG assessment period may be longer than the policy implementation period – the time period during which the policy or action is in effect – and should be as comprehensive as possible to capture the full range of significant effects based on when they are expected to occur.

The ex- post GHG assessment period *(backward- looking)* should cover the period between the date the policy or action is implemented and the date of the assessment. The GHG assessment period for a combined ex-ante and ex-post assessment should consist of both an ex-ante GHG assessment period and an ex-post GHG assessment period. In addition, users may separately estimate and report GHG effects over any other time periods that are relevant. For example, if the GHG assessment period is 2015–40, a user may separately estimate and report GHG effects over the periods 2015–20, 2015–30, and 2015–40.

Users can apply the steps outlined from sections 2 to 4 above on tier 3 indicators (response measure level indicators) as they will be monitored annually by the M&E system as well as on sustainable development co-benefit indicators as shown in figure 19.

WHAT IS MONITORED ANNUALLY BY THE M&E SYSTEM?

- **National** GHG emissions trajectory (PPD and INDC tracking)
- Decoupling of emissions from resources consumption & environmental harm
- **Sectoral and company-level** contributions to a lower-carbon economy
- **Provincial and local government** contributions to a lower-carbon economy
- **Individual mitigation projects and programmes (Response measures)** - their cost, outcome, impact on jobs, on climate change and on other sustainable development indicators

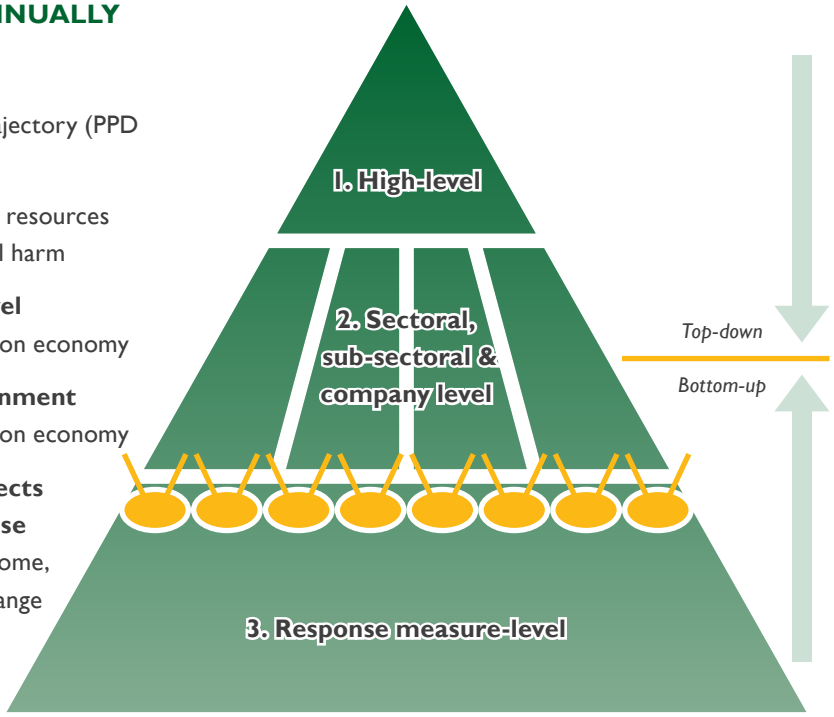


Figure 19: Indicators to be tracked annually by the M&E system. (Source: M&E Framework document, DEA 2015)

5. ESTIMATE BASELINE AND POLICY SCENARIO EMISSIONS TO ESTIMATE THE IMPACT OF THE POLICY OR ACTION

Section 5.1 **Choose type of baseline comparison method**

Section 5.2 **Estimate baseline and policy scenario emissions using deemed estimate method, scenario method or comparison group method**

In the previous sections the main aim was to identify all significant GHG effects, non-GHG effects, policy interactions and to determine a boundary for the assessment of policies. This section looks in detail at the various accounting methods available to estimate GHG and non-GHG effects of policies. It must be reiterated that this guideline does not provide users with detailed equations for doing the calculations but will guide users

Baseline Scenario

- represents the events or conditions most likely to occur in the absence of the policy or action (or package of policies and actions) being assessed

Policy Scenario

- represents the events or conditions most likely to occur in the presence of the policy or action (or package of policies and actions) being assessed

The **baseline scenario** depends on assumptions related to key emissions drivers over the GHG assessment period. Drivers include other policies or actions that have been implemented or adopted, as well as non-policy drivers, such as economic conditions, energy prices, and technological development that will have an influence on emissions other than the policy being assessed.

The most likely **baseline scenario** depends on drivers that would affect emissions in the absence of the policy or action being assessed. Identifying key drivers and determining reasonable assumptions about their "most likely" values in the absence of the policy being assessed have a significant impact on baseline emissions, and consequently on the eventual estimate of the GHG effect of the policy or action.

Choose type of baseline comparison method 5.1

Estimate baseline emissions using;

- deemed estimate method 5.2.1,
- scenario method 5.2.2 or
- comparison group method 5.2.3

Figure 20: Steps to estimate baseline emissions.

on how to calculate emissions from each source/sink category once they have identified the list of GHG effects and affected sources and gases. Users are referred to sector specific guidelines in volumes 2 to 5 of these guidelines to get detailed accounting tools and equations based on the relevant sectors of their assessment.

Estimating the effect of a policy or action requires a reference case, or a baseline scenario, against which GHG effects are estimated as well as the policy scenario emissions. The baseline scenario represents what would have happened in the absence of the policy or action being assessed. The policy scenario, on the other hand, represents the events or conditions most likely to occur in the presence of the policy or action (or package of policies and actions) being assessed. Users should note that properly estimating baseline emissions is a critical step in the assessment since it has a direct and significant impact on the estimated GHG effect of the policy or action. This section guides users on how to estimate baseline and policy scenario emissions for the set of sources and sinks included in the GHG assessment boundary. Users can follow the steps in figure 20 to estimate the baseline emissions.

Checklist of accounting requirements

Section	Accounting requirements
Estimate baseline emissions using the deemed estimate method (Section 3.1)	For users applying the deemed estimate method: • Estimate the number of actions taken under policy/group of policies assessed. • Estimate the change in GHG emissions per action taken. • Multiply to estimate the GHG effect (Using equation 2). • Aggregate GHG effects across source/sink categories to estimate total GHG effect.
Estimate baseline emissions using the scenario method (Section 3.2)	For users applying the scenario method: • Define a baseline scenario that represents the conditions most likely to occur in the absence of the policy or action for each source or sink category included in the GHG assessment boundary. • Estimate the baseline emissions and removals over the GHG assessment period for each source/sink category and greenhouse gas included in the GHG assessment boundary. • Apply global warming potential (GWP) values provided by the IPCC on a 100 year time horizon (Use GWPs from the the Third Assessment Report (TAR) of the IPCC consistent with 2000-2012 & 2000-2015 inventory and use AR4 once the inventory converts to the Fourth Assessment Report (AR4) GWP).
Estimate baseline emissions using the comparison group method (Section 3.3)	For users applying the comparison group method: • Identify the policy group and comparison group. • Third Assessment Report (TAR). • Collect data from the policy group and comparison group. • Estimate emissions from both groups and estimate the GHG effect of the policy or action.

5.1 CHOOSE TYPE OF BASELINE COMPARISON METHOD

There are three methods users can follow to assess mitigation effects of policies and their actions. Estimating the GHG effects of a policy or action ex-post involves a comparison of the outcome of the policy or action with an estimate of what would most likely have happened in the absence of that policy or action. This comparison can be done following one of the three methods mentioned below. Each method is explained in detail in the next sections.

Deemed Estimate Method

Also known as the Deemed Savings method which is the simplest accounting method that users can follow.

Scenario Method

Where users determine a plausible baseline and policy scenario and subtract the two to determine policy effect. It is a comparison of a baseline scenario with a policy scenario for the same group or region.

Comparison Group Method

A comparison of one group or region affected by the policy or action with an equivalent group or region not affected by the policy or action.

Users can follow the decision tree in figure 22 to decide which method to use to estimate baseline emissions values. Users should use the same method chosen to calculate baseline values to determine policy scenario values.

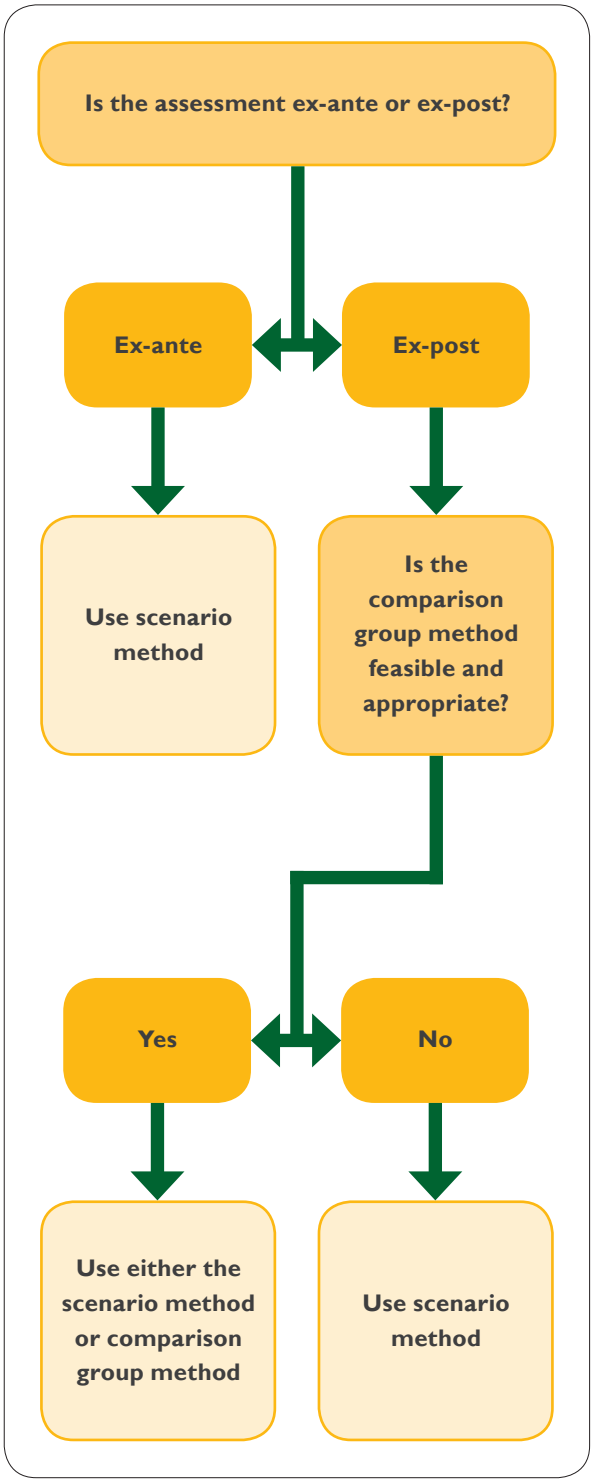


Figure 21: Decision tree to decide on choice of method. (Source: WRI Policy and Action Standard)

5.2 ESTIMATE BASELINE AND POLICY SCENARIO EMISSIONS

5.2.1 Deemed estimates method

In certain cases, users may apply a simplified method to calculate the GHG effects of the policy or group of policies directly, without separately estimating baseline emissions and policy scenario emissions. One example of doing this is the deemed estimates method (also called the 'deemed savings' or 'unit savings' approach), where the change in emissions is estimated directly by collecting data on the number of actions taken as a result of the policy (such as the number of buildings that install insulation) and applying default values that represent the estimated change in GHG emissions or other relevant parameters per action taken, relative to a baseline (such as the average reduction in energy use per building that installs insulation relative to buildings without insulation or relative to buildings with a different type of insulation) (WRI 2014: 76). See figure 22 below for an overview of steps in carrying out the deemed estimates method.

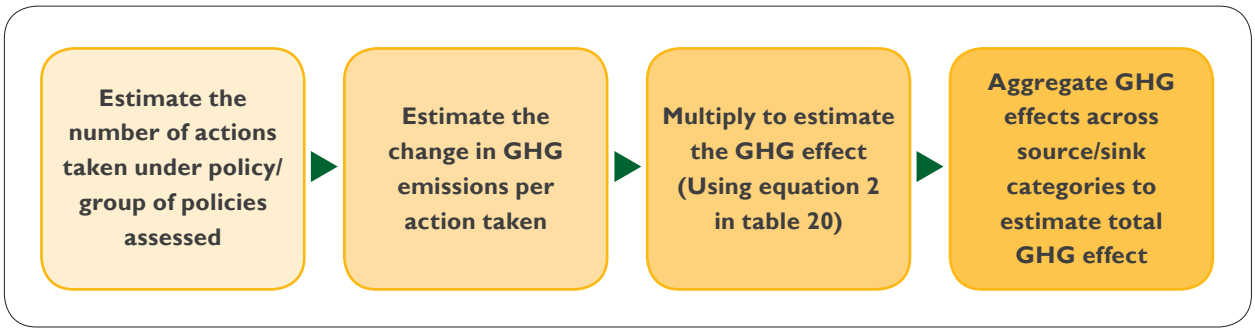


Figure 22: Steps in carrying out the Deemed Estimates Method. (Source Adapted from WRI Policy and Action Standard)

Table 20: Deemed Estimates Method – data and methodology.

Estimating Emissions using the Deemed Estimates Method	Accounting information requirements (Data and methods)
Estimate the number of actions taken/implemented as a result of a policy or group of policies	Number of actions taken as a result of implementing the policy that have an impact on GHG emissions (e.g. number of buildings that install insulation).
Estimate change in GHG emissions per action taken	Net GHG effects per action taken as a result of implementing the policy, quantified with guidance from this guideline.
Baseline emissions	For the Deemed Estimates Method, baseline emissions are based on potential effects per action taken: for example, for an insulation policy/programme the baseline would be: • Average reduction in energy use per building that installs insulation relative to buildings without insulation or relative to buildings with a different type of insulation

Baseline emissions *(continued)*	For a renewable energy (RE) installation programme in buildings/facilities, the baseline would be based on potential energy reduction per building that installs RE technology relative to facilities/buildings that operate on Eskom generated electricity.	
Multiply to estimate GHG effect using equation 2	Using **Equation 2**: Δ GHG emissions = $\sum_i Ni \times (Pi\text{-}Bi)$ Where: N - number of actions taken as a result of the policy per type i P - policy scenario emissions and removals for each affected unit, source, or sink B - baseline emissions and removals for each affected unit, source, or sink.	Using Equation 2 users shall estimate GHG effects per action taken. The M&E series volumes provide detailed guidance on estimating both baseline and the mitigation action GHG effects. These individual effects are then aggregated to estimate the policy effect. Data may also be sourced from previous literature about the number of actions taken and applying the default values for the estimated changes in GHG emissions or other relevant parameters per action taken.
Aggregate GHG effects across source/sink categories to estimate total GHG effect		

In order to estimate baseline emissions and removals using Equation 2, users should define the most likely baseline scenario by considering various drivers (both existing policies and non-policy drivers) that would affect emissions in the absence of the policy or action being assessed. The deemed estimates method may be more practical in certain cases – for example, where it is not feasible to estimate separate scenarios, where a lower level of accuracy and completeness is sufficient to meet stated objectives, or for less significant source/sink categories. Users should exercise caution in using the deemed estimates method, since it involves establishing implicit baseline and policy scenario assumptions, which are reflected in the default 'estimated change in GHG emissions per action taken' value. Users should be explicit about baseline scenario and policy scenario assumptions by following all applicable reporting requirements. The primary method outlined below (the scenario method) is the most comprehensive and transparent approach to developing explicit baseline scenario and policy scenario assumptions and hence it is recommended that users consider this as their preferred method in order to warrant credibility of their assessment based on guidance provided by the decision tree in figure 21.

5.2.2 Scenario method

The first step in applying the scenario method is to define the baseline scenario that represents the conditions most likely to occur in the absence of the policy or action for each source or sink category included in the GHG assessment boundary. The scenario method involves a comparison of a baseline scenario with a policy scenario for the same group or region. Users can follow steps below to estimate baseline scenario, policy scenario emissions and to aggregate results across all source/sink categories and ultimately calculate the change in GHG emissions.

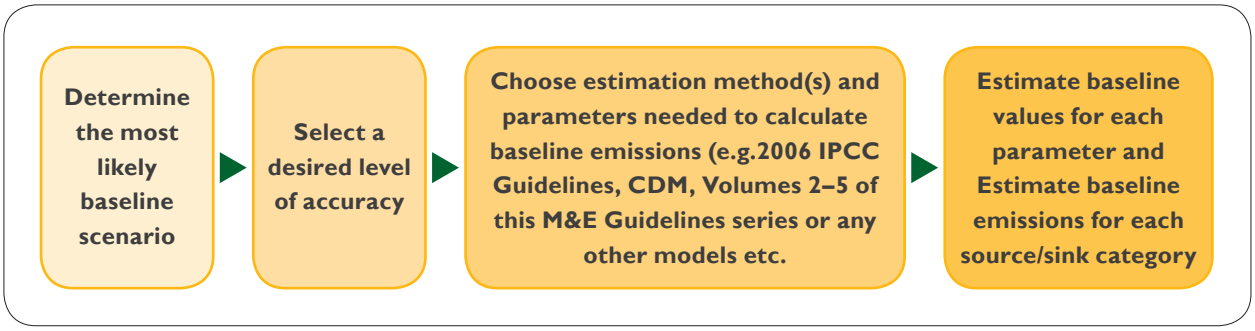


Figure 23: Steps in carrying out the Scenario Method. (Source: Adapted from WRI Policy and Action Standard)

NB

Users should determine the most likely baseline scenario following guidance provided below.

To estimate the change in GHG emissions resulting from a given policy or action using the scenario method, users define two scenarios:

- ***A baseline scenario***, which represents the events or conditions most likely to occur in the absence of the policy or action (or package of policies and actions) being assessed.
- ***A policy scenario*** which represents the events or conditions most likely to occur in the presence of the policy or action (or package of policies and actions) being assessed.

The baseline scenario depends on assumptions related to key emissions drivers over the GHG assessment period. Drivers include other policies or actions that have been implemented or adopted, as well as non-policy drivers, such as economic conditions, energy prices, and technological development that will have an influence on emissions other than the policy being assessed.

- The most likely baseline scenario depends on drivers that would affect emissions in the absence of the policy or action being assessed. Identifying key drivers and determining reasonable assumptions about their 'most likely' values in the absence of the policy being assessed have a significant impact on baseline emissions, and consequently on the eventual estimate of the GHG effect of the policy or action.

General guidance

Key considerations as part of using the scenario method – what drivers to take into account when determining the baseline using the scenario method (drivers that affect emissions).

- **Other policies or actions:** Policies, actions, and projects – other than the policy or action being assessed – that are expected to affect the emissions sources and sinks included in the GHG assessment boundary.
- **Non-policy drivers:** Other conditions such as socioeconomic factors and market forces that are expected to affect the emissions sources and sinks included in the GHG assessment boundary.

Determine the most likely baseline scenario

A list of plausible baseline scenario options should be determined and then choose the option that is considered to be the most likely to occur in the absence of the policy or action. Possible options may include:

- The continuation of current technologies, practices, or conditions.
- Discrete baseline alternatives, practices, technologies, or scenarios (such as the least-cost alternative practice or technology), identified using environmental, financial, economic, or behavioural analysis or modelling.
- A performance standard or benchmark indicative of baseline trends including other policies and actions in the baseline scenario.

Determine which other policies to include in the baseline (apart from the one being assessed)

The baseline scenario should include all other policies, actions, and projects that:

- Have a significant effect on GHG emissions (increasing or decreasing) from the sources or sinks included in the GHG assessment boundary.
- Are implemented or adopted at the time the assessment is carried out (for ex-ante assessment) or are implemented during the GHG assessment period (for ex-post assessment).
- The effects of these other policies on GHG emissions can either be represented as a percentage reduction or increase in GHG baseline values and users shall subtract or add these values in their calculations.
- Some examples of policies and actions to consider per type of policy assessed are presented in table 21.

Determine which non-policy drivers to include in the baseline:

Non-policy drivers include a wide range of exogenous factors that can influence a change in GHG emissions such as socio-economic factors and market forces. Non-policy drivers should be determined based on literature reviews of similar assessment of policies, consultation with relevant experts and stakeholders, expert judgment, modelling results, or other methods. Users should include all non-policy drivers in the baseline scenario that are not caused by the policy or action being assessed (namely, that are exogenous to the assessment), and that are

expected to result in a significant change in calculated emissions between the baseline scenario and policy scenario. In ex-ante assessments, users do not need to include drivers that are expected to remain the same under both the policy scenario and baseline scenario.

A significance threshold or other criteria to determine which non-policy drivers are significant can be used. See table 22 for examples of non-policy drivers which may be considered.

Table 21: Examples of policies and actions that may be included in the baseline scenario interactions. (Source: WRI Policy and Action Standard)

Examples of policies or actions being assessed	Examples of other policies or actions that may be included in the baseline scenario
Renewable portfolio standard	Feed-in tariffs, production tax credits or renewable incentives, renewable energy certificate markets, utility regulations and interconnect fees, rate structures.
Subsidies for public transit	Fuel taxes; tolls on bridges, tunnels, highways
Landfill gas management	Mandatory landfill diversion rates, regulations covering waste combustion, inclusion of landfill gas management activities as offset mechanisms in voluntary or mandatory carbon markets, regulations for landfill gas management
Sustainable agriculture policy	National agricultural policies, conservation programme subsidies
Afforestation / reforestation policy	Voluntary / mandatory carbon markets, forest management policies, land-use policies

Table 22: Examples of Non-Policy drivers which can be included when determining the baseline scenario. (Source: WRI Policy and Action Standard)

Examples of policies or actions	Examples of non-policy drivers
Renewable portfolio standard	Load forecast, fuel prices by fuel type, renewable technology prices, transmission and distribution accessibility, grid storage capacity, biomass supply, population, GDP
Subsidies for public transit	Fuel prices, population, cost of transit alternatives, convenience of transit alternatives, socioeconomic status of commuters, GDP
Landfill gas management	Landfill tipping fees, value of recycled commodities, waste collection and transport cost, availability of land area for new landfill, population, GDP
Sustainable agriculture policy	Agricultural productivity, cropland expansion rate, mixed farming and improved agroforestry practices, fertiliser and seed prices, population, GDP
Afforestation / reforestation policy	Value of forest products (fibre and timber), suitability of lands to support forest growth, demand for production of food, population, GDP

Select desired level of accuracy

Level of accuracy refers to the level of detail contained in the GHG assessment of policies. There is a range of methods available to estimate baseline emissions using the scenario method. The table below provides a range of methodological options, and a choice of accounting method based on the desired level of accuracy, objectives of the assessment and availability of data. The methods suggested below are those suggested by the 2006 IPCC guidelines (IPCC 2006), where a user would use tier 1–3 methods. Differences between the tiers are given in table 23 – where a tier 1 approach uses default international values and takes into account few significant policies and non-policy drivers; down to a tier 3 approach which uses higher accuracy methods based on country/technology-specific values and takes into account all other significant policies and non-policy drives. It is suggested that wherever possible, higher accuracy methods be used.

Table 23 shows the various methods available to estimate GHG effects depending on the desired level of accuracy. As the level of accuracy increases higher tier methods are used and various non-policy and other policy drivers are taken into account in the assessment. Users thus have a choice of methods to use and this choice should be informed by the objectives of the assessment, feasibility, capacity and other key factors and the priorities for each individual assessment.

Table 23: Examples of non-policy drivers which can be included when determining the baseline scenario. (Source: WRI Policy and Action Standard)

Level of accuracy	Emissions estimation method	Other policies or actions included	Non-policy drivers included	Assumption about drivers and parameters	Source of data for drivers and parameters
Lower ↓ **Higher**	Lower accuracy methods (such as Tier 1 methods in the IPCC *Guidelines for National GHG Inventories*)	Few significant policies	Few significant drivers	Most assumed to be static or linear extrapolations of historical trends	International default values
	Intermediate accuracy methods	Most significant policies	Most significant drivers	Combination	National average values
	Higher accuracy methods (such as Tier 3 methods in the IPCC *Guidelines*)	All significant policies	All significant drivers	Most assumed to be dynamic and estimated based on detailed modelling or equations	Jurisdiction- or source-specific data

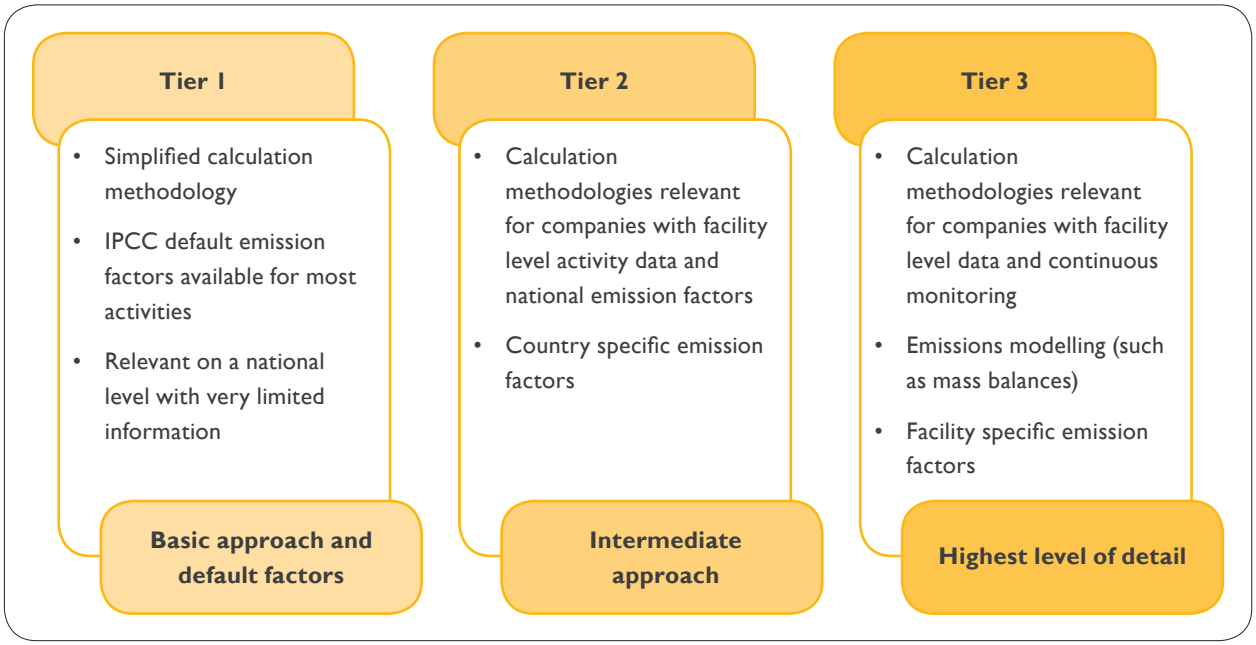


Figure 24: Key differences between the 3 tiers of accuracy, lower, intermediate and higher 1–3. (Source DEA 2017: 24)

Define emissions estimation method(s) and determine parameters needed to calculate baseline emissions

After the desired level of accuracy has been selected, determine the estimation method and the parameters to be used for each source/sink category and greenhouse gas included in the GHG assessment boundary. Users should first identify a method (such as an equation, algorithm, or model) for estimating baseline emissions or removals from that source, then identify the parameters (such as activity data and emission factors) needed to estimate emissions using the method. The method and the parameters used to determine baseline emissions shall be reported.

The typical method of estimating emissions from a source or sink category, whether baseline scenario emissions or policy scenario emissions, is to multiply activity data by an emission factor.

Emissions = activity data x emission factor

Activity data is a quantitative measure of a level of activity that results in GHG emissions. Activity data is multiplied by an emission factor to derive the GHG emissions associated with a process or an operation. An emission factor is a factor that converts activity data into GHG emissions data.

Users should refer to the most recent IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006) for GHG estimation methods and equations for various sectors and sources/sinks. Users should select methods consistent with the desired level of accuracy.

For certain types of policies or actions, simple equations may not be sufficient to represent the complexity necessary to accurately estimate baseline or policy scenario emissions. Detailed modelling approaches may be needed to estimate the effects of certain policies or actions (such as an emissions trading programme). Detailed models may also be appropriate when the emissions estimation method includes multiple interacting parameters.

General Guidance

Users are referred to Volumes 2–5 of the M&E guidelines series to obtain details on how to calculate sector-specific baseline and policy scenario emissions (table 1).

Table 24: Examples of activity data and emission factors. (Source: WRI Policy and Action Standard)

Examples of activity data	Examples of emission factors
Litres of fuel consumed	kg CO_2 emitted per litre of fuel consumed
Kilowatt-hours of electricity consumed	kg CO_2 emitted per kWh of electricity consumed
Kilograms of material consumed	kg PFC emitted per kg of material consumed
Kilometres of distance traveled	t CO_2 emitted per kilometres traveled
Hours of time operated	kg SF_6 emitted per hour of time operated
Square metres of area occupied	g N_2O emitted per square metre of area
Kilograms of waste generated	g CH_4 emitted per kg of waste generated

Once parameters needed to calculate emissions are identified, the next step is to estimate values for each parameter under the baseline scenario – these are most likely values for each parameter if the policy, or actions as a result of the policy, were not implemented over the GHG assessment period.

Estimate baseline scenario emissions for each source/sink category

Table 25: Baseline emissions estimation using the scenario method.

Baseline scenario emissions

Select the most plausible baseline in the absence of the policy or group of policies, either ex-ante or ex-post

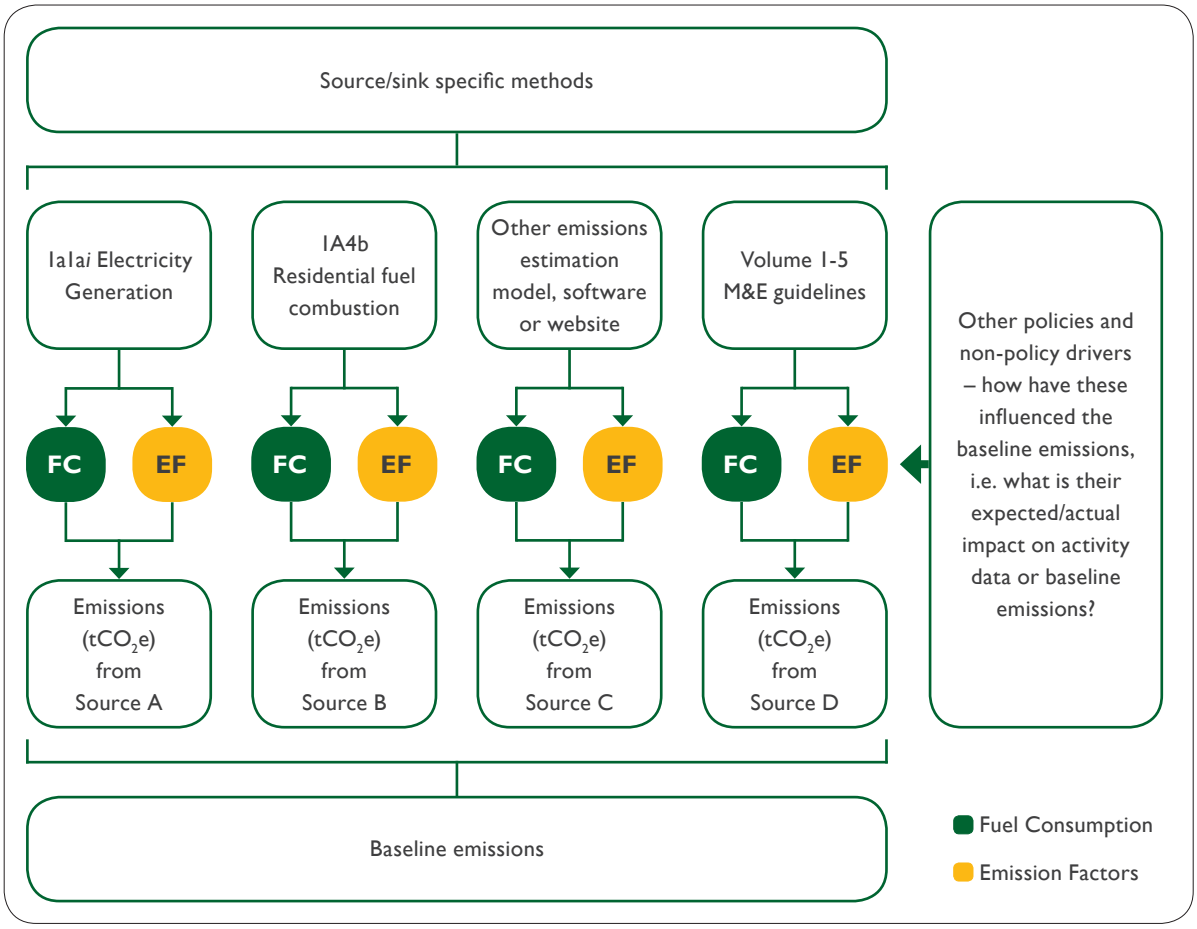


Figure 25: Baseline emissions estimation method. (Source: Adapted from WRI Policy and Action Standard)

Users should choose which methodology (calculation method) to use, and the chosen methodology will determine the required data and parameters to quantify emissions. Users are encouraged to use volumes 2–5 of the M&E guidelines series and Technical Guidelines for Monitoring, Reporting and Verification of Greenhouse Gas Emissions by Industry (DEA 2017).

Data and Parameters	• All significant GHG effects, source/sink categories included in the boundary should be included in the baseline assessment. • The method used in the baseline (namely, IPCC methods, CDM, Volume 2–5 M&E guideline series etc.) should also be used to estimate project scenario emissions. **Parameters used to estimate emissions (Activity Data)** **Emission Factors (EF) used** • Sources shall be characterised based on the IPCC source/sink codes • In certain cases emissions estimation can be more complex and not only require activity data and emission factors, other parameters also may need to be considered depending on the data needs for the source specific calculation/formula. • **Other polices/actions:** Assumptions about how other policies affecting the same source/sink categories will affect each parameter in the baseline emissions. Include these estimates as percentage fractions. • **Non-policy drivers:** For example, in the transport sector NAMA (the Gautrain) one would need to take into account non-policy drivers like fuel prices, population, costs of alternative public transport, GDP etc. into the baseline estimation – and estimate how these drivers are likely to affect the parameters included in the assessment in the **absence** of the policy or group of policies.

Estimate policy scenario emissions

Policy Scenario emissions estimation using the scenario method:
Before proceeding users should identify parameters affected by the policy/group of policies being assessed. In other words which parameters are affected by the policy being assessed: for example, in the waste sector does the policy affect waste generation per capita, the fraction of the population burning waste (no access to formal waste collection services); does the policy being assessed have an influence on emission factors and so on. Users need to identify these parameters and understand how they are affected by the policy being assessed.

For parameters not affected by the policy or action:
For these parameters, the parameter value is not expected to differ between the baseline and policy scenario. The baseline value for that parameter should also be used as the policy scenario value for that parameter. All drivers and assumptions estimated in the baseline scenario should be the same in the policy scenario except for those drivers and assumptions that are affected by the policy or action being assessed.

For parameters affected by the policy or action:
For these parameters, the parameter value is expected to differ between the policy scenario and baseline scenario. Estimate the policy scenario value for each parameter. This requires developing assumptions about how the policy or action is expected to affect each parameter over the GHG assessment period.

Project scenario emissions – the presence of the policy or group of policies (either ex-ante or ex-post) is now taken into account. All policy actions shall be included in the project scenario emissions estimation.

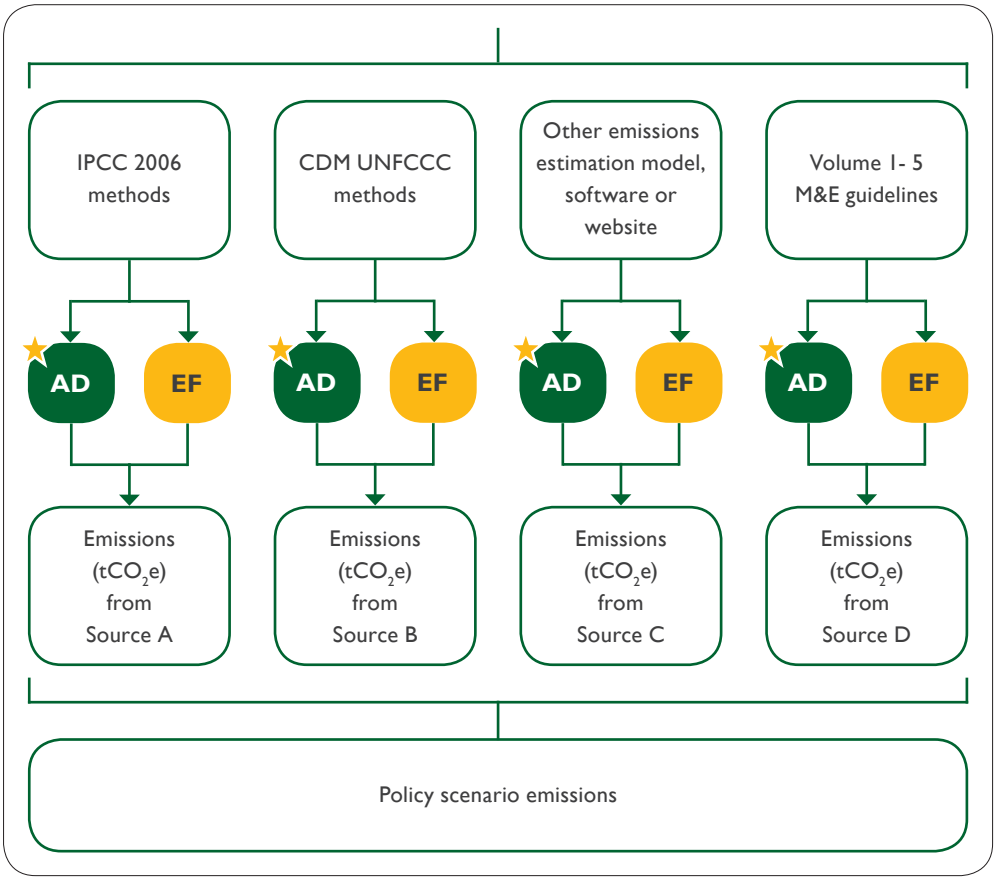


Figure 26: Method for estimating policy scenario emissions and indicating parameters affected by the policy being assessed (A=activity data, EF=emission factors). (Source WRI Policy and Action Standard)

★ The stars indicate those parameters affected by the policy under assessment. For example, those sources not affected by the policy being assessed will remain the same (the same values in the baseline) and these could be emission factors. Parameters affected by the policy, like activity data, will need to be estimated for the policy scenario.

Data and Parameters

- *The same method used in the baseline scenario is followed to estimate policy scenario emissions*
- Define a policy scenario that represents the conditions most likely to occur in the presence of the policy or action for each source or sink category included in the GHG assessment boundary.
- Estimate policy scenario emissions and removals over the GHG assessment period for each source/sink category and greenhouse gas included in the GHG assessment boundary, based on the GHG effects included in the boundary.
- *Apply the same GWP values used to estimate baseline emissions.*

Table 26: Example of reporting parameter values and assumptions used to estimate baseline emissions for a hypothetical home insulation subsidy policy. (Source: WRI Policy and Action Standard)

Para-meter	Baseline value(s) applied over the GHG assessment period	Methodology	Data sources
Natural gas used for space heating	1 000 000 MMBtu/year from 2010–25	Historical data • Average annual natural gas used for space heating over the previous 10 years 1 250 000 MMBtu/year • The trend over the past 10 years has been constant (after normalisation for variation in heating degree days and cooling degree days) rather than increasing or decreasing. Implemented and adopted policies included in the baseline scenario: • Federal energy efficiency standards (expected to reduce natural gas use by 10% in the baseline scenario) • Federal energy tax (expected to reduce natural gas use by 7.5% in the baseline scenario, taking into account overlaps with the federal energy efficiency standards) Non-policy drivers included in the baseline scenario: • Natural gas prices are projected to increase by 20% (expected to reduce natural gas use by 2% in the baseline scenario based on price elasticity of natural gas) • Free rider effect: 10% of households that receive the subsidy are expected to install insulation even if they did not receive the subsidy (expected to reduce natural gas use by 3% in the baseline scenario, given 30% expected reduction in energy use per home insulated)	National energy statistical agency; peer-reviewed literature.
Natural gas emission factor	55 kg CO_2e/MMBtu from 2010–25	Expected to remain constant at historical levels since no policies are implemented or adopted to reduce the GHG intensity of natural gas. Non-policy drivers (such as GDP and energy prices) are not expected to affect this parameter.	National energy statistical agency

Aggregate results across all source/sink categories and calculate change in GHG emissions

After users have estimated baseline emissions for each source/sink category, the next step is to aggregate these emission estimates across all source/sink categories. Use table 27 below as guidance. Following this aggregation, users need to use the equation below to determine total net GHG effect of the policy or group of policies under assessment.

Total net change in GHG emissions resulting from the policy or action (t CO_2e)
=
Total net policy scenario emissions (t CO_2e) – Total net baseline scenario emissions (t CO_2e)

Table 27: Example of calculating and aggregating baseline emissions across all source/sink categories in the home insulation subsidy. (Source: WRI Policy and Action Standard)

GHG effect included	Affected sources	Policy emissions	Baseline emissions	Change
Reduced emissions from electricity use	Fossil fuel combustion in grid-connected power plants	48 000 t CO_2e	50 000 t CO_2e	**-2 000 t CO_2e**
Reduced emissions from home natural gas use	Residential natural gas combustion	16 000 t CO_2e	20 000 t CO_2e	**-4 000 t CO_2e**
Increased emissions from insulation production	Insualtion manufacturing processes	6 000 t CO_2e	5 000 t CO_2e	**+1 000 t CO_2e**
Total emission / Total change in emissions		**70 000 t CO_2e**	**75 000 t CO_2e**	**-5 000 t CO_2e**

Note: *The table provides data for one year in the GHG assessment period.*

What should be reported when using the scenario method?

Users shall report a description of the baseline scenario – a description of the events or conditions most likely to occur in the absence of the policy or action being assessed – and justification for why it is considered to be the most likely scenario.

- A list of policies, actions, and projects included in the baseline scenario
- Disclose and justify any implemented or adopted policies, actions, or projects with a potentially significant effect on GHG emissions that are excluded from the baseline scenario
- If planned policies are included in the baseline scenario, users shall report that the baseline scenario includes planned policies and report which planned policies are included.
- A list of non-policy drivers included in the baseline scenario and disclose and justify any relevant non-policy drivers excluded from the baseline scenario
- Baseline values for key parameters in the baseline and policy scenario estimation method(s)
- The methodology and assumptions used to estimate baseline values for key parameters and whether each parameter is assumed to be static or dynamic (meaning are they constant or do they change over time and how is this change occurring over time (linear or non-linear).
- Assumptions regarding other policies/actions and non-policy drivers that affect the parameter and their respective values.
- All sources of data used for key parameters including activity data, emission factors and assumptions.
- Any potential interactions with other policies, and how these interactions were estimated.
- Report on whether baseline values used are from published data sources OR they were newly developed.

Users can either develop new baseline data and assumptions OR they can use published baseline data and assumptions.

5.2.3 Comparison group method

This method can only be applied to calculate baseline and policy emissions estimated for ex-post assessments. It *cannot* be used for ex-ante assessments because comparative data for the comparison group and the policy group during policy implementation cannot be observed prior to policy implementation.

The comparison group method involves comparing one group or region affected by a policy or action with an equivalent group or region that is not affected by that policy or action. Users following the comparison group method shall identify an equivalent comparison group for each source or sink category in the GHG assessment boundary.

Figure 27: Overview of steps for estimating GHG effects using the comparison group method.

Identify the policy group and comparison group

The first step is to identify the policy group (the group or region affected by the policy) and the comparison group or control group (an equivalent group or region not affected by the policy).

The policy groups and comparison groups may be groups of people, facilities, companies, jurisdictions, sectors, or other relevant groups. The policy group and the comparison group should be equivalent in all respects except for the existence of the policy for the policy group and absence of the policy for the comparison group. The most robust way to ensure two groups are equivalent is to implement a randomised experiment – for example, by randomly assigning one subset of entities to participate in a programme and randomly assigning the other subset to not participate in the programme. To be equivalent means the comparison group should be the same or similar to the policy group in terms of:

- Geography: for example, facilities in the same city, province/municipality, or country.
- Time: for example, facilities built within the same time period.
- Technology: for example, facilities using the same technology.
- Other policies or actions: for example, facilities subject to the same set of policies and regulations, except for the policy or action being assessed.
- Non-policy drivers: for example, facilities subject to the same external trends, such as the same changes in economic activity, population, climate, and energy prices

When identifying a potential comparison group, users should collect data from both the policy group and the comparison group before the policy or action is implemented to determine whether the groups are equivalent. Users should ensure that the entities in the comparison group are not directly or indirectly affected by the policy. If the groups are similar but not equivalent, statistical methods can be used to control for certain factors that differ between the groups (described further below). If the groups are not sufficiently equivalent, the comparison group method will yield misleading results, so users should follow the scenario method instead.

Collect data from the policy group and the comparison group

Collect data from both the policy group and the comparison group for all the parameters (such as activity data and emission factors) included in the emissions estimation methods. Users should collect data from both groups at multiple points in time to account for changes in emissions and various drivers that occur over time. At a minimum, users should collect data from both groups before and after the policy or action is implemented (in the policy group), so that the two groups can be compared during

both the pre-policy period and the policy implementation period. Either top-down or bottom-up data may be used. To collect bottom-up data, representative sampling may be used to collect data from a large number of individual sources or facilities. If so, appropriate statistical sampling procedures should be used, and the sample size should be large enough to draw valid statistical conclusions.

Estimate emissions from both groups and estimate the GHG effect of the policy or action

After data are collected, users should estimate baseline emissions (from the comparison group) and policy scenario emissions (from the policy group). In rare cases where the policy group and comparison group are equivalent, the outcomes of each group in terms of emissions over time can be compared directly. A statistical test (such as a t-test) should be employed to ensure that the difference in values cannot be attributed to chance. If the difference between the two groups is statistically significant, the difference can be attributed to the existence of the policy, rather than to other factors. In most cases, differences are expected to exist between the groups. If material differences exist that may affect the outcome, users should use statistical methods to control for variables, other than the policy, that differ between the non-equivalent groups. Such methods are intended to help address the 'selection bias' and isolate the effect of the policy being assessed. See section below for examples of methods that may be used.

Examples of statistical methods that may be used for estimating GHG effects and controlling for factors that differ between groups

- **Regression analysis** involves including data for each relevant driver that may differ between the groups (such as economic activity, population, energy prices, and climate) as explanatory variables in a regression model, as well as proxies for other relevant policies that may differ between the two groups (other than the policy being assessed). If the expanded regression model shows a statistically significant effect of the policy being assessed, then the policy can be assumed to have an effect on the policy group, relative to the comparison group.
- **Difference-in-difference methods** compare two groups over two periods of time: a first period in which neither the policy group nor the comparison group implements a given policy and a second period in which the policy group implements the policy while the comparison group does not. This method estimates the difference between the groups prior to policy implementation (A1 - B1 = X); the difference between the two groups after policy implementation (A2 - B2 = Y); and the difference between the two differences (Y- X) as a measure of the change attributable to the policy.
- **Matching methods** are statistical approaches for making two groups (a policy group and a comparison group) more equivalent, when random assignment is not possible.

6. MONITORING PERFORMANCE OVER TIME AND TRACKING M&E INDICATORS

Section 6.1 **Define key performance indicators**
Section 6.2 **Define parameters for ex-post assessment**
Section 6.3 **Define policy monitoring period**
Section 6.4 **Create a monitoring plan**
Section 6.5 **Monitor parameters over time**

This section provides guidance for users who need (i) to monitor the performance of a policy or action during the policy implementation period and (ii) guidance on the analysis of M&E indicators which are to be monitored and reported annually to track transition to a lower carbon economy in line with the National Climate Change Response Policy (DEA 2011). Users who need not monitor performance over time may skip section 6.1. Users who intend to track the M&E indicators for reporting to the M&E system can follow section 6.2 to conduct analysis for tracking the M&E indicators.

.The section provides users with guidance on:

Tracking performance over time (Section 6.1)

Key performance indicators that will be used to track performance of the policy or action over time.

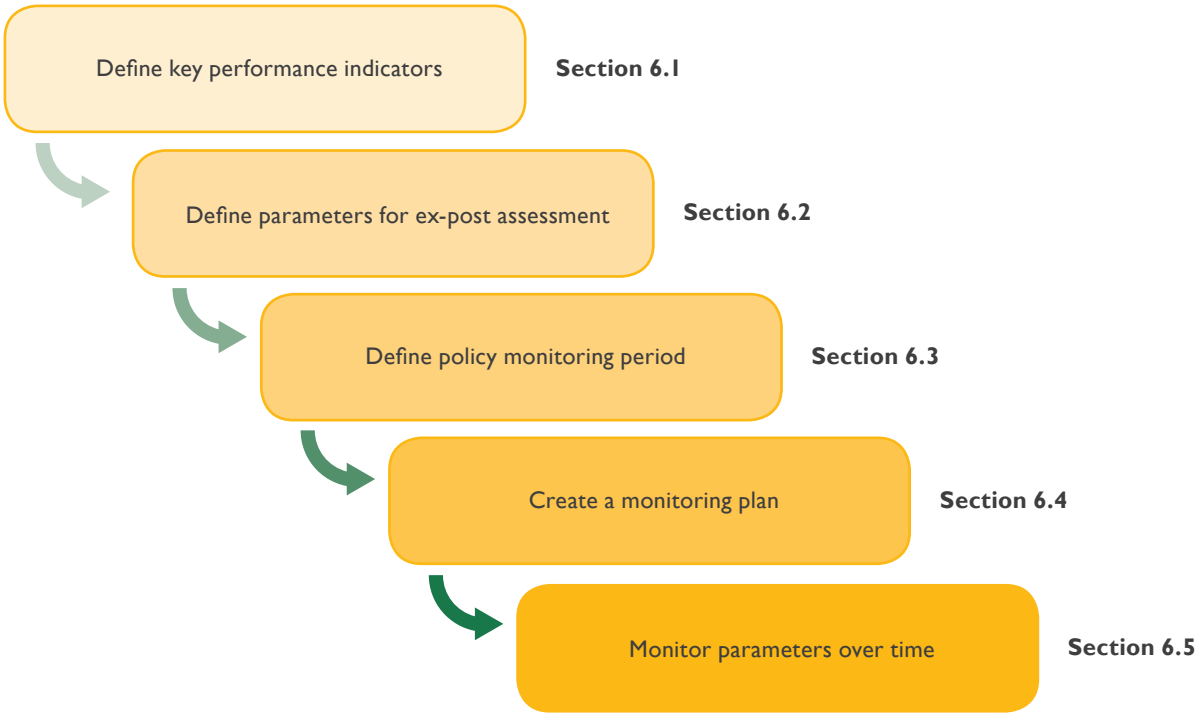
Tracking M&E indicators (Section 6.2)

Key national climate change response M&E indicators to be tracked and reported annually.

Section 6.1 is relevant to users that plan to monitor performance over time and/or estimate GHG effects ex-post. Users that choose only to estimate GHG effects ex-ante without monitoring performance may skip 6.1 and proceed to section 6.2 for conducting analysis of the key M&E indicators.

Users that monitor performance shall define the key performance indicators that will be used to track performance of the policy or action over time. Where relevant, users should define key performance indicators in terms of the relevant inputs, activities, and intermediate effects associated with the policy or action. Table 28 provides definitions and examples of each type of indicator. Inputs and activities are most relevant for monitoring policy or action implementation, while intermediate effects and non-GHG effects are most relevant for monitoring policy or action effects. Indicators can be either absolute (such as the number of homes insulated) or intensity-based (such as gCO_2e/km). Users may also define indicators to track non-GHG effects.

The selection of the indicators should be tailored to the policy or action in question, based on the type of policy or action, the requirements of stakeholders, the availability of existing data, and the cost of collecting new data.



Checklist of accounting requirements

Section	Accounting requirements
Define key performance indicators	Define the key performance indicators that will be used to track performance of the policy or action over time.
Define parameters for ex-post assessment	For users planning to carry out an ex-post assessment: Define the parameters necessary to estimate ex-post policy scenario emissions and ex-post baseline scenario emissions.
Create a monitoring plan	Create a plan for monitoring key performance indicators (and parameters for ex-post assessment if relevant).
Monitor parameters over time	Monitor each of the parameters over time in accordance with the monitoring plan.

Monitoring performance during the policy implementation period serves two related functions:

- Monitoring policy or action implementation: Monitoring trends in key performance indicators to understand whether the policy or action is on track and being implemented as planned
- Monitoring GHG effects: Collect data needed for ex-post assessment of GHG effects

Users may monitor data to fulfil one or both functions, depending on individual objectives. Key performance indicators are metrics that demonstrate changes in the targeted outcomes of the policy or action. Parameter is a broader term meaning any type of data (such as activity data or emission factors) needed to estimate emissions. In general, key performance indicators are a subset of parameters. Monitoring key performance indicators is generally less onerous than estimating GHG effects and is useful as a relatively low-cost way of understanding policy effectiveness by tracking trends in key indicators (which indicates policy effectiveness), but is not sufficient to prove or estimate policy effectiveness. Where progress is not on track, monitoring can inform any necessary corrective action. To estimate GHG effects ex-post, users need to collect data on a broader range of parameters, which should be monitored during the policy implementation period.

6.1 DEFINE KEY PERFORMANCE INDICATORS

Users that monitor performance **shall** define the key performance indicators that will be used to track performance of the policy or action over time. Where relevant, users should define indicators in terms of the relevant inputs, activities, and intermediate effects associated with the policy or action. Users may also define indicators to track non-GHG effects if relevant. Table 28 provides definitions and examples of each type of indicator. Inputs and activities are most relevant for monitoring policy or action implementation, while intermediate effects and non-GHG effects are most relevant for monitoring policy or action effects.

Users **shall** report the key performance indicators selected and the rationale for their selection. The selection of the indicators should be tailored to the policy or action in question, based on the type of policy or action, the requirements of stakeholders, the availability of existing data, and the cost of collecting new data.

Table 28: Examples of indicator types and inputs.

Indicator types	Definitions	Examples for a home insulation subsidy programme
Inputs	Resources that go into implementing a policy or action. Activities that are involved in implementing the policy or action.	Money spent to implement the subsidy programme

Indicator types	Definitions	Examples for a home insulation subsidy programme
Activities	Administrative activities involved in implementing the policy or action (undertaken by the authority or entity that implements the policy or action), such as permitting, licensing, procurement or compliance and enforcement.	Number of energy audits carried out, total subsidies provided.
Intermediate effects	Changes in behaviour, technology, processes or practices that result from the policy or action.	Amount of insulation purchased and installed by consumers, fraction of homes that have insulation, amount of natural gas and electricity consumed in homes.
GHG effects	Changes in greenhouse gas emissions by sources or removals by sinks that result from the intermediate effects of the policy or action.	Reduced, avoided and/or sequestered CO_2, CH_4, N_2O emissions from reduced natural gas and electricity use.
Non-GHG effects	Changes in relevant environmental, social or economic conditions other than GHG emissions or climate change mitigation that result from the policy or action.	Household disposable income from energy savings.

Table 29: Examples of policies and related activity indicators.

Examples of policies	Examples of activity indicators
Renewable portfolio standard	Quantity of long-term contracts with renewable energy power generators established, number of renewable energy certificates issued.
Fuel economy standard	Number of certificates issued per year, number of vehicle manufacturers from which government collects information on cars.
Subsidy for home insulation	Amount of subsidies issued.
Energy efficiency standards for appliances	Number of appliance standards and reporting templates published, number of appliance manufacturers from which information on sold appliances is collected.
Government buildings retrofit programme	Number of retrofit projects procured.

Table 30: Examples of policies and related intermediate effect indicators.

Examples of policies	Examples of activity indicators
Renewable portfolio standard	Total electricity generation by source (such as wind, solar, coal, natural gas).
Public transit policies	Passenger kilometres travelled by mode (such as subway, bus, train, private car, taxi, bicycle).
Waste management regulation	Tonnes of waste sent to landfills, tonnes of waste sent to recycling facilities, tonnes of waste sent to incineration facilities.
Landfill gas management incentive	Tonnes of methane captured and flared or used.
Sustainable agriculture policies	Soil carbon content, tonnes of synthetic fertilisers applied, crop yields.
Afforestation/reforestation policies	Area of forest replanted by type.
Grants for replacing kerosene lamps with renewable lamps	Number of renewable lamps sold, market share of renewable lamps, volume of kerosene used for domestic lighting.
Subsidy for building retrofits	Number of buildings retrofitted, energy use per building.
Information campaign to encourage home energy conservation	Household energy use.

6.2 DEFINE PARAMETERS NEEDED FOR EX-POST ASSESSMENT

Users planning to carry out an ex-post assessment shall define the parameters necessary to estimate ex-post policy scenario emissions and ex-post baseline scenario emissions. Users should first define the methods needed for ex-post assessment in order to identify the parameters that should be monitored. The selection of methods and identification of data sources is an iterative process, since the availability of data informs the selection of methods, and the selection of methods defines the data that need to be collected. There may be overlap between parameters needed for ex-post assessment and intermediate effects indicators used for monitoring performance.

If relevant, users should monitor the parameters in the ex-ante baseline estimation methods, including data related to other policies and actions and non-policy drivers, to determine the extent to which the original assumptions in the baseline scenario remain valid or need to be recalculated. The parameters needed for ex-post assessment vary by type of policy or action and sector. See table 31.

Bottom-up and top-down data

Both bottom-up and top-down data may be used, and either may be most appropriate depending on the type of policy or action, sector, quantification methods used, and data availability. Bottom-up data may be most appropriate for sectors with a relatively small, finite set of emitting sources (such as power generation or cement production), where bottom-up data collection at the facility level is feasible. Top-down data may be most appropriate for sectors with a large number of diffuse emitting sources, where bottom-up data collection is not feasible or where top-down data are more accurate and complete.

Table 31: Examples of policies and parameters to be monitored.

Examples of policies	Selected examples of parameters to be monitored
Energy efficiency programme in the commercial building sector	• Electricity use • Emissions from grid electricity for the sector • Gross floor area of building units
Solar power incentives	• Solar panels produced each year • Capacity of solar power installed • Electricity generated from solar power
Electric vehicle subsidy	• Number of electric vehicles (quarterly) • Passenger figures (monthly) • Vehicle-kilometres travelled (monthly)
Emission trading scheme	• Facility-level monitoring of emissions data from covered facilities
Information campaign to encourage energy savings in the residential sector	• Surveys of a representative sample of households to collect data such as; awareness of the campaign, actions taken as a result of the campaign, household size, household income and household energy use over time

Table 32: Examples of bottom-up and top-down data.

Sector	Examples of bottom-up data	Examples of top-down data
Transportation	• Distance travelled (vehicle-kilometres travelled) by transport mode and vehicle type • Percentage of trips taken every year by each mode of transportation, length of each trip by mode, number of trips taken by mode per year • Examples of data sources: annual household surveys and/or transportation models	• Total fuel sold in a city by fuel type • Examples of data sources: city statistics
Waste	• Quantity of waste collected by type, quantity of recyclables collected by type, quantity of compost collected, gross quantity of municipal solid waste, waste diversion rate • Examples of data sources: waste management companies (private) or agencies (public)	• Method of disposal (incineration, landfill) • Landfill: tonnage by depth of landfill • Incineration: Incineration rate by type of waste • Location of disposal sites • Examples of data sources: city statistics
Residential and commercial buildings	• Building level energy use by fuel/energy type • Examples of data sources: annual building surveys or reporting requirements	• Aggregate fuel and electricity consumed by buildings in a city, by fuel/energy type • Examples of data sources: city statistics from city utilities or energy agencies

6.3 DEFINE THE POLICY MONITORING PERIOD

The policy implementation period is the time period during which the policy is in effect. The assessment period is the time period over which the GHG impacts resulting from the policy are assessed. The monitoring period is the time period over which the policy is monitored. At minimum the monitoring period should include the policy implementation period. Users can have multiple monitoring periods for separate assessment periods. A monitoring period can also include monitoring of relevant activities prior to implementation of the policy and after the policy implementation period.

6.4 CREATE A MONITORING PLAN

Users planning to monitor performance or carry out an ex-post assessment shall create a plan for monitoring key performance indicators (and parameters for ex-post assessment if relevant). A monitoring plan is important to ensure that the necessary data is collected and analysed. Where possible, users should develop the monitoring plan during the policy design phase (before implementation), rather than after the policy has been designed and implemented.

For each of the parameters, users should describe the following elements in a monitoring plan:

- Measurement or data collection methods and procedures.
- Sources of data (either existing data sources or additional data collected specifically to monitor the indicators).
- Monitoring frequenc.y
- Units of measure.
- Whether the data is measured, modelled, calculated or estimated; the level of uncertainty in any measurements or estimates and how this uncertainty will be accounted for.
- Sampling procedures (if applicable.)
- Whether the data is verified and, if so, verification procedures used.
- Entity(ies) or person(s) responsible for monitoring activities and roles and responsibilities of 35 relevant personnel.
- Competencies required and any training needed to ensure personnel have the necessary skills.
- Methods for generating, storing, collating and reporting data on monitored parameters.
- Databases, tools or software systems to be used for collecting and managing data.
- Procedures for internal auditing, quality assurance (QA) and quality control (QC).
- Record keeping and internal documentation, procedures needed for QA/QC including length of time data will be archived.
- Any other information.

The accuracy of measurement or data collection approaches depends on the instruments used, the quality of data collected, and the rigor of the quality control measures. Users shall report the sources of data.

Measurement or data collection methods

Data may be measured, modelled, calculated, or estimated.

- Measured data refers to direct measurement, such as directly measuring emissions from a smokestack.
- Modelled data refers to data derived from quantitative models, such as models representing emissions processes from landfills or livestock.
- Calculated data refers more specifically to data calculated by multiplying activity data by an emission factor, such as multiplying natural gas consumption data by a natural gas emission factor.
- Estimated data (in the context of monitoring) refers to proxy data or other data sources used in the absence of more accurate or representative data sources.

Frequency of monitoring

Users may monitor indicators at various frequencies, such as monthly, quarterly, or annually. In general, users should collect data with as high a frequency as is feasible and appropriate in the context of objectives. The appropriate frequency of monitoring should be determined based on the needs of decision makers and stakeholders, following the principle of relevance, and may depend on the type of indicators and data availability. For example, data on inputs are typically available immediately following policy implementation. In contrast, data on the outputs and outcomes of the policy or action may not be realised for some time after implementation. It may therefore be necessary to monitor some indicators over different time periods than for others.

6.5 MONITOR PARAMETERS OVERTIME

Users shall monitor each of the parameters over time in accordance with the monitoring plan. Users shall report the performance of the policy or action over time, as measured by the key performance indicators, and whether the performance of the policy or action is on track relative to expectations. If monitoring indicates that the assumptions used in the ex-ante assessment are no longer valid, users should document the differences and take the monitoring results into account when updating the ex-ante estimates or when estimating GHG effects ex-post.

7. TRACKING NATIONAL CLIMATE CHANGE RESPONSE M&E INDICATORS

The National Climate Change Response M&E system identifies three groups of core indicators to be tracked on annual basis (at response measure level) for assessing South Africa's transition to a lower-carbon economy as follows ▶

Table 33 below gives details of the core indicators under each group in relation to climate change policies.

Implementation indicators

Impact indicators

Effectiveness indicators

Table 33: Core indicators to be tracked in the M&E system.

Indicator group	Indicator narrative	Indicator title	Description
Implementation indicators	Indicators of the phases or stages of implementation of the policy/group of policies.	Achieved progress in implementation (which can be tracked using the Climate Policy Implementation Tracking Tool)	Implementation stages or phases as a result of the policy etc. achieved, these can include administrative activities that are implemented to support the policy under assessment, resource allocation, financing etc.
Impact indicators	Indicator of the climate change mitigation impact of the policy/group of policies.	Net GHGs reduced, avoided and/ or sequestered – total net change in GHG emissions resulting from the policy or action (tCO_2e)	Equal total net policy scenario emissions (tCO_2e) minus total net baseline scenario emissions (tCO_2e0).
	Indicators of impact(s) on other relevant sustainable development priorities, including job-creation – also known as co-benefit or co-cost indicators. To be defined together with the owner/implementer.	Jobs created	Number & type of jobs created directly by the response actions.
		Other social, environmental and economic co-benefits	(As appropriately defined)
Effectiveness indicators	Key indicators of the effectiveness of the policy in responding to climate change	Cost-effectiveness	CO_2e / rand
		Job-creation effectiveness (Jobs created per amount spent)	• Number of jobs / CO_2e • Number of jobs / rand

7.1 IMPLEMENTATION INDICATORS

Policy implementation indicators: Input and activity indicators, as described below, provide a more direct picture of how well the policy is being implemented. These indicators have a direct relationship with the policy, which means that a change observed for an indicator is caused by the policy.

Input indicators: Input indicators are based on metrics that can be used to track the delivery of resources to support policy implementation. For example finance, human and organisational resources.

Activity indicators: Activity indicators track activities undertaken by the relevant authority or entity to support policy implementation. For example licensing, permitting, procurement, information monitoring, compliance and enforcement, and other policy administration activities. These indicators are defined by the project owner or implementer themselves. They may include:

- **Stages or phases in the implementation of the policy.** Thus each year the progress from one state/phase of the programme to another will be monitored, for example planned, adopted, implemented and so on.
- **Geographic coverage of the policy:** For example national, provincial, city-wide and so on.
- **Sectors targeted by the policy:** Energy, IPPU, Waste, AFOLU and so on.

7.2 IMPACT INDICATOR

Impact indicators: Intermediate effects and effects indicators are designed to assess the results of the policy. The direct relationship between the policy and changes in these indicators is usually not as straightforward as with input and activity indicators. Depending on the policy being assessed, many other factors may have influenced the observed change in the indicators.

- **Intermediate effects indicators:** This refers to a metric that measures outputs related to inputs and activities for a policy as well as measuring impacts – changes in behaviour, technology, processes or practices and in relevant environmental, social or economic conditions, as a result of the policy being implemented. Changes in indicators related to outputs can be directly observed. For example number of buildings retrofitted, area of agricultural land managed, and tons of compost generated.
- **Effects indicators:** Effects normally directly relate to the objectives of the policy. They include GHG effects (such as reduction, avoided and/or sequestered GHG emissions, and increase in GHG emissions) and non GHG co-benefits. Examples of co-benefits include air or water pollution effects, public health effects, and household income effects (Singh 2014).

7.2.1 Net GHG Impact indicator

Net GHGs reduced, avoided and/or sequestered is the key primary indicator that will be tracked in order to understand how policies, strategies and laws contribute towards climate change mitigation. In order to estimate the GHG effect of a policy or group of policies users need to follow three basic steps (if using the scenario method):

- Define a baseline scenario and estimate baseline scenario emissions (either ex-ante or ex-post).

- Define the policy scenario and estimate policy scenario emissions (either ex-ante or ex-post)
- Subtract baseline scenario emissions from policy scenario emissions to estimate the GHG effect of the policy or group of policies, expressed by equation below :

Total net change in GHG emissions resulting from the policy or action (tCO_2e)
=
Total net policy scenario emissions (tCO_2e) – Total net baseline scenario emissions (tCO_2e)

In carrying out the steps above, there are various issues that need to be considered and detailed guidance is provided on how to include these considerations. These include assessing policy interactions, defining assessment boundary and gases to include, mapping the causal chain, and so on. In assessing net GHGs reduced, avoided and/or sequestered by a policy or group of policies, certain factors need to be considered. Further guidance is provided in the sections to follow.

Summary

In step 7 the key output is a list of all the inputs, activities, intermediate effects, potential GHG effects and Non-GHG effects.

7.3 EFFECTIVENESS INDICATORS

Cost effectiveness

This indicator is expressed as a ratio involving the following two pieces of data:

$$\text{Cost effectivess (in } tCO_2e \text{ per R)} = \frac{\text{Net GHGs reduced by policy (in } tCO_2e\text{)}}{\text{Cost of implementing policy(in rands)}}$$

Where:

- Net GHGs reduced, avoided and/or sequestered = the Net GHGs reduced, avoided and/or sequestered by a particular policy, as determined using the methods in section 5 (this may be on annual basis or over the period under assessment).
- Cost = the cost of implementing the response measure (on annual basis or over the period under assessment).

Job-creation

These are the direct jobs created through implementing the policy or group of policies and include both jobs created or lost as a result of implementing the policy or group of policies:

- The number of jobs created and/or lost through implementing the policy.
- The type of jobs created (for example, temporary, management, technical, and so on).

The two indicators that may be used to assess job-creation effectiveness may be expressed as follows:

$$\text{Job creation effectivess (no of jobs per R)} = \frac{\text{Number of jobs}}{\text{Cost (in rands)}}$$

or

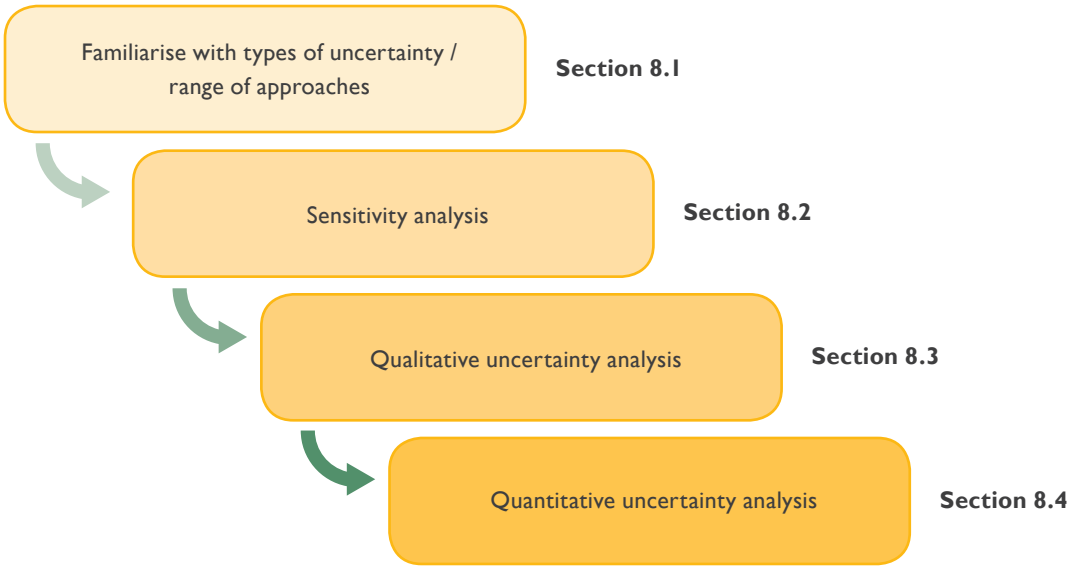
$$\text{Job creation effectivess (no of jobs per } tCO_2e) = \frac{\text{Number of jobs}}{\text{Net GHGs reduced,avoided and/or sequestered } (tCO_2e)}$$

Where:

- Number of jobs = the number of direct jobs created by implementing the policy or group of policies being assessed.
- Net GHGs reduced, avoided and/or sequestered = the net greenhouse gases reduced, avoided and/or sequestered by policy or group of policies being assessed.
- Cost = the cost of implementing the policy (on annual basis or over the GHG assessment period).

8. ASSESSING UNCERTAINTY

This section provides users with guidance on how to undertake uncertainty and sensitivity analysis. The guidance can be applied by users undertaking baseline emissions, estimating GHG emissions ex-ante or ex-post and monitoring performance overtime.



Checklist of accounting requirements

Section	Accounting requirements
Introduction to uncertainty assessment	Assess the uncertainty of the results of the GHG assessment, either quantitatively or qualitatively.
Sensitivity analysis	Conduct a sensitivity analysis for key parameters and assumptions in the assessment.

8.1 INTRODUCTION TO UNCERTAINTY ASSESSMENT

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 help users improve assessment quality and increase the level of confidence in the results. Users should identify and track key uncertainty sources throughout the assessment process. Identifying, assessing and managing uncertainty is most effective when done during, rather than after the assessment process.

Users shall assess the uncertainty of the results of the GHG assessment either quantitatively or qualitatively. A quantitative uncertainty approach can provide more robust results than qualitative assessment and help users better prioritise data improvement efforts on the sources that contribute most to uncertainty. Reporting quantitative uncertainty estimates also gives greater clarity and transparency to stakeholders. Users should report the range of possible outcomes based on different parameter values (representing upper and lower bounds of plausible values) to indicate the level of uncertainty. When uncertainty is high users should consider reporting a range of values rather than a single value. Users should also use an appropriate number of significant figures depending on the uncertainty of the results, to avoid overstating the precision of the results.

Users should make a thorough yet practical effort to communicate key sources of uncertainty in the results. If feasible users should present both quantitative and qualitative uncertainty information in the report. Users should also describe their efforts to reduce uncertainty in future revisions of the assessment, if applicable. Uncertainty can be reported in many ways, including qualitative descriptions of uncertainty sources and qualitative representations, such as error bars, histograms, and probability density functions.

Types of uncertainty

Uncertainty is divided into three categories;

Types of uncertainty	Description	Possible sources of uncertainty
Parameter uncertainty	Uncertainty regarding whether a parameter value used in the assessment accurately represents the true value of a parameter	• Activity data • Emission factors • Global warming potential (GWP) values
Scenario uncertainty	Variation in calculated emissions due to methodological choices	• Methodological choices • Selection of baseline scenario and estimation of baseline emissions • Selection of policy scenario and estimation of policy scenario emission
Model uncertainty	Limitations in the ability of modelling approaches, equations, or algorithms to reflect the real world.	• Model limitations

Parameter uncertainty: Parameter uncertainty may arise from measurement errors, inaccurate approximation, or the way the data was modelled to fit the conditions of the activity. If parameter uncertainty can be determined, it can typically be represented as a probability distribution of possible values that include the chosen values used in the assessment. Individual parameter uncertainty can be combined to provide a quantitative measure of the uncertainty of the assessment results, which may be represented in the form of a probability distribution.

Scenario uncertainty: Scenario uncertainty is created when multiple methodological choices are available, such as the selection of baseline assumptions. The use of the standard reduces scenario uncertainty by constraining choices users may make in their methodology. To identify the influence of the choices on the results, users should undertake a sensitivity analysis for key parameters.

Model uncertainty: Simplifying the real world into a numeric model always introduces some inaccuracies. Users should acknowledge model uncertainties and state model limitations qualitatively. If feasible users may estimate model uncertainty by comparing model results with independent data for purposes of verification; comparing the projections of alternative models; using expert judgement regarding the magnitude of model uncertainty; or other approaches.

Range of approaches: Various ranges of approaches are available to assess uncertainty, including qualitative and quantitative approaches. Users should select an approach based on the objectives of the assessment, the level of accuracy needed to meet stated objectives, data availability and capacity resources. Depending on the methods used and data availability, users may not be able to quantify the uncertainty of all parameters in the emission estimation method(s) or quantify the uncertainty of the total estimated change in GHG emissions and removals. Users should quantify the uncertainty for all parameters for which it is feasible. For cases where quantitative uncertainty is not possible to calculate, uncertainty should be assessed and described qualitatively. In addition to estimating or describing uncertainty users should conduct sensitivity analyses for key parameters, which is less data and time intensive than quantitative uncertainty assessment.

8.2 SENSITIVITY ANALYSIS

Sensitivity analysis is a useful tool to understand differences resulting from methodological choices and assumptions and to explore model sensitivities to inputs. A sensitivity analysis involves varying the parameters (or combinations of parameters) to understand the sensitivity of the overall results to changes in those parameters. To conduct a sensitivity analysis users should adjust the value of key parameters to determine the impact of such variations on the overall results. Users should consider reasonable variations in parameter values. Not all parameters need to be subjected to both negative and positive variations of the same magnitude, they should be varied based on what is considered reasonable. Past trends may be a guide to determine the reasonable range. As a general rule variations in the sensitivity analysis should at least cover a range of +10% or -10% (unless this range is not deemed reasonable under the specific circumstances).

8.3 QUALITATIVE UNCERTAINTY ANALYSIS

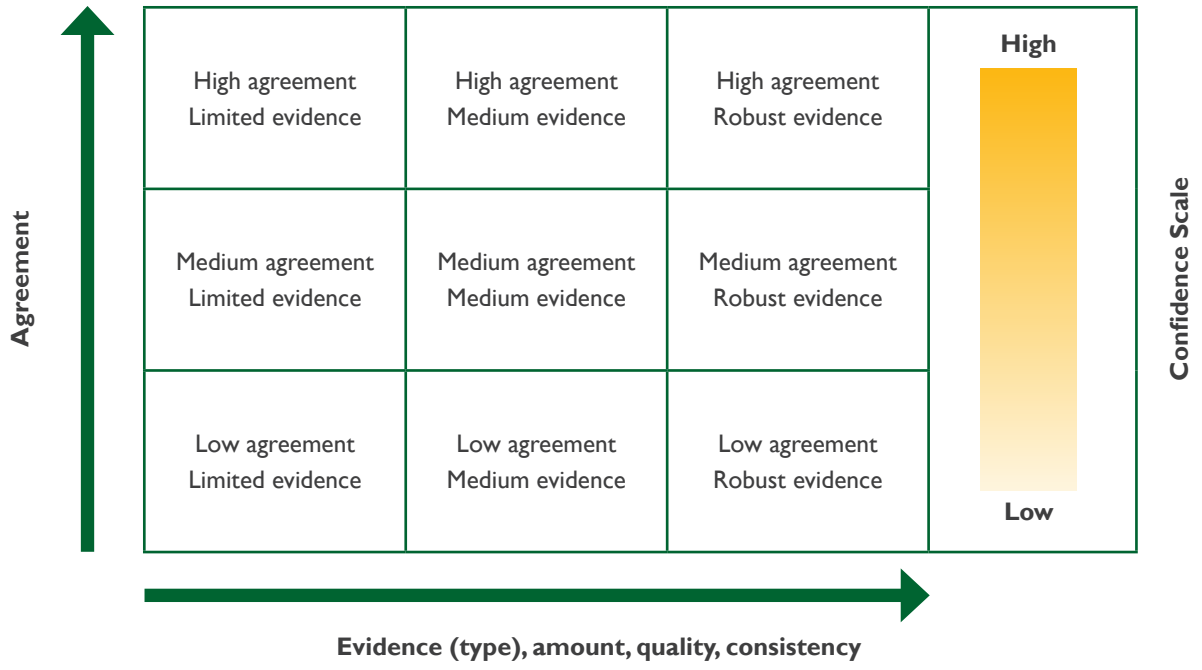
To quantitatively assess uncertainty, users should characterise the level of confidence of the results based on

- Quantity and quality of evidence
- The degree of agreement of the evidence

The level of confidence is a metric that can be expressed qualitatively to express certainty in the validity of a parameter value or result. When characterising parameter uncertainty, evidence refers to the sources available for determining a parameter value. Evidence should be assessed with regard to both the quantity and quality of evidence and can be defined in overall terms of being robust, medium, or limited. Evidence should be considered robust when there is a large quantity of high-quality evidence. Evidence should be considered medium when there is a medium quantity of medium-quality evidence. Evidence should be considered limited when there is a small quantity of low-quality evidence. Low-quality evidence shows deficiencies in adhering to principles of research quality. Medium-quality evidence is a mix of high-quality and low-quality evidence. The degree of agreement is a measure of the consensus or consistency across available sources for a parameter value or result. The degree of agreement can be defined in terms of high, medium or low. As a rule of thumb, high agreement means that all sources had the same conclusion; medium agreement means that some sources had the same conclusion; and low agreement means that most of the sources had different conclusions. This step may not be applicable if only one source is available.

A level of confidence provides a qualitative synthesis of the user's judgement about the result, integrating both the evaluation of evidence and the degree of agreement in one metric. The table below depicts summary statements for evidence and agreement and their relationship with confidence, where confidence increases as evidence and agreement increase. The level of confidence can be considered very high, high, medium, low and very low. In the best case (high confidence) the evidence found should be sourced from multiple credible, independent institutions. Presentation of findings with 'low' and 'very low' levels of confidence should be reserved for areas of major concern, and the reasons for the presentation should be explained (WRI 2014: 140).

Table 34: Summary statements for evidence and agreement and their relationship with confidence. (Source WRI Policy and Action Standard)



8.4 QUANTITATIVE UNCERTAINTY ANALYSIS

Quantitative uncertainty analysis should be undertaken where feasible to characterise the uncertainty of key parameters. Estimates of uncertainty should be made for individual parameters (single parameter uncertainty), then aggregated to source and sink categories as well as to the assessment as a whole (propagated parameter uncertainty). Propagated parameter uncertainty is the combined effect of each parameter's uncertainty on the total result.

Users should collect appropriate information to estimate overall uncertainty as well as source/sink-specific estimates of uncertainty at a specified confidence level (preferably 95%). Since it may not be practical to measure uncertainty of every source or sink category in a single way, various methods for quantifying uncertainty may be used. Users should use the best available estimates, which may be a combination of measured data, published information, model outputs and expert judgement.

Approaches to quantifying single parameter uncertainty include the following:

- Measured uncertainty approach (represented by standard deviations)
- Default uncertainty estimates for specific activities or parameters (from IPCC 2006 or other literature)
- Probability distributions from commercial databases
- Uncertainty factors for parameters reported in literature
- Pedigree matrix approach (based on qualitative data quality indicators)
- Survey of experts to generate upper and lower-bound estimates
- Expert judgement (based on as much data as available)
- Other approaches

Error propagation equations: An analytical method used to combine the uncertainty associated with individual parameters from a single scenario. Equations involve estimates of the mean and standard deviation of each input.

Monte Carlo simulation: A form of random sampling used for uncertainty analysis that shows the range of likely results based on the range of values for each parameter and probabilities associated with each value. In order to perform Monte Carlo simulation, input parameters must be specified as uncertainty distributions. The input parameters are varied at random but restricted by the given uncertainty distribution for each parameter. Repeated calculations produce a distribution of the predicted output values, reflecting the combined uncertainty of the various parameters.

9. VERIFY RESULTS

- **Verify Results (optional)**

While verification is not a requirement of these guidelines, verifying the results of the GHG assessment is useful for providing the implementing entity and relevant stakeholders with confidence in the results. Users that choose not to verify the results may skip this step. Verification provides assurance of ex-post estimates during or after the implementation of a policy or action.

The verification process involves an evaluation of whether the requirements of the standard have been met; that the GHG accounting and reporting principles have been followed; and that methods and assumptions chosen are reasonable. Verification should be a cooperative, iterative process that provides feedback, allowing users to improve accounting practices. Validation provides assurance of ex-ante estimates before the implementation of a policy or action, including confirmation that the ex-ante baseline scenario is applied correctly. In these guidelines, the term 'verification' is used to include both verification and validation. Users should decide whether and what type of verification to pursue depending on individual objectives. To meet some objectives (such as external reporting or attracting finance), verification may be required or beneficial, while to meet other objectives (such as internal decision making) verification may not be necessary.

Verification is related to quality assurance (QA) and quality control (QC). Users should use any combination of verification, QA, and QC, depending on individual objectives and circumstances. For additional guidance on QA/QC and verification, see the IPCC Guidelines for National Greenhouse Gas Inventories (2006), Volume 1, Chapter 6, Quality Assurance / Quality Control and Verification.

In the context of the 5 volume M&E guidelines series verification of the methodologies, input data and results will be done as needed. The verification of the methodologies, and assumptions contained in the 5 volume package of guidelines are key to ensure that they are appropriate, accurate, transparent and based on up-to-date methodologies, and that the use of the methodologies are well-documented. The verification of the data and results will focus on data quality and control, and the quality of the results.

The verification process shall involve self-verification and where feasible independent review will be undertaken (including assumptions) and data sources and flows used in the M&E system approach once the design is finalised, but before the approach is implemented. An independent review is the methodology laid out in ISO 14064-3 'Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions' (ISO 2009); applying this methodology to the verification of the modal shift M&E system is useful, though the ISO standard may be more rigorous than what is needed for this system.

This first expert review will verify that the selected methodologies and the data sources and flows are robust and applicable, and may provide suggestions for improving the M&E approach into the future. Though not necessarily repeated annually, the review will cater for the following occurrences:

- Aligning timeline with needed reviews for international reporting obligations (for example, a timeline that will provide timely information for inclusion in National Communications to the UNFCCC)

- Repeating reviews when there are changes or updates in methodology and/or data inputs (including assumptions and default values) used in the approach.

The quality control aspect will be handled through guidance found within the M&E approach developed, in that it ensures the methods used to estimate emissions and non-GHG benefits are well documented and that issues of quality control are considered throughout the process. Even though the expert review, which occurs at least biennially, ensures that the data collected and inputted into the M&E approach is of high quality, the aspect of data quality assessment will be ongoing. This aspect of verification will focus on data quality and the generated results as the monitoring, recording and verification (MRV) system is in operation. The annual reports will be used for this verification, though data quality checks will occur throughout as should the recording of data issues; the information on the checks and data issues will be summarised and reported in the annual report.

In addition to checking and verifying the data quality, the quality of the results will be tested and verified. The annual report can be used to assist with this, through comparing results of the current year to those of the previous year(s). This can identify any anomalous values, and will highlight potential errors. Additionally, the results can be compared to estimates using alternative methodologies. This verification will only highlight that there may be an error in the calculation and that additional work will be needed to understand what caused the anomalous value.

10. REPORT RESULTS

- **Report results and methodology used**

Users shall report the information outlined below about the GHG assessment and the estimated change in GHG emissions and removals resulting from the policy or action based on M&E reporting requirements and any additional reporting as indicated below based on each individual assessment need. In line with the Monitoring and Evaluation system reporting requirements users are encouraged to include the following elements of the individual or package of climate change response measure that will be reported annually into the M&E system:

- **Information on implementation progress:** (phases, stages, units and so on achieved).
- **Information for estimating climate change mitigation impact:** generally monitored as the outcome.
- **Cost information:** Amount of funding that went into the project in that year.
- **Jobs:** Number and type of jobs created by the response measure.
- **Information on other sustainable development benefits/costs** resulting from the response measure. These are specific to the type of response measure.

Users should also include the following detailed reporting elements of their assessments:

- The title of the policy or action (or package of policies/actions assessed).
- Whether the assessment applies to an individual policy/action or a package of policies/actions, and if a package, which individual policies and actions are included in the package.
- The objectives and intended audience of the GHG assessment.
- The year the assessment was developed.
- Whether the reported assessment is an updated of a previous assessment, and if so, links to any previous assessments.
- Whether the GHG assessment is an ex-ante assessment, an ex-post assessment, or a combined ex-ante and ex-post assessment.
- The GHG assessment period.
- The estimated total net change in GHG emissions and removals resulting from the policy/action or package of policies/actions (namely, the difference between the baseline scenario and the policy scenario) in tonnes of carbon dioxide equivalent, both annually and cumulatively over the GHG assessment period.
- Total in-jurisdiction GHG effects (the total net change in GHG emissions and removals that occurs within the implementing jurisdiction's geopolitical boundary), separately from total out-of-jurisdiction GHG effects (the net change in GHG emissions and removals that occurs outside of the jurisdiction's geopolitical boundary), if relevant and feasible.

Users shall report the following information about the policy or action assessed and the methodology used to estimate changes in GHG emissions and removals resulting from the policy and action:

Defining the policy or action

- The status of the policy or action (planned, adopted, or implemented), the date of implementation, and the date of completion (if applicable).
- The implementation entity or entities.
- The objective(s) of the policy or action.
- The type of policy or action.
- A description of the specific interventions included in the policy or action.
- The geographic coverage; the primary sectors, subsectors and emission source/sink categories targeted; and the greenhouse gases targeted (if applicable).
- Other related policies or actions that may interact with the policy or action assessed.

Identifying effects and mapping the causal chain

- A list of all potential GHG effects of the policy/action that were considered in the assessment.
- A list of all source/sink categories and greenhouse gases associated with the GHG effects of the policy or action.
- A causal chain.

Defining the GHG assessment boundary

- Any potential GHG effects, source/sink categories or greenhouse gases excluded from the GHG assessment boundary, with justification for their exclusion.
- The approach used to determine the significance of GHG effects.

Estimating baseline emissions

- A description of the baseline scenario (namely, a description of the events or conditions most likely to occur in the absence of the policy or action) and justification for why it is considered the most likely scenario.
- Total annual and cumulative baseline scenario emissions and removals over the GHG assessment period, if feasible based on the method used.
- The methodology and assumptions used to estimate baseline emissions, including the emissions estimation method(s) (including any models) used.
- Justification for the choice of whether to develop new baseline assumptions and data or to use published baseline assumptions and data.
- A list of policies, actions, and projects included in the baseline scenario.
- Any implemented or adopted policies, actions, or projects that are excluded from the baseline scenario, with justification for their exclusion.
- Whether the baseline scenario includes any planned policies and if so, which planned policies are included.
- A list of non-policy drivers included in the baseline scenario.

- Any relevant non-policy drivers that are excluded from the baseline scenario, with justification for their exclusion.
- The baseline values for key parameters (such as activity data, emission factors, and Global Warming Potential (GWP) values) in the baseline emissions estimation method(s).
- The methodology and assumptions used to estimate baseline values for key parameters, including whether each parameter is assumed to be static or dynamic, and assumptions regarding other policies/actions and non-policy drivers that affect each parameter.
- All sources of data used for key parameters, including activity data, emission factors, GWP values, and assumptions.
- Any potential interactions with other policies and actions and whether and how policy interactions were estimated.
- Any sources, sinks, or greenhouse gases in the GHG assessment boundary that have not been estimated in the baseline scenario, with justification, and a qualitative description of those sources, sinks, or gases.

Estimating GHG effects ex-ante

- A description of the policy scenario (namely, a description of the events or conditions most likely to occur in the presence of the policy or action)
- Total annual and cumulative policy scenario emissions and removals over the GHG assessment period, if feasible based on the method used.
- The methodology and assumptions used to estimate policy scenario emissions, including the emissions estimation method(s) (including any models) used.
- The policy scenario values for key parameters (such as activity data, emission factors, and GWP values) in the emissions estimation method(s).
- The methodology and assumptions used to estimate policy scenario values for key parameters, including whether each parameter is assumed to be static or dynamic.
- All sources of data used for key parameters, including activity data, emission factors, GWP values, and assumptions.
- Any potential interactions with other policies and actions and whether and how policy interactions were estimated.
- Any sources, sinks, greenhouse gases, or GHG effects in the GHG assessment boundary that have not been estimated in the policy scenario, with justification, and a qualitative description of the change to those sources, sinks, or gases.

Estimating GHG effects ex-post

- Total annual and cumulative policy scenario emissions and removals over the GHG assessment period, if feasible based on the method used.
- The methodology and assumptions used to estimate policy scenario emissions, including the emissions estimation method(s) (including any models) used.
- All sources of data for key parameters, including activity data, emission factors, GWP values and assumptions.
- Any potential interactions with other policies and actions and whether and how policy interactions were estimated.
- Methods and assumptions used to correct for effects not previously considered in the baseline scenario.

- If data are normalised, the normalised results separately reported from the non-normalised results, and the normalisation methods used.
- Description of differences between results from top-down and bottom-up methods (if applicable).
- Any sources, sinks, or greenhouse gases in the GHG assessment boundary that have not been estimated in the policy scenario, with justification, and a qualitative description of the change to those sources, sinks, or gases.

Verification

- Verification is optional. However, on the basis of underlying principles prioritised by users, users may report whether the GHG assessment results were verified, and if so, the type of verification, self-verification, (first party or third party), the relevant competencies of the verifier(s), and the opinion issued by the verifier.

Optional reporting information

- For users who have prioritised extensive reporting and wish to apply the principle of completeness the following additional reporting information may be considered;
- The net change in GHG emissions and the net change in GHG removals, separately reported in metric tons of carbon dioxide equivalent.
- Net changes in GHG emissions and removals, reported separately by individual greenhouse gas.
- Net changes in GHG emissions and removals, reported separately by individual effect, by type of effect (namely, intended effects, unintended effects, in-jurisdiction effects, out-of-jurisdiction effects, short-term effects, and long-term effects), or by source or sink category.
- A probability-adjusted estimate (or expected value) of the net changes in GHG emissions and removals resulting from the policy or action, with disclosure that the results represent a probability-adjusted estimate.
- Range of likely values for the net change in GHG emissions and removals, rather than a single estimate, when uncertainty is high (for example, due to uncertain baseline assumptions or uncertain policy interactions).
- Net changes in GHG emissions and removals resulting from likely effects, separately reported from net changes in GHG emissions and removals resulting from unlikely effects.
- Net changes in GHG emissions and removals, separately reported by likelihood category (very likely, likely, possible, unlikely, very unlikely).
- Annual or cumulative GHG effects over additional time periods other than the GHG assessment period.
- Trends in key performance indicators used to monitor performance, such as the change in key performance indicators since the last reporting period.
- The GHG inventory of the organisation or jurisdiction implementing the policy or action.
- Historical GHG emissions of the organisation or jurisdiction implementing the policy or action.
- GHG mitigation goal(s) of the organisation or jurisdiction implementing the policy or action.
- The contribution of the assessed policy or action toward the organisation or jurisdiction's GHG mitigation goal.
- Any potential overlaps with other policies and actions.

- Any possible double counting of GHG reductions by other parties that may claim GHG reductions from the same policies or actions, and any practices or precautions used to avoid double counting.
- A description of non-GHG effects of the policy or action, estimates of non-GHG effects of the policy or action, and the methodologies used to estimate non-GHG effects.
- Cost and/or cost-effectiveness of the policy or action and the methodologies used to quantify costs.
- Any limitations in the assessment not described elsewhere.
- Other relevant information.

ABBREVIATIONS

AFOLU	Agriculture, forestry, and other land use
AR4	Fourth Assessment Report of the IPCC
Btu	British thermal units
CDM	Clean Development Mechanism
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
EJ	Exajoules
G	Gram
GDP	Gross domestic product
GHG	Greenhouse gas
GW	Gigawatt
GWP	Global warming potential
HFCs	Hydrofluorocarbons
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial processes and product use
Kg	Kilogram
Km	Kilometre
KWh	Kilowatt-hour
KWp	Kilowatt-peak
LULUCF	Land use, land-use change, and forestry
M&E	monitoring and evaluation
MMBtu	Million British thermal units
MT	Metric ton (also tonne)
MMT	Million metric tons
MRV	monitoring, recording and verification
MSW	Municipal solid waste
Mtce	Million tonnes of coal equivalent
NF_3	Nitrogen trifluoride
NGO	Non-governmental organisation
N_2O	Nitrous oxide
PFCs	Perfluorocarbons
PPD	Peak Plateau and Decline
QA	Quality assurance
QC	Quality control
RD&D	research, development, and deployment
SF_6	Sulphur hexafluoride
TAR	Third Assessment Report (IPCC)
T&D	Transmission and distribution
UNFCCC	United Nations Framework Convention on Climate Change

GLOSSARY

Absolute value

The absolute value of a number is the non-negative value of that number without regard to its sign. For example, the absolute value of 5 is 5, and the absolute value of -5 is also 5.

Action

See policy and action

Activities

When used as a type of indicator: the activities that are involved in implementing the policy or action (undertaken by the authority or entity that implements the policy or action). Examples include energy audits and provision of subsidies.

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 travelled, and floor area of a building.

Adopted policies and actions

Policies and actions for which an official government decision has been made and there is a clear commitment to proceed with implementation, but that have not yet been implemented.

Baseline emissions

An estimate of GHG emissions, removals, or storage associated with a baseline scenario.

Baseline scenario

A reference case that represents the events or conditions most likely to occur in the absence of the policy or action (or package of policies or actions) being assessed.

Baseline value

The value of a parameter in the baseline scenario.

Bottom-up data

Data that are measured, monitored, or collected (for example, using a measuring device such as a fuel meter) at the source, facility, entity, or project level.

Bottom-up methods

Methods (such as engineering models) that calculate or model the change in GHG emissions for each source, project, or entity, then aggregate across all sources, projects, or entities to determine the total change in GHG emissions.

Calculated data

Data calculated by multiplying activity data by an emission factor. For example, calculating emissions by multiplying natural gas consumption data by a natural gas emission factor.

Causal chain

A conceptual diagram tracing the process by which the policy or action leads to GHG effects through a series of interlinked logical and sequential stages of cause-and-effect relationships.

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 different greenhouse gases against a common basis.

Drivers

Socioeconomic or other conditions or other policies/ actions that influence the level of emissions or removals. For example, economic growth is a driver of increased energy consumption. Drivers that affect emissions activities are divided into two types: other policies or actions and non-policy drivers.

Dynamic

A descriptor for a parameter (such as an emission factor) that changes over time.

Effects

Changes that result from a policy or action. See intermediate effects, GHG effects, and non-GHG effects. Emission factor: A factor that converts activity data into GHG emissions data. For example, kg CO_2e emitted per liter of fuel consumed.

Emissions

The release of greenhouse gases into the atmosphere.

Emissions estimation method

An equation, algorithm, or model that quantitatively estimates GHG emissions. For example, a simple emissions estimation method is the following equation: GHG emissions = emission factor x activity data. An emissions estimation method is comprised of parameters.

Estimated data

In the context of monitoring, proxy data or other data sources used in the absence of more accurate or representative data sources.

Ex-ante baseline scenario

A forward-looking baseline scenario, typically established prior to implementation of the policy or action, based on forecasts of external drivers (such as projected changes in population, economic activity, or other drivers that affect emissions), in addition to historical data.

Ex-ante assessment

The process of estimating expected future GHG effects of policies and actions.

Ex-post baseline scenario

A backward-looking baseline scenario that is established during or after implementation of the policy or action.

Ex-post assessment

The process of estimating historical GHG effects of policies and actions.

Expert judgment

A carefully considered, well-documented qualitative or quantitative judgment made in the absence of unequivocal observational evidence by a person or persons who have a demonstrable expertise in the given field (IPCC 2006).

GHG assessment

The estimation of changes in GHG emissions and removals resulting from a policy or action, either ex-ante or ex-post.

GHG assessment boundary

The scope of the assessment in terms of the range of GHG effects (and non-GHG effects, if relevant), sources and sinks, and greenhouse gases that are included in the assessment.

GHG assessment period

The time period over which GHG effects resulting from the policy or action are assessed.

GHG effects

Changes in GHG emissions by sources and removals by sinks that result from a policy or action.

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 CO_2.

Greenhouse gas (GHG)

For the purposes of this standard, GHGs are the seven gases covered by the UNFCCC: carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); hydrofluorocarbons (HFCs); Perfluorocarbons (PFCs); sulphur hexafluoride (SF_6); and nitrogen trifluoride (NF_3).

Implemented policies and actions

Policies and actions that are currently in effect, as evidenced by one or more of the following: (a) relevant legislation or regulation is in force; (b) one or more voluntary agreements have been established; (c) financial resources have been allocated; or (d) human resources have been allocated.

In-jurisdiction effects

Effects that occur inside the geopolitical boundary over which the implementing entity has authority, such as a city boundary or national boundary.

Independent policies

Policies that do not interact, such that the combined effect of implementing the policies together is equal to the sum of the individual effects of implementing the policies separately.

Indicator

See key performance indicator.

Inputs

Resources that go into implementing a policy or action, such as financial and human resources needed to implement a programme.

Intended effects

Effects that are intentional based on the original objectives of the policy or action.

Intermediate effects

Changes in behaviour, technology, processes, or practices that result from a policy or action.

Jurisdiction

The geographic area within which an entity (such as a government) exercises authority.

Key performance indicator

A metric that demonstrates changes in the targeted outcomes of the policy or action. For example, GW of wind power generated in a county may be used as an indicator for a production tax credit for wind power. Key performance indicators are a subset of parameters.

Leakage

Out-of-jurisdiction effects that increase emissions outside the jurisdictional boundary.

Life-cycle effects

Changes in upstream and downstream activities, such as extraction and production of energy and materials, or effects in sectors not targeted by the policy, resulting from the policy or action.

Long-term effects

Effects that are more distant in time, based on the amount of time between implementation of the policy and the effect.

Macroeconomic effects

Changes in macroeconomic conditions, such as GDP, income, employment, or structural changes in economic sectors, resulting from the policy or action.

Market effects

Changes in supply and demand or changes in prices resulting from the policy or action.

Measured data

Direct measurement, such as directly measuring emissions from a smokestack.

Model uncertainty

Uncertainty due to limitations in the ability of modelling approaches to reflect the real world.

Modelled data

Data derived from quantitative models, such as models representing emissions processes from landfills or livestock.

Net GHG emissions

The aggregation of GHG emissions (positive emissions) and removals (negative emissions).

Non-GHG effects

Changes in environmental, social, or economic conditions other than GHG emissions or climate change mitigation that result from a policy or action, such as changes in economic activity, employment, public health, air quality, and energy security.

Non-policy drivers

Conditions other than policies and actions, such as socioeconomic factors and market forces, that are expected to affect the emissions sources and sinks included in the GHG assessment boundary. For example, energy prices and weather are non-policy drivers that affect demand for air conditioning or heating.

Normalisation

A process to make conditions from different time periods comparable, which may be used to compare policy effectiveness by removing fluctuations not influenced by the policy or action, such as weather variations.

Other policies or actions

Policies, actions, and projects – other than the policy or action being assessed – that are expected to affect the emissions sources and sinks included in the GHG assessment boundary.

Out-of-jurisdiction effects

Effects that occur outside the geopolitical boundary over which the implementing entity has authority, such as a city boundary or national boundary.

Overlapping policies

Policies that interact with each other and the combined effect of implementing the policies together is less than the sum of the individual effects of implementing the policies separately. This includes both policies that have the same and complementary goals (such as national and subnational energy efficiency standards for appliances), as well as policies that have different or opposing goals (such as a fuel tax and a fuel subsidy). The latter are sometimes referred to as counteracting policies.

Parameter

A variable such as activity data or an emission factor that is part of an emissions estimation equation or algorithm or other calculation. For example, 'emissions per kWh of electricity', and 'quantity of electricity supplied' are both parameters in the equation '0.5 kg CO_2e/kWh of electricity x 100 kWh of electricity supplied = 50 kg CO_2e.'

Parameter value

The value of a parameter. For example, 0.5 is a parameter value for the parameter "emissions per kWh of electricity."

Parameter uncertainty

Uncertainty regarding whether a parameter value used in the assessment accurately represents the true value of a parameter.

Peer-reviewed

Literature (such as articles, studies, or evaluations) that has been subject to independent evaluation by experts in the same field prior to publication.

Planned policies and actions

Policy or action options that are under discussion and have a realistic chance of being adopted and implemented in the future, but that have not yet been adopted or implemented.

Policy and action

An intervention taken or mandated by a government, institution, or other entity, which may include laws, regulations and standards; taxes, charges, subsidies and incentives; information instruments; voluntary agreements; implementation of new technologies, processes, or practices; public or private sector financing and investment, among others.

Policy implementation period

The time period during which the policy or action is in effect.

Policy monitoring period

The time over which the policy is monitored. This may include pre-policy monitoring and post-policy monitoring in addition to monitoring during the policy implementation period.

Policy scenario

A scenario that represents the events or conditions most likely to occur in the presence of the policy or action (or package of policies or actions) being assessed. The policy scenario is the same as the baseline scenario except that it includes the policy or action (or package of policies/ actions) being assessed.

Policy scenario emissions

An estimate of GHG emissions and removals associated with the policy scenario.

Propagated parameter uncertainty

The combined effect of each parameter's uncertainty on the total result.

Proxy data

Data from a similar process or activity that is used as a stand-in for the given process or activity.

Rebound effect

Marginal increases in energy-using activities or behaviour resulting from energy efficiency improvements.

Regression analysis

A statistical method for estimating the relationships among variables (in particular, the relationship between a dependent variable and one or more independent variables).

Reinforcing policies

Policies that interact with each other and the combined effect of implementing the policies together is greater than the sum of the individual effects of implementing the policies separately.

Removal

Removal of GHG emissions from the atmosphere through sequestration or absorption, such as when CO_2 is absorbed by biogenic materials during photosynthesis.

Scenario uncertainty

Variation in calculated emissions due to methodological choices, such as selection of baseline scenarios.

Sensitivity analysis

A method to understand differences in the GHG assessment results due to methodological choices and assumptions and explore model sensitivities to inputs. The method involves varying the parameters to understand the sensitivity of the overall results to changes in those parameters.

Short-term effects

Effects that are nearer in time, based on the amount of time between implementation of the policy and the effect.

Sink

Any process, activity, or mechanism that increases storage or removals of greenhouse gases from the atmosphere.

Source

Any process, activity, or mechanism that releases a greenhouse gas into the atmosphere.

Spillover effect

Out-of-jurisdiction effects that reduce emissions outside the jurisdictional boundary, or effects that amplify the result, but are not directly driven by the policy or action being assessed (also called multiplier effects).

Static

A descriptor for a parameter (such as an emission factor) that does not change over time.

Trade effects

Changes in imports and exports resulting from the policy or action.

Top-down data

Macro-level statistics collected at the jurisdiction or sector level, such as energy use, population, GDP, or fuel prices.

Top-down methods

Methods (such as econometric models or regression analysis) that use statistical methods to calculate or model changes in GHG emissions.

Uncertainty

Quantitative definition: Measurement that characterises the dispersion of values that could reasonably be attributed to a parameter. Qualitative definition: A general 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, or lack of transparency.

Unintended effects

Effects that are unintentional based on the original objectives of the policy or action. Unintended effects may include a variety of effects, such as rebound effects, lack of compliance or enforcement, effects on behaviour once a policy is announced but before it is implemented, and effects on members of society not targeted by the policy or action.

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APPENDICES

For all the climate change policies and measures implemented in the country, users can view them on the South Africa's first Biennial Update Report on the link below

https://www.environment.gov.za/otherdocuments/reports

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