3 Overview of renewable energy policies

Historically, energy markets alone have not been able to deliver the desired level of renewable deployment in many countries. National-, subnational- and municipal-level support policies have been implemented to help to overcome market failures and to spur increased investment in RE. These policies help to reduce the cost of production, increase the price at which RE is sold or increase the volume of RE purchased. This chapter provides an overview of the three types of RE policy covered by the methodology.

3.1 Types of renewable energy policy

RE policies may be designed to overcome barriers to RE technological development and implementation, or to actively incentivize technological innovation, and speed and ease of implementation. Types of RE policies are shown in Table 3.1.[10]

TABLE **3.1**

Overview of policy instruments in the energy supply sector

Type of policy instrument *(Policies in bold are those covered by the methodology)*	Number of countries	Share of countries (%)
Reduction in sales, energy, value-added or other taxes	98	52
Public investment, loans or grants	82	43
Feed-in tariff and feed-in premium policies	81	43
Biofuels obligations and mandates	66	35
Auctions and tenders	64	34
Capital subsidy, grant or rebate	58	31
Net metering	52	27
Investment or production tax credits	45	24
Electric utility quota obligation and renewable portfolio standards	29	15
Tradable RE credits	29	15
Energy production payment[a]	25	13
Heat obligations and mandates	21	11

Source: REN21 (2016).

[a] The REN21 glossary defines an energy production payment as a "direct payment of the government per unit of renewable energy produced", whereas a feed-in tariff is defined as a "policy that sets a price that is guaranteed over a certain period of time at which power producers can sell renewably generated electricity into the grid" (REN21, 2016). A feed-in tariff in that sense is a particular type of the energy production payment. Feed-in tariff policies can therefore be seen as the most prevalent policy type.

[10] For a comprehensive overview of RE policies, see: https://irena.org/publications/2018/Apr/Renewable-energy-policies-in-a-time-of-transition.

Depending on the country circumstances, regulatory agencies and public utilities may be responsible for designing and implementing RE policies, but civil society and private actors may also have a large role to play.

Some key elements of RE policies include:[11]

- contributing to a rate of return that allows recovery of costs at a rate appropriate to the risk of investment
- guaranteeing access to networks and markets
- implementing long-term contracts to reduce risk
- using contract provisions that account for a diversity of technologies and applications
- using incentives that decline over time as technologies and/or markets mature, ensuring predictability
- ensuring broad inclusiveness with potential for participation.

3.2 Types of renewable energy policies covered by the methodology

Incentive mechanisms are a core driver for the expansion of RE capacity in many countries. Feed-in tariff policies are price-based instruments that provide a fixed, guaranteed electricity price, or a fixed or fluctuating price premium. Auctions and tender policies are quantity-based instruments that set the fixed amount of electricity generation from renewable sources to be achieved, where the market determines the price. Tax incentive policies use the tax system to improve the financial feasibility of RE investments.

These policies can be technology neutral or technology specific. For example, an auction policy can include all RE technologies, or can use eligibility criteria to include only specific technologies such as onshore and offshore wind, solar or biomass.

This methodology primarily considers these incentive policies. However, in addition to the incentive mechanisms provided through these policies, investors will consider issues relating to consent, permits and land; broader electricity market set-up (for on-grid renewables); offtake arrangements; and networks and related costs. This methodology therefore also considers how such factors can be taken into account when quantifying the GHG impact of RE policies.

3.2.1 Feed-in tariff policies (including feed-in premiums)

Feed-in tariff policies aim to promote RE deployment by offering long-term purchase agreements with power producers at a specified price per kilowatt hour.

In this methodology, feed-in tariff policies also include feed-in premiums, which provide power producers with a premium on top of the market price of their electricity production. Premiums can either be fixed at a constant level (independent of market prices) or sliding (with variable levels that depend on market prices). They provide market certainty for power producers by guaranteeing payments that are usually awarded as long-term contracts for 15–20 years.

Feed-in tariffs and feed-in premiums have been globally successful in promoting most RE technologies, including wind, solar photovoltaic (PV), solar thermal, geothermal, biogas and biomass. Successful feed-in tariffs and feed-in premiums tend to encourage a diverse array of technologies and have been used for projects of varying sizes. They have been widely successful as a result of inclusion of many of the following elements:[12]

- tariffs for all potential power producers, including utilities
- tariffs guaranteed for long enough to ensure an adequate rate of return
- tariff payment levels with carefully calculated starting values based on cost of generation, and differentiated by technology type and project size
- property access and dispatch
- utility purchase obligation
- regular long-term design evaluations and short-term payment level adjustments.

[11] Adapted from IPCC (2012).

[12] IPCC (2011).

3.2.2 Auction policies (including tender policies)

Auction policies for RE generation contracts create a competitive environment to procure renewable electricity through a defined selection process. In this methodology, "auction policies" refers to both auction and tender policies.[13]

Under these policies (as applicable in this methodology), governments issue a request for bids for the total investment cost of a project or for the cost per unit of electricity. An auction process will generally involve an open bidding process, whereas with tenders the bidding is done in confidence. They are usually designed with a total capacity of projects that will be funded. The government then selects multiple winning bids until the total capacity reaches the auction capacity goals.

Specific design elements of auction and tender policies are associated with several trade-offs:

- **Demand** – trade-off between ambition for an increasing share of renewables and cost-effectiveness. This may be manifested through a decision to introduce a technology-specific auction to develop a specific technology, or a technology-neutral auction to allow competition, which favours more cost-competitive technologies.
- **Qualification requirement** – trade-off between reducing entry barriers to encourage competition and discouraging underbidding.
- **Winner selection process** – trade-off between keeping the process simple and transparent, and ensuring that the objectives are achieved by the auction.
- **Sellers' liabilities** – weighing the allocation of risks between the power producer and the auctioneer, and exercising caution on the overallocation of risks to producers.

Price competition in auctions and tenders may favour larger and more established players, such as utilities or public companies, to the detriment of smaller players. High administrative or financial qualification requirements may result in too few bidders, which may impede the realization of the true low-cost potential.

Policymakers might consider using technology-specific tenders to enable a diverse supply. They might also consider adding local content rules, which require the use of a certain percentage of local equipment or local ownership of the project. In return, there may be an offer of lower interest rates, local tax benefits or even bonus payments for local power producers, which can benefit communities and prevent excess imports of the cheapest technologies.

3.2.3 Tax incentive policies

Various types of tax incentive policies are available for the development and deployment of RE technologies. Many governments use tax policies to promote RE sources for electricity generation. Tax incentives types include:

- value added tax exemptions
- income tax exemptions
- import or export fiscal benefits
- sales tax exemptions
- accelerated depreciation
- property tax incentives
- tax credits
- exemptions from local taxes
- RE-specific taxes, such as a geothermal vapour tax or geothermal surface tax
- other fiscal benefits.

Tax incentives usually apply to services and equipment. Pre-investment expenses are related to RE projects, as well as income from the sale of electricity or other ancillary income. Policymakers can further opt for fiscal stability incentives, whereby eligible RE technologies are shielded from potential future changes in the fiscal regime or any additional fees. Tax incentive policies can be effective when linked to the generation of electricity and not just the installation of capacity.

Different levels of government (national, subnational or municipal) may implement various tax incentive policies simultaneously.

[13] For a comprehensive guide to auction policy design, see: https://irena.org/publications/2015/Jun/Renewable-Energy-Auctions-A-Guide-to-Design.

3.3 Policy caps

Some RE policies may be subject to a cap, as in the following examples:

- A cap may be set as part of a feed-in tariff policy, either at a maximum per year or over the lifetime of the policy – this practice is increasingly common to limit the overall cost of the policy.
- Policy caps are implicit in the design of auctions and tender policies. Under these policies, a certain quantity is auctioned or tendered, serving as the cap on either the number of installations, megawatts installed or electricity generated.
- The country has an RE target that the RE policy aims to contribute towards.

Table 3.2 explains how the methodology is applicable to these different RE policies.

TABLE **3.2**

Overview of caps for renewable energy policies

RE policy	Applicability of the methodology	RE policies to which the methodology is applicable
The cap is part of the policy design (e.g. capped feed-in tariff or auction)	Methodology helps users assess whether there are any factors preventing the policy from reaching its cap (e.g. whether the scope is too limited or barriers exist that hinder the policy's impact).	• Auction policies • Feed-in tariff policies with a cap
A separate target exists in the country that the policy aims to contribute towards (e.g. an RE target such as 25% RE by 2025)	Methodology helps users assess whether the policy is sufficiently ambitious to achieve the target, or whether there are factors that may reduce the effectiveness of the policy.	• Feed-in tariff policies with national RE target in place • Tax incentive policies with national RE target in place
No target exists, nor does the policy provide an indication of the impact that should be achieved	Methodology helps users assess the impact of the policy, based on its design and other factors.	• Stand-alone feed-in tariff policies • Stand-alone tax incentive policies

4 Using the methodology

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

Checklist of key recommendations

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

4.1 Overview of steps

This document is organized according to the steps a user follows to assess the GHG impacts of an RE policy (see Figure 1.1). Depending on when the methodology is applied, users can skip certain chapters. For example, for ex-post assessments, users can skip Chapters 7 and 8.

4.2 Planning the assessment

Users should review this methodology, the *Introduction to the ICAT Assessment Guides* and other relevant assessment guides, and plan the steps, responsibilities and resources needed to meet their objectives for the assessment in advance. This includes identifying in advance the expertise and data needed for each step, planning the roles and responsibilities of different actors, and securing the budget and other resources needed. Any interdependencies between steps should be identified – for example, where outputs from one step feed into another – and timing should be planned accordingly.

The time and human resources required to implement the methodology and carry out an impact assessment depend on a variety of factors, such as the complexity of the policy being assessed, the extent of data collection needed and whether relevant data have already been collected, and the level of accuracy and completeness needed to meet the stated objectives of the assessment.

4.2.1 Choosing a desired level of accuracy based on objectives

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

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

4.2.2 Approaches to GHG impact assessment

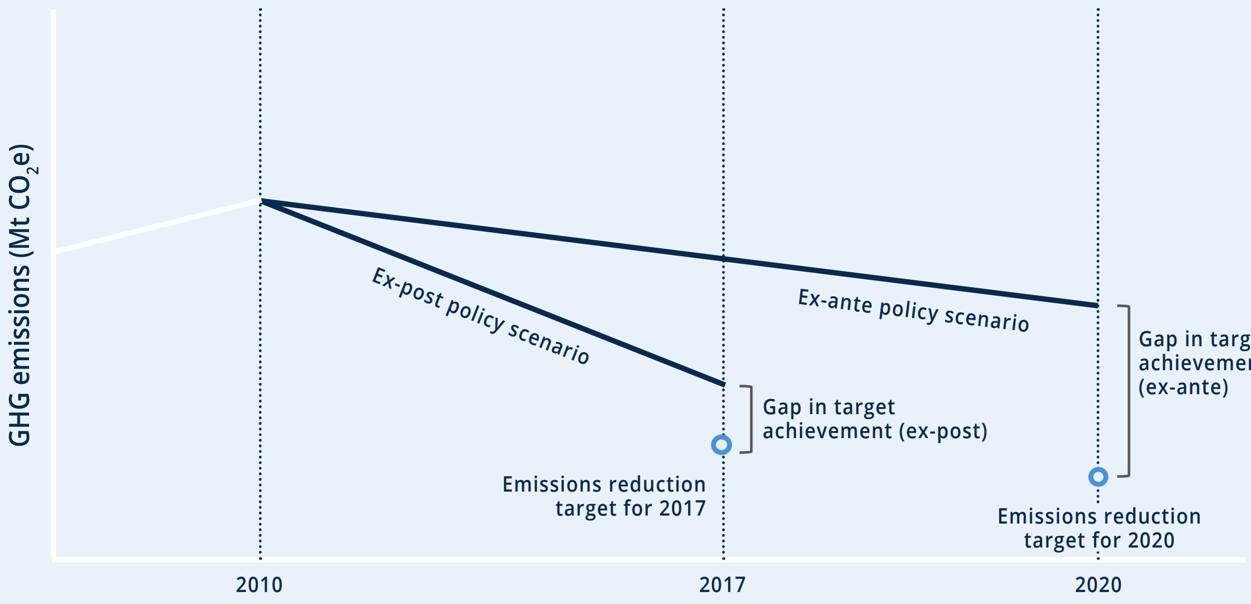
The methodology can be used to estimate either a GHG emissions level or GHG emissions reductions (either can be done ex-ante or ex-post). The choice is guided by the user's objectives in undertaking the impact assessment.

Estimating a GHG emissions level
The objective of estimating an emissions level is to evaluate policy performance in achieving NDCs. NDCs may have established emissions targets relative to a specific base year, or RE deployment or sectoral emissions levels. In such cases, users do not need to develop a baseline scenario or estimate baseline emissions.

Estimating an emissions level, either ex-ante or ex-post, allows comparison with a target, as shown in Figure 4.1. Here, an ex-ante estimate of emissions

FIGURE **4.1**

Use of GHG emissions level in ex-ante and ex-post impact assessment



Source: Adapted from WRI (2014).

levels out to 2020 shows that there is a gap, and expected emissions reductions in the sector are not on track to be met. The figure also shows an ex-post estimate of emissions levels, estimated in 2017. Here, the emissions level is higher than the target – in other words, the anticipated emissions reductions have not been achieved.

Estimating GHG emissions reductions

Estimating emissions reductions is relevant where the objective is to evaluate the GHG impact of a specific policy. This requires comparing policy scenario emissions with baseline scenario emissions. Figure 4.2 illustrates the estimation of GHG emissions reductions ex-ante and ex-post. The reductions are calculated by subtracting the ex-ante (or ex-post) policy scenario emissions from the ex-ante (or ex-post) baseline emissions. To estimate the ex-ante emissions reductions, both the policy scenario emissions and baseline emissions are forecasted. To estimate the ex-post emissions reductions, baseline emissions are estimated according to the most likely baseline scenario. The policy scenario emissions are estimated based on observed data.

Note that an RE policy may lead to GHG emissions reductions in situations where the *absolute* level of GHG emissions is rising – that is, the methodology estimates reductions based on the difference between baseline and policy scenario emissions, both of which may be rising, but at different rates.

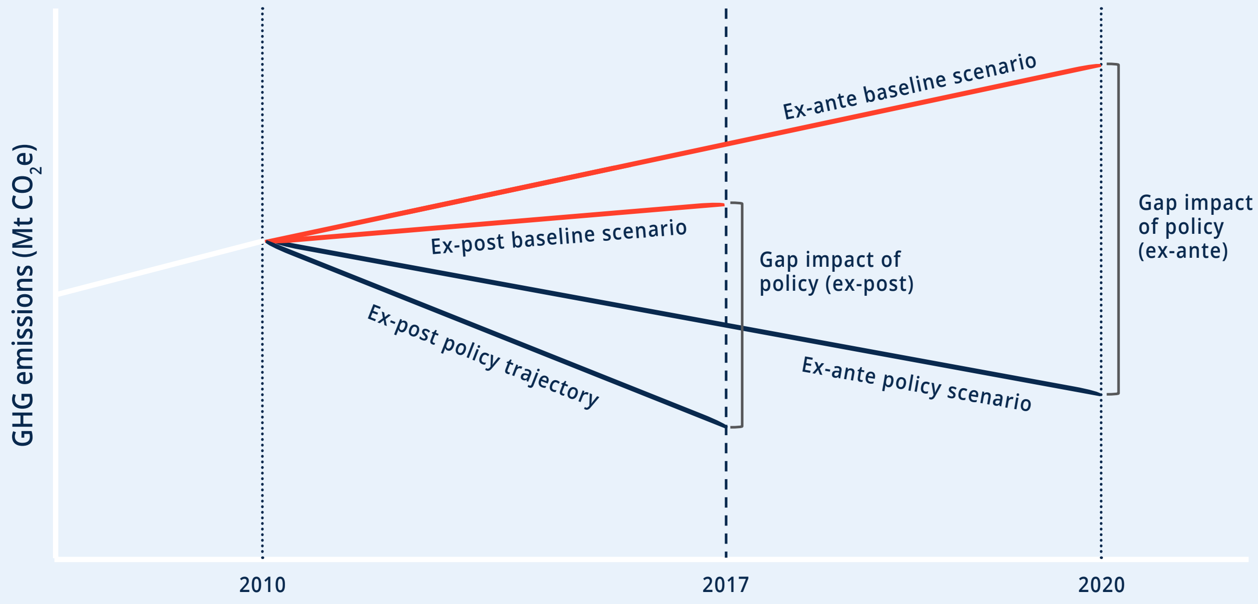
Ex-ante and ex-post assessment steps

Estimating GHG impacts ex-ante is divided into two parts. First, the RE addition of the policy is estimated (Chapter 7). RE addition is the additional installation of RE capacity or electricity generation from renewable sources realized via the policy, expressed in megawatts or megawatt-hours, respectively. Second, the GHG impacts from this RE addition are estimated (Chapter 8).

RE addition is estimated by first estimating the technical potential for the assessment period of the policy (the maximum RE resource potential for the technology or the policy cap) and then following stepwise guidance to evaluate the policy design characteristics and other factors that affect the likelihood that the policy will achieve this technical potential (illustrated in Figure 4.3). The result is the actual RE addition that the policy is expected to

FIGURE **4.2**

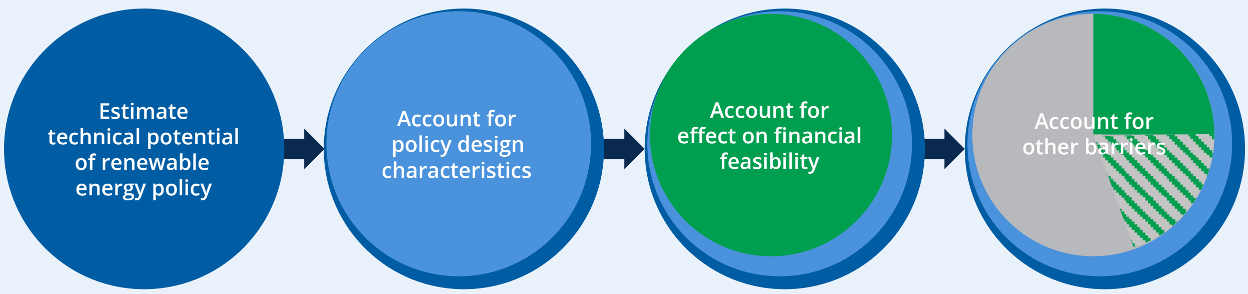
Estimating GHG emissions reductions with a baseline scenario



Source: WRI (2014).

FIGURE **4.3**

Steps for estimating renewable energy addition of the policy ex-ante



achieve. Once the RE addition has been estimated, it can then be translated into a GHG emissions level or GHG emissions reductions.

Estimating GHG impacts ex-post is also divided into two parts. First, data are collected from relevant agencies to determine the RE addition. Second, the GHG impacts (emissions level or emissions reductions) are estimated.

4.2.3 Methods for obtaining or estimating data

It is recommended that users use country-specific data. Potential data sources include the ministry of energy, national energy research institutes, and international agencies such as the International Energy Agency (IEA) or the International Renewable Energy Agency (IRENA). Where country-specific data are not available, users may use regional data or make estimates with input from experts. Section 8.2.2 provides further guidance for cases where data availability is limited.

4.2.4 Expert judgment

Expert judgment and assumptions will probably be needed to complete an assessment where information is not available or requires interpretation. Expert judgment is defined by the Intergovernmental Panel on Climate Change (IPCC) as a "carefully considered, well-documented qualitative or quantitative judgment made in the absence of unequivocal observational evidence by a person or persons who have a demonstrable expertise in the given field".[14] The goal is to be as representative as possible to reduce bias and increase accuracy. The user can apply their own expert judgment or consult experts.

Expert judgment can include applying proxy data, interpolating information, estimating a cap or technical potential for the assessment period, evaluating a barrier to RE deployment, or other types of assumptions or judgment.

When relying on expert judgment, information can be obtained using methods that help to avoid bias – known as expert elicitation. The *2006 IPCC Guidelines for National Greenhouse Gas Inventories* provides a procedure for expert elicitation, including a process for helping experts understand the elicitation process, avoiding biases, and producing independent and reliable judgments.[15]

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

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

4.2.5 Planning stakeholder participation

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

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

Various sections throughout this methodology explain where stakeholder participation is recommended – for example, in identifying a complete list of GHG impacts

[14] IPCC (2000).

[15] IPCC (2006). Note that the enhanced transparency framework states that "Each Party shall use the 2006 IPCC Guidelines and any subsequent version or refinement of the IPCC Guidelines agreed upon by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA)".

(Chapter 6), identifying barriers to RE deployment (Chapter 7), monitoring performance over time (Chapter 10) and reporting (Chapter 11).

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

It is important to conform with national legal requirements and norms for stakeholder participation in public policies. Requirements of specific donors, and of international treaties, conventions and other instruments that the country is party to should also be met. These are likely to include requirements for disclosure, impact assessments and consultations. They may include specific requirements for certain stakeholder groups (e.g. United Nations Declaration on the Rights of Indigenous Peoples, International Labour Organization Convention 169).

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

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

4.2.6 Planning technical review (if relevant)

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

4.3 Assessment principles

Assessment principles underpin and guide the impact assessment process, especially where the methodology provides flexibility. It is a *key recommendation* to base the assessment on the principles of relevance, completeness, consistency, transparency and accuracy, as follows:[16]

- **Relevance.** Ensure that the GHG assessment appropriately reflects the GHG impacts of the policy and serves the decision-making needs of users and stakeholders – both internal and external to the reporting entity. Users should apply the principle of relevance when selecting the desired level of accuracy and completeness from a range of methodological options. Applying the principle of relevance depends on the objectives of the assessment. Because of the varied nature of users' objectives, it may be more relevant to estimate and report an intermediate impact, such as the RE addition expressed as installed capacity (MW) or generated electricity (MWh) achieved by the policy, rather than the GHG emissions reductions.

- **Completeness.** Include all significant GHG impacts and sources in the GHG assessment boundary. Disclose and justify any specific exclusions.

- **Consistency.** Use consistent accounting approaches, data-collection methods and calculation methods to allow meaningful performance tracking over time. Document any changes to the data, GHG assessment

[16] Adapted from WRI (2014).

boundary, methods or any other relevant factors in the time series.

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

- **Accuracy.** Ensure that the estimated change in GHG emissions and removals is systematically neither over nor under actual values, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users and stakeholders to make appropriate and informed decisions with reasonable confidence about the integrity of the reported information. Accuracy should be pursued as far as possible, but, once uncertainty can no longer be practically reduced, conservative estimates should be used. Box 4.1 provides guidance on conservativeness.

In addition to the principles above, users should follow the principle of comparability if it is relevant to the assessment objectives – for example, if the objective is to compare multiple policies based on their GHG impacts, or to aggregate the results of multiple impact assessments and compare the collective impacts with national goals (discussed further in Box 4.2).

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

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

BOX **4.1**

Conservativeness

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

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

BOX **4.2**

Applying the principle of comparability when comparing or aggregating results

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

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