INITIATIVE FOR
Climate Action
Transparency

UNEP DTU Partnership, World Resources Institute

Transformational Change Guidance

Guidance for assessing the transformational impacts of policies and actions

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PART I: INTRODUCTION, OBJECTIVES, DEFINITION AND STEPS

1. INTRODUCTION

The unprecedented challenge of climate change requires that society undergoes a fundamental change away from carbon-intensive models of development. It is crucial that climate and development policies avoid further investments in fossil fuel infrastructure and promote clean technologies to ensure alignment with the Paris Agreement's temperature goal. In this context, there is an increasing need to assess the transformational impacts of policies and understand whether they can catalyse sustained shifts in economic, political, social and technical systems.

Purpose of the guidance

The purpose of this guidance is to help users assess transformational potential and impacts of policies and actions. Transformational impacts can result from processes and outcomes of policies or actions that drive structural changes in society towards climate change mitigation and sustainable development goals and targets, such as those envisioned in the Paris Agreement and Sustainable Development Goals (SDGs). Transformational changes can occur at international, national and subnational levels. Drivers of transformational change include changes in technology, social norms, behaviour, and economic and non-economic incentives and disincentives. If a policy's change is transformational, its impacts can alter the structures of society to achieve climate and sustainable development outcomes that are large in scale and are sustained over time.

This guidance has been developed with the following objectives in mind:

- To help users assess the extent of transformation expected or achieved by policies or actions
- To help decision makers develop effective strategies for transformational change through better understanding of how policies or actions can set in motion processes that lead to transformational outcomes
- To support transparent and consistent reporting of transformational impacts

Chapter 2 further explains the objectives that users may have for assessing the extent of transformation expected or achieved by policies or actions.

Intended users

The guidance is intended for a wide range of users, including governments, donor agencies and financial institutions, businesses, research institutions and non-governmental organisations (NGOs). Throughout the guidance, the term "user" refers to the person applying the guidance.

The following examples show how different types of users can apply the guidance:

- Governments: Assess the expected impacts of policies or actions to inform the design of transformational policies, and monitor progress and evaluate impacts of implemented policies or actions to learn from experience.
- Donor agencies and financial institutions: Assess the impacts of financial support provided, such as grants or loans, to support transformational policies or actions.

- Businesses: Assess impacts of private sector actions such as voluntary commitments and implementation of new technologies, private sector financing, or the impacts of government policies or actions on businesses and the economy.
- Research institutions and NGOs: Assess the extent to which policies or actions are transformational to generate new information to increase stakeholder awareness and support decision makers.

Scope and applicability of the guidance

This guidance provides a general approach including principles, concepts and procedures that users can follow when assessing the transformational impacts of a policy or action. The document also contains hypothetical examples and case studies [*to be developed*] that illustrate how to apply the guidance in practice. It covers both ex-ante (forward-looking) assessment and ex-post (backward-looking) assessment.

The guidance is applicable to all types of policies or actions in all sectors. It is limited in depth by not taking a sector-specific approach to assess transformational impacts. This means that characteristics of transformational change are developed as broad descriptions rather than specific to transformations in a given sector or subsector. A limitation of the generic approach is that it does not provide a comprehensive list of indicators for transformational change covering the specifics of all sectors. It also does not propose a full list of quantitative metrics. Appendix B provides examples of indicators of transformational change characteristics for users to develop more specific indicators for their policy or action.

The guidance is intended to be flexible and users should apply it considering their own objectives and circumstances. It provides recommended steps rather than requirements and is non-prescriptive to accommodate various national circumstances.

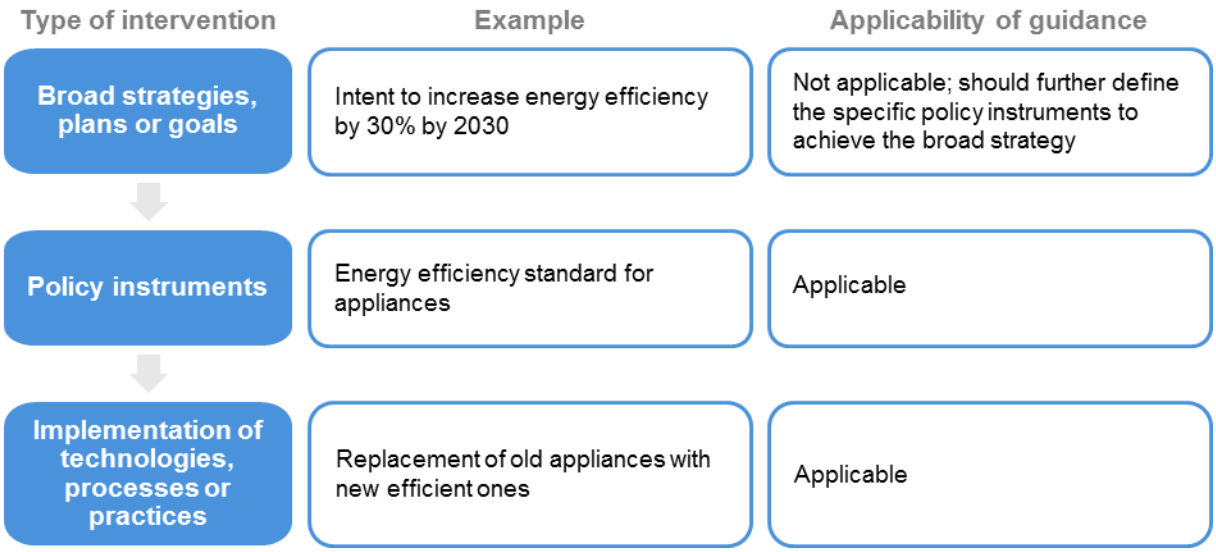
The guidance provides a qualitative approach to assess the extent of transformation expected or achieved by policies or action. It provides users with an option to quantitatively monitor indicators of transformational change as the basis for qualitative assessment.

Types of policies and actions

In this guidance, policies and actions refer to interventions taken or mandated by a government institution or other entity. Examples of policies or actions include laws, directives, decrees, regulations and standards, taxes, charges, subsidies and incentives, information instruments, voluntary agreements, introduction of new technologies, processes or practices, public or private sector financing and investments.

The terms “policy” and “action” refer to interventions at various levels along a continuum, from (1) broad strategies and plans that define high-level objectives or desired outcomes (such as 60% solar power in the grid by 2050); to (2) specific policy instruments to carry out a broad strategy or plan (such as a feed-in tariff for solar PV systems); to (3) the implementation of technologies, processes or practices that result from policy instruments (such as mandating PV systems on rooftops of government buildings). These are illustrated in Figure 1.1, which shows the range of interventions from more aspirational to more concrete.

Figure 1.1: Types of interventions along a policy continuum



This guidance is primarily designed to assess policy instruments and the implementation of technologies and processes that might influence or shape meaningful practices. Users that intend to assess the impacts of broad strategies or plans should first define the policy instruments or technologies, processes or practices that will be implemented to achieve the strategy or plan. Broad strategies or plans can be difficult to assess since the level of detail needed to assess impacts may not be available without further specificity, and different policies or actions used to achieve the same goal could have different impacts. Further, it is designed for actions at a higher level than individual projects, though users assessing the impacts of individual projects or programs may also find this guidance helpful.

The guidance is applicable to policies and actions:

- At any level of government (national, subnational, municipal) in all countries and regions
- In any sector (such as transport, energy, agriculture, forestry, industry and waste) as well as cross-sector policy instruments
- That are planned, adopted or implemented
- That are new policies or actions, or extensions, modifications or eliminations of existing policies or actions

Table 1.1 presents general types of policies or actions that can be assessed.

Table 1.1: Types of policies or actions

Type of policy or action	Description
Regulations and standards	Regulations or standards that specify abatement technologies (technology standard) or minimum requirements for energy consumption, pollution output, or other activities (performance standard). They typically include penalties for noncompliance.
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.

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.
Voluntary agreements or measures	Agreements, commitments or measures 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.
Information instruments	Requirements for public disclosure of information. These include labeling programs, emissions reporting programs, rating and certification systems, benchmarking, and information or education campaigns aimed at changing behaviour by increasing awareness.
Emissions trading programs	Programs that establish a limit on aggregate emissions of various pollutants from specified sources, requires sources to hold permits, allowances, or other units equal to their actual emissions, and allows permits to be traded among sources. These programs can be referred to as emissions trading systems (ETS) or cap-and-trade programs.
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.
Public procurement policies	Policies requiring that specific attributes (such as GHG emissions) are considered as part of public procurement processes.
Infrastructure programs	Provision of (or granting a government permit for) infrastructure, such as roads, water, urban services, and high-speed rail.
Implementation of new technologies, processes, or practices	Implementation of new technologies, processes, or practices at a broad scale (for example, those that reduce emissions compared to existing technologies, processes, or practices).
Financing and investment	Public or private sector grants or loans (for example, those supporting development strategies or policies such as a development policy loans (DPL) or development policy operations (DPO) which includes loans, credits, or grants).

Source: WRI 2014, based on IPCC 2007.

When to use the guidance

The guidance can be used at multiple points in time in the policy design and implementation process, including:

- **Before policy implementation:** To assess the extent of transformation expected from a policy or action (through ex-ante assessment)
- **During policy implementation:** To assess the extent of transformation achieved to date, ongoing performance and the extent of transformation expected in the future from a policy or action

- **After policy implementation:** To assess the extent of transformation achieved as a result of a policy or action (through ex-post assessment)

Depending on individual objectives and when the guidance is applied, users can implement the steps related to ex-ante assessment, ex-post assessment or both. The most comprehensive approach is to apply the guidance first before implementation, regularly during policy implementation, and again after implementation. Users carrying out an ex-post assessment only can skip Chapter 9. Users carrying out an ex-ante assessment only can skip Chapter 10 and 11.

Figure 1.2 outlines a simplified sequence of steps to monitor and assess impacts at multiple stages in a policy[1] design and implementation cycle. In the figure, the process is iterative such that insights from previous experience inform improvements to policy design and implementation and the development of new policies.

Figure 1.2: Assessing impacts during a policy design and implementation cycle

Key recommendations

The guidance includes key recommendations that represent recommended steps to follow when assessing and reporting the extent of transformation expected or achieved. These recommendations are intended to assist users in producing impact assessments that are high quality and based on the principles of relevance, completeness, consistency, transparency, accuracy and reflection on ambition.

[1] Throughout this guidance, where the word "policy" is used without "action," it is used as shorthand to refer to both policies and actions.

In keeping with the Initiative for Climate Action Transparency (ICAT) guidance being non-prescriptive, the key recommendations focus on the key steps that users are recommended to follow, rather than on any specific methods, models or tools they should use. Key recommendations focus more on the "what" users should do than the "how" they can do it. The guidance that accompanies each key recommendation provides the "how."

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

Key recommendations are provided as an option to users that want to assess and report impacts according to a consistent set of steps and approaches. Users that want to follow a more flexible approach can choose to use the guidance without adhering to the key recommendations.

The ICAT *Introductory Guide* provides further description of how and why key recommendations are used within the ICAT guidance documents, as well as more information about following either the "flexible approach" or the "key recommendations" approach when using the guidance. Refer to the *Introductory Guide* before deciding on which approach to follow.

Relationship to other guidance

This guidance is part of the ICAT series of guidance for assessing impacts of policies and actions. It is intended to be used in combination with any other ICAT guidance documents that the user chooses to apply, including:

- Sector-level guidance for assessing greenhouse gas impacts of policies or actions in the agriculture, forestry, energy and transport sectors
- Sustainable development guidance on how to assess the environmental, social and economic impacts of policies or action
- Stakeholder participation guidance on how to carry out effective stakeholder participation when designing, implementing and assessing policies and actions, including when assessing transformational impacts using this guidance
- Technical review guidance on how to review assessment reports, including when assessing the extent of transformation expected or achieved using this guidance

The series of ICAT guidance is intended to enable users that choose to assess the greenhouse gas (GHG) impacts, sustainable development impacts and transformational impacts of a policy or action to do so in an integrated and consistent way within a single impact assessment process. For example, users assessing a renewable energy policy or action could follow both the ICAT *Renewable Energy Guidance* to assess the GHG impacts and this *Transformational Change Guidance* to assess transformational impacts within an integrated assessment. Refer to the ICAT *Introductory Guide* for more information about the ICAT guidance documents and how to apply them in combination.

Process for developing the guidance

The guidance is being developed through an inclusive, multi-stakeholder process convened by the Initiative for Climate Action Transparency. The development is led by UNEP DTU Partnership (lead) and World Resources Institute (co-lead) who serve as the Secretariat and guide the development process.

The draft was developed by Drafting Teams, which consist of a subset of a broader Technical Working Group and the Secretariat. The Technical Working Group consists of experts and stakeholders from a range of countries identified through a public call for expressions of interest. The Technical Working Group contributes to the development of the technical content for the guidance through participation in regular meetings and written comments.

A Review Group will provide written feedback on multiple drafts of the guidance. The drafts will also be circulated for public consultation more broadly. The draft guidance will be tested with ICAT participating countries to ensure that it can be practically implemented, gather feedback for its improvement and provide case studies for the final publication. Anyone interested in testing the guidance is encouraged to get in touch with the ICAT team.

ICAT's Advisory Committee provides strategic advice to the initiative. More information about the guidance development process, including governance of the initiative and the participating countries, is available on the ICAT website.

All contributors are listed in the *Contributors* section.

2. OBJECTIVES OF ASSESSING TRANSFORMATIONAL CHANGE

This chapter provides an overview of objectives users may have in assessing the extent of transformation expected or achieved by policies and actions. Determining the assessment objectives is an important first step, since decisions made in later chapters should be guided by the stated objectives.

Checklist of key recommendations

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

Assessing the extent of transformation expected or achieved by policies and actions is a key step towards developing strategies that promote climate and sustainable development goals. It enables policymakers to understand the relationship between policies or actions and the expected or achieved transformational impacts, and supports decision making.

It is *a key recommendation* to determine the objectives of the assessment at the beginning of the impact assessment process. Examples of objectives for assessing the transformational impacts of a policy or action are listed below.

General objectives

- **Understand how policy or action helps achieve multiple goals** at international, national or subnational levels. These may include mitigation and sustainable development goals, such as those outlined as part of a country's long-term vision on climate action (e.g., Mexico's Climate Change Mid-Century Strategy), Nationally Determined Contributions (NDCs), or Sustainable Development Goals (SDGs).
- **Attract finance** by demonstrating how a given policy or action facilitates a paradigm shift to low carbon development. Increasingly, funds such as the Climate Investment Funds, NAMA Facility and the Green Climate Fund are paying more attention to understanding how to operationalise transformational change in climate finance.
- **Report and communicate** the extent of transformation expected or achieved by policies or actions. The assessment results can be reported domestically or internationally, and include ex-ante reporting of expected impacts or ex-post reporting of achieved impacts.

Objective of assessing expected impacts before policy implementation

- **Improve policy selection and design** by providing a better understanding of the extent of transformation expected by a given policy or action. The assessment can also help compare and prioritise policies or actions based on their potential for paradigm shift. Users can utilise the assessment results to select the most transformational policy or action or adjust current policy objectives and design to increase its potential to be transformational. The process of assessing transformational change can itself also be helpful to inform policy design, for example, by understanding the various characteristics of transformational change.

Objective of assessing impacts during or after policy implementation

- **Evaluate the transformational impact of a policy or action over time** to understand whether, and to what extent, it has been transformational. The assessment can also improve the likelihood of policies or actions realising their transformational potential when it is conducted regularly and policies or actions are adjusted based on its findings.
- **Learn from experience** to better understand the drivers of transformational change and further enhance the effectiveness of policies and actions.

Users should also identify the intended audience(s) of the assessment report. Possible audiences may include policymakers, civil society organisations, businesses, donors, financial institutions, research institutions or other stakeholders affected by or who can influence the policy. For more information on identifying stakeholders, refer to the ICAT *Stakeholder Participation Guidance* (Chapter 5).

Subsequent chapters provide flexibility to enable users to choose how best to assess the extent of transformation expected or achieved by policies and actions in the context of their objectives. The appropriate level of accuracy and completeness is likely to vary by objective. Users should assess the impacts of policies and actions with a sufficient level of accuracy and completeness to meet the stated objectives of the assessment as identified in this chapter.

3. UNDERSTANDING TRANSFORMATIONAL CHANGE

This chapter introduces the concept of transformational change in the context of climate change mitigation and sustainable development. It builds on the scientific literature on sustainability transitions[2] and defines transformational change for the purposes of this guidance.

3.1 Transformational change in the literature

Within social science many scholars have sought to understand how technological and societal changes occur and conceptualise how political, social and technical paradigms transform from one state to another. This has led to a number of observations on historical change processes and analysis of their drivers, with an aim to distill common characteristics of how these changes occurred. It has also led to several attempts to define what constitutes transformational change in general. Table 3.1 illustrates some recent definitions of transformational change.

Table 3.1: Examples of definitions of transformational change

Definition	Source
A transition is a radical, structural change of a societal (sub)system that is the result of a coevolution of economic, cultural, technological, ecological and institutional developments at different scale levels.	Rotmans & Loorbach, 2009
Transitions are non-linear processes that can result from the interplay of multiple developments at three analytical levels: niches (the locus for radical innovations), socio-technical regimes (the locus of established practices and associated rules), and an exogenous socio-technical landscape.	Geels 2012
The altering of fundamental attributes of a system (including value systems; regulatory, legislative or bureaucratic regimes; financial institutions; and technological or biological systems).	IPCC 2012
A structural change that alters the interplay of institutional, cultural, technological, economic and ecological dimensions of a given system. It will unlock new development paths, including social practices and worldviews.	Mersmann et al. 2014
Transformational change through Nationally Appropriate Mitigation Actions (NAMAs) is a change that: Disrupts established high-carbon pathways, contributes to sustainable development and sustains the impacts of the change (goal criteria), Is triggered by interventions of actors who innovate low carbon development models and actions, connect the innovation to day-to-day practice of economies and societies, and convince other actors to apply the innovation to actively influence the multi-level system to adopt the innovation process (process criteria), Overcomes persistent barriers toward the innovated low carbon development model and/or creates new barriers which hinder the transformed system to relapse into the former state ('low-carbon lock-in' criteria).	Olsen & Fenhann, 2016

[2] The literature tends to use "transition" and "transformation" interchangeably to convey processes that are referred to as "transformational change" in this guidance.

A transformation is a long-term fundamental shift in a system, whether political, economic, social or biological. Transformations are typically viewed as multi-actor, multi-scale processes, where the change is highly non-linear. Low-carbon energy transformations have three characteristics: large magnitude impact; non-linear change; sustained and long-term.	Westphal & Thwaites 2016
Irreversible, persistent adjustment in societal values, outlooks and behaviours of sufficient width and depth to alter any preceding situation.	TRANSIT 2017

Some general attributes of transformational change processes can be distilled from these definitions:

- Transformational change is a change of **systems**, not just singular developments, and involves multiple actors at multiple levels
- Transformational change constitutes deep, **fundamental change** that **disrupts** the status quo, and sustains that change over a long time period
- Transformational change by itself has **no normative connotation**; values are added by **defining a transformation goal**

Throughout this guidance, the term "system" is used to describe the part of society that is targeted by a particular policy or action. A system generally refers to a set of interconnected elements working together with some degree of harmony to fulfill various functions. These elements can be physical entities, such as humans or machines, as well as legislative, institutional, political or fiscal structures, or financial rules and regulations organised to achieve a set of objectives and functions.

Societal systems are complex, exhibiting dynamic, non-linear as well as linear and sometimes unpredictable change. Therefore, it may not always be possible to identify a complete chain of causal processes, but even a partial understanding of these dynamics of change can help develop policy interventions that are more likely to lead to transformation. Processes that aim at transformational change will most often not be effective if they target issues in isolation. In such a case, everyone involved could act perfectly dutifully and rationally and with good intent and still produce unintended side effects that no one wants. Inhibitors to change may be rooted in the internal structure of complex systems, and thus finding a solution in one part of the system may cause unintended problems in another part of the system. Therefore, it is essential that the design of a transformative intervention takes its entire systemic context into consideration.

Transformational change as a systemic process affects different parts of society. Because subsystems typically overlap, even small change processes do not have completely isolated impacts. Taking a systemic view means to expect and plan for transformations at many levels, ranging from the local level up to changes at the national or even international levels. Not only do large policy interventions have impacts at lower levels of governance, but local-level activities can also have impacts on higher levels, for example, through learning about successes or when effects of local intervention have bearings on other regions or countries.

Case studies of transformations for low-carbon and sustainable development are available in the literature.[3] To learn from successful examples of transformations ongoing or planned, the studies focus

[3] Olsen & Fenhann, 2015.

on experience with transformation of the energy system in Germany; the role of wind power in electricity generation in Denmark; the reduction in deforestation in Brazil (75% over a decade from 2005 to 2014); the transition to a sustainable transport system at city level in Bogotá, Columbia; and the role of state-owned companies to lead a transition away from high-carbon lock-in in South Africa.

Transformational change in this guidance is a conceptual framework to describe the impact of a change process. Transformations can lead to a better as well as a worse state, so the desired direction of change (i.e., to a better state) needs to be defined. Transformational change in relation to climate change is inseparably connected to sustainable development. Therefore, this guidance is problem oriented towards promoting low-carbon, climate-resilient, resource-efficient and sustainable societies, in line with the goals of the Paris Agreement and the Sustainable Development Goals.

3.2 Definition of transformational change in this guidance

As transformational change as a concept is gaining significant traction among climate change and sustainable development decision makers and practitioners, there is a need for a comprehensive definition specific to climate change mitigation grounded in both theory and practice.

With this background, transformational change is defined in this guidance as:

> **A fundamental, sustained change of a system that disrupts established high-carbon practices and contributes to a zero-carbon society in line with the Paris Agreement's 1.5 - 2 °C temperature goal and the UN Sustainable Development Goals.**

The terms carbon and CO_2 are used interchangeably in this guidance. Zero carbon refers to zero CO_2 equivalent emissions and takes into account other greenhouse gas emissions. Zero carbon means "net zero carbon emissions", which implies that some remaining CO_2 can be compensated by the same amount of CO_2 uptake as long as the net input to society is zero. The vision is to phase out all fossil fuel emissions and phase in a 100% renewable energy society.

Further, transformational change can be characterised by:

- **Large-scale outcomes or a multitude of smaller-scale changes coherently leading to large-scale system impacts**
- **Sustained, long-term, irreversible outcomes that reinforce zero-carbon practices**

Transformational change as considered in this guidance is not an organic or incremental evolution in line with the self-organising dynamics of a system. Instead, transformational change means the general paradigm and existing standards of how to do things are challenged and old path dependencies are disrupted. This requires an intentional, long-term change strategy as to how the system can transform and what the outcome of transformation should be. The guidance identifies four main drivers (or processes) of change based on the existing literature on transformational change:

- **Technology change**: This refers to processes that drive research and development, adoption and scale-up of clean technologies.
- **Agents of change**: This pertains to entrepreneurs, the private sector and markets, as well as coalitions and networks as agents of transformational change.

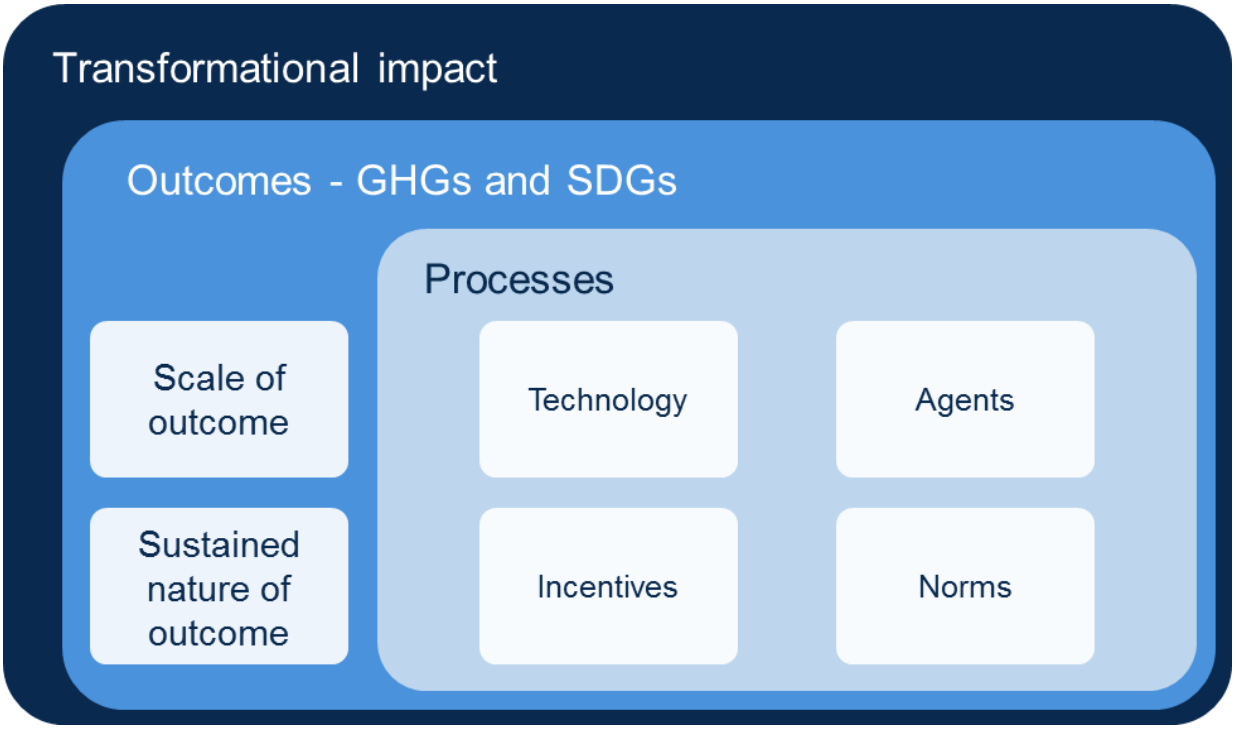
- **Incentives for change**: This refers to economic and non-economic incentives along with disincentives, which play a critical role in shifting technology and societal change.
- **Norms and behavioural change**: This includes processes that influence awareness and behaviour of people to drive a long-lasting change in societal norms and practices.

Although transformational change is context-dependent, in order for transformational change to occur, all four processes listed above are considered important.

The kind of transformational change in focus in this guidance is the “planned' transformation’ that is, the transformation that is intended through the adoption of purposeful policy and regulation aiming at shifting emission trends towards zero-carbon and sustainable development goals. Because such processes require long-term actions or interventions, a long-term management strategy is equally necessary. Only seldom can development be anticipated with a long-term (e.g., 20 or more years) perspective. Strategies and implementation modalities should be adapted to technology development, changes in norms, and changes in the economy. Effective and adaptive change management strategies as well as continuous learning are critical elements.

Figure 3.1 illustrates the logic of this guidance. The assessment of transformational impact consists of assessment of processes and outcomes of change, all of which are supported by a number of characteristics and indicators.

Figure 3.1: Layers of transformational impact assessment



The layers of the assessment follow the layers of the definition of transformational change:

- The extent of the overall transformational impact is assessed through the policy or action's contribution to a system change towards zero-carbon and sustainable development goals.

- The outcomes of a transformational policy or action are determined through its contribution to achieving GHG mitigation and sustainable development at a large scale that is sustained over time.
- The processes of a transformational policy or action comprise technologies, change agents, economic incentives, and a change of norms and behaviour, as well as effective change management that is open to continuous learning and integration of changing circumstances.

4. Steps and Assessment Principles

This chapter introduces an overview of the steps involved in the assessment of the extent of transformation expected or achieved by policies and actions and gives the principles of impact assessment.

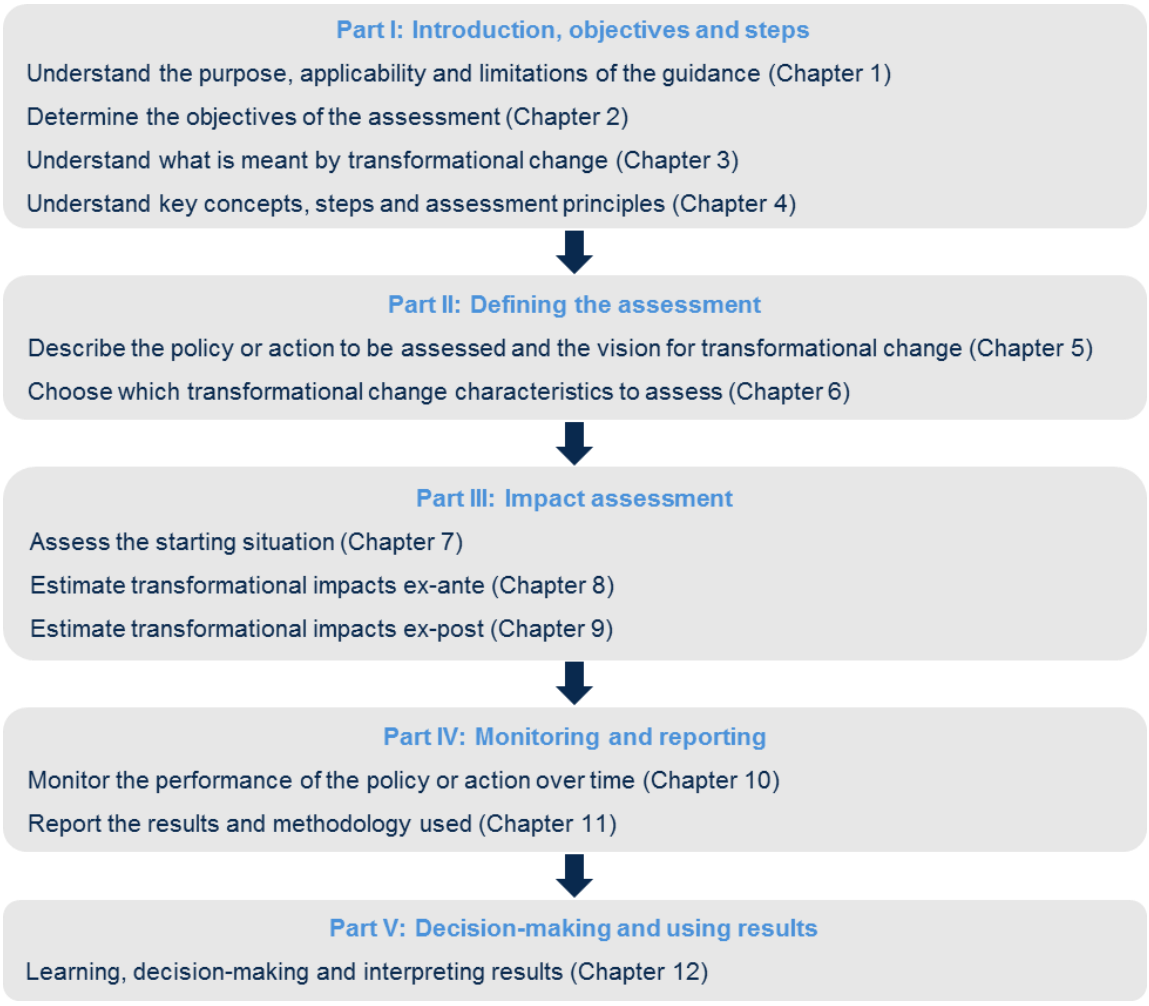
Checklist of key recommendations

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

4.1 Overview of steps

This guidance is organised in terms of the steps a user follows in assessing transformational impacts of a policy or action (see Figure 4.1). Depending on when the guidance is applied, users can select Chapter 8 or Chapters 9 and 10. For example, if the guidance is applied ex-ante before a policy is implemented, users can skip Chapters 9 and 10.

Figure 4.1: Overview of Steps



4.1.1 Planning the assessment

It is important to plan the steps, responsibilities and resources needed to meet the objectives for assessing transformational impacts. The time and human resources required to use the guidance in its entirety depend on a variety of factors, such as the complexity of the policy or action being assessed, the range of transformational change characteristics and corresponding indicators included in the assessment, the extent of data collection needed and whether relevant data has already been collected, and whether similar analysis related to the policy or action has previously been done.

Quantifying impacts of the policy or action

To assess the extent of transformation of a policy or action, it is necessary to first understand the impacts of a policy or action in terms of its GHG and sustainable development impacts. To do so, users can apply other ICAT guidance in combination with this guidance. To assess the GHG impacts of the policy or action, users can apply the GHG guidance that is relevant to the policy or action—*Renewable Energy Guidance*, *Buildings Efficiency Guidance*, *Transport Pricing Guidance*, *Agriculture Guidance* or *Forest Guidance*. To assess the various sustainable development impacts of the policy or action, users can apply the ICAT *Sustainable Development Guidance.* This includes many different types of impacts across the environmental, social and economic dimensions, such as air quality, health, jobs, income, gender equality and energy security, among many others.

Planning stakeholder participation

Stakeholder participation is recommended in many steps throughout the guidance. It can strengthen the impact assessment and the impact of policies in many ways, including by:

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

Various sections throughout this guidance explain where stakeholder participation is recommended—for example, in choosing which transformational change characteristics to assess (Chapter 6), identifying

barriers to transformational change (Chapter 7), qualitatively assessing impacts (Chapters 8 and 9), monitoring performance over time (Chapter 10), reporting (Chapter 11) and decision making and using results (Chapter 12).

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

It is important to ensure conformity with national legal requirements and norms for stakeholder participation in public policies, as well as requirements of specific donors and of international treaties, conventions and other instruments that the country is party to. These are likely to include requirements for disclosure, impact assessments and consultations, and may include specific requirements for certain stakeholder groups (e.g., UN Declaration of the Rights of Indigenous Peoples, International Labour Organisation Convention 169) or specific types of policies and actions (e.g., UNFCCC guidance on safeguards for activities reducing emissions from deforestation and degradation in developing countries).

During the planning phase, it is recommended to identify stakeholder groups that may be affected by or may influence the policy. Appropriate approaches should be identified to engage with the identified stakeholder groups, including through their legitimate representatives. To facilitate effective stakeholder participation, consider 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 advise and potentially contribute to decision making to ensure that stakeholder interests are reflected in design, implementation and assessment of policies, including on stakeholder participation in the assessment of transformational impacts of a particular policy. It is also important to ensure that stakeholders have access to a grievance redress mechanism to secure adequate protection of stakeholders' rights related to the impacts of the policy.

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

Planning technical review (if relevant)

Before beginning the assessment process, consider whether technical review of the assessment report will be pursued. The technical review process emphasises 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 Guidance* for more information on the technical review process.

4.2 Assessment principles

Principles are intended to underpin and guide the impact assessment process, particularly where the guidance provides flexibility.

It is a *key recommendation* to base the assessment on the principles of relevance, completeness, consistency, transparency, accuracy and reflection on ambition, as follows:

- **Relevance:** Ensure the assessment serves the decision-making needs of users and stakeholders. Provide sufficient information to serve the intended purpose and meet the expectations and objectives of users.
- **Completeness:** Assess all relevant and significant characteristics of transformational change related to a policy or action, and complete each relevant step in the assessment.
- **Consistency:** Use consistent approaches and data collection methods to allow for meaningful results and performance tracking over time. Any changes to data, assessment methods or any other relevant factor should be transparently documented and reported as applicable.
- **Transparency:** Provide clear and complete information for internal and external users and stakeholders to determine the credibility and reliability of results. Disclose all relevant methods, data sources, assumptions and uncertainties as far as feasible.
- **Accuracy:** Ensure use of appropriate methods and data and valid assumptions to enhance accuracy and reliability of results. It may be necessary to balance the need for accuracy with available resources and users' capacity, particularly considering the largely qualitative nature of transformational impact assessment. If accurate data is not available, users should strive to improve accuracy over time as better data becomes available.
- **Reflection on ambition:** Be problem oriented, always have a clear rationale, and focus on how the policy or action contributes to transformational change at every step of the assessment. Conduct iterative and reflexive monitoring and ongoing adjustment of transition goals and strategies towards progression and ambition of policies and actions to become more effective, efficient and up-scale transformational impacts.

In addition to the principles above, users should follow the principle of comparability if it is relevant to their assessment objectives, for example, if the objective is to compare and prioritise multiple policies based on the extent of transformation expected or achieved by them.

- **Comparability:** Ensure common methods, data sources, assumptions, and reporting formats are used in assessments so that the estimated impacts of multiple policies can be compared. While the principle of consistency refers to being consistent in the use of methods, data etc. over time in assessing a given policy or action, comparability is about commonality in assumptions and methodologies between assessments of different policies.

The principle of comparability can be applied if the objective is for a single entity to assess and compare multiple policies or actions using the same methodology. If the objective is to compare multiple assessment reports of policies carried out by different entities, it is important to exercise greater caution. Differences in reported results may be due to differences in methodology rather than real-world differences. Additional measures are necessary to enable valid comparisons in these situations, such as

consistency in the assessment period, the characteristics and indicators assessed and monitored, the starting situation, calculation methods, and data sources. To understand whether comparisons are valid, all methodologies, assumptions, and data sources used should be transparently reported.

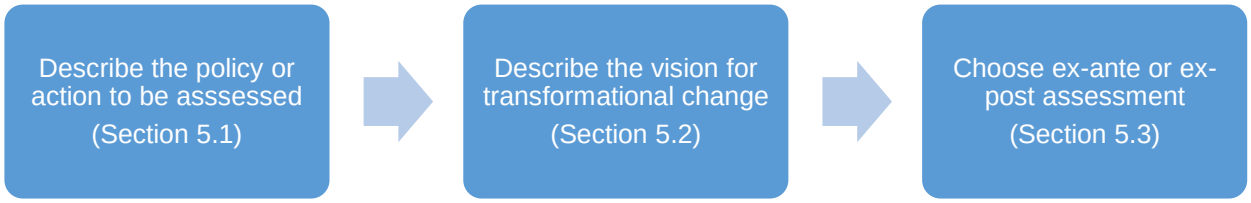
In practice, users may encounter trade-offs between principles when carrying out an assessment. For example, users may find that achieving the most complete assessment requires using less accurate data for a part of the assessment, which could compromise overall accuracy. Conversely achieving the most accurate assessment may require excluding sources with low accuracy which compromises completeness. Users should balance trade-offs between principles depending on their assessment objectives. Over time, as the accuracy and completeness of data increases, the trade-off between these principles will likely diminish.

PART II: DEFINING THE ASSESSMENT

5. DESCRIBING THE POLICY OR ACTION AND THE VISION FOR TRANSFORMATIONAL CHANGE

To assess the transformational impacts of a policy or action, users need to describe the policy or action that is assessed, decide whether to assess an individual policy or action or a package of related policies or actions, explain the policy or action's vision for transforming society, and choose whether to carry out an ex-ante or ex-post assessment.

Figure 5.1: Overview of steps in the chapter



Checklist of key recommendations

- Clearly describe the policy or action (or package of policies or actions) that is being assessed
- Describe the transformational vision of the policy or action, through consultation with key stakeholders

5.1 Describe the policy or action to be assessed

A comprehensive and structured description of the policy or action is necessary to carry out the assessment in subsequent steps. It is a *key recommendation* to clearly describe the policy or action (or package of policies or actions) that is being assessed. Table 5.1 provides a checklist of recommended information to be described to enable an effective assessment.

If multiple policies and actions are being developed or implemented in the same timeframe or as part of the same broad strategy or plan, users can assess the policies or actions either individually or together as a package. When making this decision, it is useful to consider the assessment objectives, feasibility and degree of interaction between the individual policies and actions under consideration. Further guidance on whether to assess an individual policy or action or a package of policies and actions is available in the specific ICAT GHG guidance and *Sustainable Development Guidance*. Users that are assessing the GHG impacts and/or sustainable development impacts of the policy or action following other ICAT guidance should define the policy or action or policy package in the same way to ensure a consistent and integrated assessment, or explain why there are differences in how they are defined across the assessments.

If a package is assessed, it should be explained which individual policies and actions are included in the package and how they contribute to a transformational vision. In subsequent chapters, users follow the same general steps and guidance, whether they choose to assess an individual policy or action or a package of policies and actions.

Users that assess a package of policies and actions can use Table 5.1 either for the entire package or separately for each policy or action within the package.

Table 5.1: Checklist of recommended information to understand and describe the policy or action

Information	Description	Example
Title of the policy or action	Policy or action name	Grid-Connected Solar Rooftop Programme. Throughout this guidance, it is referred to as the "Solar PV policy"
Type of policy or action	The type of policy or action such as those presented in Table 1.1, or other categories of policies or actions that may be more relevant	Financial incentive policy
Description of specific interventions	The specific intervention(s) carried out as part of the policy or action, such as the technologies, processes or practices implemented to achieve the policy or action	Description of financial incentives: The policy includes two specific interventions: 1) A financial subsidy up to 30% of project/benchmark cost for rooftop solar projects in the residential/institutional and social sectors. It also provides concessional loans to solar rooftop project developers. 2) A feed-in tariff for all new grid-connected solar rooftop and small solar power plants
Status of the policy or action	Whether the policy or action is planned, adopted or implemented	The policy has been implemented (currently in effect)
Date of implementation	The date that the policy or action comes into effect (not the date that any supporting legislation is enacted)	1 January 2016
Date of completion (if relevant)	If relevant, 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)	The provision of financial incentives and feed-in tariff ends on 31 December 2022
Implementing entity or entities	The entity(ies) that implement(s) the policy or action, including the role of various local, subnational, national, international or any other entities	Government funds are disbursed by the ministry to state agencies, financial institutions, implementing agencies and other government approved channel partners that includes renewable energy service providers, system integrators, manufacturers, vendors and NGOs. Feed-in tariff is determined at a national level by an electricity regulatory authority and is administered by the electricity utility companies.
Objectives and intended impacts	The intended impact(s) or benefit(s) the policy or action intends to achieve	The policy is intended to increase deployment of solar energy, deepen

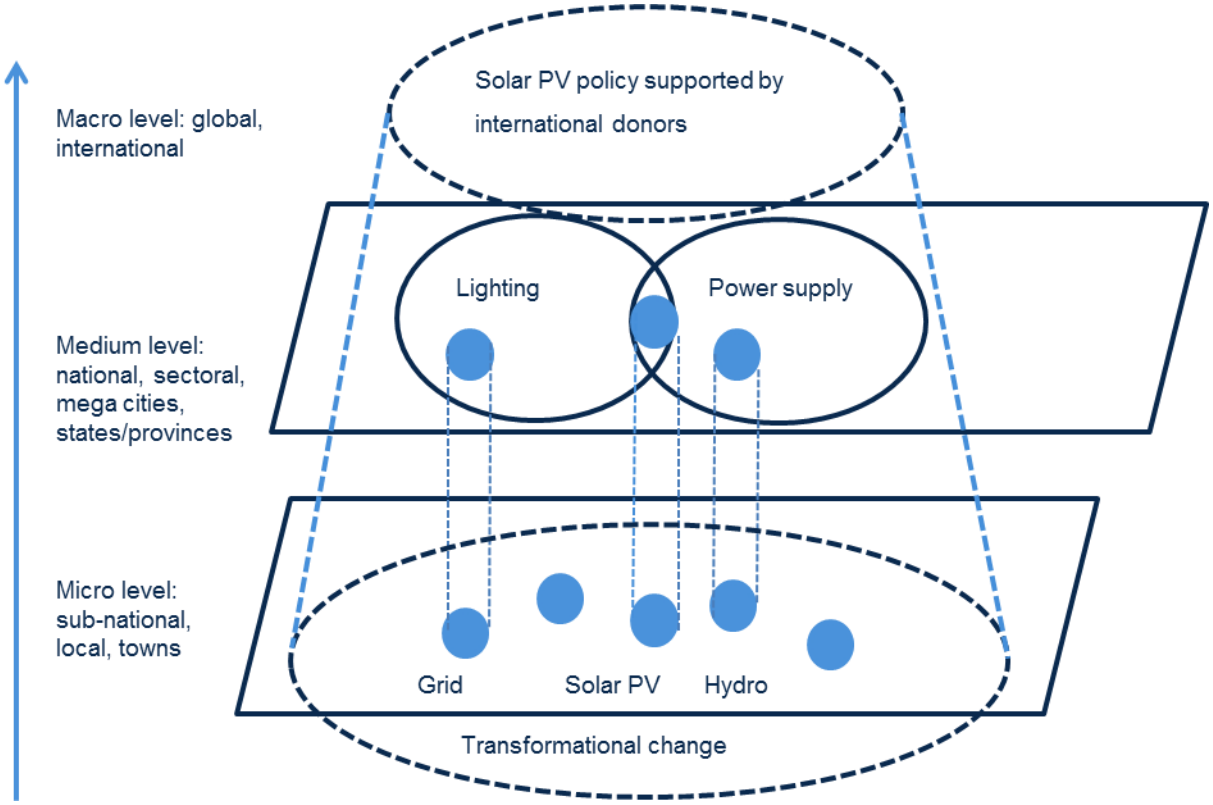
or benefits of the policy or action	(e.g., the purpose stated in the legislation or regulation), including specific goals for GHG emission reductions and sustainable development impacts if available	solar technology penetration, increase access to clean energy, increase energy security, create jobs, reduce greenhouse gas emissions, and create an enabling environment for technology penetration, investment, installation, capacity building, research and development in the solar energy sector. The policy has set the following goals: 1) Annual emission reductions of 200,000 tCO2e, 2) 2,000 new green jobs (e.g., in solar PV installation and maintenance sectors) created by 2022
Level of the policy or action	The level of implementation, such as national level, subnational level, city level, sector level or project level	National
Geographic coverage	The jurisdiction or geographic area where the policy or action is implemented or enforced, which may be more limited than all the jurisdictions where the policy or action has an impact	Country wide
Sectors targeted	Which sectors and subsectors are targeted	Energy supply, grid-connected solar PV
Other related policies or actions	Other policies or actions that may interact with the policy or action assessed	The Government targets installation of 100,000 MW of solar power by 2022 of which 40,000 MW is to be achieved through rooftop solar power plants through the solar PV policy.

5.2 Describe the vision for transformational change of a policy or action

Transformational change can happen as a result of pressures created by people, policies or new disruptive technologies at different levels of society. Such pressures may enable a reconfiguration of existing structures, policies and practices. A policy or action can contribute to transformational change by reconfiguring high-carbon and unsustainable structures in society through intervention(s) at one or several interacting societal levels.

Figure 5.2 illustrates how a solar PV policy supported by international donors intervenes to create a change (illustrated by the blue dots) in national policies for lighting and power supply (illustrated by the circles at medium level) and in towns and local areas (micro level) by promoting solar PV systems and grid connection.

Figure 5.2: Example of how a solar PV policy interacts with society at multiple levels



Source: Adapted from Geels 2004, Bodoo & Olsen (forthcoming).

It is a *key recommendation* to describe the transformational vision of the policy or action, through consultation with key stakeholders. To identify how a policy or action seeks to change society towards zero-carbon and sustainable practices, it is useful to describe the vision for transformational change over time at different levels of society.

Table 5.2 provides a template for describing the vision for transformational change at three levels of society and three time periods to understand the ambition of a policy or action for contributing to zero-carbon and sustainable development goals. This process can help guide the selection of the assessment boundary and assessment period in the next chapter.

Involving a network of key stakeholders (for example, 10-15 people) from all spheres of society is useful to help develop the vision and give advice on how to achieve transformational outcomes during the transition period. Stakeholders from government, companies, NGOs and knowledge providers should be invited to form a network of experts, advisors and opinion leaders. Refer to the ICAT *Stakeholder Participation Guidance* for more guidance on identifying and understanding stakeholders (Chapter 5) and on establishing multi-stakeholder bodies (Chapter 6).

Table 5.2: Description of the transformational change vision at different levels of society and different time periods

Levels of society and time periods	Description of the vision for desired societal and technical changes at each level and time period	Example: Solar PV policy
Global or international level (macro level)	Describe the vision for desired changes at this level	Contributing to the global vision of zero-carbon and sustainable development, the desired future change is to achieve zero carbon electricity production with international support. The policy does not result in a change at the global level.
National or sectoral level (medium level)	Describe the vision for desired changes at this level	The policy has set the following goals at the national/sectoral level: Annual emission reductions of 200,000 tCO_2e 2000 new green jobs (e.g., in solar PV installation and maintenance sectors)
Subnational level (micro level)	Describe the vision for desired changes at this level	The solar PV policy is implemented at subnational levels supported by incentives for private sector involvement and knowledge development. In rural districts and towns solar PV mini-grids enable economic growth, poverty reduction and new jobs
Long-term change (≥15 years)	Describe the long-term vision for transformational change	The long-term vision by 2050 is to achieve 60% solar PV in the national electricity mix and create 10,000 new green jobs
Medium-term change (≥5 years and <15 years)	Describe the medium-term vision for transformational change	The mid-term vision by 2030 is to achieve 30% solar PV in the national electricity mix and create 5,000 new green jobs
Short-term change (<5 years)	Describe the short-term vision for transformational change	The short-term vision by 2022 is to install 40,000 MW of rooftop solar PV and create 2000 new green jobs in doing so

5.3 Choose ex-ante or ex-post assessment

Users should choose whether to carry out an ex-ante assessment, ex-post assessment, or a combined ex-post and ex-ante assessment. An assessment is classified as either ex-ante or ex-post depending on whether it is prospective (forward-looking) or retrospective (backward-looking). Ex-ante assessment is the process of assessing expected future impacts of a policy or action. Ex-post assessment is the process of assessing historical impacts of a policy or action. Ex-ante assessment can be carried out before or during policy implementation, while ex-post assessment can be carried out either during or after policy implementation.

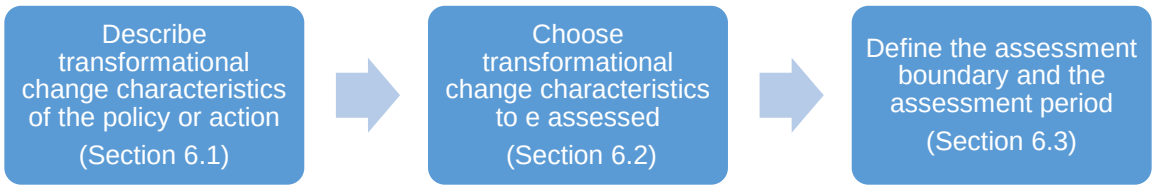
Choosing between ex-ante or ex-post assessment depends on the status of the policy or action. If the policy or action is planned or adopted, but not yet implemented, then the assessment is ex-ante by definition. Alternatively, if the policy or action is under implementation, then the assessment can be ex-

ante, ex-post or a combination of ex-ante and ex-post. In this case, users should carry out an ex-post assessment if the objective is to assess the extent of transformation achieved by the policy or action to date; an ex-ante assessment if the objective is to assess the extent of transformation expected in the future, or a combined ex-ante and ex-post assessment to assess both the extent of transformation expected and achieved by the policy or action.

6. Choosing Which Transformational Change Characteristics To Assess

This chapter provides guidance on identifying and choosing transformational change characteristics that are relevant for a policy or action. It also defines the transformational change assessment boundary and the assessment period.

Figure 6.1: Overview of steps in the chapter



Checklist of key recommendations

- Identify and describe transformational characteristics of the policy or action
- Choose characteristics to be assessed based on their relevance to a policy or action and the society in which it is implemented
- Define the assessment boundary in terms of geographical and sectoral coverage of transformational characteristics selected for assessment
- Define the assessment period

6.1 Describe transformational change characteristics of the policy or action

This section explains characteristics of transformational change to help users understand the transformational impacts of a policy or action. Characteristics are divided into two types: outcome and process characteristics. The characteristics provide a universal framework to describe all possible characteristics of a policy or action regardless of where it is implemented. It is a *key recommendation* to identify and describe transformational characteristics of the policy or action.

Identify characteristics of transformational change

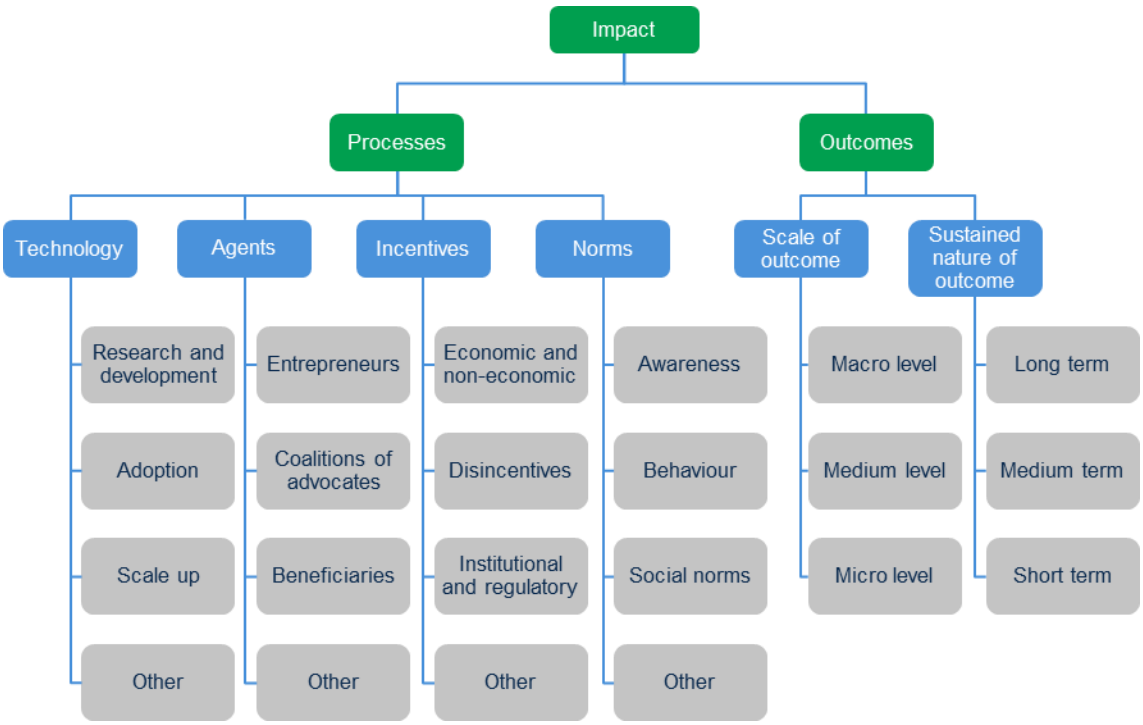
A framework of outcome and process characteristics described in Table 6.1 and Table 6.2 is used to assess how a policy or action contributes to transformational change. The outcome and process characteristics together define the transformational impact of a policy or action.

Figure 6.2 illustrates the framework of characteristics of transformational impact. All policies and actions are assessed against the categories and characteristics of transformational impact. Users identify how the general process and outcome characteristics can guide a description of the transformational change characteristics specific to a policy or action.

Describe characteristics of transformational change specific to a policy or action

Users describe all characteristics specific to their policy or action. It is important to clearly describe characteristics in a manner that these are mutually exclusive and collectively comprehensive, while recognising that the characteristics are interrelated. This will avoid duplication and overlaps between different characteristics and will ensure that a particular effect is not considered multiple times during the assessment. Table 6.4 in Section 6.2 provides a template to describe transformational change characteristics specific to a policy or action and the society in which it is implemented.

Figure 6.2: Characteristics of transformational impact



Outcome categories and characteristics

Outcome characteristics refer to the scale and sustained nature of outcomes resulting from a policy or action. Outcomes are measured in terms of GHG emissions reduction and sustainable development impacts across environmental, social and economic dimensions (e.g., air quality, health, jobs, gender equality and energy security, among others). Users assess both the scale and the sustained nature of GHG emissions and sustainable development impacts of the policy or action.

The scale of outcomes refers to a policy or action leading to outcomes that are large in terms of the magnitude of impact and/or population affected. Making a policy more transformational involves enhancing the ambition of a policy from small-scale to large-scale outcomes as well as affecting a greater population to result in changes of large magnitude. While the focus is on large-scale changes, it is important to note that multiple small-scale changes can collectively lead to large-scale changes or a single small-scale change can trigger a large-scale change over time.

To assess the magnitude of impacts, users can refer to the various ICAT GHG guidance documents (for assessing GHG impacts) and the ICAT *Sustainable Development Guidance* (for assessing the magnitude of various sustainable development impacts; in particular, see Chapter 7 for a qualitative approach to

classifying impacts as major, moderate, or minor, and Chapters 8-10 for guidance on quantifying impacts).

The sustained nature of outcomes refers to the durable nature of the effects of a policy or action. Making a policy transformational involves expanding support for the policy or action over time and preventing the removal or weakening of transformational impacts of a given policy. Table 6.1 provides an overview of outcome characteristics.

Table 6.1: Outcome categories and characteristics of transformational change

Category	Characteristics	Description of outcome characteristics
Scale of outcome	Macro level	GHG and sustainable development outcomes are large in magnitude and at international/global level
	Medium level	GHG and sustainable development outcomes are large in magnitude at national or sectoral levels
	Micro level	GHG and sustainable development outcomes are large in magnitude at subnational, subsector, city or local levels
Outcome sustained over time	Long-term	GHG and sustainable development outcomes are achieved and sustained ≥15 years from the starting situation
	Medium-term	GHG and sustainable development outcomes are achieved and sustained ≥5 years and <15 years from the starting situation
	Short-term	GHG and sustainable development outcomes are achieved and sustained <5 years from the starting situation

Process categories and characteristics

Process characteristics describe how a policy or action can trigger changes in society that enable achievement of transformational impacts. These can be understood as intermediate steps or means to realise transformational outcomes. In this guidance, process characteristics are organised in four categories: technology, agents, incentives and norms. Table 6.2 provides an overview of transformational process characteristics. Users can add 'Other' characteristics to each category if there are changes triggered in society by the policy or action that are not captured in this table (as shown in Figure 6.2).

Table 6.2: Process categories and characteristics of transformational change

Category	Characteristics	Description of characteristics
Technology	**Research and development (R&D):** Policy or action supports R&D for building technological capabilities favouring a low carbon economy	Technological research and development happens through supporting science, innovation, specialisation and learning. Investment in R&D, development of the knowledge/skill base, research networks and consortiums, capacity building efforts, and experimentation are examples of activities supporting technological development.
	Adoption: Policy or action leads to early adoption of promising low carbon technologies	Technology adoption can be facilitated by pilot projects, demonstrations, experimentation, publicly or privately funded trials of low carbon technologies. This helps in assessing the

		market for new technologies, developing skills and capacities to use them, and building networks to support the new solutions.
	Scale up: Policy or action supports scale up and diffusion of low carbon innovations	Technology scale up can be facilitated by replication, diffusion through public-private sector networks, training workshops, business forums and applying innovative ways to conduct business and deliver products and services at a larger scale.
Agents	**Entrepreneurs:** Policy or action promotes entrepreneurs, businesses and investors to catalyse transformational change	Actors, such as entrepreneurs innovating and experimenting with new technologies and applications, businesses forming markets and investors bringing resources to clean technology, are all key agents of change that the policy can support to drive change. Entrepreneurship can be supported by government policy or actions by providing an enabling environment to take initiative and risk and by facilitating exchange of information and ideas.
	Coalitions of advocates: Policy or action supports coalitions and networks that seek to broaden and deepen support for low carbon development	The agency of a wide range of stakeholders can be exercised through political mobilisation, coalitions lobbying strategies and engagement in advocacy. New networks of various types of actors, for example, the labour and environmental movements, private-public actors, may come together because of the way in which the policy was designed.
	Beneficiaries: Policy or action supports diverse groups of society affected by the transformational change	Beneficiaries include those who benefit directly from the policy or action (e.g., solar producers) as well as those who are compensated if the policy has adverse effects (e.g., workers employed in the coal industry that lose their jobs). Beneficiaries can serve as agents of change and play a role in ensuring the policy or action is durable and strengthened over time.
Incentives	**Economic and non-economic:** Policy or action utilises fiscal and non-monetary incentives to shift technology and increase market penetration	Economic incentives include tariff structures, access to low-cost finance, feed in tariff policies for renewable energy, valued added tax (VAT) exemption, import duty exemptions on new technology, and lowered land rates on renewable energy projects. Non-economic incentives include partnerships, giving ownership to local initiatives and communities, long-term institutional and governance support, lending political support/signing MOUs, and removal of bureaucratic procedures.
	Disincentives: Policy or action de-incentivises technologies and businesses contributing to a high-carbon economy	Disincentives include taxes on carbon-intensive products, the use of market-based instruments such as import duties, tariff structure discouraging investments in business-as-usual technologies, reduce/phase out fossil fuel subsidies and increase/introduce fossil fuel taxes.
	Institutional and regulatory: Policy or action creates or re-configures existing conditions, regulation and institutions favouring low carbon development	The policy or action leads to a fertile ground for further institutional or regulatory change; for example, the climate policy may lead to the creation of formal and informal institutions, or may lead to new regulation over time.
Norms	**Awareness:** Policy or action supports awareness raising and education for sustainability transition	This includes raising awareness to enhance the level of support for low carbon solutions to affect a change in norms and behaviour among diverse groups of stakeholders. Examples include awareness campaigns and sensitisation of policy makers and consumers, e.g., to inform policymakers about falling prices of renewable energy technologies or for consumers to easily identify more efficient appliances through labelling programs, addressing barriers to adopting new behaviours, disseminating information at various levels of governance, and utilising local organisations and media to spread information.

	Behaviour: Policy or action supports measures that discourage high-carbon lifestyle and practices and promote low carbon solutions	Examples of measures focused on influencing consumer behaviour include peak energy savings credit by utilities, cash incentives for using alternate transport, congestion charges for driving in certain areas during busy hours. At the same time, a growing level of awareness about benefits of recycling or preferring public transport over private cars can lead to changes in behaviour across the society.
	Social norms: Policy or action affects norms within society that align with and further promote low carbon, sustainable development	Social norms refer to cultural rules of behaviour that are considered acceptable in a society. As awareness increases and behaviour changes, societal norms change. Policy or action contributes to low carbon lifestyle becoming the prevalent societal norm, which reflects broad and deeply entrenched support within the society.

Appendix B provides examples of indicators for process and outcome characteristics for a more detailed qualitative and quantitative description of characteristics.

6.2 Choose transformational change characteristics to be assessed

The section explains how to choose transformational change characteristics to be assessed in greater detail in subsequent steps. The relevance of characteristics is determined based on the objectives of the assessment, national circumstances, policy context, and stakeholder priorities. It is a *key recommendation* to choose characteristics to be assessed based on their relevance to a policy or action and the society in which it is implemented.

Characteristics are classified as *relevant*, *possibly relevant*, or *not relevant* as shown in Table 6.3.

When determining relevance, users consider whether the policy or action directly or indirectly affects this characteristic. For example, if a given policy is expected to have a small indirect impact on coalitions of advocates in the country, and experts and stakeholders recognise that the support of influential advocates of low carbon development is crucial for transformational change to occur in the society, the coalition of advocates characteristic should be considered possibly relevant. This broader interpretation of relevance ensures that changes related to characteristics critical for transformational change in the given context are regularly monitored.

Characteristics classified as *relevant* and *possibly relevant* are assessed in subsequent steps.

Table 6.3: Determining the relevance of characteristics

Relevance	Description
Relevant	Reason to believe the policy or action will affect this characteristic
Possibly relevant	It is not clear whether the policy or action affects or does not affect this characteristic. Where the relevance is unknown or cannot be determined the characteristic should be monitored over time
Not relevant	Reason to believe the policy or action will not affect this characteristic

Relevant characteristics are identified by seeking a wide range of stakeholder opinions and priorities. The ICAT *Stakeholder Participation Guidance* (Chapter 8) provides information on designing and conducting consultations.

The relevance of characteristics can vary over time due to changes in underlying conditions and circumstances. Users may find that characteristics described as *possibly relevant* or *not relevant* become relevant over time, or some characteristics are no longer relevant. Therefore, users are encouraged to assess the relevance of characteristics regularly during the monitoring phase. In doing so, users revisit Table 6.4 and Table 6.5, and update these at regular intervals as per the monitoring plan described in Chapter 10. Users can also choose to monitor characteristics classified as *not relevant* in less detail. This can involve expert judgment, literature review, proxy data or stakeholder inputs to record any changes in these characteristics.

Table 6.4 and Table 6.5 provide a template to list and describe which outcome and process characteristics are selected as relevant for detailed analysis in subsequent steps of impact assessment and justify the choice. Users should strive for completeness, transparency and reflection on ambition when describing the critical decisions made in Sections 6.1 and 6.2, and provide rationale and justification.

Table 6.4: Template for choosing outcome characteristics relevant to a policy or action – illustrated for the solar PV policy example

Category	Outcome characteristics	Description – specific to a policy or action	Relevance	Justification
Scale of outcome	Macro level: GHG and sustainable development outcomes are large in magnitude at international/global level		Not relevant	Solar PV policy in the country may have a regional impact but this is outside the assessment boundary
	Medium level: GHG and sustainable development outcomes are large in magnitude at national or sectoral levels	The policy has set the following goals at national/sectoral level: • Annual emission reductions of 200,000 tCO_2e • 2,000 new green jobs (e.g., in solar PV installation and maintenance sectors) created by 2022	Relevant	Solar PV policy is aimed at national level impacts related to GHG and sustainable development
	Micro level: GHG and sustainable development outcomes are large in magnitude at subnational, subsector, city or local levels	The solar PV policy is implemented at subnational levels supported by incentives for private sector involvement and knowledge development. In rural districts and towns solar PV mini-grids enable economic growth, poverty reduction and new jobs	Relevant	Solar PV policy will be implemented at different subnational levels (states, cities, etc.) to influence change at a national scale

Outcome sustained over time	Long-term: GHG and sustainable development outcomes are achieved and sustained ≥15 years from the starting situation		Not relevant	Long-term is outside the assessment boundary (the assessment period is 10 years, Section 6.3). Note: Users can continue to monitor the policy beyond the assessment period if resources and other factors permit
	Medium term: GHG and sustainable development outcomes are achieved and sustained ≥5 years and <15 years from the starting situation	The mid-term vision by 2030 is to achieve 30% solar PV in the national electricity mix and create 5,000 new green jobs	Relevant	Solar PV policy is expected to result in GHG and sustainable development outcomes in the medium term
	Short term: GHG and sustainable development outcomes are achieved and sustained <5 years from the starting situation	The short-term vision by 2022 is to install 40,000 MW of rooftop solar PV and create 2000 new green jobs	Relevant	Solar PV policy is likely to result in impacts that will be sustained in the short-term

Table 6.5: Template for choosing process characteristics relevant to a policy or action – illustrated for the solar PV policy example

Category	Process characteristics	Description - specific to a policy or action	Relevance	Justification
Technology	Research and development (R&D)		Not relevant	The policy does not include any provisions for increased investment in the solar R&D.
	Adoption	The policy leads to early adoption of solar grid rooftop among residential and commercial consumers.	Relevant	Solar PV policy is expected to directly influence adoption rates of solar grid rooftop.
	Scale up	The policy leads to large scale deployment of solar PV rooftop installations as new business models emerge for service and delivery to capitalise on the policy incentives and preferential tariff.	Relevant	The policy is expected to scale up solar grid rooftop in the country.
Agents	Entrepreneurs	The policy directly engages entrepreneurs, businesses and investors through financial subsidy and feed-in tariff.	Relevant	These are some of the most important change agents for the solar PV policy. The policy is expected to mobilise each one of these groups to achieve its goal.

	Coalitions of advocates	The policy indirectly provides a fertile ground for coalitions and networks of stakeholders to engage towards a common goal of increased solar uptake.	Possibly relevant	Solar PV policy is expected to indirectly support the creation of coalitions and networks.
	Beneficiaries		Not relevant	The policy does not directly support beneficiaries of the solar PV policy.
Incentives	Economic and non-economic	Financial incentives are at the core of the policy which uses subsidies and preferential tariff to catalyse growth in the solar sector.	Relevant	Solar PV policy will utilise subsidies and preferential tariff as means to increase technology penetration.
	Disincentives	Policy does not employ disincentives for carbon-intensive energy generation.	Possibly relevant	Solar PV policy is not likely to use disincentives as means to achieve its goals. However, fossil fuels enjoy significant subsidies in the country and disincentives can be an important tool for achieving grid parity sooner.
	Institutional and regulatory	Policy leads to the formation of new agencies, institutions, and regulations at subnational level.	Relevant	Solar PV policy is expected to lead to the development of new agencies and regulations to further promote solar in states.
Norms	Awareness		Not relevant	Solar PV policy does not target awareness raising and information sharing.
	Behaviour	Solar PV policy affects the behaviour of residential and commercial consumers by preferring clean light from solar PV rather than light from unclean sources (such as kerosene lamps).	Relevant	Solar PV policy is expected to influence behaviour of consumers and residents by shifting their preferences away from carbon intensive electricity.
	Social norms	Solar PV policy may have an influence on societal attitudes in favour of rooftop PV technologies.	Possibly relevant	Solar PV policy is expected to indirectly influence societal norms but it is unclear if the effect is strong enough to change norms away from traditional practices.

6.3 Define the assessment boundary and assessment period

The assessment boundary and assessment period define the scope of the assessment. The assessment boundary defines the scope of the assessment in terms of the types of impacts (processes and outcomes of change), categories and specific characteristics of transformational change that are included in the assessment.

This guidance encourages a comprehensive assessment that includes the full range of characteristics considered to be relevant. For this reason, the assessment boundary can be broader than the geographic and sectoral boundary within which the policy or action is implemented. If a policy is implemented within one sector in one country, but has significant impacts in other sectors or in neighboring countries, the assessment boundary should include impacts in sectors and countries beyond the sector and country where it is implemented, if relevant and feasible. All specific and relevant characteristics of transformational change identified are to be included in the assessment boundary.

The assessment period is the time period over which the extent of transformation expected or achieved by the policy or action is assessed. The assessment period can differ from the policy implementation period, which is the time period during which the policy or action is in effect.

It is a *key recommendation* to define the assessment boundary in terms of geographical and sectoral coverage of transformational characteristics selected for assessment. Users define the assessment boundary in terms of the geographical coverage and sectoral coverage as follows:

- **Geographical coverage***:* Users can undertake the assessment at global, national, state- or city-level. This may or may not be distinct from the geographic coverage of the policy. For example, users can undertake a regional or national assessment of a policy such as the European Union Emissions Trading Scheme which applies to the entire EU region. In the hypothetical example of a solar PV policy, users can conduct the transformational change assessment at a national level since it is a national policy. It is also possible to undertake this assessment at a state level to understand whether the policy is likely to result in transformational change in a state.
- **Sectoral coverage***:* Users should specify the sector(s) included in the assessment. These can be the same or a subset of sectors targeted by the policy or action. Users should include at least the major sector(s) affected by the policy in their assessment. For the solar PV policy, users could undertake the assessment for the entire electricity sector, the renewable energy sector, or the narrower solar PV subsector.

It is a *key recommendation* to define the assessment period. The assessment period can differ from 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 relevant impacts based on when they are expected to occur. Further, it can be a single year or a multi-year period. For ex-ante assessment, users are encouraged to select a long assessment period (e.g., 15 years or more).

The timing and coverage of data collection to assess characteristics will depend on reporting needs as well as the indicators and data sources on which they are based. Chapter 10 provides further guidance on the practical monitoring of indicators over time and within the assessment boundary defined.

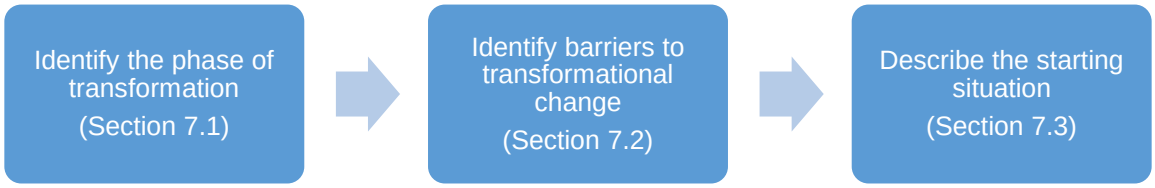
Where possible, users should align the assessment period with other assessments being conducted using ICAT guidance. For example, where users are assessing sustainable development impacts using the ICAT *Sustainable Development Guidance* in addition to assessing transformational impacts, the assessment period should be the same for both the sustainable development and transformational impact assessment.

PART III: IMPACT ASSESSMENT

7. ASSESSMENT OF THE STARTING SITUATION

This chapter provides guidance on assessing the starting situation for transformational change. The starting situation describes the state of the system and the status of the transformational change characteristics. Assessment of the starting situation is useful to understand the extent to which a policy or action triggers a shift away from carbon intensive and unsustainable pathways. The existing barriers to transitioning the system and the starting situation for transformational characteristics are both useful as a reference point. The starting situation can refer to a historical year of reference in the case of ex-post assessment or the current year in the case of ex-ante assessment.

Figure 7.1: Overview of steps in the chapter



Checklist of key recommendations

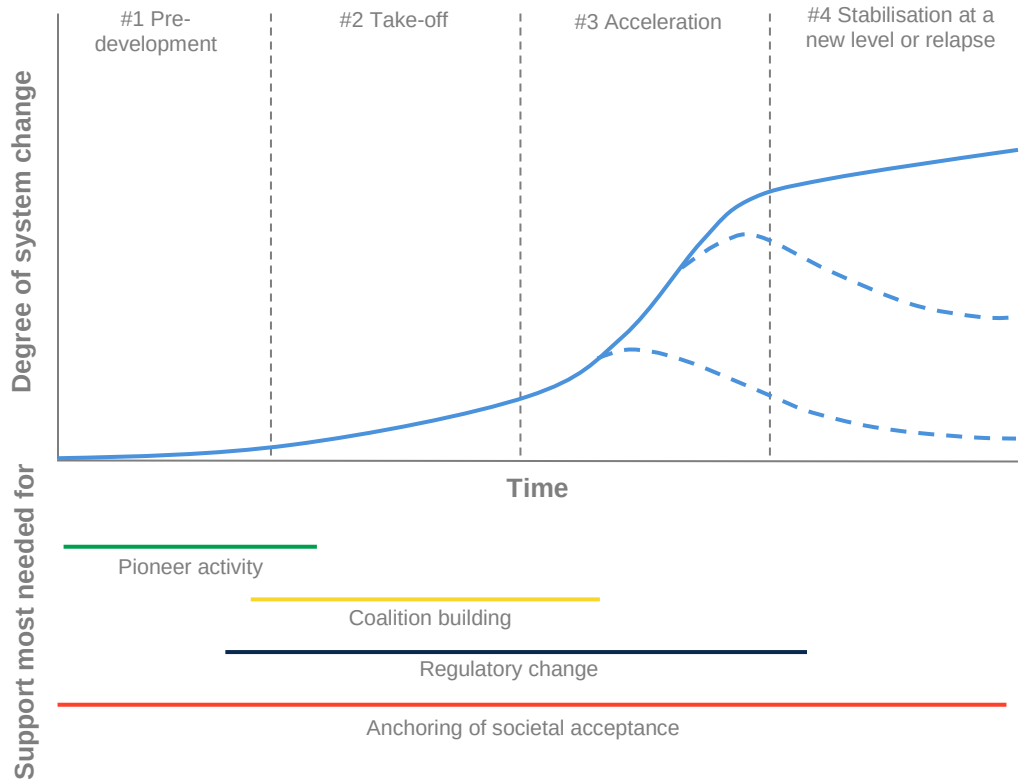
- Identify the phase of transformation to understand the context in which the policy or action is being planned or implemented
- Identify barriers for transformational change specific to the phase of transformation
- Describe the starting situation of characteristics impacted by the policy or action

7.1 Identify the phase of transformation

Comprehensively assessing the phase of transformation is a critical step in understanding whether the policy or action is well-suited to overcoming barriers and driving transformational change. Different components of the system can be at different stages of transformation towards low-carbon development. For example, while low carbon regulation may be in place, institutional capacity to implement it may be lacking, or while low carbon technological solutions may exist, consumer demand to scale up these solutions may be too weak.

Figure 7.2 shows a useful framework for the assessment and visualisation of the current status of a system, which is on a pathway of transformation towards low-carbon and sustainable development. It helps answer the question “Where are we today and where are we heading?”

Figure 7.2: Phases of transformation



Source: Mersmann et al. 2014; adapted after Rotmans et al. 2000.

A system undergoing transformation to low-carbon and sustainable development can be described to be in either of the following four phases:

Pre-development

The *pre-development phase* could be described as the comfort zone phase. This is characterised, on the one hand, by visible and increasing pressure on government and policies to make moves towards low-carbon and sustainable development. Often such pressure is generated externally and/or from local civil society. On the other hand, the pre-development stage is also characterised by stability and status quo in which existing or predominant paradigms are rarely challenged and institutions are stagnant or very few attempts are made to change them.

Take-off

The take-off phase is characterised by observable moves being taken to enable change in the system towards more openness and acceptance of new ideas and concepts that question or challenge existing high-carbon paradigms. There is an increasing awareness of problems and issues related to un-sustainable development and concrete attempts of possible solutions. Experimentation, innovation and alternatives are expanding and gaining momentum. However, consensus or common understanding is yet to be reached, about which solutions are suitable from the range that is possible. Lobbying against the new and alternative solutions remains strong, fueled by current regime elites who benefit from the present system.

Acceleration

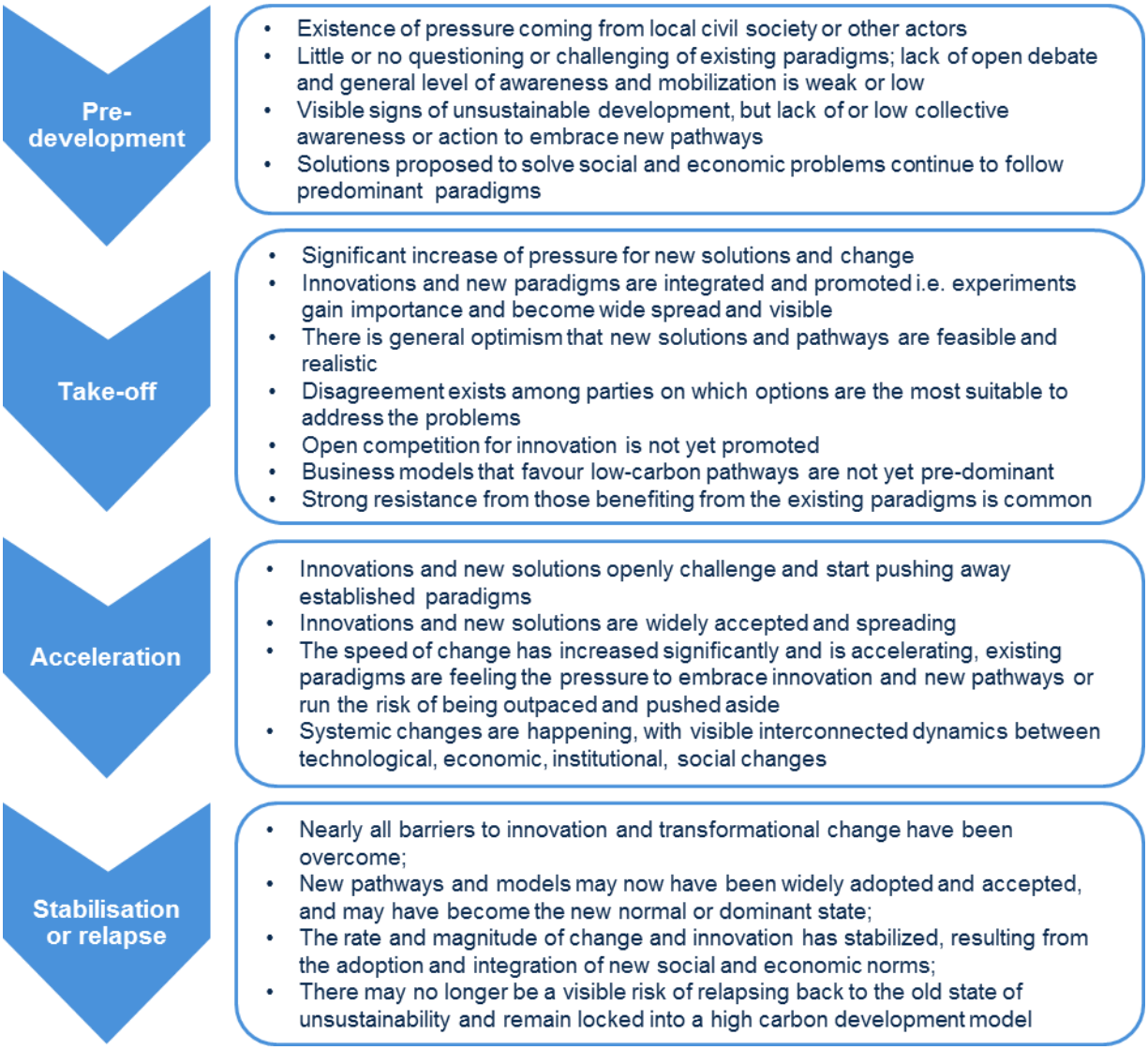
In the acceleration phase, new solutions or innovations gain momentum and challenge the status quo. Alternative solutions have become widespread and are accepted and acknowledged. Despite the opposition by interests, which profit from the high-carbon status quo, there is acceleration of change towards visible and concrete transformative low-carbon solutions for society and the economy.

Stabilisation or relapse

In the stabilisation phase, it is assumed that the system is fully transformed and the new pathways are embraced broadly in the society and economy. Consequently, the rhythm and speed of change decrease significantly and stabilisation is observed, as people start taking the new situation for granted. However, the risk of relapse is high, if the interests of the high-carbon regime remain active and continual efforts may be needed to keep the momentum.

It is a *key recommendation* to identify the phase of transformation to understand the context in which the policy or action is being planned or implemented. Figure 7.3 can be used to identify the phase in which the system is at the starting situation.

Figure 7.3: Criteria to identify the phase of transformation for a system



7.2 Identify barriers to transformational change

Barrier analysis is important for the assessment of the extent of transformation expected from policies and actions. If different types of barriers are not taken into account, the policy or action could be less effective than envisaged. Users that consider all relevant barriers to the policy or action at the starting situation are better prepared to overcome resistance and make use of opportunities that arise. It is a *key recommendation* to identify barriers for transformational change specific to the phase of transformation.

A barrier adversely affects the achievement of a target (Nygaard and Hansen, 2015). It is an obstacle to reaching the full mitigation potential of a system that can be overcome by designing and enacting measures to prevent the undesired effect (Halsnæs et al., 2007).

Barriers can either hinder desired effects, or they can aid undesired flows. The removal of barriers can itself be a mitigation measure (the desired effect), as part of a portfolio of measures or as a single measure to support already existing measures.

Policies and actions with the objective of transforming a sector or area are likely already aiming to remove barriers to low-carbon development. Subsequently many characteristics defined in this chapter already aim to assess the extent of barrier removal. However, while doing this, other barriers may hinder the effective removal of targeted barriers or will, even if some barriers are removed, still impede effective low-carbon development. A careful and comprehensive barrier analysis is therefore essential to achieve any change, including transformational change. Stakeholders can help to identify barriers. For information on designing and conducting consultations refer to the ICAT *Stakeholder Participation Guidance* (Chapter 8).

Particularly for ex-ante assessment, this is a valuable exercise that will not only enhance the quality of the assessment of expected transformational change, but can also be used to improve and fine-tune planned measures to increase the extent of transformation expected. There are different ways to categorise barriers. Categorisation can help to ensure all relevant issues are covered by the analysis. Users should consider the following:

- **Institutional and political barriers:** Absence of or insufficiently resourced institutions (e.g., for regulation, data collection or enforcement); insufficient communication among different institutions; non-existent, unclear, complicated or conflicting policies and regulations (e.g., making permitting procedures lengthy and expensive).
- **Social barriers:** Reluctance to accept the introduction of low-carbon technologies especially when replacing conventional technologies; lack of social trust in equitable distribution of benefits from mitigation projects.
- **Technology barriers:** Dependence on import of low-carbon technologies; lack of domestic production facilities or alternately, insistence on domestic sourcing of technology; low quality of available technology; unavailability of equipment for production and maintenance.
- **Capacity constraints:** Lack of trained personnel for production, installation and maintenance of low-carbon technologies; lack of trained personnel for development of own technology; lack of information on available options; lack of capacity to design and operate sustainable financial frameworks.
- **Financial constraints:** Lack of financing availability or high cost for financing low-carbon technologies; lack of risk-cover instruments; existence of counterproductive subsidies or import regulation.

Describe the barriers relevant for the policy or action, categorised by the five categories above. Table 7.1 provides an example of identifying barriers for the hypothetical solar PV policy.

Table 7.1: Template for describing identified barriers and affected characteristics – using solar PV policy example

Barriers	Explanation	Characteristics affected
Institutional and political		
Lack of a strategy or political will to discourage fossil fuel energy	Existing or foreseeable energy strategy dominantly envisages expansion of coal-fired generation capacity and only limited expansion of solar PV. This barrier makes it difficult to	Institutional and regulatory changes Behaviour

	introduce regulatory changes promoting a feed-in tariff high enough to make solar PV power attractive to private sector investments.	
Technology barriers		
Limited availability of technology	There is very little manufacturing of solar PV components in the country so components need to be imported. This barrier hampers adoption and scale-up of new PV technology.	Adoption Scale up
Capacity constraints		
Lack of technical personnel for installation and maintenance	Lack of trained technicians for solar PV installation slows down a potential scale-up of PV technology.	Scale up
Financial constraints		
High upfront financial investment needed for solar PV	Lack of financial instruments to support customers in financing solar PV weaken the economic incentive and the enabling environment for entrepreneurs to develop new business models for solar PV solutions.	Economic incentive Entrepreneurs

7.3 Describe the starting situation of relevant characteristics

The starting situation helps with the understanding of the status of the system and relevant characteristics to assess change against. It can provide useful insights into the existing barriers at the phase of transformation in which the policy or action operates. It is a *key recommendation* to describe the starting situation of characteristics impacted by the policy or action.

Starting situation is described for characteristics considered *relevant* or *possibly relevant* in Section 6.2. Indicators of outcome and process characteristics are useful to assess specific aspects of system change and can be monitored over time to track progress. Examples of qualitative and quantitative indicators are available in Appendix B.

Indicators are important to assess how the policy or action is leading to a system change that is fundamental, disruptive and sustained. Users should consult stakeholders in selecting key indicators, and when and how frequently to monitor them. A well documented notion in the literature is the use of SMART indicators; that is, indicators that are Specific, Measurable, Achievable, Realistic and Time-bound. The challenge for transformational change is identifying “SSSMART” indicators that also capture the *scale* and *sustained nature* of impacts resulting from the policy or action.

For example, the idea of scale can be captured both horizontally (e.g., innovation spreading across sectors or a greater number of people applying solar PV technology), and vertically (e.g. an incentive program at city level is adopted at regional or national level). The same indicators used to assess the starting situation can then be projected for ex-ante assessment and observed for ex-post assessment to assess transformational change. Further guidance on selection of indicators is provided in Chapter 10.

Users can select indicators for process and outcome characteristics to help describe the starting situation of relevant characteristics impacted by the policy or action. Table 7.2 and Table 7.3 provide a template

and an example using the hypothetical solar PV policy for how to use indicators to describe the starting situation of selected outcome and process characteristics.

Table 7.2: Template for description of the starting situation for selected outcome characteristics – hypothetical solar PV example

Outcome category	Outcome characteristic	Description of the starting situation	Indicators
Scale of outcome	Global or international level (macro level)	Not relevant	
	National or sectoral level (medium level)	The starting situation is 5% of solar PV in the national electricity mix by 2016.	• Share of solar generation in the total generation mix at national level • Investments (USD) in grid-connected solar rooftop nationally • New jobs created (annually) in the solar industry nationally
	Subnational level (micro level)	In two Northern rural provinces of the country solar PV contributes 20% of the electricity mix by 2016.	• Share of solar generation in the total generation mix at subnational level (or within renewable energy sector) • Investments (USD) in grid-connected solar rooftop at a subnational level • New jobs created (annually) in the solar industry subnationally
Outcome sustained over time	Long-term: (≥15 years from the starting situation)	Not relevant	
	Medium term: (≥5 years and <15 years from the starting situation)	The solar PV policy is a new policy and has been under implementation for just over a year. The projected speed of change at the starting situation is to achieve 30% solar PV in the national electricity mix and create 1,000 new green jobs by 2030.	• Share of solar generation in the total generation mix by 2030 • Investments (USD) in grid-connected solar rooftop by 2030 • New jobs created in the solar industry by 2030
	Short term: (0<5 years from the starting situation)	The solar PV policy is a new policy and has been under implementation for just over a year. Qualitative data is available that new jobs are created in 4 villages to recruit customers to connect to mini-grids and facilitate mobile-payments.	• Share of solar generation in the total generation mix by 2022 • Installed capacity of grid-connected solar rooftop power plants (up to 500 KW) by 2022 • Investments (USD) in grid-connected solar rooftop by 2022 • New jobs created in the solar industry by 2022

Table 7.3: Template for description of the starting situation for selected process characteristics – hypothetical solar PV example

Process category	Process characteristic	Description of the starting situation	Indicators
Technology	Research and development	Not relevant	
	Adoption	Relevant. High capital cost of rooftop systems and longer pay back periods have discouraged its widespread adoption by small consumers in residential and commercial sectors.	• Number of innovative business models (e.g., to overcome cost barriers of solar PV rooftop) • Number of new demonstration projects for solar rooftop PV initiated • Number of government programs and measures (including at subnational level) to support adoption of solar rooftop PV
	Scale-up	Relevant. Solar rooftop has a negligible share in the solar energy sector. There is a huge amount of untapped potential in the solar rich country. Several barriers exist to large scale deployment of rooftop PV (e.g., lack of manufacturing facilities and high skilled workforce, high upfront cost)	• Share of installed PV rooftop in the solar sector (nationwide or statewide) • Number of training workshops/ certifications for solar workforce • Number of manufacturing facilities for solar PV
	Other		
Agents	Entrepreneurs	Relevant. There is acknowledgement that solar sector should be able to attract private investment and lending to sustain interest from businesses and entrepreneurs and continue to grow. The government has commissioned a study on how to create an attractive financial environment to attract large scale investment in the sector.	• Number of new entrepreneurs /businesses/investors in solar sector (related to grid-connected rooftop) • Incentives provided for new entrepreneurs (number of different types of incentives) • Volume of venture capital investments
	Coalitions of advocates	Possibly relevant. Business associations and think tanks are active in convening stakeholders and policymakers and providing a forum to discuss issues related to renewable energy. However, there is very limited civil society involvement in the electricity sector on issues such as governance, tariffs, infrastructure and policies.	• Number of projects/research centers involving university-industry collaboration • Number of advocacy programs, campaigns and initiatives • Number of organisations/ networks established to promote solar
	Beneficiaries	Not relevant	
	Other		

Incentives	Economic and non-economic incentives	Relevant. The financial subsidy and feed-in-tariff promote grid-connected solar rooftop uptake. Other economic and non-economic incentives exist to encourage uptake of off-grid solar and large solar power plants, as well as other forms of renewable energy (e.g., wind and biomass)	• Number of new economic incentives in place for grid rooftop solar • Number of new non-economic incentives (e.g., MOUs signed, partnerships forged between government and private sector) to promote solar energy
	Disincentives	Possibly relevant. Since 2010, there has been a tax on coal and a part of the proceeds from it are used to finance clean energy projects.	• Number of new disincentives to discourage fossil fuels to generate electricity
	Institutional and regulatory	Relevant. The solar PV policy introduces regulatory changes with the feed-in-tariff. While there is a dedicated agency at the national level to promote renewable energy, there is no such counterpart in states and a robust institutional set up to design and implement measures and build capacity at all levels does not exist yet.	• Number of new regulations and institutions set up to promote solar
	Other		
Norms	Awareness	Not relevant.	
	Behaviour	Relevant. Residential and commercial consumers increasingly prefer the benefits of clean light from solar PV rather than from not so clean kerosene lamps.	• Number of media articles/ public events on solar/renewable energy • Number of new measures to influence consumer behaviour in favour of solar/ renewable energy
	Social norms	Possibly relevant. The solar PV policy demonstrates the benefits of clean energy but does not directly target change in social norms. There is a greater push for green, clean living in urban centers as pollution increases and environmental resources are depleted.	• Coverage of renewable energy issues in mainstream media • Number of emerging leaders/role models (e.g., states leading the transition to renewable energy) favoring renewables
	Other		

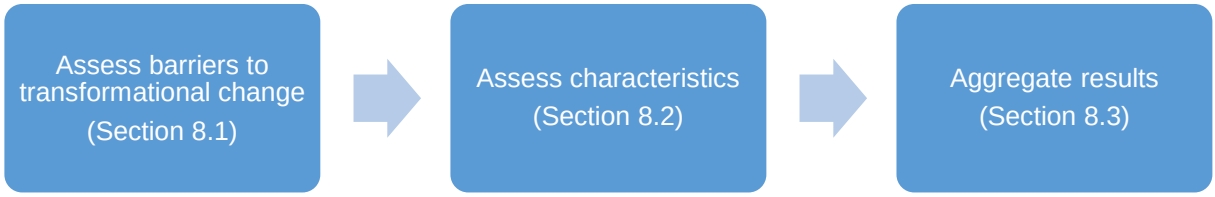
1

8. ESTIMATING TRANSFORMATIONAL IMPACTS EX-ANTE

This chapter introduces the steps for conducting an ex-ante assessment of policies or actions to understand the extent of transformation expected in the future. These include assessing the expected impacts for transformational change through assessment of characteristics in a qualitative way over the assessment period, while considering potential barriers, and aggregating the results of the assessment.

This chapter describes a purely qualitative approach to assessing transformational impacts ex-ante and compiling the assessment towards an overall assessment. Appendix C provides an alternative approach to compiling the qualitative assessment using a mathematical approach for aggregation for users that wish to do so.

Figure 8.1: Overview of steps for ex-ante assessment



Checklist of key recommendations

- Assess and qualitatively score how barriers modify the extent of transformation expected for each characteristic
- Assess and qualitatively score each characteristic using the scale provided in Table 8.3 and explain the underlying assessment
- Aggregate the results for all characteristics and barriers to the process and outcome level

8.1 Assess barriers to transformational change

Identifying and assessing barriers for transformational change is important to understand the full potential for transformational change and to enable the design of policies and actions to overcome these barriers. Barriers are understood as a negative modifier of a positive characteristic for transformational change. In Section 7.2 guidance is provided to identify various kinds of barriers to transformational change. In this step, the identified barriers are analysed to understand the degree to which, they reduce the potential of the policy to cause positive impacts.

It is a *key recommendation* to assess and qualitatively score how barriers modify the extent of transformation expected for each characteristic. The potential impact of each barrier is assessed for each characteristic individually based on the scale presented in Table 8.1. Table 8.2 provides a template for reporting on barrier impact, including providing the rationale for assigning the score.

Involving stakeholders in the process of analysing barriers is important for a comprehensive analysis and credible result. The ICAT *Stakeholder Participation Guidance* provides information on identifying and understanding stakeholders (Chapter 5) and designing and conducting consultations (Chapter 8).

Table 8.1: Scale for scoring barriers

Scale	Description
High impact	The barrier has the potential to completely counteract the envisaged effect of the characteristic
Medium impact	The barrier is expected to have a moderate impact on the achievement of a characteristic
Low impact	The barrier is expected to have a very limited impact on the achievement of a characteristic

Table 8.2: Template for reporting on barrier impact – solar PV policy example

Barrier	Characteristic affected	Score	Rationale	Barrier directly targeted by the policy or action
Limited availability of technology	Adoption	High	Lack of a strong domestic solar manufacturing industry negatively affects the adoption of solar PV within the country as it keeps the costs high due to dependence on imports.	No
Lack of technical personnel for installation and maintenance	Economic incentive	Medium	Lack of trained technicians for solar PV installation implies that staff needs to be hired abroad. This will increase cost that can outweigh the economic incentive from the feed-in tariff and financial subsidy.	No
High upfront financial investment needed for solar PV	Entrepreneurs	High	Lack of financial instruments to support customers in financing solar PV impedes the growth of private sector.	Yes

8.2 Assess characteristics

A forward-looking assessment of outcome and process characteristics is a key step to understand the extent of transformation expected. It is a *key recommendation* to qualitatively assess each characteristic and to explain the underlying assessment of process and outcome characteristics. Table 8.3 provides a scale for qualitatively assessing each characteristic. Different scales are used to assess process and each category of outcome characteristics. Table 8.4 and Table 8.5 provide templates for explaining the assessment of process and outcome characteristics.

Ex-ante assessment of transformational change is a qualitative analysis based on the comparison of starting situation and expected development over the assessment period. Users can estimate future quantitative or qualitative values for selected indicators and compare these with corresponding values for the starting situation (as described in Section 7.3) to assess the extent of transformation expected.

Appendix B provides examples of indicators for various process and outcome characteristics. For outcome characteristics, indicators related to GHG and sustainable development impacts can be quantified using the ICAT guidance for greenhouse gas impacts and sustainable development impacts.

Table 8.3: Scale for scoring characteristics

Scale	Description of scale
Process characteristics	
3	If a characteristic represents a key element of the policy or action design, and there are no or only low impact barriers to implementation, it can realistically be expected that the policy or action will impact this characteristic over the assessment period
2	If a characteristic is an important part of the policy or action design but not the main focus and there are medium impact barriers to implementation, it can realistically be expected that the policy of action will directly or indirectly impact this characteristic over the assessment period
1	If a characteristic is not an important part of the policy or action design and there are high impact barriers to implementation, it is less likely that the policy or action will directly or indirectly impact this characteristic over the assessment period
0	If a characteristic is not at all a part of the policy or action design, it is unlikely that the policy or action will impact this characteristic over the assessment period
Outcome characteristics – scale	
3	The policy or action results in GHG and sustainable development impacts that relative to the starting situation represent large emission reductions and significant, positive sustainable development impacts at the level of assessment targeted
2	The policy or action results in GHG and sustainable development impacts that relative to the starting situation represent moderate emissions reductions and moderate, positive sustainable development impacts at the level of assessment targeted
1	The policy or action results in GHG and sustainable development impacts that relative to the starting situation represent minor emission reductions and minor, positive sustainable development impacts at the level of assessment targeted
0	The policy or action does not result in GHG and sustainable development impacts relative to the starting situation at the level of assessment targeted
-1	The policy or action results in GHG and sustainable development impacts that relative to the starting situation represent a net increase in emissions or negative sustainable development impacts at the level of assessment targeted
Outcome characteristics – time	
3	The policy or action results in GHG and sustainable development impacts that are very likely to be sustained over the assessment period
2	The policy or action results in GHG and sustainable development impacts that are likely to be sustained within the assessment period
1	The policy or action results in GHG and sustainable development impacts that are less

	likely to be sustained within the assessment period
0	The policy or action results in GHG and sustainable development impacts that are not expected to be sustained over the assessment period

It is important to consider the overall level of ambition (described in Chapter 3) and vision of transformational change (described in Chapter 5) while scoring individual characteristics. This is the aspiration against which individual characteristics are assessed. When scoring, the question is to what extent the policy or action can realistically be expected to achieve the desired transformation described by a characteristic within the assessment boundary and assessment period defined by the user. Impacts that are expected to happen after the assessment period can be captured by conducting a subsequent analysis covering the relevant period.

The qualitative assessment of expected future developments is challenging and can be subjective. Therefore, a transparent, inclusive process for conducting the assessment describing individual steps and providing an explicit rationale for decisions is essential to ensure the robustness of results. To minimise subjectivity and bias, it is advisable to involve a wide range of stakeholders and experts in the exercise. A multi-stakeholder process to assess the individual characteristics adds further value by allowing an in-depth discussion which can lead to fruitful and effective improvements in the design of policies and measures. The ICAT *Stakeholder Participation Guidance* provides guidance on identifying and understanding stakeholders (Chapter 5) and establishing multi-stakeholder bodies (Chapter 6).

Table 8.4: Template for describing process characteristics – solar PV policy example

Category	Characteristic	Score	Rationale justifying the score	Indicators	Indicator value at starting situation	Indicator value for expected transformation
Technology	Research and development	-	Not relevant			
	Adoption	3	The financial subsidy and feed-in tariff have been widely used to increase adoption of clean technology across the world, and a similar result can be realistically expected in this case too. These incentives are likely to kick start the local industry thus addressing the barrier of a weak domestic solar industry.	Number of demonstration projects for solar rooftop PV initiated (annual)	None	10
	Scale up	3	Financial subsidy and feed-in tariff have been widely used to scale up clean technology across the world. Together, these will address the barrier of high upfront financial investment needed for solar PV and improve the payback period on solar. It is realistically expected that these will lead to a significant uptake of solar in the country over the assessment period while addressing the barrier of limited availability of both technology and skilled workforce for installation and maintenance by kick starting the local	Share of installed PV rooftop in the solar sector (nationwide or statewide	Less than 1%	5%

			manufacturing and service industry.			
Agents	Entrepreneurs	3	The policy is expected to influence entrepreneurs and investors to invest in solar-related businesses and capitalise on the financial incentives available. High upfront financial investment is a significant barrier in the country that currently prevents businesses and entrepreneurs from investing in solar technology.	Volume of venture capital investments	USD 10 million	USD 80 million
	Coalition of advocates	2	Solar PV policy is expected to indirectly support the creation of coalitions and networks.	Number of projects/research centers involving university-industry collaboration	1	10
	Beneficiaries	-	Not relevant			
Incentives	Economic and non-economic incentives	3	Solar PV policy will utilise subsidies and feed-in tariff as means to increase technology penetration. It is expected that the incentives will promote consumer demand, which in turn will increase the local service industry. This will help address the barrier of lack of technical personnel for installation and maintenance.	Number of new economic incentives in place for solar	1	5
	Disincentives	0	Solar PV policy is not likely to use disincentives as means to achieve its goals, nor does it seem realistic that disincentives will be extensively used over the assessment period to promote clean energy in the country. As identified in barriers, the country lacks a comprehensive strategy to discourage fossil fuels and it does not seem likely that there will be political will to overcome this in the foreseeable future.	Number of new disincentives to discourage fossil fuels to generate electricity	1	1
	Institutional and regulatory	2	Solar PV policy is expected to lead to the development of new agencies and regulations to further promote solar in states. However, there is expected to be a time lag with some front runners leading the way, while other states gradually follow as experience builds.	Number of new regulations and institutions set up to promote solar	3	10
Norms	Awareness	-	Not relevant			
	Behaviour	2	Solar PV policy is expected to influence consumer behaviour and shift their preferences away from carbon intensive electricity as a result of targeted financial incentives. However, in the absence of a strategy to discourage fossil fuels as identified in barriers, there is not expected to be any	Number of new measures to influence consumer behaviour in favor of solar/ renewable energy	None	1

			widespread change in behaviour.			
	Social norms	1	Solar PV policy is expected to indirectly influence societal norms. However in the absence of targeted initiatives towards this, it is expected to take a longer time. It is expected that 1-2 states will emerge as leaders in the solar industry over the assessment period.	Number of emerging leaders/role models (e.g., states leading the transition to renewable energy) favoring renewables	None	1-2

Table 8.5: Template for describing the assessment of outcome characteristics – solar PV policy example

Category	Characteristic	Score	Rationale justifying the score	Indicators	Indicator value at starting situation	Indicator value for expected transformation
Scale of outcome	Macro level	-	Outside the assessment boundary			
	Medium level	2	The policy aimed at national level impacts is likely to achieve its targets related to GHGs and sustainable development. The targets themselves are moderate in terms of the change that they represent over the assessment period.	Installed capacity of grid-connected solar rooftop power plants (up to 500 KW) at a national level	1 MW	500 MW
	Micro level	2	The policy is likely to achieve its national level targets through developing solar power in states and cities. While 1-2 states are expected to be front runners and lead in solar rooftop, others are likely to achieve moderate growth in solar over the assessment period.	Installed capacity of grid-connected solar rooftop power plants (up to 500 KW) at a subnational level (state level average capacity)	100 KW-500 KW	20 MW
Outcome sustained over time	Long-term	-	Outside the assessment period (2017-2030)			
	Medium-term	2	In the medium term, no reversal of impacts is expected and the gains made by the solar PV policy are likely to be sustained over the assessment period.	Trend in installed capacity of grid-connected solar rooftop power plants (up to 500 KW)		Sustained growth through 2030
	Short-term	2	In the short-term too, no reversal of impacts is expected and the gains achieved are likely to be sustained through this period and beyond.	Trend in installed capacity of grid-connected solar rooftop power plants (up to 500 KW)		Sustained growth through 2022

8.3 Aggregate results

To arrive at a more general conclusion of the transformational potential of a policy or action, it is necessary to aggregate the results from the in-depth assessment conducted in the previous steps. It is a

key recommendation to aggregate the results for all characteristics and barriers to the process and outcome level. To do so, users should use Table 8.6, Table 8.7 and Table 8.8, and Figure 8.2.

Assessment at the category level of processes and outcomes (i.e., technology, agents, incentives, norms, scale of outcome, outcome sustained over time) is based on the assessment of individual characteristics (from Table 8.4 and Table 8.5). When assessing the potential impact of a policy or action at the category level, it is important to assess the degree to which categories of transformational processes and outcomes are important to achieving the vision for transformational change in the particular context. For example, *technology* may be more important in the pre-development phase when a lack of available solar PV hardware is preventing a shift to modern lighting in remote areas. On the other hand, a focus on *norms* may be more critical in a context where the solar PV technology is available but vested interests promote coal-based electricity for lighting.

As shown in Table 8.6, users should use the scale presented in Table 8.3 to score each process and outcome category based on the previous assessment of individual characteristics. Users can adjust the relative importance of each category by using percentages, as shown in Table 8.6. The relative importance of each category is expressed as a share of the 100%. The relative importance of all four process categories should add up to 100%. For more detailed guidance refer to Appendix C, which describes a mathematical approach for aggregating the assessment. Table 8.6 and Table 8.7 provide a template for describing the results.

Table 8.6: Template for describing results of the ex-ante analysis at process category level – solar PV policy example

Category	Score	Rationale for scoring	Relative importance	Rationale for importance
Technology	3	The policy or action will positively influence the penetration of solar in the country. Since the technology is known, adoption and scale up are important to focus on over the assessment period.	30%	The country is still in the pre-development phase, which emphasises the importance of introducing new solar PV technology.
Agents	2	Overall the policy is likely to engage entrepreneurs in bringing transformation. A greater emphasis is needed to tap into the beneficiaries and others who can potentially play a key role in preventing policy reversal.	30%	Entrepreneurs who can introduce and lead technology penetration is equally important to technology change.
Incentives	2	The policy is likely to fully utilise financial incentives and institutions and regulations; however it is not likely to utilise disincentives to discourage the use of fossil fuels.	30%	In a developing country context the role of financial incentives is crucial to support technology and agents of change.
Norms	1	The policy is less likely to bring significant shifts in this category.	10%	Demonstrating the benefits of solar PV technology is more important than changing norms in society at this early stage of transition.

Table 8.7: Template for describing results of the ex-ante analysis at outcome category level – solar PV policy example

Category	Score	Rationale for scoring
Scale of outcome	2	The policy is expected to result in GHG and sustainable development impacts that relative to the starting situation represent *moderate* impacts at national and subnational levels
Outcome sustained over time	3	Based on the policy's expected impact on adoption and scale up, it is *highly likely* that the policy or action will sustain the penetration of solar in the country over the assessment period.

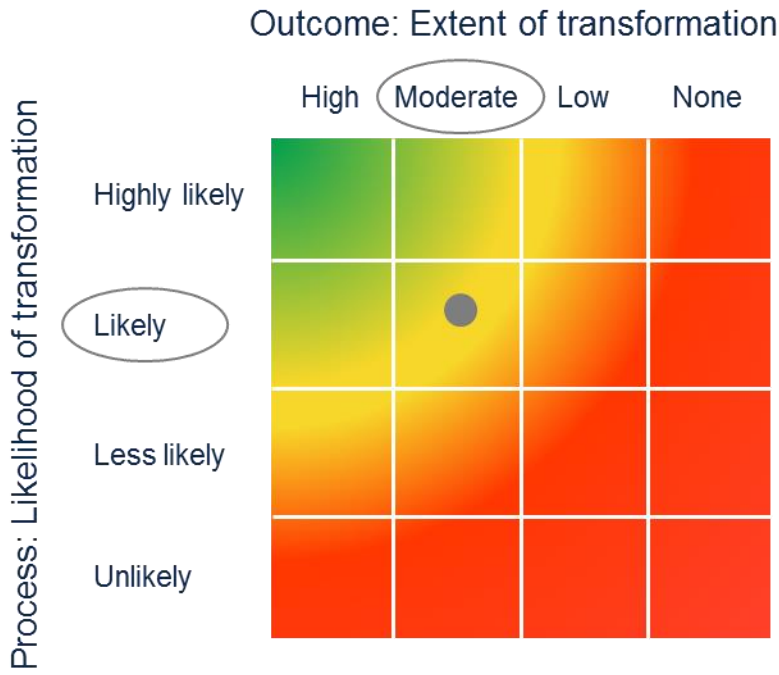
Next, users should arrive at an overall assessment at the process and outcome level, informed by the assessment at the category level (as described in Table 8.6 and Table 8.7). Users apply the scale provided in Table 8.8 to qualitatively score the extent of transformation expected from the policy or action at both the outcome and the process level.

Table 8.8: Scale for scoring process and outcome

Outcome - extent of transformation expected is	Process - transformational outcome is
High	Highly likely
Moderate	Likely
Low	Less likely
None	Unlikely

The final result indicates the extent of transformation expected by the policy or action and how likely it is that this expected transformation can be realised given the way the intervention is designed. Figure 8.2 illustrates the matrix of possible qualitative scores for process and outcome impacts and includes the final result for the hypothetical solar PV policy example. If the final result for the policy or action falls in the green area, it indicates that the policy or action is expected to be transformational. If it is situated in the red area, the policy cannot be considered transformational. The colour gradient of the matrix reflects the qualitative nature of the analysis and the high uncertainty associated with the assessment.

Figure 8.2: Transformational impact matrix – illustrating the solar PV policy example

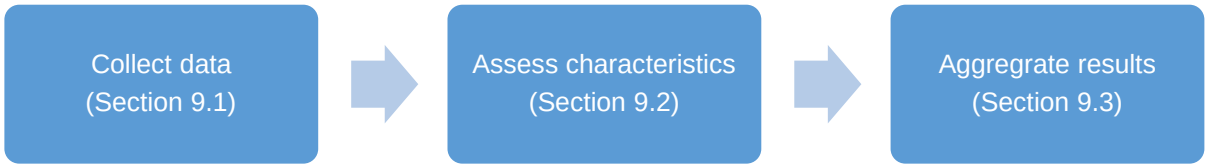


The final result for the hypothetical solar PV policy (illustrated in Figure 8.2) concludes that the extent of transformation expected by the policy is *moderate* and the transformational impact is *likely* to be sustained over time. This overall impact is achieved through technological change, engaging agents of change and using incentives and regulations, whereas there is scope to strengthen the impact through greater emphasis on norms and behaviour. It suggests that the policy design is on track and with greater attention to some of the process characteristics related to norms and behaviour, it may be possible to further expand, deepen and sustain transformational change.

9. ESTIMATING TRANSFORMATIONAL IMPACTS EX-POST

This chapter explains the steps for conducting an ex-post assessment of a policy or action to understand the extent of transformation achieved. These include collecting data for indicators to assess characteristics of transformational change and aggregating the results of the assessment.

Figure 9.1: Overview of steps in the chapter



Checklist of key recommendations

- Collect data for selected indicators
- Assess characteristics using indicators to assess the extent of transformation achieved by the policy or action
- Aggregate the results for all characteristics to the process and outcome level and describe the overall assessment

9.1 Collect data for ex-post assessment

Ex-post assessment is a backward looking qualitative and/or quantitative assessment of indicators. This is important to measure the extent of transformation achieved by a policy or action towards contributing to a vision for transformational change to low carbon and sustainable development. It provides users with observed information about the implementation process to understand whether and how policies and actions have been transformational relative to the starting situation as described in Chapter 7.

The transformation achieved is the change between the current situation and the starting situation (described in Chapter 7). Selected indicators are used to assess specific changes in characteristics impacted by the policy or action. It is a *key recommendation* to collect data for selected indicators. Table 9.2 and Table 9.3 provide templates for collecting data. Refer to Section 7.3 for guidance on selection of indicators and to Appendix B for examples of indicators.

The nature of an indicator determines the method of assessment and whether its value is better assessed quantitatively or qualitatively. Qualitative indicators enable descriptive and narrative data for characteristics, whereas quantitative indicators are estimated or measured to demonstrate the transformational extent of a policy or action on the characteristics.

The appropriate method of assessment is determined specific to each indicator. Methods of assessment can be classified into bottom-up methods and top-down methods. Often top-down methods are appropriate for a large number of affected actors, whereas bottom-up methods are more appropriate for a smaller number of affected actors or entities, where data is available and feasible to collect.

Examples of bottom-up methods are direct data collection from affected stakeholders, facilities or entities through monitoring of indicators (such as energy consumption and costs per KWh), sampling methods or use of default values from similar policies and actions to estimate effects (such as the average reduction

in grid-connected electricity use per building that installs solar PV). Examples of top-down methods are use of existing data at sector or subsector level and energy or transport modelling relying on statistically collected data to assess changes in indicator values.

For further guidance on data collection methods and monitoring of performance over time based on indicators, refer to Chapter 10 and to Appendix B, where examples of indicators of transformational change characteristics are provided.

9.2 Assess characteristics for ex-post assessment

The next step is to assess the policy or action's impact on process and outcome characteristics based on a comparison of indicator values for the starting situation and ex-post situation.

It is a *key recommendation* to assess characteristics using indicators to assess the extent of transformation achieved by the policy or action (using the scale in Table 9.1 and templates in Table 9.2 and Table 9.3). The ex-post indicator value is based on observed data and shows the extent to which the policy or action has influenced the characteristic relative to the starting situation. Users are encouraged to identify multiple indicators for each characteristic in their assessments. Only one indicator per characteristic has been chosen here for illustration purposes.

A qualitative scale is used for scoring the transformational characteristics based on the indicator values. Table 9.1 provides scales for scoring process and outcome characteristics.

Engaging stakeholders in scoring characteristics and determining relative importance can bring new insights and lend credibility to the process. Refer to the ICAT *Stakeholder Participation Guidance* (Chapter 8) for information on designing and conducting consultations.

Table 9.1: Scale for scoring characteristics

Scale	Description of scale
Process characteristics	
3	A characteristic represented a key element of the policy or action design, and there were no or only low impact barriers to implementation. Highly significant changes were triggered by the policy or action compared to the starting situation.
2	A characteristic was an important part of the policy or action design but not the main focus and there were medium impact barriers to implementation. Direct or indirect effects were triggered by the policy or action compared to the starting situation.
1	A characteristic was not directly the focus of the policy or action and high impact barriers reduced effectiveness. Direct or indirect effects of the policy or action were quite removed and in the area.
0	No or very limited change were triggered by the policy or action compared to the starting situation.
Outcome characteristics – scale	
3	The policy or action resulted in GHG and sustainable development impacts that relative to the starting situation represent large emissions reductions and significant, positive sustainable development impacts at the level of assessment targeted

2	The policy or action resulted in GHG and sustainable development impacts that relative to the starting situation represent moderate emissions reductions and moderate, positive sustainable development impacts at the level of assessment targeted
1	The policy or action resulted in GHG and sustainable development impacts that relative to the starting situation represent minor emissions reductions and minor, positive sustainable development impacts at the level of assessment targeted
0	The policy or action did not result in GHG and sustainable development impacts relative to the starting situation at the level of assessment targeted
-1	The policy or action resulted in GHG and sustainable development impacts that relative to the starting situation represent a net increase in emissions or negative sustainable development impacts at the level of assessment targeted
Outcome characteristics - sustained over time	
3	The policy or action resulted in GHG and sustainable development impacts that are sustained in the assessment period and expected to be sustained ≥15 years from the starting situation
2	The policy or action resulted in GHG and sustainable development impacts that are sustained in the assessment period and expected to be sustained ≥5 years and <15 years from the starting situation
1	The policy or action resulted in GHG and sustainable development impacts that are sustained in the assessment period and expected to be sustained <5 years from the starting situation
0	The policy or action resulted in GHG and sustainable development impacts that have not been sustained in the assessment period

1

Table 9.2: Template for ex-post assessment of process characteristics based on indicators

Category	Characteristic	Score	Rationale justifying the score	Indicators	Indicator value at starting situation	Indicator value observed
Technology	Research and development	-	Not relevant			
	Adoption	2	The financial subsidy and feed-in tariff have helped increase the adoption of clean technology and kick started the local industry.	Number of demonstration projects for solar rooftop PV initiated (annual)	0	10
	Scale up	2	Financial subsidy and feed-in tariff have led to a significant uptake of solar in the country over the assessment period while enhancing the availability of both technology and skilled workforce for installation and maintenance. It has kick-started the local manufacturing and service industry.	Share of installed PV rooftop in the solar sector (nationwide or statewide	Less than 1%	5%
Agents	Entrepreneurs	2	The policy has triggered investments and entrepreneurship in solar-related businesses compared to the starting situation when high upfront financial investment was a significant barrier.	Volume of venture capital investments	USD 10 million	USD 80 million
	Coalition of advocates	2	Solar PV policy has indirectly supported the creation of coalitions and networks.	Number of projects/research centers involving university-industry collaboration	1	10
	Beneficiaries	-	Not relevant			
Incentives	Economic and non-economic incentives	3	Solar PV policy utilised subsidies and preferential tariff as means to increase technology penetration. These incentives have promoted consumer demand, which in turn has promoted the local service industry.	Number of new economic incentives in place for solar	1	5
	Disincentives	0	Solar PV policy has not used disincentives as means to achieve its goals, nor does it seem realistic that disincentives will be extensively used over the assessment period to promote clean energy in the country. As identified in barriers, the country lacks a comprehensive strategy to discourage fossil fuels and it does not seem likely that there will be political will to overcome this in the foreseeable future.	Number of new disincentives to discourage fossil fuels to generate electricity	1	1
	Institutions and regulations	2	Solar PV policy has led to the development of new agencies and regulations to promote solar in a few front runner states.	Number of new regulations and institutions set up to promote solar	3	10

Norms	Awareness	-	Not relevant			
	Behaviour	2	Solar PV policy has somewhat influenced consumer behaviour and shifted their preferences away from carbon intensive electricity as a result of targeted financial incentives. However, in the absence of a strategy to discourage fossil fuels, a widespread change in behaviour has not happened.	Number of new measures to influence consumer behaviour in favor of solar/ renewable energy	None	1
	Social norms	0	While 1-2 states have emerged as leaders in the solar industry, a sustained change in societal norms favoring solar or renewable in general has not been observed yet.	Number of emerging leaders/role models (e.g., states leading the transition to renewable energy) favoring renewables	0	1-2

1 *Table 9.3: Template for ex-post assessment of process characteristics based on indicators*

Category	Characteristic	Score	Rationale justifying the score	Indicators	Indicator value at starting situation	Indicator value observed
Scale of outcome	Macro level	-	Outside the assessment boundary			
	Medium level	2	The policy achieved its targets related to GHGs and sustainable development. The emissions reduction and sustainable development impacts are moderate relative to the starting situation.	Installed capacity of grid-connected solar rooftop power plants (up to 500 KW) at a national level	1 MW	500 MW
	Micro level	2	The policy achieved its national level targets through developing solar power in states and cities. While 1 state led in solar rooftop scale up achieving high levels of penetration, but others showed moderate growth over the assessment period.	Installed capacity of grid-connected solar rooftop power plants (upto 500 KW) at a subnational level (state level average capacity)	100 KW-500 KW	20 MW
Outcome	Long-term	-	Outside the assessment period			
Sustained over time	Medium term	2	The policy made sustained gains over the assessment period and no reversal of impacts is expected at the time of assessment. Financial incentives and feed-in tariff are expected to be phased out but the penetration achieved is expected to continue.	Trend in installed capacity of grid-connected solar rooftop power plants (up to 500 KW)	-	Sustained growth during the assessment period
	Short-term	2	In the short-term, the policy did not result in sustained gains. And, there was a significant risk of policy reversal due to political changes in the first 5 years of the policy implementation.	Trend in installed capacity of grid-connected solar rooftop power plants (up to 500 KW)	-	Uneven growth through 2022

9.3 Aggregate results

Once the characteristics have been assessed, the next step is to aggregate the analysis to understand the impact of the policy or action at the category level, then the process and outcome level, and finally use it to understand the extent of transformation achieved by the policy or action.

It is a key recommendation *to aggregate the results for all characteristics to the process and outcome level and describe the overall assessment. This can be done using Table 9.4,*

Table 9.5 and Table 9.6 and Figure 9.2.

The assessment of process and outcome categories is based on the assessment of individual characteristics, which, in turn, is based on indicators (as described in Section 9.2). Process and outcome categories are scored taking into consideration the policy's impact on characteristics within each category, and using the same scale as in Table 9.1. When assigning a score to each category, it is important to consider the relative importance of categories of characteristics. Table 9.4 and

Table 9.5 provide templates to describe category-level qualitative scores. Table 9.4 asks users to also note the relative importance of each process category expressed as a percentage, with the sum of all process categories adding to 100%. For instance, the technology (30%), agents (30%) and incentives (30%) categories are relatively more important than the norms category (10%) in the given example (in Table 9.4 and

Table 9.5). For outcomes, each category—scale of outcome and outcome sustained over time—are considered equally important for transformational change.

Ex-post assessment focuses on observed indicator values. Barriers are inherent in these values, as they would have affected the performance of the policy or action, which is captured by the indicator in the assessment. Therefore, barriers are not assessed separately in ex-post assessment. Users can nevertheless choose to do barrier analysis following the guidance given in Section 8.2, for example, to understand the underlying reasons for the policy's lack of significant impact on a characteristic or category. Users can also consult Chapter 12, which discusses how to use the assessment results for learning and policy improvement.

Table 9.4: Template for describing results of the ex-post analysis at process category level

Category	Score	Rationale for scoring	Relative importance of category including rationale
Technology	2	Based on the policy's impact on research & development, adoption and scale up, it can be said that the policy or action positively influenced the penetration of solar in the country. Since the technology itself is known, adoption and scale up were relatively more important to focus on over the assessment period.	30% Given the starting situation, technology, incentives and agents are considered equally important to achieve transformational change in the solar sector.
Agents	1	While the policy had a positive impact on businesses and influencing entrepreneurs, investors, and other coalitions and networks, it did not support the development of a strong constituency at a grassroots level. It engaged agents of change in bringing transformation though a greater emphasis was needed to tap into the beneficiaries and others who can potentially play a key role in preventing policy reversal.	30% Given the starting situation, technology, incentives and agents are considered equally important to achieve transformational change in the solar sector.
Incentives	2	The policy utilised financial incentives which were at its core and led to the development of enabling institutions and regulations in a few front runner states. However it failed in spurring new actions involving disincentives to discourage the use of fossil fuels, thus limiting its ability to cause transformational change.	30% Given the starting situation, technology, incentives and agents are considered equally important to achieve transformational change in the solar sector.
Norms	0	The policy did not bring significant shifts in this category and the societal norms and behaviour continue to favour carbon intensive forms of energy.	10% Changing norms in society is considered less important in the context of the pre-development phase, until the technology has proved its benefits and is ready for take-off.

Table 9.5: Template for describing results of the ex-post analysis at outcome category level

Category	Score	Rationale for scoring
Scale of outcome	2	The policy achieved a moderate change in GHG emissions reductions and sustainable development impacts, relative to starting situation.
Outcome sustained over time	2	The policy was sustained over the assessment period and there is only a small risk that the gains made may be reversed as feed-in tariff and subsidy is phased out.

Next, the final ex-post assessment result is arrived at by aggregating the qualitative scores for process and outcome categories, while considering the relative importance of each category. The overall assessment indicates how high is the extent of transformation achieved (outcome) by the policy or action and how likely it is that this transformational is sustained over time (process). Table 9.6 provides the scale for scoring outcome and process impacts.

Table 9.6: Scale for scoring outcome and process categories

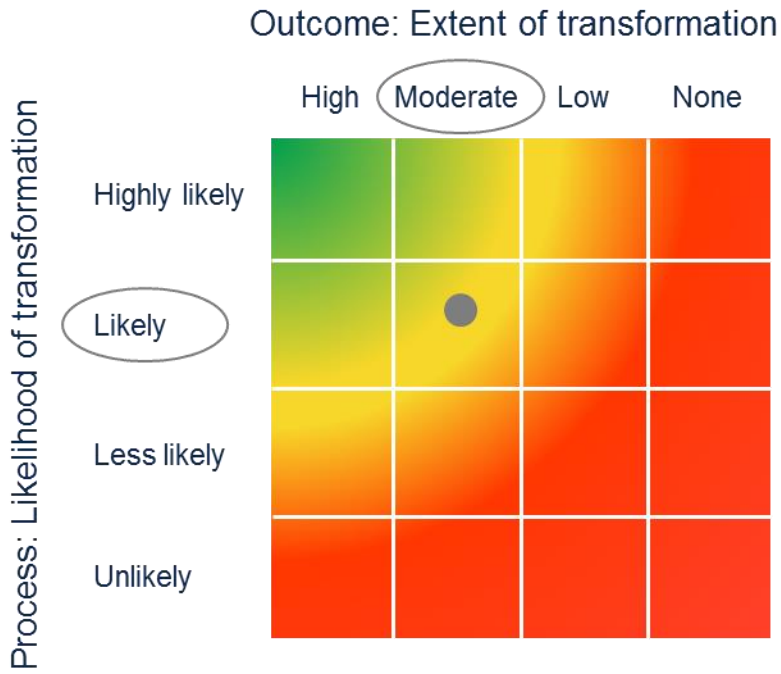
Outcome - extent of transformation achieved is	Process - transformational outcome is
High	Highly likely
Moderate	Likely
Low	Less likely
None	Unlikely

Figure 9.2 illustrates the matrix of possible qualitative scores for process and outcome impacts. If the final result for the policy falls in the green area, it indicates that a policy or action is transformational. If it is situated in the red area, the policy is not (yet) transformational. The colour gradient of the matrix reflects the qualitative nature of the analysis and the high uncertainty associated with the assessment.

Figure 9.2 illustrates the final result for the hypothetical solar PV policy. Based on Table 9.4 and

Table 9.5 and the scale for scoring in Table 9.6, the ex-post assessment for this hypothetical policy concludes that the extent of transformation achieved by the policy is *moderate* and the transformational outcome is *likely* to be sustained over time. This overall impact is achieved through technological change, engaging agents of change and using incentives and regulations, even as there is ample scope to strengthen the impact through greater emphasis on norms and behaviour. It suggests that the policy is potentially on the right course and with greater attention on some of the process characteristics related to norms and behaviour, it may be possible to further expand, deepen and sustain transformational change.

Figure 9.2: Transformational impact matrix – illustrating the solar PV policy example

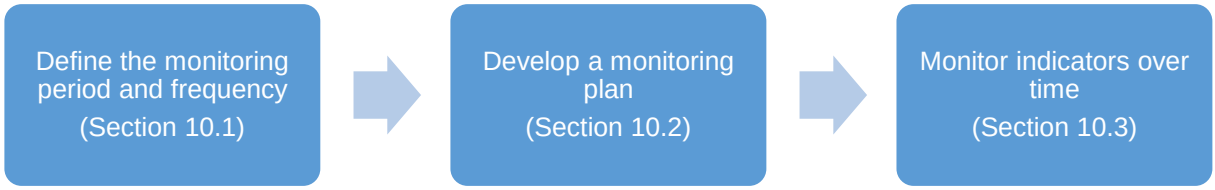


PART IV: MONITORING AND REPORTING

10. MONITORING PERFORMANCE OVER TIME

Monitoring performance of key indicators over time helps to assess progress and understand whether a policy or action is on track to achieve the desired transformational impacts. This chapter provides guidance on developing a monitoring plan and regularly following the performance of a policy or action. Users conducting ex-ante assessment can choose to skip this chapter.

Figure 10.1: Overview of steps in the chapter



Checklist of key recommendations

- Define a monitoring period that is long enough to capture the full range of transformational change impacts
- Develop a plan for monitoring key performance indicators
- Identify the key performance indicators that is used to track performance of the policy or action over time
- Monitor each key performance indicator over time in line with the monitoring plan

10.1 Define the monitoring period and frequency

Monitoring over time creates a time series of data useful for assessing trends. It also provides an opportunity for modifications of policies and actions during the implementation period if progress is not as planned. The first step is to define the monitoring period and monitoring frequency.

Monitoring period

The monitoring period is the time period over which the policy or action is monitored. However, it is worth noting that monitoring in advance of the implementation period, that is, before the implementation of the policy or action, can help define the starting situation. It is a *key recommendation* to define a monitoring period that is long enough to capture the full range of transformational impacts.

For ex-post assessments, users can choose to continue monitoring beyond the implementation period to track effects. For example, a policy with an implementation period of 2015-2030 should have at least the same monitoring period or longer (such as 2013-2032). Data collection can hence begin before implementation starts, and continue throughout the implementation period and beyond. Starting data collection at an early stage (even before policy implementation starts) improves the ability to monitor and evaluate at later stages. In general, the longer the monitoring period is, the more robust the impact assessment is.

Monitoring frequency

The monitoring frequency is generally decided at the beginning of the monitoring period. Users can monitor indicators at various frequencies, such as monthly, quarterly, or annually, depending on the objectives. The appropriate frequency of monitoring should be based on the needs of decision makers and stakeholders. Refer to ICAT *Stakeholder Participation Guidance* for engaging stakeholders in this regard (Chapter 5).

Deciding on monitoring frequency entails trade-offs between the type of impacts and indicators being monitored, cost, and data availability. Clarity on the purpose of each indicator, as well as an understanding of existing data collection practices is helpful to determine frequency. For example, if a policy goal is to create green jobs over 20 years, the indicator related to job creation can be monitored annually through an existing employment report regularly published by another agency. On the other hand, if the purpose is to measure the success of a six-month awareness-raising campaign by an agency, the indicator related to number of agency website visits or media articles can be monitored daily or weekly for the initial 1-2 months, and then monthly for the remainder of the campaign.

When a policy or action includes short-term, medium-term and long-term targets, monitoring should take place at a minimum at the critical milestones (e.g., for a solar PV policy that intends to achieve 60% PV in the electricity mix by 2050, with interim targets of 20% by 2020, 30% by 2030 and 50% by 2040, monitoring of PV share in electricity mix should occur every 10 years or more frequently). In the pre-development or take-off phase of transformational change (Chapter 7), users can decide to monitor indicators more frequently to confirm progress is on track. For example, awareness raising, capacity building, and high-level advocacy can be important for encouraging diffusion and scale-up of solar PV technologies when first introduced to a market. Therefore, indicators related to these efforts along with solar PV sales can be monitored more frequently initially in such a market.

Users may wish to align the monitoring frequency with the five-year reporting cycles of Nationally Determined Contributions and/or national climate or development reporting cycles to embed monitoring within existing processes.

10.2 Develop a monitoring plan

A monitoring plan is important to consistently track progress of indicators over time in relation to goals and to encourage documenting of assumptions and decisions for transparency. It is a *key recommendation* to develop a plan for monitoring key performance indicators

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

- **Roles and responsibilities**: Identify the entity or person responsible for monitoring key performance indicators and clarify the roles and responsibilities of the personnel conducting the monitoring. See “Institutional arrangements for coordinated monitoring” in Section 10.3.
- **Competencies**: Include information about any required competencies and any training needed to ensure that personnel have necessary skills.
- **Methods**: Explain the methods for generating, storing, collating and reporting data on monitored indicators. Include a brief description and source of data for each indicator.

- **Monitoring period and monitoring frequency**: Define the monitoring period and frequency for the policy or action. Section 10.1 discusses these in detail.
- **Collecting and managing data**: Identify the databases, tools or software systems that are used for collecting and managing data and information. Understand what data exists, in what format, how it is collected, as well as critical data gaps, and utilise this to organise a process to collect information, such as description of the indicator, whether qualitative or quantitative data needed, source of data and any relevant assumptions. Table 10.1 provides a template for data collection for the hypothetical solar PV policy.
- **Quality assurance and quality control (QA/QC)**: Define the methods for QA/QC to ensure the quality of data enhance the confidence of the assessment results. Quality assurance is a planned review process conducted by personnel who are not directly involved in the data collection and processing. Quality control is a procedure or routine set of steps that are performed by the personnel compiling the data to ensure the quality of the data.
- **Record keeping and internal documentation**: Define procedures for clearly documenting the processes and approaches for data collection as well as the data and information collected. This is beneficial for improving the availability of information for subsequent monitoring events, documenting changes over time, and creating a historical record for archiving. Define the length of time that data will be archived.

Users should review and update the monitoring plan on a regular basis (e.g., annually or biennially). This becomes particularly important for transformational change because of its long-term nature. Some characteristics may become less significant while others may become more significant during this time. Therefore, the monitoring plan should be revisited as new indicators may need to be monitored while some of the existing ones may no longer be of interest.

Table 10.1: Template for data collection – illustrated for the solar PV policy example

Indicator	Type of data (quantitative/ qualitative)	Monitoring frequency and date of collection	Data source/ collection method	Responsible entity	Observed data (unit)
Number of new solar PV installation businesses	Quantitative	Annual (January 2015)	Business license application	Department of Commerce or Energy	8 businesses /year
Number of trainings on solar PV installation	Quantitative	Monthly	Training workshop reports	Department of Energy	1 training /month
% share of solar PV in electricity mix	Quantitative	Annual (January 2015)	Electricity generation data	Department of Energy	5%

10.3 Monitor indicators over time

Monitoring of indicators helps to track performance of the policy or action over time. It is a *key recommendation* to identify the key performance indicators that is used to track performance of the policy over time.

For each characteristic included in the assessment, users identify indicators to monitor performance of the policy or action over time. Appendix B provides examples of indicators for process and outcome characteristics of transformational change. Section 7.3 also discusses selection of indicators to assess policy or action's impact in relation to the starting situation. When selecting indicators, users consider the intended objectives of monitoring, the nature of the policy or action, the characteristics being assessed, stakeholder priorities, and technical feasibility. Technical feasibility, in turn, may depend on data availability and resources needed and technical capacity to collect data.

An inclusive stakeholder consultation process can help ensure the relevance and completeness of selected indicators. The ICAT *Stakeholder Participation Guidance* provides further guidance on designing and conducting consultations (Chapter 8).

It is a *key recommendation* to monitor each indicator over time in line with the monitoring plan. Users take monitoring results into account when estimating transformational impacts ex-post. If monitoring indicates that the estimates underlying the qualitative scores used in the ex-ante assessment are no longer valid, users should document the differences and use the monitoring results to update the ex-ante estimates.

Institutional arrangements for coordinated monitoring

Information on key performance indicators can be dispersed among different institutions. Given the wide variety of data needed for impact assessment and a range of different stakeholders involved, strong institutional arrangements play a central role in coordinating monitoring activities. A technical coordinator, or a coordinating team can be assigned to lead monitoring, data collection and management even as responsibilities are delegated to different institutions. Users may wish to entrench these roles in institutions responsible for monitoring of NDCs and/or national climate or development plans to bring greater efficiency. This also reduces the risk of funding gaps for monitoring over long periods. Further, depending on the data sources identified, it may be worthwhile to pursue formal partnerships or Memorandums of Understanding (MoUs) for longer-term data collection and assess opportunities such as census to gather key data.

It can be useful to embed a collection of key indicators within the data gathering system of a relevant ministry, agency or department, or identify another existing reporting system within which specific key indicators could be housed. Countries may already have monitoring institutions in place as part of their national MRV system. Users can expand the national MRV system to also monitor the impact of the policy.

Where strong institutional arrangements do not yet exist, countries can identify a coordinating body with adequate capacity and authority to be responsible for monitoring. And if necessary, provide a legal mandate to the coordination body to collect and monitor information. Given the longer-term nature of transformational change, a key consideration is to appropriately budget for monitoring and analysis, and secure the necessary financial resources. Institutional mandates strengthen the procedures and the system, and can help ensure funding.

11. REPORTING

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

Checklist of key recommendations

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

11.1 Recommended information to report

It is a *key recommendation* to report information about the assessment process and the transformational impacts resulting from the policy (including the information listed below). Refer to the ICAT *Stakeholder Participation Guidance* for guidance about providing information to stakeholders (Chapter 7).

Chapter 2: Objectives

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

Chapter 4: Key concepts, steps, and assessment principles

- Opportunities for stakeholders to participate in the assessment
- List the principles on which the assessment is based

Chapter 5: Describing the policy or action and the transformational change vision

- Whether the assessment applies to an individual policy/action or a package of related policies/ actions, and if a package is assessed, which policies and actions are included in the package
- A description of the policy or action (or package of policies or actions) (including the information in Table 5.1)

Describe the policy or action's vision for transformational change (including information in

- Table 5.2)
- Whether the assessment is ex-ante, ex-post, or a combination of ex-ante and ex-post

Chapter 6: Choosing which transformational change characteristics to assess

- Description of relevant transformational change characteristics of the policy or action (including information in Table 6.4 and Table 6.5)
- The assessment boundary in terms of geographical and sectoral coverage
- The assessment period

Chapter 7: Assessment of the starting situation

- Identified barriers to transformational change specific to the phase of transformation (including information in Table 7.1)
- The starting situation for characteristics impacted by the policy or action (including information in Table 7.2 and Table 7.3)

Chapter 8: Estimating impacts ex-ante

- The final ex-ante assessment result expressed in terms of the extent of transformation expected and the likelihood that the expected transformation can be realised over the assessment period, including the underlying rationale
- Disaggregated results in terms of the policy or action's expected impact on individual characteristics (including the information in Table 8.4, Table 8.5, Table 8.6 and Table 8.7)

Chapter 9: Estimating impacts ex-post

- The final ex-post assessment result expressed in terms of the extent of transformation achieved and the likelihood that the transformation is sustained over time, including the underlying rationale for the conclusions

Disaggregated results in terms of the policy or action's impact on individual characteristics using indicators (including the information in Table 9.2, Table 9.3, Table 9.4 and

- Table 9.5)

Chapter 10: Monitoring performance over time

- The monitoring period
- The performance of the policy or action over time, as measured by the indicators, and whether the performance of the policy or action is on track relative to expectations
- Whether the assumptions on key indicators within the ex-ante assessment remain valid, if relevant

PART V: DECISION MAKING AND USING RESULTS

12. LEARNING, DECISION MAKING AND INTERPRETING RESULTS

Interpreting the assessment results is important for learning and decision making to promote transformational change for climate and sustainable development goals. This chapter provides guidance on how to understand assessment results and apply insights gained at different stages of planning and implementation in the policy and action cycle.

12.1 Understanding assessment results

Learning from results is an integral part of an assessment exercise. It is important that users understand the benefits as well as the limitations of transformational change assessment to make the best use of the results.

The assessment that has been described here is to a large extent qualitative and based on expert judgment. This is not a shortcoming but a simple reality to be kept in mind. It does mean, however, that the assessment is limited by the extent of human knowledge about complex inter-acting systems and their processes. Users should seek to be realistic about these types of predictions and not be deterred by the fact that the outcome may not be exactly what had been expected. It is better to be approximately right than exactly wrong.

Ex-ante assessment for transformational change, in particular, involves high uncertainty given the unpredictable nature of how complex systems evolve over long-term. Uncertainty increases when the objective is to seek a deviation from established pathways. This rules out the use of established methods of predicting future development based on past experiences of trends and drivers. Ascertaining what triggers this deviation and what magnitude of change can be expected is highly speculative. This is one reason why this guidance focuses on the transparency of reporting of assumptions and choices made.

There is a lot of flexibility provided at each step in applying the assessment framework, as the guidance is applicable for a wide variety of policies and actions. Different choices made during the assessment, however, limit the comparability of results between different assessments.

Despite these limitations, the assessment results can greatly aid in prioritising policies, modifying existing interventions to enhance their transformational potential, and shortlisting actions for financial support. Depending on the objective of the assessment, users will want to look deeper at different aspects of the results of the assessment described within this guidance. Also, depending on the case, disaggregated and singular results (for example, the assessment of high upfront investment costs as a barrier to achieving impact on the *entrepreneurs* characteristic) can be more helpful than aggregated and numerical results (for example, a numerical score at the category level stating that the expected impact of the policy for technology change is ‘3’).

12.2 How to apply results

As outlined above, the assessment of transformational impact is not an exact science but a learning exercise that can provide valuable insights and support decision making. How to use which type of results from the assessment (e.g., at a more or less aggregate level) depends strongly two factors:

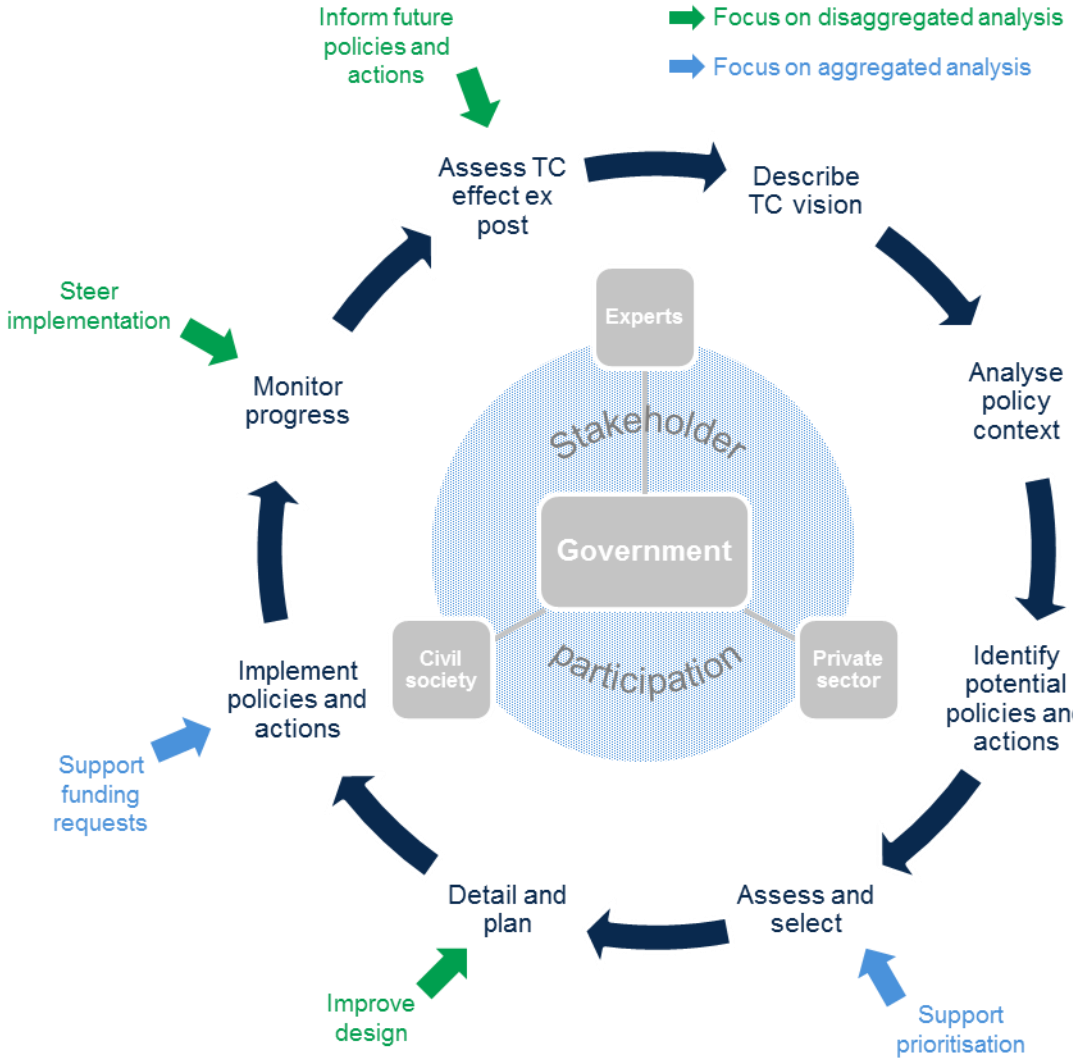
- The objective of the assessment

- The status of the policy or action in the implementation cycle

The assessment will either be carried out by the entity (or entities) that is also planning and implementing the policy or action (or commissioned by this entity), or by an independent user not responsible for policy implementation. Independent users could for example be research organisations, private consultants or civil society groups. The objectives of assessing a policy or action at the various stages of implementation may differ between these two groups. The usefulness of more or less aggregate results for independent assessments will strongly depend on the objective of the assessment. In the following we therefore concentrate on the usefulness of results for those entities planning and implementing the assessed measures.

Figure 12.1 illustrates when aggregated results (e.g., at category level) versus disaggregated results (e.g., at characteristic level) are useful to consider in the policy implementation cycle. Refer to Chapter 6, Figure 6.2 for an illustration of the levels (characteristic, category and type) for assessment of transformational impact.

Figure 12.1: Usefulness of transformational change assessment at different stages of policy planning and implementation



Support prioritisation and inform policy design options

An aggregated result describes the extent of transformation expected or achieved by the policy or action as well as how likely it is that the impact can be achieved. This enables comparison and prioritisation of policy options early in the implementation cycle. However, users should exercise great caution in comparing results, and ensure that the methodology applied and choices made to assess various policies do not render the results incomparable. Further, transformational change assessment is likely to be one among many factors (such as resources needed, effects on stakeholders, sustainable development benefits) considered in decision making.

Disaggregated results are more useful to support the design of policies and actions. The greater level of detail can indicate areas of weaknesses and whether barriers are adequately addressed in policy design.

Support funding requests to attract finance

Both aggregated and disaggregated results can support funding requests to potential donors and make the case for the proposed intervention. It is important to note, however, that individual donor organisations may have a different definitions and criteria for transformational change from the one used in this guidance document. At the same time, there is sufficient flexibility in the guidance to enable users to utilise the results for various purposes.

Steer implementation and inform future policies

Detailed results from assessment conducted during implementation help understand if the policy or action is on track, allow for course modifications if needed, and address new barriers or those that may have been overlooked in the design stage. Disaggregated level information from ex-post assessment can also inform the design of future policies and actions by providing valuable insights on what worked and reasons for not achieving the desired impact, thus contributing towards future planning.

APPENDIX A: STAKEHOLDER PARTICIPATION DURING THE ASSESSMENT PROCESS

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

Table A.1: List of steps where stakeholder participation is recommended in transformational impact assessment

Chapter/step in this guidance document	Why stakeholder participation is important at this step	Relevant chapters in *Stakeholder Participation Guidance*
Chapter 2 – Objectives of assessing transformational change	• Ensure that the objectives of the assessment respond to the needs and interests of the stakeholders	Chapter 5 – Identifying and understanding stakeholders
Chapter 4 – Steps and assessment principles • Section 4.2 Overview of steps - planning the assessment	• Build understanding, participation and support for the policy or action among stakeholders • Ensure conformity with national and international laws and norms, as well as donor requirements related to stakeholder participation • Identify and plan how to engage stakeholder groups who may be affected or may influence the policy or action • Coordinate participation at multiple steps for this assessment with participation in other stages of the policy design and implementation cycle and other assessments	Chapter 4 – Planning effective stakeholder participation Chapter 5 – Identifying and understanding stakeholders Chapter 6 – Establishing multi-stakeholder bodies Chapter 9 – Establishing grievance redress mechanisms
Chapter 5 – Describing the policy or action and the transformational change vision • Section 5.2 Describe the vision for transformational change of a policy or action	• Reflect diverse stakeholder interests and concerns in the vision for transformational change	Chapter 5 – Identifying and understanding stakeholders Chapter 6 – Establishing multi-stakeholder bodies/structures
Chapter 6 - Choosing which transformational change characteristics to assess • Section 6.2 Choosing transformational change	• Enhance completeness of identification of transformational change characteristics with stakeholder insights • Ensure indicators and frequency of	Chapter 8 – Designing and conducting consultations

characteristics to be assessed	monitoring reflect stakeholder interests and information needs	
Chapter 7 – Assessment of the starting situation • Section 7.2 Identify barriers to transformational change	• Improve identification of barriers to transformational change with stakeholder insights	Chapter 8 – Designing and conducting consultations
Chapter 8 – Estimating transformational impacts ex-ante • Section 8.1 Assess barriers • Section 8.2 Assess characteristics	• Improve identification of barriers to transformational change with stakeholder insights • Minimise subjectivity and bias by integrating diverse stakeholder insights on estimated future changes of transformational characteristics	Chapter 5 – Identifying and understanding stakeholders Chapter 6 – Establishing multi-stakeholder bodies/structures Chapter 8 – Designing and conducting consultations
Chapter 9 – Estimating transformational impacts ex-post • Section 9.2 Assess characteristics	• Improve scoring of changes in transformational characteristics with stakeholder insights	Chapter 8 – Designing and conducting consultations
Chapter 10 – Monitoring performance over time • Section 10.1 Define the monitoring period and frequency • Section 10.3 Monitor indicators over time	• Ensure monitoring frequency addresses the needs of decision makers and other stakeholders • Ensure relevance and completeness of indicators to be monitored	Chapter 5 – Identifying and understanding stakeholders Chapter 8 – Designing and conducting consultations
Chapter 11 – Reporting	• Inform decision makers and other stakeholders about transformational impacts • Increase accountability and transparency and thereby credibility and acceptance of the assessment	Chapter 7 – Providing information

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APPENDIX B: EXAMPLES OF INDICATORS FOR PROCESS AND OUTCOME CHARACTERISTICS

This appendix provides examples of indicators for various process and outcome characteristics.

Table B.1: Examples of outcome indicators

Category	Characteristics	Indicators	References
Scale of outcome	Macro level	• Achievement of global Sustainable Development Goals in percentage • Share of total GHG emission reductions or removals globally, regionally, by sector or subsector • Share of zero carbon emissions in electricity generation compared to global best practices • Average total emissions per KWh • Increase in renewable energy use (e.g. solar or wind) X times compared to the starting situation • Phase out of coal - number of new investments in coal plants • Phase out of fossil fuel - number of new investments in fossil fuel plants	• IEA. 2017. *Metrics for energy sector decarbonisation 2015*. Available at: https://www.iea.org/etp/tracking2015/figures/metrics/ • UN. 2016. *Final List of Proposed Sustainable Development Goal Indicators*. Available at: https://unstats.un.org/sdgs/iaeg-sdgs/report-iaeg-sdgs/. • Vieweg, M., & Noble, I. 2013. *Options for Resource Allocation in the Green Climate Fund (GCF)*. Incentivising Paradigm Shift Within the GCG Allocation Framework. Background Paper 2.
	Medium level	• Achievement of national Sustainable Development Goals in percentage • Limits to growth of final energy use in the sector or subsector targeted to X% compared to the starting situation • Capacity share of zero carbon emissions • Subsector energy intensity • Final energy fuel share by sector or subsector • Phase out of coal - number of investments in new coal plants • Phase out of fossil fuel - number of new investments	Same as above
	Micro level	• Achievement of subnational or local sustainable development targets • New-build emissions intensity • Equipment energy performance • Per capita energy use and emissions intensity • Passenger energy use and emissions intensity	Same as above

		• Phase out coal - number of investment in new coal plants • Phase out fossil fuel - number of new investments	
Outcome sustained over time	Long-term	• By 2100 phase out of all fossil fuels • By 2050 phase out of coal plants • By 2050 achieve enhanced Sustainable Development Goals	Same as above
	Medium term	• By 2030 achieve the global and national Sustainable Development Goals • By 2030 phase out of X% of coal plants • Accelerate energy efficiency by limiting growth of final energy use in the sector or subsector targeted to X% by 2030 compared to the starting situation	Same as above
	Short term	• By 2020 achieve X% of the Sustainable Development Goals • By 2020 phase out of X% of coal plants • Accelerate energy efficiency by limiting growth of final energy use in the sector or subsector to X% by 2020 compared to the starting situation	Same as above

Table B.2: Examples of process indicators

Category	Characteristics	Indicators	References
Technology	Research and development	• R&D investments/funding • Patents registered (applied) • Number of centres, think tanks, or institutes of learning • Number of trainings, rate of participation • Number of new testing/Lab facilities • Number of new business models with an element of innovation	• Bergek, A., Jacobsson, S., Carlsson, S., Lindmark, S., and Rickne, A. 2008. *Analysing the functional dynamics of technological innovation systems: A scheme of analysis.* Research Policy, (37), 3, 407-429 • Laursen, K., & Salter, A. 2004. *Searching high and low: what types of firms use universities as a source of innovation?* Research policy, 33(8), 1201-1215.
	Adoption	• Number of new businesses/start-ups • Number of new business models • Number of product or process innovations • Documented examples of incremental and radical innovations • Number of awards for innovation development	• OECD. 2005. *Oslo Manual, Guidelines for collecting and interpreting Innovation data, 3rd Edition*. Organisation for Economic Cooperation and Development (OECD), Paris. • Fageberg, J. 2005. *Innovation: A guide to the Literature*. in Fagerberg, J., et al. (eds.) The Oxford Handbook of Innovation, Oxford University Press, Oxford.

	Scale up	• Number of workshops, platforms for knowledge sharing among industry associations etc. • Number of new demonstration projects initiated • Number of projects replicating state-of-the-art technology (ongoing) • Number of projects implemented (with economies of scale) • Number of government services to support adoption of new technologies	• Nygaard, I., & Hansen, U. 2015. *Overcoming Barriers to the Transfer and Diffusion of Climate Technologies*. 2nd ed. UNEP DTU Partnership. TNA Guidebook Series • Nemet, G. 2009. *Demand-pull, technology-push, and government-led incentives for non-incremental technical change*. Research Policy, 38, 700–709 • Michael, P. Schneider, M., Griesshaber, T., Hoffmann, V. 2012. *The impact of technology-push and demand-pull policies on technical change – Does the locus of policies matter?* Research Policy, 41(8), 1296–1308.
Agents	Entrepreneurs	• Number of new entrepreneurs and new entrants in the low carbon sectors • Provision of training in entrepreneurship • Incentives provided for new entrepreneurs (subsidies, seed funding for SMEs, research support etc.) • Number of PPP projects • Volume of venture capital investments • Share of private funding and public funding • MOUs signed, Projects under pipeline • New models of partnerships formed with government/firms and donors	• Langevang, T., Namatovu, R. and Dawa, S. 2012: *Beyond necessity and opportunity entrepreneurship: motivations and aspirations of young entrepreneurs in Uganda, International Development Planning Review*. 34(4), 242-252. • Kemp. R., Schot, J., Hoogma, R., 1998. *Regime Shifts to Sustainability Through Processes of Niche Formation: The Approach of Strategic Niche Management*. Technology Analysis and Strategic Management 10, 175-195
	Coalitions of advocates	• Trade expos, business shows, workshops, conferences, seminars • University-industry collaboration • Number of linkages across research institutions • Research grants and research projects • Consultancy projects • Industry associations created to enhance firm cooperation • Number of lobby groups (organisations or committees that are committed to low carbon development and have been	• Lundvall, B. (ed.) 1992. *National Innovation Systems: Towards a Theory of Innovation and Interactive Learning*. Pinter, London. • Hekkert, M., Negro, S., Heimeriks, G., & Harmsen, R. 2011. *Technological innovation system analysis*. Faculty of Geosciences Utrecht University • Kebede, K., Mitsufuji, T., Choi, E. 2014. *Looking for innovation system builders: A case of Solar Energy Foundation in Ethiopia*. African J. Sci. Technol. Innov. Dev. 6, 289–300. • Ockwell, D., Byrne, R., 2015.

		established or significantly strengthened/actively lobbies for changes) • Number of advocacy programs, campaigns and initiatives • Civil society organisations denouncing unsustainable, high-carbon practices and behaviour • Community surveys/preferences denouncing the outreach of unsustainable practices • Number of leaders, authorities bringing up /promoting/demonstrating zero-carbon development practices and changed behavior	*Improving technology transfer through national systems of innovation: climate relevant innovation-system builders (CRIBs)*. Clim. Policy 1–19 • Hellsmark, H., Jacobsson, S., 2009. *Opportunities for and limits to Academics as System builders-The case of realising the potential of gasified biomass in Austria*. Energy Policy 37, 5597–5611. • NAMA Facility Monitoring and Evaluation Guidance for NAMA Support Projects (Sep 2015), Annex 4
	Beneficiaries	• Number of grassroot campaigns in favor of low carbon practices	
Incentives	Economic and non-economic incentives	• New subsidies: tariff structures such as renewable energy obligations, feed-in tariffs, renewable energy auctions, VAT exemption • New MOUs signed • New projects under pipeline • New models of partnerships formed with government/firms and donors (f.e. models that create access to resources and services thus incentivising conscious behaviour towards resource use)	• Johnstone, N., Haščič, D. Popp, D. 2010. *Renewable Energy Policies and Technological Innovation: Evidence Based on Patent Counts*. Environmental and Resource Economics, 45(1), 133–155. • Butler, L. & Neuhoff, K. 2008. *Comparison of feed-in tariff, quota and auction mechanisms to support wind power development*. Renewable Energy, 33(8), 1854–1867. • Norberg-Bohm, V. 2000. *Creating incentives for environmentally enhancing technological change: lessons from 30 years of US energy technology policy*. Technological forecasting and social change, 65(2), 125-148. • Westley, F., Olsson, P., Folke, C., Homer-Dixon, T., Vredenburg, H., Loorbach, D., & Banerjee, B. 2011. *Tipping toward sustainability: emerging pathways of transformation*. Ambio, 40(7), 762-780 • Painuly, P. (2001) Barriers to renewable energy penetration; a framework for analysis. Renewable Energy, 24, 73–89. • Gallastegui, i. 2002. *The use of Eco-labels: a review of the literature*. European Environment 12, 316–331. • Kiss, B., Manchón, C. & Neij, L.

			2013. *The role of policy instruments in supporting the development of mineral wool insulation in Germany, Sweden and the United Kingdom*. Journal of Cleaner Production, 48, 187–199.
	Disincentives	• Disincentives provided via carbon pricing/tax, increase in petrol/diesel prices, car registration tax etc.	• Wesselink, J., Niesten, E., Faber, J., Hekkert, M. 2013. *Business Strategies of Incumbents in the Market for Electric Vehicles: Opportunities and Incentives for Sustainable Innovation*. Business Strategy and the Environment, 24, 518–531. • Hansen, T. & Coenen, L. 2016. *Unpacking resource mobilisation by incumbents for biorefineries: the role of micro-level factors for technological innovation system weaknesses*, Technology Analysis and Strategic Management, forthcoming.
	Institutional and regulatory	• Number of new regulations and institutions to promote low carbon practices	
Norms	Awareness	• Number of open debates/ statements/publications highlighting the insufficiency of current practices • Number of leaders/organisations pushing/heading debates questioning current practices and pathways and lobbying for behavioural change • Number of information workshops and such platforms • Number of awareness generation programs through private sector or business associations etc. • Number of initiatives targeting public opinion in ethical and moral issues (e.g. agenda setting)	• Nygaard, I., & Hansen, U. 2015. *Overcoming Barriers to the Transfer and Diffusion of Climate Technologies*. (2nd ed.) UNEP DTU Partnership. TNA Guidebook Series • Wüstenhagena, R., Wolsink, M., Bürera, M. 2007. *Social acceptance of renewable energy innovation: An introduction to the concept*. Energy Policy, 35(5), 2683–2691.

	Behaviour	• New Government persuasion programs, appealing to the collective conscious through the medium of advertising • New Government enforcement programs and initiatives, compelling changed behaviour • Policies targeting change in the norms and rules (e.g. dynamic pricing regulation) • No of young leaders trained (future generation to keep momentum and sustained change and even 'more' change in case necessary) • Number of leadership awards announced for public demonstration of changed behaviour • Number of governmental agents/services supporting the adoption of new technologies and changed behaviour	• McAdams, R. H. 1997. *The origin, development, and regulation of norms*. Michigan Law Review, 96(2), 338-433. • Shove, E. (2003). Converging conventions of comfort, cleanliness and convenience. Journal of Consumer policy, 26(4), 395-418. • Lapinski, M. K., & Rimal, R. N. 2005. *An explication of social norms*. Communication Theory, 15(2), 127-147. • Kinzig, A. P., Ehrlich, P. R., Alston, L. J., Arrow, K., Barrett, S., Buchman, T. G., ... & Ostrom, E. 2013. *Social norms and global environmental challenges: the complex interaction of behaviours, values, and policy*. BioScience, 63(3), 164-175.
	Social norms	• New regulatory standards, e.g. mandatory emission levels • New laws making previous behaviour illegal • Number of users affected • Services affected (e.g., energy savings, change in public • Checks and balances introduced to prevent fall-backs into previous practices and behaviour	• Barbu, A., Griffiths, N., & Morton, G. 2013. *Achieving energy efficiency through behaviour change: what does it take?* European Environment Agency-Copenhagen: Publications Office of the European Union. • Ambec, S., Cohen, M., Elgie, S:, Lanoie, P. 2013. *The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness?* Rev Environ Econ Policy, 7(1), 2-22. • Maia David, M., Sinclair-Desgagné, B. 2005. *Environmental Regulation and the Eco-Industry*. Journal of Regulatory Economics 28(2), 141–155.

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APPENDIX C: COMPILING THE ASSESSMENT USING A MATHEMATICAL APPROACH

This appendix offers the option to use a mathematical approach to aggregate each barrier and characteristic assessment to higher levels. The general methodology outlined in previous chapters remains valid, supplemented by a few additional steps included in this appendix. The tables and method in this appendix are therefore not replacing previous chapters but provide supplementary information.

To follow a mathematical approach all the qualitative results from the assessment of transformational processes and outcomes need to be translated to numerical values. These need to be weighted and can then be aggregated to the next level, using a mathematical equation. The following sections provide the individual steps to translate the qualitative scores in Chapter 8 (ex-ante assessment) to numerical values. For Chapter 9 (ex-post assessment), the method of aggregation is in principle the same, however, the specific steps are not described in this appendix.

C.1 Assess barriers to transformational change

Step 1: Assess impact of barriers on transformational change characteristics

Numerical values: to allow for a relatively simple way of assessing how the qualitative evaluation of barriers and characteristics translates to an overall assessment, numerical values are assigned to the qualitative scores in Table 8.1. Barriers serve as modifiers for the assessment of the characteristics in such a way that the extent to which the characteristic can be achieved will be reduced.

Table C.1 provides the default numerical values for each possible qualitative value on a scale from 0-1. A value of “0” signifies that effectiveness will be reduced by 100%, a value of “0.5” that effectiveness will be reduced by 50%. Users can apply their own values for individual barriers and describe the rationale in Table C.2.

Table C.1: Numerical values for scoring barriers

Scale	Comments	Numerical default values
High impact	The barrier has the potential to completely counteract the envisaged effect of the characteristic	0
Medium impact	The barrier is expected to have a medium impact on the achievement of a characteristic	0.5
Low impact	The barrier is expected to have a very limited impact on the achievement of a characteristic	0.9

Table C.2: Template for reporting on barrier impact

Barrier	Characteristic affected	Barrier score	Rationale
Limited availability of technology	Adoption	0.1	Lack of a strong domestic solar manufacturing industry negatively affects the adoption of solar PV within the country as it keeps the costs high

			due to dependency on imports
Lack of technical personnel for installation and maintenance	Economic incentive	0.5	Lack of trained technicians for solar PV installation implies that staff needs to be hired abroad. This will increase cost that can outweigh the economic incentive from the feed-in tariff and financial subsidy
High upfront financial investment needed for solar PV	Entrepreneurs	0.2	Lack of financial instruments to support customers in financing solar PV impedes the growth of private sector

Step 2: Determine aggregate impact of barriers

The analysis of barriers can result in more than one barrier affecting a single characteristic. To integrate the barrier analysis with the assessment of characteristics, we need to aggregate results to identify how all barriers are likely to affect the overall performance of the characteristic. For this two elements are needed:

- Numerical values
- Weighting factors

Weighting factors are only required if more than one barrier affect the same characteristic. Otherwise, the barrier numerical values can directly be used as the barrier score for a characteristic (as illustrated in Table C.4).

Weighting factors: these factors determine the relative importance of different elements. This relative importance will strongly depend on the exact nature of the policy or action, national circumstances and priorities. The default assumption is that all barriers are equally important, but users can choose to define individual weights and document these using Table C.3.

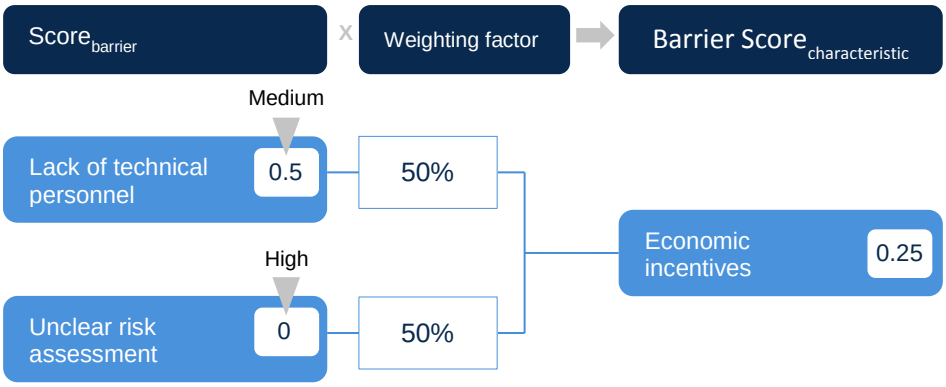
Table C.3: Template for describing user-specific weighting factors for barrier aggregation illustrated for a single characteristic – solar PV example

Characteristic	Barrier	Barrier score	User-specific weighting factor	Rationale
Economic incentives	Lack of technical personnel	0.5	50%	The lack of technical personnel increases the costs of solar PV and reduces the effect of a feed-in tariff. This barrier is estimated to be equally important to other barriers.
	Unclear risk assessment	0	50%	Continued support to fossil fuel based electricity production provides an unknown risk that high-carbon lighting may be cheaper than low-carbon lighting. This barrier is estimated to be equally important to other barriers.

Figure C.1 illustrates the process of aggregation. The score values for each barrier are multiplied with the weighting factor and all values across a characteristic are added up, following the equation:

$$Barrier\ score_{characteristic} = \sum (score_{barrier} \times weighting\ factor)$$

Figure C.1: Map for aggregation of barrier assessment



For the example presented in Figure C.1, the calculation is:

(0 x 0.5) + (0.5 x 0.5) = 0.25 = 25%

For each characteristic, where barriers have been identified, the aggregate value of the identified barrier(s) should be described using Table C.4. The barrier score for characteristics with just one barrier are included in the table.

Table C.3: Template for describing aggregate impact of barriers – solar PV policy example

Characteristic	Aggregate barrier score for the characteristic
Economic incentives	0.25
Adoption	0.1
Entrepreneurs	0.2

C.2 Assessing characteristics

In line with the approach for barrier assessment, the assessment of characteristics also needs to be expressed in numerical values as illustrated in Table C.5. The numerical values are the same as used in the main guidance Table 8.3.

Table C.5: Numerical values for scoring characteristics

Numerical values	Description of scale
Process characteristics	
3	If a characteristic represents a key element of the policy or action design, and there are no or only low impact barriers to implementation, it can realistically be expected that the policy

	or action will impact this characteristic over the assessment period
2	If a characteristic is an important part of the policy or action design but not the main focus and there are medium impact barriers to implementation, it can realistically be expected that the policy of action will directly or indirectly impact this characteristic over the assessment period
1	If a characteristic is not an important part of the policy or action and there are high impact barriers to implementation, it is less likely that the policy or action will directly or indirectly impact this characteristic over the assessment period
0	If a characteristic is not at all a part of the policy or action, it is unlikely that the policy or action will impact this characteristic over the assessment period
Outcome characteristics – scale	
3	The policy or action results in GHG and sustainable development impacts that relative to the starting situation represent large emission reductions and significant, positive sustainable development impacts at the level of assessment targeted
2	The policy or action results in GHG and sustainable development impacts that relative to the starting situation represent moderate emissions reductions and moderate, positive sustainable development impacts at the level of assessment targeted
1	The policy or action results in GHG and sustainable development impacts that relative to the starting situation represent minor emission reductions and minor, positive sustainable development impacts at the level of assessment targeted
0	The policy or action does not result in GHG and sustainable development impacts relative to the starting situation at the level of assessment targeted
-1	The policy or action results in GHG and sustainable development impacts that relative to the starting situation represent a net increase in emissions or negative sustainable development impacts at the level of assessment targeted
Outcome characteristics – time	
3	The policy or action results in GHG and sustainable development impacts that are to be sustained within the assessment period
2	The policy or action results in GHG and sustainable development impacts that are likely to be sustained within the assessment period
1	The policy or action results in GHG and sustainable development impacts that are less likely to be sustained within the assessment period
0	The policy or action results0020in GHG and sustainable development impacts that are not expected to be sustained within the assessment period

C.3 Aggregating the assessment

The principles related to the aggregation of barrier scores also apply to the overall aggregation. In this step, however, the characteristic scores and the corresponding barrier scores are aggregated to the category level and then to the process level.

Step 1: Aggregating characteristics

Users can choose to apply their own priorities by changing the default weighting factors. The weighting factors are expressed with percentage points to indicate the relative importance of both characteristics and categories of transformational change. The relative importance of characteristics within a category are assessed independent of the relative importance of categories, as weighting factors are determined at each level of assessment. For example, the default weighting factor of each characteristic is 25% and the sum of weighting factors in the *technology* category is 100%. Likewise, the default weighting factor for each category is 25% and the sum of weighting factors of all four categories is 100%. User-specific weighting factors will in most cases better reflect the specific characteristics of the policy or action assessed. They do, however, reduce comparability of assessments.

Users should provide a rationale for the user-specific weighting factors in Table C.6. Weighting factors should be determined together with the assessment of characteristics, using a stakeholder and expert consultation approach, supported by relevant literature and taking into consideration the phase of transition as identified in Chapter 7.

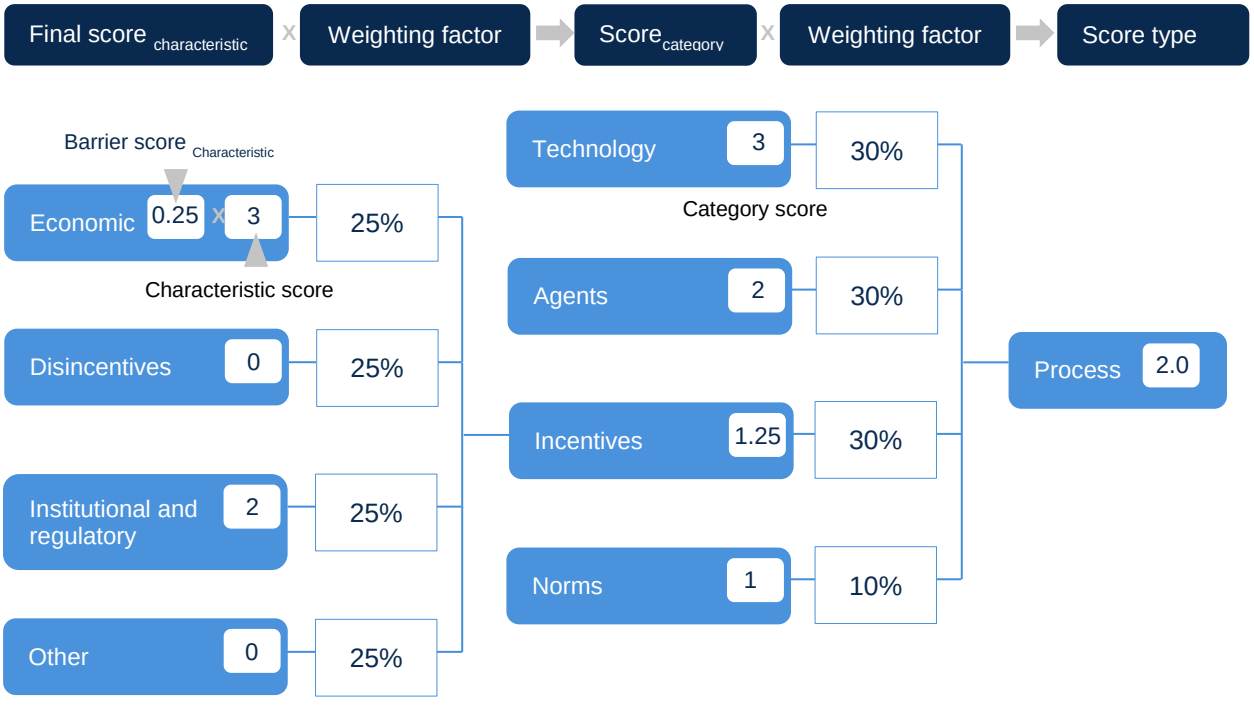
Table C.6: Template for describing user-specific weighting factors for aggregation of characteristics

Category	Characteristic	Default weighting factor	User-specific weighting factor	Rationale
Technology		25%	30%	The country is still in the pre-development phase, which emphasises the importance of introducing new solar PV technology
	Research and development	25%		
	Adoption	25%		
	Scale up	25%		
	Other	25%		
Agents		25%	30%	Entrepreneurs who can introduce and lead technology penetration is equally important to technology change
	Entrepreneurship	25%		
	Coalitions of advocates	25%		
	Beneficiaries	25%		
	Other	25%		
Incentives		25%	30%	In a developing country context the role of financial incentives is crucial to support technology and agents of change
	Economic and non-economic	25%		

	Disincentives	25%		
	Institutional and regulatory	25%		
	Other	25%		
Norms		25%	10%	Demonstrating the benefits of solar PV technology is more important than changing norms in society at this early stage of transition
	Awareness	25%		
	Behaviour	25%		
	Social norms	25%		
	Other	25%		

Figure C.2 illustrates the process of aggregation.

Figure C.2: Map for aggregation to category and type



The score values for characteristics and barrier assessment are multiplied to get the final assessment of the characteristic using the following formula:

$$Final\ score_{characteristic} = score_{characteristic} \times barrier\ score_{characteristic}$$

The result is then multiplied with the weighting factor as illustrated in Figure C.2. Finally, all values across a category are added up, following the equation:

$$Score_{category} = \sum (final\ score_{characteristic} \times weighting\ factor)$$

Score values for the categories are multiplied in the same way with their respective weighting factor to arrive at the score for the type (process or outcome). Table C.7 provides a template for describing the score values at category level. Although the examples use process characteristics, the same methodology for aggregation applies to the outcome characteristics. In principle the results can be used to inform and support the qualitative assessment conducted in Chapters 8 and 9, though the steps and examples are not yet fully developed for outcome characteristics and ex-post assessment.

Table C.7: Template for describing numerical values of the ex-ante analysis at category level

Type	Category	Score based on mathematical approach
Process	Technology	0.90
	Agents	0.60
	Incentives	0.38
	Norms	0.10
Outcome	Scale of outcome	2
	Outcome sustained over time	3

Step 2: Overall assessment

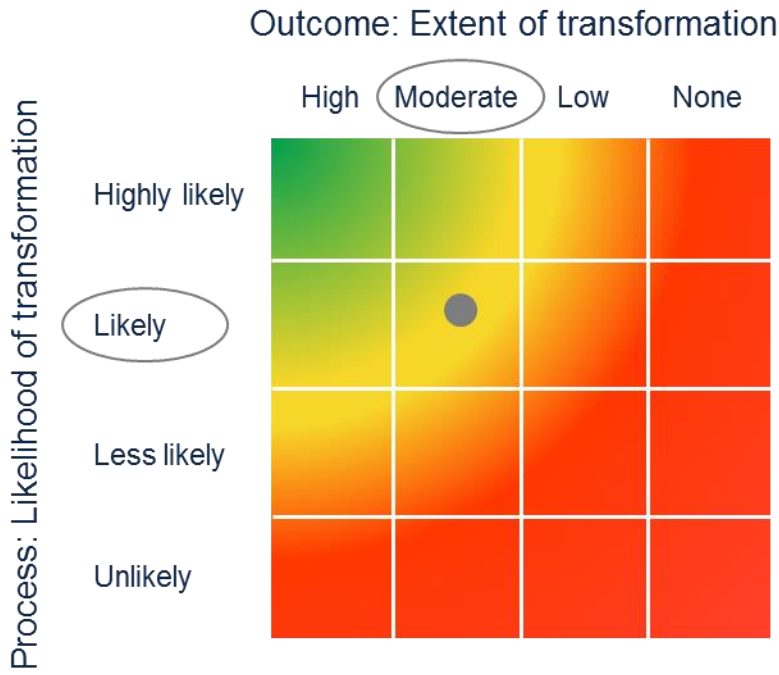
The previous step delivers an aggregated assessment of barriers and characteristic up to the level of different categories of transformational impact. Due to the different nature of outcome and process impacts, the scales for communicating results are different to better represent what the scoring aims to reflect. How the scores for outcome and process translate to the final qualitative result is provided in Table C.8.

Table C.8: Scale for scoring process and outcome impacts

Scale - numerical	Outcome - extent of transformation expected is	Process - transformational outcome is
2.6-3	High	Highly likely
1.6-2.5	Moderate	Likely
0.6-1.5	Low	Less likely
0-0.5	None	Unlikely

Figure C.3 provides an illustration of the matrix in which results are presented. Green areas indicate that a policy or action can be expected to be transformational. The qualitative nature of the analysis and the high uncertainty connected with the assessment are reflected in the colour gradient. Figure C.3 illustrates the result of the PV example using the matrix.

Figure C.3: Example for illustrating overall results for the PV illustrative example



ABBREVIATIONS AND ACRONYMS

EU	European Union
GHG	greenhouse gas
ICAT	Initiative for Climate Action Transparency
IPCC	Intergovernmental Panel on Climate Change
NDC	Nationally Determined Contribution
NGO	non-governmental organisation
MRV	Measurement, Reporting and Verification
PV	photovoltaic
R&D	research and development
RD&D	research, development and deployment
SDG	Sustainable Development Goal
SMART	specific, measurable, achievable, realistic, time-bound
SSSMART	scale, sustained nature, specific, measurable, achievable, realistic, time-bound
USD	United States Dollars
UNFCCC	United Nations Framework Convention on Climate Change
WRI	World Resources Institute

GLOSSARY

Assessment boundary	The scope of the assessment in terms of the range of transformational change characteristics that are included in the assessment and the geographical and sectoral coverage of the assessment
Assessment period	The time period over which transformational change impacts attributed to the policy or action are assessed. The assessment period can differ from the policy or action implementation period (the time period over which the policy or action is being executed) and the wider transformational change period (both historical and future changes)
Assessment report	A report, completed by the user, that documents the assessment process and the GHG, sustainable development and/or transformational impacts of the policy or action
Bottom-up data	Data that are measured, monitored, or collected at the facility, entity or project level
Bottom-up methods	Methods (such as engineering models) that calculate or model the impact of the policy or action for each facility, project, or entity affected by the policy or action, then aggregate across all facilities, projects, or entities to determine the total impact of the policy or action
Category of transformational change	A group of transformational characteristics that describe processes of change (technology, agents, incentives and norms) and outcomes of change (scale of outcome and sustained nature of outcome)
Characteristic of transformational change	An element or property of a system undergoing a transformation. A policy or action can result in changes of characteristics describing a system that lead to process of change and outcomes of change.
Ex-ante assessment	The process of assessing expected future transformational change impacts of policies and actions (i.e., a forward-looking assessment)
Expert judgment	A carefully considered, well-documented qualitative or quantitative judgment made in the absence of unequivocal observational evidence by a person or persons who have a demonstrable expertise in the given field (IPCC 2006).
Ex-post assessment	The process of assessing historical transformational change impacts of policies and actions (i.e., a backward-looking assessment)
Impact assessment	The qualitative or quantitative assessment of transformational impacts resulting from a policy or action, either ex-ante or ex-post

Impact type	A result of transformational change that describe the process of change and the outcome of change
Implemented policies	Policies and actions that are currently in effect, as evidenced by one or more of the and actions following: (a) relevant legislation or regulation is in force, (b) one or more voluntary agreements have been established and are in force, (c) financial resources have been allocated, or (d) human resources have been mobilised
Indicator of transformational change	For qualitative assessment: a variable that can be assessed to indicate the impact of the policy or action on a given characteristic of transformational change. For quantitative assessment: a metric that can be estimated or measured to indicate the impact of a policy or action on a characteristic of transformational change.
Monitoring period	The time over which the policy is monitored, which may include pre-policy monitoring and post-policy monitoring in addition to the policy implementation period
Outcome of transformational change	A transformational outcome is the change in GHG emission reductions and sustainable development impacts at scale and sustained over time resulting from a policy or action
Phase of transformation	A stage in the historical development of a system that undergoes an innovation and social transition process. Generic phases are pre-development, take-off, acceleration and stabilisation or relapse.
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 or 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; and public or private sector financing and investment, among others.
Policy implementation period	The time period during which the policy or action is in effect
Process of transformational change	A series of events describing how elements or characteristics of a system interact and change to reconfigure a system. Elements of a transformational change process are technology, agents, incentives and norms.
Stakeholders	People, organisations, communities or individuals who are affected by and/or who have influence or power over the policy
Starting situation	The current situation of a selected historical year before implementation of a policy or action that describes the phase of

	transition and the status of selected indicators as a benchmark to track performance against
Sustainable development impacts	Changes in environmental, social, or economic conditions that result from a policy or action, such as changes in economic activity, employment, public health, air quality, gender equality and energy security
System	A configuration of social and technical elements (characteristics of transformational change) forming a complex whole across three levels of society; micro, medium and macro
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
Transformational change	A fundamental, sustained change of a system that disrupts established high-carbon practices and contributes to a zero-carbon society in line with the Paris Agreement's 1.5-2 °C temperature goal and the UN Sustainable Development Goals
Transformational impact	Changes in system characteristics resulting from a policy or action described by processes and outcomes of transformational change with regard to greenhouse gas and sustainable development impacts at scale and sustained over time

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